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FASHION & TECHNOLOGY

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From Fig Leaves Forward: Fashion & Technological Advances in Historical Context

Technology has been a driving force in the fashion industry for millennia, from the emergence of jewelry and invention of the needle to the mechanized Jacquard loom and smart fabric. The legal implications of these technological advances are an equally significant part of fashion's story. In our first session, we will examine how law is interwoven into the fabric of the quintessential American garment: blue jeans, first patented by Levi Strauss and Co. in 1873. After this introductory historical overview, we will visit Stitch Fix and learn how its legal team is addressing issues raised by the use of data mining and artificial intelligence in today's tech-driven retail.

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F.I.T.: FASHION AS INFORMATION TECHNOLOGY

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INTRODUCTION

Before you begin reading, pause for a moment to picture an example of information and communications technology. Perhaps the first thing that came to mind was your laptop, iPod, or new mobile phone. Whatever image you envisioned, it probably wasn't a 100,000-year-old necklace,¹ a nineteenth-century loom,² or the latest designer handbag—yet those clothing and textile-related items exhibit the same information-related capacities as their digital descendants.

The use of technology to manage, process, or communicate information is a defining characteristic of the modern era. Even as digital technologies have become more prevalent in our lives, however, the

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1. See Marian Vanhaeren et al., *Middle Paleolithic Shell Beads in Israel and Algeria*, 312 *SCI. MAG.* 1785-88 (2006) (discussing the discovery of ancient jewelry and its significance).

2. See generally JAMES ESSINGER, *JACQUARD'S WEB: HOW A HAND-LOOM LED TO THE BIRTH OF THE INFORMATION AGE* (2004).

popular conception of “information technology”—and thus its scope as a tool of cultural and legal analysis—has narrowed.³ We suffer from a sort of digital blindness, able to draw upon and interpret the multiplicity of information sources surrounding us, but reluctant to analyze them according to the prevailing information technology paradigm.

At the same time that we have limited our focus with respect to information technology, we have elevated its importance in formulating the legal policies that promote creativity and regulate access to the means of production in the new Information Age.⁴ The spread of Internet communications has prompted increases in intellectual property protection for those with established creative investments,⁵ as well as arguments that such legal interference is a threat to evolving forms of expression.⁶ Debates over access to technology, including network neutrality, have developed along similar lines. Indeed, no reasonable person could deny that the rapid spread of new technologies over the past few decades requires careful attention and thoughtful analysis. The conceptual restriction of information technology to recently created digital platforms, however, unnecessarily confines our understanding of the broader phenomena of communication and dissemination of information and thus our ability to manage them productively.

The goals of this essay are twofold: first, to redirect attention to the broader realm of information and communications technology, of which fashion is a foundational medium; and second, to analyze fashion as an information technology in order to better understand the industry’s desire for intellectual property protection, popular resistance to such protection, and the most efficacious balance between them in terms of creative expression. My long-term research has focused on cultural and historical reasons for the limited degree of intellectual property protection extended

3. Over a decade ago, James Boyle offered a caution against unnecessarily narrow definitions of information itself, noting that it “does not need to be stored in ones and zeroes.” JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY 4 (1996).

4. See generally Joel R. Reidenberg, *Lex Informatica: The Formulation of Information Policy Rules Through Technology*, 76 TEX L. REV. 553 (1998) (offering early insight into the necessary integration of technology and policy).

5. E.g., Digital Millennium Copyright Act of 1998, Pub. L. No. 105-304, 112 Stat. 2860 (codified as amended in scattered sections of 17 U.S.C.).

6. Many significant works have raised structural concerns about the relationship between law and information production. See generally, e.g., YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* (2006); LAWRENCE LESSIG, *FREE CULTURE: HOW BIG MEDIA USES TECHNOLOGY AND THE LAW TO LOCK DOWN CULTURE AND CONTROL CREATIVITY* (2004); JESSICA LITMAN, *DIGITAL COPYRIGHT* (2001).

in the past to certain categories of human creativity, including fashion design.⁷ This essay turns to the question of why—despite shifting cultural attitudes and other conditions—some tension still exists between creators and consumers of fashion, how information theory can contribute to an explanation for that tension, and what role law can play in its resolution.

Beginning with Part I, the following pages explore the definition of information and communications technology and its legal parameters. Turning specifically to the clothing and textile industry, Part II focuses on both the historical role of fashion in conveying information and the production mechanisms that are direct historical antecedents of more recently developed information technologies. Part III discusses the bi-level nature of clothing and accessories as information technology; simultaneously embodying the designer's authorial voice and generating information on behalf of and about the wearer. Finally, Part IV identifies the dueling approaches to intellectual property law inherent in fashion's dual information identity and suggests a framework for their resolution.

Fashion, in simplest terms, is not merely an information technology, but an ancient, universal, and complex information technology. By examining it according to this rubric, we can gather insight into not only the concept of such technologies but also the particular characteristics of fashion that influence its relationship to intellectual property law. That fashion is a creative and communicative medium is a longstanding characteristic of human culture; that U.S. law must finally recognize it as such is a rational unfolding of information policy.

I. PATTERNS OF INFORMATION

Outside of the legal context, scholars invoke an expansive view of information technology to describe and understand a range of phenomena far beyond the telecom industry.⁸ Nothing is too vast or too minute, too simple or too complex, to function in an information theory context. Within the realm of human interaction, information exchange is the medium that can bind a culture together or, in its absence, result in chaos and collapse. Understood from this perspective, information processing is a vital function, and the law plays an important role by managing the flow of information and protecting the strength and clarity of individual

7. See generally SUSAN SCAFIDI, WHO OWNS CULTURE?: APPROPRIATION AND AUTHENTICITY IN AMERICAN LAW (2005); SUSAN SCAFIDI, COUNTERFEIT CHIC: THE REAL STORY OF FAKE FASHION (forthcoming 2009).

8. See, e.g., SETH LLOYD, PROGRAMMING THE UNIVERSE: A QUANTUM COMPUTER SCIENTIST TAKES ON THE COSMOS 3 (2006).

messages. Massachusetts Institute of Technology computer scientist Seth Lloyd, in his recent work *Programming the Universe*, observes that the universe itself is a natural form of information technology—“[e]very . . . particle registers bits of information [and e]very interaction between those pieces of the universe processes that information by altering those bits.”⁹ The patterns generated through this process give rise to new computational forms, from stars and planetary ecosystems to human language and culture, “a true information-processing revolution that has substantially changed the face of the Earth.”¹⁰

Lloyd’s research points to an important distinction between scientific and popular notions of information technology. As Charles Seife notes in his recent overview of information research, “The word *information* conjures visions of computers and hard drives and Internet superhighways; after all, the introduction and popularization of computers came to be known as the information revolution. However, computer science is only a very small aspect of an overarching idea known as information theory.”¹¹

To understand why, it is necessary to look past the narrow boundaries of information technology as the term is used by technicians and telecommunications experts. At the most fundamental level, information is a property of physical existence.¹² In Lloyd’s words, it is the means by which “one physical system . . . can be put into correspondence with another physical system.”¹³ Just as a computer language enables a laptop to convert keystrokes into paragraphs, the information in a particle shapes the distinct properties that we observe and measure.¹⁴ In the natural world, information processing determines the contours of all physical objects, from the heat of the sun to the ice in the tundra, as well as the changes that emerge when these objects interact.¹⁵

Our perception of the power of information processing has given rise to a diverse array of communications technologies designed to relate and transform. Perhaps the most familiar is abstract symbolic language, a communications medium that most people use every day.¹⁶ As with telephony, the medium in which Claude Shannon first elaborated the core

9. *Id.*

10. *Id.* at 209.

11. CHARLES SEIFE, *DECODING THE UNIVERSE: HOW THE NEW SCIENCE OF INFORMATION IS EXPLAINING EVERYTHING IN THE COSMOS, FROM OUR BRAINS TO BLACK HOLES 1* (2006) (emphasis in original).

12. *See* LLOYD, *supra* note 8, at 65.

13. *Id.* at 27.

14. *See id.* at 27-37.

15. *Id.* at 38-61.

16. *Id.* at 13.

principles of modern information theory,¹⁷ language raises the question of how to transmit information efficiently without the message degrading into incoherence.¹⁸ In this regard, grammar serves as an information technology that encodes optimal arrays for organizing semantic values. At a more basic level, the human voice is an information processing “technology” that itself “makes language possible” and in doing so facilitates “the uniquely human forms of social organization that have made our species so successful thus far.”¹⁹

Human language may be a ubiquitous mode of encoding information, but it is by far not the only one. Before information technology became synonymous with electronic computing in the popular mind, pioneering theorists in information theory and communications technology established the category’s greater breadth. For example, in his 1961 classic, *An Introduction to Information Theory: Symbols, Signals and Noise*, John Pierce, a California Institute of Technology professor and the inventor of communications satellite technology, expressly relates the physics of information to the identification of styles in art.²⁰ Music programs sound to create identifiable songs with discrete effects, while painting plots color and texture to create distinct images.²¹

Although we may be accustomed to speaking of such phenomena in more humanistic terms, they are as much modes of organizing relational data as the American Standard Code for Information Interchange (ASCII), the coding system that assigns identifiable symbols to patterns of digital bits. As Pierce observes, art, like telephony or radio, involves the transmission of distinct messages through communications media.²² In the same way a telecommunications engineer seeks to maintain the integrity of a spoken message as it travels through the wires or the airways, composers and painters leverage the dynamics of information processing to create distinct artistic forms. Both the artist and the engineer strive to maximize the efficiency of their respective encoding so as to enable the recipient of the message to identify the source and to perceive discrete patterns.²³

This broadened perspective on information technology similarly pervades the work of Marshall McLuhan, arguably the most influential

17. See generally CLAUDE E. SHANNON & WARREN WEAVER, *THE MATHEMATICAL THEORY OF COMMUNICATION* (paperback ed. 1998).

18. See JOHN R. PIERCE, *AN INTRODUCTION TO INFORMATION THEORY: SYMBOLS, SIGNALS & NOISE* 107-24 (2d rev. ed. Dover Publications 1980) (1961).

19. LLOYD, *supra* note 8, at 13.

20. PIERCE, *supra* note 18, at 250-67.

21. *Id.* at 252-53, 264-66.

22. *Id.* at 264-65.

23. See *id.* at 267.

theorist of the information age. As McLuhan observes, technology programs how people relate to their environment—it is, in short, a *techné*, or craft, in the fullest sense of the word, shaping not just the material out of which it is fashioned, but the users themselves.²⁴ While McLuhan is now best known for his observations regarding electronic media, his own work extends beyond it to examine how a wide range of technologies affect information processing, from the effect of clocks on our organization of time to the role of print in structuring both our physical and social environments.²⁵

Digital media and other modes of information processing are not, however, analogous in all respects. The logic of computer programming is binary; it reduces information to unambiguous alternatives, commonly represented as ones and zeroes. As Lloyd notes, for the modern computer, “ambiguity is a bug”; a statement capable of sustaining multiple interpretations will trigger an error message.²⁶ In contrast, human communication in all its forms is rife with ambiguity—sometimes a cigar is sexually suggestive, and sometimes it is just a cigar.

Far from being an aberration, this aspect of human patterns of interaction actually reflects the complexity evident at the most fundamental levels of existence. Quantum states are not susceptible to description in absolute binary terms; rather than being a one or a zero, the spin and location of a quantum object can be described as exhibiting multiple contradictory values at once.²⁷ In other words, where classical physics would hold that an object “must always be in one state or another, on or off, left or right,” quantum information describes particles in terms of “an ambiguous superposition of two states.”²⁸

To assert that human language and culture exhibit all the traits of quantum behavior extends the analogy farther than current research would support. Nonetheless, superposition serves as an apt metaphor for describing the complexity of information in human cultural communications media. Just as Schrödinger’s cat can be described as both alive and dead before the observer lifts the lid to see what’s in the box, cultural artifacts are capable of supporting an array of contradictory meanings, with different observers perceiving different values.

This systemic complexity has any number of implications for

24. See MARSHALL MCLUHAN, UNDERSTANDING MEDIA: THE EXTENSIONS OF MAN 12-14, 19-20 (W. Terrence Gordon, ed., critical ed., Gingko Press 2003) (1964).

25. See generally *id.*

26. LLOYD, *supra* note 8, at 27.

27. See SEIFE, *supra* note 11, at 182.

28. *Id.*

maintaining the integrity of information across various media. In certain contexts, such as the regulation of automobile traffic, society employs the law to resolve ambiguities in favor of clear discrete values: stop or go, one-way or two-way, no right turn. Other media, however, may actually depend on a degree of ambiguity in order to maintain their integrity. In the example of propaganda, an artistic work may affirm the values of the state, but by failing to accommodate diverse perspectives it can lose its value as a creative work.

Within this environment, law and social norms play a critical role in maintaining the integrity of transmitted messages. Corporate law, for instance, provides various matrices and markers for encoding relations within associative enterprises, balancing the value of enforcing the integrity of signals regarding the allocation of profits and the assumption of risk with the perceived adaptive benefits of free association. Intellectual property performs a similar function; whereas unfettered copying in an unregulated marketplace can obscure critical information as to a product's source, quality and social meaning, the limits on reproduction encoded within an intellectual property system can serve to strengthen the integrity of creative content and identifying symbols.

II. WEAVING TALES AND SPINNING YARNS: A HISTORICAL PERSPECTIVE

Although electronic media may dominate popular discussions of information technology, fashion has played a central role in human communication for upwards of a hundred thousand years. As archaeologists have recently discovered in a series of excavations, ancient jewelry—shell beads with holes used to string them together—provided the earliest evidence of human symbolic thought.²⁹ Not only do the beads themselves demonstrate a capacity for symbolic manipulation and creative gestures, but, researchers observe, the existence of communicative decorations implies the existence of spoken language sufficient to describe them:

“Personal ornaments are a powerful tool of communication,” says Francesco D’Errico at the Institute of the Prehistory and Geology of the Quaternary in Talence, France “They can indicate social or marital status, for example. But you need to have a complex system of language behind that. To me [these beads] are very powerful archaeological evidence that these people were able to speak like us.”³⁰

29. Anna Gosline, *Ancient Beads Imply Culture Older Than We Thought*, NEW SCIENTIST, June 22, 2006, <http://www.newscientist.com/channel/being-human/dn9392-ancient-beads-imply-culture-older-than-we-thought.html> (last visited Nov. 11, 2008).

30. *Id.*

Further reinforcing the symbolic significance of early jewelry are discoveries of beads at sites a considerable distance from water.³¹ The earliest objects known to be exchanged in trade, these prehistoric beads conveyed information that went beyond personal status to the embodiment of relative value.³² In addition, bead discoveries from 75,000 years ago bear the marks of ochre, evidence of ornamental body pigmentation, or prehistoric makeup.³³ The significance of this goes beyond signaling status and relative value to a revolutionary development in personal identity: pride in the creation of a distinct transformative appearance.³⁴

The importance of fashion in defining personal and social identity is equally apparent in early human myths. For example, the creation story that opens the Genesis narrative in the Hebrew Bible uses clothing to symbolize the emergence of human self-awareness. Before Adam and Eve tasted the forbidden fruit, they were naked; after “the eyes of both were opened,” they “sewed fig leaves together and made themselves aprons,” an act that at once communicated their newfound awareness of being more than animals and their act of disobedience.³⁵ The Genesis story also depicts God using clothes as a means of communicating his ongoing protective relation to human beings, despite their disobedience. After imposing punishment, “the Lord God made for Adam and for his wife garments of skins, and clothed them.”³⁶

Greek mythology also provides telling depictions of weaving as an information technology as central to communication as verbal narrative. Homer’s *Odyssey* portrays Odysseus and his wife Penelope in counterpoint, with Odysseus spinning clever tales throughout his journey home while Penelope keeps her parasitic suitors at bay by weaving and unweaving a shroud.³⁷ For the ancient Greeks, the fiber arts were an extension of symbolic thought, as vital to a meaningful existence as speech.

Similarly Odysseus’ guide, Athena, was the goddess of both wisdom and weaving.³⁸ In one of her defining stories, Athena engages in a contest with her devotee Arachne, each using her woven creation to depict signal

31. *See id.*

32. *Id.*

33. Hazel Muir, *Ancient Shell Jewelry Hints at Language*, NEW SCIENTIST, Apr. 16, 2004, <http://www.newscientist.com/article.ns?id=dn4892> (last visited Nov. 11, 2008).

34. *Id.*

35. *Genesis* 3:7 (Revised Standard Version).

36. *Genesis* 3:21 (Revised Standard Version).

37. HOMER, *THE ODYSSEY passim* (Robert Fagles trans., Penguin Books 1996).

38. Susan Ackerman, *Asherah, The West Semitic Goddess of Spinning and Weaving?*, 67 J. NEAR E. STUD. 1, 4-7 (2008).

moments in divine and human history.³⁹ Athena's weaving portrays her role in the creation of her namesake city, Athens, in an image metaphorically illustrating the weaving together of the citizens into a mighty polis.⁴⁰ Arachne, however, uses her weaving to depict the impious acts of the gods, an act which leads to her eventual transformation into a thread-spinning spider.⁴¹

These are, of course, but a few of the mythic narratives worldwide that associate weaving and looms with information. The African spider-god Anansi blends weaving and verbal cleverness into a single form, an amalgam mirrored by the symbolic functions of patterns in kente cloth and other African fabric.⁴² A similar dynamic is evident in Native American mythology, which depicts the weaving of Spider-Woman as the fabric of creation, with textiles as a real-world analogue of the process that shapes the world.⁴³

This association of textiles with communication has continued well past religious myth into the present. In the world of literature, Charles Dickens brought the loom of the ancient Greek Fates into the Victorian era with his archetypal image of Madame Defarge knitting into her needlework the names of those condemned to die.⁴⁴ A contrasting narrative has emerged within the contemporary African American community regarding the role of quilts as information technology encoding the route to safe houses in the Underground Railroad.⁴⁵ Even if this is a modern myth, as some contend, the evident power of the story is itself testimony to the persistence of communal sewing as an icon of social identity.⁴⁶

The significance of textiles and clothing as an information technology encoding personal and social identity has been recognized by select academic theorists as well. In his influential 1964 classic *Understanding Media*, Marshall McLuhan devotes an entire chapter to clothing as a means

39. OVID, *THE METAMORPHOSES OF OVID* 105-09 (David R. Slavitt trans., Johns Hopkins University Press 1994).

40. *Id.* at 107.

41. *Id.* at 107-09.

42. KATHRYN SULLIVAN KRUGER, *WEAVING THE WORD: THE METAPHORICS OF WEAVING AND FEMALE TEXTUAL PRODUCTION* 24-25 (2001).

43. *Id.* at 25.

44. CHARLES DICKENS, *A TALE OF TWO CITIES* *passim* (Grosset & Dunlap 1935) (1859).

45. *See generally* JACQUELINE L. TOBIN & RAYMOND G. DOBARD, *HIDDEN IN PLAIN VIEW: THE SECRET STORY OF QUILTS AND THE UNDERGROUND RAILROAD* (1999).

46. *See* BARBARA BRACKMAN, *FACTS AND FABRICATIONS: UNRAVELING THE HISTORY OF QUILTS AND SLAVERY* 70 (2006).

of processing information.⁴⁷ On one level, he observes, clothing serves as an extension of the skin in regulating our relation to temperature; like a house or office building, clothing extends the information processing in the body's heat-control processes in an external form.⁴⁸ At the same time clothing also serves "as a means of defining the self socially," providing a blueprint for personal and collective values ranging from status and ideology to privacy and connectedness.⁴⁹ While legal scholars—to the extent they acknowledge fashion at all—tend to focus on the role of clothing in signaling one's status as a member of the elite, theorists outside the legal academy have echoed McLuhan in examining the richly diverse ways in which people use fashion as a communications tool.⁵⁰

However, the nature of fashion as an information technology goes beyond the realms of academic theory and cultural narrative. The very origin of modern computing lies in the textile industry—in particular, the invention of programmable punch-card machines to increase the speed and flexibility of luxury silk fabric production.⁵¹ As James Essinger documents in *Jacquard's Web: How a Hand-Loom Led to the Birth of the Information Age*, each card in the loom patented by Joseph-Marie Jacquard in 1804 specified a unit of information pertaining to such critical data as the angle and color of each line of thread, enabling the machine to produce automatically multiple copies of the same design.⁵²

The significance of this invention was not lost on Charles Babbage, the inventor who designed the first modern computer intended for mathematical calculation.⁵³ Babbage studied the Jacquard loom in exacting detail and, as Essinger observes, "really did borrow Jacquard's idea lock, stock, and barrel."⁵⁴ In Babbage's own words when explaining his obsession with Jacquard's work,

You are aware that the system of cards which Jacard [sic] invented are the *means* by which we can communicate to a very ordinary loom orders

47. MCLUHAN, *supra* note 24, at 161-66.

48. *Id.* at 163.

49. *Id.*

50. *E.g.*, MALCOLM BARNARD, *FASHION AS COMMUNICATION* 29 (2d ed. 2002); ROLAND BARTHES, *THE LANGUAGE OF FASHION* 27 (Andy Stafford trans., Berg 2006) (2004); ROLAND BARTHES, *THE FASHION SYSTEM* 59-62 (Matthew Ward & Richard Howard trans., University of California Press 1990) (1967); JEAN BAUDRILLARD, *THE SYSTEM OF OBJECTS* 204-05 (James Benedict, trans., Verso 2d ed. 2005) (1968); FRED DAVIS, *FASHION, CULTURE, AND IDENTITY* 3-8 (1992); ANNE HOLLANDER, *SEEING THROUGH CLOTHES* 311 (1993).

51. *See* ESSINGER, *supra* note 2, at 48.

52. *Id.* at 35-38.

53. *Id.* at 48-49.

54. *Id.* at 47.

to weave *any* pattern that may be desired. Availing myself of the same beautiful invention I have by similar means communicated to my Calculating Engine orders to calculate *any* formula however complicated.⁵⁵

As Babbage himself freely admitted, the key step in the development of the modern computer was the adaptation of information processing in textile production to the processing of abstract mathematical symbols.⁵⁶ Not coincidentally, the language of weaving continues to pervade computerized information processing: from the metaphor of the “web”—mirroring the information arrays embodied in a spider’s silken thread—to the new Weave project of Mozilla Labs.⁵⁷ In fact, contemporary scientific research in the processing of information on a universal scale persists in using the metaphors of strings, knots, and fabric, thereby fashioning mathematical models of the shape of nature that give new life to the divine weavers of ancient myth.⁵⁸ The advent of wearable computing, rejoining the twin progeny of the loom, further underscores this cultural connection.⁵⁹

III. LAYERED LOOK: THE DUAL NATURE OF FASHION AS A COMMUNICATIONS MEDIUM

Creators of fashion are clearly able to weave information into their fabric, but the communicative power of fashion does not end with the author’s text. Instead, fashion is noteworthy for its ability to simultaneously express the point of view of both originator and user. The fashion designer begins by making an artistic statement in the form of a new garment, drawing upon various social and aesthetic forces in order to channel her muse. Then the designer, who may be the equivalent of a celebrated *avant-garde* sculptor or a modest greeting card painter, learns whether her creative vision is also a commercially successful one. The wearer who subsequently acquires the garment gives it dimension and movement, at the same time using the garment to represent her physical body to the world and to broadcast a message about herself, whether deliberately planned or unintended. In other words, every garment potentially functions as an information technology with two concurrent

55. *Id.* (emphasis in original).

56. ESSINGER, *supra* note 2, at 49.

57. Mozilla Labs, *Weave*, <http://labs.mozilla.com/projects/weave/> (last visited Oct. 2, 2008).

58. *See, e.g.*, BRIAN GREENE, *THE FABRIC OF THE COSMOS: SPACE, TIME AND THE TEXTURE OF REALITY* 402-03 (2004).

59. *See generally* ADAM GREENFIELD, *EVERYWARE: THE DAWNING AGE OF UBIQUITOUS COMPUTING* (2006).

messages in superposition: one embodying the designer's authorial voice, and the other generating information on behalf of and about the wearer.

Mainstream American scholars and critics seldom pay much attention to fashion, except perhaps in the context of gender studies, and still less to its communicative functions.⁶⁰ When they do so, their analysis is frequently focused on the consumer rather than on the original designer. Studies of fashion that go beyond technical costume history, moreover, are often heavily influenced by the relationship between clothing and the signaling of socioeconomic status, an association that does not elicit sympathetic treatment from the typical academic.⁶¹ While it is true that the differences between white collar and blue collar uniforms, a luxurious mink and a Republican cloth coat,⁶² or the latest "it" bag and a cheap knockoff offer information about the wearer, such hierarchical indicia are only the crudest measure of identity as expressed by clothing.

Additional data such as specific professional role, group affiliation or disaffection, gender, sexual orientation, moral or religious stance, political perspective, emotional outlook, and aesthetic identity are all manifest in dress—and one need not be a fashionista to recognize the majority of such information. Before an American infant even leaves the hospital, and months before learning to speak, he or she is likely to wear blue or pink clothing, respectively; baby's first code is a dress code. Among adults, consider judicial robes, a New York Yankees t-shirt, a miniskirt, a leather harness over a bare male chest, a yarmulke, a black armband during the Vietnam War, a widow's black veil, or the dark frills of a Japanese Goth Lolita. Each of these garments immediately identifies the wearer to the onlooker, even if the two are complete strangers. Some of these messages are culturally specific: a widow's black veil, for example, is quite anachronistic in modern Western culture and would not scan at all in a society in which the color of mourning is white or in which most women leave the house only if completely shrouded in fabric. Similarly, the wearer of a Yankees t-shirt may be a fan, a girl who borrowed her boyfriend's shirt, or a Bostonian who lost a bet. Such complexity is nevertheless consistent with the function of conveying information.

60. See Valerie Steele, *The F-Word*, LINGUA FRANCA, Apr. 1991, at 18-20. The only fashion journalist ever to receive a Pulitzer Prize for criticism was Robin Givhan of *The Washington Post* in 2006. See The Pulitzer Prizes, Criticism, <http://www.pulitzer.org/bycat/criticism> (last visited Oct. 2, 2008).

61. See, e.g., Jonathan M. Barnett, *Shopping for Gucci on Canal Street: Reflections on Status Consumption, Intellectual Property, and the Incentive Thesis*, 91 VA. L. REV. 1381, 1383, 1386-88, 1388-89 (2005).

62. See President Richard M. Nixon, Checkers Speech (Sept. 23, 1952), available at <http://www.watergate.info/nixon/checkers-speech.shtml> (last visited Nov. 11, 2008).

Within a cultural subgroup, the messages expressed by wearing clothing may be at once more elaborate and harder to translate into words. A dedicated follower of fashion, whose senses are keenly attuned to designer styles, may recognize a kindred spirit via her Manolo Blahnik pumps or his Bape hoodie—articles of apparel that, to the uninitiated, might simply be described as women’s shoes or a sweatshirt, respectively. The inability of one group to recognize all of the signals embedded in another’s toilette, however, no more undermines its expressive function than the insistence of a parent that a teenager’s favorite music is just noise or the child’s retort that all classical compositions sound alike. Some fashion information is directed toward the general public; other information is like a dog whistle or a high-frequency ring tone, audible to certain ears only.

While all clothing communicates information about the wearer, not all wearers are deliberately engaged in crafting an individual aesthetic statement on a daily basis. Much of the time we simply get dressed, in relatively generic garments that resemble those we expect our peers to be wearing. Like a bon mot that eventually becomes a standard phrase or even a cliché, a basic article of apparel like a white button-down shirt is no longer attributable to a particular designer, nor does it communicate a strong, individualized message on behalf of the wearer—though it is not entirely silent, either. Even the least fashion-conscious person, however, is likely to devote extra attention to attire for a special occasion, like her wedding, and to view her choice as a matter of personal expression. As a result, the consumer may be wary of any legal regime that might temporarily restrict her ability to acquire a particular item of clothing, even if the rule’s effect is to enhance the fashion designer’s ability to make creative statements and ultimately provide a wider vocabulary for the wearer.

Clothing is, of course, not the only identity-bearing commodity available to consumers. The choice of a hybrid vehicle over an SUV, a glass of local tap water over a plastic bottle from a distant spring, or a city apartment over a suburban McMansion is dictated by a host of factors, including economic ones, but still expresses the identity of the purchaser. Similarly, a commuter reading the *Wall Street Journal* will offer a different impression than one flipping through a celebrity gossip rag, even though the goal of buying a newspaper is presumably to consume information rather than to generate it. The association between an individual and her clothing, however, makes a particularly strong public statement, since clothing covers the person and represents the individual’s physical being to the world. After all, we may regularly appear without many of our possessions in tow, but we rarely appear without our clothes.

Fashion is a powerful medium of communication, not merely for its creators but also for its wearers. As an information technology, fashion thus functions simultaneously as both message and medium.

IV. A CUTTING-EDGE LEGAL APPROACH TO FASHION AS INFORMATION TECHNOLOGY

The competing messages embedded in fashion foster a systemic regulatory tension, as the law's efforts to protect the integrity of the creator's content may clash with the wearer's choice of personal expression. Similar tensions are inherent in other fields of intellectual property law; in the case of fashion design, however, the current U.S. approach is to ignore the original designer's message to the greatest extent possible and essentially to deny the status of fashion as an information technology. As American fashion enters into a cultural ascendancy and the emerging designer movement brings more individuals into the marketplace as both producers and consumers, pressure is increasing to strengthen legal protection against unauthorized copying—a trend that has prompted complaints against imposing new limits on personal expression.⁶³ The optimal approach to resolving this dilemma is not to view protection or consumption as mutually exclusive absolutes, but to craft a narrowly-tailored statute that respects the complexity of fashion itself.

A. *So Last Season: The Legal Status Quo*

At present, U.S. intellectual property law provides at best partial protection for innovative articles of clothing and accessories. In the absence of comprehensive design protection, the fashion industry has instead over the past century turned to existing areas of intellectual property law that can be extended to some of the individual elements related to a fashion design.⁶⁴

The most widely utilized means of preserving the designer's investment is trademark law, which provides a relatively accessible means

63. See, e.g., Felix Salmon, *Knock-Off Fashion*, <http://www.portfolio.com/views/blogs/market-movers/2007/09/18/knock-off-fashion> (Sept. 18, 2007, 9:38 EDT); Rashmi Ragnath, *Design Protection for Fashion Designs and Autoparts: A Bad Idea Times Two*, <http://www.publicknowledge.org/node/1399> (Feb. 16, 2008, 12:21).

64. For a discussion of fashion designers' efforts over the past century to secure legal protection for their designs, see generally, Susan Scafidi, *Intellectual Property and Fashion Design*, in *INTELLECTUAL PROPERTY AND INFORMATION WEALTH: ISSUES AND PRACTICES IN THE DIGITAL AGE* 115 (Peter K. Yu ed., 2007).

of defending against the incursions of copyists.⁶⁵ Trademarks are, of course, available to almost all goods and services that are exchanged in commerce, including apparel.⁶⁶ Logos and labels, however, are the elements least associated with the design of an individual garment; they are typically affixed late in the design and manufacturing process and do not vary from look to look or season to season.

Because protection for labels and logos is available while protection for the underlying design of a garment is not, the intellectual property regime has a distorting effect on fashion design. The relative availability of trademark protection privileges the display of corporate symbols: the more visible the logo, the greater the item's intellectual property protection, and the better the chance of defeating copyists. As a result, in recent years a number of prominent designers have made the display of logos a prominent feature of their design.⁶⁷ Intensifying the corporate advantage in fashion is the fact that trademark law offers a competitive edge to more established companies with better known brands. If a famous designer is knocked off, consumers may still be willing to pay for the trademarked version. Less familiar emerging designers, by contrast, cannot depend on public recognition to maintain a customer base.

The advantage enjoyed by more established companies is amplified within the narrow category of designs that qualify for "trade dress" protection. This subcategory of trademark law protects not only the usual trademarked symbols, but also product packaging or even product configurations that serve to indicate the source of the goods.⁶⁸ As the Supreme Court opined in *Wal-Mart Stores, Inc. v. Samara Brothers*, product designs like the garments at issue in the case are never "inherently distinctive" or intrinsically capable of source identification.⁶⁹ Instead, the Court held that product designs only point to their origin if they have developed "secondary meaning" in the minds of consumers.⁷⁰ The result is that even without trademark registration, famous designs receive more protection in the form of trade dress than new items on the fashion scene. In the event of design piracy, the owner of a famous design is in a stronger legal position than the emerging designer, and thus more likely to thrive.

65. See 15 U.S.C. §§ 1051-52 (2006); see also 15 U.S.C. § 1125 (2006).

66. See 15 U.S.C. § 1051 (2006).

67. See, e.g., RENATA MOLHO, BEING ARMANI: A BIOGRAPHY 91-92 (Antony Shugaar trans., 2007) (describing designer Giorgio Armani's reluctant decision to incorporate a prominent logo into his Emporio Armani line as a deterrent to copyists).

68. *Wal-Mart Stores, Inc. v. Samara Bros.*, 529 U.S. 205, 209 (2000) (citations omitted).

69. *Id.* at 212.

70. *Id.* at 209-15.

Trademark law is nevertheless far from a panacea, even for designers who have become household names. Fashion trademarks, although protected by law, arguably receive less popular respect than their counterparts in other categories of consumer goods, and articles bearing counterfeit marks are themselves a medium with contested meanings. Shopping for counterfeit fashion is a common vacation activity, both in the U.S. and abroad; New York's Canal Street and Beijing's Silk Market are notorious tourist destinations. Consumers who purchase counterfeit handbags and athletic shoes seek to convey a diverse array of messages, successfully or not. For some, purchasing counterfeits signals their thriftiness and talent for shrewd shopping; others regard counterfeits as an egalitarian challenge to class distinctions; still others believe that their contraband acquisitions are a critique of consumer culture. Congress has not responded to such arguments by creating a trademark exemption for clothing and accessories, however. Rather, it has strengthened trademark protection by enhancing penalties and increasing budgetary support for law enforcement, though the rhetoric supporting such changes has less to do with protection of fashion designers than with fighting organized crime, cutting off funds that might support terrorism, and eliminating child labor.⁷¹

The nature of branding aids in explaining the persistence of trademark protection even in the face of denial of protection for the designs to which labels are attached. In contrast, say, to the shape of a dress, a name or logo is associated with commerce and with the designer as an economic actor. Even when the consumer purchases an item marked with the brand, the designer does not disappear; rather, the product continues to have a visible connection to its source. Maintaining the coherence of the designer's identity is thus an evidently rational act, as justifiable on a visceral level as preventing identity theft. From this perspective, appropriating another's mark conveys a different message, one that is framed primarily by lawlessness and association with unsavory criminal activities.

Like trademarks, patents offer a certain amount of legal protection to fashion, although, given the time, expense, and qualification requirements,

71. See, e.g., Edith Honan, *NYC Campaign Shows Dark Side of Counterfeit Goods*, REUTERS, May 16, 2008, <http://www.reuters.com/article/domesticNews/idUSN1642669920080516>. See generally, e.g., INTERNATIONAL ANTI-COUNTERFEITING COALITION, WHITE PAPER—THE NEGATIVE CONSEQUENCES OF INTERNATIONAL INTELLECTUAL PROPERTY THEFT: ECONOMIC HARM, THREATS TO THE PUBLIC HEALTH AND SAFETY, AND LINKS TO ORGANIZED CRIME AND TERRORIST ORGANIZATIONS (2005), <http://www.iacc.org/resources/resources.php> (follow "IACC White Paper" hyperlink).

to a far lesser extent. A fashion design or design element that is functional can, if deemed sufficiently innovative, be registered as a patentable invention.⁷² Some ornamental rather than functional aspects of clothing and accessories may also qualify for protection through design patents.⁷³ However, as with utility patents, the lengthy process of prior review makes this impractical for most designs due to their seasonal nature. What patent shares with trademark is its focus on an aspect of design relatively separate from the wearer. The elements granted such protections are akin to the characteristic design of a Coke bottle or the functional workings of a hard drive—objects used by the consumer but to a significant degree identifiably distinct.

This quality of separateness also plays a role in copyright protection—not simply in the separability of creative from useful elements required by the useful article doctrine, but in the abiding distinctness of the creative object from the physical form of the wearer.⁷⁴ Jewelry is worn by the consumer, for example, but it has long enjoyed copyright protection as a creative object separable from any underlying function and more akin to a sculpture.⁷⁵ A pendant or bracelet rests on the body relatively unchanged by its wearer and without obscuring or transforming the human shape underneath. Similarly, a print or woven textile design creates a surface pattern akin to a painting or a photograph, an analogy that has contributed to the recognition of full copyright protection for graphic designs emblazoned on shirts and innovative fabric patterns.⁷⁶ Courts have also extended protection to certain distinct artistic features, such as the mask of a Halloween costume, which convey a relatively discrete message apart from their connection to the wearer.⁷⁷

The shape of an article of apparel, by contrast, becomes identified

72. See 35 U.S.C. § 101 (2000).

73. See 35 U.S.C. § 171 (2000).

74. See 1 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 2.08[B][3] (2008) (citations omitted).

75. See *Mazer v. Stein*, 347 U.S. 201, 211-213 (1954); *Trifari, Krussman & Fishel, Inc. v. Charel Co.*, 134 F. Supp. 551, 552-53 (S.D.N.Y. 1955).

76. See *Folio Impressions, Inc. v. Byer California*, 937 F.2d 759, 763 (2d Cir. 1991) (protecting textile design as a “writing”); see also *Eve of Milady v. Impression Bridal, Inc.*, 957 F. Supp. 484, 488-89 (S.D.N.Y. 1997) (qualifying bridal dress lace designs for copyright protection); *Peter Pan Fabrics, Inc. v. Candy Frocks, Inc.*, 187 F. Supp. 334, 336-37 (S.D.N.Y. 1960) (finding copyright infringement of floral pattern textile design). A distorting effect on fashion similar to that of trademark protection also exists in relation to copyrightable elements like fabric prints and embellishment. See *supra* note 66 and accompanying text; Alessandra Ilari, *New Technologies Give Prints Pop*, WWD, Jan. 22, 2008, at 16, available at <http://www.wwd.com/business-news/new-technologies-give-prints-pop-469897>.

77. *Chosun Int'l, Inc. v. Chrisha Creations, Ltd.*, 413 F.3d 324, 329 (2d Cir. 2005).

with the wearer to a more significant degree, such that some may perceive restricting access as an unacceptable limit on self-expression regardless of any harm to the designer. The focus of attention shifts directly to the wearer; to paraphrase art historian Anne Hollander, the design derives social and personal significance from the act of being worn.⁷⁸ Not coincidentally, Congress has thus far failed to extend copyright protection to fashion designs.⁷⁹ The ostensible reason for this exclusion of fashion designs from copyright is that clothing is regarded as merely “utilitarian,” but this is at best an archaic rationalization.⁸⁰ A fashionable consumer does not merely buy any available item of clothing so long as it merely covers enough skin; she chooses the item that appears to make the statement she wants to express. Accordingly, what leads some individuals to resist intellectual property protection for fashion is not a sense that their garments have no creative value, but rather a connection between fashion and identity so strong that they are reluctant to cede the designer ownership of an original creation and control over its availability—unlike the popular acknowledgment of property rights in the author of a novel or the inventor of a better mousetrap. Fashion’s relationship to self-expression, in other words, can prompt selfishness.

The intensity of fashion’s significance as an identity-bearing commodity is reflected in relationships between wearers as well. Despite the fact that nearly all clothing is produced in multiple units rather than as one-of-a-kind pieces, it is still considered a faux pas to appear in the same garment at the same event or in the same context as another person. Nevertheless, the wish for the latest fashion, as opposed to a necessary item of clothing, is often driven by what social theorist René Girard calls “mimetic desire,” or imitation.⁸¹ When a subject desires an object possessed by her model, such as the latest trendy bauble worn by the most popular girl in school or a frequently photographed celebrity, relational conflict may ensue.⁸² The perception of creativity in fashion as limited to the realm of inaccessible luxury goods—an inaccurate but persistent characterization—has the potential to intensify that conflict. In some cases, a consumer’s desire to possess a particular identity-bearing fashion item is subsequently manifest in not only the purchase of a knockoff or counterfeit,

78. HOLLANDER, *supra* note 50, at 451.

79. See H.R. REP. NO. 94-1476, at 55 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5668 (excluding “ladies’ dress” from protection under the Copyright Act of 1976).

80. *Id.*

81. See RENÉ GIRARD, *EVOLUTION AND CONVERSION: DIALOGUES ON THE ORIGINS OF CULTURE* 56-57 (2007) (defining the “mimetic mechanism,” including mimetic desire).

82. See *id.* at 57, 61-64.

but also in expressions of resentment toward the very fashion house that created the original item of desire in the first place—a form of the scapegoat suggested by Girard’s theory.⁸³ The same consumer who implicitly or explicitly acknowledges fashion as a creative medium may thus resist extending a reasonable range of intellectual property protection to fashion, or even respecting those laws already in place, on the strength of desire for unlimited personal expression.

B. Trend Report: Tailoring Law to Fit Creators and Consumers

Despite the partial legal measures adapted to fashion and the piracy perspective of professional copyists and some consumers, circumstances in recent years have changed in ways that render the lack of rational intellectual property protection for fashion designs unsustainable. Advances in technology, globalization of production, democratization of creativity, cultural shifts in America’s relationship to fashion, and international harmonization of intellectual property laws all contribute to a need for greater equity in the legal treatment of fashion designs as compared to other creative forms. Since the essence of a well-balanced intellectual property system is to promote creativity, both fashion designers and fashion consumers can benefit from modernization of the current state of the law.⁸⁴

Among the structural changes that have affected fashion designers in recent years are the rise of the Internet and the movement of much fashion manufacturing to nations with low-cost labor forces. While the immediate online availability of photographs of new styles from the runway or the red carpet contributes to consumer interest in cutting-edge fashion, it also enables design pirates to offer fast, cheap knockoffs—often before the original versions are available in stores. Similarly, a copyist who gains access to a trade show can surreptitiously photograph new styles, upload the pictures, send them halfway around the world, and make copies available before the execution of wholesale orders for the original, much less retail sales.

The increase in inexpensive international production following the dismantling of quota systems that had limited U.S. imports of textiles and apparel is a similarly complex development. On the one hand, foreign manufacturing facilitates copying, contributes to the proliferation of sweatshops in countries that do not enforce labor standards, and increases the environmental impact of clothing manufacturing by requiring additional

83. See *id.* at 56, 64-74.

84. See, e.g., U.S. CONST. art. I, § 8, cl. 8.

resources for long-distance shipping; on the other hand, it also enables a creative designer to offer consumers access to original design across price points. Even a consumer who consciously eschews knockoffs can find affordable yet innovative style from a variety of sources: the inexpensive work of emerging designers, the mass-market lines by critically acclaimed designers pioneered by Isaac Mizrahi for Target, and the eponymous diffusion lines of high-end labels such as Giorgio Armani and Ralph Lauren. The infiltration of low-quality, low-priced knockoffs into the market not only limits a designer's ability to recover the investment in the design process through the sale of original works, but also her ability to regulate distribution and to adapt or license the most commercially successful of her more experimental designs for a broader audience. In this environment, a cheap knockoff is not merely a challenge to the designer's business; it undercuts the ability of fashion to serve as an information technology by discouraging the production of designer originals and obscuring the statement made by those who buy the real thing.

An equally important trend is the democratization of fashion design as a creative enterprise. Whether on Etsy, eBay, or in local shops, a new generation of emerging designers has entered the marketplace, most without additional capitalization beyond what they make in their day jobs. As more people attempt to trade on their creative talents, fashion copying takes on a new significance among individuals who might not have otherwise seen it as a problem. Now the concern is not common citizens having access to luxury goods, but the appropriation of designers' personal creativity by corporate design pirates whose stock in trade is the systematic, predatory copying of both famous and unknown individuals' work.

Further destabilizing the lack of protection for fashion design is the effect it has on the integrity of the U.S. government's own anti-counterfeiting message and its commitment to the international harmonization of intellectual property protection. While a counterfeiter who engages in the unauthorized reproduction of trademarks risks both civil and criminal penalties, a design pirate who copies every stitch of a garment except the label is engaged in a legal business practice.⁸⁵ This differential treatment of counterfeiting and design piracy has created a loophole for counterfeiters, some of whom avoid customs enforcement by importing cheap copies that do not yet bear counterfeit labels and then affixing those labels in the U.S.⁸⁶

85. See 15 U.S.C. §§ 1116-18 (2006); 18 U.S.C. § 2320 (2006).

86. Ross Tucker and Liza Casabona, *Making Fakes in the U.S.A.: Counterfeiters Step Up Domestic Manufacturing*, WWD, July 22, 2008, <http://www.wwd.com/fashion-news/making-fakes-in-the-usa-counterfeiters-step-up-domestic-manufacturing-481734>.

Among those nations with influential fashion industries—Paris, London, Milan, and New York host the world’s premier fashion weeks—the U.S. is the only one that does not protect fashion designs. In the E.U. and various countries around the globe, the emerging consensus is to extend protection to fashion designs for a limited period of time, varying between ten and twenty-five years.⁸⁷ With the U.S. exerting pressure on countries such as China to conform to international standards of intellectual property protection, the lacuna in America’s own legal system grows increasingly conspicuous. The signal seems clear: the U.S. wants to shut down copyists in other jurisdictions while allowing its own to thrive.

To adapt to the evolving environment, the U.S. needs to adopt an approach that reflects the complex messages embedded in fashion as an information technology. The wearer’s desire for free self-expression is an important value, but it does not necessarily militate against intellectual property protection for the designer. Unfettered mass copying can increase the noise-to-signal ratio to such a degree that the wearer can no longer achieve her desired effect. Copyists whom the law forces to innovate, moreover, will not simply disappear, any more than newspapers prevented by copyright law from plagiarizing competitors’ articles respond by stopping the presses. Instead, when American law finally rewards fashion innovation rather than imitation, former design pirates are likely to hire young designers and create more choices for consumers. The existence of protection does not hinder consumer self-fashioning through clothing and accessories and may even enhance it; consider that the inexpensive fast-fashion companies that have colonized the globe in recent years, such as H&M and Zara, are European companies in whose home markets copying is prohibited.

At the same time, the advantages accrued from preserving the integrity of the designer’s creative expression may not be sufficient to justify extending protection for the full term of copyright. Fashion is a seasonal medium, and its creators would receive significant relief from protection that applied immediately after the introduction of new designs and during the development or licensing of diffusion lines based on them. In addition, designers may benefit from being able to adapt and/or utilize elements of others’ work that are somewhat more contemporaneous than life plus seventy years old.⁸⁸

87. See Council Regulation 6/2002, 2002 O.J. (L3) 1, 5 (EC); Fusei kyoso boshiho [Unfair Competition Prevention Act], Law No. 47 of 1993, art. 11, *unofficial translation available* <http://www.cas.go.jp/jp/seisaku/hourei/data/uca.pdf> (2007). See generally The Designs Act, No. 16 of 2000; INDIA CODE (2000), *unofficial version available* http://www.wipo.int/clea/en/text_html.jsp?lang=EN&id=2398.

88. Cf. 17 U.S.C. § 302(a) (2006) (establishing term of copyright for works published

Rather than maintaining the outdated and unstable status quo, we have an opportunity in fashion to create a model of short-term protection, tailored to the needs of both consumers and creators. The E.U. model offers one alternative, with a short three-year term for unregistered designs or five years for registered designs, renewable for a total of up to twenty-five years.⁸⁹ Another minimalist approach to protection is the term specified in the Design Piracy Prohibition Act, a bill currently under consideration in Congress.⁹⁰ If passed, the Act would protect registered fashion designs for three years, a period that respects the seasonal nature of the fashion industry as well as the inspirational influence of trends.⁹¹ After this brief period of protection expired, a design would enter the public domain.⁹²

The American legal system has too long ignored the importance of fashion design as a complex information technology and has systematically discounted the creative expressions of original fashion designers. From both a theoretical standpoint and a practical one, change is inevitable—and the opportunity to craft a system of legal protection that finally takes into account the perspectives of both creators and consumers is a compelling challenge.

on or after January 1, 1978 as the lifetime of the author plus seventy years after the author's death).

89. Council Regulation 6/2002, 2002 O.J. (L3) 5 (EC).

90. See Design Piracy Prohibition Act, H.R. 2033, 110th Cong. § 2 (2007); *A Bill to Provide Protection for Fashion Design: Hearing Before the Subcomm. on Courts, the Internet, and Intellectual Property of the Comm. on the Judiciary*, 109th Cong. 77-85 (2006) (statement of Susan Scafidi).

91. H.R. 2033 § 2(c)(a)(2).

92. *Id.*

HISTORY OF THE LEVI'S® 501® JEANS

- 1853 Levi Strauss arrives in San Francisco and opens a wholesale dry goods business, selling clothing, blankets, handkerchiefs, etc. to small general stores throughout the American West.
- 1872 Jacob Davis, a Reno Nevada tailor, writes to Levi Strauss, telling him about the process he invented to rivet the pocket corners on men's pants to make them stronger. He suggests the two men take out a patent on the process together and Levi agrees.
- 1873 Levi Strauss & Jacob Davis are granted a patent on the process of riveting pants by the U.S. Patent and Trademark Office on May 20. It is patent number 139,121 and this is the invention of the blue jean.
- The pants - called "waist overalls" - have one back pocket with the Arcuate stitching design, a watch pocket, a cinch, suspender buttons and a rivet in the crotch. We don't know the origin of the Arcuate stitching design. Stories about it representing the wingspread of a bird are myths; the loss of our records in 1906 (see below) makes it impossible to know why the stitching was first used. There may have been a tradition of pocket stitching on men's workwear but this has not been found in any research done so far. The cinch and suspender buttons were standard on men's pants. Keep in mind that we did not invent the cut or fit of the waist overalls; what we did was take traditional men's work pants and rivet them, creating the new category of workwear which we today call blue jeans.
- The pants are made of 9 oz. XX blue denim, which comes from the Amoskeag Mill in Manchester, New Hampshire.
- They are sewn in San Francisco, probably in a combination of factory production and home sewing. Because of the loss of historical records in the 1906 earthquake and fire we don't yet know when the first factories were opened. It's also possible we leased factory space in the 1870 and then opened our own factories in the 1880s.
- 1886 The Two Horse® brand leather patch is first used on the waist overalls. Its purpose was to demonstrate the strength of the pants and reinforce our status as the originator of patent riveted clothing. We knew that the patent would go into the public domain around 1890 and decided to reinforce our message of originality and strength graphically. There may also have been a tradition of some sort of patch on men's workwear at this time, but this has been hard to research.



DOCKERS
SAN FRANCISCO

Levi Strauss
SIGNATURE

- c1890 The rivet patent goes into the public domain, so that Levi Strauss & Co. is not longer the exclusive manufacturer of riveted clothing.
- Lot numbers are first assigned to the products being manufactured. 501® is used to designate the famous copper-riveted waist overalls. We don't know why this number was chosen. We also made a 201 jean, which was a less expensive version of the pants, as well as other products using other three-digit numbers. Because of the loss of our records in 1906, the reasons for many of these changes are unknown.
- c1901 The pants – now just called “overalls” - now have two back pockets. It's likely we added this additional pocket due to consumer requests or changes in men's fashions at the time.
- 1902 Levi Strauss dies at the age of 73. His nephews take over the business; their descendants still run the company today.
- 1906 The San Francisco earthquake and fire destroys the headquarters and factories of Levi Strauss & Co.
- A new factory is built at 250 Valencia Street in San Francisco and opens in November.
- 1910s Sometime during this decade the jeans are sewn with a felled inseam. Prior to this time the inseam was “mock” felled.
- 1915 The overalls win a “Highest Award” at the Panama-Pacific International Exposition in San Francisco.
- LS&CO. begins to buy denim from Cone Mills in Greeborsboro, North Carolina.
- 1922 Belt loops are added to the overalls, but the suspender buttons are still retained. The cinch is also still used on the pants, but some men cut it off in order to wear the overalls with a belt. Again, the addition of belt loops was in response to changes in men's fashions and our understanding of what consumers wanted.
- LS&CO. now buys its denim exclusively from Cone Mills.
- c1927 Cone Mills develops the 10 oz. red selvage denim exclusively for the 501® jeans. The denim is woven in 29” wide looms.
- 1936 The red Tab is first placed onto the right back pocket of the overalls. The word “Levi's®” is stitched in white in all capital letters on one side only. The Tab is created to differentiate Levi's® overalls from the many competitors in the marketplace who were using dark denim and an Arcuate stitch. We had not yet trademarked the Arcuate so other companies were using it in direct imitation of us.

- 1937 The back pockets on the overalls are sewn so that they cover the rivets. This is in response to consumers who complained that the rivets scratched furniture and saddles.
- The suspender buttons are removed from the overalls. Consumers are given snap-on buttons in case they still want to wear suspenders.
- World War II Changes are made to the overalls in order to conform to rules set by the War Production Board for the conservation of raw materials. The crotch rivet, watch pocket rivets and back cinch are removed to save fabric and metal. The Arcuate stitching design is removed as the thread is decorative only and not vital to the usefulness of the garment. In order to keep the design on the pants, LS&CO. sewing machine operators paint it on each pair.
- 1943 The Arcuate stitching design is registered as a trademark.
- c1947 The post-war version of the 501® jeans starts coming off the production line. The cinch is gone forever, the rivets are put back on the watch pocket and the Arcuate is now stitched with a double-needle machine which gives it the “diamond” shape at the point where the two lines of stitching meet. This creates the uniform look of the Arcuate, which is in contrast to previous years, when the single needle application gave each Arcuate design a unique appearance, depending on the skill of the operator.
- Early 1950s The word LEVI’S is now stitched on both sides of the red Tab. We are not sure why this was done.
- 1954 A zippered version of the overalls is introduced and named 501Z. This was introduced as we had begun selling our products on the East Coast of the United States and many people were unfamiliar with the button fly.
- Late 1950s The leather patch is replaced by a Two Horse patch made of heavy-duty card stock, known as the “leather like.” This is due to the fact that the company was selling products nationally, and it was becoming more expensive to use real leather. Also, the newer automatic washing machines were very hard on the real thing.
- 1960 The word “overalls” is replaced by the word “jeans” in advertising and on packaging. We had made other products in the past which we called “jeans” (specifically, denim pants for boys in the 1930s) but our top of the line “overalls” – 501® jeans – did not get this name until teenagers began calling the product “jeans” in the 1950s. No one really knows why the word became associated with the men’s overalls, but teenagers adopted the phrase and it became the term used by all manufacturers.
- c1961 Pre-shrunk Levi’s® jeans are introduced.
- 1964 The jeans become part of the permanent collections of the Smithsonian Institution in Washington, D.C.

- 1966 The first television commercial for Levi's® jeans is aired.
- The rivets are removed from the back pockets and replaced with bar tacking. This is due to the fact that the strong rivets eventually wore through the denim, exposing them and causing the problems that led to their being covered back in 1937: scratching furniture.
- 1971 The word "Levi's® on the red Tab device is now stitched in white with a capital "L" only; the "E" looks like it changed, leading to the vintage clothing concept of "Big E" and "little e." This was done to conform to the company's new housemark – the "batwing" – which was adopted in 1967 and in which the word "Levi's" is meant to be the proper name of our founder, Levi Strauss.
- 1981 501® jeans for women are introduced, with the airing of the famous "Travis" television commercial.
- 1983 Cone Mills begins to introduce XXX denim through the use of 60" wide looms.
- 1984 The renowned "501 Blues" television advertising campaign is launched at the summer Olympic Games in Los Angeles.
- 1985 LS&CO. wins the Governor's Committee Media/Advertising Award from the New York State Office of Advocates for the Disabled, for its positive portrayals of disabled people in the "501 Blues" television ads.
- 1986 The first in a series of innovative television commercials for the 501® jeans airs in Europe. These commercials feature classic American rock music mixed with nostalgia and romance.
- 1992 Due to the interest in "vintage" Levi's® jeans on the part of consumers worldwide, LS&CO. introduces the "Capital E" jean in the United States. This also follows on the success of the vintage model created earlier by Levi Strauss Japan.
- 1993 Levi Strauss & Co. sponsors the "Send Them Home Search," a contest to find the oldest pair of Levi's® jeans in the United States. The winning pair dates to the late 1920s.
- 1996 Building on the success of the Capital E product, a new series of vintage reproductions - called the Levi's® Vintage Clothing line - is introduced in stores worldwide.
- 1997 LS&CO. buys a pair of c1890 501® jeans for \$25,000.
- 1998 The Levi's® 501® jeans celebrate 125 years of originality.
- 2003 LS&CO. celebrates the 130th anniversary of the invention of the blue jean.

From the June 28, 1873 issue of Pacific Rural Press

“A New Pocket Fastening - Mr. J.W. Davis, formerly of Reno, Nevada, but now residing in this city [San Francisco] has just received through the Scientific Press Patent Agency, letters patent for an improvement in fastening the seams of pockets. The improvement consists in the employment of a metal rivet or eyelet for fastening the seams.

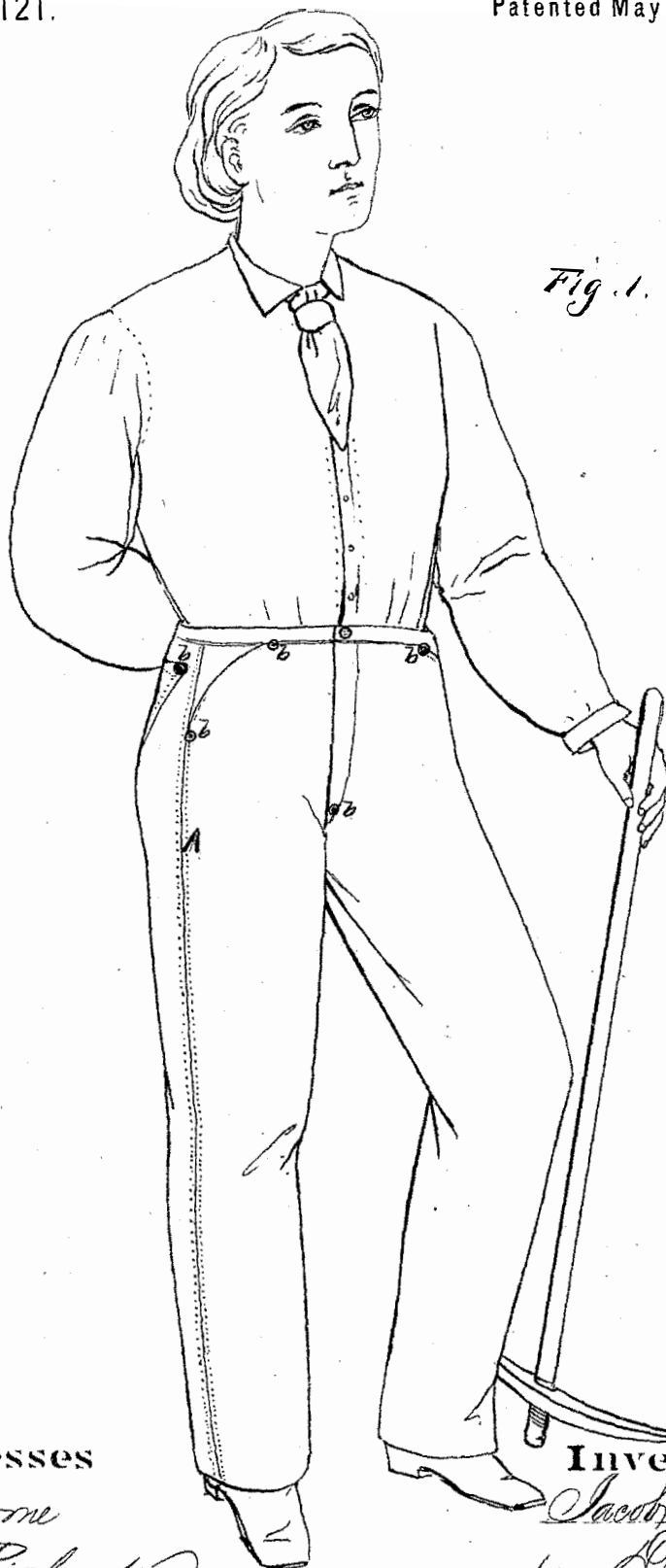
“Simple as this device seems, nevertheless it is quite effective, and we do not doubt that his manufacture, of overalls especially, will become quite popular amongst our working men, as the overalls are made and cut in the style of the best custom made pants. Nothing looks more slouchy in a workman than to see his pockets ripped open and hanging down, and no other part of the clothing is so apt to be torn and ripped as the pockets. Besides it slouchy appearance, it is inconvenient and often results in the person losing things from his pockets.

“Levi Strauss & Co. of this city are sole agents for the new manufacture, and will soon place them in the market in large quantities, so that our miners, farmers and workingmen can supply themselves with superior overalls.”

J. W. DAVIS.
Fastening Pocket-Openings.

No. 139,121.

Patented May 20, 1873.



Witnesses

J. L. Boone
C. M. Richardson

Inventor

Jacob W. Davis
per Dewart G. Atter

UNITED STATES PATENT OFFICE.

JACOB W. DAVIS, OF RENO, NEVADA, ASSIGNOR TO HIMSELF AND LEVI STRAUSS & COMPANY, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN FASTENING POCKET-OPENINGS.

Specification forming part of Letters Patent No. **139,121**, dated May 20, 1873; application filed August 9, 1872.

To all whom it may concern :

Be it known that I, JACOB W. DAVIS, of Reno, county of Washoe and State of Nevada, have invented an Improvement in Fastening Seams; and I do hereby declare the following description and accompanying drawing are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention or improvement without further invention or experiment.

My invention relates to a fastening for pocket-openings, whereby the sewed seams are prevented from ripping or starting from frequent pressure or strain thereon; and it consists in the employment of a metal rivet or eyelet at each edge of the pocket-opening, to prevent the ripping of the seam at those points. The rivet or eyelet is so fastened in the seam as to bind the two parts of cloth which the seam unites together, so that it shall prevent the strain or pressure from coming upon the thread with which the seam is sewed.

In order to more fully illustrate and explain my invention, reference is had to the accompanying drawing, in which my invention is represented as applied to the pockets of a pair of pants.

Figure 1 is a view of my invention as applied to pants.

A is the side seam in a pair of pants, drawers, or other article of wearing apparel, which terminates at the pockets; and *b b* represent the rivets at each edge of the pocket opening. The seams are usually ripped or started by the placing of the hands in the pockets and

the consequent pressure or strain upon them. To strengthen this part I employ a rivet, eyelet, or other equivalent metal stud, *b*, which I pass through a hole at the end of the seam, so as to bind the two parts of cloth together, and then head it down upon both sides so as to firmly unite the two parts. When rivets which already have one head are used, it is only necessary to head the opposite end, and a washer can be interposed, if desired, in the usual way. By this means I avoid a large amount of trouble in mending portions of seams which are subjected to constant strain.

I am aware that rivets have been used for securing seams in shoes, as shown in the patents to Geo. Houghton, No. 64,015, April 23, 1867, and to L. K. Washburn, No. 123,313, January 30, 1872; and hence I do not claim, broadly, fastening of seams by means of rivets.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

As a new article of manufacture, a pair of pantaloons having the pocket-openings secured at each edge by means of rivets, substantially in the manner described and shown, whereby the seams at the points named are prevented from ripping, as set forth.

In witness whereof I hereunto set my hand and seal.

JACOB W. DAVIS. [L. S.]

Witnesses:

JAMES C. HAGERMAN,
W. BERGMAN.

**UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, DC**

In the Matter of
CERTAIN LASER ABRADED DENIM
GARMENTS

Investigation No. 337-TA-____

**VERIFIED COMPLAINT UNDER
SECTION 337 OF THE TARIFF ACTION OF 1930**

COMPLAINANTS

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Exhibit List		
Exhibit Number	Description	Designation
1	Certified Copies of the Asserted Patents	
A	U.S. Patent No. 5,990,444	Public
B	U.S. Patent No. 6,140,602	Public
C	U.S. Patent No. 6,252,196	Public
D	U.S. Patent No. 6,664,505	Public
E	U.S. Patent No. 6,819,972	Public
F	U.S. Patent No. 6,858,815	Public
2	Certified Assignment Records of the Asserted Patents	
A	Certified Assignment Record for U.S. Patent No. 5,990,444	Public
B	Certified Assignment Record for U.S. Patent No. 6,140,602	Public
C	Certified Assignment Record for U.S. Patent No. 6,252,196	Public
D	Certified Assignment Record for U.S. Patent No. 6,664,505	Public
E	Certified Assignment Record for U.S. Patent No. 6,819,972	Public
F	Certified Assignment Record for U.S. Patent No. 6,858,815	Public
3	Foreign Counterparts to Asserted Patents	
4	Licenses	
A	DVUV, LLC	Confidential
B	GST AutoLeather	Confidential
C	Lear Corp.	Confidential
D	Green Bay Decking, LLC	Confidential
5	Accused Products' Images	
A	A&F - Hollister Product	Public
B	American Eagle Product	Public
C	BlankNYC Product	Public
D	Buckle Product	Public
E	Buffalo Product	Public
F	[Reserved]	
G	Diesel Product	Public
H	DL1961 Product	Public
I	Eddie Bauer Product	Public
J	Gap Product	Public
K	Guess Product	Public
L	H&M Product	Public
M	Just Cavalli Product	Public
N	Koos - AG Jeans Product	Public
O	Koos - Big Star Product	Public

P	Levi's Product	Public
Q	Lucky Product	Public
R	Replay Product	Public
S	VF (Seven for All Mankind) Product	Public
6	Importation	
A	Ryan Ripley Declaration	Public
B	A&F - Hollister Receipt	Public
C	American Eagle Receipt	Public
D	BlankNYC Receipt	Public
E	Buckle Receipt	Public
F	Buffalo Receipt	Public
G	[Reserved]	
H	Diesel Receipt	Public
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J	Eddie Bauer Receipt	Public
K	Gap Receipt	Public
L	Guess Receipt	Public
M	H&M Receipt	Public
N	Just Cavalli Receipt	Public
O	Koos - AG Jeans Receipt	Public
P	Koos - Big Star Receipt	Public
Q	Levi's Receipt	Public
R	Lucky Receipt	Public
S	Replay Receipt	Public
T	VF (Seven For All Mankind) Receipt	Public
7	Claim Analysis Against Accused Products	
A	Marcatex Flexi Manual Rev 1.3.1 _English_ FDA	Public
B	YouTube Video – Jeanologia, Flexi3 ONE MACHINE, MULTIPLE OPTIONS (https://www.youtube.com/watch?v=apPFfm78_1E&feature=c4-overview&list=UUXQ2v180qUhLWKYzvGkNMQg)	Public
C	YouTube Video – Jeanologia, Laser System_ Twin HS at Itma Barcelona 2011 (https://www.youtube.com/watch?v=CsP_ZxgIQQI)	Public
D	YouTube Video – Tonello, Laser Blaze by Tonello (https://www.youtube.com/watch?v=a2BJiDM8kpg)	Public
E	YouTube Video – Macsa ID, S.A., DENIM - LASERTEX Pro - Macsa Laser Systems (https://www.youtube.com/watch?v=IDAt9dcSMv8)	Public

F	YouTube Video – Jeanologia, Laser Technology in Siete Leguas (https://www.youtube.com/watch?v=8u4WPumH6Kg)	Public
G	YouTube Video – Jeanologia, Finishing Jeans Present And Future Trends And Technologies In Denim 02 (http://www.youtube.com/watch?v=HgxvoYgl-tM)	Public
H	YouTube Video – Replay Laserblast	Public
I	YouTube Video – Replay Laserblast - Official Teaser	Public
J	CBS This Morning, Levi’s New Stadium – Brand launches \$1.2 billion sports arena	Public
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9	American Eagle Claim Charts	
A	American Eagle Claim Chart U.S. Patent 5,990,444	Public
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A	BlankNYC Claim Chart U.S. Patent 5,990,444	Public
B	BlankNYC Claim Chart U.S. Patent 6,140,602	Public
C	BlankNYC Claim Chart U.S. Patent 6,252,196	Public
D	BlankNYC Claim Chart U.S. Patent 6,664,505	Public
E	BlankNYC Claim Chart U.S. Patent 6,819,972	Public
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A	Buckle Claim Chart U.S. Patent 5,990,444	Public
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C	Buffalo Claim Chart U.S. Patent 6,252,196	Public
D	Buffalo Claim Chart U.S. Patent 6,664,505	Public
E	Buffalo Claim Chart U.S. Patent 6,819,972	Public
F	Buffalo Claim Chart U.S. Patent 6,858,815	Public
13	[Reserved]	
14	Diesel Claim Charts	
A	Diesel Claim Chart U.S. Patent 5,990,444	Public
B	Diesel Claim Chart U.S. Patent 6,140,602	Public
C	Diesel Claim Chart U.S. Patent 6,252,196	Public
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15	DL1961 Claim Charts	
A	DL1961 Claim Chart U.S. Patent 5,990,444	Public
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19	H&M Claim Charts		
	A	H&M Claim Chart U.S. Patent 5,990,444	Public
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20	Just Cavalli Claim Charts		
	A	Just Cavalli Claim Chart U.S. Patent 5,990,444	Public
	B	Just Cavalli Claim Chart U.S. Patent 6,140,602	Public
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22	Koos – Big Star Claim Charts		
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D	Levi's Claim Chart U.S. Patent 6,664,505	Public
E	Levi's Claim Chart U.S. Patent 6,819,972	Public
F	Levi's Claim Chart U.S. Patent 6,858,815	Public
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D	Lucky Brand Claim Chart U.S. Patent 6,664,505	Public
E	Lucky Brand Claim Chart U.S. Patent 6,819,972	Public
F	Lucky Brand Claim Chart U.S. Patent 6,858,815	Public
25	Replay Claim Charts	
A	Replay Claim Chart U.S. Patent 5,990,444	Public
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C	Replay Claim Chart U.S. Patent 6,252,196	Public
D	Replay Claim Chart U.S. Patent 6,664,505	Public
E	Replay Claim Chart U.S. Patent 6,819,972	Public
F	Replay Claim Chart U.S. Patent 6,858,815	Public
26	VF Corp. Claim Charts	
A	VF Claim Chart U.S. Patent 5,990,444	Public
B	VF Claim Chart U.S. Patent 6,140,602	Public
C	VF Claim Chart U.S. Patent 6,252,196	Public
D	VF Claim Chart U.S. Patent 6,664,505	Public
E	VF Claim Chart U.S. Patent 6,819,972	Public
F	VF Claim Chart U.S. Patent 6,858,815	Public
	Domestic Industry	
27	Linear Processing Claim Charts	
A	Linear Processing Claim Chart for U.S. Patent No. 5,990,444	Confidential
B	Linear Processing Claim Chart for U.S. Patent No. 6,140,602	Confidential
C	Linear Processing Claim Chart for U.S. Patent No. 6,252,196	Confidential
D	Linear Processing Claim Chart for U.S. Patent No. 6,664,505	Confidential
E	Linear Processing Claim Chart for U.S. Patent No. 6,819,972	Confidential
F	Linear Processing Claim Chart for U.S. Patent No. 6,858,815	Confidential
G	Video - RevoLaze Linear Processing	Public
28	Sports Logos Claim Charts	
A	Sport Logos Claim Chart for U.S. Patent No. 5,990,444	Confidential
B	Sport Logos Claim Chart for U.S. Patent No. 6,140,602	Confidential
C	Sport Logos Claim Chart for U.S. Patent No. 6,252,196	Confidential
D	Sport Logos Claim Chart for U.S. Patent No. 6,664,505	Confidential
E	Sport Logos Claim Chart for U.S. Patent No. 6,819,972	Confidential

F	Sport Logos Claim Chart for U.S. Patent No. 6,858,815	Confidential
G	Video - Chicago Bears Logo	Confidential
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C	DVUV Claim Chart for U.S. Patent No. 6,252,196	Confidential
D	DVUV Claim Chart for U.S. Patent No. 6,664,505	Confidential
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B	High Speed Abrasion Claim Chart for U.S. Patent No. 6,140,602	Confidential
C	High Speed Abrasion Claim Chart for U.S. Patent No. 6,252,196	Confidential
D	High Speed Abrasion Claim Chart for U.S. Patent No. 6,664,505	Confidential
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C	Easy Laser - Our Customers	Public
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E	Jeanologia's lead in sustainable technology for garment finishing	Public
F	WWD - Panel: Industry Drives Sustainability Effort	Public
G	Koos - Ocean Bill of Lading	Public
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A	Certified File Wrapper for U.S. Patent No. 5,990,444	Public
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C	Certified File Wrapper for U.S. Patent No. 6,140,602	Public
D	Cited References for U.S. Patent No. 6,140,602	Public
E	Certified File Wrapper for U.S. Patent No. 6,252,196	Public
F	Cited References for U.S. Patent No. 6,252,196	Public
G	Certified File Wrapper for U.S. Patent No. 6,664,505	Public
H	Cited References for U.S. Patent No. 6,664,505	Public
I	Certified File Wrapper for U.S. Patent No. 6,819,972	Public
J	Cited References for U.S. Patent No. 6,819,972	Public
K	Certified File Wrapper for U.S. Patent No. 6,858,815	Public
L	Cited References for U.S. Patent No. 6,858,815	Public

I. INTRODUCTION

1. This Complaint is filed, pursuant to Section 337 of the Tariff Act of 1930 as amended (19 U.S.C. § 1337), by RevoLaze, LLC (“RevoLaze”) and TechnoLines, LLC (“TechnoLines”) (collectively “Complainants”) based on unfair methods of competition and unfair acts in the unlawful importation into the United States, sale for importation into the United States, or sale within the United States after importation by Abercrombie & Fitch Co.; American Eagle Outfitters, Inc.; BBC Apparel Group, LLC; Gotham Licensing Group, LLC; The Buckle, Inc.; Buffalo International ULC; 1724982 Alberta ULC; Diesel S.p.A.; DL1961 Premium Denim Inc.; Eddie Bauer LLC; The Gap, Inc.; Guess?, Inc.; H&M Hennes & Mauritz AB; H&M Hennes & Mauritz LP; Roberto Cavalli S.p.A. d/b/a Just Cavalli; Koos Manufacturing, Inc. d/b/a AG Jeans and Big Star; Levi Strauss & Co.; Lucky Brand Dungarees, Inc.; Fashion Box S.p.A. d/b/a Replay Jeans; and VF Corporation d/b/a 7 for All Mankind (collectively “Respondents”) of certain laser abraded denim garments (collectively the “Accused Products”). The Accused Products manufactured, imported, offered for sale, and/or sold by Respondents are manufactured by methods directly infringing, under 19 U.S.C. § 1337(a)(1)(B)(ii), one or more claims (the “Asserted Claims”) of the following U.S. patents (the “Asserted Patents” or “Patents-in-Suit”) owned by RevoLaze.

- Claims 1-3, 8, 21, 33-34, 46, 69, 70, and 72 of U.S. Patent No. 5,990,444 (“the ’444 Patent”) (“Exhibit 1A”);
- Claims 1, 14, 15, 53, 73, 83, 85, 94, 97, 99, 112, 120, 122-125, and 141-143 of U.S. Patent No. 6,140,602 (“the ’602 Patent”) (“Exhibit 1B”);
- Claims 5, 11, 13, 14, and 16 of U.S. Patent No. 6,252,196 (“the ’196 Patent”) (“Exhibit 1C”);

- Claims 1 and 49-51 of U.S. Patent No. 6,664,505 (“the ’505 Patent”) (“Exhibit 1D”);
- Claims 1, 2, 4-6, 11, 12, 16-19, 56-59, 61, 63, 64, 72, 77, 78, 83-87, and 92-95 of U.S. Patent No. 6,819,972 (“the ’972 Patent”) (“Exhibit 1E”); and
- Claims 13 and 14 of U.S. Patent No. 6,858,815 (“the ’815 Patent”) (“Exhibit 1F”).

2. Complainants seek a permanent general exclusion order barring infringing denim garments from entry into the United States. In the alternative, Complainants seek a limited exclusion order barring the infringing denim garments manufactured by or on the behalf of Respondents and are imported, offered for sale, sold, sold for importation, or sold after importation by Respondents. Complainants also seek permanent cease-and-desist orders against each Respondent prohibiting the importation, sale, offer for sale, advertisement, or solicitation of any sale by Respondents of the Accused Products or other products encompassed by the claims of the Patents-in-Suit.

II. **THE PARTIES**

A. **Complainants**

3. RevoLaze, LLC is a Delaware limited liability company with its principal place of business at 29300 Clemens Road, Westlake, Ohio 44145. TechnoLines, LLC, a Delaware limited liability company with the same address, is the majority member of RevoLaze and invested some 20 years in the research, development, obtainment of numerous patents and commercialization of its novel laser scribing technology. Through the use of sophisticated mathematical modeling techniques, TechnoLines overcame the technical barriers to successfully laser scribe high quality graphics and patterns on a host of textile fabrics including denim, cotton, polyester, nylon, and silk, as well as vinyl, suede, and leather.

4. Complainants have made a significant long-term investment to build the textile laser scribing technology business in the United States. They have dedicated considerable technical manpower, research and development facilities (three in Ohio and one in Minnesota) and financial resources for the invention and commercialization of their unique laser scribing technology to impart graphics and patterns on myriad of substrates. Importantly, Complainants' technology answers the textile industry's cry for sustainability, eco-friendliness and is in perfect alignment with the green movement for the environment.

5. Over the course of the last 15 years, Complainants have developed the technology and associated equipment through licensing with garment manufacturers including Sights Denim Systems, Taylor Togs, Inc., VF Corporation, Gear For Sports, Inc., and Final Finish Laundry. None of these licenses is still in force. Complainants' subsidiaries also previously operated two denim jean companies offering denim apparel manufactured by the patented technology: Fractal Jean Co. and Fins Denim Co.

6. Complainants' laser abrasion technology replaces the extremely dangerous and harmful sandblasting process, which has been found to be associated with a disabling lung disease called silicosis, to create a worn look on denim jeans. Because silicosis may result in death to workers, numerous denim jean companies, including industry leaders, have banned the use of sandblasting. Complainants, through the use of their 2,500-Watt laser systems, offer a patented laser abrading technology to solve this catastrophic health problem and substantially increase throughput versus the sandblast process.

7. Complainants also have introduced linear processing technology to the market that may revolutionize the textile industry by reducing the environmental impact associated with processes like enzyme washing jeans. A worldwide concern exists regarding the

environmental hazards associated with enzyme washing jeans and other processes such as the environmentally burdensome chemical printing processes that is used to laser scribe graphics and patterns to denim jeans. Complainants' linear laser etching technology may reduce or eliminate these environmental problems.

8. Through a combination of software developed by Complainants and specifically designed material delivery systems, Complainants have created the highest speed, highest power galvanometric driven laser machines in the industry that can economically apply graphics and patterns on fabrics and other substrates. Complainants continue to invest in developing new concepts for laser scribing materials in unique ways to solve current environmental, quality and cost problems associated with manufacturing and decorating garments and textiles.

9. RevoLaze is the owner of each of the Patents-in-Suit. Exhibits 2A-2F.

B. Proposed Respondents

10. Abercrombie & Fitch Co. ("A&F") d/b/a Hollister Jeans is a Delaware corporation with its principal place of business at 6301 Fitch Path, New Albany, Ohio 43054. On information and belief, A&F makes in Guatemala, has others make in Guatemala, exports from Guatemala into the United States, and imports from Guatemala certain denim garments that are made by methods that are claimed in the Patents-in-Suit. A&F also operates multiple retail stores across the United States under both the Hollister brand and the Abercrombie & Fitch brand. *See* Abercrombie & Fitch Store Locator, <http://www.abercrombie.com/webapp/wcs/stores/servlet/StoreLocator?catalogId=10901&langId=-1&storeId=10051> (last visited July 14, 2014); Hollister Co. Store Locator, <http://www.hollisterco.com/webapp/wcs/stores/servlet/StoreLocator?catalogId=10201&langId=->

l&storeId=10251 (last visited July 14, 2014). Specifically, A&F sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Hollister High Rise Super Skinny – Medium Jeans (Item No. 355-550-0184-024) (“A&F Product”). A sample of the A&F Product is shown in Exhibit 5A.

11. American Eagle Outfitters, Inc. (“AEO”) is a Delaware corporation with its principal place of business at 77 Hot Metal Street, Pittsburgh, Pennsylvania 15203. On information and belief, AEO makes in Mexico, has others make in Mexico, exports from Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. AEO also operates multiple retail stores across the United States. American Eagle Outfitters Store Locator, <http://www.ae.com/web/storelocator/default.jsp> (last visited July 15, 2014). Specifically, AEO sells to retail customers and/or wholesalers within the United States imported, infringing garments including the American Eagle Men’s Original Straight – Dark Tinted Crackle Jeans (Item No. 2870) (“AEO Product”). A sample of the AEO Product is shown in Exhibit 5B.

12. BBC Apparel Group, LLC and Gotham Licensing Group, LLC d/b/a BlankNYC (collectively “BlankNYC”) are companies with their principal place of business at 1407 Broadway, New York, New York 10018. BlankNYC has a business address at 275 West 39th Street, New York, New York 10018. On information and belief, BlankNYC makes in China, has others make in China, exports from China into the United States, and imports from China certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Specifically, BlankNYC sells to retail customers and/or wholesalers within the United States imported, infringing garments including the BlankNYC Polka Dot Jeans (“BlankNYC Product”). A sample of the BlankNYC Product is shown in Exhibit 5C.

13. The Buckle, Inc. (“Buckle”) is a Nebraska corporation with its principal place of business at 2407 West 24th Street, Kearney, Nebraska 68845. On information and belief, Buckle makes in Mexico, has others make in Mexico, exports from Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Buckle also operates multiple retail stores across the United States. Buckle Store Locator, <http://www.buckle.com/stores/locator.jsp;jsessionid=hDJGTFHTsYlg6gkNBn9nhBbjGHGgnn3kGNvkrcvpGnn8v2YKk2Wy!-2113174839!-695411156> (last visited July 15, 2014). Specifically, Buckle sells to retail customers and/or wholesalers within the United States imported, infringing products including the Buckle BKE Payton Bootcut – Porter Jeans (Item No. BPL1403L) (“Buckle Product”). A sample of the Buckle Product is shown in Exhibit 5D.

14. Buffalo International ULC and 1724982 Alberta ULC d/b/a Buffalo David Bitton (collectively “Buffalo”) are Quebec companies with business addresses at 400 Sauve West, Montreal, Quebec H3L 1Z8. On information and belief, Buffalo makes in Thailand, has others make in Thailand, exports from Thailand into the United States, and imports from Thailand certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Specifically, Buffalo sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Buffalo Driven-X (Item No. BM16324) (“Buffalo Product”). A sample of the Buffalo Product is shown in Exhibit 5E.

15. [Reserved].

16. Diesel S.p.A. (“Diesel”) is an Italian company with its principal place of business at via dell’Industria, 4/6, 36042 Breganze (VI), Italy. On information and belief, Diesel makes in Italy, has others make in Italy, exports from Italy into the United States, and imports

from Italy certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Diesel also operates multiple stores across the United States. *See* Diesel Store Locator, www.diesel.com/store-locator (last visited July 14, 2014). Specifically, Diesel sells to retail customers and/or wholesalers within the United States imported, infringing garments including Diesel Shioner Skinny Fit Jeans (Item No. 117009) (“Diesel Product”). A sample of the Diesel Product is shown in Exhibit 5G.

17. DL1961 Premium Denim Inc. (“DL1961”) is a Delaware corporation with its principal place of business at 530 7th Avenue, Suite 1505, New York, New York 10018. On information and belief, DL1961 makes in Pakistan, has others make in Pakistan, exports from Pakistan into the United States, and imports from Pakistan certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Specifically, DL1961 sells to retail customers and/or wholesalers within the United States imported, infringing garments including the DL1961 Emma Legging – McCarren (No. 2264) (“DL1961 Product”). A sample of the DL1961 Product is shown in Exhibit 5H.

18. Eddie Bauer LLC (“Eddie Bauer”) is a Delaware limited liability company with its principal place of business at 10401 NE 8th Street, Suite 500, Bellevue, Washington 98004. On information and belief, Eddie Bauer makes in Sri Lanka, has others make in Sri Lanka, exports from Sri Lanka into the United States, and imports from Sri Lanka certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Eddie Bauer also operates multiple retail stores across the United States. Eddie Bauer Store Locator, http://www.eddiebauer.com/storelocator/store_locator.jsp? (last visited July 15, 2014). Specifically, Eddie Bauer sells to retail customers and/or wholesalers within the United States

imported, infringing garments including the Eddie Bauer Skinny Print Jeans (Style No. 2974) (“Eddie Bauer Product”). A sample of the Eddie Bauer Product is shown in Exhibit 5I.

19. The Gap, Inc. (“Gap”) is a Delaware corporation with its principal place of business at 2 Folsom Street, San Francisco, California 94105. On information and belief, Gap makes in China, has others make in China, exports from China into the United States, and imports from China certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Gap also operates multiple retail stores across the United States. *See* Gap Store Locator, <http://www.gap.com/customerService/storeLocator.do?mlink=39813,6836749,StoreLocator&mlink=6836749> (last visited July 14, 2014). Specifically, Gap sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Gap Floral Print Always Skinny Jeans (Item No. 600542) (“Gap Product”). A sample of the Gap Product is shown in Exhibit 5J.

20. Guess?, Inc. (“Guess?”) is a Delaware corporation with its principal place of business at 1444 South Alameda Street, Los Angeles, California 90021. On information and belief, Guess? makes in Mexico, has others make in Mexico, exports from Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Guess? also operates multiple retail stores across the United States. Guess? Store Locator, shop.guess.com/en/StoreLocator (last visited July 14, 2014). Specifically, Guess? sells to retail customers and/or wholesalers within the United States imported, infringing products including Guess? Alameda Slim Fit Shorts – Hickory Wash (Style No. M41A01D1A91) (“Guess? Product”). A sample of the Guess? Product is shown in Exhibit 5K.

21. H&M Hennes & Mauritz AB is a Swedish company with its principal place of business at Mäster Samuelsgatan 46A, SE-106 38 Stockholm, Sweden. H&M Hennes & Mauritz LP is a New York company with a business address at 110 Fifth Avenue, 11th Floor, New York, New York 10011. H&M Hennes & Mauritz AB and H&M Hennes & Mauritz LP are collectively referred to as “H&M.” On information and belief, H&M makes in Turkey, has others make in Turkey, exports from Turkey into the United States, and imports from Turkey certain denim garments that are made by methods that are claimed in the Patents-in-Suit. H&M also operates multiple stores across the United States. *See* H&M Store Locator, <http://www.hm.com/us/store-locator> (last visited July 15, 2014). Specifically, H&M sells to retail customers and/or wholesalers within the United States imported, infringing garments including the H&M Boyfriend Low Waist Tapered Leg (“H&M Product”). A sample of the H&M Product is shown in Exhibit 5L.

22. Roberto Cavalli S.p.A. d/b/a Just Cavalli (“Just Cavalli”) is an Italian company with its principal place of business at Piazza San Babila 3 - 0122 Milan, Italy. On information and belief, Just Cavalli makes in Romania, has others make in Romania, exports from Romania into the United States, and imports from Romania certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Just Cavalli operates two retail stores, one at One Borgata Way, Atlantic City, New Jersey, and a second at 434 West Broadway, New York, New York. Roberto Cavalli Store Locator, http://www.robortocavalli.com/store_locator/ (last visited July 15, 2014). Specifically, Just Cavalli sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Just Cavalli Laser Croc Denim Shirt (“Just Cavalli Product”). A sample of the Just Cavalli Product is shown in Exhibit 5M.

23. Koos Manufacturing, Inc. d/b/a AG Jeans and Big Star Jeans (“Koos”) is a California corporation with its principal place of business at 2741 Seminole Avenue, South Gate, California 90280. On information and belief, Koos makes in Mexico, has others make in Mexico, exports from Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Koos also operates multiple retail stores across the United States under the AG Adriano Goldschmied name. AG Jeans Store Locator, <http://www.agjeans.com/store/storelocator.aspx> (last visited July 15, 2014). Specifically, Koos sells to retail customers and/or wholesalers within the United States imported, infringing garments including the AG Jeans, The Matchbox – Skinny Straight LON (Style No. 11311MALON) and the Big Star – Alex Skinny Pattern Jeans (Style No. SWALXFS) (collectively “Koos Products”). Samples of the Koos Products are shown in Exhibit 5N and 5O.

24. Levi Strauss & Co. (“Levi’s”) is a Delaware corporation with its principal place of business at 1155 Battery Street, San Francisco, California. On information and belief, Levi’s makes in Mexico, has others make in Mexico, exports from Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Levi’s also operates multiple stores across the United States. See Levi’s Store Locator, us.levi.com/storeLocator/ (last visited July 14, 2014). Specifically, Levi’s sells to retail customers and/or wholesalers within the United States imported, infringing garments including Levi’s 501 Original Fit Broken Black (Item No. 005011480) (“Levi’s Product”). A sample of the Levi’s Product is shown in Exhibit 5P.

25. Lucky Brand Dungarees, Inc. (“Lucky”) is a Delaware corporation with its principal place of business at 540 South Santa Fe Avenue, Los Angeles, California 90013. On information and belief, Lucky makes in Mexico, has others make in Mexico, exports from

Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. Lucky also operates multiple retail stores across the United States. Lucky Brand Store Locator, <http://www.luckybrand.com/stores> (last visited July 15, 2014). Specifically, Lucky sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Lucky Brand 363 New Vintage Straight Jeans (Style No. 7M11649) (“Lucky Product”). A sample of the Lucky Product is shown in Exhibit 5Q.

26. Fashion Box S.p.A. d/b/a Replay Jeans (“Replay”) is an Italian company with its principal place of business at Via Marcouli 1 - 31011 Localita Casella, Asolo (Treviso) Italy. On information and belief, Replay makes in Tunisia, has others make in Tunisia, exports from Tunisia into the United States, and imports from Tunisia certain denim garments that are made by methods that are claimed in the Patents-in-Suit. On information and belief, Replay previously operated retail stores at 860 Collins Avenue, Miami Beach, Florida 33139 and 109 Prince Street, New York, New York 10012. Specifically, Replay sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Replay Re-Army 335 906 – Slim Bootcut Fit Jeans (Item Number WV676.000.335 906) (“Replay Product”). A sample of the Replay Product is shown in Exhibit 5R.

27. VF Corporation d/b/a 7 for All Mankind (“VF”) is a Pennsylvania corporation with its principal place of business at 105 Corporate Center Boulevard, Greensboro, North Carolina 27408. On information and belief, VF makes in Mexico, has others make in Mexico, exports from Mexico into the United States, and imports from Mexico certain denim garments that are made by methods that are claimed in the Patents-in-Suit. VF also operates multiple stores in the United States under the 7 for All Mankind name. 7 for All Mankind Store

Locator, <https://www.7forallmankind.com/store/storelocator.aspx> (last visited July 15, 2014).

Specifically, VF sells to retail customers and/or wholesalers within the United States imported, infringing garments including the Seven for All Mankind Austyn Jeans (Item No. JTA046702S) (“VF Product”). A sample of the VF Product is shown in Exhibit 5S.

III. THE PATENTS AT ISSUE

A. The '444 Patent – Laser Method and System of Scribing Graphics

28. The '444 Patent, entitled “Laser Method and System of Scribing Graphics,” was issued to Costin on November 23, 1999. A certified copy of the '444 Patent is attached to the Complaint as Exhibit 1A. U.S. Application No. 08/729,493, which issued as the '444 Patent, was filed on October 11, 1996 and claims priority as a continuation-in-part to U.S. Patent Application No. 08/550,339. The '444 Patent has 72 claims including 19 independent claims. RevoLaze became the owner of the '444 Patent by assignment. Exhibit 2A.

29. Complainants have filed a certified copy and three additional copies of the prosecution history for the '444 Patent as Appendix A. Complainants have filed four copies of each patent and technical reference identified in the prosecution history of the application from which the '444 Patent issued as Appendix B.

B. The '602 Patent – Marking of Fabrics and Other Materials Using a Laser

30. The '602 Patent, entitled “Marking of Fabrics and Other Materials Using a Laser,” was issued to Costin on October 31, 2000. A certified copy of the '602 Patent is attached to the Complaint as Exhibit 1B. U.S. Application No. 08/844,114, which issued as the '602 Patent, was filed on April 29, 1997. The '602 Patent has 154 claims including 22 independent claims. RevoLaze became the owner of the '602 Patent by assignment. Exhibit 2B.

31. Complainants have filed a certified copy and three additional copies of the prosecution history for the '602 Patent as Appendix C. Complainants have filed four copies of each patent and technical reference identified in the prosecution history of the application from which the '602 Patent issued as Appendix D.

C. The '196 Patent – Laser Method of Scribing Graphics

32. The '196 Patent, entitled "Laser Method of Scribing Graphics," was issued to Costin, et al. on June 26, 2001. A certified copy of the '196 Patent is attached to the Complaint as Exhibit 1C. U.S. Application No. 09/390,956, which issued as the '196 Patent, was filed on September 7, 1999 and claims priority as a divisional application to U.S. Patent Application No. 08/729,493, which issued as the '444 Patent. The '196 Patent has 16 claims including six independent claims. RevoLaze became the owner of the '196 Patent by assignment. Exhibit 2C.

33. Complainants have filed a certified copy and three additional copies of the prosecution history for the '196 Patent as Appendix E. Complainants have filed four copies of each patent and technical reference identified in the prosecution history of the application from which the '196 Patent issued as Appendix F.

D. The '505 Patent – Laser Processing of Materials Using Mathematical Tools

34. The '505 Patent, entitled "Laser Processing of Materials Using Mathematical Tools," was issued to Martin on December 16, 2003. A certified copy of the '505 Patent is attached to the Complaint as Exhibit 1D. U.S. Application No. 09/730,497, which issued as the '505 Patent, was filed on December 5, 2000 and claims priority to Provisional U.S. Patent Application No. 60/169,096. The '505 Patent has 115 claims including nine independent claims. RevoLaze became the owner of the '505 Patent by assignment. Exhibit 2D.

35. Complainants have filed a certified copy and three additional copies of the prosecution history for the '505 Patent as Appendix G. Complainants have filed four copies of each patent and technical reference identified in the prosecution history of the application from which the '505 Patent issued as Appendix H.

E. The '972 Patent – Material Surface Processing with a Laser that has a Scan Modulated Effective Power to Achieve Multiple Worn Looks

36. The '972 Patent, entitled “Material Surface Processing with a Laser that has a Scan Modulated Effective Power to Achieve Multiple Worn Looks,” was issued to Martin, et al. on November 16, 2004. A certified copy of the '972 Patent is attached to the Complaint as Exhibit 1E. U.S. Application No. 09/653,997, which issued as the '972 Patent, was filed on September 1, 2000 and claims priority to Provisional U.S. Patent Application No. 60/157,904. The '972 Patent has 95 claims including 12 independent claims. RevoLaze became the owner of the '972 Patent by assignment. Exhibit 2E.

37. Complainants have filed a certified copy and three additional copies of the prosecution history for the '972 Patent as Appendix I. Complainants have filed four copies of each patent and technical reference identified in the prosecution history of the application from which the '972 Patent issued as Appendix J.

F. The '815 Patent – Denim Designs from Laser Scribing

38. The '815 Patent, entitled “Denim Designs from Laser Scribing,” was issued to Costin on February 22, 2005. A certified copy of the '815 Patent is attached to the Complaint as Exhibit 1F. U.S. Application No. 10/319,163, which issued as the '815 Patent, was filed on December 14, 2002 and claims priority as a continuation of U.S. Application No. 09/408,131 and to Provisional U.S. Patent Application No. 60/102,363. The '815 Patent has 17

claims including three independent claims. RevoLaze became the owner of the '815 Patent by assignment. Exhibit 2F.

39. Complainants have filed a certified copy and three additional copies of the prosecution history for the '815 Patent as Appendix K. Complainants have filed four copies of each patent and technical reference identified in the prosecution history of the application from which the '815 Patent issued as Appendix L.

G. Foreign Counterparts

40. The Patents-in-Suit have the following foreign counterpart patents or patent applications:

- The '444 Patent – PCT Publication No. 1997/016279, Canadian Patent App. No. 2236480 (abandoned), European Patent No. 0954404 (Nationalized in Italy, Spain, France, Germany, Great Britain, and Ireland; currently undergoing opposition proceedings before the European Patent Office), Mexican Patent No. 204894 (expired), Australian Patent App. No. 19960074655 (abandoned);
- The '602 Patent – None;
- The '196 Patent – The '196 Patent is a divisional application filed from the '444 Patent. The foreign counterparts to the '196 Patent are the same as those filed from the '444 Patent;
- The '505 Patent – PCT Publication No. 2001/042554, Australian Patent App. No. 20010047119 (abandoned);
- The '972 Patent – PCT Publication No. 2001/025824, Turkish Patent No. 200201254 (issued), Chinese Patent No. 08816659.5 (issued), Mexican Patent No. 237135 (issued), Mexican Patent No. 202403 (abandoned), Australian Patent App.

No. 20000077306 (abandoned), Canadian Patent No. 2386786 (abandoned), European Patent Publication No. 1242962 (withdrawn from examination), Japanese Patent App. No. 2003511242 (abandoned), South Korean Patent No. 564715 (abandoned);

- The '815 Patent – None.

H. Licensees

41. The Asserted Patents are currently licensed to Lear Corporation; Green Bay Decking LLC; GST AutoLeather, Inc.; Nike, Inc.; DVUV, LLC; and Fins Denim Co. The Asserted Patents were previously licensed to GFSI, Inc. (Gear for Sports); Sights Denim Systems; Taylor Togs, Inc.; Final Finish Laundry, and VF Corporation, but these licenses are no longer in force.

I. Non-Technical Description of the Patented Technologies

42. For the last two decades, the denim market has demanded jeans with a worn appearance. This is achieved by abrading the denim jeans along the thighs and buttocks to give the appearance of jeans that have been worn for a long period of time. The process of choice to create this abraded or worn look had been the sandblast process, in which workers blast sand in the thigh and buttock areas to abrade the denim. In recent years, however, it has been confirmed that sandblasting denim can cause a disabling, and sometimes fatal, lung disease called silicosis for the workers.

43. Because of this deadly process, Turkey, once a predominant manufacturing country for sandblasting denim jeans, has completely banned sandblasting denim country-wide. Furthermore, all major denim apparel companies, such as Levi's, Gap, VF, and H&M, have banned the use of sandblasting in the creation of denim jeans with a worn look. The

two most acceptable alternative methods to create the worn look are hand sanding and laser abrading. This sandblasting ban has thus increased the demand for lasers to abrade denim to help satisfy the market demand for denim featuring the worn look.

44. Accordingly, denim apparel companies and their jean manufacturers are rapidly scaling up laser abrading processes to produce the denim with a worn look.

Complainants have developed laser technology to abrade denim and sought patent protection for their technology.

45. The '444 Patent is drawn to a method of scribing with a laser on material such as denim. Avoidance of undesired carbonization, melting or burn-through is achieved by controlling continuous power output, spot size of the laser beam on the material and speed of the laser relative to the material.

46. The '602 Patent is drawn to a method and apparatus for forming a design on material such as denim with a laser. Speed of the laser relative to the material is controlled between a maximum speed that will provide a perceivable change to the material and a minimum speed below which carbonization, undesired burn-through or undesired melting will occur.

47. The '196 Patent is drawn to a method to prevent over etching of material such as denim with a laser. Before the laser beam is output, the laser is set in motion relative to the material so that it is moving when the beam is output to the material.

48. The '972 Patent is drawn to a method and apparatus for changing the power of the laser beam "on the fly." A worn look on jeans has areas, for example, in the middle that appear more worn or lighter than areas on the sides or margins that appear less worn or darker. As the laser scribes the worn look it does so one line at a time (scan line), with each line above or below the next as the pattern is developed. The effective power output of the laser

changes during the course of a single scan line to provide the variation in intensity to achieve the feathering or variation in color called for by the pattern design.

49. The '505 Patent is drawn to a method of forming images on a material such as denim with a laser. The images to be formed are subdivided into picture elements called pixels. Each specific pixel has an x,y coordinate and is associated with a color or grayscale. Each grayscale is associated with a specified amount of energy from the laser to achieve the grayscale. The amount of energy that is assigned to a grayscale is determined by a mathematical operation.

50. The '815 Patent is drawn to laser scribing material such as denim. The amount of energy applied by the laser is controlled to alter the surface chemistry of a denim article without undesirably damaging the denim article. The laser thus modifies an entire width of the denim article.

IV. THE PRODUCTS AT ISSUE

A. Complainants Products

51. Complainants are innovators in laser scribing of high quality graphics and patterns on a variety of materials including denim, cotton, polyester, nylon, and silk for use in apparel and upholstery, as well as in polymer composites and natural building materials. Complainants have spent years developing and licensing the technology to partners such as Lear Corporation, a global leader in automobile seating and upholstery, Nike, Inc., Green Bay Decking, a manufacturer of composite decking, DVUV, LLC, a manufacturer of powder coated medium density fiberboard. See *infra*, Paragraphs 92 – 104 and associated Exhibits.

B. Respondent's Infringing Products

52. Respondents are each manufacturers, retailers, and/or wholesalers who make or have made and sell denim garments abraded using the Complainants' patented

technology. After investigation, Complainants have reason to believe that the Respondents' garments are abraded using a CO₂ laser, Technical Declaration of Darryl Costin ("Costin Technical Declaration"), ¶¶ 8-31 (attached as Exhibit 36A), in order to create designs on the garments or to simulate worn sections that are desirable to consumers. On information and belief, Respondents process their garments using a laser system such as that created by Jeanologia – GFK and Easy Laser. Declaration of William Murcia ("Murcia Declaration"), ¶¶ 7-11 (attached as Exhibit 37A).

V. UNLAWFUL AND UNFAIR ACTS OF THE RESPONDENTS

A. **A&F**

53. A&F manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the A&F Product. The A&F Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the A&F Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 12; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, A&F uses Easy Laser and Jeanologia – GFK technology to manufacture its products. *See* Exhibit 35A, Cynthia Martens, Jeanologia: Seeking a Friendlier Denim Finish, *Women's Wear Daily* (Nov. 9, 2011); Exhibit 35B, Jeanologia: Ultimate technology for jean finishing, *The Indian Textile Journal* (June 2012).

54. The A&F Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the A&F Product are attached as Exhibits 8A-8F.

The claims charts demonstrate how the A&F Product meets every limitation of the Asserted Claims.

B. American Eagle Outfitters

55. AEO manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the AEO Product. The AEO Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the AEO Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 13; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, AEO uses Easy Laser and Jeanologia – GFK lasers and methods to create the AEO Product. *See* Exhibit 35C, Easy Laser, Our Customers.

56. The AEO Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the AEO Product are attached as Exhibits 9A-9F. The claims charts demonstrate how the AEO Product meets every limitation of the Asserted Claims.

C. BlankNYC

57. BlankNYC manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the BlankNYC Product. The BlankNYC Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the BlankNYC Product includes laser abrasion pores formed from a CO₂

laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 14; Exhibit 37A, Murcia Declaration, ¶¶ 7-11.

58. The BlankNYC Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the BlankNYC Product are attached as Exhibits 10A-10F. The claims charts demonstrate how the BlankNYC Product meets every limitation of the Asserted Claims.

D. Buckle

59. Buckle manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Buckle Product. The Buckle Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Buckle Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 15; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, Buckle uses Easy Laser and Jeanologia – GFK lasers and methods to create the Buckle Product. *See* Exhibit 35D, Jeanologia dominates Mexican garment finishing market, fibre 2 fashion (Mar. 11, 2014).

60. The Buckle Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Buckle Product are attached as Exhibits 11A-11F. The claims charts demonstrate how the Buckle Product meets every limitation of the Asserted Claims.

E. **Buffalo**

61. Buffalo manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Buffalo Product. The Buffalo Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Buffalo Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 16; Exhibit 37A, Murcia Declaration, ¶¶ 7-11.

62. The Buffalo Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Buffalo Product are attached as Exhibits 12A-12F. The claims charts demonstrate how the Buffalo Product meets every limitation of the Asserted Claims.

F. **[Reserved]**

63. [Reserved].

64. [Reserved].

G. **Diesel**

65. Diesel manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Diesel Product. The Diesel Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Diesel Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 18; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and

belief, Diesel uses Easy Laser and Jeanologia – GFK lasers and methods to create the Diesel Product. *See* Exhibit 35C, Easy Laser, Our Customers.

66. The Diesel Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Diesel Product are attached as Exhibits 14A-14F. The claims charts demonstrate how the Diesel Product meets every limitation of the Asserted Claims.

H. **DL1961**

67. DL1961 manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the DL1961 Product. The DL1961 Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the DL1961 Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 19; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. DL1961 admits that it uses Jeanologia – GFK equipment in the production of its jeans. Exhibit 35F, Panel: Industry Drives Sustainability Effort, Women’s Wear Daily at 8 (July 24, 2013) (“DL1961 has employed both Lenzing fibers and, in its parent company’s plant in Pakistan, Jeanologia’s equipment.”).

68. The DL1961 Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the DL1961 Product are attached as Exhibits 15A-15F. The claims charts demonstrate how the DL1961 Product meets every limitation of the Asserted Claims.

I. **Eddie Bauer**

69. Eddie Bauer manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Eddie Bauer Product. The Eddie Bauer Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Eddie Bauer Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 20; Exhibit 37A, Murcia Declaration, ¶¶ 7-11.

70. The Eddie Bauer Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Eddie Bauer Product are attached as Exhibits 16A-16F. The claims charts demonstrate how the Eddie Bauer Product meets every limitation of the Asserted Claims.

J. **Gap**

71. Gap manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Gap Product. The Gap Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Gap Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 21; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, Gap uses Easy Laser and Jeanologia – GFK lasers and methods to create the Gap Product. *See* Exhibit 35B, Jeanologia: Ultimate technology for jean finishing, The Indian Textile Journal (June 2012); Exhibit 35C, Easy Laser, Our Customers.

72. The Gap Product is made by a method infringing the Asserted Claims.

Claim charts applying the Asserted Claims to the Gap Product are attached as Exhibits 17A-17F.

The claims charts demonstrate how the Gap Product meets every limitation of the Asserted Claims.

K. Guess?

73. Guess? manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Guess? Product. The Guess? Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Guess? Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 22; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, Guess? uses Easy Laser and Jeanologia – GFK lasers and methods to create the Guess? Product. *See* Exhibit 35D, Jeanologia dominates Mexican garment finishing market, fibre 2 fashion (Mar. 11, 2014).

74. The Guess? Product is made by a method infringing the Asserted Claims.

Claim charts applying the Asserted Claims to the Guess? Product are attached as Exhibits 18A-

18F. The claims charts demonstrate how the Guess? Product meets every limitation of the Asserted Claims.

L. H&M

75. H&M manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the H&M Product. The H&M Product is

manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the H&M Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 23; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, H&M uses Easy Laser and Jeanologia – GFK technology to manufacture the H&M Product. *See* Exhibit 35A, Cynthia Martens, Jeanologia: Seeking a Friendlier Denim Finish, *Women’s Wear Daily* (Nov. 9, 2011).

76. The H&M Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the H&M Product are attached as Exhibits 19A-19F. The claims charts demonstrate how the H&M Product meets every limitation of the Asserted Claims.

M. Just Cavalli

77. Just Cavalli manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Just Cavalli Product. The Just Cavalli Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Just Cavalli Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 24; Exhibit 37A, Murcia Declaration, ¶¶ 7-11.

78. The Just Cavalli Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Just Cavalli Product are attached as Exhibits 20A-20F. The claims charts demonstrate how the Just Cavalli Product meets every limitation of the Asserted Claims.

N. Koos

79. Koos manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Koos Products. The Koos Products are manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Koos Products include laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶¶ 25-26; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, Koos uses Easy Laser and Jeanologia – GFK lasers and methods to create the Koos Products. *See* Exhibit 35D, Jeanologia dominates Mexican garment finishing market, fibre 2 fashion (Mar. 11, 2014). In addition, Koos has purchased Jeanologia equipment. Exhibit 35G, Ocean Bill of Lading for Koos (showing importation of Jeanologia equipment by Koos Manufacturing). On information and belief, Koos uses the Jeanologia equipment to manufacture the Koos Products.

80. The Koos Products are made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Koos Products are attached as Exhibits 21A-21F and 22A-22F. The claims charts demonstrate how the Koos Products meet every limitation of the Asserted Claims.

O. Levi's

81. Levi's manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Levi's Product. The Levi's Product is manufactured by a method that infringes one or more of the Asserted Claims. On information

and belief, the Levi's Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 27; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, Levi's uses Easy Laser and Jeanologia – GFK lasers and methods to create the Levi's Product. *See* Exhibit 35C, Easy Laser, Our Customers. Levi's also provides instructions to its employees on a laser etching process "involv[ing] the use of lasers to fade dyes, giving garments a worn and abraded appearance. This technique may also be used to create faded images or letters." Exhibit 35H, Environment, Health and Safety Handbook, Levi Strauss & Co. at 87 (v2.0 April 2007).

82. The Levi's Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Levi's Product are attached as Exhibits 23A-23F. The claims charts demonstrate how the Levi's Product meets every limitation of the Asserted Claims.

P. Lucky

83. Lucky manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Lucky Product. The Lucky Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the Lucky Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 28; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, Lucky uses Easy Laser and Jeanologia – GFK lasers and methods to create the Lucky

Product. *See* Exhibit 35D, Jeanologia dominates Mexican garment finishing market, fibre 2 fashion (Mar. 11, 2014).

84. The Lucky Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Lucky Product are attached as Exhibits 24A-24F. The claims charts demonstrate how the Lucky Product meets every limitation of the Asserted Claims.

Q. Replay

85. Replay manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the Replay Product. The Replay Product is manufactured by a method that infringes one or more of the Asserted Claims. Replay admits that it manufactures, has manufactured, and/or distributes these products using laser-abrading technology. Exhibit 7H, Replay Laserblast – Official Teaser Video *available at* <https://www.youtube.com/watch?v=csHda3aEqIk&index=7&list=PLFFE50865E37B4517>. On information and belief, Replay uses Easy Laser and Jeanologia – GFK lasers and methods to create the Replay Product. *Id.* On information and belief, the Replay Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 29; Exhibit 37A, Murcia Declaration, ¶¶ 7-11.

86. The Replay Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the Replay Product are attached as Exhibits 25A-25F. The claims charts demonstrate how the Replay Product meets every limitation of the Asserted Claims.

R. VF Corp.

87. VF manufactures for import, has others manufacture for import, imports into the United States, offers for sale, and/or sells in the United States after importation infringing denim garments including, but not limited to the VF Product. The VF Product is manufactured by a method that infringes one or more of the Asserted Claims. On information and belief, the VF Product includes laser abrasion pores formed from a CO₂ laser using the patented method such as that used by Easy Laser and Jeanologia – GFK. Exhibit 36A, Costin Technical Declaration, ¶ 30; Exhibit 37A, Murcia Declaration, ¶¶ 7-11. On information and belief, VF uses Easy Laser and Jeanologia – GFK lasers and methods to create the VF Product. *See* Exhibit 35D, Jeanologia dominates Mexican garment finishing market, fibre 2 fashion (Mar. 11, 2014).

88. The VF Product is made by a method infringing the Asserted Claims. Claim charts applying the Asserted Claims to the VF Product are attached as Exhibits 26A-26F. The claims charts demonstrate how the VF Product meets every limitation of the Asserted Claims.

VI. SPECIFIC INSTANCES OF IMPORTATION AND SALE

89. Each Accused Product is marked as having been made outside of the United States and was sold in the United States after importation or sold for importation into the United States. Exhibit 6A, Ripley Declaration ¶¶ 4-58. The A&F Product was manufactured in Guatemala. *Id.* ¶ 6. The Koos Products, AEO Product, Buckle Product, Guess? Product, Levi's Product, Lucky Product, and VF Product were manufactured in Mexico. *Id.* ¶¶ 9, 15, 36, 49, 52, and 58. The BlankNYC Product and Gap Product were manufactured in China. *Id.* ¶ 12 and 33. The Buffalo Product was manufactured in Thailand. *Id.* ¶ 18. The Diesel Product was manufactured in Italy. *Id.* ¶ 24. The DL1961 Product was manufactured in Pakistan. *Id.* ¶ 27.

The Eddie Bauer Product was manufactured in Sri Lanka. *Id.* ¶ 30. The H&M Product was manufactured in Turkey. *Id.* ¶ 39. The Just Cavalli Product was manufactured in Romania. *Id.* ¶ 42. The Replay Product was manufactured in Tunisia. *Id.* ¶ 55.

VII. CLASSIFICATION OF THE INFRINGING PRODUCTS UNDER THE HARMONIZED TARIFF SCHEDULE OF THE UNITED STATES.

90. The Accused Products are believed to fall within at least the following classifications of the harmonized tariff schedules of the United States: 6203.42.4011 and 6204.62.4011. These classifications are intended for illustrative purposes only and are not intended to restrict the scope or type of product accused of infringing the Asserted Patents.

VIII. RELATED LITIGATION

91. Complainant RevoLaze has filed complaints alleging patent infringement in the U.S. District Court for the Northern District of Ohio on August 15, 2014, styled as RevoLaze, LLC, v. Abercrombie & Fitch Co. (Case No. 1:14-cv-01797-PAG), RevoLaze, LLC, v. American Eagle Outfitters, Inc. (Case No. 1:14-cv-01799-PAG), RevoLaze, LLC, v. BBC Apparel Group, LLC, et al. (Case No. 1:14-cv-01800-DCN), RevoLaze, LLC, v. The Buckle, Inc. (Case No. 1:14-cv-01801-PAG), RevoLaze, LLC, v. Buffalo International ULC, et al. (Case No. 1:14-cv-01803-JG), RevoLaze, LLC, v. Diesel S.p.A. (Case No. 1:14-cv-01806-DAP), RevoLaze, LLC, v. DL1961 Premium Denim Inc. (Case No. 1:14-cv-01807-DCN), RevoLaze, LLC, v. Eddie Bauer LLC (Case No. 1:14-cv-01809-DCN), RevoLaze, LLC, v. The Gap, Inc. (Case No. 1:14-cv-01821), RevoLaze, LLC, v. Guess?, Inc. (Case No. 1:14-cv-01818), RevoLaze, LLC, v. H&M Hennes & Mauritz AB, et al. (Case No. 1:14-cv-01812-PAG), RevoLaze, LLC, v. Roberto Cavalli S.p.A. (Case No. 1:14-cv-01819), RevoLaze, LLC, v. Koos Manufacturing, Inc. (Case No. 1:14-cv-01814), RevoLaze, LLC, v. Levi Strauss & Co. (Case No. 1:14-cv-01816), RevoLaze, LLC, v. Lucky Brand Dungarees, Inc. (Case No. 1:14-cv-01817),

RevoLaze, LLC, v. Fashion Box S.p.A. (Case No. 1:14-cv-01815), and RevoLaze, LLC, v. VF Corporation (Case No. 1:14-cv-01820), accusing each Respondent of infringing one or more of the Asserted Patents.

IX. **DOMESTIC INDUSTRY**

92. A domestic industry exists and is in the process of being established within the United States as defined by 19 U.S.C. §§1337(a)(3)(A)-(C) relating to significant investments in plant and equipment, significant employment of labor and capital, and significant investment in the exploitation of the Asserted Patents, including engineering and development of domestic industry products. The identified domestic industry products covered by one or more Asserted Claim include the domestic industry of Complainants and their licensees.

A. **Technical Prong**

93. RevoLaze is currently in the process of establishing a domestic industry by utilizing linear processing of rolls of denim or other materials using at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, the '505 Patent, the '972 Patent, and the '815 Patent. Complainants have attached claim charts detailing how the linear processing industry practices the Asserted Patents. Exhibits 27A-27F.

94. Complainants are currently in the process of developing a domestic industry for sports apparel marking. By this industry, consumers will be able to purchase apparel having their favorite sports team's logo, likeness, name, or other mark laser etched into an item of apparel. The sports apparel marking process utilizes at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, the '505 Patent, the '972 Patent, and the '815 Patent. Complainants have attached claim charts detailing how the sports apparel industry practices the Asserted Patents. Exhibits 28A-28F.

95. Complainants have licensed the claimed technology to Green Bay Decking LLC to scribe simulated wood grain patterns on composite decking to make it appear more realistic like natural wood decking. Exhibit 4D, Green Bay Decking LLC License. The decking industry utilizes at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, the '505 Patent, the '972 Patent, and the '815 Patent. Complainants have attached claim charts detailing how the composite decking material industry practices the Asserted Patents. Exhibits 29A-29F.

96. Complainants have licensed the claimed technology to Lear Corporation to scribe graphics and patterns on automotive products. Exhibit 4C, Lear Corp. License. Lear's use of the patented technology for automotive cloth interiors utilizes at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, the '505 Patent, the '972 Patent, and the '815 Patent. Complainants have attached claim charts detailing how Lear's automotive upholstery industry practices the Asserted Patents. Exhibits 30A-30F.

97. Complainants have licensed the claimed technology to GST AutoLeather, Inc. to scribe graphics and patterns on leather upholstery products. Exhibit 4B, GST AutoLeather, Inc. License. GST's use of the patented technology for leather upholstery utilizes at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, and the '505 Patent. Complainants have attached claim charts detailing how GST's leather upholstery industry practices the Asserted Patents. Exhibits 31A-31D.

98. Complainants have licensed the claimed technology to DVUV, LLC to scribe graphic and patterns on medium density fiberboard. Exhibit 4A, DVUV, LLC License. The laser etched medium density fiberboard industry utilizes at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, the '505 Patent, and

the '815 Patent. Complainants have attached claim charts detailing how DVUV's fiberboard industry practices the Asserted Patents. Exhibits 32A-32E.

99. RevoLaze is currently in the process of developing a domestic industry by utilizing high-speed laser abrasion of denim jeans using at least one embodiment of the invention as claimed in the '444 Patent, the '602 Patent, the '196 Patent, the '505 Patent, the '972 Patent, and the '815 Patent. Complainants have attached claim charts detailing how the high-speed abrasion industry practices the Asserted Patents. Exhibits 33A-33F.

B. Economic Prong

100. Both Complainants and their licensees have made in the past and are continuing to make substantial investments in plants and equipment, labor and capital, and exploitation of the Asserted Patents and products manufactured utilizing the methods and systems claimed in the Asserted Patents. *See* Exhibit 34A, Domestic Industry Declaration of Darryl J. Costin, Ph.D. ("Costin Domestic Industry Declaration") and associated Exhibits.

101. Specifically, RevoLaze has made significant investments to operate offices, research and development, and manufacturing facilities in Westlake, Ohio and St. Paul, Minnesota. In the Westlake, Ohio facility, Complainants operate approximately

of office space and of research and development space. Exhibit 34A, Costin Domestic Industry Declaration, ¶ 10. In the St. Paul facility, Complainants operate approximately of manufacturing and research and development space in conjunction with LasX Industries. Exhibit 34A, Costin Domestic Industry Declaration, ¶ 12-13. RevoLaze is in the process of opening a linear processing system at its Westlake facility for which approximately has been contracted for the development and initial operation of the linear processing system. Exhibit 34A, Costin Domestic Industry Declaration, ¶ 16. Over

the past five years, Complainants have also invested approximately [redacted] for other laser equipment, manufacturing and office space, maintenance and repairs, and equipment rental. Exhibit 34A, Costin Domestic Industry Declaration, ¶ 22.

102. RevoLaze, TechnoLines, their affiliates, and their licensees have invested significant resources in labor and capital as well. Between 2010 and 2014, they invested approximately [redacted] for the research, development, and commercialization of the patented technology including the various products identified in Exhibits 29A-29F, 30A-30F, 31A-31D, 32A-32E, and 33A-33F. Exhibit 34A, Costin Domestic Industry Declaration, ¶ 30-130. In addition, personnel costs between 2010 and May 31, 2014 have totaled approximately [redacted] for Complainants. Exhibit 34A, Costin Domestic Industry Declaration, ¶ 29.

103. Complainants have worked to exploit the claimed technology continuously since the Asserted Patents were filed. Complainants have participated in numerous trade shows showcasing the patented technology at a cost of approximately [redacted] over the past two years. Exhibit 34A, Costin Domestic Industry Declaration, ¶¶ 36-63. Complainants have also licensed the Asserted Patents and Complainants' technical know-how to multiple licensees over the course of the last several years, and are continuing to explore new market potential and partners. Exhibit 34A, Costin Domestic Industry Declaration ¶¶ 64-130.

104. Complainants have developed hundreds of graphic files for laser etching for numerous customers, including one or more of the Respondents, throughout Complainants history in response to sample requests. Exhibit 34A, Costin Domestic Industry Declaration ¶¶ 119-130.

X. GENERAL EXCLUSION ORDER

105. There is a pattern of violation of the 19 U.S.C. § 1337, as evidenced by the large number of respondents, and it is difficult to identify all sources of infringing products.

Many manufacturing facilities in many different countries manufacture infringing garments for apparel companies, including the Respondents. It is difficult for Complainants to identify all apparel companies whose apparel is manufactured by the infringing processes. Likewise, it is difficult for Complainants to identify all manufacturing facilities that apparel companies use to manufacture infringing garments. Accordingly, Complainants request a general exclusion order be entered by the United States International Trade Commission.

XI. RELIEF REQUESTED

106. Complainants respectfully request that the United States International Trade Commission:

a) institute an immediate investigation pursuant to Section 337(b)(1) of the Tariff Act of 1930 (19 U.S.C. § 1337(b)(1)) into the violations by Respondents of Section 337 arising from the unlawful importation into the United States, sale for importation, and/or sale within the United States after importation of Respondents denim garments that are made and/or processed by methods that infringe the Asserted Claims of the Asserted Patents.

b) schedule and conduct a hearing pursuant to Section 337(c) for purposes of receiving evidence and hearing argument whether there has been a violation of Section 337, and, following the hearing, determine that there has been a violation of Section 337;

c) issue a permanent general exclusion order pursuant to 19 U.S.C. § 1337(d)(2)(B) forbidding entry into the United States of all denim garments manufactured or processed by methods that infringe the Asserted Patents ; or, in the alternative;

d) issue a limited exclusion order pursuant to 19 U.S.C. §1337(d)(1) forbidding entry of denim garments imported, sold for importation, or sold in the United State following importation by Respondents that infringe the Asserted Patents;

e) issue permanent cease-and-desist orders pursuant to 19 U.S.C. §1337(f) directing Respondents to cease and desist from the importation, sale, offer for sale, advertising, or solicitation for sale by Respondents of denim garments that are manufactured or processed by methods that infringe one or more of the Asserted Patents;

f) grant such other relief as the Commission deems just and proper based on the facts determined by the investigation.

Dated: August 18, 2014

Respectfully submitted,



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September 17, 2014
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Inv. No. 337-TA-930
Contact: Peg O'Laughlin, 202-205-1819

**USITC INSTITUTES SECTION 337 INVESTIGATION OF CERTAIN LASER
ABRADED DENIM GARMENTS**

The U.S. International Trade Commission (USITC) has voted to institute an investigation of certain laser abraded denim garments. The products at issue in this investigation are denim garments, including jeans and leggings, that have been abraded with a laser to apply designs or to simulate wear.

The investigation is based on a complaint filed by RevoLaze, LLC, and TechnoLines, LLC, both of Westlake, OH, on August 18, 2014. The complaint alleges violations of section 337 of the Tariff Act of 1930 in the importation into the United States and sale of certain laser abraded denim garments that infringe patents asserted by the complainants. The complainants request that the USITC issue a general exclusion order, or in the alternative a limited exclusion order, and cease and desist orders.

The USITC has identified the following as respondents in this investigation:

Abercrombie & Fitch Co. of New Albany, OH;
American Eagle Outfitters, Inc., of Pittsburgh, PA;
BBC Apparel Group, LLC, of New York, NY;
Gotham Licensing Group, LLC, of New York, NY;
The Buckle, Inc., of Kearney, NE;
Buffalo International ULC of Montreal, Quebec, Canada;
1724982 Alberta ULC of Montreal, Quebec, Canada;
Diesel S.p.A. of Breganze (VI), Italy;
DL1961 Premium Denim Inc. of New York, NY;
Eddie Bauer LLC of Bellevue, WA;
The Gap, Inc., of San Francisco, CA;
Guess?, Inc., of Los Angeles, CA;
H&M Hennes & Mauritz AB of Stockholm, Sweden;
H&M Hennes & Mauritz LP of New York, NY;
Roberto Cavalli S.p.A. of Milan, Italy;
Koos Manufacturing, Inc., of South Gate, CA;
Levi Strauss & Co. of San Francisco, CA;
Lucky Brand Dungarees, Inc., of Los Angeles, CA;
Fashion Box S.p.A. of Asolo (Treviso), Italy; and
VF Corporation of Greensboro, NC.

By instituting this investigation (337-TA-930), the USITC has not yet made any decision on the merits of the case. The USITC's Chief Administrative Law Judge will assign the case to one of the USITC's administrative law judges (ALJ), who will schedule and hold an evidentiary

hearing. The ALJ will make an initial determination as to whether there is a violation of section 337; that initial determination is subject to review by the Commission.

The USITC will make a final determination in the investigation at the earliest practicable time. Within 45 days after institution of the investigation, the USITC will set a target date for completing the investigation. USITC remedial orders in section 337 cases are effective when issued and become final 60 days after issuance unless disapproved for policy reasons by the U.S. Trade Representative within that 60-day period.

#

Levi's Settles ITC Patent Infringement Case

 rivetandjeans.com/levis-settles-itc-patent-infringement-case/

Levi Strauss & Co. has settled a denim technology infringement case through the U.S. International Trade Commission (ITC). The company agreed to enter into a licensing agreement with RevoLaze, LLC and TechnoLines, LLC, which filed a complaint last August claiming infringement on six patents regarding laser abraded denim garments.

RevoLaze said it holds 29 patents for laser inscribing methods that apply patterns and worn-in looks to various materials, including denim. The laser abrasion technology is used as an alternative to sandblasting techniques, which can be harmful to workers' health.

According to the family-operated company, RevoLaze CEO Darryl Costin, PhD., has spent 20 years developing high-speed, high-power laser scribing technology for the denim industry.

"We have worked very hard over the last two decades to invent and patent our proprietary laser scribing technology to benefit the denim industry," Costin said. "Our goal has always been to do the right thing. We want to help protect workers. We want to conserve the environment and significantly contribute to the denim industry's green movement. We want the denim industry to continue growing and to realize cost, quality, throughput and environmental advantages with RevoLaze technology."

Levi's was one of 17 companies the ITC complaint targeted, including VF Corp, Hennes & Mauritz and Gap Inc. BBC Apparel, Eddie Bauer, Fashion Box SpA and Gotham Licensing Group and have already settled the cases against them.

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) Title: FABRIC WITH ENHANCED RESPONSE CHARACTERISTICS FOR LASER FINISHING

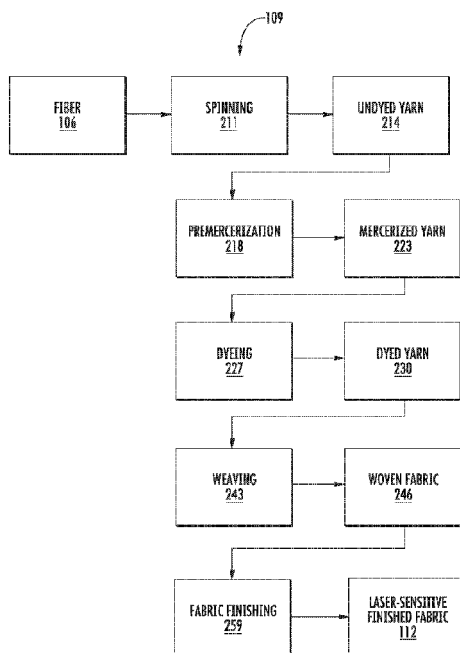


FIG. 2

(57) Abstract: A fabric has enhanced response characteristics for laser finishing. The fabric can be denim for denim apparel such as jeans. Software and lasers are used to finish apparel made of the fabric to produce a desired wear or distressing pattern or other design. The fabric allows for relatively fast color change in response to the laser, color changes in hue from indigo blue to white, many grayscale levels, and maintains strength and stretch properties. A method used to make the fabric includes spinning, dyeing, and weaving yarns in such a way to obtain the desired enhanced response characteristics for laser finishing.



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Fabric with Enhanced Response Characteristics for Laser Finishing

Description

Cross-Reference to Related Applications

[01] This patent application claims the benefit of U.S. patent application 62/433,739, filed December 13, 2016, which is incorporated by reference along with all other references cited in this application.

Background of the Invention

[02] The present invention relates to textiles and, more specifically, to materials and fabrics and their manufacture, in which the materials and fabrics will have enhanced response characteristics for laser finishing, especially for denim and denim apparel including jeans, shirts, shorts, jackets, vests, and skirts, to obtain a faded, distressed, washed, or worn finish or appearance.

[03] In 1853, during the California Gold Rush, Levi Strauss, a 24-year-old German immigrant, left New York for San Francisco with a small supply of dry goods with the intention of opening a branch of his brother's New York dry goods business. Shortly after arriving in San Francisco, Mr. Strauss realized that the miners and prospectors (called the "forty niners") needed pants strong enough to last through the hard work conditions they endured. So, Mr. Strauss developed the now familiar jeans which he sold to the miners. The company he founded, Levi Strauss & Co., still sells jeans and is the most widely known jeans brand in the world. Levi's is a trademark of Levi Strauss & Co.

[04] Though jeans at the time of the Gold Rush were used as work clothes, jeans have evolved to be fashionably worn everyday by men and women, showing up on billboards, television commercials, and fashion runways. Fashion is one of the largest consumer industries in the U.S. and around the world. Jeans and related apparel are a significant segment of the industry.

[05] As fashion, people are concerned with the appearance of their jeans. Many people desire a faded or worn blue jeans look. In the past, jeans became faded or distressed through normal wash and wear. The apparel industry recognized people's desire for the worn blue jeans look and began producing jeans and apparel with different wear patterns. The wear

patterns have become part of the jeans style and fashion. Some examples of wear patterns include combs or honeycombs, whiskers, stacks, and train tracks.

[06] Despite the widespread success jeans have enjoyed, the process to produce modern jeans with wear patterns takes processing time, has relatively high processing cost, and is resource intensive. A typical process to produce jeans uses significant amounts of water, chemicals (e.g., bleaching or oxidizing agents), ozone, enzymes, and pumice stone. For example, it may take from about 20 to 60 liters of water to finish each pair of jeans.

[07] Therefore, there is a need for an improved materials and fabrics for laser finishing of jeans and other apparel that reduces environmental impact, processing time, and processing costs, while maintaining the look and style of traditional finishing techniques.

Brief Summary of the Invention

[08] A fabric has enhanced response characteristics for laser finishing. The fabric can be denim for denim apparel such as jeans. Software and lasers are used to finish apparel made of the fabric to produce a desired wear or distressing pattern or other design. The fabric allows for relatively fast color change in response to the laser, color changes in hue from indigo blue to white, many grayscale levels, and maintains strength and stretch properties. A method used to make the fabric includes spinning, dyeing, and weaving yarns in such a way to obtain the desired enhanced response characteristics for laser finishing.

[09] In an implementation, a method includes: processing a cotton yarn using an indigo dye to have a cross section having an outer ring and an inner core, where a thickness of the outer ring is about, for example, 10 percent (e.g., from about 7.5 percent to about 12.5 percent) of a total thickness of the yarn, and the outer ring is indigo colored due to being penetrated through by the indigo dye while the inner core is white or off-white colored due to not being penetrated to by the indigo dye; and weaving the dyed cotton yarn into a denim fabric, where the warp yarns include dyed cotton and the weft yarns include undyed cotton, and the denim fabric is to be finished by exposing the dyed cotton yarn to a laser.

[10] When exposed to the laser, the laser creates a finishing pattern on a surface of the garment based on a laser input file provided to the laser. The laser input file includes a laser exposure values for different laser pixel location. For each laser exposure value, the laser removes a depth or thickness of material from the surface of the denim material that corresponds to the laser exposure value.

[11] For lighter pixel locations of the finishing pattern, a greater depth of the indigo ring-dyed cotton yarn is removed, revealing a greater width of an inner core of the dyed yarn, as

compared to darker pixel locations of the finishing pattern, where a lesser depth of the indigo ring-dyed cotton yarn is removed, revealing a lesser width of an inner core of the dyed yarn.

[12] In another implementation, a method includes: A garment made from fabric panels of a denim material is provided. The fabric panels are sewn together using thread. The denim material will be finished by using a laser to remove selected amounts of material from a surface of the denim material at selected locations of the garment.

[13] The denim material includes an indigo ring-dyed cotton yarn having cross section having an outer ring and an inner core. A cross-sectional profile of the outer ring relative to the inner core is compatible with the laser to obtain at least 64 different grayscale levels. For the cross-sectional profile, a thickness of the outer ring that is, for example, about 10 percent (e.g., from about 7.5 percent to about 12.5 percent) of a total thickness of the yarn.

[14] The outer ring is indigo colored due to being penetrated through by an indigo dye while the inner core is white or off-white colored due to not being penetrated to by the indigo dye. The indigo ring-dyed cotton yarn with laser-compatible cross-sectional profile is obtained by a dyeing process.

[15] The process can include: mercerizing an undyed yarn in an alkaline solution to obtain an mercerized undyed yarn; immersing the mercerized undyed yarn into at least one indigo dye solution having a pH in a range, for example, from about 10.7 to about 11.6; and exposing the garment to a laser to create a finishing pattern on a surface of the garment based on a laser input file provided to the laser. The laser input file has laser exposure values, each for a different laser pixel location.

[16] For each laser exposure value, the laser will remove a depth of material from the surface of the garment that corresponds to the laser exposure value. For lighter pixel locations of the finishing pattern, a greater depth of the indigo ring-dyed cotton yarn is removed as compared to darker pixel locations of the finishing pattern, where a lesser depth of the indigo ring-dyed cotton yarn is removed.

[17] Other objects, features, and advantages of the present invention will become apparent upon consideration of the following detailed description and the accompanying drawings, in which like reference designations represent like features throughout the figures.

Brief Description of the Drawings

[18] Figure 1 shows a process flow for manufacturing apparel such as jeans where garments are finished using a laser.

- [19] Figure 2 shows a flow for fabric processing to produce a laser-sensitive finished fabric.
- [20] Figure 3 shows a flow for a dyeing process.
- [21] Figure 4 shows technique of using a dye range to dye yarn.
- [22] Figure 5 shows a weave pattern for a denim fabric.
- [23] Figure 6 shows a cross section of a dyed yarn with a ring dyeing effect.
- [24] Figure 7 shows a technique of laser finishing denim fabric made from ring-dyed yarn.
- [25] Figure 8 shows a computer system which is part of a laser finishing system for apparel or system for manufacturing a fabric with enhanced response characteristics for laser finishing.
- [26] Figure 9 shows a system block diagram of the computer system.
- [27] Figures 10–13 show how the laser alters the color of ring-dyed yarn.
- [28] Figures 14–16 show the impact of the thickness or depth of the ring dye on the laser's ability alter the color of the ring-dyed yarn.
- [29] Figures 17–18 show photomicrographs of cross sections of warp yarn, before and after lasering.
- [30] Figures 19 and 20 show for the same ring dye thickness or depth, percentages of exposed white fibers for a fine yarn and a coarse yarn, respectively.
- [31] Figures 21 and 22 show cross sections of a coarse yarn and a fine yarn, respectively, with elastane cores.

Detailed Description of the Invention

- [32] Figure 1 shows a process flow 101 for manufacturing apparel such as jeans, where garments are finished using a laser. The fabric or material for various apparel including jeans is made from natural or synthetic fibers 106, or a combination of these. A fabric mill takes fibers and processes 109 these fibers to produce a laser-sensitive finished fabric 112, which has enhanced response characteristics for laser finishing.
- [33] Some examples of natural fibers include cotton, flax, hemp, sisal, jute, kenaf, and coconut; fibers from animal sources include silk, wool, cashmere, and mohair. Some examples of synthetic fibers include polyester, nylon, spandex or elastane, and other polymers. Some examples of semisynthetic fibers include rayon, viscose, modal, and lyocell, which are made from a regenerated cellulose fiber. A fabric can be a natural fiber alone (e.g., cotton), a synthetic fiber alone (e.g., polyester alone), a blend of natural and synthetic fibers

(e.g., cotton and polyester blend, or cotton and spandex), or a blend of natural and semisynthetic fibers, or any combination of these or other fibers.

[34] For jeans, the fabric is typically a denim, which is a sturdy cotton warp-faced textile in which a weft passes under two or more warp threads. This twill weaving produces a diagonal ribbing. The yarns (e.g., warp yarns) are dyed using an indigo or blue dye, which is characteristic of blue jeans.

[35] Although this patent describes the apparel processing and finishing with respect to jeans, the invention is not limited jeans or denim products, such as shirts, shorts, jackets, vests, and skirts. The techniques and approaches described are applicable to other apparel and products, including nondenim products and products made from knit materials. Some examples include T-shirts, sweaters, coats, sweatshirts (e.g., hoodies), casual wear, athletic wear, outerwear, dresses, evening wear, sleepwear, loungewear, underwear, socks, bags, backpacks, uniforms, umbrellas, swimwear, bed sheets, scarves, and many others.

[36] A manufacturer creates a design 115 (design I) of its product. The design can be for a particular type of clothing or garment (e.g., men's or women's jean, or jacket), sizing of the garment (e.g., small, medium, or large, or waist size and inseam length), or other design feature. The design can be specified by a pattern or cut used to form pieces of the pattern. A fabric is selected and patterned and cut 118 based on the design. The pattern pieces are assembled together 121 into the garment, typically by sewing, but can be joined together using other techniques (e.g., rivets, buttons, zipper, hoop and loop, adhesives, or other techniques and structures to join fabrics and materials together).

[37] Some garments can be complete after assembly and ready for sale. However, other garments are unfinished 122 and have additional laser finishing 124. The finishing may include tinting, washing, softening, and fixing. For distressed denim products, the finishing can include using a laser to produce a wear pattern according to a design 127 (design II). Some additional details of laser finishing are described in U.S. patent application 62/377,447, filed August 19, 2016, which is incorporated by reference. U.S. patent applications 15/682,507, filed August 21, 2017, and 62/433,746, filed December 13, 2016, are also incorporated by reference.

[38] Design 127 is for postassembly aspects of a garment while design 115 is for preassembly aspects of a garment. After finishing, a finished product 130 is complete and ready for sale. The finished product is inventoried and distributed 133, delivered to stores 136, and sold to consumers or customers 139. The consumer can buy and wear worn blue

jeans without having to wear out the jeans themselves, which usually takes significant time and effort.

[39] Traditionally, to produce distressed denim products, finishing techniques include dry abrasion, wet processing, oxidation, or other techniques, or combinations of these, to accelerate wear of the material in order to produce a desired wear pattern. Dry abrasion can include sandblasting or using sandpaper. For example, some portions or localized areas of the fabric are sanded to abrade the fabric surface. Wet processing can include washing in water, washing with oxidizers (e.g., bleach, peroxide, ozone, or potassium permanganate), spraying with oxidizers, washing with abrasives (e.g., pumice, stone, or grit).

[40] These traditional finishing approaches take time, incur expense, and impact the environment by utilizing resources and producing waste. It is desirable to reduce water and chemical usage, which can include eliminating the use agents such as potassium permanganate and pumice. An alternative to these traditional finishing approaches is laser finishing.

[41] Figure 2 shows a flow for fabric processing 109 to produce a laser-sensitive finished fabric. In a specific implementation, the fabric is laser-sensitive denim that is made for laser finishing, where the laser produces a distressed finish.

[42] Denim fabric is typically made from cotton, which is a plant-based cellulose fiber. There are many different varieties of cotton including upland cotton and long staple cotton, also known as Pima cotton. Upland cotton has fiber lengths from about 13 to 35 millimeters, while long staple cotton have fiber lengths from about 25 to 65 millimeters. The fiber length for denim is generally about 28 millimeters or greater. Denim is often made from upland cotton, but may be from other varieties or a blend of different varieties of cotton.

[43] A cotton picker machine picks the cotton bolls from the cotton plant. The cotton bolls are the fruit of the cotton plant and include lint and cotton seeds. The cotton fibers twist and spiral together. A cotton gin separates the lint from the cotton seeds and other debris, which are discarded and used for other purposes (e.g., extracting cottonseed oil). Cotton is generally a white or off-white color. The cotton fiber is hollow, allowing the fiber to absorb moisture—making cotton warm in the winter and cool in the summer.

[44] Fiber 106 can be 100 percent cotton fiber. Or fiber 106 can be a blend, including cotton and other noncotton fibers to modify the characteristics of the fabric. For example, spandex, elastane, or other elastic polyurethane fiber can be blended with the cotton fibers to give the denim a stretch characteristic.

[45] By spinning 211 the fiber, an undyed yarn 214 is obtained. During spinning, cotton staple fibers or a blend of cotton and other fibers are twisted together to form a continuous spun yarn. Depending on the specific spinning process, a diameter and number of twists in the yarn can vary. The undyed yarn is the same color as the cotton fiber, white or off white.

[46] Spinning can be by, for example, ring spinning, rotor spinning, or other spinning technique. Another spinning technique is core spinning, where a fiber (e.g., staple fiber) is wound around a core of another material, such as polyester or elastane. Core spinning can be used to be used create stretch denim material.

[47] After spinning and before dyeing, the yarn can be mercerized 218 to obtain a mercerized yarn 223. Mercerization can also be performed after weaving. When performed on the undyed yarn, the mercerization can be referred to as premercerization. When performed on the fabric, the mercerization can be referred to as fabric mercerization. Mercerization is optional and yarns and fabrics are not necessarily mercerized. If used, mercerization is usually done only once in the process, either yarn premercerization or fabric mercerization.

[48] Mercerization strengthens the yarn and gives the yarn a more lustrous appearance. Mercerization alters the chemical structure of the cotton fiber. Mercerizing results in the swelling of the cell wall of the cotton fiber. This causes an increase in the surface area and reflectance, and gives the fiber a softer feel. In an implementation, for premercerization, the yarn is treated in a sodium hydroxide bath (or other chemical, typically highly alkaline solution, that causes the fibers to swell). This is followed with an acid bath that neutralizes the sodium hydroxide.

[49] After spinning and optionally mercerization, a dyeing process 227 in which the yarn is dyed. For blue denim, the undyed yarn is dyed using an indigo dye to obtain a dyed yarn 230, which will be indigo blue. The dyed yarn is woven 243 to obtain a woven fabric 246, which can be further finished by fabric finishing 259. Fabric finishing may include, for example, preshrinking. This results in laser-sensitive finished fabric 112.

[50] Figure 3 shows a flow for dyeing process 217 that includes dyeing using indigo. Indigo dye is blue dye with a chemical formula $C_{16}H_{10}N_2O_2$. Indigo dye can be plant-based or synthetic. Indigo dye has very low solubility in water and is considered insoluble. To be dissolved, the indigo dye is converted into a soluble form by a reduction process. A chemical reduction process is to use, for example, sodium hydrosulphite or other chemical constituent, which reduces indigo rapidly in solution at temperatures from about 30 to 60 degrees Celsius. Other reduction processes include bacterial reduction and electrochemical reduction.

[51] For dyeing, a pH of the reduced indigo solution can be a range from about 10.5 to about 13, which is a basic solution. In chemistry, pH is a numeric scale that specifies an acidity or basicity (or alkalinity) of an aqueous solution in which 7 is considered neutral. Water has a pH of 7. A pH value is defined as the decimal logarithm of the reciprocal of the hydrogen ion activity in a solution. Solutions having pH greater than 7 would be consider basic, while solutions with pH less than 7 would be consider acidic. A usual range for pH is from 0 to 14, but the pH value can be below 0 or above 14. The pH is a relative value: The higher the pH indicates the greater the basicity or less the acidity of a solution. The lower the pH indicates the less the basicity or greater the acidity of a solution.

[52] An indigo dying process can include, optionally, a sulfur bottoming 306 before dyeing with indigo. For sulfur bottoming, the yarn is first dyed using a sulfur dye or sulfur dyestuff. Often the sulfur dye is black or gray, but can be other colors. Generally sulfur bottoming is used to give yarn a particular color cast. Sulfur bottoming is optional and can be omitted from the dyeing process.

[53] Indigo dyeing occurs by dipping 310 or immersing yarn into a vat with the reduced indigo dye. The color of the reduced indigo dye solution is not indigo or blue, but rather greenish or yellowish-green in color. When a white yarn is dipped into and removed from a vat with reduced indigo dye, the yarn will be yellowish-green in color. However, by exposure to oxygen in the air, the indigo oxidizes 315, and slowly over time, the yellowish-green yarn will turn the familiar blue color associated indigo. The blue color is caused by chromophores trapped in the fabric which reflect light as a blue color. The blue color of indigo has a wavelength between about 420 to 465 nanometers.

[54] The dye dipping and oxidizing steps can be repeated multiple times 319, such as 2, 3, 4, 5, 6, 7, 8, 12, or more times. Multiple dips can be used to obtain deeper shades of blue. With each dip, the dye penetrates (e.g., migrates or diffuses) more toward a center or core of the yarn, rather than staying on the surface or close to the surface of the yarn.

[55] After indigo dyeing is completed, the process can include, optionally, a sulfur topping 324. Sulfur topping is similar to sulfur bottoming, but sulfur topping occurs after indigo dyeing instead of before. Sulfur topping is optional and can be omitted from the dyeing process.

[56] In an implementation, the dying process includes sulfur bottoming, indigo dyeing, and sulfur topping. In an implementation, the sulfur bottoming and sulfur topping are not used, and the yarn will be dyed using only indigo. Another implementation includes sulfur

bottoming and indigo dyeing, and not sulfur topping. Another implementation includes indigo dyeing and sulfur topping, and not sulfur bottoming.

[57] It should be understood that the invention is not limited to the specific flows and steps presented. A flow of the invention may have additional steps (not necessarily described in this patent), different steps which replace some of the steps presented, fewer steps or a subset of the steps presented, or steps in a different order than presented, or any combination of these. Further, the steps in other implementations of the invention may not be exactly the same as the steps presented and may be modified or altered as appropriate for a particular application or based on the data or situation.

[58] Figure 4 shows technique of using an indigo dye range 408 to dye yarn. A dye range machine has that a number of boxes or vats, which are used to hold the solutions that the yarn will be dipped. Dye ranges can have any number of boxes, such as 6 boxes, 8 boxes, or 12 boxes, or greater. With greater number of boxes, more dips are possible.

[59] The boxes or vats 412 for the dye range are typically housed on one floor (e.g., first floor or basement) a building. The dye range has a skyer mechanism 416 with extends through the ceiling of the floor with boxes into upper floors of the building, such as the second and third floors, or higher floors. For example, for a three floor unit, where each floor is about 12 feet, the skyer unit can extend into the air at least 24 feet.

[60] During operation, undyed yarn 214 is conducted or transported via rollers, pulleys, and other mechanisms and pathways through the various boxes (e.g., vat 1, vat 2, and vat 3) to dip the yarn into the solutions within the boxes. The solutions in the boxes can be for sulfur bottoming (optional), indigo dip in a reduced indigo solution, and sulfur topping (optional). Between dips, the yarn is conducted via the skyer above the boxes or vats (or urns or vessels), which exposes the yarn to oxygen so it can oxidize and the indigo can turn blue. At the end of the process, dyed yarn 220 is obtained.

[61] Figure 5 shows a weave pattern of a denim fabric 220. A loom does the weaving. In weaving, warp is the lengthwise or longitudinal yarn or thread in a roll, while weft or woof is the transverse thread. The weft yarn is drawn through the warp yarns to create the fabric. In figure 5, the warps extend in a first direction 505 (e.g., north and south) while the wefts extend in a direction 516 (e.g., east and west). The wefts are shown as a continuous yarn that zigzags across the warps (e.g., carried across by a shuttle or a rapier of the loom). Alternatively, the wefts could be separate yarns. In some specific implementations, the warp yarn has a different weight or thickness than the weft yarns. For example, warp yarns can be coarser than the weft yarns.

[62] For denim, dyed yarn 220 is used for the warp, and undyed or white yarn is typically used for the weft yarn. In some denim fabrics, the weft yarn can be dyed and have a color other than white, such as red. In the denim weave, the weft passes under two or more warp threads. Figure 5 shows a weave with the weft passing under two warp threads. Specifically, the fabric weave is known as a 2x1 right-hand twill. For a right-hand twill, a direction of the diagonal is from a lower left to an upper right. For a left-hand twill, a direction of the diagonal is from an lower right to an upper left. But in other denim weaves, the weft can pass under a different number of warp threads, such as 3, 4, 5, 6, 7, 8, or more. In other implementation, the denim is a 3x1 right-hand twill, which means the weft passes under three warp threads.

[63] Because of the weave, one side of the fabric exposes more of the warp yarns (e.g., warp-faced side), while the other side exposes more of the weft yarns (e.g., weft-faced side). When the warp yarns are blue and weft yarns are white, a result of the weave is the warp-faced side will appear mostly blue while the reverse side, weft-faced side, will appear mostly white.

[64] In denim, the warp is typically 100 percent cotton. But some warp yarns can be a blend with, for example, elastane to allow for warp stretch. And some yarns for other fabrics may contain other fibers, such as polyester or elastane as examples.

[65] Figure 6 shows a cross section of a dyed yarn with a ring dyeing effect. A ring dyeing effect occurs when dyeing of a yarn does not diffuse or penetrate completely through the yarn. Rather, a surface layer 606 of the yarn is dyed, while a core 612 of the yarn is not. The core would remain undyed and, for example, white. In denim, the warp yarns are indigo dyed, and a cross section of ring-dyed warp yarns would be similar to that shown in figure 6.

[66] The yarn has a diameter 622, the ring dyed portion has a thickness 626, and the core has a diameter 629. An area of the yarn, $A(\text{yarn})$, is $\text{Pi} * (\text{D}622/2)^2$, where Pi a mathematical constant, the ratio of a circle's circumference to its diameter, approximated as 3.14159, D622 is diameter 622, and 2 indicates the quantity in parenthesis to the power 2 or squared. An area of the core, $A(\text{core})$, is $\text{Pi} * (\text{D}612/2)^2$, where D612 is diameter 612. The area of the ring dyed portion is $A(\text{yarn})$ minus $A(\text{core})$.

[67] To simplify the diagram, figure 6 shows a solid or hard boundary between the dyed portion and the undyed core portion. In practice, the boundary between the dyed and undyed portions can be due to dye diffusion, a gradient, where the dye gradually lightens or fades in blue color.

[68] Ring dyeing is often considered undesirable since the dye is not evenly been distributed through the yarn. However, for laser finishing, ring-dyed yarn can improve a fabric's response characteristics to the laser. Fabric with ring-dyed yarn has an improved grayscale resolution, allowing the laser to obtain a greater number of gray levels that are visually distinguishable from each other.

[69] Figure 7 shows a technique of laser finishing denim fabric 703 with ring-dyed yarn 708. In denim, the ring-dyed yarn is the warp yarn. The fabric or garment is positioned in front of a laser 712 that emits a laser beam 717 that strikes the fabric. A computer 721 controls a power level and exposure time of the laser. The resulting laser beam removes at least a portion of the dyed yarn with chromophores from the fabric. Depending on the amount of dyed yarn with chromophores removed, the shade of blue of the fabric can be altered or varied, from deep blue to white.

[70] The computer can control a positioning mechanism 726 to position the laser to print, for example, a distressing pattern or any other pattern onto the garment. For example, the laser can print the pattern row by row (or column by column). Also, the laser can make multiple passes across one or more rows (or columns). Multiple passes can be used to further increase or enhance grayscale resolution. Also laser passes may be made between rows (e.g., half or quarter rows), which can increase pixel resolution.

[71] Laser finishing is a technique that includes the use of a laser. A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. Lasers are used for bar code scanning, medical procedures such as corrective eye surgery, and industrial applications such as welding. A particular type of laser for finishing apparel is a carbon dioxide laser, which emits a beam of infrared radiation.

[72] The laser can be controlled by an input file and control software to emit a laser beam onto fabric at a particular position or location at a specific power level for a specific amount of time. Further, the power of the laser beam can be varied according to a waveform such as a pulse wave with a particular frequency, period, pulse width, or other characteristic. Some aspects of the laser that can be controlled include the duty cycle, frequency, marking or burning speed, and other parameters.

[73] The duty cycle is a percentage of laser emission time. Some examples of duty cycle percentages include 40, 45, 50, 55, 60, 80, and 100 percent. The frequency is the laser pulse frequency. A low frequency might be, for example, 5 kilohertz, while a high frequency might be, for example, 25 kilohertz. Generally, lower frequencies will have higher surface penetration than high frequencies, which has less surface penetration.

[74] The laser acts like a printer and “prints,” “marks,” or “burns” a wear pattern (specified by, for example, an input file) onto the garment. The fabric that is exposed to the infrared beam changes color, lightening the fabric at a specified position by a certain amount based on the laser power, time of exposure, and waveform used. The laser continues from position to position until the wear pattern is completely printed on the garment.

[75] In a specific implementation, the laser has a resolution of about 34 dots per inch (dpi), which on the garment is about 0.7 millimeters per pixel. The technique described in this patent is not dependent on the laser’s resolution, and will work with lasers that have more or less resolution than 34 dots per inch. For example, the laser can have a resolution of 10, 15, 20, 25, 30, 40, 50, 60, 72, 80, 96, 100, 120, 150, 200, 300, or 600 dots per inch, or more or less than any of these or other values. Typically, the greater the resolution, the finer the features that can be printed on the garment in a single pass. By using multiple passes (e.g., 2, 3, 4, 5, or more passes) with the laser, the effective resolution can be increased. In an implementation, multiple laser passes are used.

[76] A system of laser finishing can include a computer to control or monitor operation, or both. Figure 8 shows an example of a computer that is component of a laser finishing system. The computer may be a separate unit that is connected to a laser system, or may be embedded in electronics of the laser system. In an embodiment, the invention includes software that executes on a computer workstation system, such as shown in figure 8.

[77] Further, a system for manufacturing a fabric with enhanced response characteristics for laser finishing can also include a computer to control or monitor operation, or both. Figure 8 also shows an example of a computer that is component of a fabric manufacturing system. For example, the computer can be connected to control the spinning machines, dye range or dyeing machines, loom or weaving machines, or other machines used in the manufacture or processing of the fabric, or a combination of these.

[78] Figure 8 shows a computer system 801 that includes a monitor 803, screen 805, enclosure 807, keyboard 809, and mouse 811. Mouse 811 may have one or more buttons such as mouse buttons 813. Enclosure 807 (may also be referred to as a system unit, cabinet, or case) houses familiar computer components, some of which are not shown, such as a processor, memory, mass storage devices 817, and the like.

[79] Mass storage devices 817 may include mass disk drives, floppy disks, magnetic disks, optical disks, magneto-optical disks, fixed disks, hard disks, CD-ROMs, recordable CDs, DVDs, recordable DVDs (e.g., DVD-R, DVD+R, DVD-RW, DVD+RW, HD-DVD, or Blu-ray Disc), flash and other nonvolatile solid-state storage (e.g., USB flash drive or solid state

drive (SSD)), battery-backed-up volatile memory, tape storage, reader, and other similar media, and combinations of these.

[80] A computer-implemented or computer-executable version or computer program product of the invention may be embodied using, stored on, or associated with computer-readable medium. A computer-readable medium may include any medium that participates in providing instructions to one or more processors for execution. Such a medium may take many forms including, but not limited to, nonvolatile, volatile, and transmission media. Nonvolatile media includes, for example, flash memory, or optical or magnetic disks. Volatile media includes static or dynamic memory, such as cache memory or RAM. Transmission media includes coaxial cables, copper wire, fiber optic lines, and wires arranged in a bus. Transmission media can also take the form of electromagnetic, radio frequency, acoustic, or light waves, such as those generated during radio wave and infrared data communications.

[81] For example, a binary, machine-executable version, of the software of the present invention may be stored or reside in RAM or cache memory, or on mass storage device 817. The source code of the software of the present invention may also be stored or reside on mass storage device 817 (e.g., hard disk, magnetic disk, tape, or CD-ROM). As a further example, code of the invention may be transmitted via wires, radio waves, or through a network such as the Internet.

[82] Figure 9 shows a system block diagram of computer system 801 used to execute software of the present invention. As in figure 8, computer system 801 includes monitor 803, keyboard 809, and mass storage devices 817. Computer system 801 further includes subsystems such as central processor 902, system memory 904, input/output (I/O) controller 906, display adapter 908, serial or universal serial bus (USB) port 912, network interface 918, and speaker 920. The invention may also be used with computer systems with additional or fewer subsystems. For example, a computer system could include more than one processor 902 (i.e., a multiprocessor system) or the system may include a cache memory.

[83] The processor may be a dual core or multicore processor, where there are multiple processor cores on a single integrated circuit. The system may also be part of a distributed computing environment. In a distributed computing environment, individual computing systems are connected to a network and are available to lend computing resources to another system in the network as needed. The network may be an internal Ethernet network, Internet, or other network.

[84] Arrows such as 922 represent the system bus architecture of computer system 801. However, these arrows are illustrative of any interconnection scheme serving to link the subsystems. For example, speaker 920 could be connected to the other subsystems through a port or have an internal connection to central processor 902. Computer system 801 shown in figure 8 is but an example of a computer system suitable for use with the present invention. Other configurations of subsystems suitable for use with the present invention will be readily apparent to one of ordinary skill in the art.

[85] Computer software products may be written in any of various suitable programming languages, such as C, C++, C#, Pascal, Fortran, Perl, Matlab, SAS, SPSS, JavaScript, AJAX, Java, Python, Erlang, and Ruby on Rails. The computer software product may be an independent application with data input and data display modules. Alternatively, the computer software products may be classes that may be instantiated as distributed objects. The computer software products may also be component software such as Java Beans (from Oracle Corporation) or Enterprise Java Beans (EJB from Oracle Corporation).

[86] An operating system for the system may be one of the Microsoft Windows® family of operating systems (e.g., Windows 95, 98, Me, Windows NT, Windows 2000, Windows XP, Windows XP x64 Edition, Windows Vista, Windows 7, Windows 8, Windows 10, Windows CE, Windows Mobile, Windows RT), Symbian OS, Tizen, Linux, HP-UX, UNIX, Sun OS, Solaris, Mac OS X, Apple iOS, Android, Alpha OS, AIX, IRIX32, or IRIX64. Other operating systems may be used. Microsoft Windows is a trademark of Microsoft Corporation. Other operating systems may be used. A computer in a distributed computing environment may use a different operating system from other computers.

[87] Any trademarks or service marks used in this patent are property of their respective owner. Any company, product, or service names in this patent are for identification purposes only. Use of these names, logos, and brands does not imply endorsement.

[88] Furthermore, the computer may be connected to a network and may interface to other computers using this network. For example, each computer in the network may perform part of the task of the many series of steps of the invention in parallel. Furthermore, the network may be an intranet, internet, or the Internet, among others. The network may be a wired network (e.g., using copper), telephone network, packet network, an optical network (e.g., using optical fiber), or a wireless network, or any combination of these. For example, data and other information may be passed between the computer and components (or steps) of a system of the invention using a wireless network using a protocol such as Wi-Fi (IEEE standards 802.11, 802.11a, 802.11b, 802.11e, 802.11g, 802.11i, 802.11n, 802.11ac, and

802.11ad, just to name a few examples), near field communication (NFC), radio-frequency identification (RFID), mobile or cellular wireless (e.g., 2G, 3G, 4G, 3GPP LTE, WiMAX, LTE, LTE Advanced, Flash-OFDM, HIPERMAN, iBurst, EDGE Evolution, UMTS, UMTS-TDD, 1xRDD, and EV-DO). For example, signals from a computer may be transferred, at least in part, wirelessly to components or other computers.

[89] Figures 10–13 show how the laser alters the color of ring-dyed yarn. Figure 10 shows a laser beam 1007 striking a ring-dyed yarn 1013 having indigo-dyed fibers 1018 and white core fibers 1022. The laser removes the dyed fibers, which can be by vaporizing or otherwise destroying the cotton fiber via heat or high temperature that the laser beam causes.

[90] Figure 11 shows the laser using a first power level setting or first exposure time setting, or a combination of these, to remove some of the dyed fibers, but not revealing any of the white core fibers. The undyed fibers remain covered. There is no color change.

[91] Figure 12 shows the laser using a second power level setting or second exposure time setting, or a combination of these, to remove more of the dyed fibers than in figure 11. The second power level is greater than the first power level, or the second exposure time setting is greater than the first exposure time setting, or a combination of these. The result is some of the undyed fibers are revealed. There is a color change, subtle highlighting.

[92] Figure 13 shows the laser using a third power level setting or third exposure time setting, or a combination of these, to remove even more of the dyed fibers than in figure 12. The third power level is greater than the second power level, or the third exposure time setting is greater than the second exposure time setting, or a combination of these. The result is more of the undyed fibers are revealed. There is a color change, brighter highlighting.

[93] Further, the diameter of lasers beam can be adjusted or changed. The focal distance between the lens and the fabric may also be adjusted to keep the laser focused. In a specific laser finishing system, the laser is set to allow it to reach a size of an entire pair of pants from top (e.g., waistband) to bottom (e.g., leg opening ends); at that focal distance, the resolution for the laser is 1 millimeter. The resolution can be increased, but then the laser will need to be moved closer to the fabric, and the laser would not reach a typical pair of pants, top to bottom.

[94] The laser system has a scan speed, which is also known as a pixel time or exposure time setting. This is the amount of time the laser spends at each pixel. As an example, a black pixel (which prints as “white” on the denim) of “0” is 100 percent of the pixel time, and each fading grey is a percentage of that pixel time. So a very light file (e.g., less highlighting) will move more quickly across a garment than a more intense one. When using an enhanced laser-

sensitive fabric, less time and energy is needed to create the pattern. In an implementation, when the laser power level or intensity is fixed, the exposure time is used to determine the energy a pixel of the apparel is exposed to.

[95] In another implementation, the exposure time is fixed, and the laser power level or intensity is adjustable or variable to determine the energy at a pixel of the apparel is exposed to. In another implementation, the laser power level and exposure time are both variable to determine the energy at a pixel of the apparel is exposed to.

[96] Figures 14–16 show the impact of the thickness or depth of the ring dye on the laser's ability alter the color of the ring-dyed yarn. Figure 14 shows a first thickness or depth of the ring dye. Figure 15 shows a second thickness or depth of the ring dye. Figure 16 shows a third thickness or depth of the ring dye. The first thickness is thicker than the second thickness, and the second thickness is greater than the first thickness.

[97] Figure 14 shows that due to the first thickness being relatively thick, the laser does not remove sufficient amount of the dyed region to expose the core fibers. There is no color change, and the result is no highlighting.

[98] Figure 15 shows that due to the second thickness being a medium thickness, the laser removes some of the dyed region so that some of the white core fibers are exposed. The result is slight highlighting.

[99] Figure 16 shows that due to the third thickness being a relatively narrow thickness, the laser removes the dyed region so that many of the white core fibers are exposed. The result is very bright highlighting.

[100] Figure 17 shows a photomicrograph of a cross section of warp yarn from a denim fabric, before lasering. The warp yarns exhibit ring dyeing.

[101] Figure 18 shows a photomicrograph of a cross section of warp yarn from a denim fabric, after lasering. Some of the ring dyed portion has been removed by the laser, and the white fibers of the core are exposed. The dyed portion (e.g., indigo- or blue-colored portion) can be referred to as an outer ring, while the undyed or less dyed portion (e.g., white or off-white colored portion) can be referred to as an inner core.

[102] If figure 18, some of the measured ring dye thicknesses are 91, 108, and 92 microns. A measure distance of yarn surface to exposed fiber length is about 406 microns. A measured distance from yarn surface to exposed fiber length is about 406 microns. A measured distance from core edge to exposed fiber length is about 289 microns.

[103] In a specific implementation of ring dyed yarn, the ring dye thickness or depth penetrates no more than about 10 percent of the yarn thickness, from all surfaces (or sides).

So, about 20 percent of the total diameter is dyed, and the core is 80 percent of the diameter.

[104] Further, due to process variations, the total ring dye thickness (including both sides) can vary, such as 20 percent plus or minus 10, 15, 20, 25, or even up to 50 percent in some instances. So, the ranges can be from about 18 to 22 percent, about 17 to 23 percent, about 16 to 24 percent, about 15 to 25 percent, or up to about 10 to 30 percent. The ring dye thickness for a single side would about half of these values. More specifically, the range for a single-side ring dye thickness would be about 9 to 11 percent, about 8.5 to 11.5 percent, about 8 to 12 percent, about 7.5 to 12.5 percent, or up to about 5 to 15 percent.

[105] As an example, in an implementation, for greater highlights from laser finishing, the total ring-depth depth (which includes thicknesses of both sides of the outer ring) should be from about 15 percent to about 25 percent of the yarn thickness or diameter. When less than 15 percent, the ring dye can wash down too fast, and there not enough colored material for the laser to work with. With more than 25 percent ring-dye is not responsive to provide as large a number of grayscale levels (e.g., not able to provide 64 or more different levels, 128 or more different levels, or 256 or more different levels). Therefore, for a single side, the outer ring thickness can be from about 7.5 percent (e.g., 15 percent divided by 2) to about 12.5 percent (e.g., 25 percent divided by 2).

[106] As a result of the process of making a fabric, a fabric has response characteristics for laser finishing. It is desirable that the fabric have the following good or strong performance characteristics including: (i) fast or relatively fast color change with minimal laser irradiation, (ii) color changes to a hue close to white (e.g., 64 or more grayscale levels, 128 grayscale levels, or 256 or more grayscale levels), and (iii) minimal degradation to strength or stretch properties, or any combination of these. It is undesirable that the fabric have the following poor performance characteristics such as: (i) slow color change, (ii) color changes to a color with noticeable hue, such as grey, blue, or green, instead of white or (iii) unacceptable degradation to strength or stretch properties, or any combination of these.

[107] A fabric with good characteristics for laser finishing has yarns with undyed core fibers (white fibers) closer to their surfaces. A process is to manufacture yarns and this fabric can include one or more of the following techniques, in any combination:

[108] 1. Lower pH. Lowering the pH reduces indigo dye affinity to the yarn fiber, reducing penetration. In a specific implementation, the pH of the indigo dye solutions used in the dyeing process are about 11.6 or less, 11.5 or less, 11.4 or less, 11.3 or less, 11.2 or less, or

11.1 or less. In an implementation, the pH will be in a range from about 10.7 to 11.2. By maintaining pH at these levels, the dye yarn will exhibit the ring dye effect.

[109] 2. Premercerization. Swelling of fibers makes indigo dye penetration more difficult, reducing ring-dye depth. When the yarns have been premercerization, the pH can be increased slightly and the yarn will still have a desired ring dye. For example, with premercerization, the pH of the indigo dye solution can be increased to 11.2, rather than using 10.7 or 10.8.

[110] 3. Lower dye concentration, faster dyeing speed, number of dips, lower temperatures, or any combination of these. If shade matching is not important, a technique reduces opportunity for dye penetration. For example, the dye concentration can be in a range from, for example, about 1.0 to 1.05 grams per liter. In other implementations, the range can extend up to 3 grams per liter.

[111] For dips, there can be, for example, about 8 dye dips. In other implementations, there can be 8 or fewer dye dips, such as 2, 3, 4, 5, 6, or 7. In other implementations, there can be more than 8 dye dips, such as 9, 10, 11, 12, or more than 12 dye dips. With more dips, a lower dye concentration (or adjustment in other parameter) can be used to obtain the same shading and core diameter. With fewer dips, a higher dye concentration (or adjustment in other parameter) can be used to obtain the same shading and core diameter.

[112] Alternatively, or in combination with lower dye concentration, there can be faster speed indigo dips in the indigo, or reduce time of yarn in indigo dips. The machine speed of the dye range can be, for example, about 25 meters per minute. The machine speed of the dye range can exceed 25 meters per minute, which will decrease the dye dip time. In other implementations, the machine speed can be less than 25 meters per minute, and other parameters such as the dye concentration can be used to obtain the same shading and core diameter.

[113] Lower temperatures reduce diffusion rate, and thus the ring dye effect will be enhanced and more controllable at lower temperatures. The vats or dye boxes typically have a temperature controller to control heating of the indigo solution. A temperature of the indigo solution is typically room temperature (e.g., 20 degrees Celsius) or above. In an implementation, the temperature range of the indigo solution is from about 20 degrees Celsius to about 30 degrees Celsius. For example, the temperature can be 30 degrees Celsius or below. In an implementation, the temperature range of the indigo solution is from about 30 degrees Celsius to about 40 degrees Celsius. For example, the temperature can be 40 degrees Celsius or below. In an implementation, the temperature range of the indigo solution is from

about 40 degrees Celsius to about 50 degrees Celsius. For example, the temperature can be 50 degrees Celsius or below. In an implementation, the temperature range of the indigo solution is from about 50 degrees Celsius to about 60 degrees Celsius. For example, the temperature can be 60 degrees Celsius or below. In an implementation, the temperature range of the indigo solution is from about 60 degrees Celsius to about 70 degrees Celsius. For example, the temperature can be 70 degrees Celsius or below. Various other parameters, such as dye concentration or number of dips, can be adjusted to compensate for higher or lower temperatures.

[114] 4. Higher yarn twist. High yarn twist makes dye penetration more difficult, reducing ring-dye depth. For example, yarns for denim are twisted in a range between 4.2 and 4.8 twists per inch or TPI. TPI refers to the number of twist spirals in an inch of yarn. Generally, anything 4.6 or above would be considered a higher twist yarn. For some shrink-to-fit products, yarn twist can be about 4.8 twists per inch.

[115] 5. Coarse yarn count. Ring-dye depth is a lower percentage of the total yarn diameter, leaving a large undyed yarn core. More fibers remain for improved tear or tensile properties. For equivalent bath concentrations and warp ends, ratio of dye to fiber mass in bath is lower. Fine yarns are at risk of becoming dyed to the center, leaving no undyed fibers to provide color change and highlight.

[116] For fine yarns, dye penetration makes up a larger percentage of total yarn diameter, leaving only a small white core, meaning the ratio of blue to white fibers is higher. This causes the highlight to appear bluish rather than white. Fine yarns are also more at risk for physical failure before highlight is achieved due to removal of a larger percentage of total fiber.

[117] Figures 19 and 20 show for the same ring dye thickness or depth, percentages of exposed white fibers for a fine yarn and a coarse yarn, respectively. In figure 19, the fine yarn has, as an example, 28 percent of exposed white fibers. In figure 20, the coarse yarn has, as an example, 50 percent of exposed white fibers.

[118] 6. Reduce, minimize, or eliminate sulfur bottoming. Due to the affinity of sulfur dyestuff to cotton, sulfur dyes penetrate to the yarn core, dyeing the once-white core fibers. The fabric will now highlight to the color of the sulfur bottom. A small amount of sulfur may be acceptable if the core fibers are dyed to a negligible color change. If sulfur bottoming is desired, a dark indigo dye can create the illusion of bright highlights via contrast against base shade.

[119] 7. Sulfur topping. Sulfur topping is less risky than bottoming because many dye-sites are already occupied by indigo, and loose indigo slows penetration of sulfur into yarn.

However, sulfur topping still contributes to the total dye quantity; high concentrations can still lead to poor performance, particularly with fine yarns.

[120] 8. Reduce or minimize elastane fibers in warp. Some warp-stretch fabrics may show poor performance because the elastane core is clear rather than white. This would mean the “target” for a white highlight is doughnut shaped yarn core, which is a more difficult target to hit, particularly in finer yarn counts. Stronger performing warp-stretch fabrics should have both a shallow ring-dye and a large yarn diameter.

[121] Some warp-stretch failures may pertain to the translucent nature of the elastane core. Since the elastane core is translucent rather than opaque white, indigo dyed fibers are visible through the yarn core. Figures 21 and 22 show cross sections of a coarse yarn and a fine yarn, respectively, with elastane cores.

[122] In an implementation, a fabric with excellent performance characteristic has (i) no overdyes, no coatings, (ii) pure indigo dyed at the lowest possible pH (indigo solution has pH of 11.2 or less), and (iii) premercerized warp yarns.

[123] Some other important factors, having secondary impact, include: (i) coarse warp yarns (e.g., 7s–8s Ne rather than 13s–14s Ne), (ii) high twist warp yarns (above 4.6 twists), (iii) dyed at highest speed allowable to achieve desired shade (can vary between suppliers based on machinery), (iv) no sulfur bottoming or topping, and (v) 100 percent cotton warp.

[124] Typically for denim, yarn counts range from a 7s Ne to a 16s Ne, though it is not uncommon to see counts as coarse as a 5s or as fine as a 20s. “Ne” represents an English cotton yarn count system (used by the textile industry for cotton spun yarns). It is an indirect way of indicating the coarseness of the yarn, where the lower the number, the coarser the yarn, lower number is a coarser yarn.

[125] The English cotton yarn count system is calculated as follows: “Ne” refers to the number of hanks in pounds. One hank is equal to 840 yards of yarn. For example, 7s Ne (or a 7s count) is equal to 7 times 840 yards of yarn in 1 pound. And, 16s Ne (or a 16s count) is equal to 16 times 840 yards of yarn in 1 pound.

[126] Some denim yarns have slub, which means a yarn has been engineered with thick and thin places to create a particular aesthetic. The diameter of the yarn is not uniform and can vary across its length. Slub patterns average about 0.25 mile in length of repeat and vary from mill to mill. Thus, the Ne calculation gives the average fineness or thickness of a yarn.

Generally, a yarn is described by its yarn count, spinning method, and twist multiple. As an

example, men's denim fabric generally use coarser counts like 7s and 8s, and women's denim fabrics generally use finer counts of 10s, 12s, and 14s. For stretch products, some finer counts are used.

[127] Although this patent specifically describes laser finishing of woven fabrics, the techniques would also apply to knit fabrics used for knit apparel. A knit fabric is made by a series of interlocking loops of yarn. For laser finishing of knits, the techniques described to produce or obtain a ring-dyed yarn apply. Ring-dyed yarn is used to produce the knit. The knit which is made from ring-dyed can be laser finished.

[128] In an implementation, a method includes processing a cotton yarn using an indigo dye to have a cross section having an outer ring and an inner core, where a thickness of the outer ring is about, for example, from about 7.5 percent to about 12.5 percent of a total thickness of the yarn, and the outer ring is indigo colored due to being penetrated through by the indigo dye while the inner core is white or off-white colored due to not being penetrated to by the indigo dye; and weaving the dyed cotton yarn into a denim fabric, where the warp yarns include dyed cotton and the weft yarns include undyed cotton, and the denim fabric is to be finished by exposing the dyed cotton yarn to a laser.

[129] When exposed to the laser, the laser creates a finishing pattern on a surface of the garment based on a laser input file provided to the laser. The laser input file includes a laser exposure values for different laser pixel location. For each laser exposure value, the laser removes a depth or thickness of material from the surface of the denim material that corresponds to the laser exposure value.

[130] For lighter pixel locations of the finishing pattern, a greater depth of the indigo ring-dyed cotton yarn is removed, revealing a greater width of an inner core of the dyed yarn, as compared to darker pixel locations of the finishing pattern, where a lesser depth of the indigo ring-dyed cotton yarn is removed, revealing a lesser width of an inner core of the dyed yarn.

[131] The laser file includes grayscale values for each pixel location to be lasered. For example, a value can be from 0 to 255 (e.g., an 8-bit binary value) for up to 256 levels of gray. In an implementation, the lower the value, the greater the thickness of the material that will be removed. For a value 255, no material may be removed, while for 0, a maximum amount of material is removed to achieve a very white color, which would represent a well worn point (or pixel) in the finishing pattern. The 0 value may represent a removal of, for example, 50 percent (or more or less) of the thickness of the yarn.

[132] In other implementations, reverse or negative logic may be use, where the greater the value, the less the thickness of the material that will be removed. For example, the greater the

value, the greater the thickness of the material that will be removed. For a value 0, no material may be removed, while for 255, a maximum amount of material is removed to achieve a very white color, which would represent a well worn point (or pixel) in the finishing pattern. The 255 value may represent a removal of 50 percent (or more or less) of the thickness of the yarn.

[133] In various implementations, the processing a cotton yarn can include immersing the cotton yarn into at least one indigo dye solution having a pH in a range from about 10.7 to about 11.6. The processing a cotton yarn can include immersing the cotton yarn into at least one indigo dye solution having a pH of about 11.6 or less.

[134] The processing a cotton yarn can include immersing the cotton yarn into at least one indigo dye solution having a pH in a range from about 10.7 to about 11.2, and maintaining a temperature of the indigo dye solution at about 50 degrees Celsius or less (e.g., or 60 degrees Celsius or less or 70 degrees Celsius) while the cotton yarn is being immersed.

[135] The processing a cotton yarn can include mercerizing an undyed cotton yarn in an alkaline solution before an initial immersion of the undyed yarn into an indigo dye solution. This may be referred to as premercerizing the yarn.

[136] The processing a cotton yarn can include not immersing the cotton yarn into a solution including sulfur dyestuff before an initial immersion of the cotton yarn into an indigo dye solution. This may be referred to as not using sulfur bottoming during the processing.

[137] The laser finishing can produce at least 64 different grayscale levels (e.g., at least 128 or at least 256) on the denim fabric. These would be optically distinguishable (e.g., optically distinguishable by a camera, photospectrometer, or the like) grayscale levels on the denim fabric. This allows the finish pattern to show better highlights or a greater distinction between the highs and lows in the pattern. This facilitates garment laser patterning with better aesthetics instead of a duller, less attractive finish.

[138] Further, based on a value stored in laser input file, the laser removes a selected depth of material starting from the outer surface of the yarn. And as a result, a vertical segment of the inner core is revealed by the laser between outer core segments (e.g., left and right outer ring thickness) that is in a range from 0 to about 85 percent of the total thickness of the yarn. This produces at least 64 different grayscale levels (e.g., at least 128 or at least 256) on the denim material.

[139] The cotton yarn can have from about 4.2 to about 4.8 twists per inch. The processing a cotton yarn can include: mercerizing an undyed cotton yarn in an alkaline solution before an initial immersion of the undyed yarn into an indigo dye solution, and immersing the

mercerized cotton yarn into five or fewer separate dips of indigo dye solution having a pH of about 11.6 or less.

[140] This description of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form described, and many modifications and variations are possible in light of the teaching above. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications. This description will enable others skilled in the art to best utilize and practice the invention in various embodiments and with various modifications as are suited to a particular use. The scope of the invention is defined by the following claims.

Claims

The invention claimed is:

1. A method comprising:

processing a cotton yarn using an indigo dye to have a cross section comprising an outer ring and an inner core, wherein a thickness of the outer ring is from about 7.5 percent to about 12.5 percent of a total thickness of the yarn, and the outer ring is indigo colored due to being penetrated through by the indigo dye while the inner core is white or off-white colored due to not being penetrated to by the indigo dye; and

weaving the dyed cotton yarn into a denim fabric, wherein the warp yarns comprise dyed cotton and the weft yarns comprise undyed cotton, and the denim fabric is to be finished by exposing the dyed cotton yarn to a laser, and

when exposed to the laser, the laser creates a finishing pattern on a surface of the garment based on a laser input file provided to the laser, and the laser input file comprises a plurality of laser exposure values, each for a different laser pixel location,

for each laser exposure value, the laser removes a depth of material from the surface of the denim material that corresponds to the laser exposure value, and

for lighter pixel locations of the finishing pattern, a greater depth of the indigo ring-dyed cotton yarn is removed, revealing a greater width of an inner core of the dyed yarn, as compared to darker pixel locations of the finishing pattern, where a lesser depth of the indigo ring-dyed cotton yarn is removed, revealing a lesser width of an inner core of the dyed yarn.

2. The method of claim 1 wherein the processing a cotton yarn comprises:

immersing the cotton yarn into at least one indigo dye solution having a pH in a range from about 10.7 to about 11.6.

3. The method of claim 1 wherein the processing a cotton yarn comprises:

immersing the cotton yarn into at least one indigo dye solution having a pH of about 11.6 or less.

4. The method of claim 1 wherein the processing a cotton yarn comprises:

mercerizing an undyed cotton yarn in an alkaline solution before an initial immersion of the undyed yarn into an indigo dye solution.

5. The method of claim 1 wherein the processing a cotton yarn comprises:

immersing the cotton yarn into at least one indigo dye solution having a pH in a range from about 10.7 to about 11.2; and

maintaining a temperature of the indigo dye solution at about 50 degrees Celsius or less while the cotton yarn is being immersed.

6. The method of claim 1 wherein the processing a cotton yarn comprises:

immersing the cotton yarn into at least one indigo dye solution having a pH in a range from about 10.7 to about 11.2; and

maintaining a temperature of the indigo dye solution at about 60 degrees Celsius or less while the cotton yarn is being immersed.

7. The method of claim 1 wherein the processing a cotton yarn comprises:

not immersing the cotton yarn into a solution comprising sulfur dyestuff before an initial immersion of the cotton yarn into an indigo dye solution.

8. The method of claim 1 wherein the laser finishing can produce at least 64 different grayscale levels on the denim fabric.

9. The method of claim 1 wherein the laser finishing can produce at least 128 different grayscale levels on the denim fabric.

10. The method of claim 1 wherein the laser finishing can produce at least 256 different grayscale levels on the denim fabric.

11. The method of claim 1 wherein the cotton yarn comprises a yarn twist from about 4.2 to about 4.8 twists per inch.

12. The method of claim 1 the processing a cotton yarn comprises:

mercerizing an undyed cotton yarn in an alkaline solution before an initial immersion of the undyed yarn into an indigo dye solution; and

immersing the mercerized cotton yarn into five or fewer separate dips of indigo dye solution having a pH of about 11.6 or less.

13. A method comprising:

providing a garment made from fabric panels of a denim material, wherein the fabric panels are sewn together using thread,

the denim material will be finished by using a laser to remove selected amounts of material from a surface of the denim material at selected locations of the garment,

the denim material comprises an indigo ring-dyed cotton yarn having cross section comprising an outer ring and an inner core, a cross-sectional profile of the outer ring relative to the inner core is compatible with the laser to obtain at least 64 different grayscale levels, and the cross-sectional profile comprises a thickness of the outer ring that is from about 7.5 percent to about 12.5 percent of a total thickness of the yarn,

the outer ring is indigo colored due to being penetrated through by an indigo dye while the inner core is white or off-white colored due to not being penetrated to by the indigo dye, and the indigo ring-dyed cotton yarn with laser-compatible cross-sectional profile is obtained by

mercerizing an undyed yarn in an alkaline solution to obtain an mercerized undyed yarn,

immersing the mercerized undyed yarn into at least one indigo dye solution having a pH in a range from about 10.7 to about 11.6; and

exposing the garment to a laser to create a finishing pattern on a surface of the garment based on a laser input file provided to the laser,

wherein the laser input file comprises a plurality of laser exposure values, each for a different laser pixel location, and

for each laser exposure value, causing the laser to remove a depth of material from the surface of the garment that corresponds to the laser exposure value,

whereby for lighter pixel locations of the finishing pattern, a greater depth of the indigo ring-dyed cotton yarn is removed as compared to darker pixel locations of the finishing pattern, where a lesser depth of the indigo ring-dyed cotton yarn is removed.

14. The method of claim 13 wherein based on a value stored in laser input file, the laser removes a selected depth of material starting from the outer surface of the yarn, and as a result, a vertical segment of the inner core is revealed by the laser between outer core segments that is in a range from 0 to about 85 percent of the total thickness of the yarn, thereby producing at least 64 different grayscale levels on the denim material.

15. The method of claim 13 wherein undyed yarn comprises a yarn twist from about 4.2 to about 4.8 twists per inch.

16. The method of claim 13 wherein the indigo ring-dyed cotton yarn with laser-compatible cross-sectional profile is obtained further by

maintaining a temperature of the indigo dye solution at about 50 degrees Celsius or less while the mercerized undyed yarn is being immersed.

17. The method of claim 13 wherein the indigo ring-dyed cotton yarn with laser-compatible cross-sectional profile is obtained further by

maintaining a temperature of the indigo dye solution at about 60 degrees Celsius or less while the mercerized undyed yarn is being immersed.

18. The method of claim 13 wherein the indigo ring-dyed cotton yarn with laser-compatible cross-sectional profile is obtained further by

maintaining a temperature of the indigo dye solution at about 70 degrees Celsius or less while the mercerized undyed yarn is being immersed.

19. The method of claim 13 wherein the indigo ring-dyed cotton yarn with laser-compatible cross-sectional profile is obtained further by

not immersing the mercerized undyed yarn into a solution comprising sulfur dyestuff before an initial immersion of the mercerized undyed yarn into an indigo dye solution.

20. The method of claim 13 wherein sulfur bottoming is not performed on the undyed yarn.

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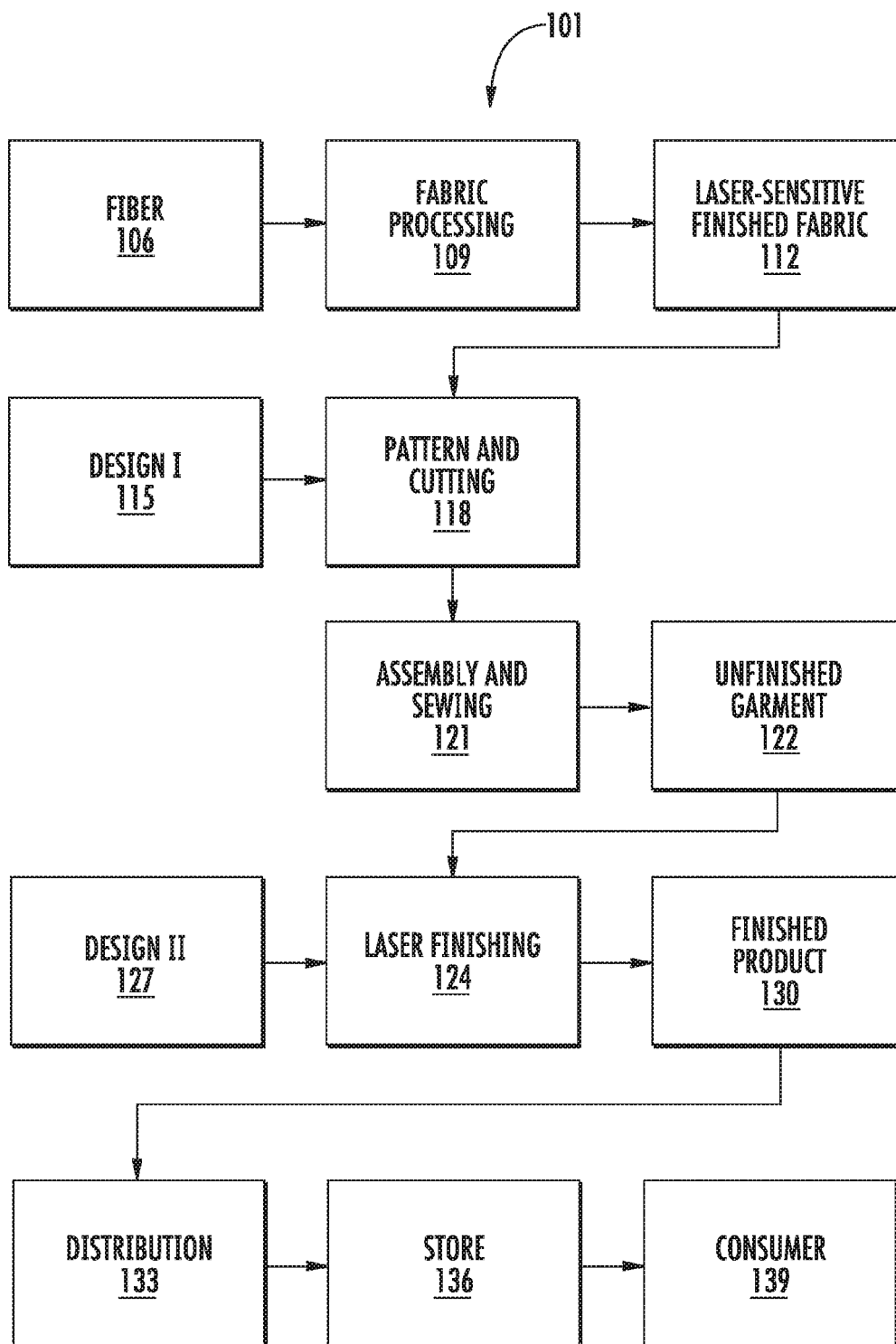


FIG. 1

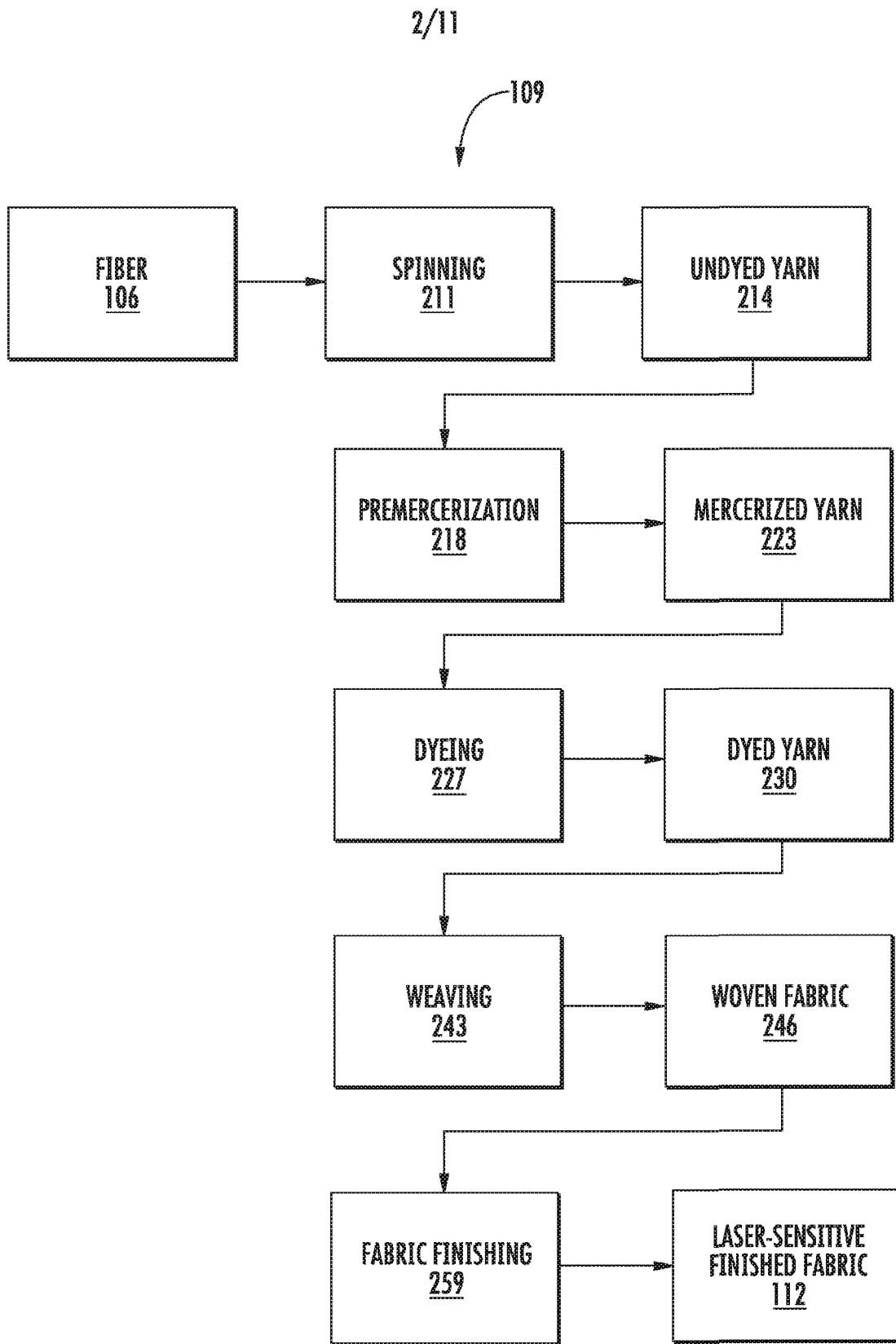


FIG. 2

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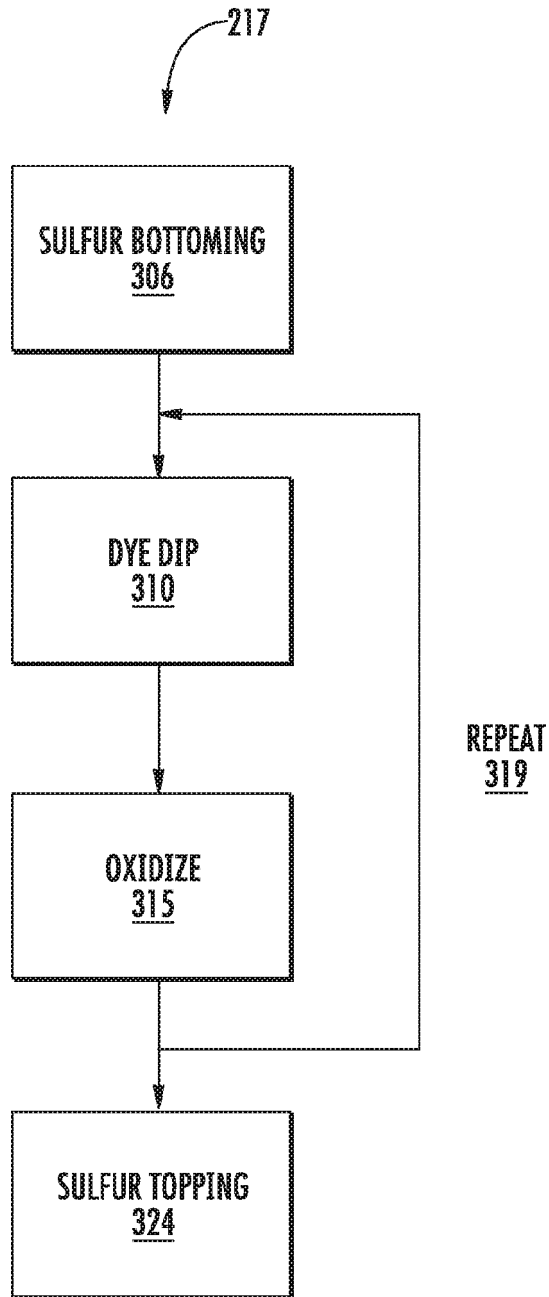


FIG. 3

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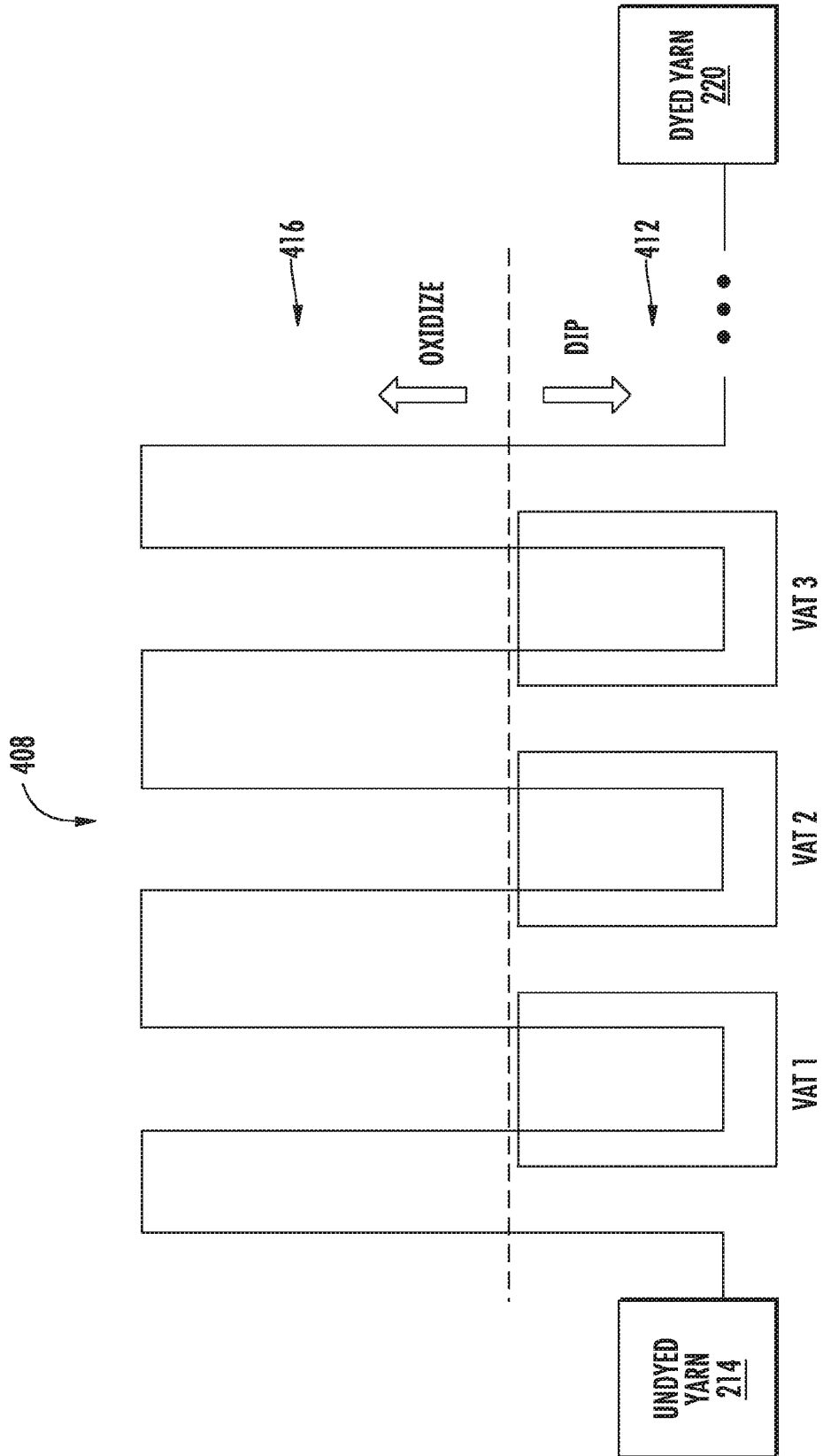


FIG. 4

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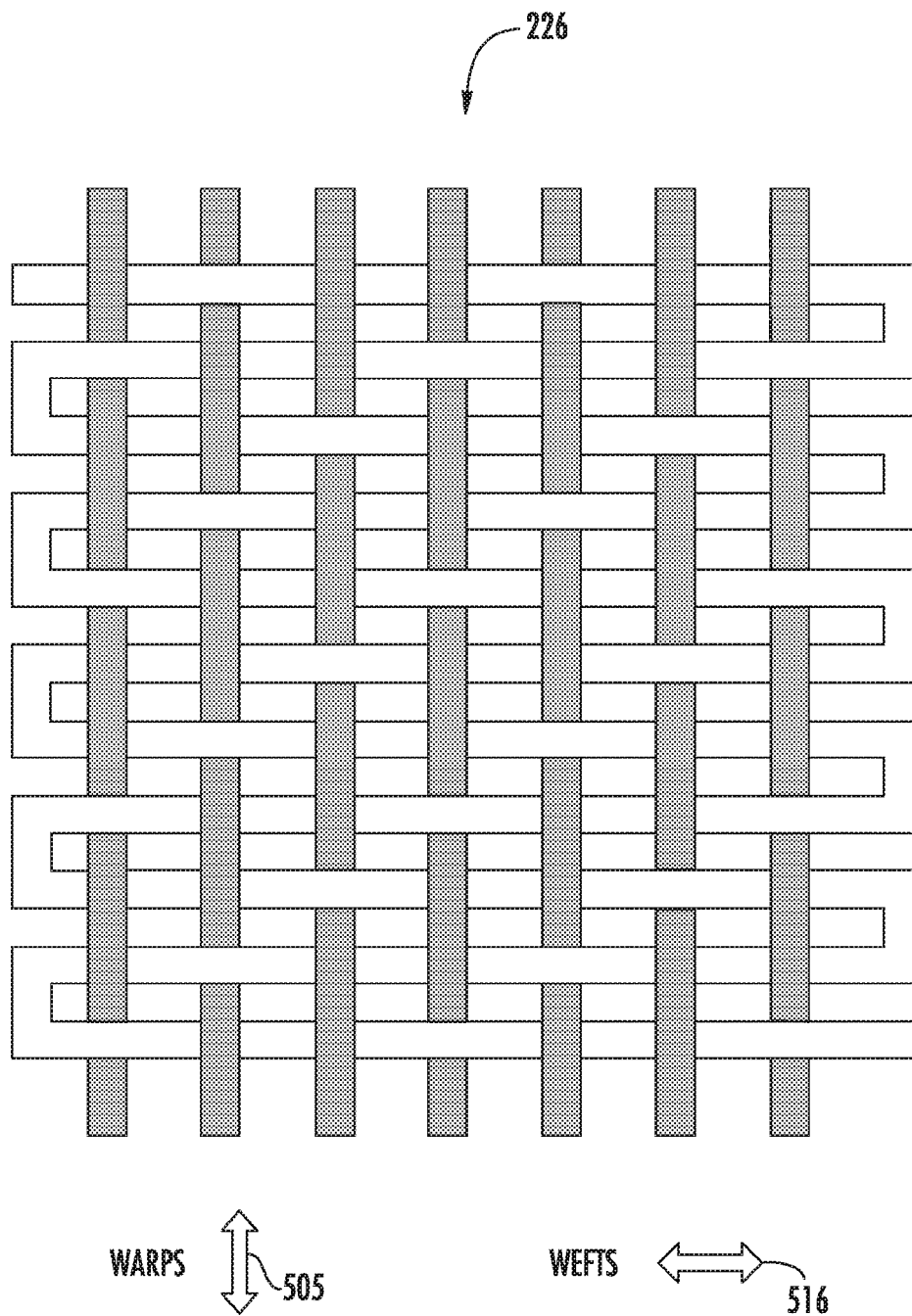


FIG. 5

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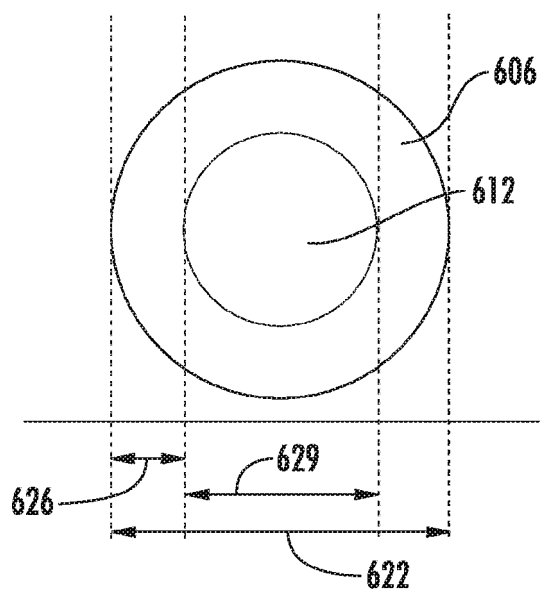


FIG. 6

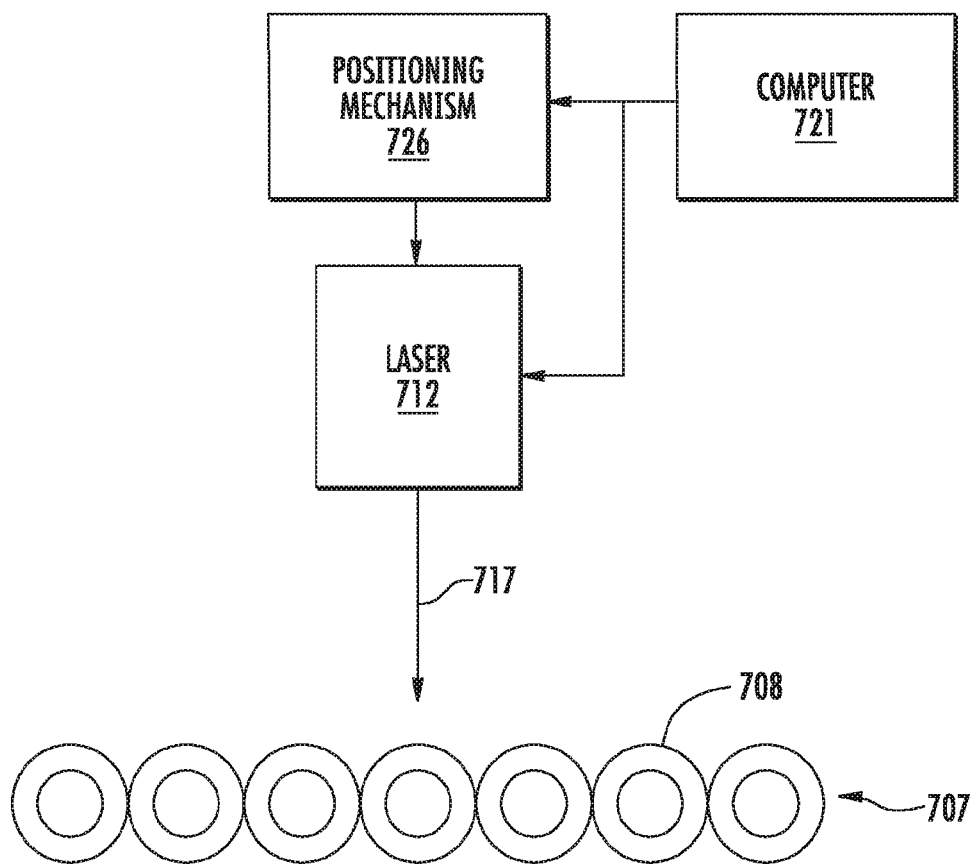


FIG. 7

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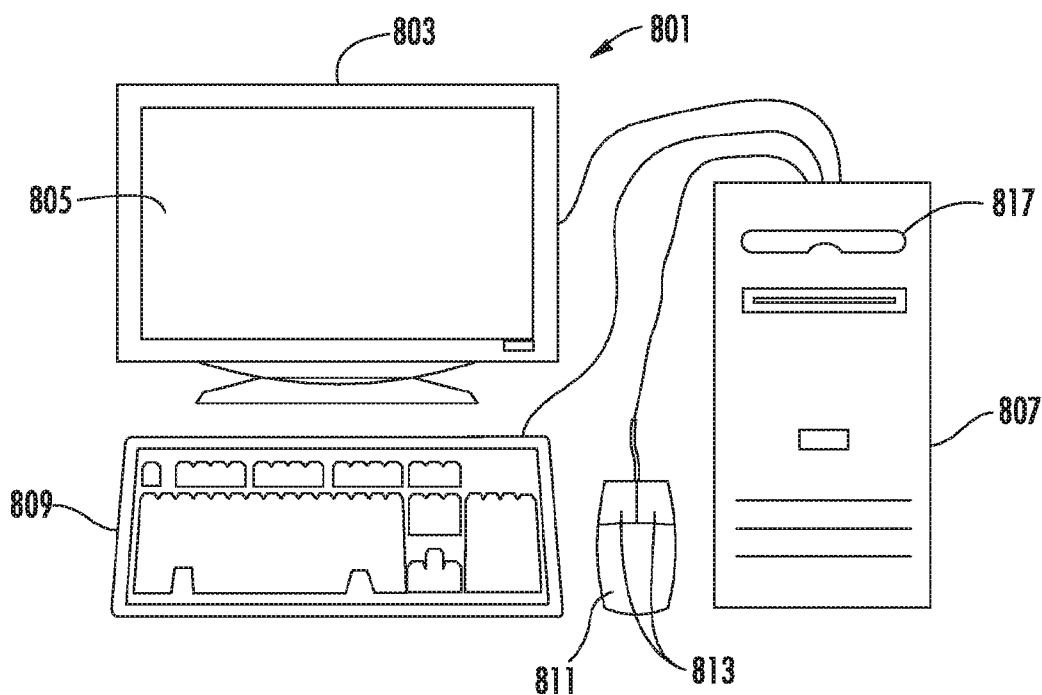


FIG. 8

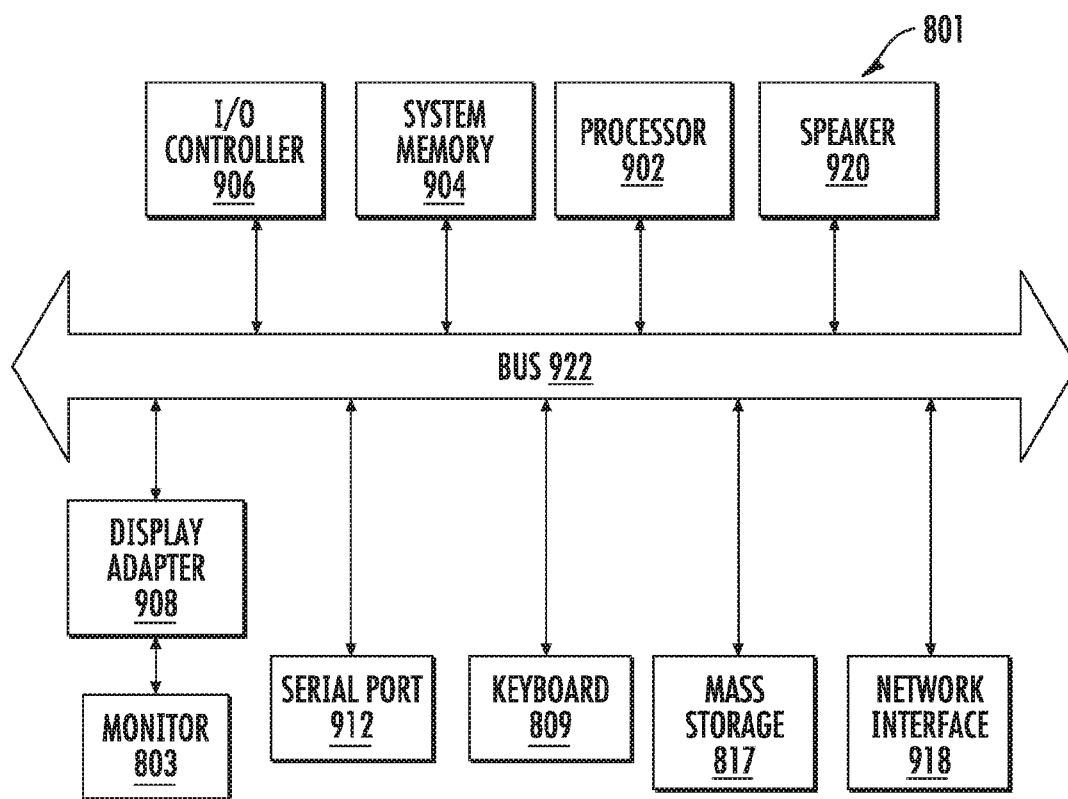


FIG. 9

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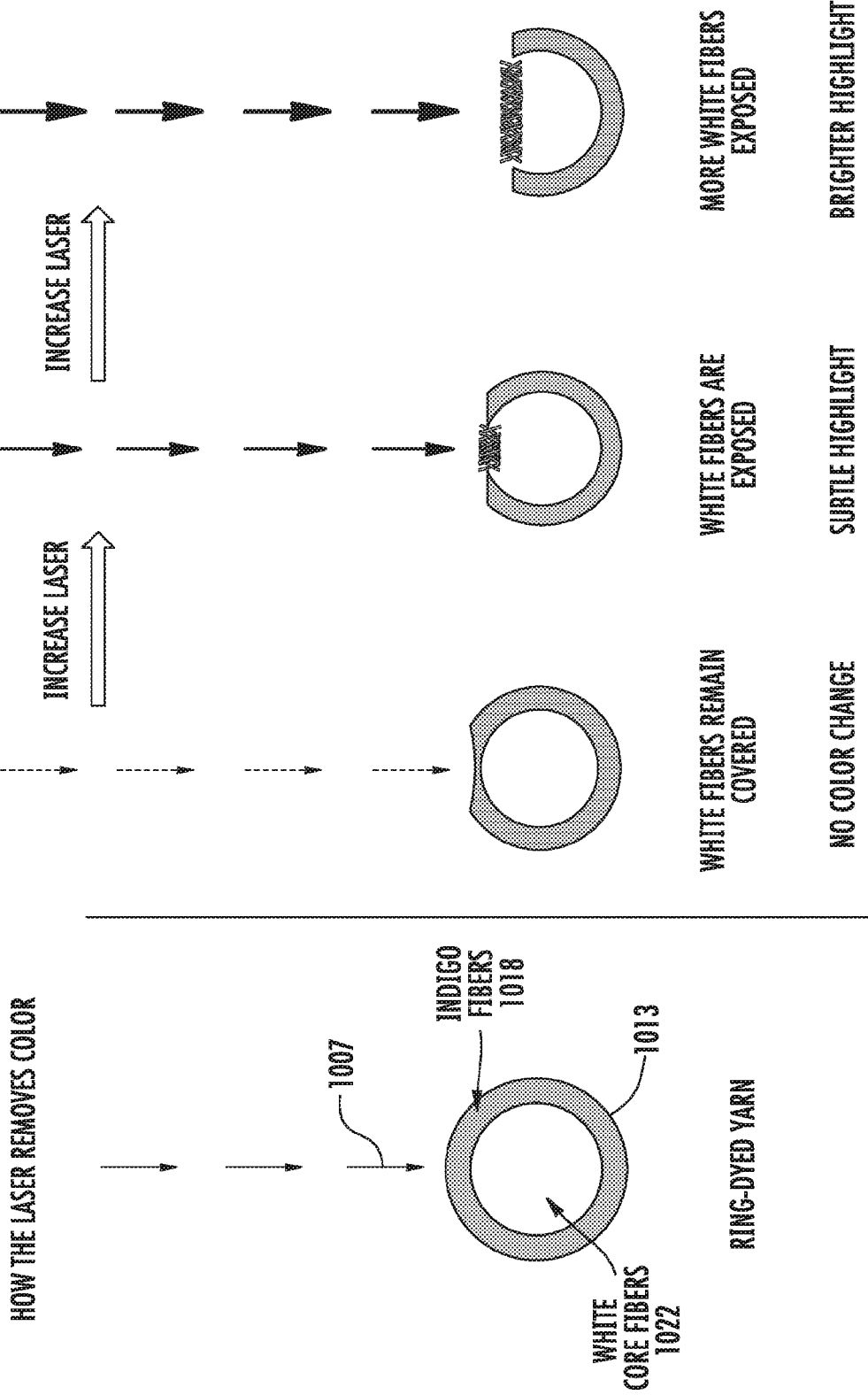
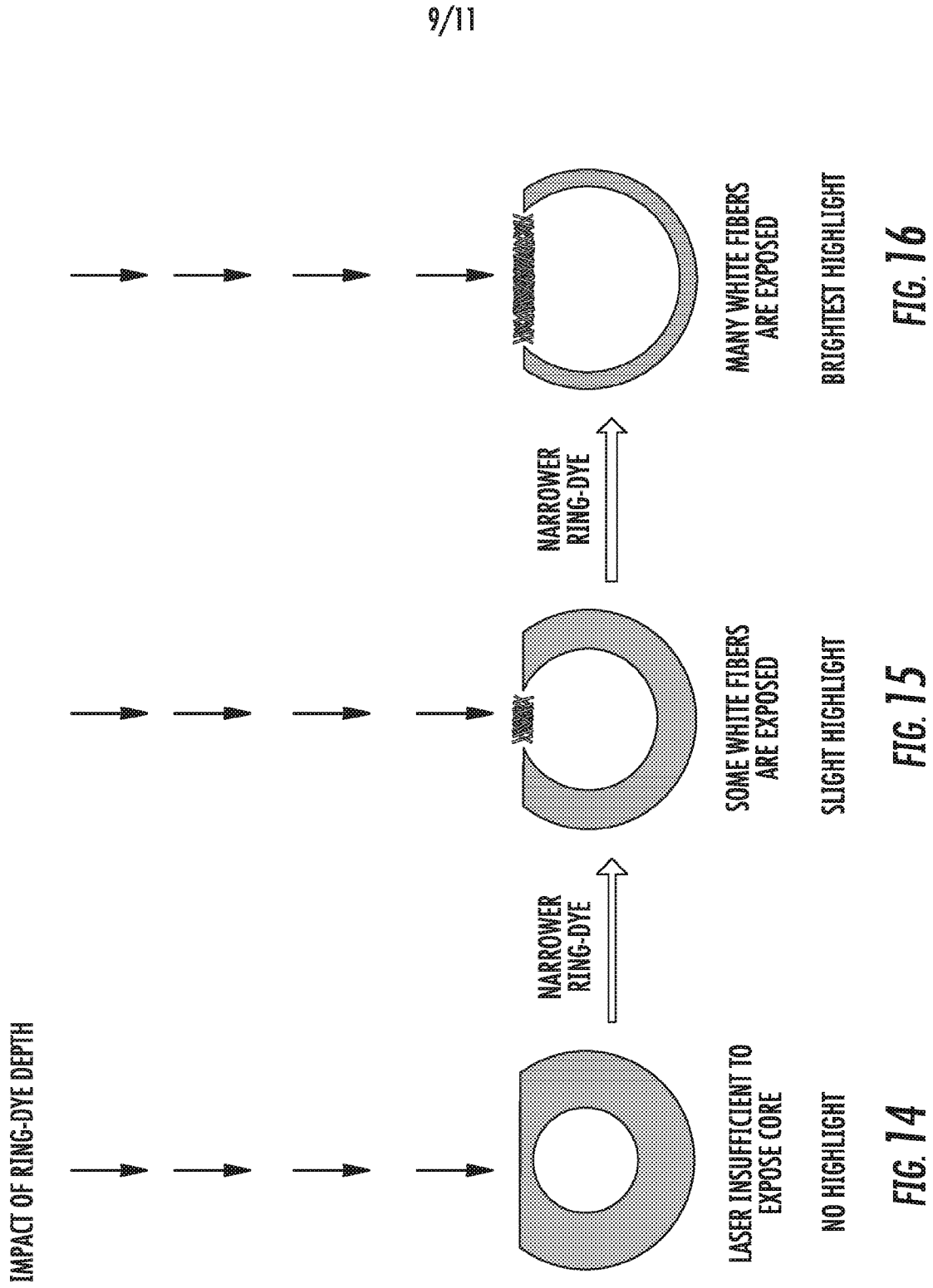


FIG. 10

FIG. 11

FIG. 12

FIG. 13



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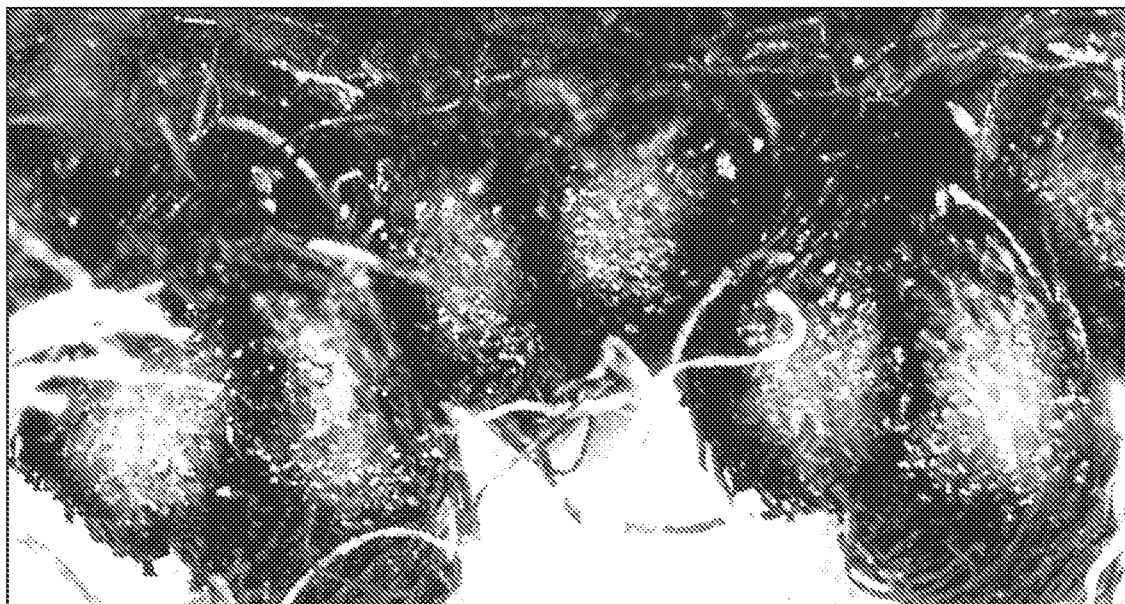


FIG. 17

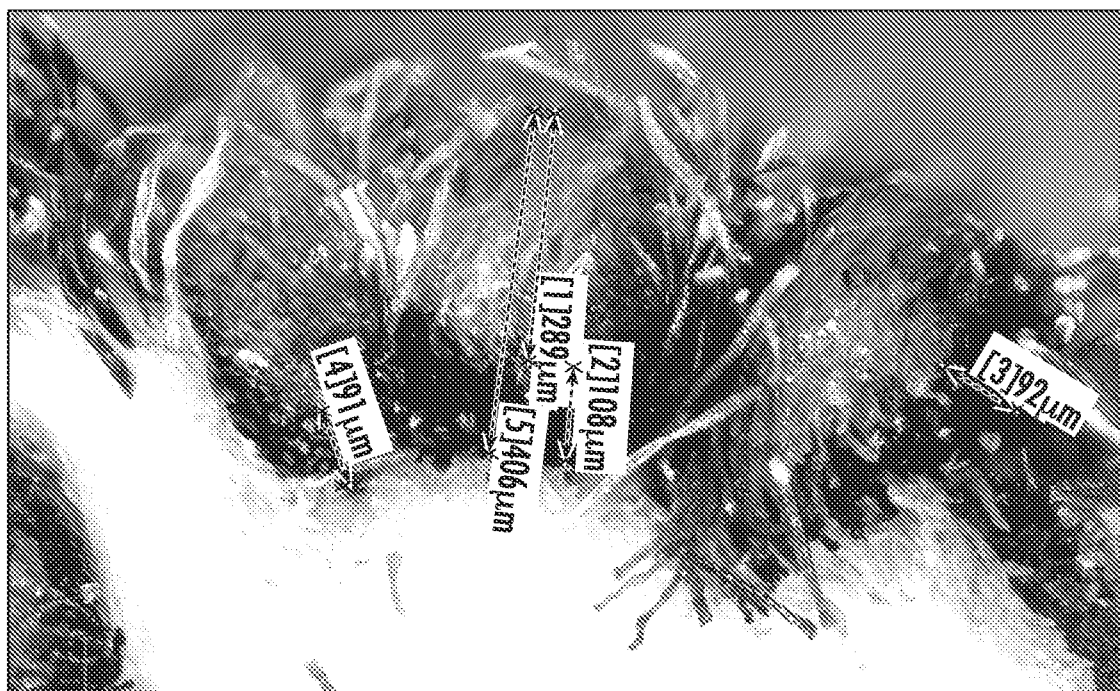
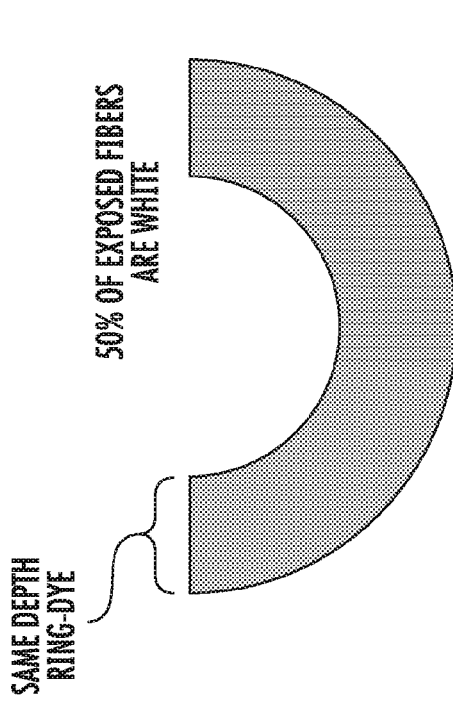
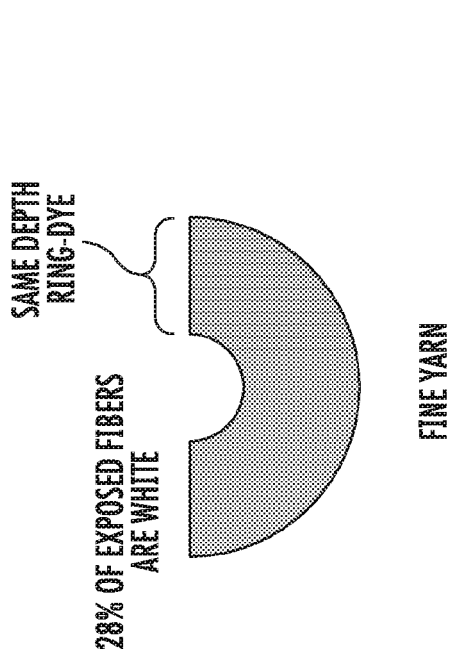


FIG. 18



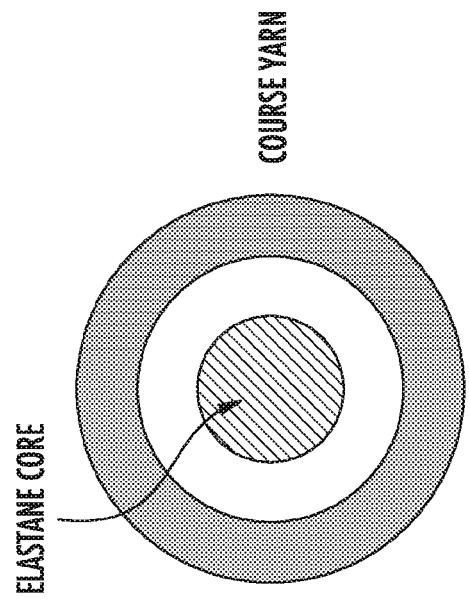
FINE YARN

FIG. 19



COURSE YARN

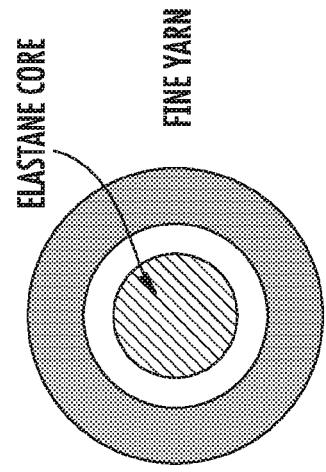
FIG. 20



ELASTANE CORE

COURSE YARN

FIG. 21



ELASTANE CORE

FINE YARN

FIG. 22

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2017/066223

A. CLASSIFICATION OF SUBJECT MATTER IPC (2018.01) B23K 26/00, D06B 11/00, D06C 23/00, D06C 29/00, G02B 26/10, D06P 1/38 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC (2018.01) B23K 26/00, D06B 11/00, D06C 23/00, D06C 29/00, G02B 26/10, D06P 1/38 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Databases consulted: Esp@cenet, Google Patents, Google Scholar, PatBase Search terms used: cotton; ring-dyed; yarn; cross-section; outer; ring; inner; core; laser; finishing; image; scrubbing; pattern		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20140150187 A1 SCHOOTS HARRIE [US]; CELANESE INT CORP [US] 05 Jun 2014 (2014/06/05) the whole document	1-20
Y	US 20150275423 A1 FINLEY RANDOLPH L [US] 01 Oct 2015 (2015/10/01) the whole document	1-20
Y	WO 0125824 A2 TECHNOLINES LLC [US]; MARTIN CLARENCE H [US]; COSTIN DARRYL J [US] 12 Apr 2001 (2001/04/12) the whole document	1-20
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 27 Mar 2018		Date of mailing of the international search report 27 Mar 2018
Name and mailing address of the ISA: Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616		Authorized officer: KATZ Nina Telephone No. 972-2-5651779

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US2017/066223

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
US 20140150187 A1	05 Jun 2014	NONE	
US 20150275423 A1	01 Oct 2015	NONE	
WO 0125824 A2	12 Apr 2001	NONE	

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D06B 11/00 (2006.01) *G02B 26/10* (2006.01)
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) Title: USING FABRIC TEMPLATES TO OBTAIN MULTIPLE FINISHES BY LASER FINISHING

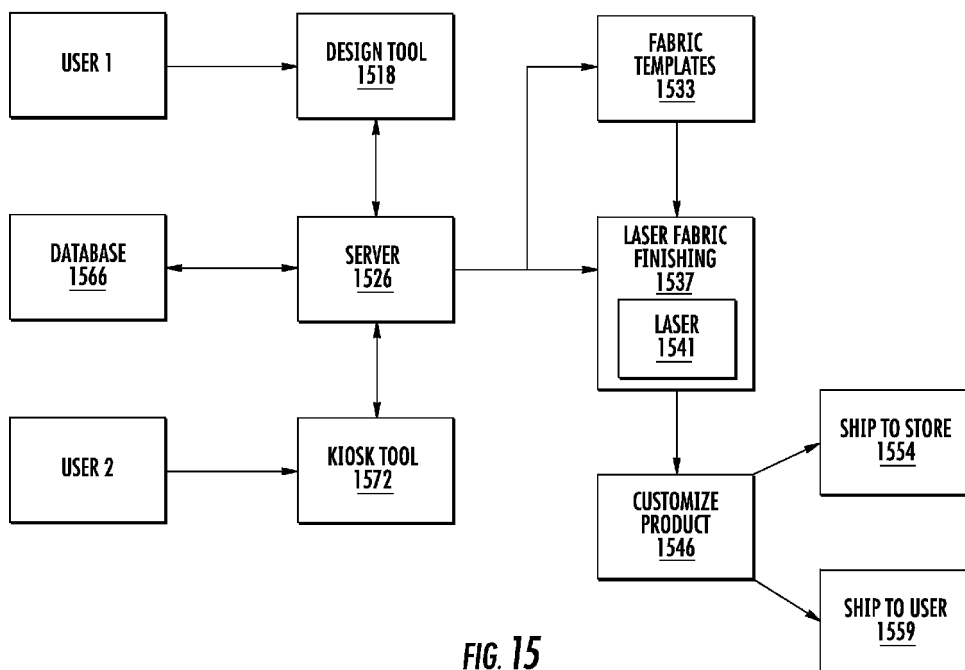


FIG. 15

(57) Abstract: Laser finishing of apparel products allows an operating model that reduces finishing cost, lowers carrying costs, increases productivity, shortens time to market, be more reactive to trends, reduce product constraints, reduces lost sales and dilution, and more. Improved aspects include design, development, planning, merchandising, selling, making, and delivering. The model uses fabric templates, each of which can be used to produce a multitude of laser finishes. Operational efficiency is improved.



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TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

Using Fabric Templates to Obtain Multiple Finishes by Laser Finishing

Description

Cross-Reference to Related Applications

[01] This patent application claims the benefit of U.S. patent application 62/433,746, filed December 13, 2016, which is incorporated by reference along with all other references cited in this application.

Background of the Invention

[02] The present invention relates to textiles and, more specifically, to techniques for various aspects of laser finishing of apparel products including designing, developing, planning, merchandising, selling, making, and delivering of such products. These products include denim apparel such as jeans, shirts, shorts, jackets, vests, and skirts, where laser finishing is used to produce a faded, distressed, washed, or worn finish or appearance.

[03] In 1853, during the California Gold Rush, Levi Strauss, a 24-year-old German immigrant, left New York for San Francisco with a small supply of dry goods with the intention of opening a branch of his brother's New York dry goods business. Shortly after arriving in San Francisco, Mr. Strauss realized that the miners and prospectors (called the "forty niners") needed pants strong enough to last through the hard work conditions they endured. So, Mr. Strauss developed the now familiar jeans which he sold to the miners. The company he founded, Levi Strauss & Co., still sells jeans and is the most widely known jeans brand in the world. Levi's is a trademark of Levi Strauss & Co.

[04] Though jeans at the time of the Gold Rush were used as work clothes, jeans have evolved to be fashionably worn everyday by men and women, showing up on billboards, television commercials, and fashion runways. Fashion is one of the largest consumer industries in the U.S. and around the world. Jeans and related apparel are a significant segment of the industry.

[05] As fashion, people are concerned with the appearance of their jeans. Many people desire a faded or worn blue jeans look. In the past, jeans became faded or distressed through normal wash and wear. The apparel industry recognized people's desire for the worn blue jeans look and began producing jeans and apparel with different wear patterns. The wear

patterns have become part of the jeans style and fashion. Some examples of wear patterns include combs or honeycombs, whiskers, stacks, and train tracks.

[06] Despite the widespread success jeans have enjoyed, the process to produce modern jeans with wear patterns takes processing time, has relatively high processing cost, and is resource intensive. A typical process to produce jeans uses significant amounts of water, chemicals (e.g., bleaching or oxidizing agents), ozone, enzymes, and pumice stone. For example, it may take from about 20 to 60 liters of water to finish each pair of jeans.

[07] Therefore, there is a need for improved techniques to accommodate laser finishing for jeans and other apparel, which will reduce environmental impact, processing time, and processing costs, while maintaining the look and style of traditional finishing techniques.

Brief Summary of the Invention

[08] Laser finishing of apparel products allows an operating model that reduces finishing cost, lowers carrying costs, increases productivity, shortens time to market, be more reactive to trends, reduce product constraints, reduces lost sales and dilution, and more. Improved aspects include design, development, planning, merchandising, selling, making, and delivering. The model uses fabric templates, each of which can be used to produce a multitude of laser finishes. Operational efficiency is improved.

[09] In an implementation, a system includes a first garment product, second garment product, digital design tool, and a laser finishing machine. The first garment is identifiable by a first product code identifier. The second garment product is identifiable by a second product code identifier. The digital design tool is used to generate or produce one or more laser files, including a first laser file for a first finishing pattern. The laser finishing machine receives as input the first laser file that is generated by the digital design tool.

[10] When the first garment template is used as a target garment for a laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the first finishing pattern on the target garment, which results in the target garment becoming the first garment product. When the second garment template is used as the target garment for the laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the finishing pattern on the target garment, which results in the target garment becoming the second garment product.

[11] In an implementation, a method includes: providing a first garment template washed using a first base wash recipe; providing a second garment template washed using a second

base wash recipe; providing a first laser file including a first finishing pattern; and inputting the first laser file to a laser finishing machine to burn the first finishing pattern onto the first garment template to obtain a first finished garment.

[12] The method further includes: indicating the first finished garment as a first garment product, identifiable by a first product code identifier; inputting the first laser file to the laser finishing machine to burn the first finishing pattern onto the second garment template to obtain a second finished garment; and indicating the second finished garment as a second garment product, identifiable by a second product code identifier, different from the first product code identifier.

[13] Other objects, features, and advantages of the present invention will become apparent upon consideration of the following detailed description and the accompanying drawings, in which like reference designations represent like features throughout the figures.

Brief Description of the Drawings

[14] Figure 1 shows a comparison between traditional manufacturing and laser finishing.

[15] Figure 2 shows a process flow for manufacturing apparel such as jeans, where garments are finished using a laser.

[16] Figure 3 shows a technique of creating multiple finishes by laser finishing a fabric template (or a base fit fabric) for a fabric.

[17] Figure 4 shows an example of use of finishes and fabrics to create different products for men's jeans with traditional processing.

[18] Figure 5 shows an example of use of finishes and fabrics to create different products for women's jeans with traditional processing.

[19] Figure 6 shows a hierarchy of fabrics and finishes for laser processing, where the hierarchy includes fabric templates (or base fit fabrics).

[20] Figure 7 is shows a distributed computer network.

[21] Figure 8 shows a computer system that can be used in laser finishing.

[22] Figure 9 shows a system block diagram of the computer system.

[23] Figures 10–11 show examples of mobile devices.

[24] Figure 12 shows a system block diagram of a mobile device.

[25] Figure 13 shows flow for finishing apparel to produce a desired wear pattern.

[26] Figure 14 shows a block diagram of a system for creating, designing, producing apparel products with laser finishing.

- [27] Figure 15 shows a block diagram of a user tool to create customized apparel using laser finishing.
- [28] Figure 16 shows an implementation of a kiosk tool.
- [29] Figure 17 shows traditional flow for getting an apparel product to market.
- [30] Figure 18 shows various techniques for reducing time to market when using laser finishing
- [31] Figure 19 shows a flow for a finishing technique that includes the use of a laser.
- [32] Figure 20 shows a flow for finishing in two finishing steps and using base templates.
- [33] Figures 21–23 show various approaches for staging the base fit fabrics or base templates.

Detailed Description of the Invention

- [34] Figure 1 shows a comparison between a traditional manufacturing process 111 and laser finishing 122 to produce distressed apparel including jeans. Compared to the traditional flow, the laser finishing process provides significant time savings 134.
- [35] The traditional process includes dry processing such as local scrape, whisker, holes, and crack and net to produce apparel with a distressed distress appearance. Crack and net is an example of a manual technique where jeans are placed in a sausage casing like net and washed while in the net to gain white streaks on the surface of the finish, which replicate a feature of vintage jeans. There also a potassium permanganate (PP) spray which is a chemical oxidizer.
- [36] In the laser finishing flow, the traditional dry process and chemical steps are replaced by a laser finishing step 139. The overall process flow for laser finishing is simpler, takes less time, and is more environmentally and resource friendly (e.g., chemical oxidizers are not used). There is a time gap 145 between a wash step and laser finishing 139. This gap represents a postponement time from when base wash is done to when the finish is finally designated. The apparel manufacturer has more time before committing to a particular finish, so that with the laser finishing, the manufacturer can adapt and respond to market trends more quickly.
- [37] Some steps occur in both flows, such as cut and sew, wash, tint wash, and add sundries. These steps take a similar amount of time in both flows. The add sundries step refers to adding tags and the like to the jeans. Since oxidizers are not used in laser finishing, the tint wash is for tinting, not neutralizing and tinting as in the traditional flow.

[38] Figure 2 shows a process flow 201 for manufacturing apparel such as jeans, where garments are finished using a laser. The fabric or material for various apparel including jeans is made from natural or synthetic fibers 206, or a combination of these. A fabric mill takes fibers and processes 209 these fibers to produce a laser-sensitive finished fabric 212, which has enhanced response characteristics for laser finishing.

[39] Some examples of natural fibers include cotton, flax, hemp, sisal, jute, kenaf, and coconut; fibers from animal sources include silk, wool, cashmere, and mohair. Some examples of synthetic fibers include polyester, nylon, spandex or elastane, and other polymers. Some examples of semisynthetic fibers include rayon, viscose, modal, and lyocell, which are made from a regenerated cellulose fiber. A fabric can be a natural fiber alone (e.g., cotton), a synthetic fiber alone (e.g., polyester alone), a blend of natural and synthetic fibers (e.g., cotton and polyester blend, or cotton and spandax), or a blend of natural and semisynthetic fibers, or any combination of these or other fibers.

[40] For jeans, the fabric is typically a denim, which is a sturdy cotton warp-faced textile in which a weft passes under two or more warp threads. This twill weaving produces a diagonal ribbing. The fabric is dyed using an indigo or blue dye, which is characteristic of blue jeans.

[41] Although this patent describes the apparel processing and finishing with respect to jeans, the invention is not limited jeans or denim products, such as shirts, shorts, jackets, vests, and skirts. The techniques and approaches described are applicable to other apparel and products, including nondenim products and products made from knit materials. Some examples include T-shirts, sweaters, coats, sweatshirts (e.g., hoodies), casual wear, athletic wear, outerwear, dresses, evening wear, sleepwear, loungewear, underwear, socks, bags, backpacks, uniforms, umbrellas, swimwear, bed sheets, scarves, and many others.

[42] A manufacturer creates a design 215 (design I) of its product. The design can be for a particular type of clothing or garment (e.g., men's or women's jean, or jacket), sizing of the garment (e.g., small, medium, or large, or waist size and inseam length), or other design feature. The design can be specified by a pattern or cut used to form pieces of the pattern. A fabric is selected and patterned and cut 218 based on the design. The pattern pieces are assembled together 221 into the garment, typically by sewing, but can be joined together using other techniques (e.g., rivets, buttons, zipper, hoop and loop, adhesives, or other techniques and structures to join fabrics and materials together).

[43] Some garments can be complete after assembly and ready for sale. However, other garments are unfinished 222 and have additional finishing 224 (which can include laser

finishing). The finishing may include tinting, washing, softening, and fixing. For distressed denim products, the finishing can include using a laser to produce a wear pattern according to a design 227 (design II). Some additional details of laser finishing are described in U.S. patent application 62/377,447, filed August 19, 2016, which is incorporated by reference. U.S. patent applications 15/682,507, filed August 21, 2017, and 62/433,746, filed December 13, 2016, are also incorporated by reference.

[44] Design 227 is for postassembly aspects of a garment while design 115 is for preassembly aspects of a garment. After finishing, a finished product 130 is complete and ready for sale. The finished product is inventoried and distributed 133, delivered to stores 136, and sold to consumers or customers 139. The consumer can buy and wear worn blue jeans without having to wear out the jeans themselves, which usually takes significant time and effort.

[45] Traditionally, to produce distressed denim products, finishing techniques include dry abrasion, wet processing, oxidation, or other techniques, or combinations of these, to accelerate wear of the material in order to produce a desired wear pattern. Dry abrasion can include sandblasting or using sandpaper. For example, some portions or localized areas of the fabric are sanded to abrade the fabric surface. Wet processing can include washing in water, washing with oxidizers (e.g., bleach, peroxide, ozone, or potassium permanganate), spraying with oxidizers, washing with abrasives (e.g., pumice, stone, or grit).

[46] These traditional finishing approaches take time, incur expense, and impact the environment by utilizing resources and producing waste. It is desirable to reduce water and chemical usage, which can include eliminating the use agents such as potassium permanganate and pumice. An alternative to these traditional finishing approaches is laser finishing. Laser finishing can replace many steps in the traditional finishing approach, leading to cost and time savings.

[47] Figure 3 shows a technique of creating multiple finishes by laser finishing a base fit fabric for a fabric. Laser finishing can be used to create many different finishes (each a different product) easily and quickly from the same fabric template or “blank.” These fabric templates can be referred to as base fit fabrics or BFFs.

[48] In short, base fit fabrics are assembled garments in fabrics (e.g., warp stretch, selvedge, and others) for various fits (e.g., 502, 511, or 711, and others) that have been base washed (e.g., light, medium, dark, and others). The base fit fabrics serve as templates for laser finishing.

[49] For each fabric 312, there will be a number of base fit fabrics 324. These base fit fabrics are lasered to produce many different finishes, each being a different product for product line. Laser finishing allows greater efficiency because by using fabric templates (or base fit fabrics), a single fabric or material can be used to create many different products for a product line, more than is possible with traditional processing. This reduces the inventory of different fabric and finish raw materials.

[50] Figure 4 shows an example of use of finishes and fabrics to create different products for men's jeans with traditional processing. A particular finish (finish 1) is done with three different fabrics (fabric 1, fabric 2, and fabric 3). Fabric 1 is used to product three different products, the 511, 501, and 510 products.

[51] As an example, with traditional processing, for men's jeans, an average of about four products are produced for each fabric. PC9 refers to a product code (e.g., a nine digit product code), each product code describing a different product model. For example, there can be the 511 jeans line in different sizes with one distressing pattern; this would be categorized under a first PC9 code. And there can be the 501 jeans line in different sizes with one distressing pattern; this would be categorized as a second PC9 code, different from the first PC9. Therefore, each PC9 code refers to a different product or product model.

[52] Figure 5 shows an example of use of finishes and fabrics to create different products for women's jeans with traditional processing. For a 711 product, there can be three different fabrics with different degrees of stretch, high stretch, medium stretch, and low stretch. As an example, with traditional processing, for women's jeans, an average of about five products or PC9s are produced for each fabric.

[53] Figure 6 shows a hierarchy of fabrics and finishes for laser processing. For the 511 product, there can be two different fabrics, fabric 1 and fabric 2. The fabrics can be part of a fabric tool kit. For fabric 1, there are three base fit fabrics, BFF1, BFF2, and BFF3. Using laser finishing, a base fit fabrics can be used to product eight different finishes, each of which would be considered a different product model. Although only eight different finishes are shown, then can be any number of finishes (e.g., 8 or more, 20 or more, or 100 or more).

[54] Thus, with laser finishing, in a comparison to figures 4 and 5, ten products or PC9s are produced for each base fit fabric or blank. Compared to traditional processing, this is a significant improvement in providing greater numbers of different products with less different fabrics and finishes (each of which in traditional processing consume resources, increasing cost, and take time). Inventory is reduced. The technique of providing base fit finishes or fabric templates for laser finishing has significant and many benefits.

[55] A system incorporating laser finishing can include a computer to control or monitor operation, or both. Figure 7 shows an example of a computer that is component of a laser finishing system. The computer may be a separate unit that is connected to a system, or may be embedded in electronics of the system. In an embodiment, the invention includes software that executes on a computer workstation system or server, such as shown in figure 7.

[56] Figure 7 is a simplified block diagram of a distributed computer network 700 incorporating an embodiment of the present invention. Computer network 700 includes a number of client systems 713, 716, and 719, and a server system 722 coupled to a communication network 724 via a plurality of communication links 728. Communication network 724 provides a mechanism for allowing the various components of distributed network 700 to communicate and exchange information with each other.

[57] Communication network 724 may itself be comprised of many interconnected computer systems and communication links. Communication links 728 may be hardwire links, optical links, satellite or other wireless communications links, wave propagation links, or any other mechanisms for communication of information. Communication links 728 may be DSL, Cable, Ethernet or other hardwire links, passive or active optical links, 3G, 3.5G, 4G and other mobility, satellite or other wireless communications links, wave propagation links, or any other mechanisms for communication of information.

[58] Various communication protocols may be used to facilitate communication between the various systems shown in figure 7. These communication protocols may include VLAN, MPLS, TCP/IP, Tunneling, HTTP protocols, wireless application protocol (WAP), vendor-specific protocols, customized protocols, and others. While in one embodiment, communication network 724 is the Internet, in other embodiments, communication network 724 may be any suitable communication network including a local area network (LAN), a wide area network (WAN), a wireless network, an intranet, a private network, a public network, a switched network, and combinations of these, and the like.

[59] Distributed computer network 700 in figure 7 is merely illustrative of an embodiment incorporating the present invention and does not limit the scope of the invention as recited in the claims. One of ordinary skill in the art would recognize other variations, modifications, and alternatives. For example, more than one server system 722 may be connected to communication network 724. As another example, a number of client systems 713, 716, and 719 may be coupled to communication network 724 via an access provider (not shown) or via some other server system.

[60] Client systems 713, 716, and 719 typically request information from a server system which provides the information. For this reason, server systems typically have more computing and storage capacity than client systems. However, a particular computer system may act as both as a client or a server depending on whether the computer system is requesting or providing information. Additionally, although aspects of the invention have been described using a client-server environment, it should be apparent that the invention may also be embodied in a stand-alone computer system.

[61] Server 722 is responsible for receiving information requests from client systems 713, 716, and 719, performing processing required to satisfy the requests, and for forwarding the results corresponding to the requests back to the requesting client system. The processing required to satisfy the request may be performed by server system 722 or may alternatively be delegated to other servers connected to communication network 724.

[62] Client systems 713, 716, and 719 enable users to access and query information stored by server system 722. In a specific embodiment, the client systems can run as a standalone application such as a desktop application or mobile smartphone or tablet application. In another embodiment, a “web browser” application executing on a client system enables users to select, access, retrieve, or query information stored by server system 722. Examples of web browsers include the Internet Explorer browser program provided by Microsoft Corporation, Firefox browser provided by Mozilla, Chrome browser provided by Google, Safari browser provided by Apple, and others.

[63] In a client-server environment, some resources (e.g., files, music, video, or data) are stored at the client while others are stored or delivered from elsewhere in the network, such as a server, and accessible via the network (e.g., the Internet). Therefore, the user’s data can be stored in the network or “cloud.” For example, the user can work on documents on a client device that are stored remotely on the cloud (e.g., server). Data on the client device can be synchronized with the cloud.

[64] Figure 8 shows an exemplary client or server system of the present invention. In an embodiment, a user interfaces with the system through a computer workstation system, such as shown in figure 8. Figure 8 shows a computer system 801 that includes a monitor 803, screen 805, enclosure 807 (may also be referred to as a system unit, cabinet, or case), keyboard or other human input device 809, and mouse or other pointing device 811. Mouse 811 may have one or more buttons such as mouse buttons 813.

[65] It should be understood that the present invention is not limited any computing device in a specific form factor (e.g., desktop computer form factor), but can include all types of

computing devices in various form factors. A user can interface with any computing device, including smartphones, personal computers, laptops, electronic tablet devices, global positioning system (GPS) receivers, portable media players, personal digital assistants (PDAs), other network access devices, and other processing devices capable of receiving or transmitting data.

[66] For example, in a specific implementation, the client device can be a smartphone or tablet device, such as the Apple iPhone (e.g., Apple iPhone 6), Apple iPad (e.g., Apple iPad or Apple iPad mini), Apple iPod (e.g., Apple iPod Touch), Samsung Galaxy product (e.g., Galaxy S series product or Galaxy Note series product), Google Nexus devices (e.g., Google Nexus 6, Google Nexus 7, or Google Nexus 9), and Microsoft devices (e.g., Microsoft Surface tablet). Typically, a smartphone includes a telephony portion (and associated radios) and a computer portion, which are accessible via a touch screen display.

[67] There is nonvolatile memory to store data of the telephone portion (e.g., contacts and phone numbers) and the computer portion (e.g., application programs including a browser, pictures, games, videos, and music). The smartphone typically includes a camera (e.g., front facing camera or rear camera, or both) for taking pictures and video. For example, a smartphone or tablet can be used to take live video that can be streamed to one or more other devices.

[68] Enclosure 807 houses familiar computer components, some of which are not shown, such as a processor, memory, mass storage devices 817, and the like. Mass storage devices 817 may include mass disk drives, floppy disks, magnetic disks, optical disks, magneto-optical disks, fixed disks, hard disks, CD-ROMs, recordable CDs, DVDs, recordable DVDs (e.g., DVD-R, DVD+R, DVD-RW, DVD+RW, HD-DVD, or Blu-ray Disc), flash and other nonvolatile solid-state storage (e.g., USB flash drive or solid state drive (SSD)), battery-backed-up volatile memory, tape storage, reader, and other similar media, and combinations of these.

[69] A computer-implemented or computer-executable version or computer program product of the invention may be embodied using, stored on, or associated with computer-readable medium. A computer-readable medium may include any medium that participates in providing instructions to one or more processors for execution. Such a medium may take many forms including, but not limited to, nonvolatile, volatile, and transmission media. Nonvolatile media includes, for example, flash memory, or optical or magnetic disks. Volatile media includes static or dynamic memory, such as cache memory or RAM. Transmission media includes coaxial cables, copper wire, fiber optic lines, and wires

arranged in a bus. Transmission media can also take the form of electromagnetic, radio frequency, acoustic, or light waves, such as those generated during radio wave and infrared data communications.

[70] For example, a binary, machine-executable version, of the software of the present invention may be stored or reside in RAM or cache memory, or on mass storage device 817. The source code of the software of the present invention may also be stored or reside on mass storage device 817 (e.g., hard disk, magnetic disk, tape, or CD-ROM). As a further example, code of the invention may be transmitted via wires, radio waves, or through a network such as the Internet.

[71] Figure 9 shows a system block diagram of computer system 801 used to execute the software of the present invention. As in figure 8, computer system 801 includes monitor 803, keyboard 809, and mass storage devices 817. Computer system 501 further includes subsystems such as central processor 902, system memory 904, input/output (I/O) controller 906, display adapter 908, serial or universal serial bus (USB) port 912, network interface 918, and speaker 920. The invention may also be used with computer systems with additional or fewer subsystems. For example, a computer system could include more than one processor 902 (i.e., a multiprocessor system) or a system may include a cache memory.

[72] Arrows such as 922 represent the system bus architecture of computer system 801. However, these arrows are illustrative of any interconnection scheme serving to link the subsystems. For example, speaker 920 could be connected to the other subsystems through a port or have an internal direct connection to central processor 902. The processor may include multiple processors or a multicore processor, which may permit parallel processing of information. Computer system 801 shown in figure 8 is but an example of a computer system suitable for use with the present invention. Other configurations of subsystems suitable for use with the present invention will be readily apparent to one of ordinary skill in the art.

[73] Computer software products may be written in any of various suitable programming languages, such as C, C++, C#, Pascal, Fortran, Perl, Matlab (from MathWorks, www.mathworks.com), SAS, SPSS, JavaScript, AJAX, Java, Python, Erlang, and Ruby on Rails. The computer software product may be an independent application with data input and data display modules. Alternatively, the computer software products may be classes that may be instantiated as distributed objects. The computer software products may also be component software such as Java Beans (from Oracle Corporation) or Enterprise Java Beans (EJB from Oracle Corporation).

[74] An operating system for the system may be one of the Microsoft Windows® family of systems (e.g., Windows 95, 98, Me, Windows NT, Windows 2000, Windows XP, Windows XP x64 Edition, Windows Vista, Windows 7, Windows 8, Windows 10, Windows CE, Windows Mobile, Windows RT), Symbian OS, Tizen, Linux, HP-UX, UNIX, Sun OS, Solaris, Mac OS X, Apple iOS, Android, Alpha OS, AIX, IRIX32, or IRIX64. Other operating systems may be used. Microsoft Windows is a trademark of Microsoft Corporation.

[75] Any trademarks or service marks used in this patent are property of their respective owner. Any company, product, or service names in this patent are for identification purposes only. Use of these names, logos, and brands does not imply endorsement.

[76] Furthermore, the computer may be connected to a network and may interface to other computers using this network. The network may be an intranet, internet, or the Internet, among others. The network may be a wired network (e.g., using copper), telephone network, packet network, an optical network (e.g., using optical fiber), or a wireless network, or any combination of these. For example, data and other information may be passed between the computer and components (or steps) of a system of the invention using a wireless network using a protocol such as Wi-Fi (IEEE standards 802.11, 802.11a, 802.11b, 802.11e, 802.11g, 802.11i, 802.11n, 802.11ac, and 802.11ad, just to name a few examples), near field communication (NFC), radio-frequency identification (RFID), mobile or cellular wireless (e.g., 2G, 3G, 4G, 3GPP LTE, WiMAX, LTE, LTE Advanced, Flash-OFDM, HIPERMAN, iBurst, EDGE Evolution, UMTS, UMTS-TDD, 1xRDD, and EV-DO). For example, signals from a computer may be transferred, at least in part, wirelessly to components or other computers.

[77] In an embodiment, with a web browser executing on a computer workstation system, a user accesses a system on the World Wide Web (WWW) through a network such as the Internet. The web browser is used to download web pages or other content in various formats including HTML, XML, text, PDF, and postscript, and may be used to upload information to other parts of the system. The web browser may use uniform resource identifiers (URLs) to identify resources on the web and hypertext transfer protocol (HTTP) in transferring files on the web.

[78] In other implementations, the user accesses the system through either or both of native and nonnative applications. Native applications are locally installed on the particular computing system and are specific to the operating system or one or more hardware devices of that computing system, or a combination of these. These applications (which are sometimes also referred to as “apps”) can be updated (e.g., periodically) via a direct internet

upgrade patching mechanism or through an applications store (e.g., Apple iTunes and App store, Google Play store, Windows Phone store, and Blackberry App World store).

[79] The system can run in platform-independent, nonnative applications. For example, client can access the system through a web application from one or more servers using a network connection with the server or servers and load the web application in a web browser. For example, a web application can be downloaded from an application server over the Internet by a web browser. Nonnative applications can also be obtained from other sources, such as a disk.

[80] Figures 10–11 show examples of mobile devices, which can be mobile clients. Mobile devices are specific implementations of a computer, such as described above. Figure 10 shows a smartphone device 1001, and figure 11 shows a tablet device 1101. Some examples of smartphones include the Apple iPhone, Samsung Galaxy, and Google Nexus family of devices. Some examples of tablet devices include the Apple iPad, Samsung Galaxy Tab, and Google Nexus family of devices.

[81] Smartphone 1001 has an enclosure that includes a screen 1003, button 1009, speaker 1011, camera 1013, and proximity sensor 1035. The screen can be a touch screen that detects and accepts input from finger touch or a stylus. The technology of the touch screen can be a resistive, capacitive, infrared grid, optical imaging, or pressure-sensitive, dispersive signal, acoustic pulse recognition, or others. The touch screen is screen and a user input device interface that acts as a mouse and keyboard of a computer.

[82] Button 1009 is sometimes referred to as a home button and is used to exit a program and return the user to the home screen. The phone may also include other buttons (not shown) such as volume buttons and on-off button on a side. The proximity detector can detect a user's face is close to the phone, and can disable the phone screen and its touch sensor, so that there will be no false inputs from the user's face being next to screen when talking.

[83] Tablet 1101 is similar to a smartphone. Tablet 1101 has an enclosure that includes a screen 1103, button 1109, and camera 1113. Typically the screen (e.g., touch screen) of a tablet is larger than a smartphone, usually 7, 8, 9, 10, 12, 13, or more inches (measured diagonally).

[84] Figure 12 shows a system block diagram of mobile device 1201 used to execute the software of the present invention. This block diagram is representative of the components of smartphone or tablet device. The mobile device system includes a screen 1203 (e.g., touch screen), buttons 1209, speaker 1211, camera 1213, motion sensor 1215, light sensor 1217,

microphone 1219, indicator light 1221, and external port 1223 (e.g., USB port or Apple Lightning port). These components can communicate with each other via a bus 1225.

[85] The system includes wireless components such as a mobile network connection 1227 (e.g., mobile telephone or mobile data), Wi-Fi 1229, Bluetooth 1231, GPS 1233 (e.g., detect GPS positioning), other sensors 1235 such as a proximity sensor, CPU 1237, RAM memory 1239, storage 1241 (e.g. nonvolatile memory), and battery 1243 (lithium ion or lithium polymer cell). The battery supplies power to the electronic components and is rechargeable, which allows the system to be mobile.

[86] Figure 13 shows flow for finishing apparel to produce a desired wear pattern. A technique includes determining a fabric's response to a laser, capturing an initial image of a wear pattern on a garment, and processing the initial image to obtain a working image in grayscale. The working image is further processed to obtain a difference image by comparing each pixel relative to a dark reference. The difference image is converted to a laser values image by using the previously determined fabric response to the laser.

[87] In a step 1312, a desired target photo is selected. An input is a user file selection. An output is an imported image.

[88] In a step 1318, a garment is extracted from the photo. An input is an imported image. An output is a work image.

[89] In a step 1324, a difference image is converted to a laser fabric file. An input is a different image. An output is a laser image.

[90] In a step 1329, the difference image is converted to a laser fabric file. An input is a difference image. An output is a laser image.

[91] In a step 1335, user defined filtering and feature enhancement is performed. An input is a laser image. An output is an enhanced image.

[92] Figure 14 shows a block diagram of a system for creating, designing, producing apparel products with laser finishing. A box line plan 1402 is an internal and interim tool for communication between a merchandising group and design group. Through the box line plan, merchandising can communicate what needs to be designed by the design group. The box line plan can have open slots to be designed 1409.

[93] There is a digital design tool 1416 merchants and design can use to click and drag finish effects (e.g., laser files) and tint casts over images of base washes (BFFs) in order to visualize possible combinations and build the line visually before the garment finish is actually finished by the laser. The visualizations can be by rendering on a computer system, such as using three-dimensional (3D) graphics. A specific implementation of a digital design

tool is described in U.S. patent application 62/579,863, filed October 31, 2017, which is incorporated by reference.

[94] Designers can use the digital design tool to design products that are used to satisfy the requests in open slots 1409. Designs created using the digital design tool can be stored in a digital library 1422. Input to the digital design tool include fabric templates or blanks 1427 (e.g., base fit fabrics or BFFs), existing finishes 1433 (e.g., can be further modified by the tool 1416), and new finishes 1438. New finishes can be from designs 1441 (e.g., vintage design) captured using a laser finish software tool 1445, examples of which are described in figure 13 and U.S. patent application 62/377,447, filed August 19, 2016. Digital library 1422 can be accessible by the region assorting and sell-in 1450. And the digital library can be used populate or satisfy the box line plan.

[95] Figure 15 shows a block diagram of a user or consumer tool to create customized apparel using laser finishing. A user (user 1) can access a design tool 1518. This design tools might be available and execute via a Web browser or a mobile application (e.g., smartphone or tablet app). The design tool interacts and communicates over a network with a server 1526. The design tool allows the user to create or customize a unique distressing or other pattern on, for example, jeans. The user will be able to visualize the design on a computer screen before making an order for the customized product.

[96] The design tool communicates the user's design to the server. The server handles selecting an appropriate fabric template or blank 1533 and sending an appropriate laser file to the laser fabric finishing system 1537 to control the laser 1541 to make the customized product 1546. The customized product can be shipped to a store 1554 or shipped directly to the user 1559.

[97] Further, the server has access to a database 1566, where the server can store a user's designed, so that the user may access the same design in the future. The database may also be a digital library of different designs that the user can select and add to make their customized design.

[98] Instead of using a Web browser or mobile app, a user (user 2) can also access create a customize product through a kiosk tool 1572 that is at a store or other location. This can be helpful for customers who are already in the store or does not want to use the other tools. The kiosk tool is optional and is not included in some implementations of the system. In other implementations, there is a kiosk tool and not the design tool 1518.

[99] Figure 16 shows another implementation of a kiosk tool. The tool and components of the tool are in the same location (e.g., fabric blanks and laser), so the user will be able to design and received the customized product immediately, without waiting for shipping.

[100] The kiosk has a display 1604 and input interface 1609 for the user to interact with the kiosk. The display can be a touchscreen, which incorporate the input interface. The user can also upload and save files via an external storage interface 1612, such as via a USB flash drive. Also, the kiosk can have a camera 1621 or scanner 1625, or both, to take as input images of existing patterns or designs.

[101] A design tool 1638 takes input from any of the above input sources and additionally has access to a library 1643. With the design tool, the user can design a customized product. The tool handles selecting an appropriate fabric template or blank 1652, sending an appropriate laser file to the laser fabric finishing system 1657 to control the laser 1661 to make the customized product 1669. The customized product is available to the user minutes after lasering.

[102] The kiosk can include an optional network connection 1677, which can be wired or wireless. With the network connection, the kiosk can connect over a network to other computers, servers, and machines. For example, software of the kiosk can be updated via the network. For example, through the network, the kiosk can check inventory of fabric templates, software of the kiosk can be updated, mobile devices can connect via Wi-Fi to the kiosk, and other functionality can be enabled.

[103] Figure 17 shows traditional flow for getting a product to market. This also may be referred to as the “go-to-market” process. There are a brief, concept, or line plan phase 1703, design or development phase 1707, initial assortment 1712 (which may sometimes be referred to a line assortment worksheet (LAW)) or internal and interim checks in between merchandising and design to review product line phase 1712, prototype phase 1718, final line assortment (FLA) 1724 or a final line assortment meeting where the group aligns on what will be in the line phase, commercial samples phase 1729, market week time 1735, sell-in phase 1741, and fulfillment phase 1750 and in-season 1754.

[104] Figure 18 shows various techniques for reducing time to market when using laser finishing. A flow 1802 is a process flow for traditional process. It will take, for example, about 4.5 months from product commitment to arriving on the floor for sale. FG refers to finished good. DC refers to distribution center.

[105] A flow 1835 is a process flow for laser finishing, no other changes from the traditional process. This flow will take, for example, about 4 months from product commitment to arriving on the floor for sale.

[106] A flow 1824 is another flow for laser finishing, where the blanks or fabric templates are stored at the vendor (e.g., fabric mill). This flow will take, for example, about 2.5 months from product commitment to arriving on the floor for sale. The time savings is due the fabric not needing to be shipped to the dry processing facility, which requires shipping time.

[107] A flow 1835 is another flow for laser finishing, where the blanks or fabric templates are stored at the distribution center (e.g., close to the customer). This flow will take, for example, about 1 month from product commitment to arriving on the floor for sale. The time savings is due the fabric being laser finished, just be shipment, at a location close to the customer location.

[108] In other flows, there can 1-day turnaround for in store or online orders or purchases. In such cases, blanks or base fit fabrics are stored at store or e-commerce distribution center. When the order is received, the blanks are burned immediately. Then the completed orders are delivered to customer. For online orders, overnight or other express shipping (e.g., 2-day shipping, 3-day shipping, messenger, plane, or drone) can be used.

[109] Figure 19 shows a finishing technique that includes the use of a laser 1907. A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. Lasers are used for bar code scanning, medical procedures such as corrective eye surgery, and industrial applications such as welding. A particular type of laser for finishing apparel is a carbon dioxide laser, which emits a beam of infrared radiation.

[110] The laser is controlled by an input file 1910 and control software 1913 to emit a laser beam onto fabric at a particular position or location at a specific power level for a specific amount of time. Further, the power of the laser beam can be varied according to a waveform such as a pulse wave with a particular frequency, period, pulse width, or other characteristic. Some aspects of the laser that can be controlled include the duty cycle, frequency, marking or burning speed, and other parameters.

[111] The duty cycle is a percentage of laser emission time. Some examples of duty cycle percentages include 40, 45, 50, 55, 60, 80, and 100 percent. The frequency is the laser pulse frequency. A low frequency might be, for example, 5 kilohertz, while a high frequency might be, for example, 25 kilohertz. Generally, lower frequencies will have higher surface penetration than high frequencies, which has less surface penetration.

[112] The laser acts like a printer and “prints,” “marks,” or “burns” a wear pattern (specified by input file 1910) onto the garment. The fabric that is exposed to the laser beam (e.g., infrared beam) changes color, lightening the fabric at a specified position by a certain amount based on the laser power, time of exposure, and waveform used. The laser continues from position to position until the wear pattern is completely printed on the garment.

[113] In a specific implementation, the laser has a resolution of about 34 dots per inch (dpi), which on the garment is about 0.7 millimeters per pixel. The technique described in this patent is not dependent on the laser’s resolution, and will work with lasers have more or less resolution than 34 dots per inch. For example, the laser can have a resolution of 10, 15, 20, 25, 30, 40, 50, 60, 72, 80, 96, 100, 120, 150, 200, 300, or 600 dots per inch, or more or less than any of these or other values. Typically, the greater the resolution, the finer the features that can be printed on the garment in a single pass. By using multiple passes (e.g., 2, 3, 4, 5, or more passes) with the laser, the effective resolution can be increased. In an implementation, multiple laser passes are used.

[114] U.S. patent application 62/433,739, which is incorporated by reference, describes a denim material with enhanced response characteristics to laser finishing. Using a denim material made from indigo ring-dyed yarn, variations in highs and lows in indigo color shading is achieved by using a laser.

[115] As shown in figure 19, before laser 1907, the fabric can be prepared 1916 for the laser, which may be referred to as a base preparation, and can include a prelaser wash. This wash is also referred to as a base wash (e.g., washed using a base wash recipe). This step helps improves the results of the laser. After the laser, there can be a postlaser wash 1919. This wash can clean or remove any residue caused by the laser, such as removing any charring (which would appear as brown or slightly burning). There can be additional finish 1221, which may be including tinting, softening, or fixing, to complete finishing.

[116] Figure 20 shows a technique where finishing is divided into two finishing steps, finishing I and finishing II. Finishing I 2008 is an initial finishing to create base templates 2011. For example, fully assembled garments (e.g., jeans) can be base washed using a specific base wash recipe to obtain a base template.

[117] Different base wash recipes are used to obtain different base templates. For example, the different base washes can vary in the amount of cycles, timing, temperature, abrasives, oxidizers, dyes, or tinting used, or any combination of these. The base template may be a dark finish, medium finish, light finish, ultralight finish, or other base finish. The dark finish can have a darker shade of indigo compared to the medium finish. The medium finish can have a

darker shade of indigo compared to the light finish. The light finish can have a lighter shade of indigo compared to the medium and the dark finishes. The ultralight finish can have a lighter shade of indigo compared to the light shade finish.

[118] With finishing II 2014 (e.g., laser finishing), each base template can be used to manufacture multiple final finishes 2017. For example, the laser uses a laser input file to burn a particular finishing pattern (e.g., wear pattern, whiskers, holes, or other) onto the garment.

[119] Figures 21–23 show various approaches for staging (e.g., storing inventory) the base fit fabrics or base templates. In figure 21, there is a first facility at a first location and a second facility at a second location, different from each other (in different buildings). The second facility may be referred to as a distribution center and stores an inventory of the finished products. As an example, the first facility can be in China or Asia. The second facility can be in the United States (e.g., distribution center for the U.S. market).

[120] The first facility is handles assembling the garments, wet processing (e.g., base wash), storing an inventory of the base templates, lasering of the garment by a laser finishing machine when needed. The finished product, output from the laser machine, is shipped to the second facility for inventorying.

[121] In figure 22, compared to the approach in figure 21, the first facility no longer stores the blank template inventory, but ships the templates after base wash to the second facility. The second facility stores an inventory of the base templates, and has laser machines that can laser finish the garments. The resulting finished products are also inventoried at the second facility. In this approach, the time from finished product to store is shortened (compared to the approach in figure 21) because typically the second facility (e.g., distribution center) is closer to, for example, the retail stores and location of the purchasers. This approach may be considered in-market final finishing because laser finishing occurs in the same location as the market the facility serves.

[122] In figure 23, compared to the approaches in figures 21 and 22, there are three facilities. The third facility is a distribution center (similar to the second facilities in figures 21 and 22) and stores the finished products. The second facility handles storing inventory of the base templates and lasering of the garments. The first facility handles assembling the garments and base wash. The first facility ships the base templates to the second facility, which inventories them. After lasering, the second facility ships the finished products to the third facility.

[123] As an example, the first facility can be in China or Asia. The second facility can be in Mexico, or other location geographically closer to the third facility than the first facility. The third facility can be in the United States (e.g., distribution center for the U.S. market).

[124] In an implementation, a system includes: a first garment product, second garment product, digital design tool, and a laser finishing machine. The first garment is identifiable by a first product code identifier. The first garment product is made from a first garment template washed using a first base wash recipe. The first garment template is an assembled garment made from fabric panels of a woven first material comprising a warp yarn including indigo-dyed cotton yarn, and the fabric panels are sewn together using thread.

[125] The second garment product is identifiable by a second product code identifier. The second garment product is made from a second garment template washed using a second base wash recipe, different from the first base wash recipe. The second garment template is an assembled garment made from fabric panels of the woven first material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread.

[126] The digital design tool is used to generate or produce one or more laser files, including a first laser file for a first finishing pattern. The digital design tool generates a visualization of a finishing pattern on a computer screen and allows editing of the finishing pattern.

[127] The laser finishing machine receives as input the first laser file that is generated by the digital design tool. When the first garment template is used as a target garment for a laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the first finishing pattern on the target garment, which results in the target garment becoming the first garment product. When the second garment template is used as the target garment for the laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the finishing pattern on the target garment, which results in the target garment becoming the second garment product.

[128] In various implementations, the first product code identifier is different from the second product code identifier. The first material is a denim. The first garment product can be a first pair of jeans product. The second garment product can be a second pair of jeans product.

[129] The first base wash recipe can result in a lighter colored apparel template than the second base wash recipe. For example, the first base wash recipe may include more oxidizer

(e.g., sodium hypochlorite) that chemically oxidizes the material or fabric of the assembled apparel. Of the first base wash recipe may include abrasives (e.g., pumice) that abrades the surface of the material.

[130] The system can further include: a third garment product, identifiable by a third product code identifier, where the third garment product is made from the first garment template. The digital design tool generates a second laser file including a second finishing pattern, different from the first finishing pattern. The laser finishing machine receives as input the second laser file that is generated by the digital design tool. When the first garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the third garment product.

[131] The system can include: a third garment product, identifiable by a third product code identifier, where the third garment product is made from the first garment template; and a fourth garment product, identifiable by a fourth product code identifier, where the fourth garment product is made from the second garment template. The digital design tool generates a second laser file including a second finishing pattern, different from the first finishing pattern. The laser finishing machine receives as input the second laser file that is generated by the digital design tool.

[132] When the first garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the third garment product. When the second garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the fourth garment product.

[133] The laser finishing machine can be housed in a processing facility including machines used to perform the first and second base wash recipes. The first and second garment products are stored at a distribution center. The processing facility and distribution center are separate buildings in different locations. A template inventory including the first garment template and second garment template are stored at the processing facility.

[134] The laser finishing machine can be housed in a dry processing facility. The first and second garment products are stored at a distribution center. The dry processing facility and

distribution center are separate buildings in different locations. A template inventory including the first garment template and second garment template are stored at the dry processing facility. The dry processing facility does not include machines used to perform the first and second base wash recipes.

[135] The laser finishing machine can be housed in a dry processing facility. The first and second garment products are stored at a distribution center. The dry processing facility and distribution center are in the same building at the same location. A template inventory including the first garment template and second garment template are stored at the distribution center.

[136] The system can include a server, connected to a user digital design tool and laser finishing machine via a network. A user accesses the user digital design tool at the server via the Web (e.g., the Internet or the Cloud) and creates a user laser file with a customized laser finishing pattern. The user selects a template from a template library to which the customized laser finishing pattern. The laser finishing machine receives as input the user laser file. When the user's selected garment template is used as the target garment for the laser head of the laser finishing machine and the user laser file controls operation of the laser head, the laser finishing machine burns the customized finishing pattern on the target garment, which results in the target garment becoming a customized product for the user.

[137] In another implementation, a method includes: providing a first garment template washed using a first base wash recipe, where the first garment template is an assembled garment made from fabric panels of a woven first material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread; providing a second garment template washed using a second base wash recipe, where the second garment template is an assembled garment made from fabric panels of a woven first material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread; providing a first laser file including a first finishing pattern; and inputting the first laser file to a laser finishing machine to burn the first finishing pattern onto the first garment template to obtain a first finished garment.

[138] The method further includes: indicating the first finished garment as a first garment product, identifiable by a first product code identifier; inputting the first laser file to the laser finishing machine to burn the first finishing pattern onto the second garment template to obtain a second finished garment; and indicating the second finished garment as a second garment product, identifiable by a second product code identifier, different from the first product code identifier.

[139] In various implementations, the method can include: providing a second laser file including a second finishing pattern, different from the first finishing pattern; inputting the second laser file to the laser finishing machine to burn the second finishing pattern onto the first garment template to obtain a third finished garment; and indicating the third finished garment as a third garment product, identifiable by a third product code identifier, different from the first and second product code identifiers.

[140] The method can include: providing a second laser file including a second finishing pattern, different from the first finishing pattern; inputting the second laser file to the laser finishing machine to burn the second finishing pattern onto the first garment template to obtain a third finished garment; indicating the third finished garment as a third garment product, identifiable by a third product code identifier; inputting the second laser file to the laser finishing machine to burn the second finishing pattern onto the second garment template to obtain a fourth finished garment; and indicating the fourth finished garment as a fourth garment product, identifiable by a fourth product code identifier, different from the fourth product code identifier.

[141] The first base wash recipe can result in a lighter colored (or darker colored) apparel template than the second base wash recipe.

[142] A first inventory of the first and second garment template can be stored in a first facility at a first location. The first and second finished garments are stored in a second inventory at a second facility at a second location. The first and second facilities are different buildings in different locations.

[143] A first inventory of the first and second garment template can be stored in a first facility at a first location, the first and second finished garments are stored in a second inventory at the first facility. The laser finishing machine and burning of the finishing patterns also occurs at the first facility.

[144] The providing a first garment template washed using a first base wash recipe can include washing an assembled garment first base wash recipe to obtain the first garment template at a first facility at a first location. The method can include: shipping the first garment template to a second facility at a second location, different from the first facility, and storing an inventory the first garment template at the second facility. The second facility can house the laser finishing machine. The second facility can store an inventory of the first garment product.

[145] This description of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise

form described, and many modifications and variations are possible in light of the teaching above. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications. This description will enable others skilled in the art to best utilize and practice the invention in various embodiments and with various modifications as are suited to a particular use. The scope of the invention is defined by the following claims.

Claims

The invention claimed is:

1. A system comprising:

a first garment product, identifiable by a first product code identifier, wherein the first garment product is made from a first garment template washed using a first base wash recipe, the first garment template is an assembled garment made from fabric panels of a woven first material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread;

a second garment product, identifiable by a second product code identifier, wherein the second garment product is made from a second garment template washed using a second base wash recipe, different from the first base wash recipe, the second garment template is an assembled garment made from fabric panels of the woven first material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread;

a digital design tool, generating at least a first laser file including a first finishing pattern, wherein the digital design tool generates a visualization of a finishing pattern on a computer screen and allows editing of the finishing pattern;

a laser finishing machine, receiving as input the first laser file that is generated by the digital design tool,

when the first garment template is used as a target garment for a laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the first finishing pattern on the target garment, which results in the target garment becoming the first garment product, and

when the second garment template is used as the target garment for the laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the finishing pattern on the target garment, which results in the target garment becoming the second garment product.

2. The system of claim 1 wherein the first base wash recipe results in a lighter colored apparel template than the second base wash recipe.

3. The system of claim 1 wherein the first product code identifier is different from the second product code identifier.

4. The system of claim 1 comprising:

a third garment product, identifiable by a third product code identifier, wherein the third garment product is made from the first garment template,

the digital design tool generates a second laser file including a second finishing pattern, different from the first finishing pattern,

the laser finishing machine receives as input the second laser file that is generated by the digital design tool, and

when the first garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the third garment product.

5. The system of claim 4 comprising:

a third garment product, identifiable by a third product code identifier, wherein the third garment product is made from the first garment template;

a fourth garment product, identifiable by a fourth product code identifier, wherein the fourth garment product is made from the second garment template,

the digital design tool generates a second laser file including a second finishing pattern, different from the first finishing pattern,

the laser finishing machine receives as input the second laser file that is generated by the digital design tool,

when the first garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the third garment product, and

when the second garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the fourth garment product.

6. The system of claim 1 wherein the laser finishing machine is housed in a processing facility including machines used to perform the first and second base wash recipes, and the first and second garment products are stored at a distribution center, and the processing facility and distribution center are separate buildings in different locations, and

a template inventory including the first garment template and second garment template are stored at the processing facility.

7. The system of claim 1 wherein the laser finishing machine is housed in a dry processing facility, and the first and second garment products are stored at a distribution center, and the dry processing facility and distribution center are separate buildings in different locations, and

a template inventory including the first garment template and second garment template are stored at the dry processing facility.

8. The system of claim 7 wherein the dry processing facility does not include machines used to perform the first and second base wash recipes.

9. The system of claim 1 wherein the laser finishing machine is housed in a dry processing facility, the first and second garment products are stored at a distribution center, and the dry processing facility and distribution center are in the same building at the same location, and

a template inventory including the first garment template and second garment template are stored at the distribution center.

10. The system of claim 1 comprising:

a server, coupled to the to a user digital design tool and laser finishing machine via a network,

wherein a user accesses the user digital design tool at the server via the Web and creates a user laser file with a customized laser finishing pattern, the user selects a template from a template library to which the customized laser finishing pattern, and

the laser finishing machine receives as input the user laser file, and when the user's selected garment template is used as the target garment for the laser head of the laser finishing machine and the user laser file controls operation of the laser head, the laser finishing machine burns the customized finishing pattern on the target garment, which results in the target garment becoming a customized product for the user.

11. The system of claim 1 wherein the first material is a denim.

12. The system of claim 1 wherein the first garment product is a first pair of jeans product.

13. The system of claim 12 wherein the second garment product is a second pair of jeans product.

14. A system comprising:

a first garment product, identifiable by a first product code identifier, wherein the first garment product is made from a first garment template washed using a first base wash recipe, the first garment template is an assembled garment made from fabric panels of a woven first

material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread;

a second garment product, identifiable by a second product code identifier, wherein the second garment product is made from a second garment template washed using a second base wash recipe, different from the first base wash recipe, the second garment template is an assembled garment made from fabric panels of the woven first material comprising a warp yarn comprising indigo-dyed cotton yarn, and the fabric panels are sewn together using thread;

a third garment product, identifiable by a third product code identifier, wherein the third garment product is made from the first garment template, and the first, second, and third product code identifiers are different from each other;

a digital design tool, generating a first laser file including a first finishing pattern and a second laser file including a second finishing pattern, wherein the digital design tool generates a visualization of a finishing pattern on a computer screen and allows editing of the finishing pattern;

a laser finishing machine, receiving as input at least one of the first laser file or the second laser file that is generated by the digital design tool,

when the first garment template is used as a target garment for a laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the first finishing pattern on the target garment, which results in the target garment becoming the first garment product,

when the second garment template is used as the target garment for the laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the finishing pattern on the target garment, which results in the target garment becoming the second garment product, and

when the first garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the third garment product.

15. The system of claim 14 comprising:

a fourth garment product, identifiable by a fourth product code identifier, wherein the fourth garment product is made from the second garment template, and the fourth product code identifier is different from the first, second, and third product code identifiers, and

when the second garment template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the fourth garment product.

16. The system of claim 14 wherein the laser finishing machine is housed in a processing facility including machines used to perform the first and second base wash recipes, and the first and second garment products are stored at a distribution center, and the processing facility and distribution center are separate buildings in different locations, and a template inventory including the first garment template and second garment template are stored at the processing facility.

17. The system of claim 14 wherein the laser finishing machine is housed in a dry processing facility, and the first and second garment products are stored at a distribution center, and the dry processing facility and distribution center are separate buildings in different locations, and

a template inventory including the first garment template and second garment template are stored at the dry processing facility.

18. The system of claim 17 wherein the dry processing facility does not include machines used to perform the first and second base wash recipes.

19. The system of claim 14 wherein the laser finishing machine is housed in a dry processing facility, the first and second garment products are stored at a distribution center, and the dry processing facility and distribution center are in the same building at the same location, and

a template inventory including the first garment template and second garment template are stored at the distribution center.

20. A system comprising:

a first jeans product, identifiable by a first product code identifier, wherein the first jeans product is made from a first jeans template washed using a first base wash recipe, the first jeans template is an assembled pair of jeans made from denim fabric panels, and the denim fabric panels are sewn together using thread;

a second jeans product, identifiable by a second product code identifier, wherein the second jeans product is made from a second jeans template washed using a second base wash recipe, different from the first base wash recipe, the second jeans template is an assembled pair of jeans made from denim fabric panels, and the denim fabric panels are sewn together using thread;

a third jeans product, identifiable by a third product code identifier, wherein the third jeans product is made from the first jeans template, and the first, second, and third product code identifiers are different from each other;

a digital design tool, generating a first laser file including a first finishing pattern and a second laser file including a second finishing pattern, wherein the digital design tool generates a visualization of a finishing pattern on a computer screen and allows editing of the finishing pattern;

a laser finishing machine, receiving as input at least one of the first laser file or the second laser file that is generated by the digital design tool,

when the first jeans template is used as a target garment for a laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the first finishing pattern on the target garment, which results in the target garment becoming the first jeans product,

when the second jeans template is used as the target garment for the laser head of the laser finishing machine and the first laser file controls operation of the laser head, the laser finishing machine burns the finishing pattern on the target garment, which results in the target garment becoming the second jeans product, and

when the first jeans template is used as the target garment for the laser head of the laser finishing machine and the second laser file controls operation of the laser head, the laser finishing machine burns the second finishing pattern on the target garment, which results in the target garment becoming the third jeans product.

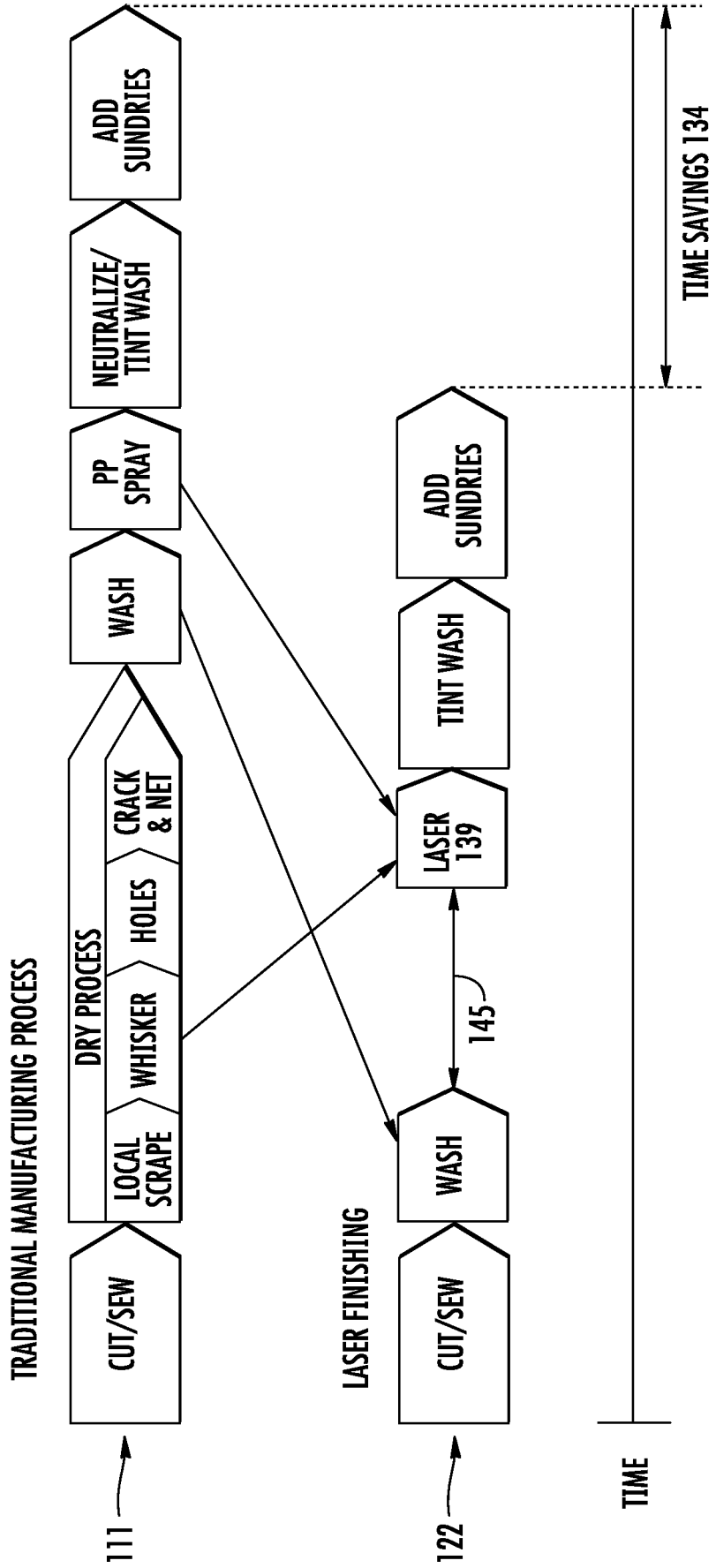


FIG. 1

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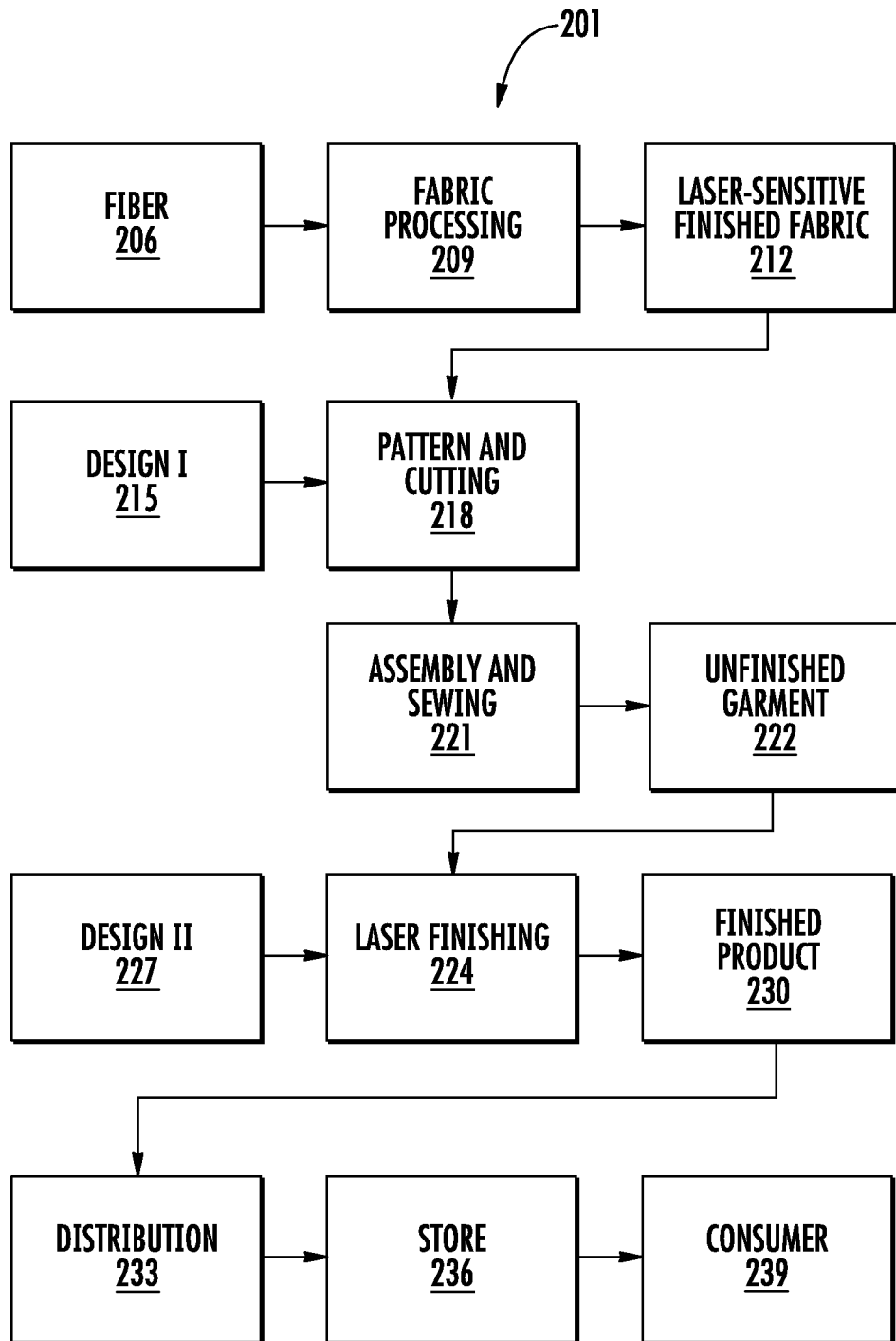


FIG. 2

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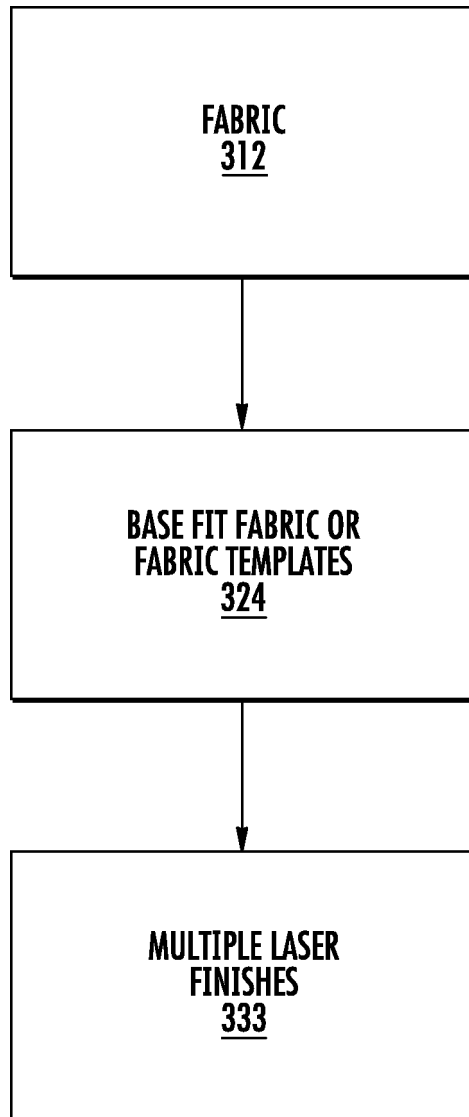


FIG. 3

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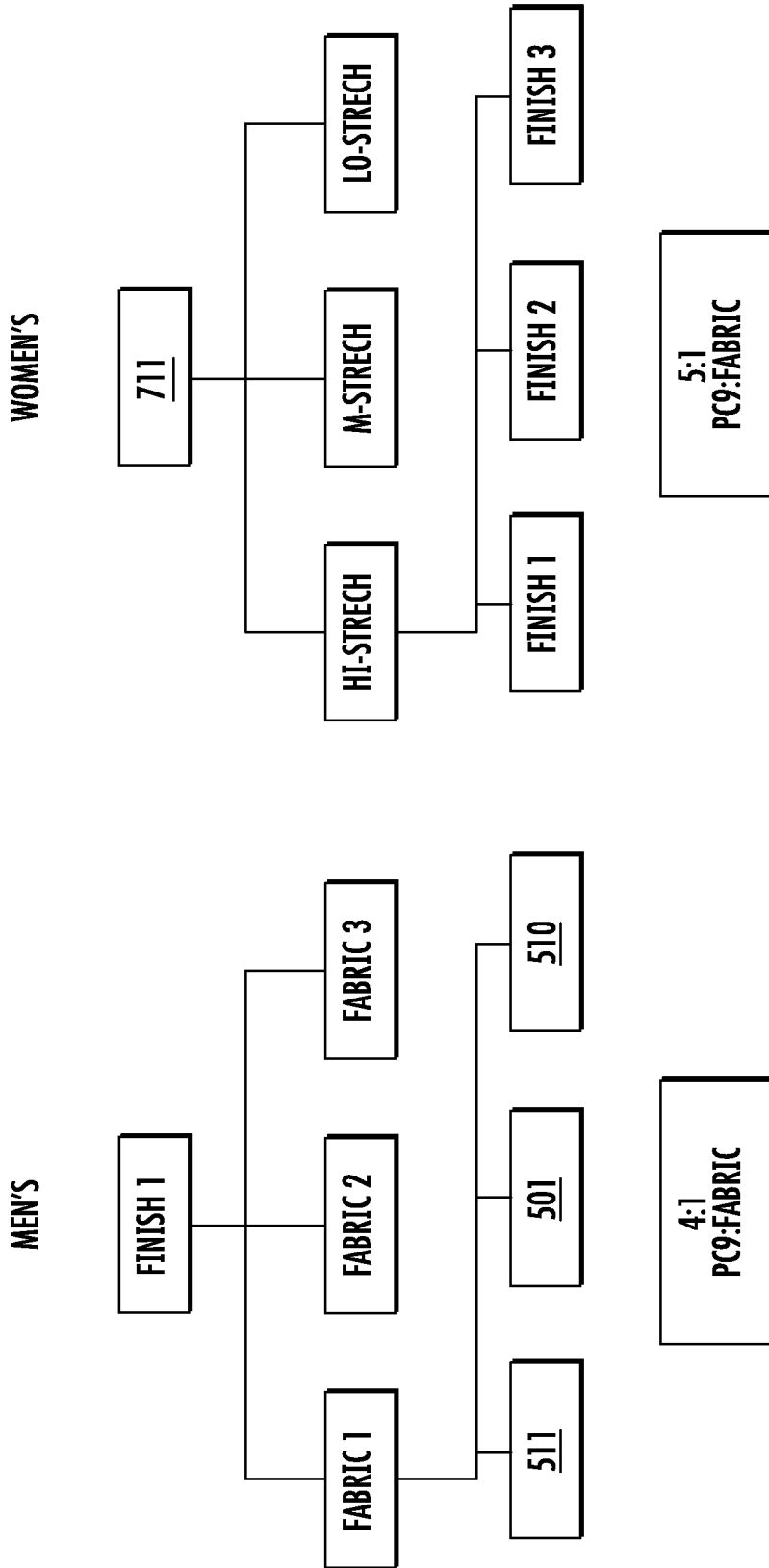


FIG. 4

FIG. 5

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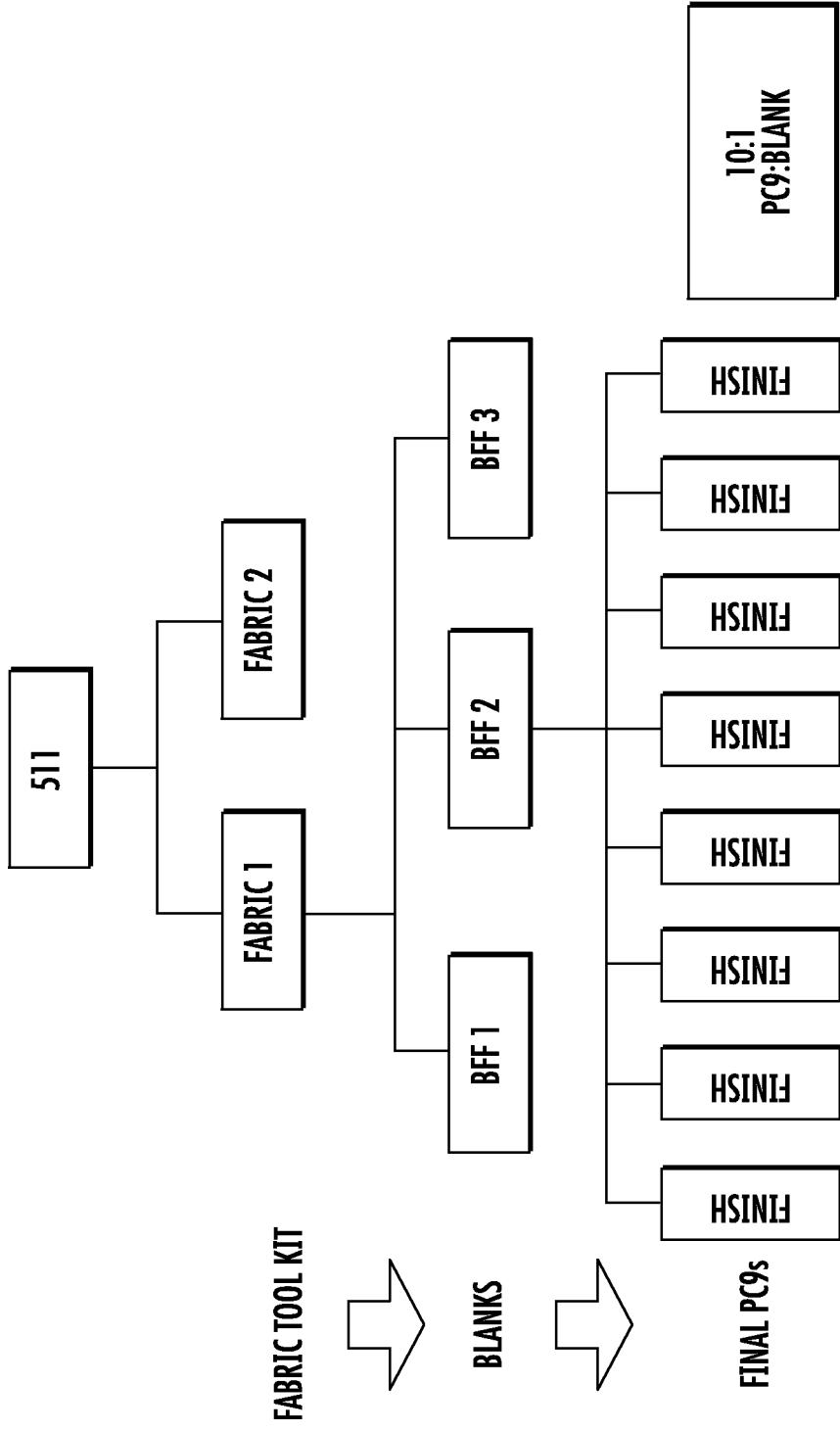


FIG. 6

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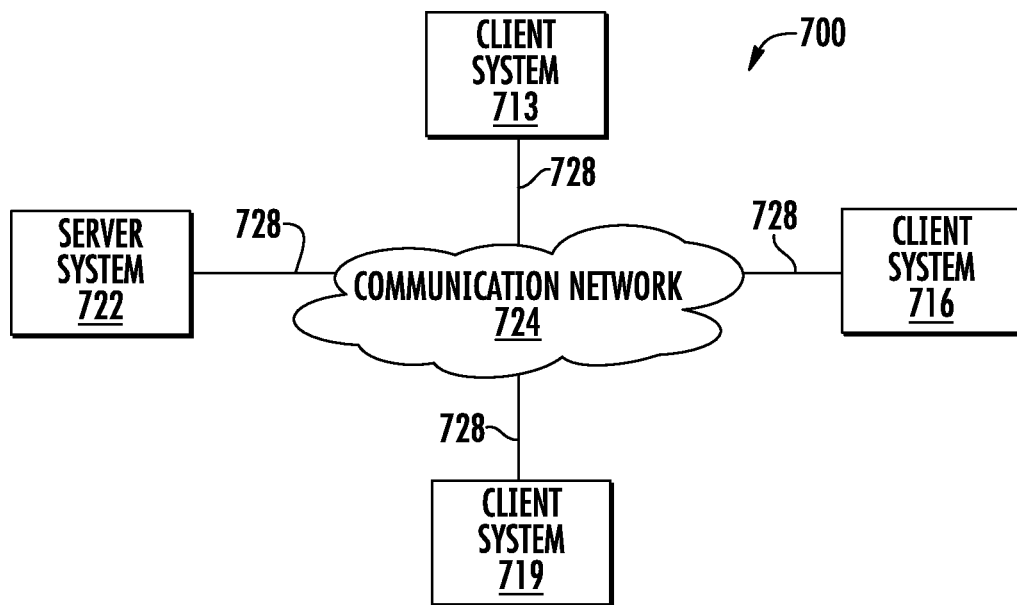


FIG. 7

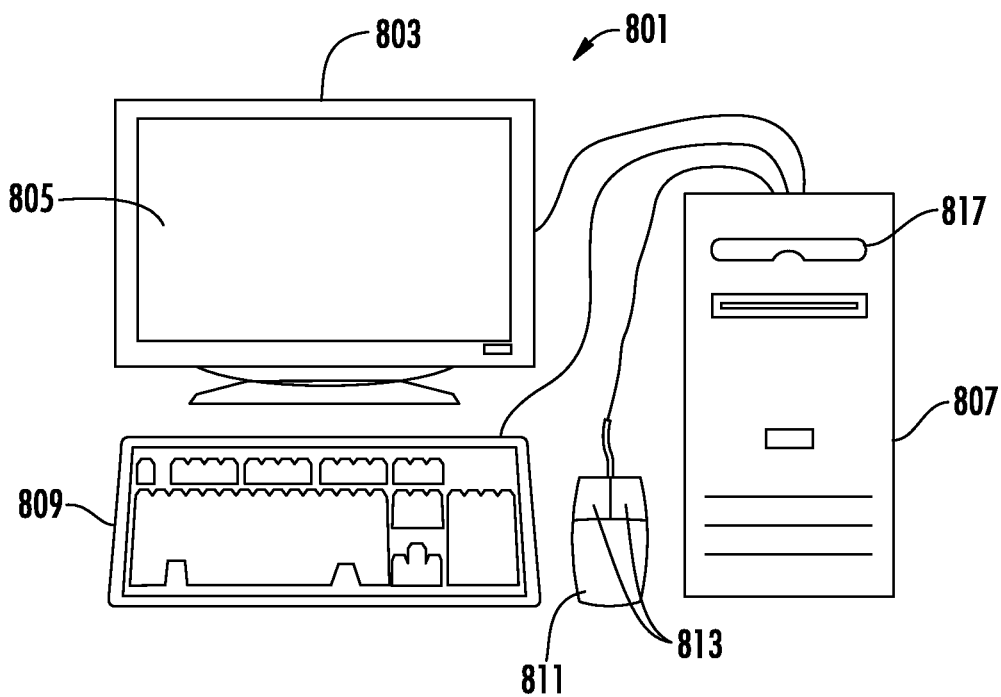


FIG. 8

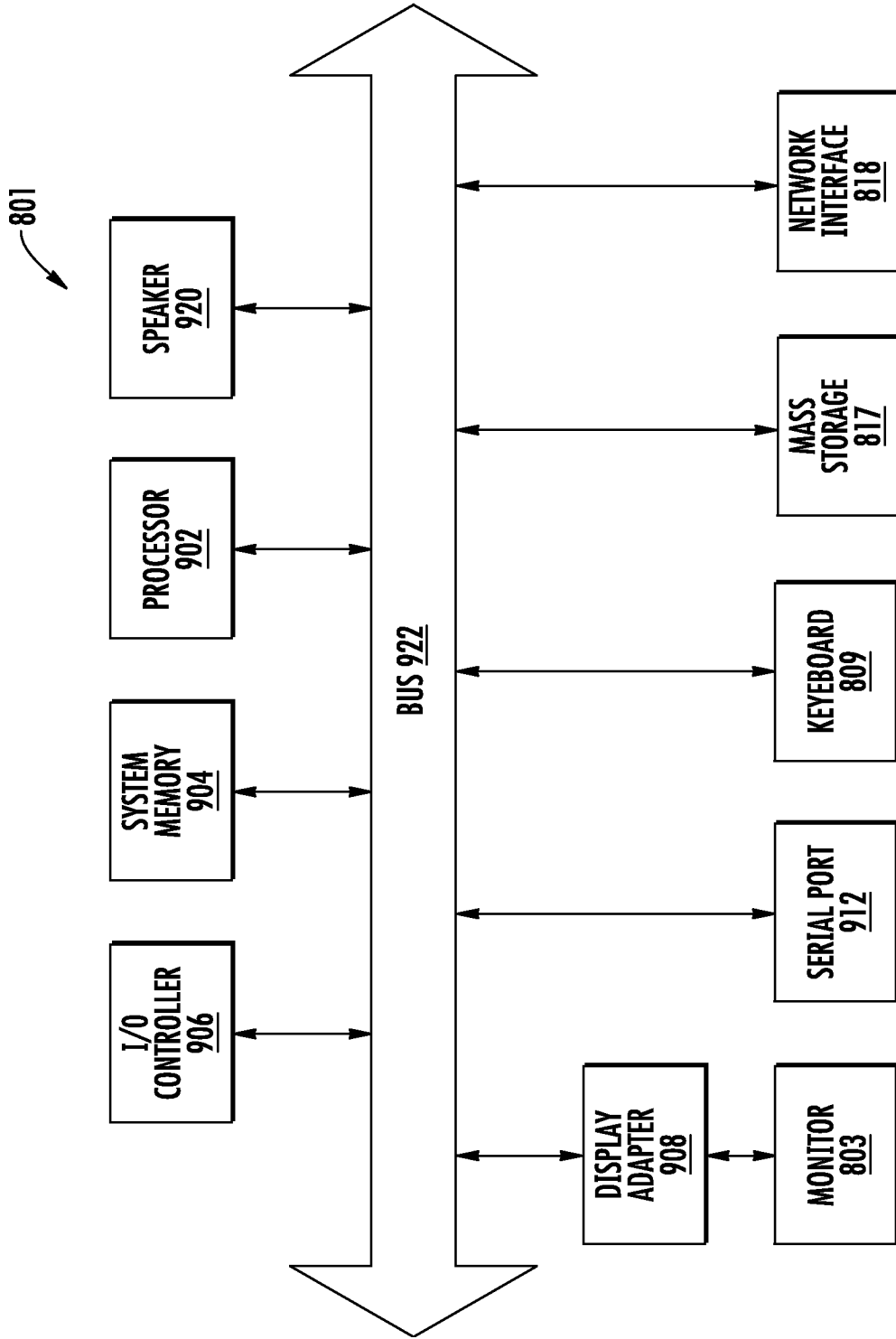


FIG. 9

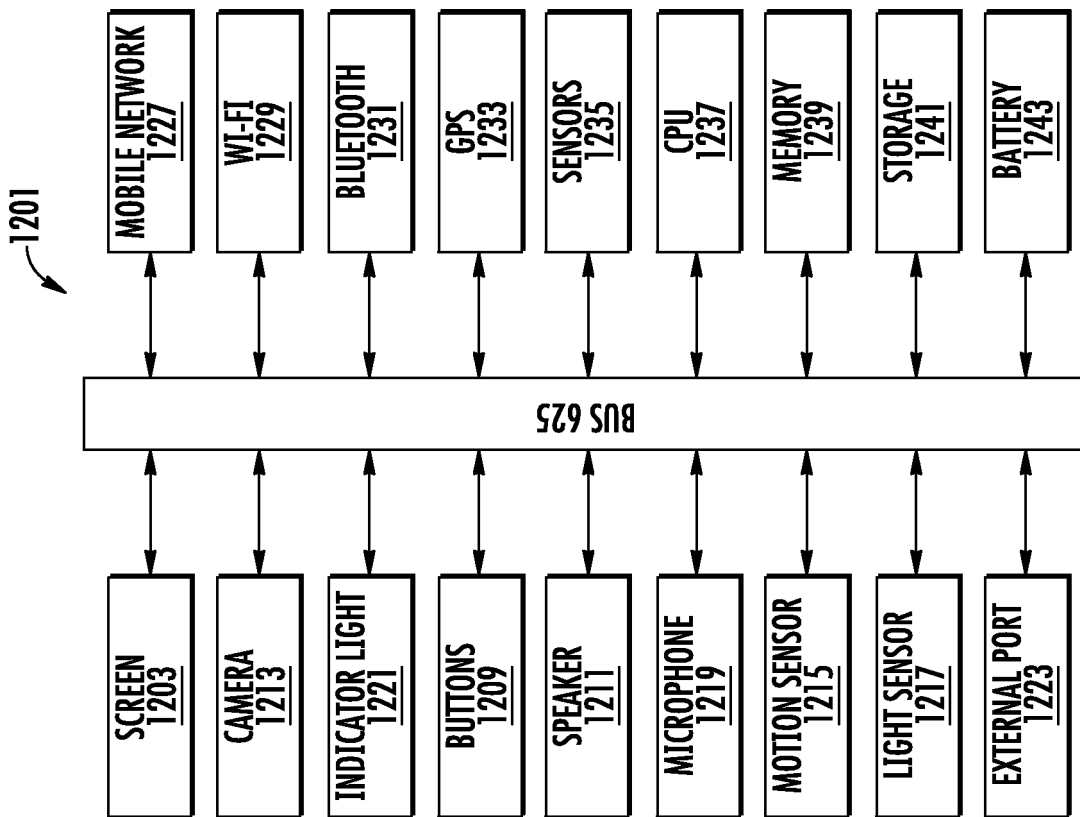


FIG. 12

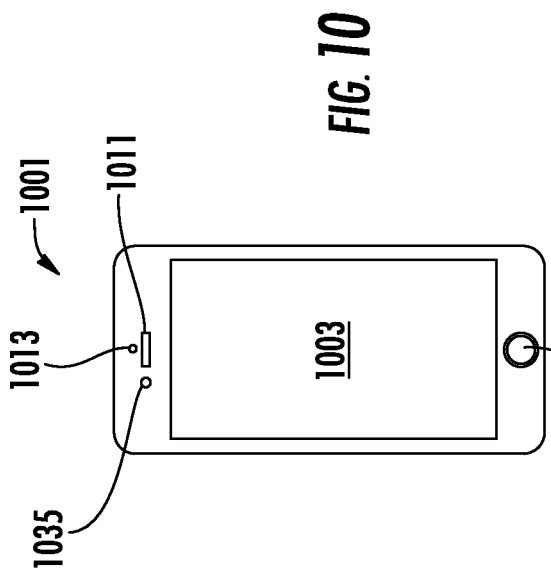


FIG. 10

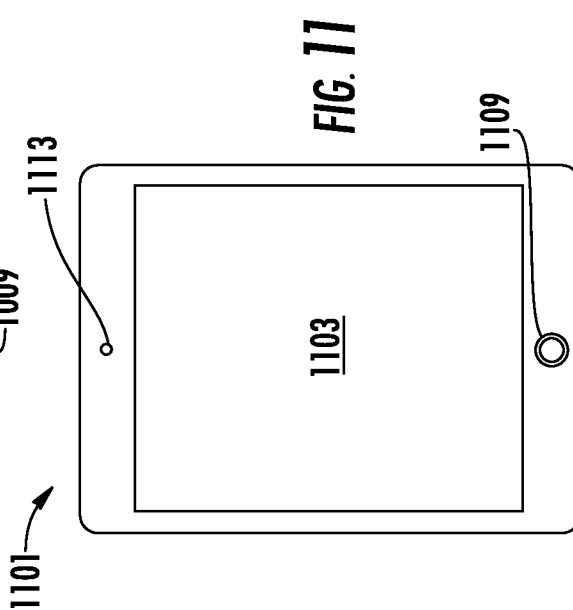


FIG. 11

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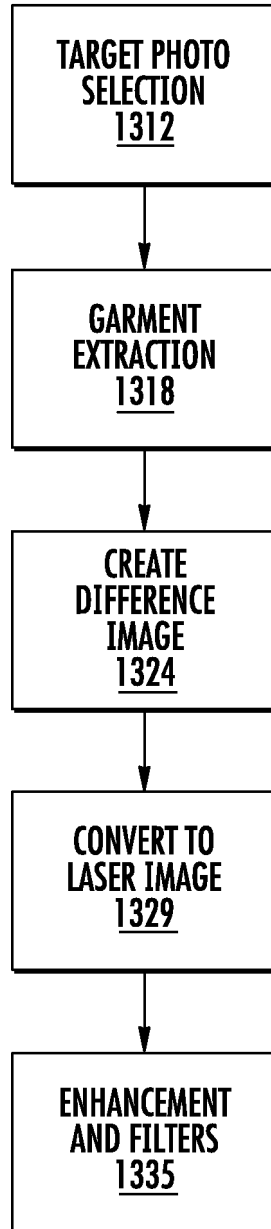


FIG. 13

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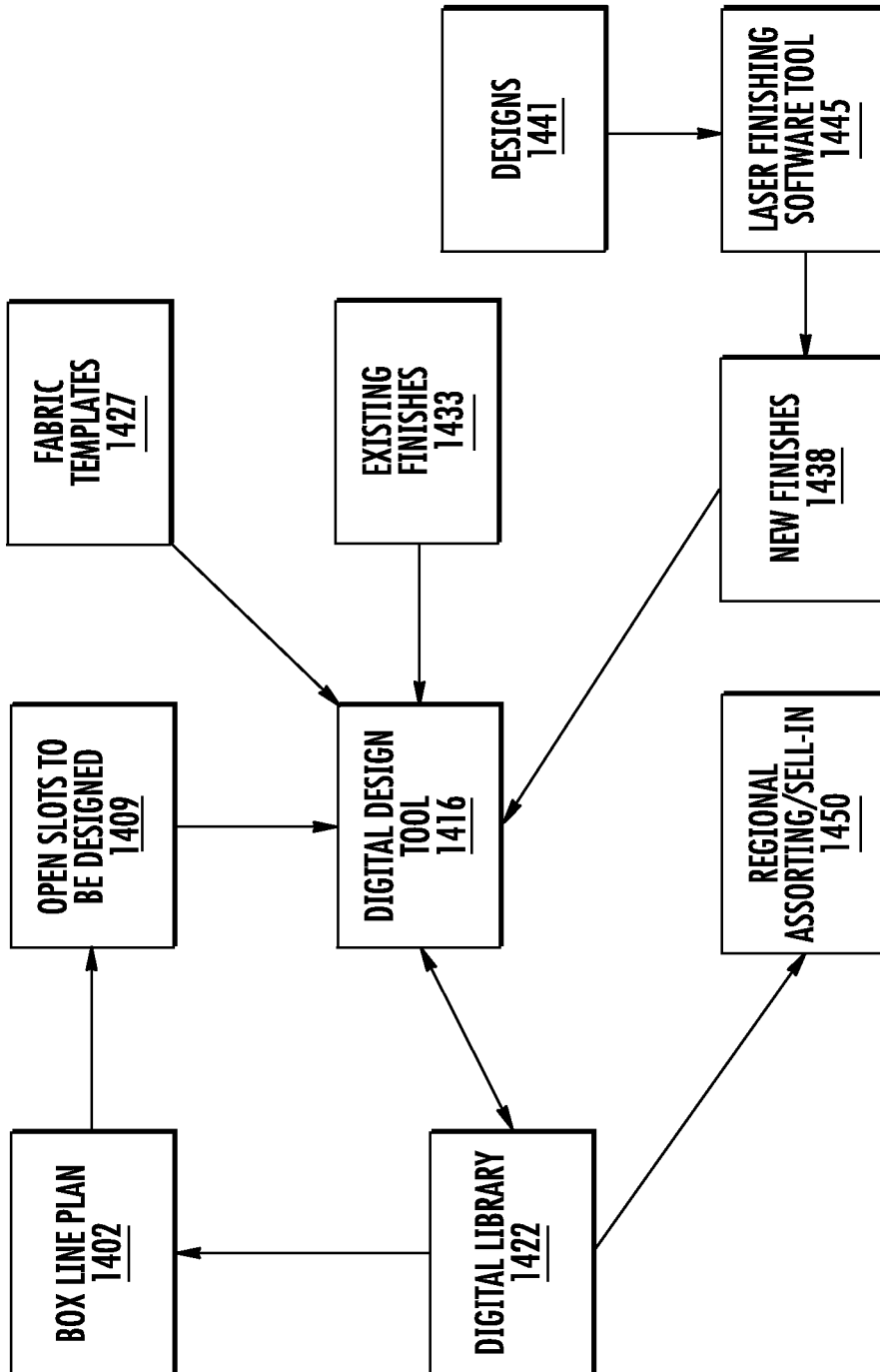


FIG. 14

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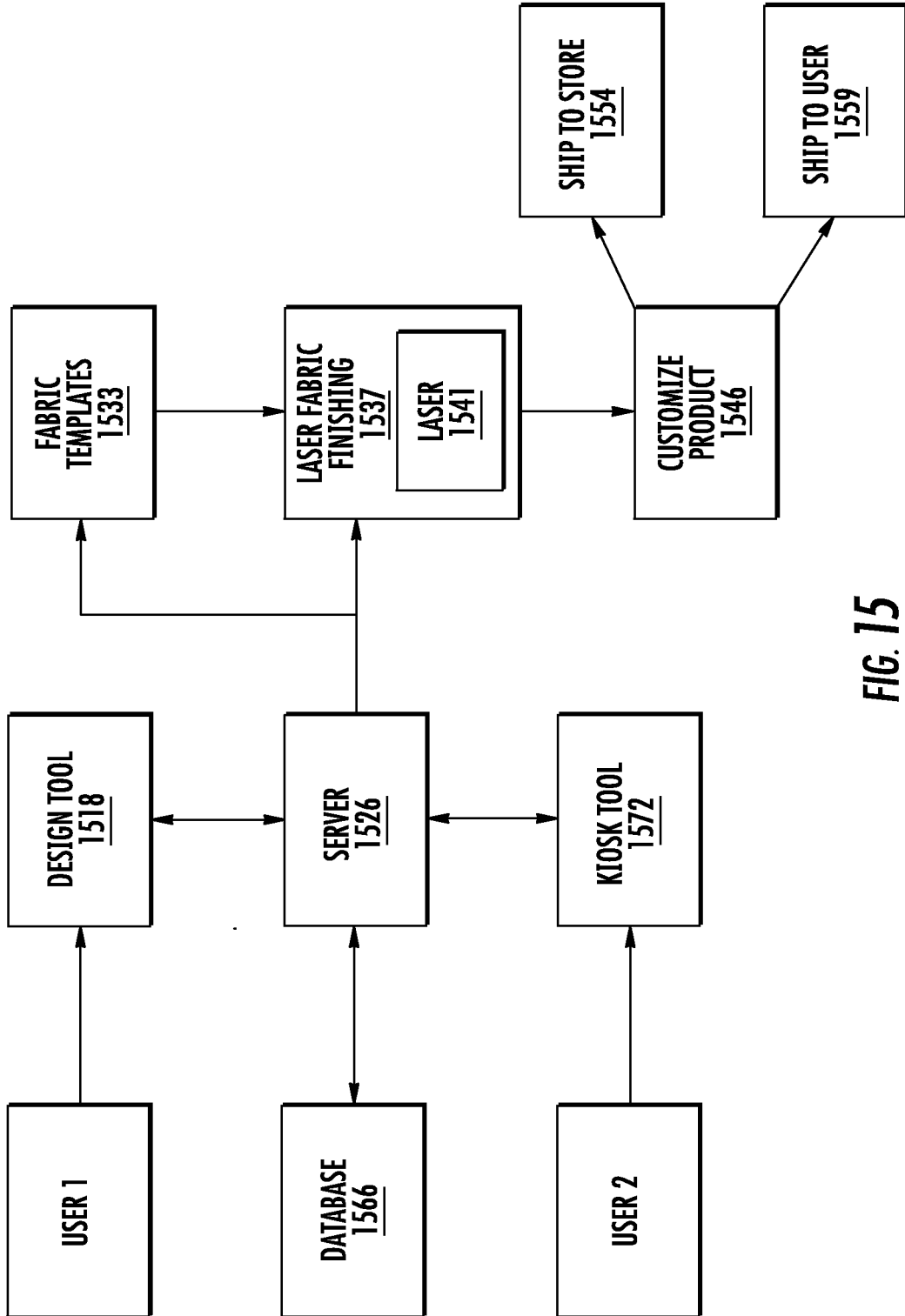


FIG. 15

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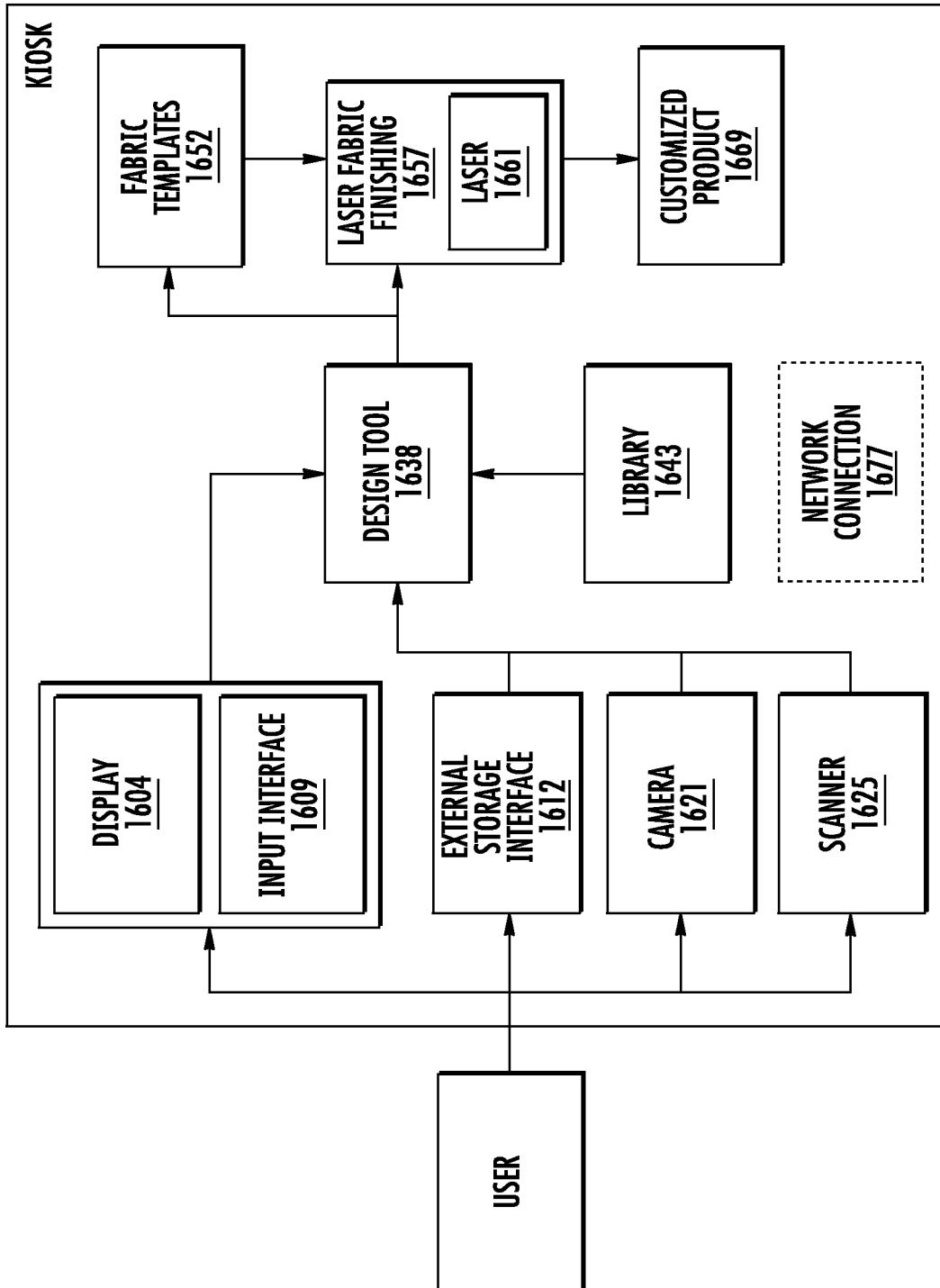


FIG. 16

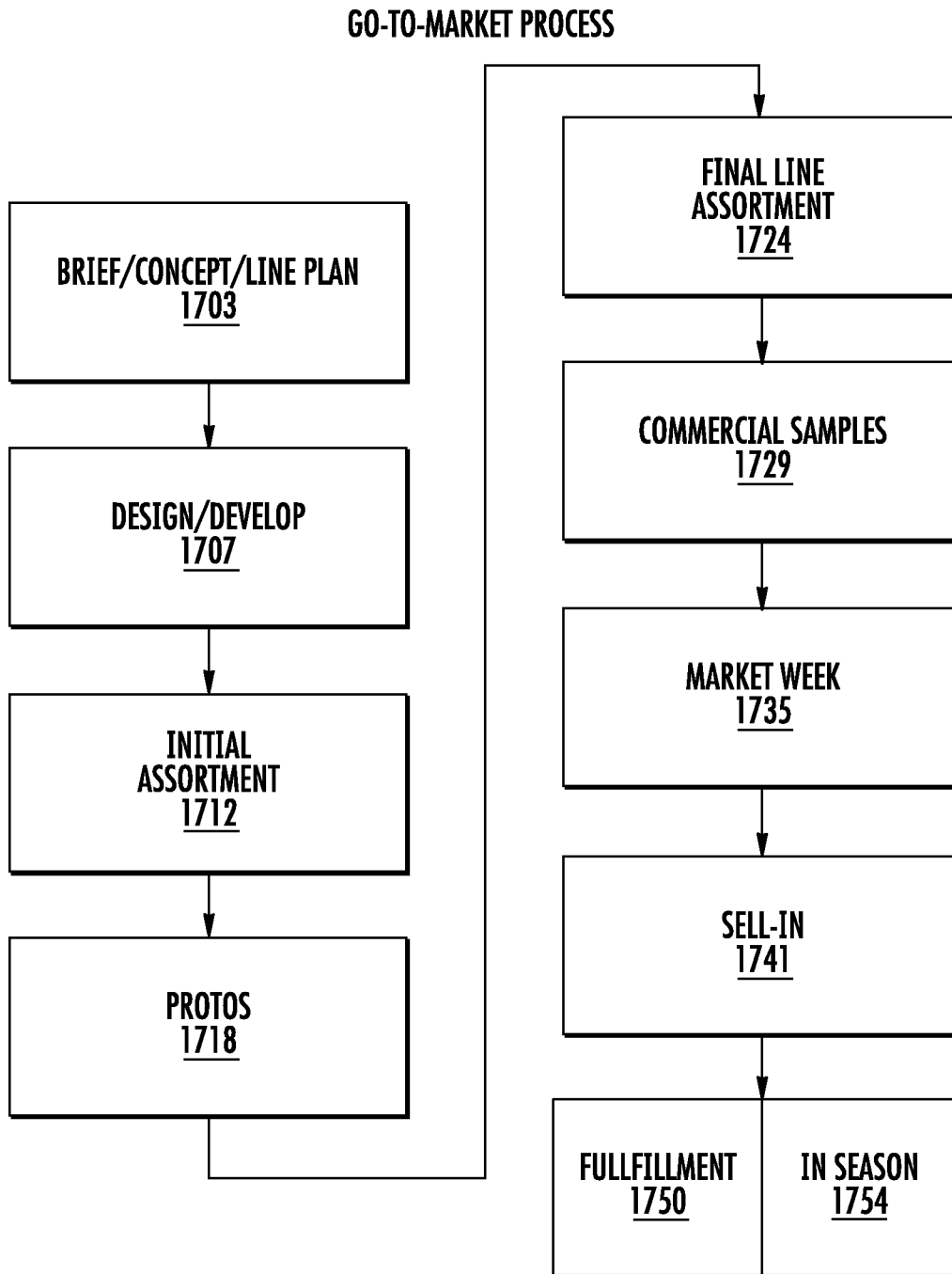


FIG. 17

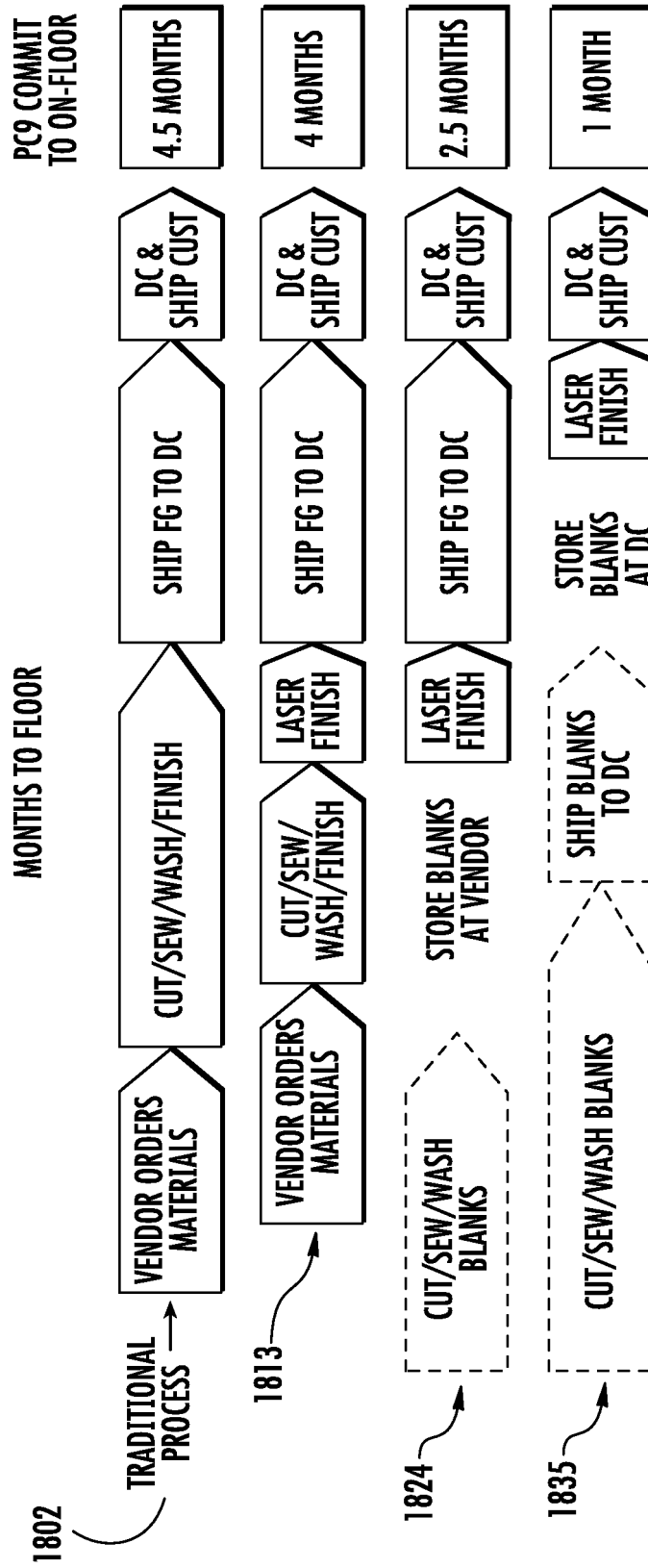


FIG. 18

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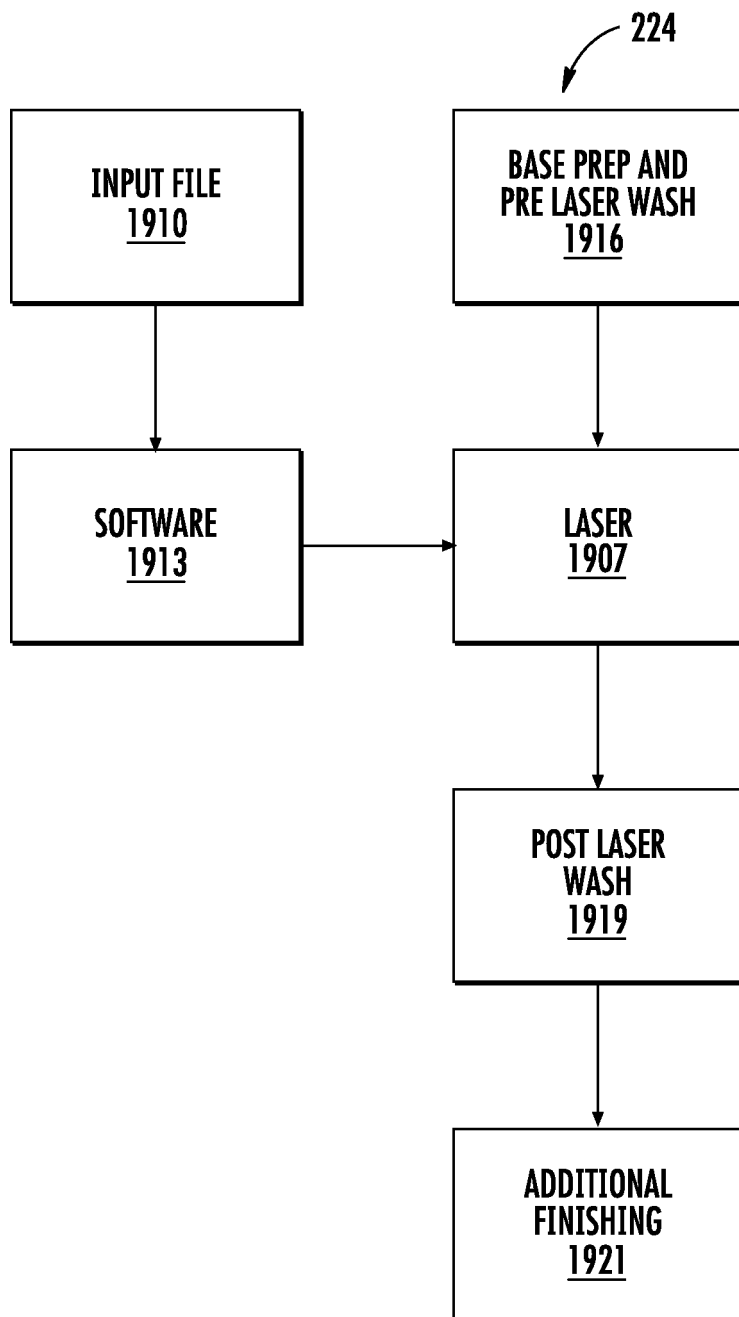


FIG. 19

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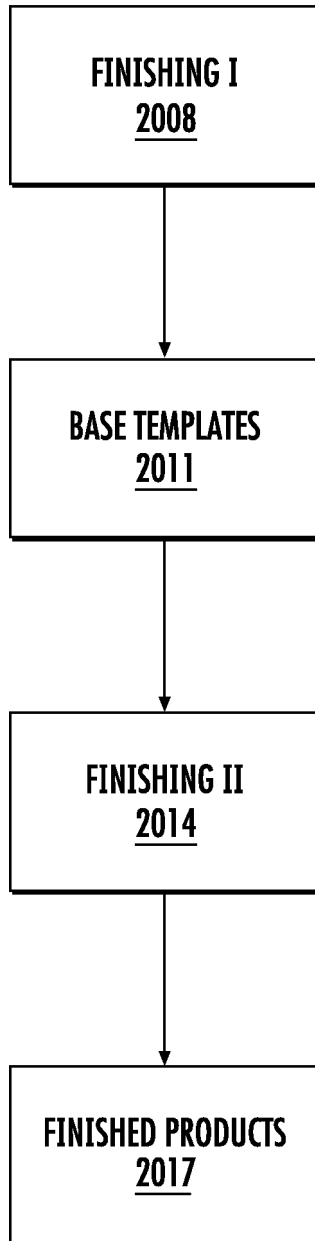
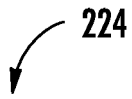


FIG. 20

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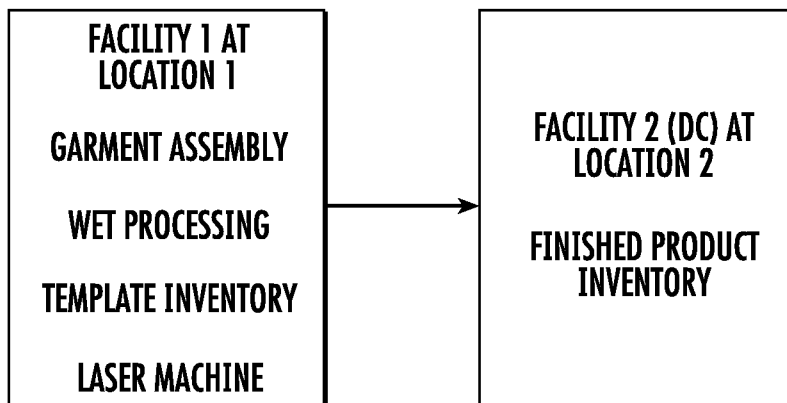


FIG. 21

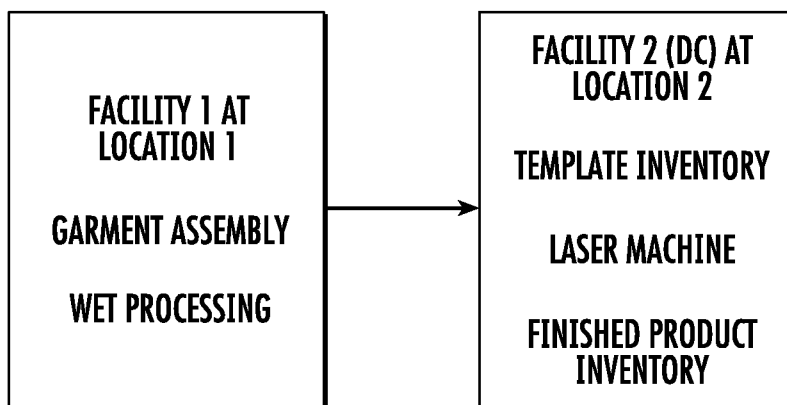


FIG. 22

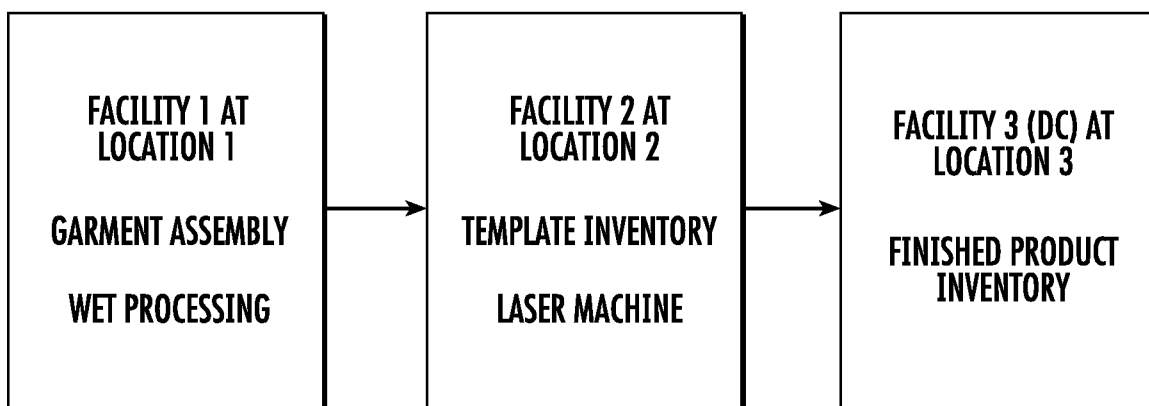


FIG. 23

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2017/066228

A. CLASSIFICATION OF SUBJECT MATTER IPC (2018.01) B23K 26/00, D06B 11/00, D06C 23/00, D06C 29/00, G02B 26/10 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC (2018.01) B23K 26/00, D06B 11/00, D06C 23/00, D06C 29/00, G02B 26/10 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Databases consulted: Esp@cenet, Google Patents, Google Scholar, PatBase Search terms used: garment; textile; finishing; laser; image; copying; denim; jeans		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0125824 A2 TECHNOLINES LLC [US]; MARTIN CLARENCE H [US]; COSTIN DARRYL J [US] 12 Apr 2001 (2001/04/12) the whole document	1-20
A	US 5567207 A ICON INC [US] 22 Oct 1996 (1996/10/22) the whole document	1-20
A	WO 2015042441 A1 REVOLAZE LLC [US] 26 Mar 2015 (2015/03/26) the whole document	1-20
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 27 Mar 2018		Date of mailing of the international search report 28 Mar 2018
Name and mailing address of the ISA: Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616		Authorized officer: KATZ Nina Telephone No. 972-2-5651779

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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(12) **United States Patent**
Poupyrev

(10) **Patent No.:** **US 9,983,747 B2**
(45) **Date of Patent:** **May 29, 2018**

(54) **TWO-LAYER INTERACTIVE TEXTILES**

(71) Applicant: **Google Inc.**, Mountain View, CA (US)

(72) Inventor: **Ivan Poupyrev**, Sunnyvale, CA (US)

(73) Assignee: **Google LLC**, Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days. days.

(21) Appl. No.: **14/959,730**

(22) Filed: **Dec. 4, 2015**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 62/138,831, filed on Mar. 26, 2015.

(51) **Int. Cl.**
D03D 1/00 (2006.01)
G06F 3/044 (2006.01)

(Continued)

(52) **U.S. Cl.**
CPC **G06F 3/044** (2013.01); **D03D 1/0088** (2013.01); **D03D 25/005** (2013.01); **G06F 3/0416** (2013.01); **H03K 17/962** (2013.01); **D03D 2700/0166** (2013.01); **D10B 2401/16** (2013.01); **D10B 2401/18** (2013.01); **G06F 2203/04102** (2013.01); **G06F 2203/04103** (2013.01);

(Continued)

(58) **Field of Classification Search**
CPC D03D 1/0088; D03D 25/005; D03D 2700/0166; D10B 2401/16; D10B

2401/18; G06F 2203/04102; G06F 2203/04103; G06F 2203/04111; G06F 3/0416; G06F 3/044; H01H 2203/0085

See application file for complete search history.

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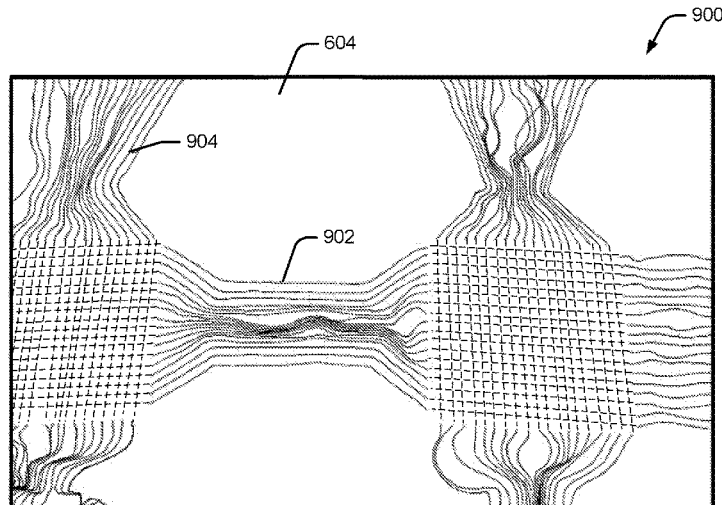
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Primary Examiner — Ibrahim A Khan
(74) *Attorney, Agent, or Firm* — Colby Nipper

(57) **ABSTRACT**

This document describes two-layer interactive textiles. In one or more implementations, the interactive textile includes a top textile layer and a bottom textile layer. Conductive threads are woven into the top textile layer and the bottom textile layer. When the top textile layer is combined with the bottom textile layer, the conductive threads from each layer form a capacitive touch sensor that is configured to detect touch-input. The bottom textile layer is not visible and couples the capacitive through sensor to electronic components, such as a controller, a wireless interface, an output device (e.g., an LED, a display, or speaker), and so forth.

20 Claims, 23 Drawing Sheets



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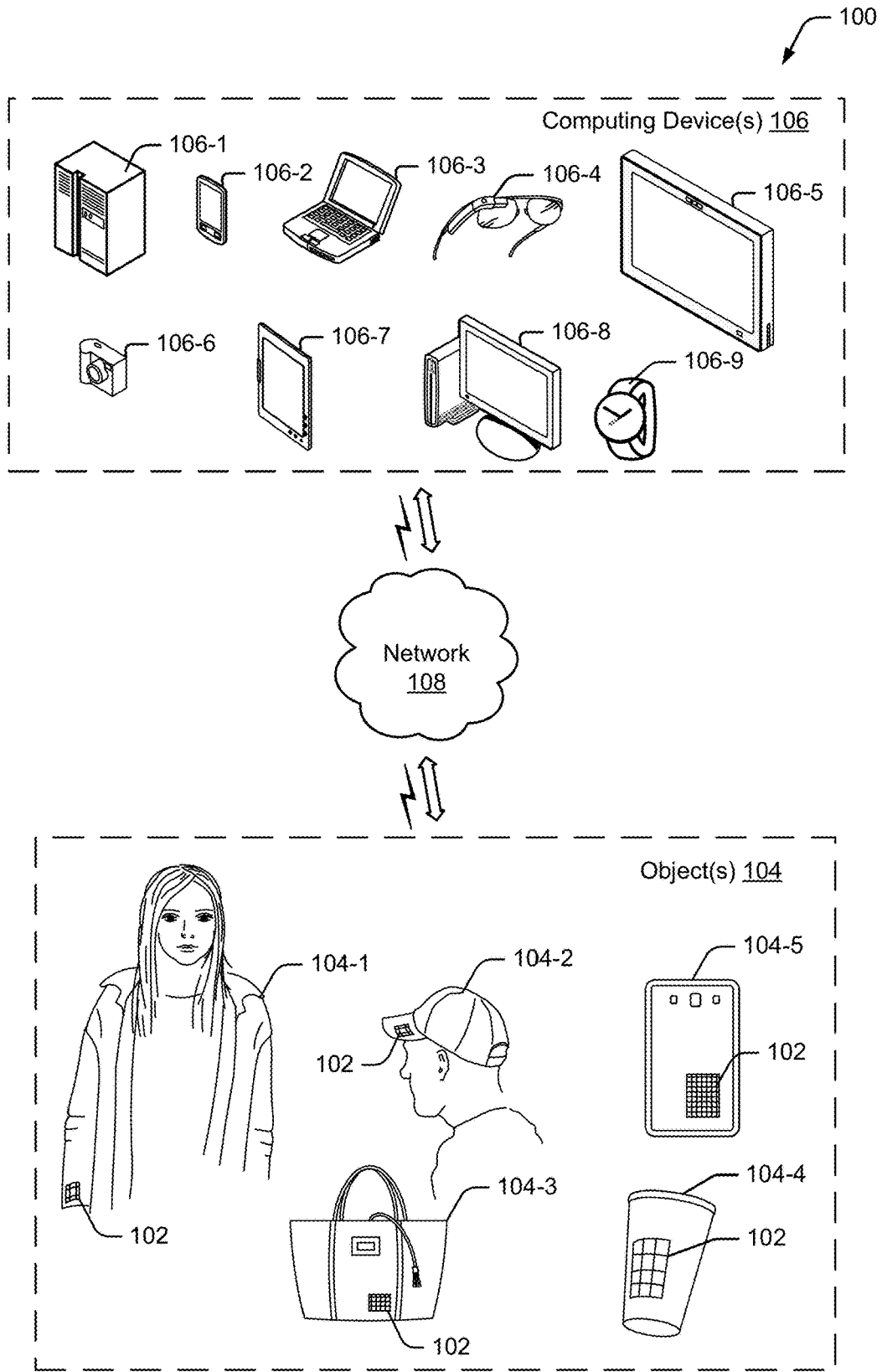


Fig. 1

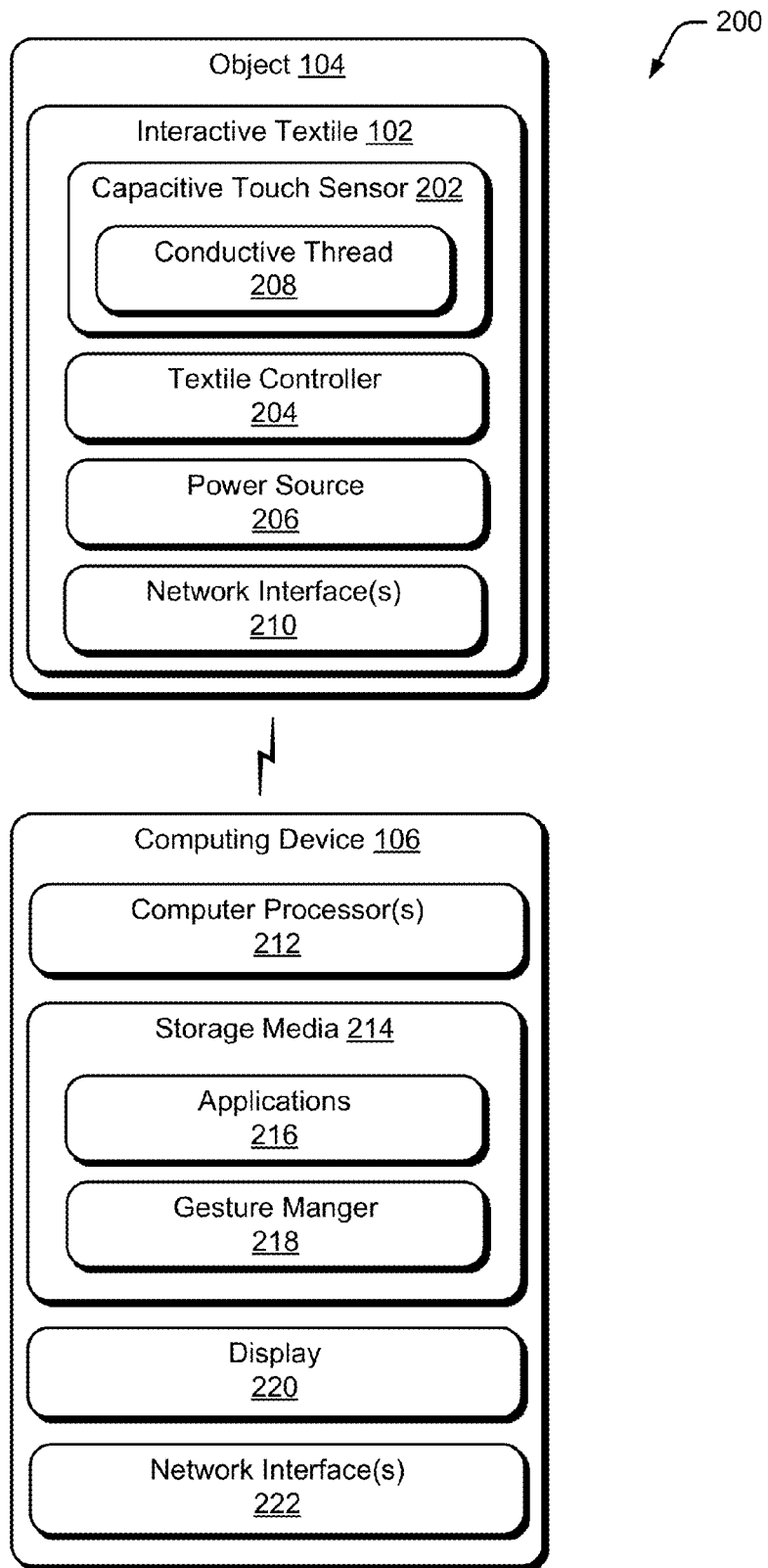


Fig. 2

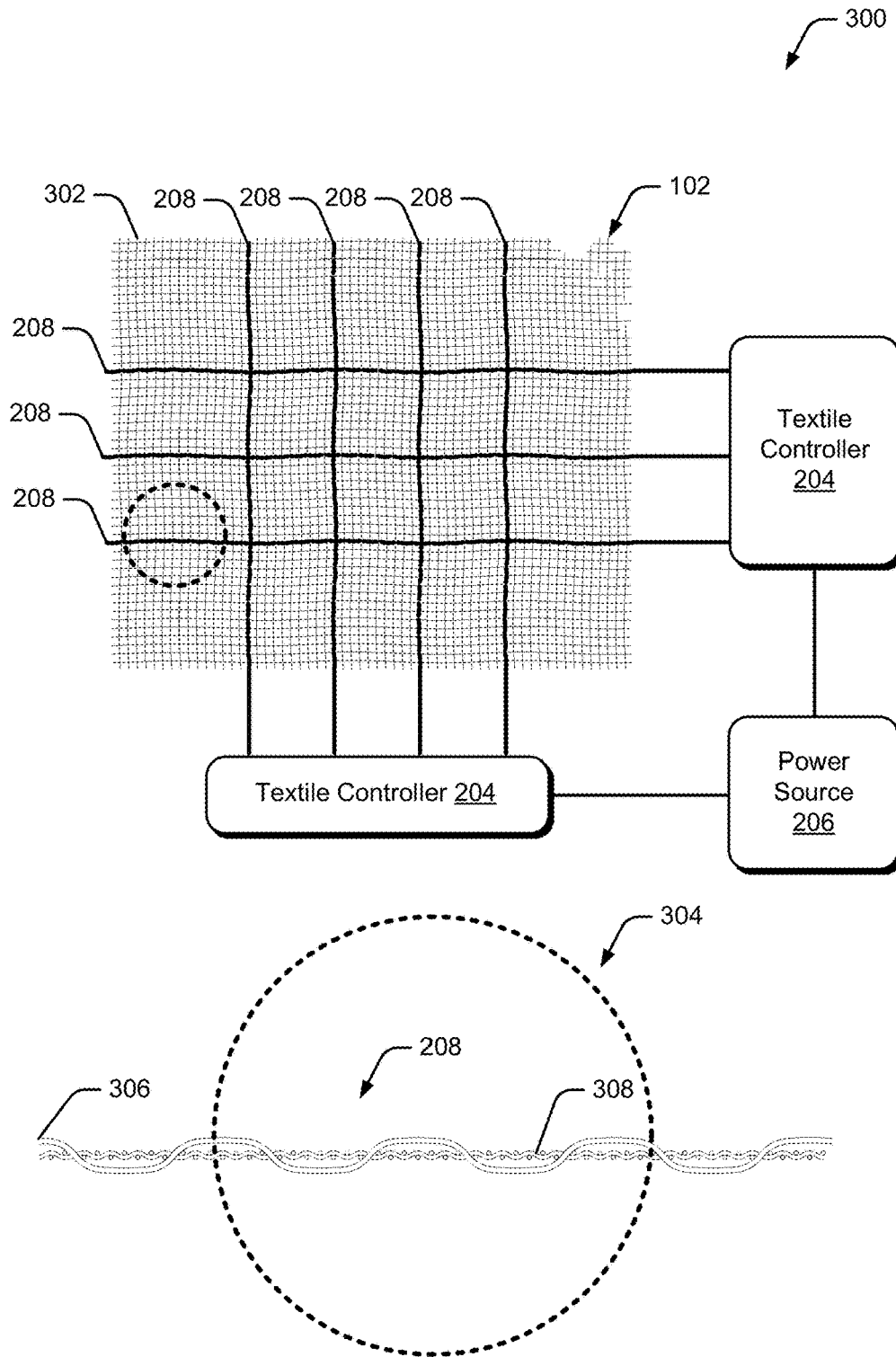


Fig. 3

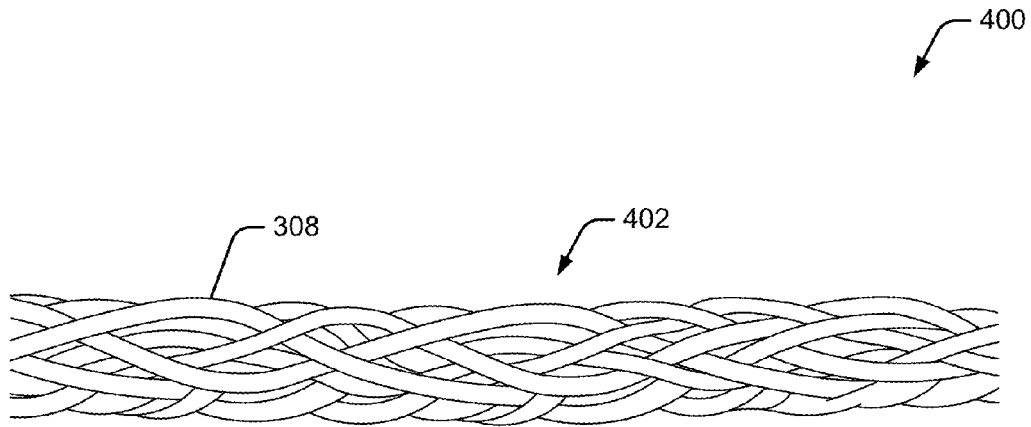


Fig. 4a

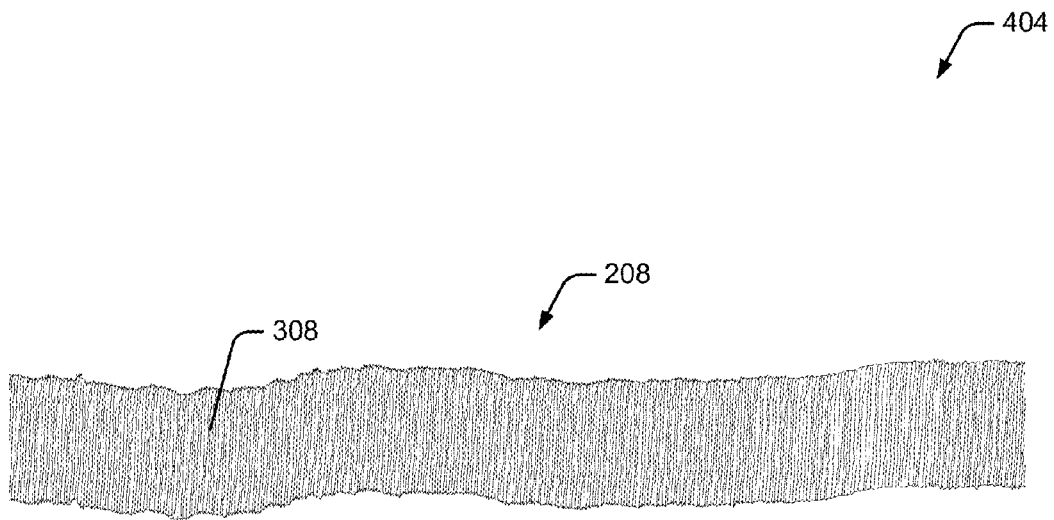


Fig. 4b

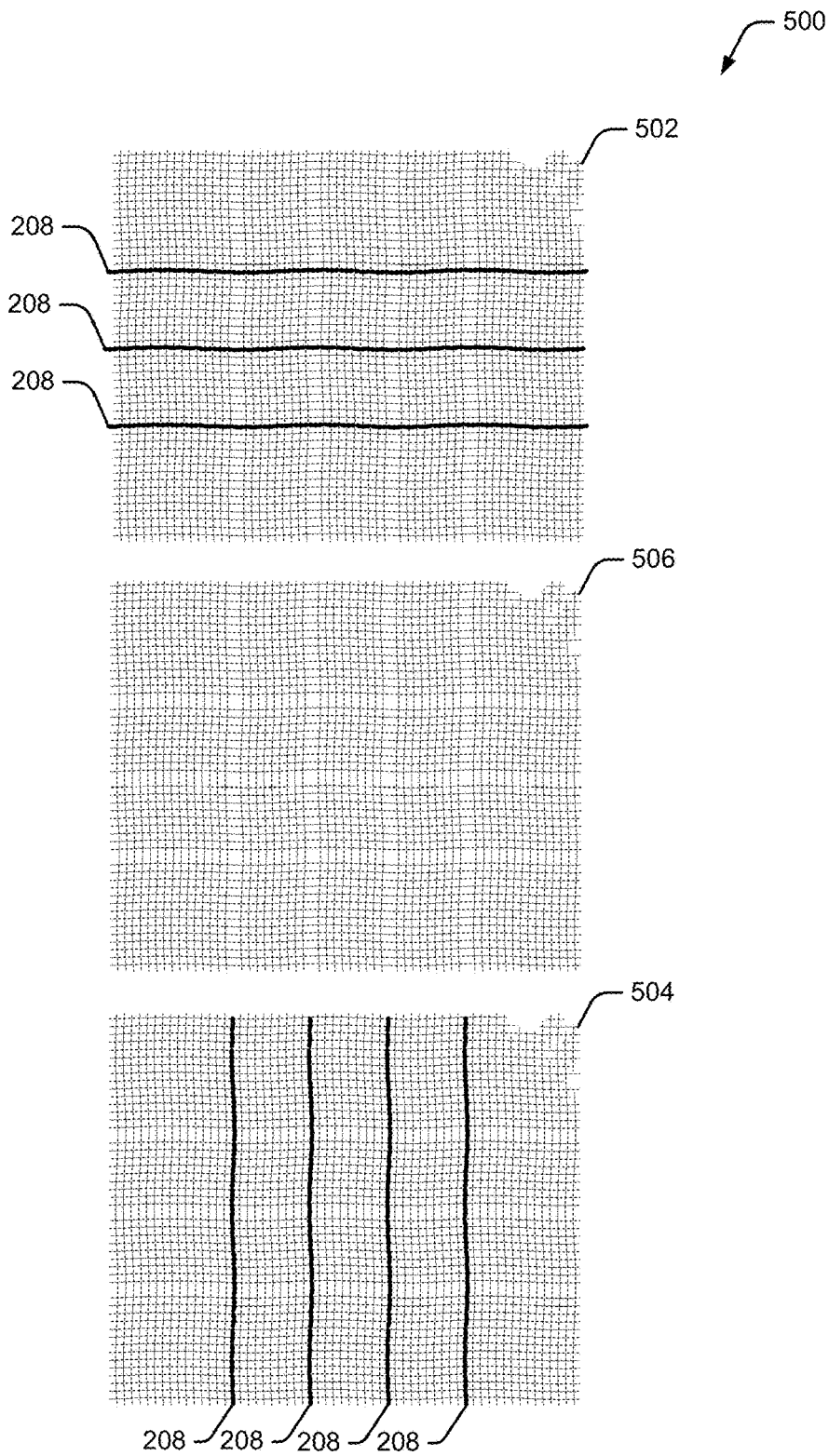


Fig. 5

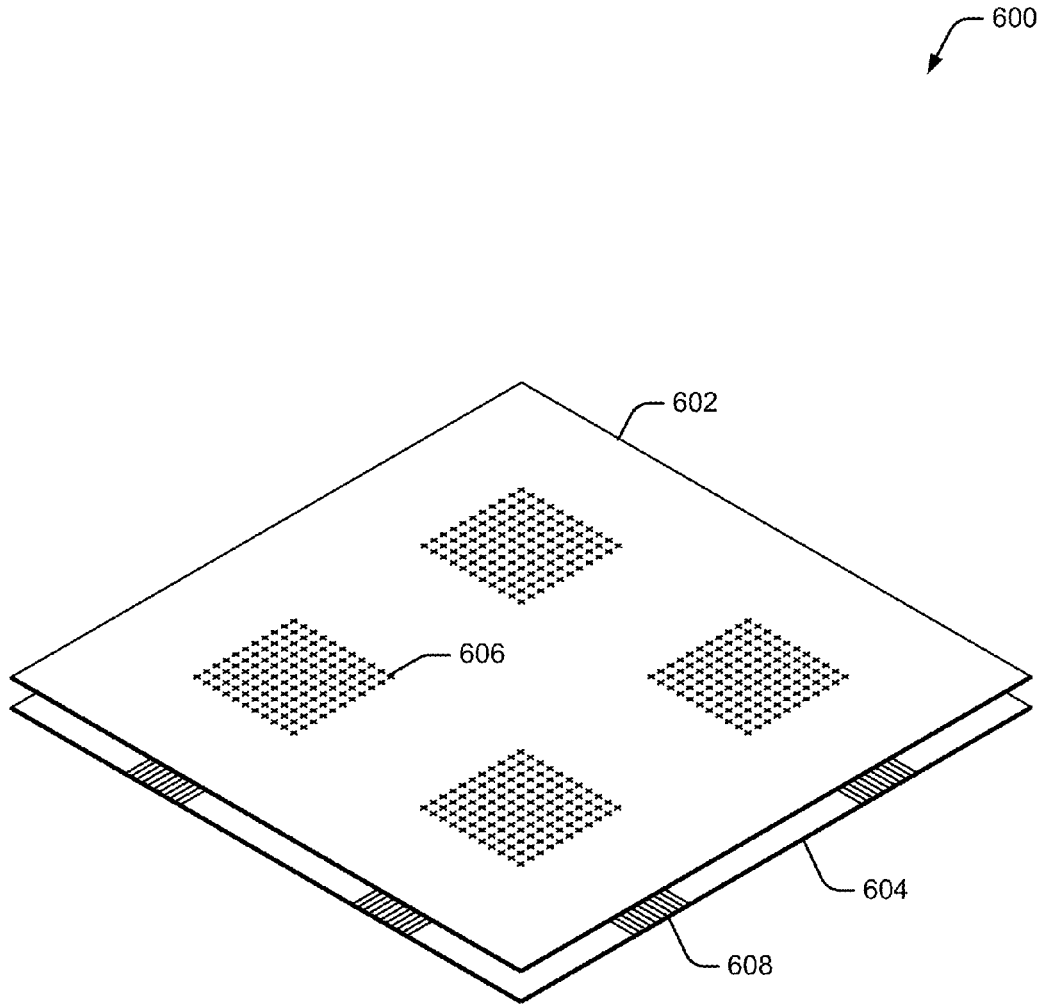


Fig. 6

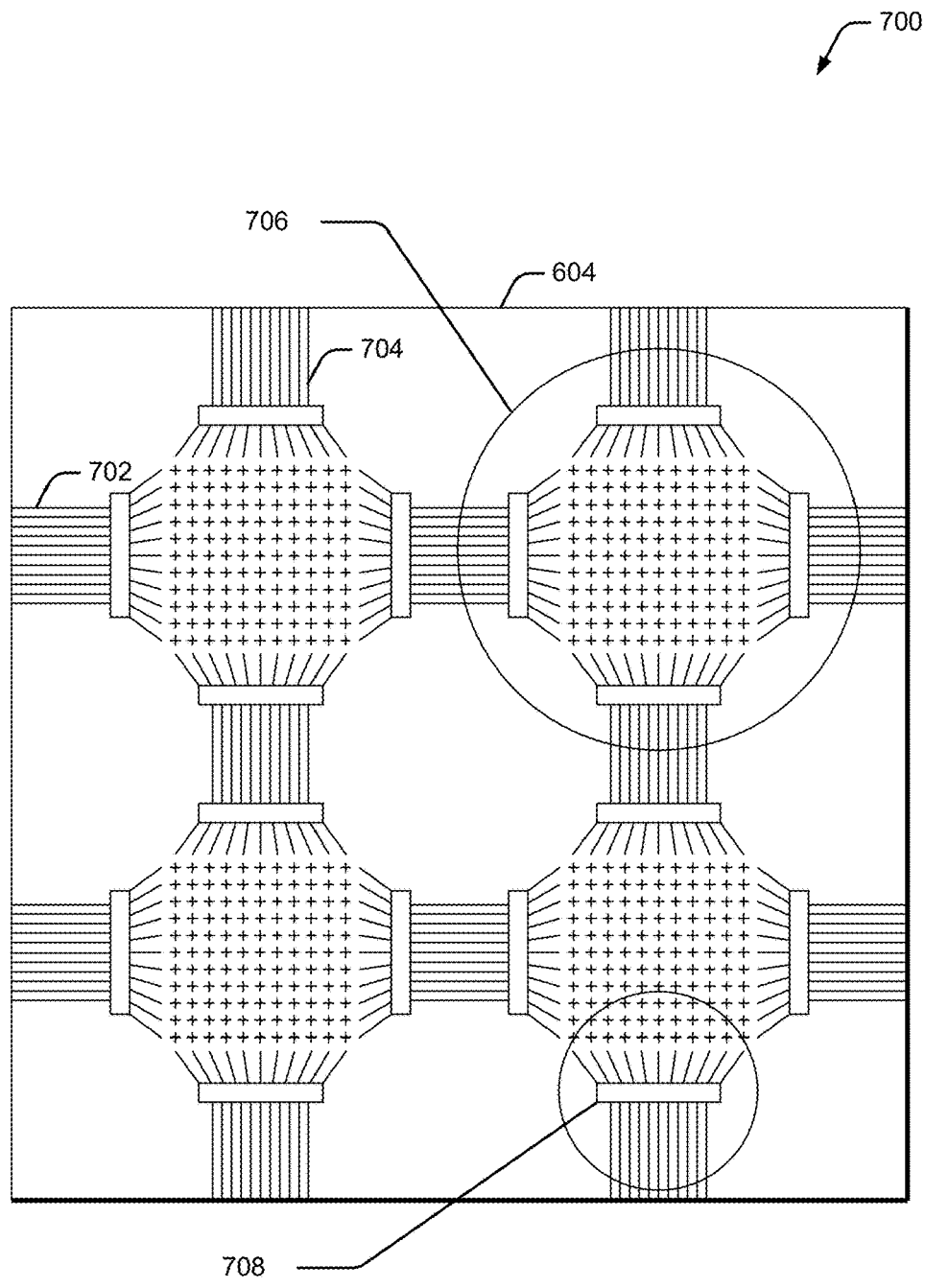


Fig. 7

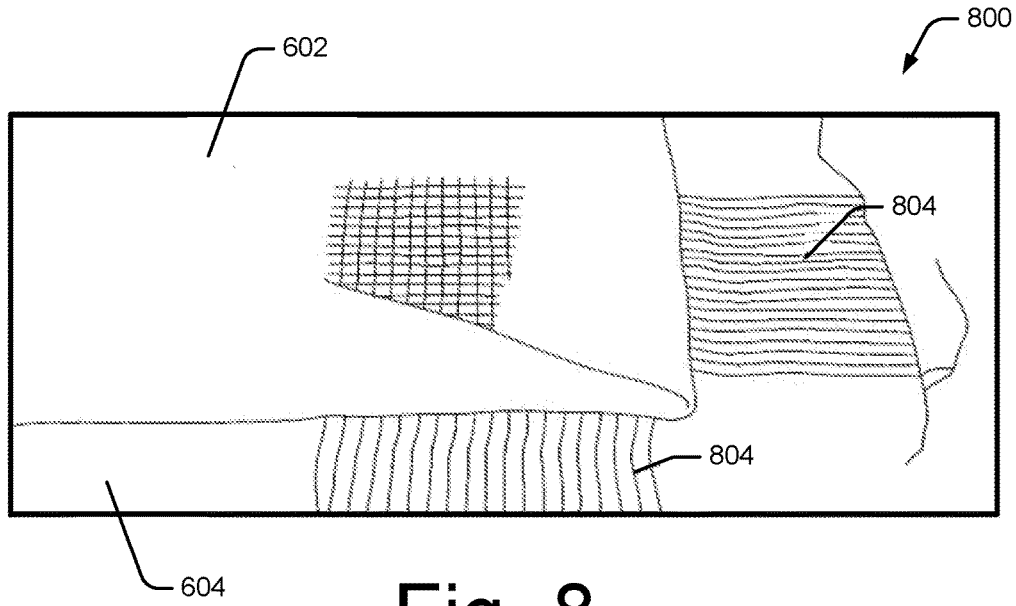


Fig. 8

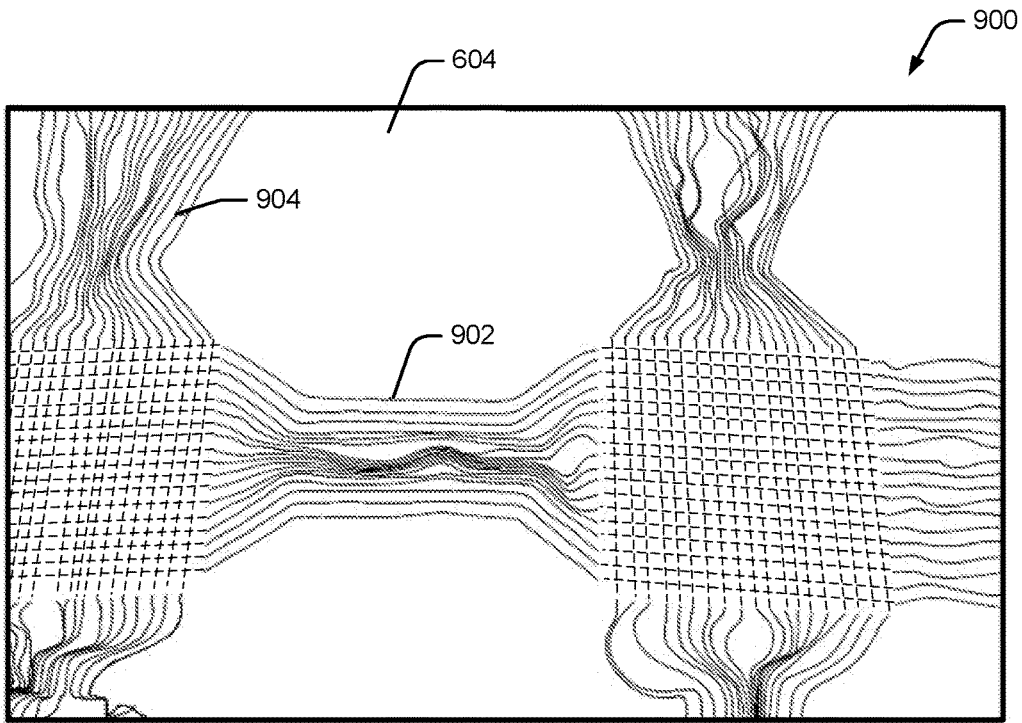


Fig. 9

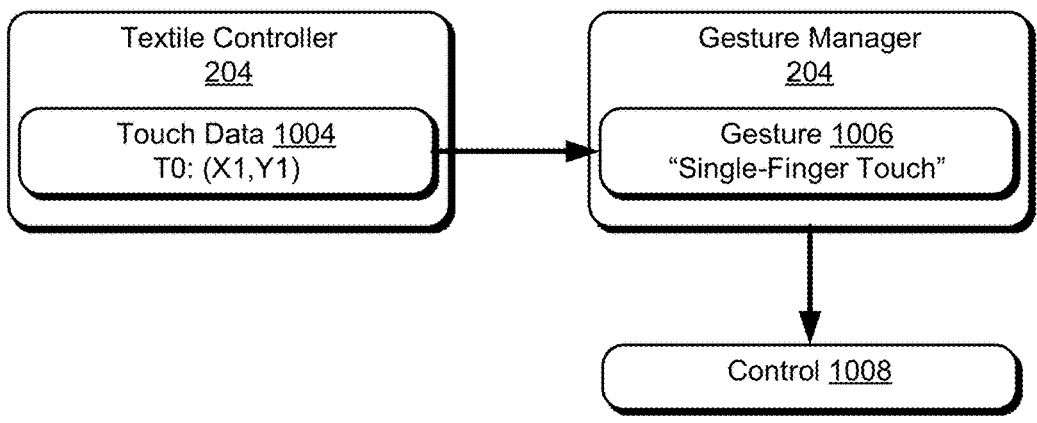
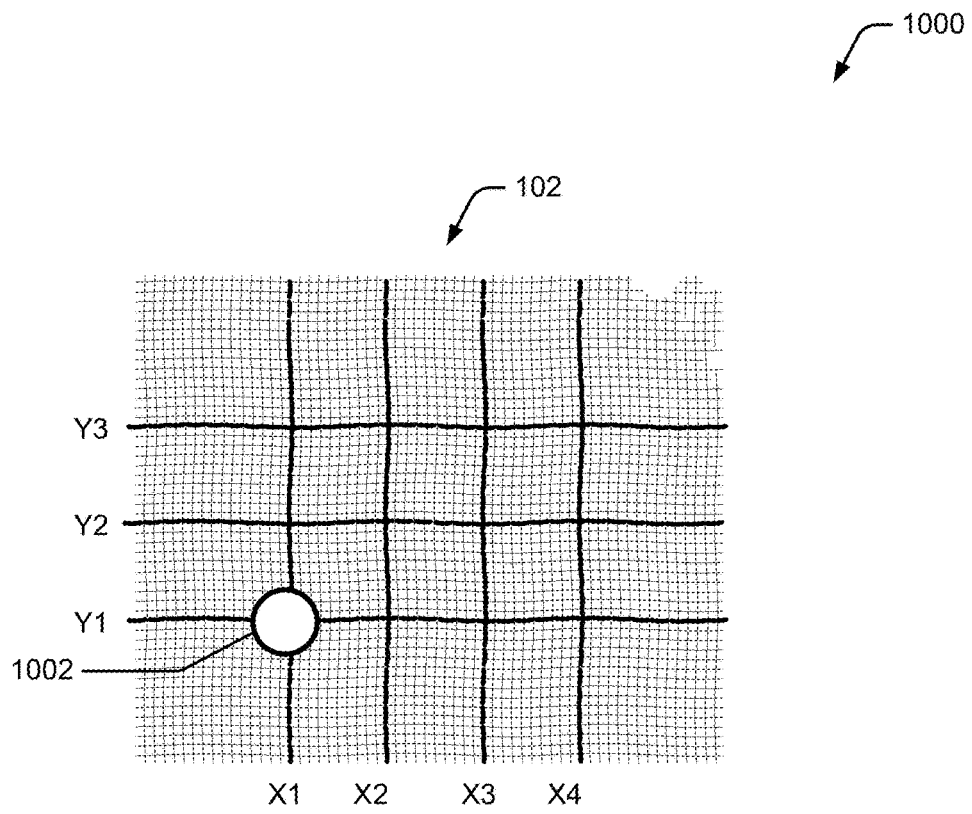


Fig. 10A

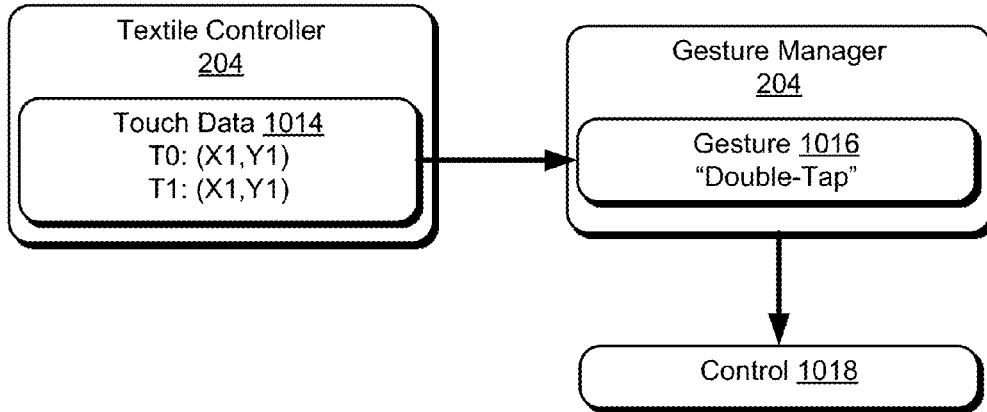
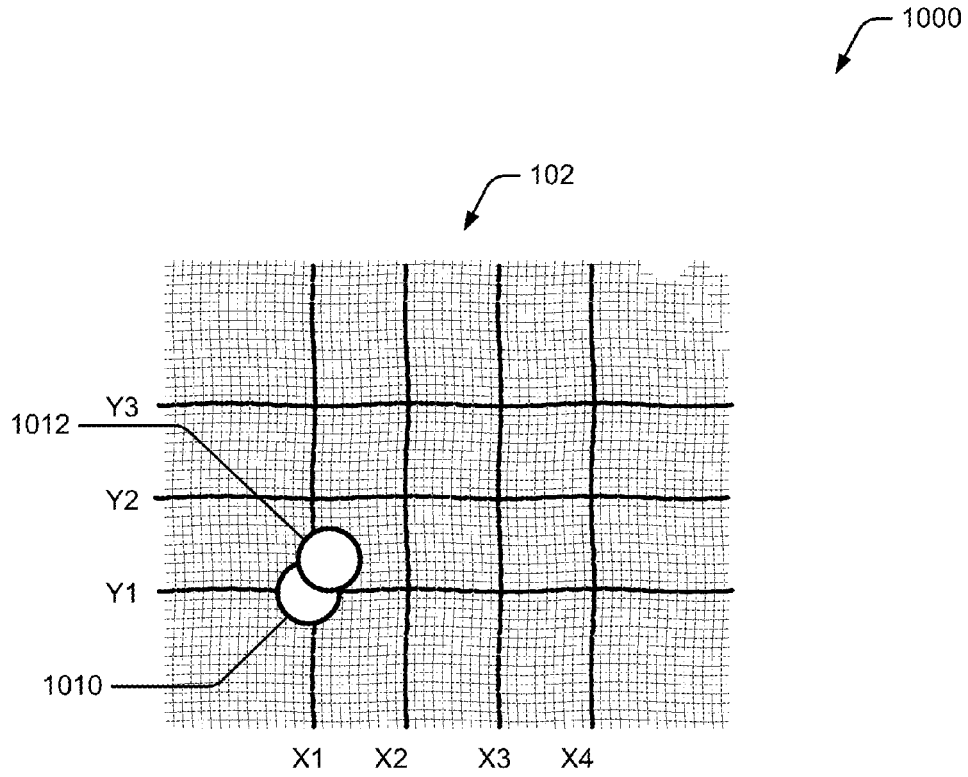


Fig. 10B

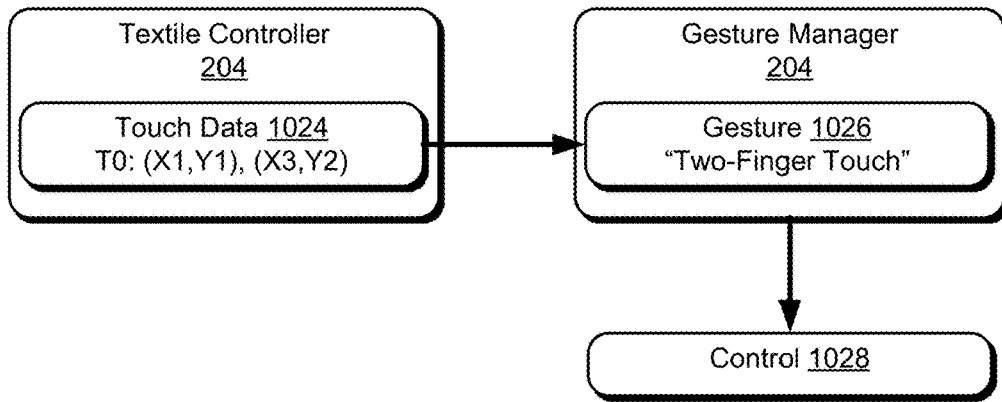
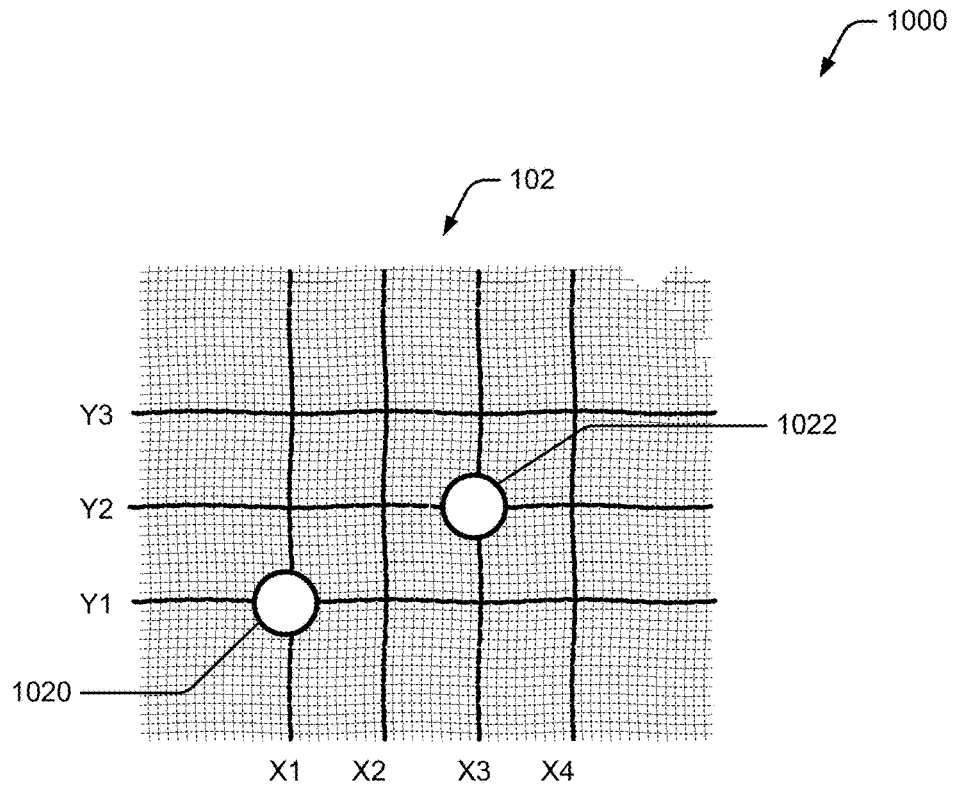


Fig. 10C

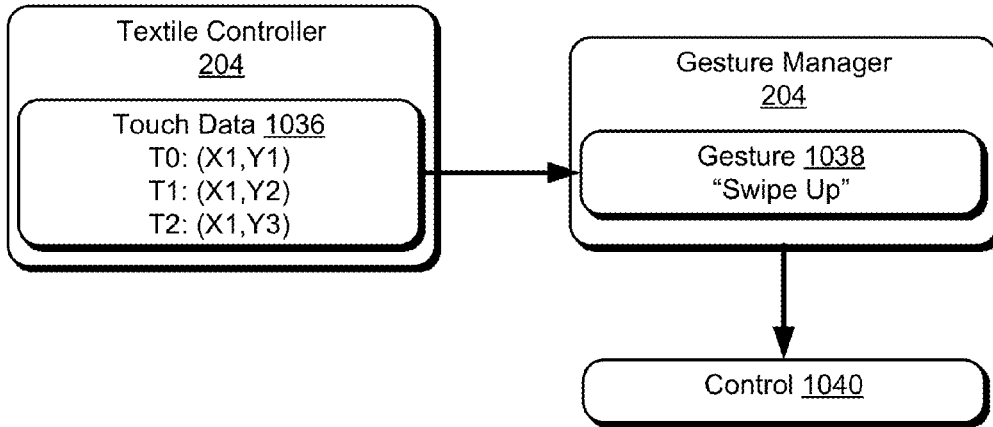
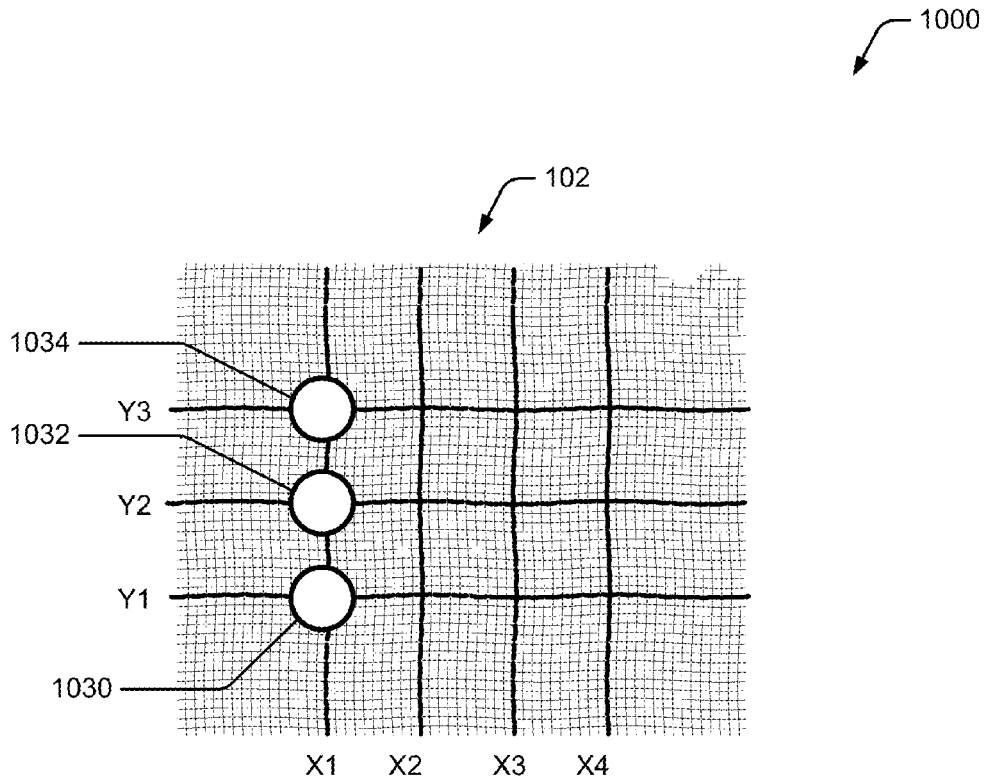


Fig. 10D

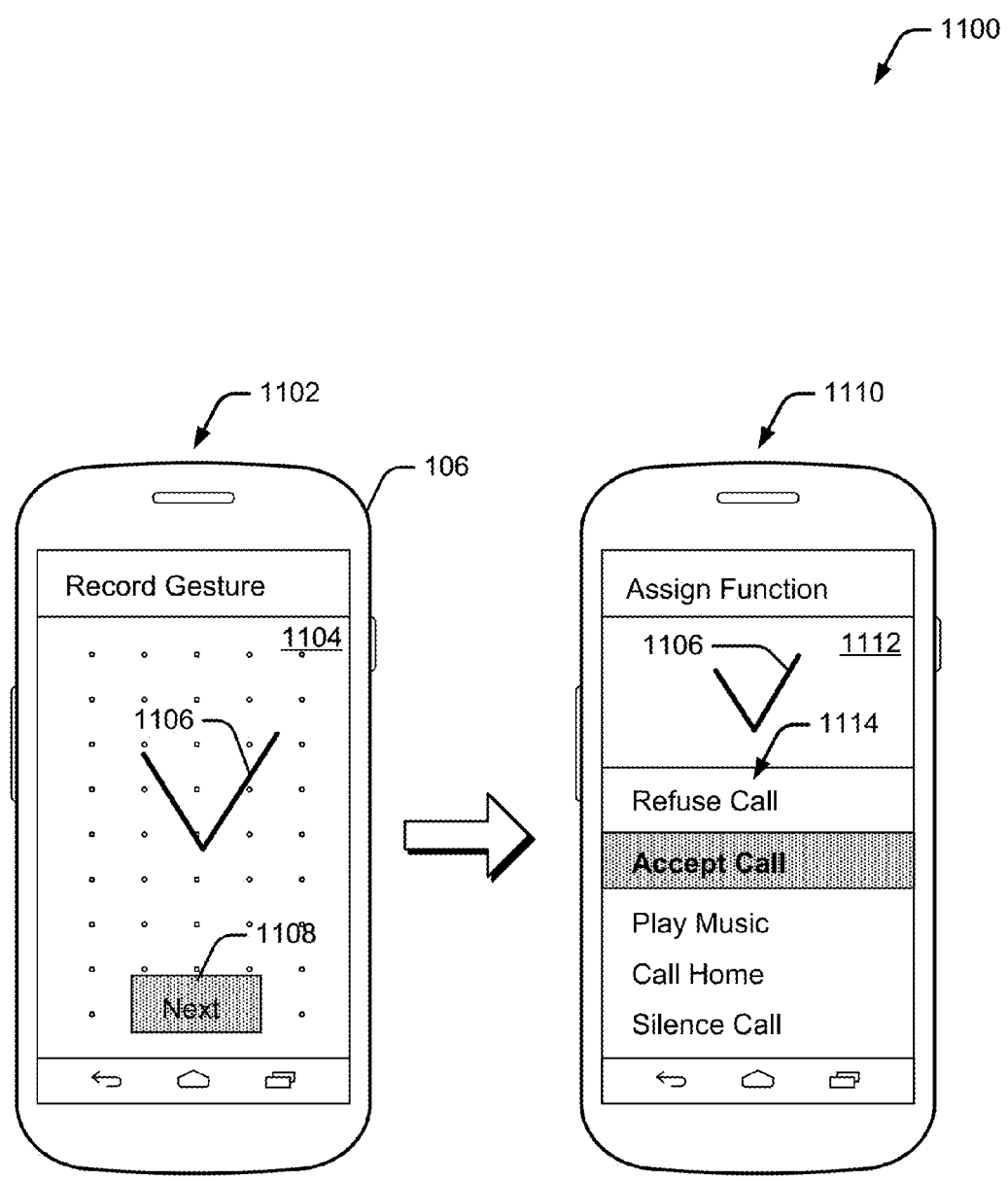


Fig. 11

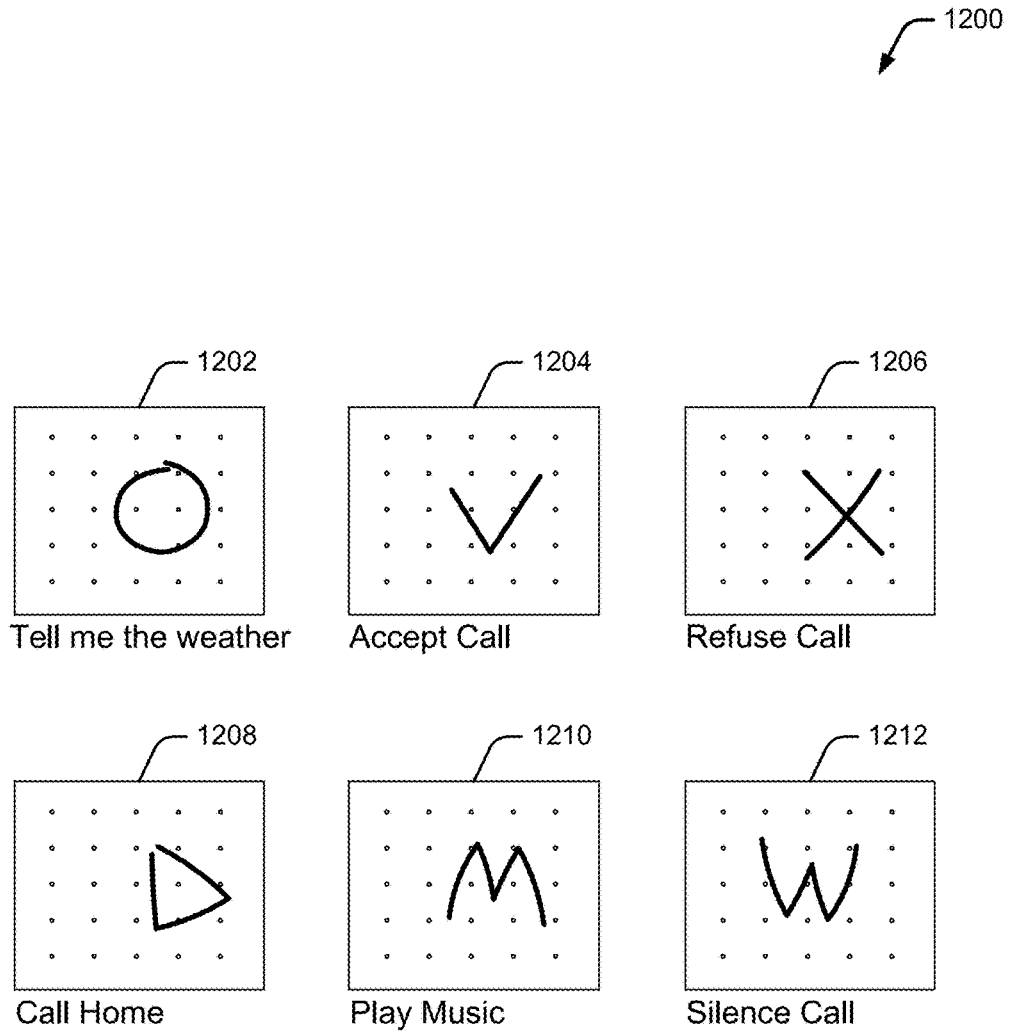


Fig. 12

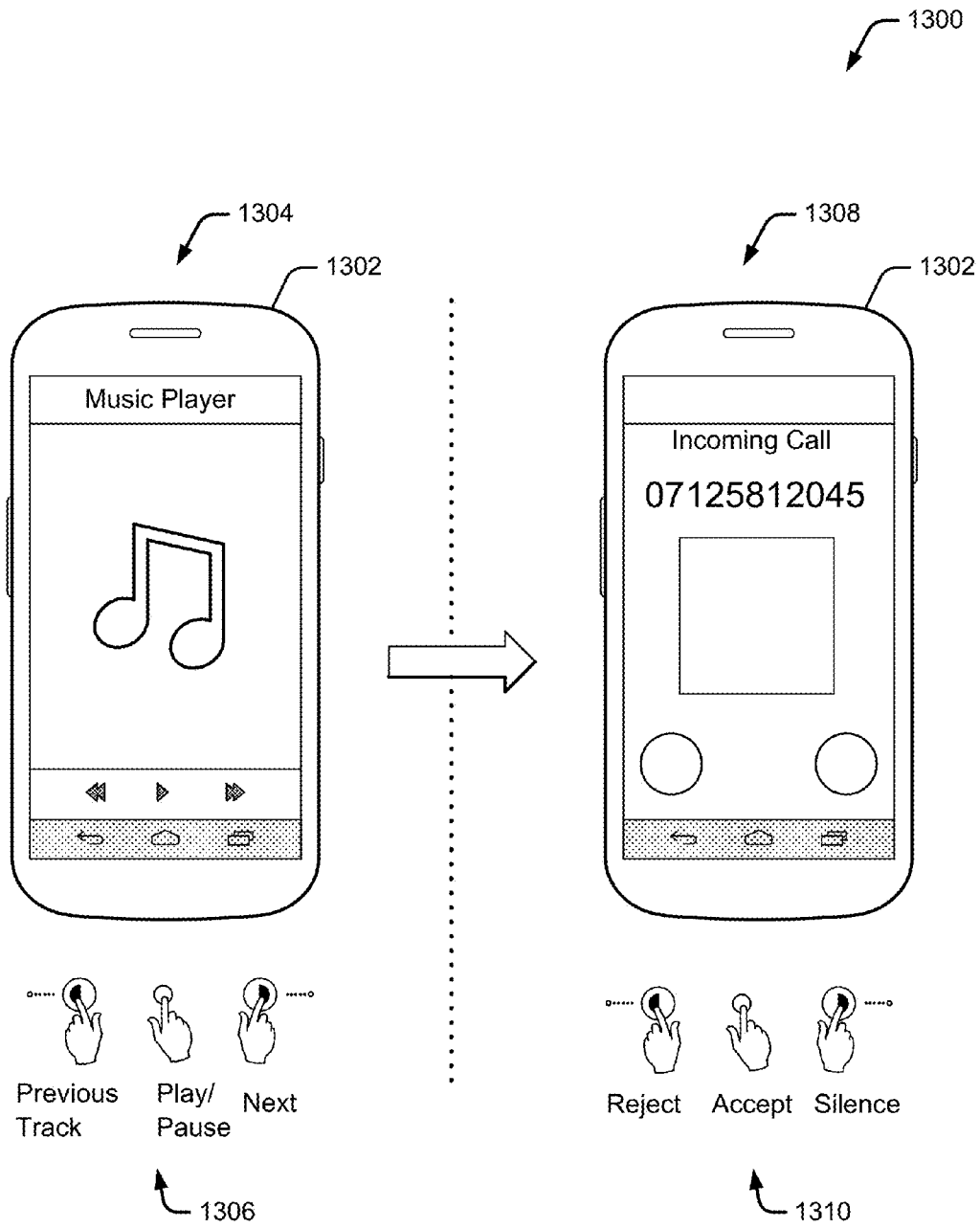


Fig. 13

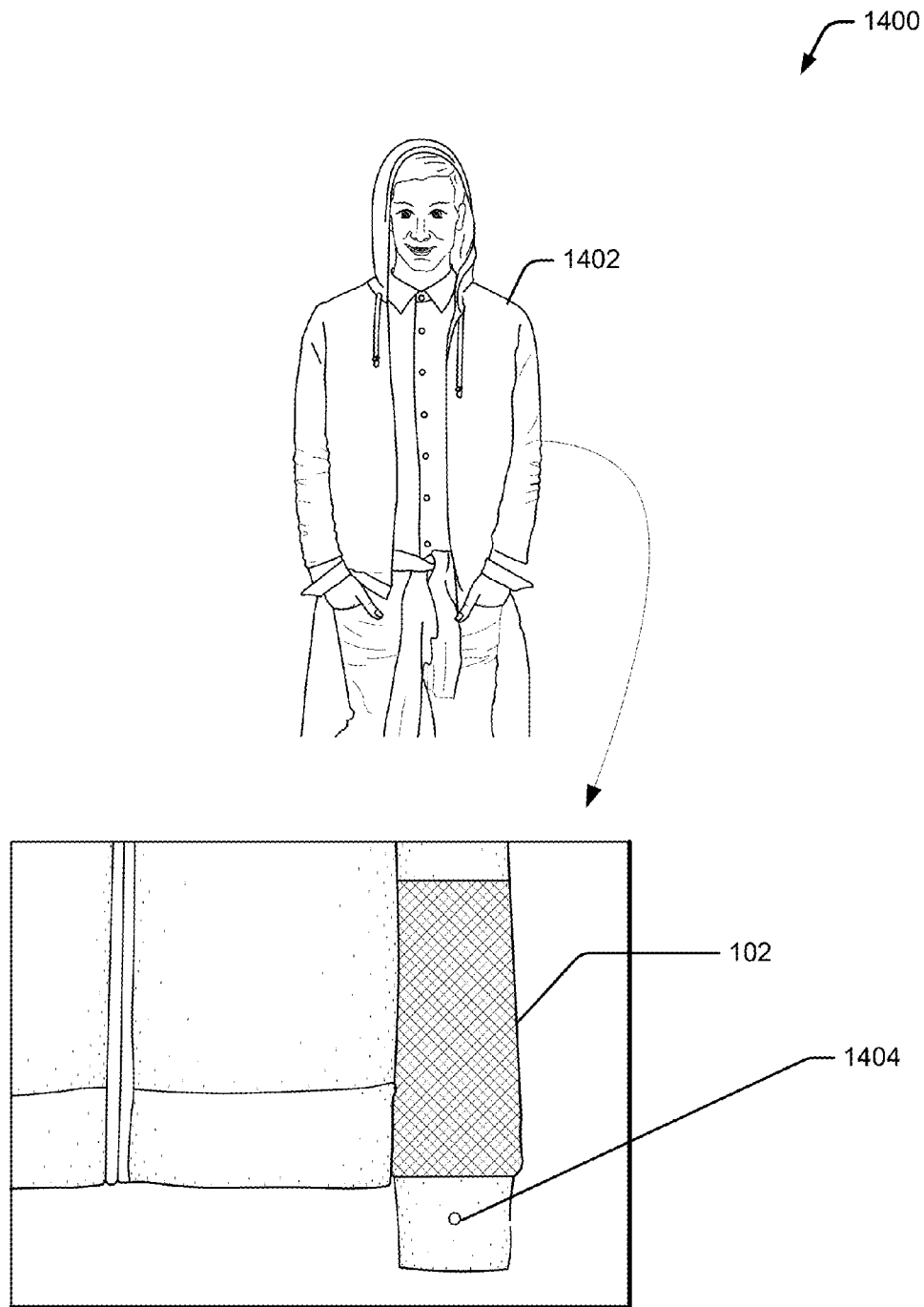


Fig. 14

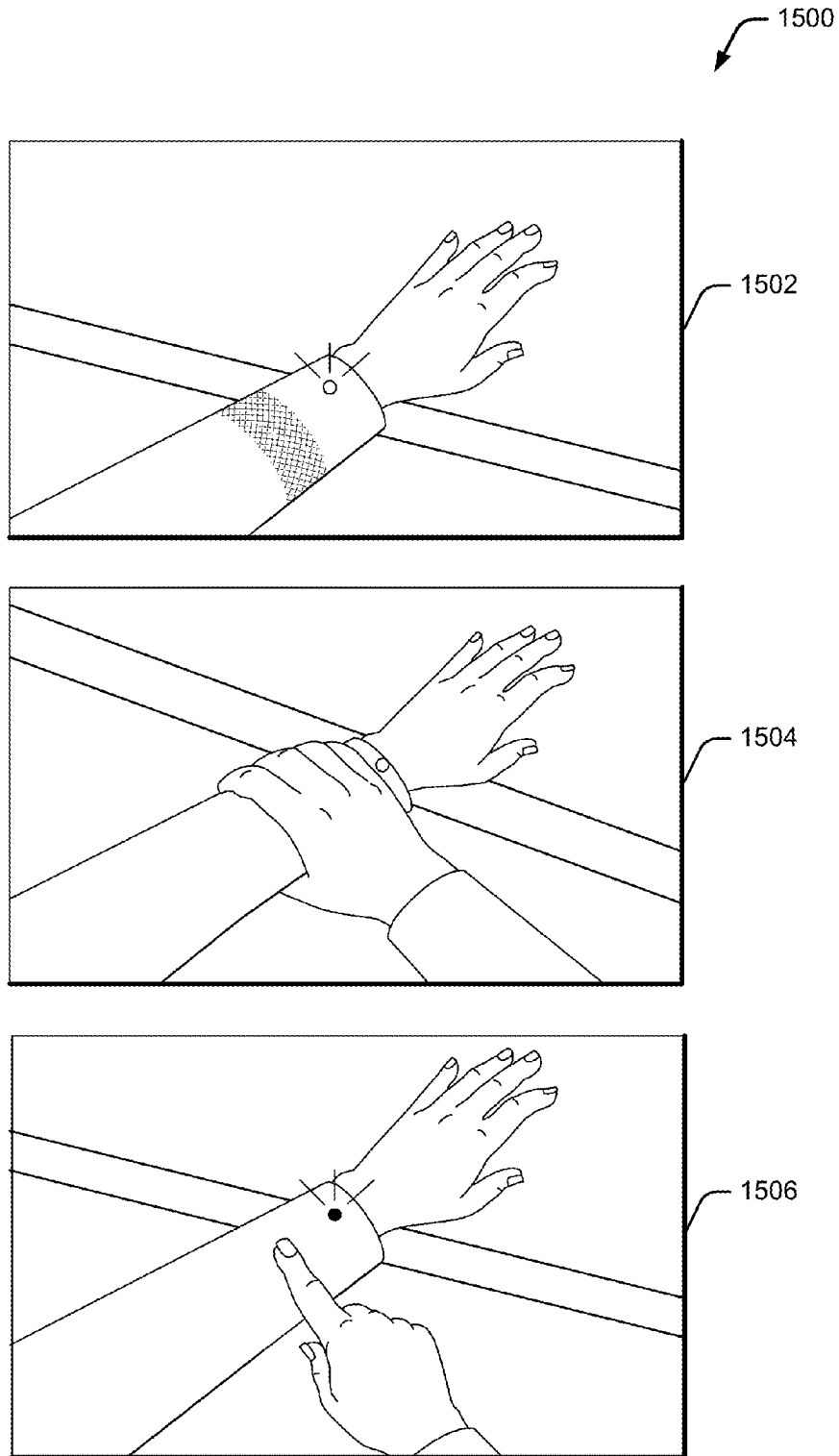


Fig. 15

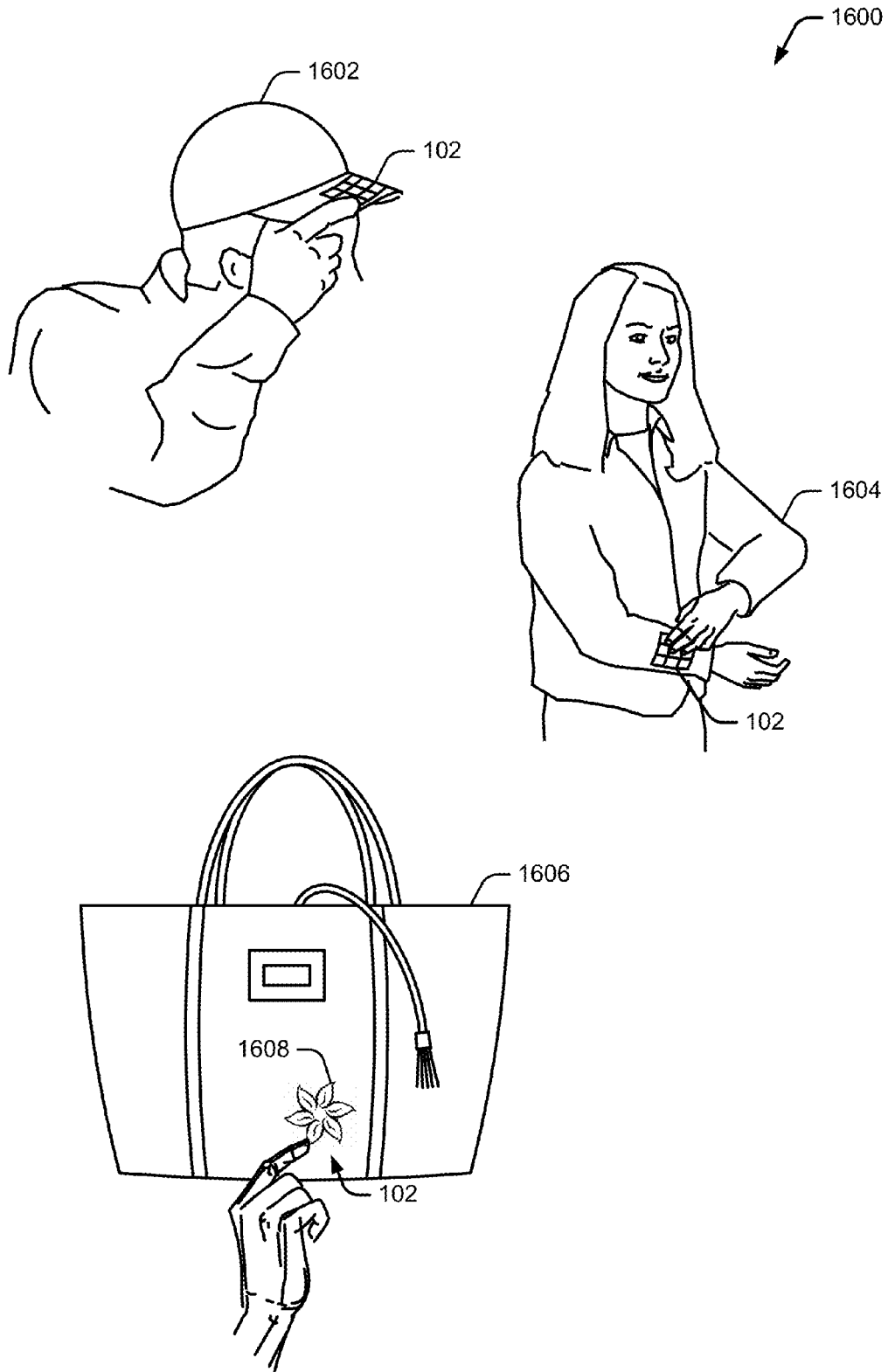


Fig. 16

1700

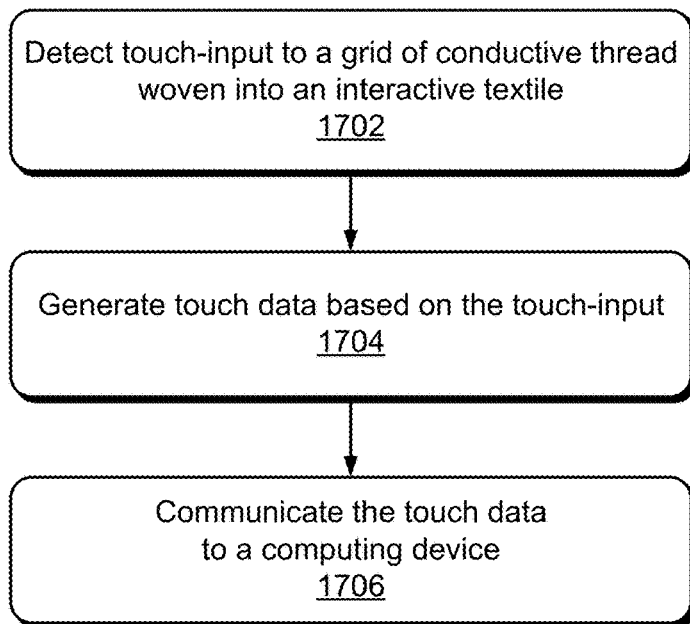



Fig. 17

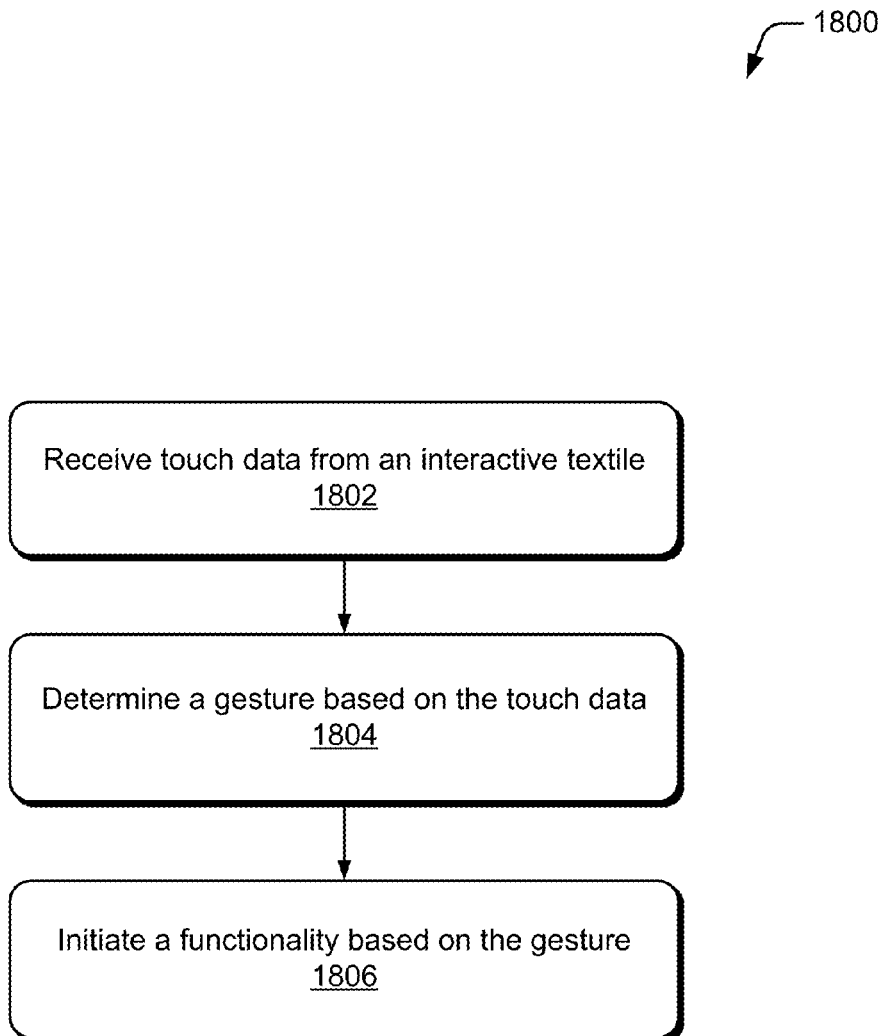


Fig. 18

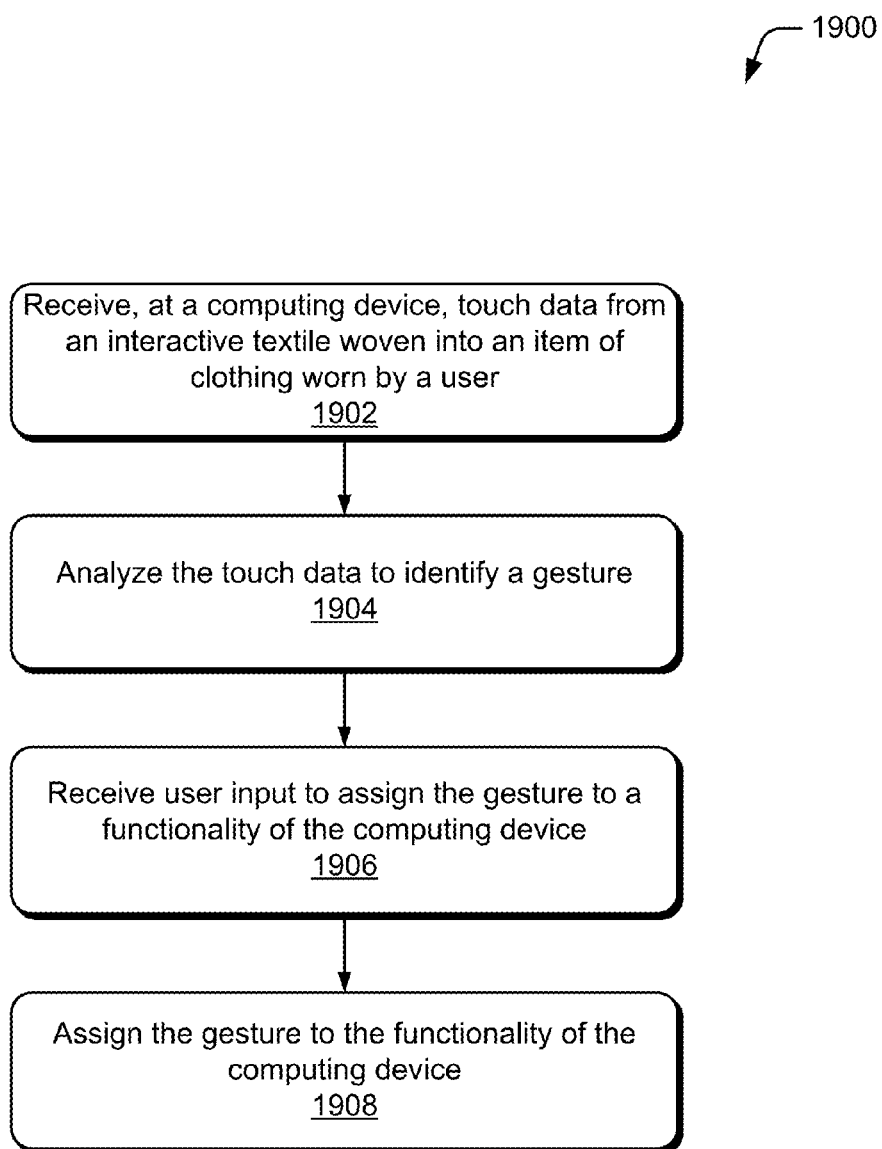


Fig. 19

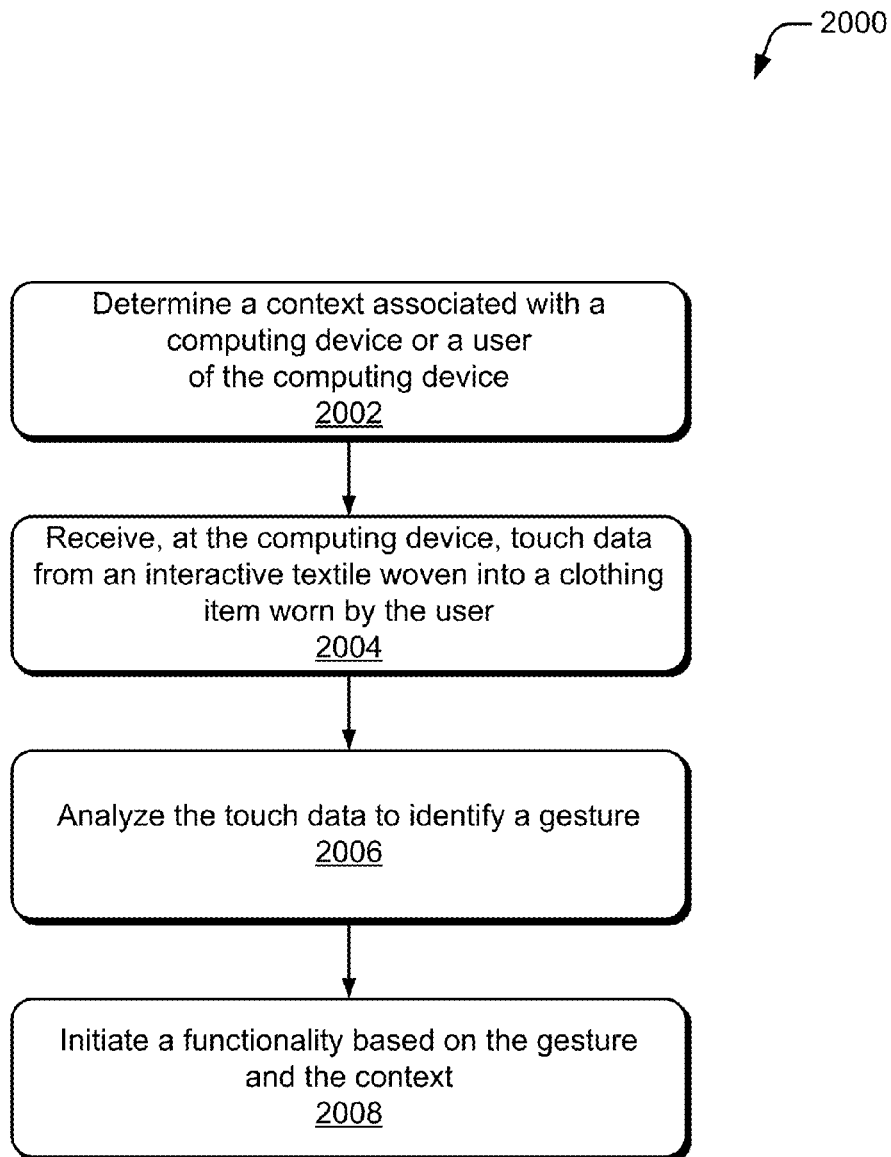


Fig. 20

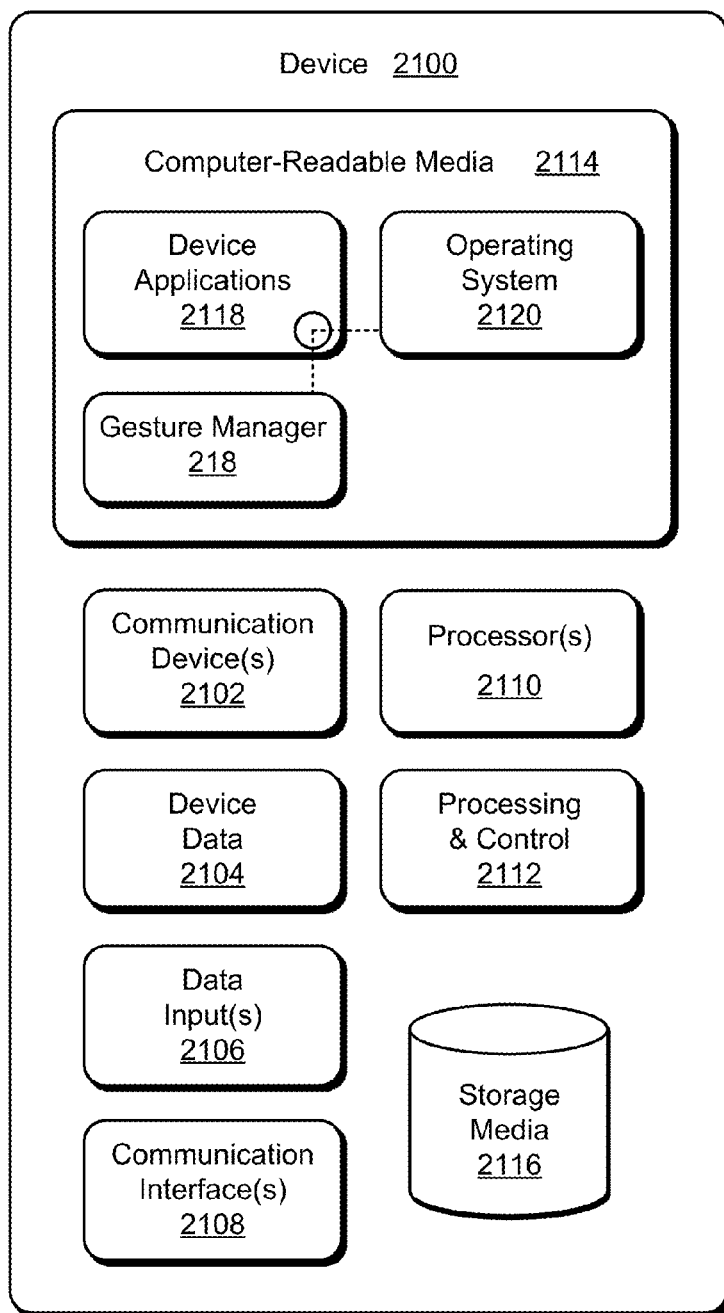


Fig. 21

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TWO-LAYER INTERACTIVE TEXTILES

PRIORITY APPLICATION

This application is a non-provisional of and claims priority under 35 U.S.C. § 119(e) to U.S. patent application Ser. No. 62/138,831 titled "Two-Layer Interactive Textiles," filed Mar. 26, 2015, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

Currently, producing touch sensors can be complicated and expensive, especially if the touch sensor is intended to be light, flexible, or adaptive to various different kinds of use. Conventional touch pads, for example, are generally non-flexible and relatively costly to produce and to integrate into objects.

SUMMARY

This document describes two-layer interactive textiles. An interactive textile includes a grid of conductive thread woven into the interactive textile to form a capacitive touch sensor that is configured to detect touch-input. The interactive textile can process the touch-input to generate touch data that is useable to initiate functionality at various remote devices that are wirelessly coupled to the interactive textile. For example, the interactive textile may aid users in controlling volume on a stereo, pausing a movie playing on a television, or selecting a webpage on a desktop computer. Due to the flexibility of textiles, the interactive textile may be easily integrated within flexible objects, such as clothing, handbags, fabric casings, hats, and so forth.

In one or more implementations, the interactive textile includes a top textile layer and a bottom textile layer. Conductive threads are woven into the top textile layer and the bottom textile layer. When the top textile layer is combined with the bottom textile layer, the conductive threads from each layer form a capacitive touch sensor that is configured to detect touch-input. The bottom textile layer is not visible and couples the capacitive touch sensor to electronic components, such as a controller, a wireless interface, an output device (e.g., an LED, a display, or speaker), and so forth.

In one or more implementations, the conductive thread of the interactive textile includes a conductive core that includes at least one conductive wire and a cover layer constructed from flexible threads that covers the conductive core. The conductive core may be formed by twisting one or more flexible threads (e.g., silk threads, polyester threads, or cotton threads) with the conductive wire, or by wrapping flexible threads around the conductive wire. In one or more implementations, the conductive core is formed by braiding the conductive wire with flexible threads (e.g., silk). The cover layer may be formed by wrapping or braiding flexible threads around the conductive core. In one or more implementations, the conductive thread is implemented with a "double-braided" structure in which the conductive core is formed by braiding flexible threads with a conductive wire, and then braiding flexible threads around the braided conductive core.

In one or more implementations, a gesture manager is implemented at a computing device that is wirelessly coupled to the interactive textile. The gesture manager enables the user to create gestures and assign the gestures to various functionalities of the computing device. The gesture

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manager can store mappings between the created gestures and the functionalities in a gesture library to enable the user to initiate a functionality, at a subsequent time, by inputting a gesture assigned to the functionality into the interactive textile.

In one or more implementations, the gesture manager is configured to select a functionality based on both a gesture to the interactive textile and a context of the computing device. The ability to recognize gestures based on context enables the user to invoke a variety of different functionalities using a subset of gestures. For example, for a first context, a first gesture may initiate a first functionality, whereas for a second context, the same first gesture may initiate a second functionality.

In one or more implementations, the interactive textile is coupled to one or more output devices (e.g., a light source, a speaker, or a display) that is integrated within the flexible object. The output device can be controlled to provide notifications initiated from the computing device and/or feedback to the user based on the user's interactions with the interactive textile.

This summary is provided to introduce simplified concepts concerning two-layer interactive textiles, which is further described below in the Detailed Description. This summary is not intended to identify essential features of the claimed subject matter, nor is it intended for use in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of techniques and devices for two-layer interactive textiles are described with reference to the following drawings. The same numbers are used throughout the drawings to reference like features and components:

FIG. 1 is an illustration of an example environment in which techniques using, and an objects including, an interactive textile may be embodied.

FIG. 2 illustrates an example system that includes an interactive textile and a gesture manager.

FIG. 3 illustrates an example of an interactive textile in accordance with one or more implementations.

FIG. 4a which illustrates an example of a conductive core for a conductive thread in accordance with one or more implementations.

FIG. 4b which illustrates an example of a conductive thread that includes a cover layer formed by wrapping flexible threads around a conductive core.

FIG. 5 illustrates an example of an interactive textile with multiple textile layers.

FIG. 6 illustrates an example of a two-layer interactive textile in accordance with one or more implementations.

FIG. 7 illustrates a more-detailed view of a second textile layer of a two-layer interactive textile in accordance with one or more implementations.

FIG. 8 illustrates an example of a second textile layer of a two-layer interactive textile in accordance with one or more implementations.

FIG. 9 illustrates an additional example of a second textile layer of a two-layer interactive textile in accordance with one or more implementations.

FIG. 10A illustrates an example of generating a control based on touch-input corresponding to a single-finger touch.

FIG. 10B illustrates an example of generating a control based on touch-input corresponding to a double-tap.

FIG. 10C illustrates an example of generating a control based on touch-input corresponding to a two-finger touch.

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FIG. 10D illustrates an example of generating a control based on touch-input corresponding to a swipe up.

FIG. 11 illustrates an example of creating and assigning gestures to functionality of a computing device in accordance with one or more implementations.

FIG. 12 illustrates an example of a gesture library in accordance with one or more implementations.

FIG. 13 illustrates an example of contextual-based gestures to an interactive textile in accordance with one or more implementations.

FIG. 14 illustrates an example of an interactive textile that includes an output device in accordance with one or more implementations.

FIG. 15 illustrates implementation examples 1500 of interacting with an interactive textile and an output device in accordance with one or more implementations.

FIG. 16 illustrates various examples of interactive textiles integrated within flexible objects.

FIG. 17 illustrates an example method of generating touch data using an interactive textile.

FIG. 18 illustrates an example method of determining gestures usable to initiate functionality of a computing device in accordance with one or more implementations.

FIG. 19 illustrates an example method 1900 of assigning a gesture to a functionality of a computing device in accordance with one or more implementations.

FIG. 20 illustrates an example method 2300 of initiating a functionality of a computing device based on a gesture and a context in accordance with one or more implementations.

FIG. 21 illustrates various components of an example computing system that can be implemented as any type of client, server, and/or computing device as described with reference to the previous FIGS. 1-20 to implement two-layer interactive textiles.

DETAILED DESCRIPTION

Overview

Currently, producing touch sensors can be complicated and expensive, especially if the touch sensor is intended to be light, flexible, or adaptive to various different kinds of use. This document describes techniques using, and objects embodying, interactive textiles which are configured to sense multi-touch-input. To enable the interactive textiles to sense multi-touch-input, a grid of conductive thread is woven into the interactive textile to form a capacitive touch sensor that can detect touch-input. The interactive textile can process the touch-input to generate touch data that is useable to initiate functionality at various remote devices. For example, the interactive textiles may aid users in controlling volume on a stereo, pausing a movie playing on a television, or selecting a webpage on a desktop computer. Due to the flexibility of textiles, the interactive textile may be easily integrated within flexible objects, such as clothing, handbags, fabric casings, hats, and so forth.

In one or more implementations, the interactive textile includes a top textile layer and a bottom textile layer. Conductive threads are woven into the top textile layer and the bottom textile layer. When the top textile layer is combined with the bottom textile layer, the conductive threads from each layer form a capacitive touch sensor that is configured to detect touch-input. The bottom textile layer is not visible and couples the capacitive through sensor to electronic components, such as a controller, a wireless interface, an output device (e.g., an LED, a display, or speaker), and so forth.

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In one or more implementations, the conductive thread of the interactive textile includes a conductive core that includes at least one conductive wire and a cover layer constructed from flexible threads that covers the conductive core. The conductive core may be formed by twisting one or more flexible threads (e.g., silk threads, polyester threads, or cotton threads) with the conductive wire, or by wrapping flexible threads around the conductive wire. In one or more implementations, the conductive core is formed by braiding the conductive wire with flexible threads (e.g., silk). The cover layer may be formed by wrapping or braiding flexible threads around the conductive core. In one or more implementations, the conductive thread is implemented with a “double-braided” structure in which the conductive core is formed by braiding flexible threads with a conductive wire, and then braiding flexible threads around the braided conductive core.

In one or more implementations, a gesture manager is implemented at a computing device that is wirelessly coupled to the interactive textile. The gesture manager enables the user to create gestures and assign the gestures to various functionalities of the computing device. The gesture manager can store mappings between the created gestures and the functionalities in a gesture library to enable the user to initiate a functionality, at a subsequent time, by inputting a gesture assigned to the functionality into the interactive textile.

In one or more implementations, the gesture manager is configured to select a functionality based on both a gesture to the interactive textile and a context of the computing device. The ability to recognize gestures based on context enables the user to invoke a variety of different functionalities using a subset of gestures. For example, for a first context, a first gesture may initiate a first functionality, whereas for a second context, the same first gesture may initiate a second functionality.

In one or more implementations, the interactive textile is coupled to one or more output devices (e.g., a light source, a speaker, or a display) that is integrated within the flexible object. The output device can be controlled to provide notifications initiated from the computing device and/or feedback to the user based on the user’s interactions with the interactive textile.

Example Environment

FIG. 1 is an illustration of an example environment 100 in which techniques using, and objects including, an interactive textile may be embodied. Environment 100 includes an interactive textile 102, which is shown as being integrated within various objects 104. Interactive textile 102 is a textile that is configured to sense multi-touch input. As described herein, a textile corresponds to any type of flexible woven material consisting of a network of natural or artificial fibers, often referred to as thread or yarn. Textiles may be formed by weaving, knitting, crocheting, knotting, or pressing threads together.

In environment 100, objects 104 include “flexible” objects, such as a shirt 104-1, a hat 104-2, and a handbag 104-3. It is to be noted, however, that interactive textile 102 may be integrated within any type of flexible object made from fabric or a similar flexible material, such as articles of clothing, blankets, shower curtains, towels, sheets, bed spreads, or fabric casings of furniture, to name just a few. As discussed in more detail below, interactive textile 102 may

be integrated within flexible objects **104** in a variety of different ways, including weaving, sewing, gluing, and so forth.

In this example, objects **104** further include “hard” objects, such as a plastic cup **104-4** and a hard smart phone casing **104-5**. It is to be noted, however, that hard objects **104** may include any type of “hard” or “rigid” object made from non-flexible or semi-flexible materials, such as plastic, metal, aluminum, and so on. For example, hard objects **104** may also include plastic chairs, water bottles, plastic balls, or car parts, to name just a few. Interactive textile **102** may be integrated within hard objects **104** using a variety of different manufacturing processes. In one or more implementations, injection molding is used to integrate interactive textiles **102** into hard objects **104**.

Interactive textile **102** enables a user to control object **104** that the interactive textile **102** is integrated with, or to control a variety of other computing devices **106** via a network **108**. Computing devices **106** are illustrated with various non-limiting example devices: server **106-1**, smart phone **106-2**, laptop **106-3**, computing spectacles **106-4**, television **106-5**, camera **106-6**, tablet **106-7**, desktop **106-8**, and smart watch **106-9**, though other devices may also be used, such as home automation and control systems, sound or entertainment systems, home appliances, security systems, netbooks, and e-readers. Note that computing device **106** can be wearable (e.g., computing spectacles and smart watches), non-wearable but mobile (e.g., laptops and tablets), or relatively immobile (e.g., desktops and servers).

Network **108** includes one or more of many types of wireless or partly wireless communication networks, such as a local-area-network (LAN), a wireless local-area-network (WLAN), a personal-area-network (PAN), a wide-area-network (WAN), an intranet, the Internet, a peer-to-peer network, point-to-point network, a mesh network, and so forth.

Interactive textile **102** can interact with computing devices **106** by transmitting touch data through network **108**. Computing device **106** uses the touch data to control computing device **106** or applications at computing device **106**. As an example, consider that interactive textile **102** integrated at shirt **104-1** may be configured to control the user’s smart phone **106-2** in the user’s pocket, television **106-5** in the user’s home, smart watch **106-9** on the user’s wrist, or various other appliances in the user’s house, such as thermostats, lights, music, and so forth. For example, the user may be able to swipe up or down on interactive textile **102** integrated within the user’s shirt **104-1** to cause the volume on television **106-5** to go up or down, to cause the temperature controlled by a thermostat in the user’s house to increase or decrease, or to turn on and off lights in the user’s house. Note that any type of touch, tap, swipe, hold, or stroke gesture may be recognized by interactive textile **102**.

In more detail, consider FIG. 2 which illustrates an example system **200** that includes an interactive textile and a gesture manager. In system **200**, interactive textile **102** is integrated in an object **104**, which may be implemented as a flexible object (e.g., shirt **104-1**, hat **104-2**, or handbag **104-3**) or a hard object (e.g., plastic cup **104-4** or smart phone casing **104-5**).

Interactive textile **102** is configured to sense multi-touch-input from a user when one or more fingers of the user’s hand touch interactive textile **102**. Interactive textile **102** may also be configured to sense full-hand touch input from a user, such as when an entire hand of the user touches or swipes interactive textile **102**. To enable this, interactive textile **102** includes a capacitive touch sensor **202**, a textile controller **204**, and a power source **206**.

Capacitive touch sensor **202** is configured to sense touch-input when an object, such as a user’s finger, hand, or a conductive stylus, approaches or makes contact with capacitive touch sensor **202**. Unlike conventional hard touch pads, capacitive touch sensor **202** uses a grid of conductive thread **208** woven into interactive textile **102** to sense touch-input. Thus, capacitive touch sensor **202** does not alter the flexibility of interactive textile **102**, which enables interactive textile **102** to be easily integrated within objects **104**.

Power source **206** is coupled to textile controller **204** to provide power to textile controller **204**, and may be implemented as a small battery. Textile controller **204** is coupled to capacitive touch sensor **202**. For example, wires from the grid of conductive threads **208** may be connected to textile controller **204** using flexible PCB, creping, gluing with conductive glue, soldering, and so forth.

In one or more implementations, interactive textile **102** (or object **104**) may also include one or more output devices, such as light sources (e.g., LED’s), displays, or speakers. In this case, the output devices may also be connected to textile controller **204** to enable textile controller **204** to control their output.

Textile controller **204** is implemented with circuitry that is configured to detect the location of the touch-input on the grid of conductive thread **208**, as well as motion of the touch-input. When an object, such as a user’s finger, touches capacitive touch sensor **202**, the position of the touch can be determined by controller **204** by detecting a change in capacitance on the grid of conductive thread **208**. Textile controller **204** uses the touch-input to generate touch data usable to control computing device **102**. For example, the touch-input can be used to determine various gestures, such as single-finger touches (e.g., touches, taps, and holds), multi-finger touches (e.g., two-finger touches, two-finger taps, two-finger holds, and pinches), single-finger and multi-finger swipes (e.g., swipe up, swipe down, swipe left, swipe right), and full-hand interactions (e.g., touching the textile with a user’s entire hand, covering textile with the user’s entire hand, pressing the textile with the user’s entire hand, palm touches, and rolling, twisting, or rotating the user’s hand while touching the textile). Capacitive touch sensor **202** may be implemented as a self-capacitance sensor, or a projective capacitance sensor, which is discussed in more detail below.

Object **104** may also include network interfaces **210** for communicating data, such as touch data, over wired, wireless, or optical networks to computing devices **106**. By way of example and not limitation, network interfaces **210** may communicate data over a local-area-network (LAN), a wireless local-area-network (WLAN), a personal-area-network (PAN) (e.g., Bluetooth™), a wide-area-network (WAN), an intranet, the Internet, a peer-to-peer network, point-to-point network, a mesh network, and the like (e.g., through network **108** of FIG. 1).

In this example, computing device **106** includes one or more computer processors **212** and computer-readable storage media (storage media) **214**. Storage media **214** includes applications **216** and/or an operating system (not shown) embodied as computer-readable instructions executable by computer processors **212** to provide, in some cases, functionalities described herein. Storage media **214** also includes a gesture manager **218** (described below).

Computing device **106** may also include a display **220** and network interfaces **222** for communicating data over wired, wireless, or optical networks. For example, network interfaces **222** can receive touch data sensed by interactive textile **102** from network interfaces **210** of object **104**. By way of

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example and not limitation, network interface 222 may communicate data over a local-area-network (LAN), a wireless local-area-network (WLAN), a personal-area-network (PAN) (e.g., Bluetooth™), a wide-area-network (WAN), an intranet, the Internet, a peer-to-peer network, point-to-point network, a mesh network, and the like.

Gesture manager 218 is capable of interacting with applications 216 and interactive textile 102 effective to activate various functionalities associated with computing device 106 and/or applications 216 through touch-input (e.g., gestures) received by interactive textile 102. Gesture manager 218 may be implemented at a computing device 106 that is local to object 104, or remote from object 104.

Having discussed a system in which interactive textile 102 can be implemented, now consider a more-detailed discussion of interactive textile 102.

FIG. 3 illustrates an example 300 of interactive textile 102 in accordance with one or more implementations. In this example, interactive textile 102 includes non-conductive threads 302 woven with conductive threads 208 to form interactive textile 102. Non-conductive threads 302 may correspond to any type of non-conductive thread, fiber, or fabric, such as cotton, wool, silk, nylon, polyester, and so forth.

At 304, a zoomed-in view of conductive thread 208 is illustrated. Conductive thread 208 includes a conductive wire 306 twisted with a flexible thread 308. Twisting conductive wire 306 with flexible thread 308 causes conductive thread 208 to be flexible and stretchy, which enables conductive thread 208 to be easily woven with non-conductive threads 302 to form interactive textile 102.

In one or more implementations, conductive wire 306 is a thin copper wire. It is to be noted, however, that conductive wire 306 may also be implemented using other materials, such as silver, gold, or other materials coated with a conductive polymer. Flexible thread 308 may be implemented as any type of flexible thread or fiber, such as cotton, wool, silk, nylon, polyester, and so forth.

In one or more implementations, conductive thread 208 includes a conductive core that includes at least one conductive wire 306 (e.g., one or more copper wires) and a cover layer, configured to cover the conductive core, that is constructed from flexible threads 308. In some cases, conductive wire 306 of the conductive core is insulated. Alternately, conductive wire 306 of the conductive core is not insulated.

In one or more implementations, the conductive core may be implemented using a single, straight, conductive wire 306. Alternately, the conductive core may be implemented using a conductive wire 306 and one or more flexible threads 308. For example, the conductive core may be formed by twisting one or more flexible threads 308 (e.g., silk threads, polyester threads, or cotton threads) with conductive wire 306 (e.g., as shown at 304 of FIG. 3), or by wrapping flexible threads 308 around conductive wire 306.

In one or more implementations, the conductive core includes flexible threads 308 braided with conductive wire 306. As an example, consider FIG. 4a which illustrates an example 400 of a conductive core 402 for a conductive thread in accordance with one or more implementations. In this example, conductive core 402 is formed by braiding conductive wire 306 (not pictured) with flexible threads 308. A variety of different types of flexible threads 308 may be utilized to braid with conductive wire 306, such as polyester or cotton, in order to form the conductive core.

In one or more implementations, however, silk threads are used for the braided construction of the conductive core. Silk

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threads are slightly twisted which enables the silk threads to “grip” or hold on to conductive wire 306. Thus, using silk threads may increase the speed at which the braided conductive core can be manufactured. In contrast, a flexible thread like polyester is slippery, and thus does not “grip” the conductive wire as well as silk. Thus, a slippery thread is more difficult to braid with the conductive wire, which may slow down the manufacturing process.

An additional benefit of using silk threads to create the braided conductive core is that silk is both thin and strong, which enables the manufacture of a thin conductive core that will not break during the interaction textile weaving process. A thin conductive core is beneficial because it enables the manufacturer to create whatever thickness they want for conductive thread 208 (e.g., thick or thin) when covering the conductive core with the second layer.

After forming the conductive core, a cover layer is constructed to cover the conductive core. In one or more implementations, the cover layer is constructed by wrapping flexible threads (e.g., polyester threads, cotton threads, wool threads, or silk threads) around the conductive core. As an example, consider FIG. 4b which illustrates an example 404 of a conductive thread that includes a cover layer formed by wrapping flexible threads around a conductive core. In this example, conductive thread 208 is formed by wrapping flexible threads 308 around the conductive core (not pictured). For example, the cover layer may be formed by wrapping polyester threads around the conductive core at approximately 1900 turns per yard.

In one or more implementations, the cover layer includes flexible threads braided around the conductive core. The braided cover layer may be formed using the same type of braiding as described above with regards to FIG. 4a. Any type of flexible thread 308 may be used for the braided cover layer. The thickness of the flexible thread and the number of flexible threads that are braided around the conductive core can be selected based on the desired thickness of conductive thread 208. For example, if conductive thread 208 is intended to be used for denim, a thicker flexible thread (e.g., cotton) and/or a greater number of flexible threads may be used to form the cover layer.

In one or more implementations, conductive thread 208 is constructed with a “double-braided” structure. In this case, the conductive core is formed by braiding flexible threads, such as silk, with a conductive wire (e.g., copper), as described above. Then, the cover layer is formed by braiding flexible threads (e.g., silk, cotton, or polyester) around the braided conductive core. The double-braided structure is strong, and thus is unlikely to break when being pulled during the weaving process. For example, when the double-braided conductive thread is pulled, the braided structure contracts and forces the braided core of copper to contract also with makes the whole structure stronger. Further, the double-braided structure is soft and looks like normal yarn, as opposed to a cable, which is important for aesthetics and feel.

Interactive textile 102 can be formed cheaply and efficiently, using any conventional weaving process (e.g., jacquard weaving or 3D-weaving), which involves interlacing a set of longer threads (called the warp) with a set of crossing threads (called the weft). Weaving may be implemented on a frame or machine known as a loom, of which there are a number of types. Thus, a loom can weave non-conductive threads 302 with conductive threads 208 to create interactive textile 102.

In example 300, conductive thread 208 is woven into interactive textile 102 to form a grid that includes a set of

substantially parallel conductive threads **208** and a second set of substantially parallel conductive threads **208** that crosses the first set of conductive threads to form the grid. In this example, the first set of conductive threads **208** are oriented horizontally and the second set of conductive threads **208** are oriented vertically, such that the first set of conductive threads **208** are positioned substantially orthogonal to the second set of conductive threads **208**. It is to be appreciated, however, that conductive threads **208** may be oriented such that crossing conductive threads **208** are not orthogonal to each other. For example, in some cases crossing conductive threads **208** may form a diamond-shaped grid. While conductive threads **208** are illustrated as being spaced out from each other in FIG. 3, it is to be noted that conductive threads **208** may be weaved very closely together. For example, in some cases two or three conductive threads may be weaved closely together in each direction.

Conductive wire **306** may be insulated to prevent direct contact between crossing conductive threads **208**. To do so, conductive wire **306** may be coated with a material such as enamel or nylon. Alternately, rather than insulating conductive wire **306**, interactive textile may be generated with three separate textile layers to ensure that crossing conductive threads **208** do not make direct contact with each other.

Consider, for example, FIG. 5 which illustrates an example **500** of an interactive textile **102** with multiple textile layers. In example **500**, interactive textile **102** includes a first textile layer **502**, a second textile layer **504**, and a third textile layer **506**. The three textile layers may be combined (e.g., by sewing or gluing the layers together) to form interactive textile **102**. In this example, first textile layer **502** includes horizontal conductive threads **208**, and second textile layer **504** includes vertical conductive threads **208**. Third textile layer **506** does not include any conductive threads, and is positioned between first textile layer **502** and second textile layer **504** to prevent vertical conductive threads from making direct contact with horizontal conductive threads **208**.

In one or more implementations, interactive textile **102** includes a top textile layer and a bottom textile layer. The top textile layer includes conductive threads **208** woven into the top textile layer, and the bottom textile layer also includes conductive threads woven into the bottom textile layer. When the top textile layer is combined with the bottom textile layer, the conductive threads from each layer form capacitive touch sensor **202**.

Consider for example, FIG. 6 which illustrates an example **600** of a two-layer interactive textile **102** in accordance with one or more implementations. In this example, interactive textile **102** includes a first textile layer **602** and a second textile layer **604**. First textile layer **602** is considered the “top textile layer” and includes first conductive threads **606** woven into first textile layer **602**. Second textile layer **604** is considered the “bottom textile layer” of interactive textile **102** and includes second conductive threads **608** woven into second textile layer **604**. When integrated into flexible object **104**, such as a clothing item, first textile layer **602** is visible and faces the user such that the user is able to interact with first textile layer **602**, while second textile layer **604** is not visible. For instance, first textile layer **602** may be part of an “outside surface” of the clothing item, while second textile layer may be the “inside surface” of the clothing item.

When first textile layer **602** and second textile layer **604** are combined, first conductive threads **606** of first textile layer **602** couples to second conductive threads **608** of

second textile layer **604** to form capacitive touch sensor **202**, as described above. In one or more implementations, the direction of the conductive threads changes from first textile layer **602** to second textile layer **604** to form a grid of conductive threads, as described above. For example, first conductive threads **606** in first textile layer **602** may be positioned substantially orthogonal to second conductive threads **608** in second textile layer **604** to form the grid of conductive threads.

In some cases, first conductive threads **606** may be oriented substantially horizontally and second conductive threads **608** may be oriented substantially vertically. Alternately, first conductive threads **606** may be oriented substantially vertically and second conductive threads **608** may be oriented substantially horizontally. Alternately, first conductive threads **606** may be oriented such that crossing conductive threads **608** are not orthogonal to each other. For example, in some cases crossing conductive threads **606** and **608** may form a diamond-shaped grid.

First textile layer **602** and second textile layer **604** can be formed independently, or at different times. For example, a manufacturer may weave second conductive threads **608** into second textile layer **604**. A designer could then purchase second textile layer **604** with the conductive threads already woven into the second textile layer **604**, and create first textile layer **602** by weaving conductive thread into a textile design. First textile layer **602** can then be combined with second textile layer **604** to form interactive textile **102**.

First textile layer and second textile layer may be combined in a variety of different ways, such as by weaving, sewing, or gluing the layers together to form interactive textile **102**. In one or more implementations, first textile layer **602** and second textile layer **604** are combined using a jacquard weaving process or any type of 3D-weaving process. When first textile layer **602** and second textile layer **604** are combined, the first conductive threads **606** of first textile layer **602** couple to second conductive threads **608** of second textile layer **604** to form capacitive touch sensor **202**, as described above.

In one or more implementations, second textile layer **604** implements a standard configuration or pattern of second conductive threads **608**. Consider, for example, FIG. 7 which illustrates a more-detailed view **700** of second textile layer **604** of two-layer interactive textile **102** in accordance with one or more implementations. In this example, second textile layer **604** includes horizontal conductive threads **702** and vertical conductive threads **704** which intersect to form multiple grids **706** of conductive thread. It is to be noted, however, that any standard configuration may be used, such as different sizes of grids or just lines without grids. The standard configuration of second conductive threads **608** in the second level enables a precise size, shape, and placement of interactive areas anywhere on interactive textile **102**. In example **700**, second textile layer **604** utilizes connectors **708** to form grids **706**. Connectors **708** may be configured from a harder material, such as polyester.

Second conductive threads **608** of second textile layer **604** can be connected to electronic components of interactive textile **102**, such as textile controller **204**, output devices (e.g., an LED, display, or speaker), and so forth. For example, second conductive threads **608** of second textile layer **604** may be connected to electronic components, such as textile controller **204**, using flexible PCB, creping, gluing with conductive glue, soldering, and so forth. Since second textile layer **604** is not visible, this enables coupling to the

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electronics in a way that the electronics and lines running to the electronics are not visible in the clothing item or soft object.

In one or more implementations, the pitch of second conductive threads **608** in second textile layer **604** is constant. As described herein, the “pitch” of the conductive threads refers to a width of the line spacing between conductive threads. Consider, for example, FIG. **8** which illustrates an additional example **800** of second textile layer **604** in accordance with one or more implementations. In this example, first textile layer **602** is illustrated as being folded back to reveal second textile layer **604**. Horizontal conductive threads **802** and vertical conductive threads **804** are completely woven into second textile layer **604**. As can be seen, the distance between each of the lines does not change, and thus the pitch is considered to be constant.

Alternately, in one or more implementations, the pitch of second conductive threads **608** in second textile layer **604** is not constant. The pitch can be varied in a variety of different ways. In one or more implementations, the pitch can be changed using shrinking materials, such as heat shrinking polymers. For example, the pitch can be changed by weaving polyester or heated yarn with the conductive threads of the second textile layer.

In one or more implementations second conductive threads **608** may be partially woven into the second textile layer **604**. Then, the pitch of second conductive threads **608** can be changed by weaving first textile layer **602** with second textile layer **604**. Consider, for example, FIG. **9** which illustrates an additional example **900** of a second textile layer **604** in accordance with one or more implementations. In this example, horizontal conductive threads **902** and vertical conductive threads **904** are only partially woven into second textile layer **604**. The pitch of the horizontal and vertical conductive threads can then be altered by weaving first textile layer **602** with second textile layer **604**.

During operation, capacitive touch sensor **202** may be configured to determine positions of touch-input on the grid of conductive thread **208** using self-capacitance sensing or projective capacitive sensing.

When configured as a self-capacitance sensor, textile controller **204** charges crossing conductive threads **208** (e.g., horizontal and vertical conductive threads) by applying a control signal (e.g., a sine signal) to each conductive thread **208**. When an object, such as the user’s finger, touches the grid of conductive thread **208**, the conductive threads **208** that are touched are grounded, which changes the capacitance (e.g., increases or decreases the capacitance) on the touched conductive threads **208**.

Textile controller **204** uses the change in capacitance to identify the presence of the object. To do so, textile controller **204** detects a position of the touch-input by detecting which horizontal conductive thread **208** is touched, and which vertical conductive thread **208** is touched by detecting changes in capacitance of each respective conductive thread **208**. Textile controller **204** uses the intersection of the crossing conductive threads **208** that are touched to determine the position of the touch-input on capacitive touch sensor **202**. For example, textile controller **204** can determine touch data by determining the position of each touch as X,Y coordinates on the grid of conductive thread **208**.

When implemented as a self-capacitance sensor, “ghosting” may occur when multi-touch input is received. Consider, for example, that a user touches the grid of conductive thread **208** with two fingers. When this occurs, textile controller **204** determines X and Y coordinates for each of the two touches. However, textile controller **204** may be

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unable to determine how to match each X coordinate to its corresponding Y coordinate. For example, if a first touch has the coordinates X1, Y1 and a second touch has the coordinates X4, Y4, textile controller **204** may also detect “ghost” coordinates X1, Y4 and X4, Y1.

In one or more implementations, textile controller **204** is configured to detect “areas” of touch-input corresponding to two or more touch-input points on the grid of conductive thread **208**. Conductive threads **208** may be weaved closely together such that when an object touches the grid of conductive thread **208**, the capacitance will be changed for multiple horizontal conductive threads **208** and/or multiple vertical conductive threads **208**. For example, a single touch with a single finger may generate the coordinates X1, Y1 and X2, Y1. Thus, textile controller **204** may be configured to detect touch-input if the capacitance is changed for multiple horizontal conductive threads **208** and/or multiple vertical conductive threads **208**. Note that this removes the effect of ghosting because textile controller **204** will not detect touch-input if two single-point touches are detected which are spaced apart.

Alternately, when implemented as a projective capacitance sensor, textile controller **204** charges a single set of conductive threads **208** (e.g., horizontal conductive threads **208**) by applying a control signal (e.g., a sine signal) to the single set of conductive threads **208**. Then, textile controller **204** senses changes in capacitance in the other set of conductive threads **208** (e.g., vertical conductive threads **208**).

In this implementation, vertical conductive threads **208** are not charged and thus act as a virtual ground. However, when horizontal conductive threads **208** are charged, the horizontal conductive threads capacitively couple to vertical conductive threads **208**. Thus, when an object, such as the user’s finger, touches the grid of conductive thread **208**, the capacitance changes on the vertical conductive threads (e.g., increases or decreases). Textile controller **204** uses the change in capacitance on vertical conductive threads **208** to identify the presence of the object. To do so, textile controller **204** detects a position of the touch-input by scanning vertical conductive threads **208** to detect changes in capacitance. Textile controller **204** determines the position of the touch-input as the intersection point between the vertical conductive thread **208** with the changed capacitance, and the horizontal conductive thread **208** on which the control signal was transmitted. For example, textile controller **204** can determine touch data by determining the position of each touch as X,Y coordinates on the grid of conductive thread **208**.

Whether implemented as a self-capacitance sensor or a projective capacitance sensor, capacitive sensor **208** is configured to communicate the touch data to gesture manager **218** to enable gesture manager **218** to determine gestures based on the touch data, which can be used to control object **104**, computing device **106**, or applications **216** at computing device **106**.

Gesture manager **218** can be implemented to recognize a variety of different types of gestures, such as touches, taps, swipes, holds, and covers made to interactive textile **102**. To recognize the various different types of gestures, gesture manager **218** is configured to determine a duration of the touch, swipe, or hold (e.g., one second or two seconds), a number of the touches, swipes, or holds (e.g., a single tap, a double tap, or a triple tap), a number of fingers of the touch, swipe, or hold (e.g., a one finger-touch or swipe, a two-finger touch or swipe, or a three-finger touch or swipe), a frequency of the touch, and a dynamic direction of a touch or swipe

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(e.g., up, down, left, right). With regards to holds, gesture manager 218 can also determine an area of capacitive touch sensor 202 of interactive textile 102 that is being held (e.g., top, bottom, left, right, or top and bottom. Thus, gesture manager 218 can recognize a variety of different types of holds, such as a cover, a cover and hold, a five finger hold, a five finger cover and hold, a three finger pinch and hold, and so forth.

FIG. 10A illustrates an example 1000 of generating a control based on touch-input corresponding to a single-finger touch. In example 1000, horizontal conductive threads 208 and vertical conductive threads 208 of capacitive touch sensor 202 form an X,Y grid. The X-axis in this grid is labeled X1, X2, X3, and X4, and the Y-axis is labeled Y1, Y2, and Y3. As described above, textile controller 204 can determine the location of each touch on this X,Y grid using self-capacitance sensing or projective capacitance sensing.

In this example, touch-input 1002 is received when a user touches interactive textile 102. When touch-input 1002 is received, textile controller 204 determines the position and time of touch-input 1002 on the grid of conductive thread 208, and generates touch data 1004 which includes the position of the touch: "X1,Y1", and a time of the touch: T0. Then, touch data 1004 is communicated to gesture manager 218 at computing device 106 (e.g., over network 108 via network interface 210).

Gesture manager 218 receives touch data 1004, and generates a gesture 1006 corresponding to touch data 1004. In this example, gesture manager 218 determines gesture 1006 to be "single-finger touch" because the touch data corresponds to a single touch-input point (X1,Y1) at a single time period (T0). Gesture manager 218 may then initiate a control 1008 to activate a functionality of computing device 106 based on the single-finger touch gesture 1006 to control object 104, computing device 106, or an application 216 at computing device 106. A single-finger touch gesture, for example, may be used to control computing device 106 to power-on or power-off, to control an application 216 to open or close, to control lights in the user's house to turn on or off, and so on.

FIG. 10B illustrates an example 1000 of generating a control based on touch-input corresponding to a double-tap. In this example, touch-input 1010 and 1012 is received when a user double taps interactive textile 102, such as by quickly tapping interactive textile 102. When touch-input 1010 and 1012 is received, textile controller 204 determines the positions and time of the touch-input on the grid of conductive thread 208, and generates touch data 1014 which includes the position of the first touch: "X1,Y1", and a time of the first touch: T0. The touch data 1014 further includes the position of the second touch: "X1,Y1", and the time of the second touch: T1. Then, touch data 1014 is communicated to gesture manager 218 at computing device 106 (e.g., over network 108 via network interface 210).

Gesture manager 218 receives touch data 1014, and generates a gesture 1016 corresponding to the touch data. In this example, gesture manager 218 determines gesture 1016 as a "double-tap" based on two touches being received at substantially the same position at different times. Gesture manager 218 may then initiate a control 1018 to activate a functionality of computing device 106 based on the double-tap touch gesture 1016 to control object 104, computing device 106, or an application 216 at computing device 106. A double-tap gesture, for example, may be used to control computing device 106 to power-on an integrated camera, start the play of music via a music application 216, lock the user's house, and so on.

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FIG. 10C illustrates an example 1000 of generating a control based on touch-input corresponding to a two-finger touch. In this example, touch-input 1020 and 1022 is received when a user touches interactive textile 102 with two fingers at substantially the same time. When touch-input 1020 and 1022 is received, textile controller 204 determines the positions and time of the touch-input on the grid of conductive thread 208, and generates touch data 1024 which includes the position of the touch by a first finger: "X1,Y1", at a time T0. Touch data 1024 further includes the position of the touch by a second finger: "X3,Y2", at the same time T0. Then, touch data 1024 is communicated to gesture manager 218 at computing device 106 (e.g., over network 108 via network interface 210).

Gesture manager 218 receives touch data 1024, and generates a gesture 1026 corresponding to the touch data. In this case, gesture manager 218 determines gesture 1026 as a "two-finger touch" based on two touches being received in different positions at substantially the same time. Gesture manager may then initiate a control 1028 to activate a functionality of computing device 106 based on two-finger touch gesture 1026 to control object 104, computing device 106, or an application 216 at computing device 106. A two-finger touch gesture, for example, may be used to control computing device 106 to take a photo using an integrated camera, pause the playback of music via a music application 216, turn on the security system at the user's house and so on.

FIG. 10D which illustrates an example 1000 of generating a control based on touch-input corresponding to a single-finger swipe up. In this example, touch-input 1030, 1032, and 1034 is received when a user swipes upwards on interactive textile 102 using a single finger. When touch-input 1030, 1032, and 1034 is received, textile controller 204 determines the positions and time of the touch-input on the grid of conductive thread 208, and generates touch data 1036 corresponding to the position of a first touch as "X1,Y1" at a time T0, a position of a second touch as "X1,Y2" at a time T1, and a position of a third touch as "X1,Y3" at a time T2. Then, touch data 1036 is communicated to gesture manager 218 at computing device 106 (e.g., over network 108 via network interface 210).

Gesture manager 218 receives touch data 1036, and generates a gesture 1038 corresponding to the touch data. In this case, the gesture manager 218 determines gesture 1038 as a "swipe up" based on three touches being received in positions moving upwards on the grid of conductive thread 208. Gesture manager may then initiate a control 1040 to activate a functionality of computing device 106 based on the swipe up gesture 1038 to control object 104, computing device 106, or an application 216 at computing device 106. A swipe up gesture, for example, may be used to control computing device 106 to accept a phone call, increase the volume of music being played by a music application 216, or turn on lights in the user's house.

While examples above describe, generally, various types of touch-input gestures that are recognizable by interactive textile 102, it is to be noted that virtually any type of touch-input gestures may be detected by interactive textile 102. For example, any type of single or multi-touch taps, touches, holds, swipes, and so forth, that can be detected by conventional touch-enabled smart phones and tablet devices, may also be detected by interactive textile 102.

In one or more implementations, gesture manager 218 enables the user to create gestures and assign the gestures to functionality of computing device 106. The created gestures may include taps, touches, swipes and holds as described

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above. In addition, gesture manager 218 can recognize gesture strokes, such as gesture strokes corresponding to symbols, letters, numbers, and so forth.

Consider, for example, FIG. 11 which illustrates an example 1100 of creating and assigning gestures to functionality of computing device 106 in accordance with one or more implementations.

In this example, at a first stage 1102, gesture manager 218 causes display of a record gesture user interface 1104 on a display of computing device 106 during a gesture mapping mode. The gesture mapping mode may be initiated by gesture manager 218 automatically when interactive textile 102 is paired with computing device 106, or responsive to a control or command initiated by the user to create and assign gestures to functionalities of computing device 106.

In the gesture mapping mode, gesture manager 218 prompts the user to input a gesture to interactive textile 102. Textile controller 204, at interactive textile 102, monitors for gesture input to interactive textile 102 woven into an item of clothing (e.g., a jacket) worn by the user, and generates touch data based on the gesture. The touch data is then communicated to gesture manager 218.

In response to receiving the touch data from interactive textile 102, gesture manager 218 analyzes the touch data to identify the gesture. Gesture manager 218 may then cause display of a visual representation 1106 of the gesture on display 220 of computing device 106. In this example, visual representation 1106 of the gesture is a “v” which corresponds to the gesture that is input to interactive textile 102. Gesture user interface includes a next control 1108 which enables the user to transition to a second stage 1110.

At second stage 1110, gesture manager 218 enables the user to assign the gesture created at first stage 1102 to a functionality of computing device 106. As described herein, a “functionality” of computing device 106 can include any command, control, or action at computing device 102. Examples of functionalities of computing device 106 may include, by way of example and not limitation, answering a call, music playing controls (e.g., next song, previous song, pause, and play), requesting the current weather, and so forth.

In this example, gesture manager 218 causes display of an assign function user interface 1112 which enables the user to assign the gesture created at first stage 1102 to one or more functionalities of computing device 102. Assign function user interface 1112 includes a list 1114 of functionalities that are selectable by the user to assign or map the gesture to the selected functionality. In this example, list 1114 of functionalities includes “refuse call”, “accept call”, “play music”, “call home”, and “silence call”.

Gesture manager receives user input to assign function user interface 1112 to assign the gesture to a functionality, and assigns the gesture to the selected functionality. In this example, the user selects the “accept call” functionality, and gesture manager 218 assigns the “v” gesture created at first stage 1102 to the accept call functionality.

Assigning the created gesture to the functionality of computing device 106 enables the user to initiate the functionality, at a subsequent time, by inputting the gesture into interactive textile 102. In this example, the user can now make the “v” gesture on interactive textile 102 in order to cause computing device 106 to accept a call to computing device 106.

Gesture manager 218 is configured to maintain mappings between created gestures and functionalities of computing device 106 in a gesture library. The mappings can be created by the user, as described above. Alternately or additionally,

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the gesture library can include predefined mappings between gestures and functionalities of computing device 106.

As an example, consider FIG. 12 which illustrates an example 1200 of a gesture library in accordance with one or more implementations. In example 1200, the gesture library includes multiple different mappings between gestures and device functionalities of computing device 106. At 1202, a “circle” gesture is mapped to a “tell me the weather” function, at 1204 a “v” gesture is mapped to an accept call function, at 1206 an “x” gesture is mapped to a “refuse call” function, at 1208 a “triangle” gesture is mapped to a “call home” function, at 1210 an “m” gesture is mapped to a “play music” function, and at 1212 a “w” gesture is mapped to a “silence call” function.

As noted above, the mappings at 1202, 1204, 1206, 1208, 1210, and 1212 may be created by the user or may be predefined such that the user does not need to first create and assign the gesture. Further, the user may be able to change or modify the mappings by selecting the mapping and creating a new gesture to replace the currently assigned gesture.

Notably, there may be a variety of different functionalities that the user may wish to initiate via a gesture to interactive textile 102. However, there is a limited number of different gestures that a user can realistically be expected to remember. Thus, in one or more implementations gesture manager 218 is configured to select a functionality based on both a gesture to interactive textile 102 and a context of computing device 106. The ability to recognize gestures based on context enables the user to invoke a variety of different functionalities using a subset of gestures. For example, for a first context, a first gesture may initiate a first functionality, whereas for a second context, the same first gesture may initiate a second functionality.

In some cases, the context of computing device 106 may be based on an application that is currently running on computing device 106. For example, the context may correspond to listening to music when the user is utilizing a music player application to listen to music, and to “receiving a call” when a call is communicated to computing device 106. In these cases, gesture manager 218 can determine the context by determining the application that is currently running on computing device 106.

Alternately or additionally, the context may correspond to an activity that the user is currently engaged in, such as running, working out, driving a car, and so forth. In these cases, gesture manager 218 can determine the context based on sensor data received from sensors implemented at computing device 106, interactive textile 102, or another device that is communicably coupled to computing device 106. For example, acceleration data from an accelerometer may indicate that the user is currently running, driving in a car, riding a bike, and so forth. Other non-limiting examples of determining context include determining the context based on calendar data (e.g., determining the user is in a meeting based on the user’s calendar), determining context based on location data, and so forth.

After the context is determined, textile controller 204, at interactive textile 102, monitors for gesture input to interactive textile 102 woven into an item of clothing (e.g., a jacket) worn by the user, and generates touch data based on the gesture input. The touch data is then communicated to gesture manager 218.

In response to receiving the touch data from interactive textile 102, gesture manager 218 analyzes the touch data to identify the gesture. Then, gesture manager 218 initiates a functionality of computing device based on the gesture and

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the context. For example, gesture manager **218** can compare the gesture to a mapping that assigns gestures to different contexts. A given gesture, for example, may be associated with multiple different contexts and associated functionalities. Thus, when a first gesture is received, gesture manager **218** may initiate a first functionality if a first context is detected, or initiate a second, different functionality if a second, different context is detected.

As an example, consider FIG. **13** which illustrates an example **1300** of contextual-based gestures to an interactive textile in accordance with one or more implementations.

In this example, computing device **106** is implemented as a smart phone **1302** that is communicably coupled to interactive textile **102**. For example, interactive textile **102** may be woven into a jacket worn by the user, and coupled to smart phone **1302** via a wireless connection such as Bluetooth.

At **1304**, smart phone **1302** is in a “music playing” context because a music player application is playing music on smart phone **1302**. In the music playing context, gesture manager **218** has assigned a first subset of functionalities to a first subset of gestures at **1306**. For example, the user can play a previous song by swiping left on interactive textile **102**, play or pause a current song by tapping interactive textile **102**, or play a next song by swiping right on interactive textile **102**.

At **1308**, the context of smart phone **1302** changes to an “incoming call” context when smart phone **1302** receives an incoming call. In the incoming call context, the same subset of gestures is assigned to a second subset of functionalities which are associated with the incoming call context at **1310**. For example, by swiping left on interactive textile **102** the user can now reject the call, whereas before swiping left would have caused the previous song to be played in the music playing context. Similarly, by tapping interactive textile **102** the user can accept the call, and by swiping right on interactive textile **102** the user can silence the call.

In one or more implementations, interactive textile **102** further includes one or more output devices, such as one or more light sources (e.g., LED’s), displays, speakers, and so forth. These output devices can be configured to provide feedback to the user based on touch-input to interactive textile **102** and/or notifications based on control signals received from computing device **106**.

FIG. **14** which illustrates an example **1400** of a jacket that includes an interactive textile **102** and an output device in accordance with one or more implementations. In this example, interactive textile **102** is integrated into the sleeve of a jacket **1402**, and is coupled to a light source **1404**, such as an LED, that is integrated into the cuff of jacket **1402**.

Light source **1404** is configured to output light, and can be controlled by textile controller **204**. For example, textile controller **204** can control a color and/or a frequency of the light output by light source **1404** in order to provide feedback to the user or to indicate a variety of different notifications. For example, textile controller **204** can cause the light source to flash at a certain frequency to indicate a particular notification associated with computing device **106**, e.g., a phone call is being received, a text message or email message has been received, a timer has expired, and so forth. Additionally, textile controller **204** can cause the light source to flash with a particular color of light to provide feedback to the user that a particular gesture or input to interactive textile **102** has been recognized and/or that an associated functionality is activated based on the gesture.

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FIG. **15** illustrates implementation examples **1500** of interacting with an interactive textile and an output device in accordance with one or more implementations.

At **1502**, textile controller **204** causes a light source to flash at a specific frequency to indicate a notification that is received from computing device **106**, such as an incoming call or a text message.

At **1504**, the user places his hand over interactive textile **102** to cover the interactive textile. This “cover” gesture may be mapped to a variety of different functionalities. For example, this gesture may be used to silence a call or to accept a call. In response, the light source can be controlled to provide feedback that the gesture is recognized, such as by turning off when the call is silenced.

At **1506**, the user taps the touch sensor with a single finger to initiate a different functionality. For example, the user may be able to place one finger on the touch sensor to listen to a voicemail on computing device **106**. In this case, the light source can be controlled to provide feedback that the gesture is recognized, such as by outputting orange light when the voicemail begins to play.

Having discussed interactive textiles **102**, and how interactive textiles **102** detect touch-input, consider now a discussion of how interactive textiles **102** may be easily integrated within flexible objects **104**, such as clothing, handbags, fabric casings, hats, and so forth.

FIG. **16** illustrates various examples **1600** of interactive textiles integrated within flexible objects. Examples **1600** depict interactive textile **102** integrated in a hat **1602**, a shirt **1604**, and a handbag **1606**.

Interactive textile **102** is integrated within the bill of hat **1602** to enable the user to control various computing devices **106** by touching the bill of the user’s hat. For example, the user may be able to tap the bill of hat **1602** with a single finger at the position of interactive textile **102**, to answer an incoming call to the user’s smart phone, and to touch and hold the bill of hat **1602** with two fingers to end the call.

Interactive textile **102** is integrated within the sleeve of shirt **1604** to enable the user to control various computing devices **106** by touching the sleeve of the user’s shirt. For example, the user may be able to swipe to the left or to the right on the sleeve of shirt **1604** at the position of interactive textile **102** to play a previous or next song, respectively, on a stereo system of the user’s house.

In examples **1602** and **1604**, the grid of conductive thread **208** is depicted as being visible on the bill of the hat **1602** and on the sleeve of shirt **1604**. It is to be noted, however, that interactive textile **102** may be manufactured to be the same texture and color as object **104** so that interactive textile **102** is not noticeable on the object.

In some implementations, a patch of interactive textile **102** may be integrated within flexible objects **104** by sewing or gluing the patch of interactive textile **102** to flexible object **104**. For example, a patch of interactive textile **102** may be attached to the bill of hat **1602**, or to the sleeve of shirt **1604** by sewing or gluing the patch of interactive textile **102**, which includes the grid of conductive thread **208**, directly onto the bill of hat **1602** or the sleeve of shirt **1604**, respectively. Interactive textile **102** may then be coupled to textile controller **204** and power source **206**, as described above, to enable interactive textile **102** to sense touch-input.

In other implementations, conductive thread **208** of interactive textile **102** may be woven into flexible object **104** during the manufacturing of flexible object **104**. For example, conductive thread **208** of interactive textile **102** may be woven with non-conductive threads on the bill of hat

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1602 or the sleeve of a shirt 1604 during the manufacturing of hat 1602 or shirt 1604, respectively.

In one or more implementations, interactive textile 102 may be integrated with an image on flexible object 104. Different areas of the image may then be mapped to different areas of capacitive touch sensor 202 to enable a user to initiate different controls for computing device 106, or application 216 at computing device 106, by touching the different areas of the image. In FIG. 16, for example, interactive textile 102 is weaved with an image of a flower 1608 onto handbag 1606 using a weaving process such as jacquard weaving. The image of flower 1608 may provide visual guidance to the user such that the user knows where to touch the handbag in order to initiate various controls. For example, one petal of flower 1608 could be used to turn on and off the user's smart phone, another petal of flower 1608 could be used to cause the user's smart phone to ring to enable the user to find the smart phone when it is lost, and another petal of flower 1608 could be mapped to the user's car to enable the user to lock and unlock the car.

Similarly, in one or more implementations interactive textile 102 may be integrated with a three-dimensional object on flexible object 104. Different areas of the three-dimensional object may be mapped to different areas of capacitive touch sensor 202 to enable a user to initiate different controls for computing device 106, or application 216 at computing device 106, by touching the different areas of the three-dimensional object. For example, bumps or ridges can be created using a material such as velvet or corduroy and woven with interactive textile 102 onto object 104. In this way, the three-dimensional objects may provide visual and tactile guidance to the user to enable the user to initiate specific controls. A patch of interactive textile 102 may be weaved to form a variety of different 3D geometric shapes other than a square, such as a circle, a triangle, and so forth.

In various implementations, interactive textile 102 may be integrated within a hard object 104 using injection molding. Injection molding is a common process used to manufacture parts, and is ideal for producing high volumes of the same object. For example, injection molding may be used to create many things such as wire spools, packaging, bottle caps, automotive dashboards, pocket combs, some musical instruments (and parts of them), one-piece chairs and small tables, storage containers, mechanical parts (including gears), and most other plastic products available today.

Example Methods

FIGS. 17, 18, 19, and 20 illustrate an example method 1700 (FIG. 17) of generating touch data using an interactive textile, an example method 1800 (FIG. 18) of determining gestures usable to initiate functionality of a computing device, an example method 1900 (FIG. 19) of assigning a gesture to a functionality of a computing device, and an example method 2000 (FIG. 20) of initiating a functionality of a computing device based on a gesture and a context. These methods and other methods herein are shown as sets of blocks that specify operations performed but are not necessarily limited to the order or combinations shown for performing the operations by the respective blocks. In portions of the following discussion reference may be made to environment 100 of FIG. 1 and system 200 of FIG. 2, reference to which is made for example only. The techniques are not limited to performance by one entity or multiple entities operating on one device.

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FIG. 17 illustrates an example method 1700 of generating touch data using an interactive textile.

At 1702, touch-input to a grid of conductive thread woven into an interactive textile is detected. For example, textile controller 204 (FIG. 2) detects touch-input to the grid of conductive thread 208 woven into interactive textile 102 (FIG. 1) when an object, such as a user's finger, touches interactive textile 102.

Interactive textile 102 may be integrated within a flexible object, such as shirt 104-1, hat 104-2, or handbag 104-3. Alternately, interactive textile 102 may be integrated with a hard object, such as plastic cup 104-4 or smart phone casing 104-5.

At 1704, touch data is generated based on the touch-input. For example, textile controller 204 generates touch data based on the touch-input. The touch data may include a position of the touch-input on the grid of conductive thread 208.

As described throughout, the grid of conductive thread 208 may include horizontal conductive threads 208 and vertical conductive threads 208 positioned substantially orthogonal to the horizontal conductive threads. To detect the position of the touch-input, textile controller 204 can use self-capacitance sensing or projective capacitance sensing.

At 1706, the touch data is communicated to a computing device to control the computing device or one or more applications at the computing device. For example, network interface 210 at object 104 communicates the touch data generated by textile controller 204 to gesture manager 218 implemented at computing device 106. Gesture manager 218 and computing device 106 may be implemented at object 104, in which case interface may communicate the touch data to gesture manager 218 via a wired connection. Alternately, gesture manager 218 and computing device 106 may be implemented remote from interactive textile 102, in which case network interface 210 may communicate the touch data to gesture manager 218 via network 108.

FIG. 18 illustrates an example method 1800 of determining gestures usable to initiate functionality of a computing device in accordance with one or more implementations.

At 1802, touch data is received from an interactive textile. For example, network interface 222 (FIG. 2) at computing device 106 receives touch data from network interface 210 at interactive textile 102 that is communicated to gesture manager 218 at step 906 of FIG. 9.

At 1804, a gesture is determined based on the touch data. For example, gesture manager 218 determines a gesture based on the touch data, such as single-finger touch gesture 506, a double-tap gesture 516, a two-finger touch gesture 526, a swipe gesture 538, and so forth.

At 1806, a functionality is initiated based on the gesture. For example, gesture manager 218 generates a control based on the gesture to control an object 104, computing device 106, or an application 216 at computing device 106. For example, a swipe up gesture may be used to increase the volume on a television, turn on lights in the user's house, open the automatic garage door of the user's house, and so on.

FIG. 19 illustrates an example method 1900 of assigning a gesture to a functionality of a computing device in accordance with one or more implementations.

At 1902, touch data is received at a computing device from an interactive textile woven into an item of clothing worn by the user. For example, network interface 222 (FIG. 2) at computing device 106 receives touch data from net-

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work interface **210** at interactive textile **102** that is woven into an item of clothing worn by a user, such as a jacket, shirt, hat, and so forth.

At **1904**, the touch data is analyzed to identify a gesture. For example, gesture manager **218** analyzes the touch data to identify a gesture, such as a touch, tap, swipe, hold, or gesture stroke.

At **1906**, user input to assign the gesture to a functionality of the computing device is received. For example, gesture manager **218** receives user input to assign function user interface **1112** to assign the gesture created at step **1904** to a functionality of computing device **106**.

At **1908**, the gesture is assigned to the functionality of the computing device. For example, gesture manager **218** assigns the functionality selected at step **1906** to the gesture created at step **1904**.

FIG. **20** illustrates an example method **2000** of initiating a functionality of a computing device based on a gesture and a context in accordance with one or more implementations.

At **2002**, a context associated with a computing device or a user of the computing device is determined. For example, gesture manager **218** determines a context associated with computing device **106** or a user of computing device **106**.

At **2004**, touch data is received at the computing device from an interactive textile woven into a clothing item worn by the user. For example, touch data is received at computing device **106** from interactive textile **102** woven into a clothing item worn by the user, such as jacket, shirt, or hat.

At **2006**, the touch data is analyzed to identify a gesture. For example, gesture manager **218** analyzes the touch data to identify a gesture, such as a touch, tap, swipe, hold, stroke, and so forth.

At **2008**, a functionality is activated based on the gesture and the context. For example, gesture manager **218** activates a functionality based on the gesture identified at step **2006** and the context determined at step **2002**.

The preceding discussion describes methods relating to gestures for interactive textiles. Aspects of these methods may be implemented in hardware (e.g., fixed logic circuitry), firmware, software, manual processing, or any combination thereof. These techniques may be embodied on one or more of the entities shown in FIGS. **1-16** and **21** (computing system **2100** is described in FIG. **21** below), which may be further divided, combined, and so on. Thus, these figures illustrate some of the many possible systems or apparatuses capable of employing the described techniques. The entities of these figures generally represent software, firmware, hardware, whole devices or networks, or a combination thereof.

Example Computing System

FIG. **21** illustrates various components of an example computing system **2100** that can be implemented as any type of client, server, and/or computing device as described with reference to the previous FIGS. **1-20** to implement two-layer interactive textiles. In embodiments, computing system **2100** can be implemented as one or a combination of a wired and/or wireless wearable device, System-on-Chip (SoC), and/or as another type of device or portion thereof. Computing system **2100** may also be associated with a user (e.g., a person) and/or an entity that operates the device such that a device describes logical devices that include users, software, firmware, and/or a combination of devices.

Computing system **2100** includes communication devices **2102** that enable wired and/or wireless communication of device data **2104** (e.g., received data, data that is being

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received, data scheduled for broadcast, data packets of the data, etc.). Device data **2104** or other device content can include configuration settings of the device, media content stored on the device, and/or information associated with a user of the device. Media content stored on computing system **2100** can include any type of audio, video, and/or image data. Computing system **2100** includes one or more data inputs **2106** via which any type of data, media content, and/or inputs can be received, such as human utterances, touch data generated by interactive textile **102**, user-selectable inputs (explicit or implicit), messages, music, television media content, recorded video content, and any other type of audio, video, and/or image data received from any content and/or data source.

Computing system **2100** also includes communication interfaces **2108**, which can be implemented as any one or more of a serial and/or parallel interface, a wireless interface, any type of network interface, a modem, and as any other type of communication interface. Communication interfaces **2108** provide a connection and/or communication links between computing system **2100** and a communication network by which other electronic, computing, and communication devices communicate data with computing system **2100**.

Computing system **2100** includes one or more processors **2110** (e.g., any of microprocessors, controllers, and the like), which process various computer-executable instructions to control the operation of computing system **2100** and to enable techniques for, or in which can be embodied, interactive textiles. Alternatively or in addition, computing system **2100** can be implemented with any one or combination of hardware, firmware, or fixed logic circuitry that is implemented in connection with processing and control circuits which are generally identified at **2112**. Although not shown, computing system **2100** can include a system bus or data transfer system that couples the various components within the device. A system bus can include any one or combination of different bus structures, such as a memory bus or memory controller, a peripheral bus, a universal serial bus, and/or a processor or local bus that utilizes any of a variety of bus architectures.

Computing system **2100** also includes computer-readable media **2114**, such as one or more memory devices that enable persistent and/or non-transitory data storage (i.e., in contrast to mere signal transmission), examples of which include random access memory (RAM), non-volatile memory (e.g., any one or more of a read-only memory (ROM), flash memory, EPROM, EEPROM, etc.), and a disk storage device. A disk storage device may be implemented as any type of magnetic or optical storage device, such as a hard disk drive, a recordable and/or rewriteable compact disc (CD), any type of a digital versatile disc (DVD), and the like. Computing system **2100** can also include a mass storage media device **2116**.

Computer-readable media **2114** provides data storage mechanisms to store device data **2104**, as well as various device applications **2118** and any other types of information and/or data related to operational aspects of computing system **2100**. For example, an operating system **2120** can be maintained as a computer application with computer-readable media **2114** and executed on processors **2110**. Device applications **2118** may include a device manager, such as any form of a control application, software application, signal-processing and control module, code that is native to a particular device, a hardware abstraction layer for a particular device, and so on.

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Device applications **2118** also include any system components, engines, or managers to implement interactive textiles. In this example, device applications **2118** include gesture manager **218**.

CONCLUSION

Although embodiments of techniques using, and objects including, two-layer interactive textiles have been described in language specific to features and/or methods, it is to be understood that the subject of the appended claims is not necessarily limited to the specific features or methods described. Rather, the specific features and methods are disclosed as example implementations of two-layer interactive textiles.

What is claimed is:

1. An interactive textile configured to be integrated within a flexible object, the interactive textile comprising:

a top textile layer comprising first conductive threads woven into the top textile layer;

a bottom textile layer comprising second conductive threads woven into the bottom textile layer, the bottom textile layer coupled to the first textile layer effective to cause the first conductive threads and the second conductive threads to form a capacitive touch sensor having a grid of crossing conductive threads, at least two adjacent conductive threads of the second conductive threads in the bottom textile layer having a pitch that varies based on a weaving between the bottom textile layer and the top textile layer; and

a textile controller coupled to the capacitive touch sensor, the textile controller configured to detect a position of a touch-input to the grid of conductive threads when an object touches the grid of conductive threads, and process the position of the touch-input to provide touch data usable to control a computing device wirelessly coupled to the interactive textile.

2. The interactive textile as recited in claim **1**, wherein the textile controller is coupled to the capacitive touch sensor via the second conductive threads of the bottom textile layer.

3. The interactive textile as recited in claim **1**, wherein the first conductive threads woven into the top textile layer are positioned substantially orthogonal to the second conductive threads woven into the second textile layer to form the grid of conductive threads.

4. The interactive textile as recited in claim **1**, wherein the second conductive threads are partially woven into the second textile layer.

5. The interactive textile as recited in claim **1**, wherein the first textile layer and the second textile layer are combined using a 3D-weaving process.

6. The interactive textile as recited in claim **1**, wherein the flexible object comprises a clothing item.

7. The interactive textile as recited in claim **6**, wherein the first textile layer comprises an outside surface of the clothing item.

8. The interactive textile as recited in claim **1**, wherein the second textile layer comprises a standardized structure of second conductive threads.

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9. The interactive textile as recited in claim **1**, wherein the first and second conductive threads each comprise a conductive wire that is twisted, wrapped, or braided with one or more flexible threads.

10. The interactive textile as recited in claim **9**, wherein the conductive wire comprises a copper wire, a gold wire, or a silver wire.

11. A flexible object comprising:

an interactive textile integrated within the flexible object, the interactive textile comprising a top textile layer coupled to a bottom textile layer, the top textile layer comprising first conductive threads woven into the top textile layer and the bottom textile layer comprising second conductive threads woven into the bottom textile layer, the first conductive threads and the second conductive threads forming a grid of conductive threads, a pitch between at least two adjacent conductive threads of the second conductive threads being varied based on a weaving between the bottom textile layer and the top textile layer; and

a textile controller coupled to the interactive textile, the textile controller configured to detect a position of a touch-input to the grid of conductive threads, and process the position of the touch-input to provide touch data usable to initiate functionality of a computing device wirelessly coupled to the interactive textile.

12. The flexible object as recited in claim **11**, wherein the textile controller is coupled to the interactive textile via the second conductive threads of the bottom textile layer.

13. The flexible object as recited in claim **11**, wherein the flexible object comprises a clothing item.

14. The flexible object as recited in claim **11**, wherein the second conductive threads and the textile controller are not visible when the clothing item is worn by a user.

15. The flexible object as recited in claim **11**, wherein the first textile layer and the second textile layer are combined using a 3D-weaving process.

16. The flexible object as recited in claim **11**, wherein: the second conductive threads are partially woven into the second textile layer.

17. The flexible object as recited in claim **11**, wherein the textile controller is configured to detect the position of the touch-input to the grid of conductive threads based on a change in capacitance of one or more touched conductive threads in the grid of conductive threads.

18. The flexible object as recited in claim **17**, wherein the change in capacitance is used to identify a presence of an object that touches the one or more touched conductive threads.

19. The flexible object as recited in claim **17**, wherein the textile controller is configured to detect the position of the touch-input to the grid of conductive threads as X, Y coordinates on the grid of conductive thread.

20. The flexible object as recited in claim **11**, wherein the second conductive threads include a first subset of conductive threads in a first direction and a second subset of threads in a second direction that is different than the first direction, the first subset of conductive threads being charged and the second subset of conductive threads implemented as a virtual ground by not being charged.

* * * * *

Inside The Design Of Google's First Smart Jacket

Google's futuristic Project Jacquard is making its commercial debut—as a jean jacket.

JOHN BROWNLEE 05.23.16 1:00 PM

Last year, Google announced Project Jacquard: an intriguing plan to turn all of your clothes into touchscreen controllers, partnering with Levi's to incorporate the technology into its denim products.

Now, a year later, and Levi's and Google have announced the first retail garment with Project Jacquard inside: the Levi's Commuter x Jacquard, a trucker jacket with a multitouch sleeve that lets you control your Android smartphone—without ever pulling it out of your pocket.



WHY A JACKET?

During an ATAP presentation at Google I/O on Friday, interaction designer Ivan Poupyrev and Levi's VP of Innovation, Paul Dillinger, took the stage to show off what the Commuter x Jacquard could do. The jacket has a patch on the sleeve that serves as the interface between you and your phone. It's aimed primarily at bike commuters; a cyclist riding down the street could tap the sleeve of their jacket to get an ETA on how long it will take for them to reach work, swipe the cuff to cycle songs on Spotify, double tap to accept an incoming call, or triple tap to dismiss it.

Last year when I spoke to Poupyrev and Dillinger about the Jacquard-Levi's partnership, both spoke in loose terms about what they intended to do—except to say that Google had chosen Levi's as an initial partner for Jacquard because "if you can make Jacquard work with denim, you can do it with anything." This is because denim goes through a notoriously tortuous manufacturing process, which involves the material being literally blasted with fire at one stage. So the first question I asked them this year was why they decided to make a jacket—instead of a pair of jeans or some other product.

There aren't many garments that we find personally or socially acceptable to wear more than half of our waking lives without changing.

The decision to make a jacket, says Dillinger, ultimately came from a desire to make a garment which was useful all the time. "How many jeans do you have in your closet, compared to how many jackets?" he asks. "In our research, we discovered that 70% of our customers have at least one jacket they wear more than three days a week." He points out that there aren't many garments that we find personally or socially acceptable to wear more than half of our waking lives without changing.

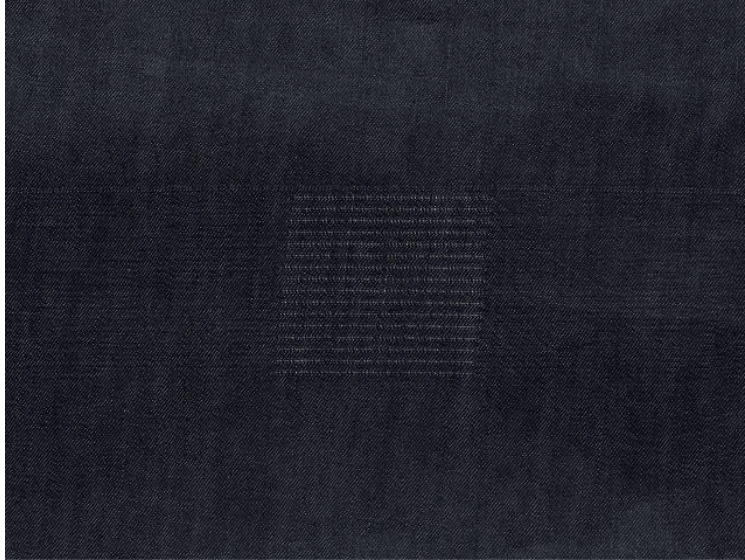
DEVELOPING UX STANDARDS FOR FASHION

So in appearance, the Levi's Commuter x Jacquard is a fairly standard denim trucker jacket, with Project Jacquard woven into the wrist. The controller, which connects via Bluetooth to your smartphone, is a flexible rubber dongle. But it doesn't look like one: it looks like a cuff. It connects to the Project Jacquard patch by snapping on like a button near the sleeve, then wrapping around the cuff, like the fabric loop attached to the buttons on the cuff of a classic trench coat. "We wanted the controller to function within the existing vocabulary of fashion," Dillinger tells me. The controller plugs into a standard USB port to juice, and can go days without a charge.

Another way in which Jacquard has been adapted to fit within the existing vocabulary of denim is the way the touch panel is woven into the garment. Poupyrev says that one of the UX problems they've wrestled with in Jacquard is how visible to make the touch panel. Make it too prominent, and it distracts from the integrity of a garment; make it invisible, and users don't know where to touch. In the case of the jacket, Levi's and Google came up with a beautiful compromise that makes the Jacquard panel visible but is still authentic to the way denim is made. In denim manufacturing, there's a natural weaving flaw called a missed pick in the weft, which represents itself as a visible seam in the material: a dark line, representing a literal gap where a line of thread is missing in the piece of cloth. It's totally natural, and since it's a problem that mostly happens on denim that is hand woven on older machines, missed picks are strongly associated with vintage denim.

Instead of looking high-tech, the Jacquard patch on the jacket looks charmingly imperfect, and desirably bespoke.

With the Commuter jacket, Levi's integrated Jacquard by weaving the conductive threads of the technology into a grid of purposely missed weft picks. So, instead of looking high-tech, the Jacquard patch on the jacket looks charmingly imperfect, and desirably bespoke. "I'm just amazed at the poetry of that solution," says Poupyrev. By introducing this weaving error on purpose, Levi's gave the Commuter jacket an authenticity amongst denim lovers that it might otherwise have lacked.



Eventually, says Poupyrev, Google wants to find ways to work with other garment makers to integrate Jacquard into products. "The whole point of Jacquard is to work within the confines of existing production techniques to make fabric smarter," he says. "So the trick for every kind of material is to find an implementation of Jacquard that does not feel like an imposition upon [each fabric or garment] maker's craft." So whether Jacquard comes to men's suits, silk scarves, Victoria's Secret bras, or high-tech Speedos next, it needs to do so in a way that feels authentic to the material.

In the meantime, Project Jacquard will be exclusive to the Levi's Commuter x Jacquard. It will launch in beta in autumn this year, and start shipping in 2017—at a price that Levi's says shouldn't prompt consumers used to purchasing high-performance denim jackets to run screaming for the hills.

All Images: courtesy Levi's Commuter x Jacquard

<http://www.fastcodesign.com/3060133/inside-the-design-of-googles-first-smart-jacket>

Here's Why Google and Levi's Are Working Together to Make a Jean Jacket

The leaders of Google's Project Jacquard and Levi's product innovation discuss why they think a jean jacket will make you covet smart clothes.

by [Rachel Metz](#)

May 26, 2016

[Ivan Poupyrev](#) and [Paul Dillinger](#) come from very different worlds: Poupyrev, a technical program lead for Google's Advanced Technologies and Projects (ATAP) unit, has spent years working on user-interface design and interactive technology, while Dillinger, the head of global product innovation for Levi Strauss & Co., has immersed himself in fashion.

These worlds collided more than a year ago, though, when Levi's agreed to work with Google on [Project Jacquard](#), an interactive fabric project that Poupyrev heads. It aims to create conductive textiles that can be manufactured like regular fabrics and woven into everything from shirts to teddy bears. The idea is that you'll then be able to [swipe and tap](#) the fabric to do things like control music or get directions.

Right now, Poupyrev and Dillinger are gearing up to roll out the first Jacquard-enabled consumer product that will do these things in 2017: a jean jacket aimed at cycling commuters with conductive thread woven into one arm that connects to a removable, flexible electronic tag (the tag comes off so you can charge its battery and wash the jacket).



Poupyrev and Dillinger spoke with *MIT Technology Review* last week about how they decided on what to bring to market first, the difficulties of building interactivity into different kinds of fabrics, and when we might see a Project Jacquard couch.

How did you decide to make a jacket as the first consumer product for Project Jacquard? And what was that design process like?

Dillinger: When we started talking to consumers we found there's a big group of people that had one jacket that was their go-to functional jacket that they would wear like three times a week or more. And they wore it that often because it had some utility, value. We wanted this thing to have value, we wanted people to use it often, and the best place to get that frequent use was going to be a piece of outerwear.



Paul Dillinger, Levi's head of global product innovation, is working with Project Jacquard to create a smart jacket that you can swipe and tap to do things like control music.

There are also certain technical constraints. You launder your jackets less frequently than you launder your [jeans]. This was before we had all the confidence about the washability, this was when we were anticipating having to be a little more careful with it—what's that one garment that isn't going to go in the washing machine as often?

[And making] a commuter jacket made the needs even more explicit. When you're on your bike, it's about safety, awareness, focus. And that need started to inform the function that we saw as a potential value of this integrated woven tactile interface.

Lots of people have been working on smart fabrics, smart clothing for years. Nobody has been able to make it mainstream. Why do you think Google can do this with Project Jacquard?

Poupyrev: Instead of trying to take something from Levi's and add our something as an add-on and sell it, we're actually trying to integrate our technology into the supply chain, the manufacturing chain of the garment industry. So we don't want to make our own garments. That was the biggest decision made by our team, by me, pretty much, from the very beginning, these

fundamental things: we will not make our garments, we will empower industry to make their garments. And the industry is gigantic.

Dillinger: Where there's a chance for success here where there hadn't been in the past has to do with the configuration of the decision-making process. The people inventing the technology are not the people saying yes to using the technology. In this case, the invention of the technology was done by Google ... and it was up to us to say, "That we can do it doesn't mean that we should do it."

What are some big differences between how textiles are made versus consumer electronics that Google has had to adjust to?



Ivan Poupyrev, leader of Google's Project Jacquard, is trying to make smart fabric that can be easily manufactured.

Poupyrev: The supply chain and delivery of the goods is completely different. The way we think about shipping is completely different. In the consumer electronics industry, everything is identical. Here, you take different samples of denim—the color, weave, structure are slightly different.

The factory that's making the conductive yarn is also a little different from what you'd typically encounter in consumer electronics, right?

Poupyrev: There's a small factory that's been there for 50 years in the mountains of Japan. The guy [who runs it], he's like 80 years old. He doesn't know how to use e-mail. He doesn't know how to use a mobile phone. He refuses to accept any phone calls. He only uses fax.

I don't remember [the output of yarn] exactly but it's something like a meter every second or maybe every two seconds they're able to produce. If you look at the [consumer electronics] production line, you have a phone coming out every two seconds from the production line. And we have, like, a piece of yarn. Like, alright, we're talking about different scales here.

What are some major remaining issues for making interactive fabrics producible and usable on a mass scale?

Poupyrev: I think the big issue right now is we resolved this for cotton. The reality is that the variety of fabrics out there is just incredible, and all of them have a different manufacturing process. Not only different manufacturing processes, but the factories that provide them are specialized. The factory that makes denim only makes denim, a cotton-based fabric. They don't do silk, they don't do polyester, they don't do synthetic fabrics ... they don't do wool, they don't do, like, fine organza stuff. That's a completely different factory. Now we think, "Okay, how are we going to scale that into wool, how are we going to scale that into synthetic fibers which are used by companies like Patagonia or North Face?"

Beyond clothing, lots of things rely on fabric—like chairs and toys, for instance. Where else might Jacquard fabric show up over the next year or two?

Poupyrev: Textiles is one of those materials that's ubiquitous. So absolutely, we want to go further, we want to expand, we look at this as a platform. But we need to focus. We need to start with something and I think clothing and apparel is exciting. People get excited about it, people love it. There's a lot of clothing being made. Fashion is awesome. We think we need to get it solved for the garment. If we solve for the garment, we can solve for the couches and for the cars and for the airplanes and seats or whatever textiles.



Google and Levi's smart jacket gets a small but useful update

The Jacquard team is slowly exploring the best uses for connected clothing.

May 14, 2018

Three years ago, when Google and Levi's [announced their smart jacket](#), the tech industry's obsession with [wearables was at its peak](#). Fitness trackers and smartwatches were proliferating, while every other day a [new item of clothing](#) was getting [the connected treatment](#). At the time (and even today), the [Levi's Commuter Trucker jacket](#) had a refreshingly simple premise. It's a garment targeted at cyclists (or, y'know, jean-jacket wearers) who can [shell out \\$350](#) to avoid repeatedly whipping out their phone while traveling. It has touch-sensitive fibers woven into the cuff so you can swipe or tap on your wrist to carry out quick tasks thanks to Google's Jacquard technology. Jacquard's not here to track your fitness or run your life -- it just wants to make your commute a bit easier.

Because of that, the first iteration focused on a relatively narrow set of applications -- you could tap or swipe on the left cuff to control your music, have your incoming messages read out to you or find out where to make your next turn. A Bluetooth dongle tucked away in the sleeve talks to your phone to make all this happen, and is so unintrusive that I often forget it's there. Since launching Jacquard, Google's added some small updates, letting you find your phone or make the Bluetooth dongle light up. But nothing superexciting.

Now it's getting an update that brings a few more useful features. With the rollout of Jacquard 1.2 this week, you can bookmark places you pass in the app and get alerts when your Lyft or Uber are arriving. If you own a pair of Bose QuietComfort 30 or 35 headphones, you can use your jacket to toggle noise-cancellation. These changes aren't groundbreaking, but they are useful in specific scenarios.

I definitely appreciated knowing when my ride was arriving without having to stare at my phone. The jacket vibrated when my taxi was on the same block, giving me ample time to go outside. Swiping on my cuff while the tag was vibrating also made my phone read out the car's model, color and license plate number, which eliminated my need to take out my phone altogether.

I set my sleeve to bookmark my location when I brushed outwards from my wrist towards my fingers, and went about saving places like sample sale popups and restaurants I wanted to check out. For people who like exploring their cities, this is also a useful addition.

The new updates work, as do the other existing features, as long as your jacket remains linked to your phone. But the connection between the Bluetooth tag and my Pixel 2 frequently dropped out, rendering the garment useless. Curiously enough, this was much less of a problem when I wore the jacket in San Francisco for a week -- it remained linked to my phone as long as it was within range. When the smart jacket (smarket?) (*ed note: No.*) does perform as it's supposed to though, it almost feels like magic, I really appreciate the convenience it adds. When the tag vibrated, indicating I had an incoming message, I swiped on the sleeve and my phone read out what my friend texted me. Little touches like this added to the endgame of not having to take your handset out while you're on the go (if you don't want to) any longer, which frankly, would be ideal.

At \$350, the Commuter jacket isn't cheap and is at least twice the price of [the "dumb" garment it's based on](#). But it's a high-quality, durable piece of clothing that's stylish enough to match most outfits.

I'm more intrigued by what Google might come up with in the future. Jacquard isn't meant to exist solely in jacket sleeves. Project lead Ivan Poupyrev told Engadget that he would like to see the platform become "a zipper or a button -- part of apparel that any company can buy and integrate themselves at some point."

Even as his team continues to discover what makes the most sense for Jacquard and push through more functions in updates to come, Poupyrev isn't going to take things too seriously. "Things are going to be whimsical, funny and interesting," and to prove his point he highlighted the ability to make the tag light up for no real reason. For now, it has a limited audience, but the Jacquard platform holds plenty of promise, especially as [Google continues](#), bit by bit, to explore ways to make it truly useful.

Vogue Meets Levi's Historian, Tracey Panek

vogue.co.uk/news/2016/07/25/tracey-panek-levis-historian-interview

25 July 2016

Katie Berrington

Ahead of Levi's inclusion in the V&A's *You Say You Want a Revolution? Rebels & Records 1966 - 1970* exhibition this autumn, *Vogue* meets the brand's historian, Tracey Panek, to talk about Levi's historical influence, her favourite archive items and the stories behind some of the brand's most iconic pieces.

Tracey Panek

Picture credit: Twitter/TraceyPanek

What's it been like to work with the V&A?

It's really exciting! The V&A is one of my favorite museums and it's been a real pleasure working with them. I toured their conservation area earlier this week and was struck by the similarities. At the Levi Strauss & Co. archives in San Francisco, we even use the same type of boxes to store our and conserve our vintage garments as the V&A.



I think one of the things that sets this partnership apart is how authentic it feels for both partners. The Sixties were not only a defining moment in popular culture but also a period when LS&Co. was at the forefront of the generational and social zeitgeist. One of the V&A's curators came to visit us in San Francisco last year and, together, we picked Levi's pieces that could best showcase the themes in the exhibition, which was great. We'll be featuring a pair of our iconic 501 jeans, a Fifties leather jacket (the ultimate "rebel wear" piece) and an amazing pair of customised 505 jeans. The colours on the 505 from the patches and embellishments will really knock people out. We're also including a pair of bellbottoms and Super Slim jeans from our Orange Tab line that was first introduced in 1969.

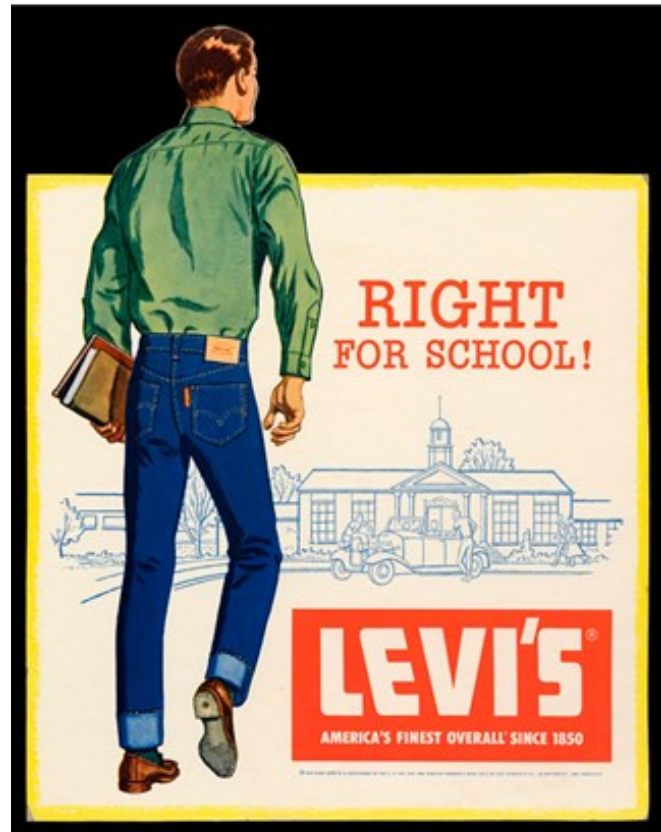
What defines that period - the late Sixties - in fashion to you?

Fashion can be a key indicator of time and culture. The late Sixties and early Seventies were an explosive time, symbolised by a rising youth culture experimenting with music, drugs, counter-culture ideals and political activism. These happenings influenced fashion, with dress becoming a personal expression of one's philosophies and individuality. Colour, customisation and thrift-shop chic were among the distinctive elements of style and blue jeans and denim became a canvas for such personal expression.

The introduction of Levi's 505 jeans in 1967 fit seamlessly into this era and was quickly adopted by many teenagers, hippies and rock-and-rollers. A classic straight leg jean in pre-shrunk denim with a zipper, rather than a button fly, the slim-fitting 505 became the unofficial uniform for many trailblazers and musicians who came to define the era. From rockers like the Rolling Stones who used the jeans' zipper fly on the cover of *Sticky Fingers* to punk bands like the Ramones, the "coming of age" 505 jean became a staple for later rock stars like Debbie Harry.

What influence do you think Levi's had on that era and vice versa?

The association of Levi's jeans with youth culture, music and individual style flourished in the Sixties. The late Sixties and early Seventies were an incredibly rich cultural period - where youth led a change in the social-political-cultural zeitgeist. Peace marches, the desire for sexual freedom, student protests and an explosion of music left a lasting influence on today's society, with Levi's interwoven into the fabric of that time. With our headquarters set in San Francisco, an epicenter of that cultural change, Levi's garments naturally became integrated into the social fabric of the era.



Do you own any vintage pieces from that era that you love?

I've been a life-long fan of Levi's jeans and wore 501 jeans throughout high school. The 501 was the world's first blue jean and the blueprint for all jeans today. They are a classic and were a must-have item for my three sisters and I during school. I wished I had saved those jeans when I left home for college!

What's your personal favourite period of time in terms of fashion and why?

I'm a product of fashion in the Eighties when I was in high school. I wore shrink-to-fit Levi's 501s and borrowed a skinny black silk tie from my dad - something he wore in the Fifties. The tie reminds me of one I saw at the Rock and Roll Hall of Fame owned by Buddy Holly. He wore it with a black suit and it's typical of the time. My 501s, dad's tie and a red pullover sweater was a favorite outfit from that time. I was just starting to develop my own sense of style back then.



Can you tell us more about your role as the Levi Strauss historian?

I feel incredibly fortunate that I'm able to apply my passion for history at work every day. As the historian for Levi Strauss & Co., I work closely with executives, employees and the public to understand, interpret and share the heritage of the brand. I also manage the archives and work closely with our design team studying historic items from the collection to use as inspiration for future products. On top of that, I'm always on the lookout for new additions to the archives and am regularly searching and asking questions to gain a deeper understanding of how LS&Co. fits into larger scope of history.

What elements of the role do you particularly enjoy?

I love hearing stories from Levi's fans! The stories range from one of a man I met in Moscow whose father bought Levi's jeans on the black market during the Cold War and a woman in India who just starting wearing our women's 711 skinny jean, to the story of Barbara, an 80-plus-year-old woman from Los Angeles who found our famous Calico 1890 waist overalls in a mine in the Mojave Desert as a teenager in the Forties.

What, in your opinion, is the most interesting/surprising thing about the history of the brand?

I've been pleasantly surprised by the interconnections of the Levi's brand with key cultural moments in history. This happened to me while I was visiting London. I learned that a Levi Strauss & Co. leather jacket worn by Albert Einstein was going to be up for auction. I went to Christie's Auction House to see it and ended being the successful bidder.

Einstein bought the jacket sometime in the mid-Thirties when he was preparing for naturalisation - a fitting symbol of his journey to becoming an "official American" by purchasing an iconic American brand. Einstein was famously photographed in the Levi's jacket throughout the period and appeared in it on the cover of *Time* magazine in 1938.

In a surprising coming together of Einstein and the Levi's brand, *Time* magazine named Einstein Man of the Century in 1999 when his photo was again featured on the cover. In the same issue, Levi's 501 jeans were named the Fashion Item of the 20th Century.



What are your favourite items from the archive?

I'm naturally drawn to the oldest pieces in the collection and especially those with an interesting story. The 1890 Calico waist overalls, the early name for blue jeans, is a favourite. I met [Barbara] who found the pants as a teenager. Today, in her eighties, she's still a spunky woman. She wore the found jeans to high school until she discovered how old they were from a pocket bag inscription and donated them to LS&Co.

Along with Calico, my favourites list continues to grow. The Einstein jacket is definitely going on that list. It still retains the scent of Einstein's pipe smoke!

You Say You Want a Revolution? Rebels & Records 1966 - 1970 opens at the V&A on September 10.



(12) **United States Patent**
Martin et al.

(10) **Patent No.:** **US 9,624,608 B2**
(45) **Date of Patent:** **Apr. 18, 2017**

(54) **ARCHITECTURALLY REINFORCED DENIM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 791 days.

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Related U.S. Application Data

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- D03D 13/00** (2006.01)
- D03D 15/00** (2006.01)
- B32B 5/06** (2006.01)
- D03D 15/08** (2006.01)
- D03D 1/00** (2006.01)
- A41D 31/00** (2006.01)

(52) **U.S. Cl.**

- CPC **D03D 13/004** (2013.01); **B32B 5/06** (2013.01); **D03D 13/00** (2013.01); **D03D 15/08** (2013.01); **A41D 31/0055** (2013.01); **D03D 1/0035** (2013.01); **D10B 2201/02** (2013.01); **D10B 2331/021** (2013.01); **D10B 2401/02** (2013.01); **D10B 2401/063** (2013.01); **D10B 2501/04** (2013.01); **Y10T 442/3179** (2015.04)

(58) **Field of Classification Search**

CPC .. D03D 1/0041; D03D 15/00; A41D 31/0011;
D02G 3/02; D02G 3/04; D02G 3/047;
D02G 3/442

See application file for complete search history.

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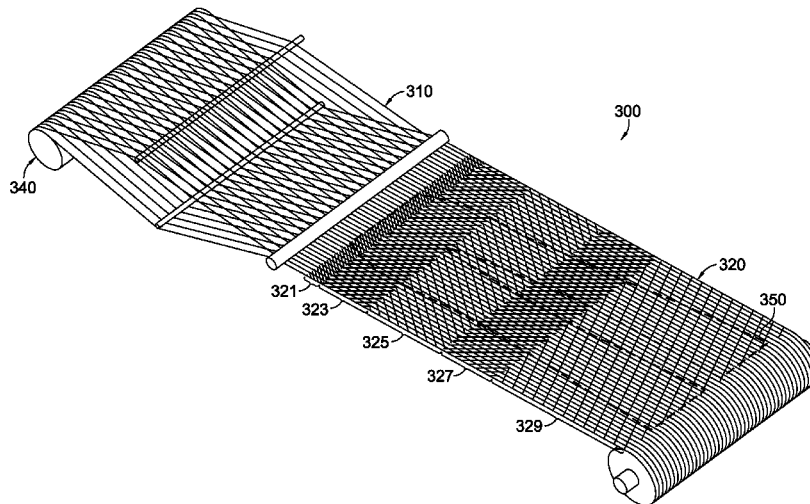
Primary Examiner — Jenna Johnson

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(57) **ABSTRACT**

A denim fabric with high tenacity and/or moisture management and/or stretch materials is provided. Proportions of materials in the denim fabric may vary during the weave of the fabric to create different performance zones in the resulting garment with or without assembling different fabric pieces.

16 Claims, 5 Drawing Sheets



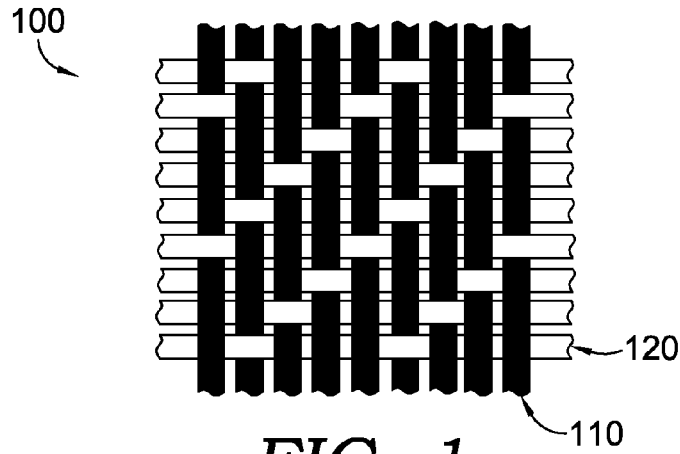


FIG. 1.

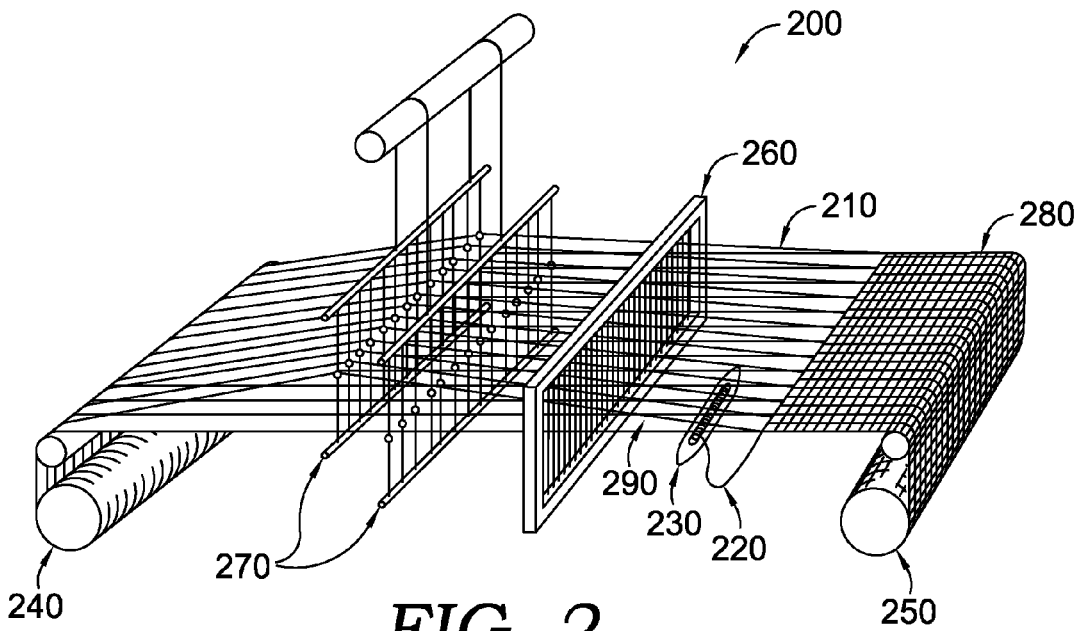


FIG. 2.

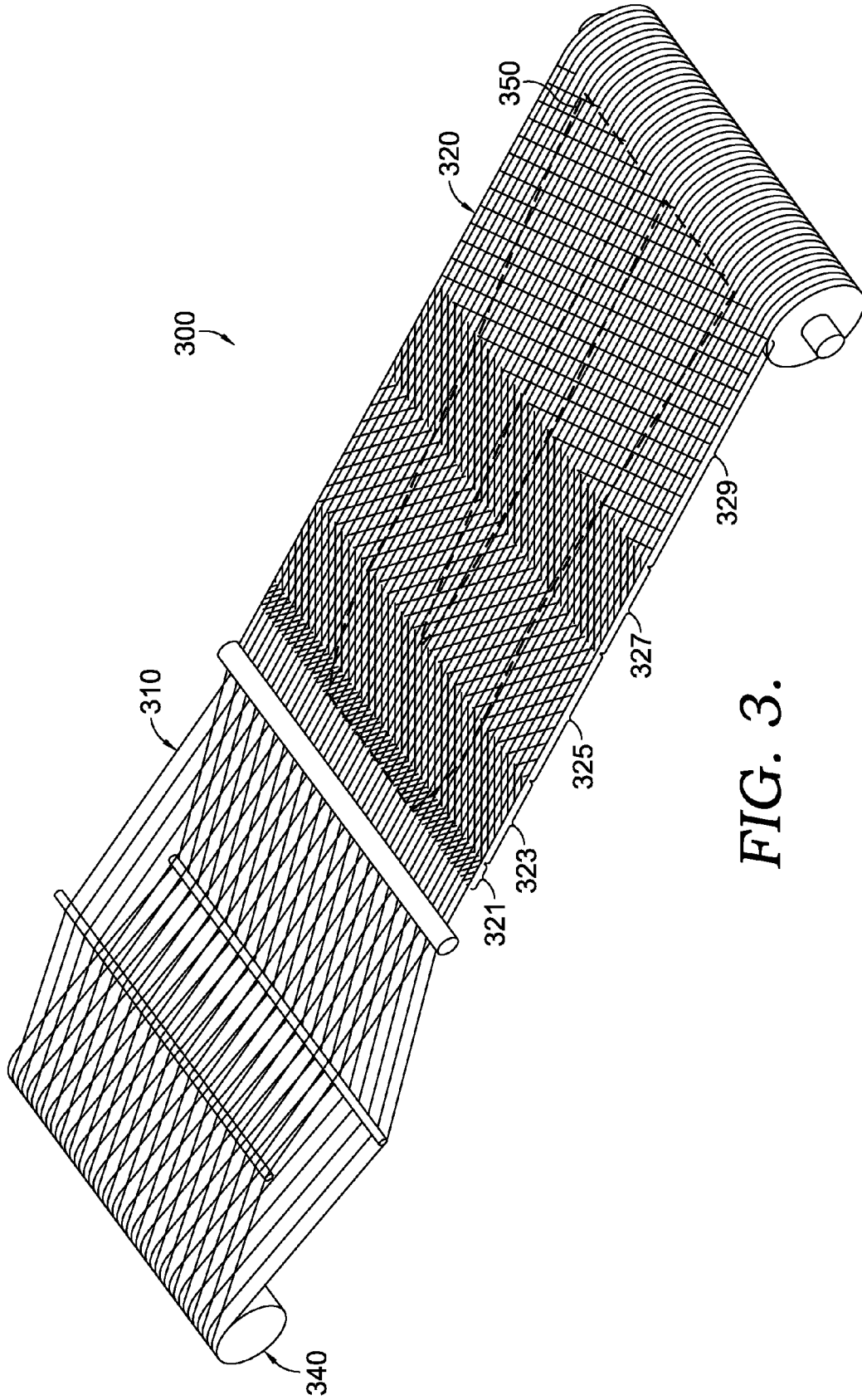


FIG. 3.

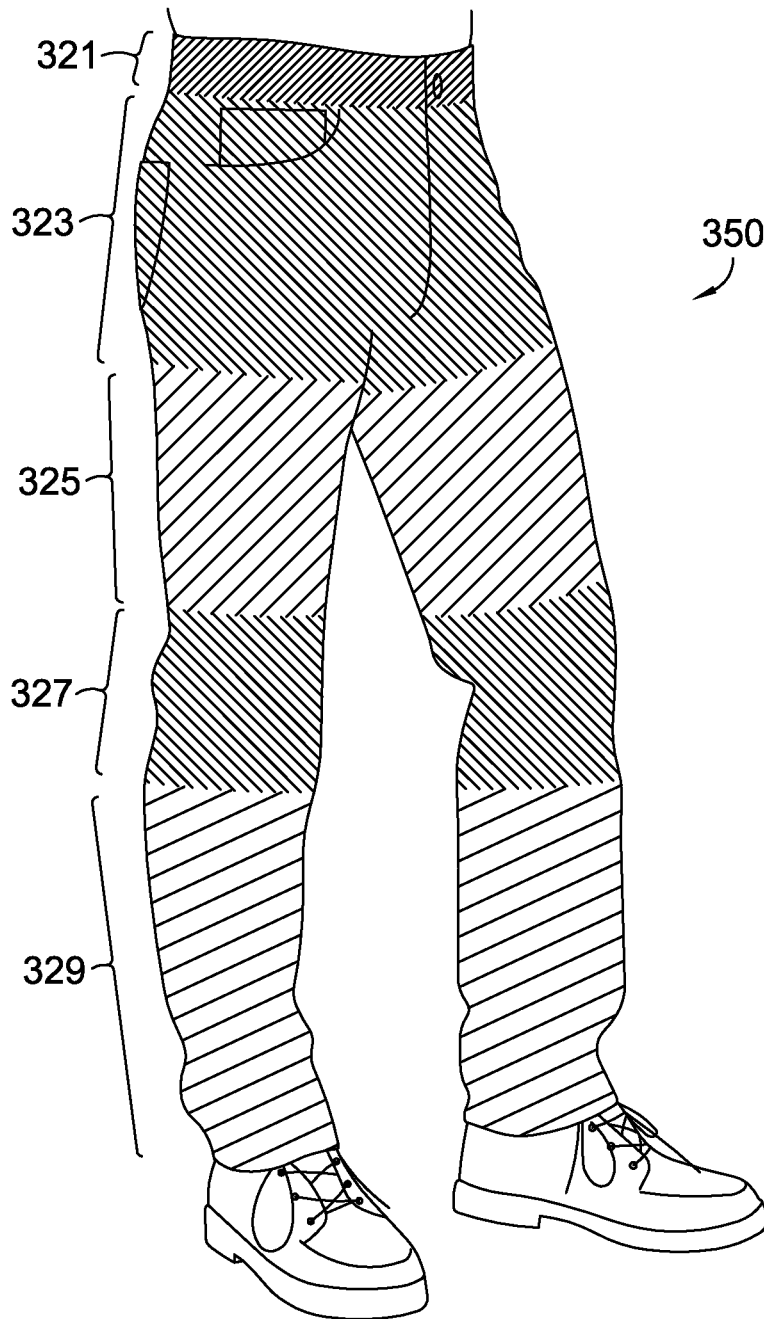
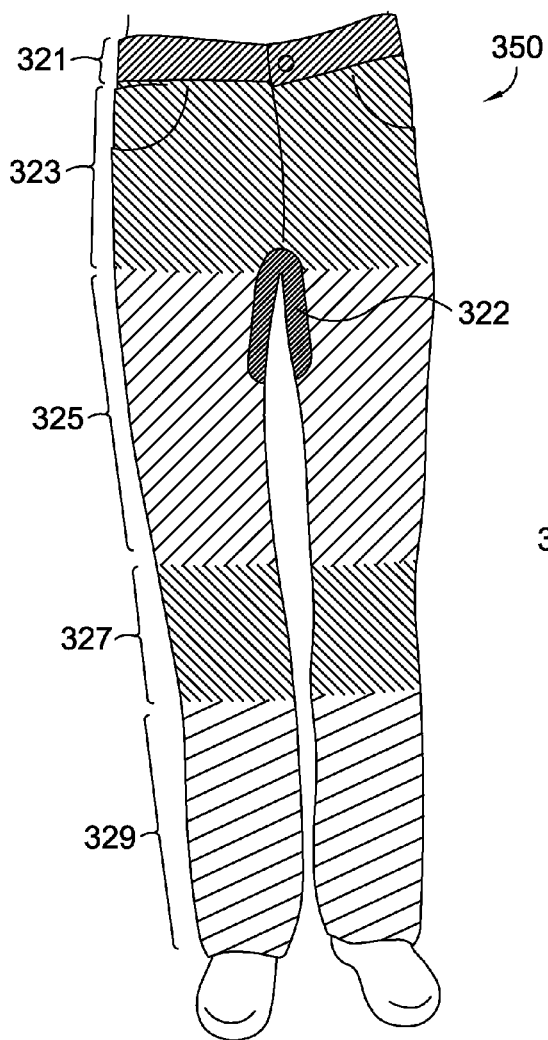
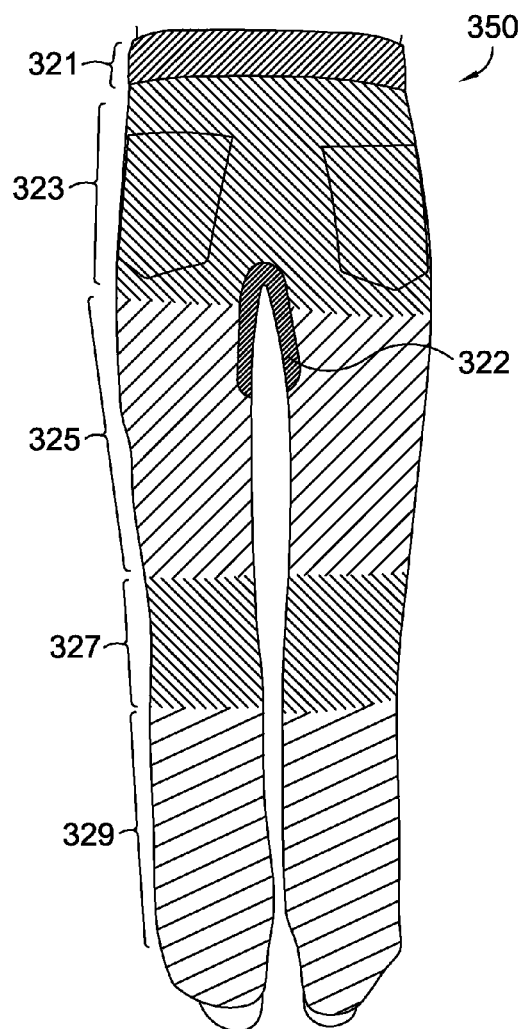


FIG. 4.

**FIG. 5A.****FIG. 5B.**

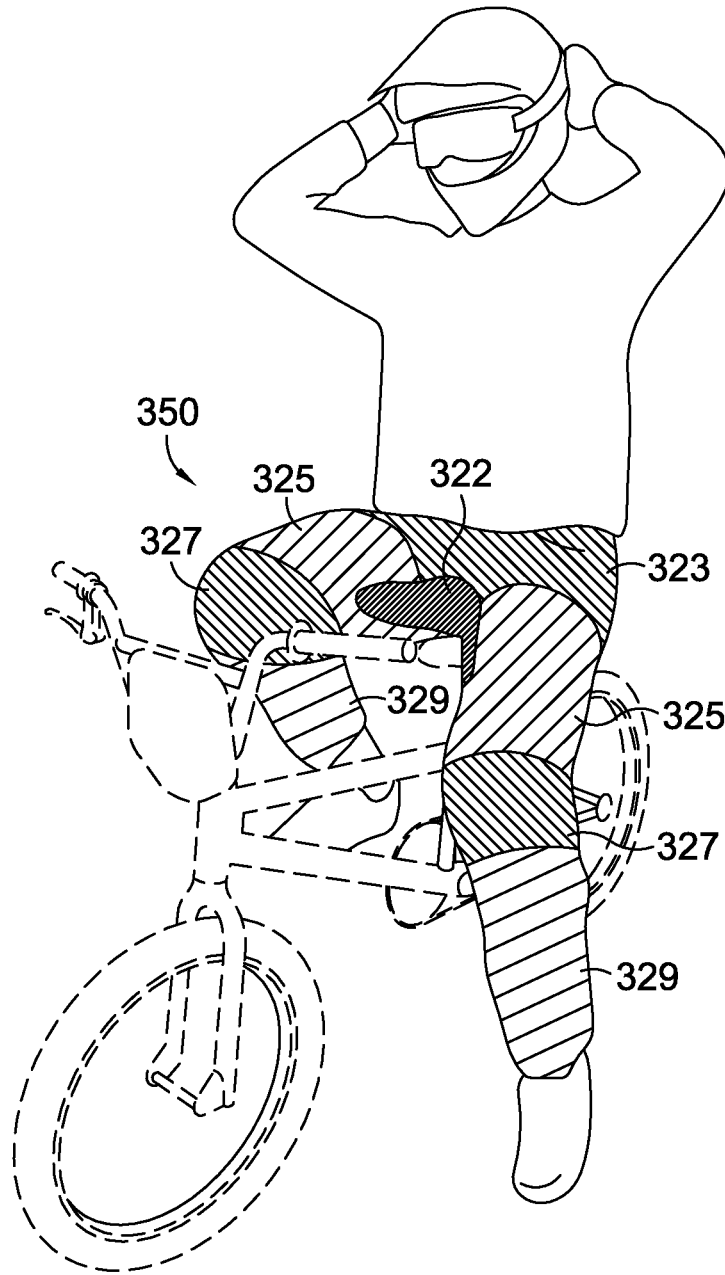


FIG. 5C.

ARCHITECTURALLY REINFORCED DENIM**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application claims the benefit of U.S. Provisional Application No. 61/600,286, filed Feb. 17, 2012, entitled "Architecturally Reinforced Denim," which is incorporated in its entirety by reference herein.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

TECHNICAL FIELD

The present invention relates to architecturally reinforced denim fabrics. In particular, the present invention relates to architecturally reinforced denim fabrics for the use in manufacturing athletic gear for athlete of extreme sports, having moisture regulation properties and high structural integrity, even after repeated exposure to external environmental elements such as friction against cement, rock, metal, or dirt, particularly when the athlete is engaged in the particular sport.

BACKGROUND OF THE INVENTION

Athletes who practice extreme sports such as FMX, BMX, adventure racing, skateboarding, sandboarding, and many others, require specialized gear that must be comfortable and protective, but these athletes also prefer clothing and other gear that are fashionable and attractive. The specialized gear needs to be able to withstand the great physical exertion of the athlete and the exposure to different external elements that result from the environment of the particular sport.

For decades now, denim has been a popular "American comfort" staple in everyone's closet, both in the United States and around the world. While denim is a relatively tough and durable fabric, conventional denim lacks the resilience and other performance and/or comfort characteristics desired for athletic endeavors particularly extreme sports. It is an object of this invention to provide a denim fabric and gear made from this fabric suitable for extreme sports athletes, providing them with comfort and an outstanding level of protection, while being fashionable and attractive.

SUMMARY OF THE INVENTION

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

The present invention relates to an architecturally reinforced denim fabric and articles of manufacture made from this architecturally reinforced denim fabric. One example of the architecturally reinforced denim fabric of the present invention may be light weight and may possess moisture management properties facilitating the wicking of moisture from the wearer's skin. Denim in accordance with the present invention may provide elasticity that adds comfort and flexibility.

Denim fabric in accordance with the present invention may incorporate commercially available strengthening polymer fibers that are abrasion, temperature and/or chemical resistant. Examples of such fibers are available under such trade names as Kevlar (available from DuPont), Vectran® (available from Kuraray Co., Ltd.), Dyneema® (available from DSM Dyneema), Gold Flex® (available from Honeywell), Twanron® (available from AKZO), Nomex® (available from DuPont), and any other polymer fiber with similar physicochemical properties. These strengthening polymer fibers, when combined with cotton fibers, may yield lightweight durable denim fabrics with puncture and tear resistance while still maintaining comfort.

Yet in another example of the present invention, the architecturally reinforced denim fabric of the present invention may incorporate both moisture wicking fibers and strengthening polymer fibers in combination with cotton fibers. This denim fabric with moisture management properties and strengthening fibers may provide comfort when in contact with the skin of the wearer while still providing protection for the wearer.

The denim fabric of the present invention may be used to manufacture bottoms such as pants, shorts, skirts, tops such as jackets, shirts, etc. Other items of apparel such as hats, gloves, etc., may be manufactured in accordance with the present invention. The denim fabric of the present invention may also be used in the fabrication of shoes or shoe parts, such as shoe uppers.

The denim of the present invention may be different tones of the typical indigo blue, or may also be different tones of other colors such as black, red, orange, yellow, pink, purple, green, or any other color available for the dyeing of cotton based fabrics, or any combination of colors and tones of the dyes.

Any style of pants may be constructed in accordance with the present invention. Examples of pants for male athletes of extreme sports of the present invention may be skinny, slim, straight, baggy, taper, boot cut, or classic fits such as relaxed or comfort fit jeans, or jeans with any other custom fit chosen to be appropriate for the particular sport. Examples of pants for female athletes of extreme sports of the present invention may be leggings, slim, skinny, boot cut, flare, baggy, wide leg fit jeans, or jeans with any other custom fit chosen to be appropriate for the particular sport. The pants manufactured from the denim fabric of the present invention may incorporate padding in areas of high impact, such as the buttocks and the knees, to offer impact absorption in case of a fall.

In a further example, pants may be manufactured utilizing a combination components made of classic 100% cotton denim and components made of one or more denim fabrics in accordance with the present invention. In another example, pants may be manufactured from a combination of different denim fabrics of the present invention, such as moisture management denim and strengthened denim, or moisture management denim and strengthened denim with added moisture management capabilities, etc. Different types of denim may be combined to create a single garment in accordance with the present invention by stitching or otherwise joining together different types of fabric to form a garment and/or by controlling and varying textile properties while weaving the fabric to be used in forming a garment.

The same ideas as for the fabrication of pants presented above, could also be applied to the fabrication of tops such as jackets, shirts, vests, gloves, hats, shoes or any other type

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of garment suitable to be worn during the practice of extreme sports, or during the practice of a highly physically demanding activities.

Additional objects, advantages, and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The present invention is described in detail below with reference to the attached drawing figures, wherein:

FIG. 1 is an enlarged view of a twill weave, typical of denim fabrics.

FIG. 2 is an illustration of an exemplary loom where the warp yarns and the fill yarns used in the weaving of fabrics can be identified.

FIG. 3 is a perspective view of an exemplary denim fabric as it is being woven and rolled. Also, a schematic of a garment is shown on the fabric to show how a garment with multiple "performance zones" is constructed from a single fabric in accordance with the present invention.

FIG. 4 is an illustration of the constructed garment with the different "performance zones" in FIG. 3 shown as worn by an athlete.

FIG. 5A is a front view of the constructed garment with the different "performance zones" in FIG. 4 further comprising a gusset performance zone, shown as worn by an athlete.

FIG. 5B is a back view of the constructed garment with the different "performance zones" in FIG. 5A.

FIG. 5C is a perspective view of the constructed garment in FIG. 5A and FIG. 5B, showing the garment as worn by an athlete of BMX.

DETAILED DESCRIPTION OF THE INVENTION

Classic denim fabrics are made of 100% cotton fibers which provide advantageous properties such as good absorbency, comfortable soft hand and good color retention. However, 100% cotton denim fabrics are limited to the properties of cotton fibers which may not be stretchable, tend to retain water (making such fabrics slow to dry), shrink easily, retain soil, and tend to wear out faster than synthetic fibers. Therefore, an object of the present invention is to provide a cotton and synthetic fiber blend denim fabric that takes advantage of all the good traits of cotton fibers and at the same time, takes care of the disadvantages of cotton fibers by blending synthetic fibers.

Twill is a type of textile weave with the characteristic diagonal pattern observed in denim fabrics. Classic denim is a two faced "twill" construction fabric, as is illustrated in the piece of fabric 100 presented in FIG. 1. In classic denim, the front is considered to be the warp-face consisting mainly of the warp yarn 110 (usually tinted indigo blue to give "blue jeans" their distinctive color), and the back-face comprised mostly of the fill yarn 120 (usually left white). In the present description "yarn" is to be understood to be an assembly of fibers spun or twisted together to form a long and continuous string or filament useful for weaving or knitting fabric materials. The words "environment" and "environmental" are to be understood as the particular surfaces where athletes of extreme sports perform their activities, for example a skatepark for skateboarders usually comprising a series of

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ramps and half pipes made of wood, cement, or synthetic construction materials. For FMX and BMX riders, the "environment" may comprise mountainous terrain, etc. Other types of extreme sports, and even day to day wear, may involve different environments.

In FIG. 2, an exemplary loom 200 is depicted. In a weaving process, warp yarns 210 are fed to the loom 200 from a warp beam 240 and finally rolled as the finished woven fabric 280 onto a fabric beam 250. The warp yarns 210 are kept tightened throughout the weaving process. A loom 200 typically has at least two "harnesses" 270 holding different sets of warp yarns 210. When one of the harnesses is lifted, a set of warp yarns is lifted and a v-shaped "shed" 290 is created in between the two sets of warp yarns 210. The fill yarn(s) 220 is then completely passed through the shed 290 via a shuttle 230 and then, the lifted harness is lowered. A comb like "reed" 260 is used to push the fill yarn(s) 220 tightly into place. Finally, when a different set of warp yarns 210 is lifted with a different harness, the fill yarn(s) 220 becomes trapped and interlaced forming the woven fabric 280.

It should be noted that there are different kinds of looms that may operate differently, especially modern day industrial looms. Modern day industrial looms, are automated and may or may not have shuttles carrying the fill yarn(s). Examples of modern day industrial looms are Water Jet looms, Air Jet looms, Shuttle looms, Rapier looms and Projectile looms. Water Jet and Air Jet looms are typically very fast because they do not require a shuttle to carry the fill yarn(s) across the warp yarns. Typically, when using Water Jet and Air Jet looms, the selvage on the fabric produced (the edges on either side of the fabric) is fringed because the fill yarn(s) is trimmed after insertion. Shuttle, Rapier and Projectile looms may be slower than Water Jet and Air Jet looms due to their higher requirement for mechanical action. However, fabrics produced with Shuttle, Rapier and Projectile looms have a finished selvage because they are produced from a continuous strand of fill yarn(s).

A first example denim fabric, hereinafter "moisture wicking denim" may possess moisture management capabilities by incorporating moisture wicking polymer fibers such as but not limited to Sorbtek® (available from Unifi). For example, Sorbtek® polyester fibers or any other polymer fibers with like properties may be incorporated in core spun yarns to be used as fill yarns. With the addition of moisture management polymer fibers in the moisture wicking denim in accordance with the present invention, when an athlete perspires, the moisture wicking denim fabric is able to pull the moisture produced on the surface of the athlete's skin away from the athlete's skin and subsequently facilitate evaporation of the moisture. By pulling away moisture from the athlete's skin without retaining the moisture, the athlete may experience a continuous dry feeling, increasing the levels of comfort for the athlete.

When constructing the moisture wicking denim in accordance with the present invention, the warp yarns may comprise up to 100 weight percent cotton and carry the color for the final constructed denim fabric. The fill and/or warp yarns for the construction of the moisture wicking denim fabric of the present invention may also comprise additional synthetic fibers in the form of spandex or elastane, or any other elastic fiber usable in the construction of fabrics to add elasticity to the final moisture wicking denim fabric.

The moisture wicking denim fabric of the present invention may comprise up to 63 weight percent cotton fiber. For example, the moisture wicking denim fabric may comprise 40 to 63, 45 to 60, or 50 to 55 weight percent cotton fiber.

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Further, the moisture wicking denim fabric of the present invention may comprise at least 35 weight percent moisture management polymer fibers and at least 2 weight percent elastic fibers.

A second example denim fabric, hereinafter “architecturally reinforced denim” may use high tenacity yarns integrated into the denim fabric for durability and strength. The high tenacity yarns of the present invention may incorporate synthetic liquid crystal polymer materials such as Vectran®, Kevlar®, Nomex®, Dyneema®, Twaron®, or the like, or any combination of different synthetic liquid crystal polymer materials suitable for the construction of fabrics. These synthetic liquid crystal polymer materials are desirable because they exhibit extraordinary physicochemical properties due to their unique crystalline like ordered state when melted or dissolved in a solvent. Processing these liquid crystal polymers into fibers or extrusion molded materials, gives rise to polymeric fibers or materials that have high resistance to chemical damage, wear and tear, puncturing, rupturing, and have great mechanical strength. The outstanding resilience properties of these synthetic polymer materials are a result of their self reinforcing properties at the molecular level deriving from the specific molecular organization and orientation of the molecules known as Van der Waals interactions. Another advantage of these types of synthetic polymer materials is their light weight and soft feel.

The fibers of the high tenacity polymer material for the manufacture of the architecturally reinforced denim of the present invention may be spun and incorporated directly into the cotton warp and/or the fill yarns. The fill yarns may also incorporate moisture management polymer fibers to add moisture management capabilities, as in the moisture wicking denim example presented earlier. Further, the high tenacity polymer material may be incorporated in the warp yarns, as the warp yarns go to the front face (exposed surface), which is the face directly subjected to the most environmental stress. Alternatively, the fibers of the high tenacity polymer materials may be spun into a 100 weight percent high tenacity polymer yarn. The 100 weight percent high tenacity polymer yarns may then be intercalated with up to 100 weight percent cotton yarns either as the warp and/or the fill yarns.

The architecturally reinforced denim example of the present invention may comprise up to 63 weight percent cotton fiber. The architecturally reinforced denim fabric may comprise 40 to 63, 45 to 60, or 50 to 55 weight percent cotton fiber. The architecturally reinforced denim fabric example of the present invention may comprise at least 35 weight percent synthetic and high tenacity synthetic polymer fibers and at least 2 weight percent elastic fibers, to increase elasticity and comfort, and improve fit when fabric is made into a garment.

The architecturally reinforced denim example of the present invention, in addition to its sturdiness, may also have an added visual and textural effect by having “wire” like motifs that correspond to the high tenacity yarns in the garment. The high tenacity yarns may optionally protrude from the front face of the denim weave, have different color, or otherwise be visually distinct from the other portions of a garment. However, such visual aspects of the high tenacity yarns are not necessary in garments in accordance with the present invention. For example, the motifs may be incorporated in the architecturally reinforced denim example by using the high tenacity synthetic polymer fibers in the warp and/or fill yarns taking advantage of the different look and feel that these fibers may have when compared to cotton fibers. Further, the motifs may be presented diagonally in the

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same direction of the twill weave, the motifs may be continuously sequential, or the motifs may be spaced apart (spacing may be chosen according to the final desired visual and textural effect). In another example, the motifs may be woven into different shapes such as zig zag lines, curly lines, squares, circles, etc. Further, the motifs may be woven into particular designs or logos.

A third example denim fabric in accordance with the present invention, hereinafter “architecturally reinforced wicking denim” is further provided wherein properties of the moisture wicking denim through the moisture management fibers and the high tenacity polymer fibers are combined to provide a smooth, light weight, comfortable, dry feeling, resilient denim. The architecturally reinforced wicking denim example of the present invention provides outstanding resilience and protection against rips, and significantly slows down wear and tear even when exposed against repeated friction against harsh surfaces such as cement, rocks, sand, etc.

The architecturally reinforced wicking denim example of the present invention may comprise up to 63 weight percent cotton fiber. For example, the architecturally reinforced wicking denim example may comprise 40 to 63, 45 to 60, or 50 to 55 weight percent cotton fiber. The architecturally reinforced wicking denim fabric example of the present invention may comprise at least 35 weight percent of a combination of synthetic and high tenacity polymer synthetic fibers and moisture management fibers, and at least 2 weight percent elastic fibers, to increase comfort and improve fit when fabric is made into a garment.

The architecturally reinforced wicking denim of the present invention may further comprise other polymeric treatments such as “waterless wash,” or other finishing technologies suitable for the particular end use of the garment made from the denim of the present invention.

As briefly presented earlier, denim in accordance with the present invention may be used to manufacture different types of garments including tops (e.g. vests, jackets, shirts, blouses, etc), bottoms (e.g. pants, skirts, shorts, skorts, etc), gloves, pads, shoes, hats, etc. The garments may be made completely of one denim type in accordance with the present invention, or a combination of multiple denim types in accordance with the present invention. The garments may also be made from a combination of classic 100 weight percent cotton denim with one, or more types of denim in accordance with the present invention. The denim of the present invention when used in combination with other types of denim may be placed in strategic areas of the garments to maximize the specific characteristics of each type of denim.

For example, in the manufacture of pants for athletes of skateboarding, sandboarding, and/or competitive extreme rollerblading, the pants may be constructed completely of architecturally reinforced wicking denim to provide all best characteristics of moisture management and strength. Additionally, the pants may discretely comprise padding in the areas of the buttocks and the knees to provide shock absorption in case of a fall.

In another example of athletic denim pants, the area of the waist line may be comprised of the moisture wicking denim example where the pants come in closest contact with the body. The areas of the buttocks and the knees may comprise the architecturally reinforced denim example to provide visual appeal and added strength and resilience to these areas, which are subjected to greater stress both from the movement of the athlete and from contact with environmental stressors. The rest of the pants may comprise classic stretchable, and/or classic non-stretchable lightweight

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denim, and/or architecturally reinforced wicking denim, and/or any other type of denim or even other fabrics. These different denim types in different performance zones of the garment may, for example, be welded and/or stitched together to construct the final garment.

In a different example, multiple types of denim may be woven at different locations on a textile that will be formed into a garment to create different performance zones. For example, the moisture wicking denim and the architecturally reinforced denim examples may be woven into different performance zones of the same fabric piece. Yet, in another example, the moisture wicking denim and the architecturally reinforced wicking denim examples may be woven into different performance zones of a single fabric piece. Further, the architecturally reinforced wicking denim and the architecturally reinforced denim examples may be woven into different performance zones of a single fabric piece, or yet in another example, all three denim types, i.e. the moisture wicking denim, the architecturally reinforced denim and the architecturally reinforced wicking denim may be woven into different performance zones of a single fabric piece.

In yet a further example, a full body garment for a BMX or FMX athlete may be constructed from one or a few pieces of fabric woven into different performance zones. First, the areas corresponding to the elbows, chest, crotch, buttocks and knees of an athlete may be woven into the architecturally reinforced denim in accordance with the present invention to provide extra resilience in those areas. Second, the areas corresponding to the back and thighs may be woven into the architecturally reinforced wicking denim of the present invention to provide comfort and resilience by wicking away perspiration from these areas. Finally, the areas of the armpits and the rest of the garment may be woven into the moisture management denim, where resilience is not as crucial as moisture management.

Shown in FIG. 3 is a section of a loom 300 weaving a denim fabric 320 with different performance zones in accordance with the present invention. The warp yarns 310 are fed from warp beam 340 and the fill yarn(s) is fed according to the loom type (not shown). The fabric piece 320 shown in FIG. 3 has a first performance zone 321, a second performance zone 323, a third performance zone 325, a fourth performance zone 327, and finally a fifth performance zone 329 woven into it.

In the example shown in FIG. 3, a zoned denim fabric for the construction of pants 350 for an athlete of extreme sports is shown. The example illustrated by FIG. 3 is not necessarily to scale. For example, multiple garment pieces may be cut from a single width of fabric woven in accordance with the present invention. The different types of fibers needed for the different performance zones of the final fabric piece may be introduced through the warp yarns and/or the fill yarns. If the different types of fibers are introduced through warp yarns, warp yarns having different types of fibers along their length may be used. The presence of each different type of fiber along the warp yarns' lengths may be predetermined according to the specifications of the final fabric product. If the different types of fibers are introduced through the fill yarn(s), the fill yarn(s) may be spliced with the yarn containing the next type of polymer fiber desired.

In FIG. 3, only one cut is made for the construction of a garment. However, depending on the width of the zoned denim fabric, several garments could be cut out along the width of the zoned denim fabric in accordance with the present invention. The position of performance zones along the length and/or width of a textile should be accorded for in laying out and/or cutting pieces for forming garments in

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accordance with the present invention. For example markers denoting transitions between performance zones may be temporarily or permanently applied to the textile, woven into the textile, etc. Alternatively/additionally, different types of performance zones may be distinguishable from one another. Markers and/or performance zones themselves may be perceived by an unaided human, an aided human (for example using black light), or may be detected by automated sensors. By way of further example, computer software operating on a computing device may coordinate weaving and cutting operations to assure the proper location of performance zones in the final garment.

Continuing on the discussion of FIG. 3, a denim fabric for the fabrication of athletic pants 350 with different performance zones woven in to it is provided. Performance zone 321 may also be thought of as a waist performance zone and may be woven into a moisture wicking denim fabric by supplying the moisture management fibers through the fill yarn(s) and/or the warp yarns to provide moisture management comfort along the waistline of pants 350. Performance zone 323 may also be thought of as a buttocks performance zone and may be woven into an architecturally reinforced denim fabric to provide protection and durability in the area of the buttocks. The high tenacity fibers may be supplied mainly through the warp yarns to place the high tenacity fibers on the external face of the garment. Performance zone 325 may also be thought of as a thigh performance zone and may be woven into an architecturally reinforced wicking denim fabric with both the moisture management fibers and the high tenacity fibers incorporated. Performance zone 327 may also be thought of as a knee performance zone and may again be woven into an architecturally reinforced denim fabric like in the buttocks performance zone 323 to provide the protection and durability in the knee area. Performance zones 323 and 327, which are subjected to high levels of stress both from the environment and the physical exertion of the athlete may need extra reinforcement and thus, may comprise up to 100 weight percent high tenacity synthetic polymer fibers. Finally, performance zone 329 may also be thought of as a calf performance zone and may be woven into a classic denim fabric since performance zone 329 is subject to the least amount of stress when pants 350 are worn by the athlete. In yet a further example, a full body garment for a BMX or FMX athlete.

FIG. 4 is an exemplary illustration of constructed pants 350 from the zoned denim fabric presented in FIG. 3, as worn by an athlete. As can be observed in FIG. 4, the waist performance zone 321 corresponds to the waistline of the athlete, the buttocks performance zone 323 corresponds to the buttocks area of the athlete, the thigh performance zone 325 corresponds to the thighs of the athlete, the knee performance zone 327 corresponds to the knees of the athlete, and finally, the calf performance zone 329 corresponds to the calves of the athlete and extends downward towards the ankles of the athlete.

FIG. 5A through FIG. 5C show a further example of constructed pants 350 from the zoned denim fabric presented in FIG. 3, as worn by an athlete such as a BMX athlete. Pants 350 in FIG. 5A through FIG. 5C are constructed with the same performance zones as the pants 350 presented in FIG. 4 except, in FIG. 5A through FIG. 5C, the pants 350 further comprise an extra tough and resilient gusset performance zone 322 corresponding to the crotch area when pants are worn. The gusset performance zone 322 in pants 350 may be subject to constant friction from the contact with the seat of a bike, and thus the need for extra

protection in this area may be necessary for better protection of the athlete and durability of pants **350**.

FIG. 5A is a front view of pants **350** as worn by an athlete. As can be observed in FIG. 5A, the waist performance zone **321** corresponds to the waistline of the athlete, the buttocks performance zone **323** corresponds to the hip area of the athlete on the front, the thigh performance zone **325** corresponds to the thighs of the athlete, the gusset performance zone **322** corresponds to the crotch area of the athlete, the knee performance zone **327** corresponds to the knees of the athlete, and finally, the calf performance zone **329** corresponds to the calves of the athlete and extends downward towards the ankles of the athlete. Further, the gusset performance zone may extend partially (as shown) or completely around the leg of the athlete (not shown).

FIG. 5B is a back view of pants **350** as worn by an athlete. As can be observed in FIG. 5A, the waist performance zone **321** corresponds to the waistline of the athlete, the buttocks performance zone **323** corresponds to the buttocks area of the athlete on the back, the thigh performance zone **325** corresponds to the thighs of the athlete, the gusset performance zone **322** corresponds to the crotch area of the athlete, the knee performance zone **327** corresponds to the knees of the athlete, and finally, the calf performance zone **329** corresponds to the calves of the athlete and extends downward towards the ankles of the athlete. Further, the gusset performance zone may extend partially (as shown) or completely around the leg of the athlete (not shown).

FIG. 5C is a perspective view of a BMX athlete sitting on a bike and wearing pants **350**. FIG. 5C shows with more clarity how the different performance zones may play an important role in protecting the athlete and, at the same time, insuring the comfort of the athlete when the pants **350** are worn.

Since the different performance zones in a zoned denim fabric in accordance with the present invention are very specific and must be localized properly in the final garment, extra care may be taken when cutting out the fabric and then constructing the desired garment. Alternatively, the denim fabric may have a fixed width corresponding exactly to the length of the garment. Then, the different performance zones may be woven vertically along the fabric's length such that the cuts for the garments may be taken horizontally. In other words, the zoning set up shown in FIG. 3 may be rotated 90 degrees such that the different zones appear from left to right, or right to left, as opposed to from top to bottom (as shown). In addition to being visually appealing, apparel made from a single fabric with different performance zones may be more comfortable since the need for bulky stitching between two or more fabrics when trying to create a garment with different properties in different areas would be eliminated. Reducing the amount of stitching needed to create a garment with different properties in different areas also makes a more durable garment since the chances of the garment coming apart if the stitches become undone may be reduced.

Single fabric pieces comprising two or more denim types woven together, may be custom woven to manufacture custom made garments or protective gear that fit the specific needs of the user, and specific to the particular sport or activity to be engaged in. Also, whether the zoning setup is done along the fabrics length or across the fabric's length, different permutations of the zones may be possible. The specific zone lengths and frequencies may be adjusted according to the needs for the specific garments to be constructed.

Further, the garments or protective gear comprising the denim of the present invention may be woven using dual-loom technology to create seamless garments and protective gear. For example, in the manufacture of gloves, the palm-side may be woven into an architecturally reinforced wicking denim fabric and the back side may be woven into an architecturally reinforced denim fabric. This combination would result in a strong, flexible and moisture absorbent glove on the palm-side (where sweat gathers) and a strong, flexible and protective glove on the back side. This dual-loom weaving could also be applied to other garments such as pants, shorts, vests, shoes, socks, etc., choosing the right type of denim for different areas of choice. This may be done with any combinations and permutations of architecturally reinforced wicking denim, architecturally reinforced denim, moisture wicking denim, classic stretchy, and/or classic non-stretchy denim. Further, the names, compositions and/or properties of these three examples of denim in accordance with the present invention are for illustrative purposes only.

As one may also be able to conceive, the possibilities presented above may be applied to other types of fabrics as well, not being limited to denim.

From the foregoing, it will be seen that this invention is one well adapted to attain all the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

Having thus described the invention, what is claimed is:

1. An architecturally reinforced denim woven fabric comprising:

a first face and an opposite second face, wherein the first face is different from the opposite second face;

at least a first woven performance zone comprising a first ratio of synthetic fiber to natural fiber, wherein the first woven performance zone is positioned at a first location on the architecturally reinforced denim woven fabric, wherein the first woven performance zone comprises:

- (1) up to a 63 weight percent cotton fiber;
- (2) at least a 35 weight percent combination of moisture management polymer fiber and high tenacity polymer fiber, wherein the high tenacity polymer fiber is in one or more warp yarns, and wherein the moisture management polymer fiber is in one or more fill yarns of the architecturally reinforced denim woven fabric and wherein the one or more warp yarns are exposed on the second face and the one or more fill yarns are exposed on the first face; and

- (3) at least a 2 weight percent elastic polymer fiber; and at least a second woven performance zone comprising a second ratio of synthetic fiber to natural fiber, wherein the first ratio of synthetic fiber to natural fiber is different than the second ratio of synthetic fiber to natural fiber, and wherein the second woven performance zone is positioned at a second location on the architecturally reinforced denim woven fabric such that it is integrally woven and seamlessly adjacent to the first woven performance zone.

2. The architecturally reinforced denim woven fabric of claim **1**, wherein the second woven performance zone comprises:

- up to a 63 weight percent of the cotton fiber;
- at least a 35 weight percent of the high tenacity polymer fiber; and
- at least a 2 weight percent of the elastic polymer fiber.

US 9,624,608 B2

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3. The architecturally reinforced denim woven fabric of claim 2, wherein the architecturally reinforced denim woven fabric further comprises a third woven performance zone, the third woven performance zone comprising a 100 weight percent cotton fiber.

4. The architecturally reinforced denim woven fabric of claim 1, wherein the first face of the architecturally reinforced denim woven fabric is configured to be an internal face of a manufactured garment and the opposite second face of the architecturally reinforced denim woven fabric is configured to be an external face of the manufactured garment.

5. The architecturally reinforced denim woven fabric of claim 4, wherein the warp yarns are visually distinct from other portions of the architecturally reinforced denim woven fabric.

6. An architecturally reinforced denim woven fabric comprising:

at least a first woven performance zone comprising a first ratio of synthetic fiber to natural fiber, wherein the first woven performance zone is positioned at a first location on the architecturally reinforced denim woven fabric, wherein the first woven performance zone comprises:

- (1) up to a 63 weight percent cotton fiber;
- (2) at least a 35 weight percent high tenacity polymer fiber, wherein the high tenacity polymer fiber is incorporated into one or more warp yarns of the architecturally reinforced denim woven fabric; and
- (3) at least a 2 weight percent elastic polymer fiber; and

at least a different second woven performance zone comprising a second ratio of synthetic fiber to natural fiber, wherein the first ratio of synthetic fiber to natural fiber is different from the second ratio of synthetic fiber to natural fiber, and wherein the second woven performance zone is positioned at a second location on the architecturally reinforced denim woven fabric, wherein the first location is different from the second location, and wherein the first woven performance zone and the second woven performance zone are integrally woven and are seamlessly adjacent to each other.

7. The architecturally reinforced denim woven fabric of claim 6, wherein the first woven performance zone comprises between 45 and 60 weight percent cotton fiber.

8. The architecturally reinforced denim woven fabric of claim 6, wherein the high tenacity polymer fiber comprises liquid crystal polymer materials.

9. The architecturally reinforced denim woven fabric of claim 6, wherein the second woven performance zone comprises a 100 weight percent cotton fiber.

10. The architecturally reinforced denim woven fabric of claim 6, wherein the warp yarns comprising the high tenacity polymer fiber form one or more protrusions on an external surface of the architecturally reinforced denim

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woven fabric that are visually distinct from other portions of the architecturally reinforced denim woven fabric.

11. A garment manufactured from an architecturally reinforced denim woven fabric, the garment comprising seamlessly adjacent and integrally woven performance zones, wherein:

a first woven performance zone comprising a first ratio of synthetic fibers to natural fibers, wherein the synthetic fibers comprise high tenacity polymer fibers forming one or more warp yarns;

a second woven performance zone comprising a second ratio of synthetic fibers to natural fibers that is different from the first ratio of synthetic fibers to natural fibers, wherein the synthetic fibers comprise moisture management polymer fibers and high tenacity polymer fibers, wherein the moisture management polymer fibers form one or more fill yarns and the high tenacity polymer fibers form one or more warp yarns; and

a third woven performance zone comprising a third ratio of synthetic fibers to natural fibers that is different from the first ratio and the second ratio of synthetic fibers to natural fibers.

12. The garment of claim 11, wherein the first woven performance zone of the garment is configured to form a thigh and knee performance zone configured to align with the thighs and knees of a wearer when the garment is worn; wherein the second woven performance zone of the garment is configured to form a buttocks performance zone configured to align with the buttocks of the wearer when the garment is worn; and wherein the third woven performance zone of the garment is configured to form a calf performance zone configured to align with the calves of the wearer when the garment is worn.

13. The garment of claim 12, wherein the buttocks performance zone and the knee performance zone further comprise padding for shock absorption.

14. The garment of claim 11, wherein the first woven performance zone and the second woven performance zone comprise up to a 63 weight percent of cotton fiber, and the third woven performance zone comprises 100 weight percent of the cotton fiber.

15. The garment of claim 11, wherein the garment comprises an internal face and an external face, wherein the high tenacity polymer fiber in the first performance zone and the second performance zone is mainly located on the external face of the garment.

16. The garment of claim 15, wherein a portion of the warp yarns comprising the high tenacity polymer fiber form one or more protrusions on the external face of the garment, wherein the one or more protrusions are visually distinct from other portions of the external face of the garment.

* * * * *

WWD


BUSINESS / TECHNOLOGY

Nike's New Patent Could Mark the Rise of Ath-Denim

The athletic multinational got its first denim patent this week.

By [Kali Hays](#) on April 21, 2017



 Nike, best known for athletic shoes and gear, has secured a patent for performance denim.
Lexie Moreland

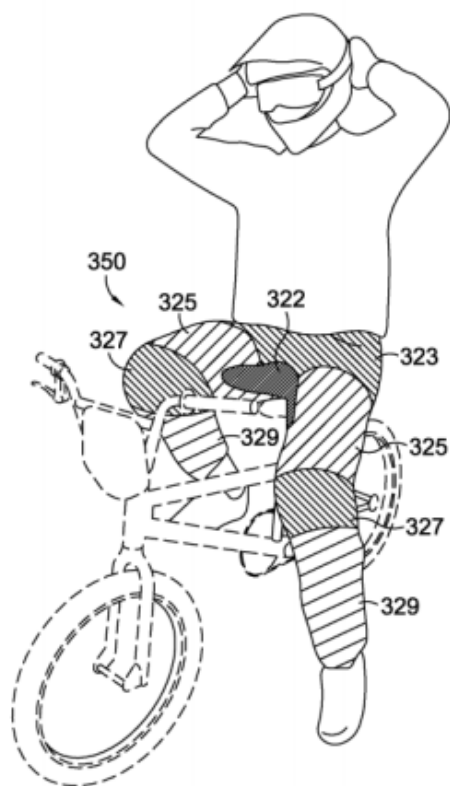
NEW YORK — Denim and athleticwear may seem an unlikely fit, but Nike could be the brand to change that.

Earlier this week, the activewear giant secured a utility patent for “architecturally reinforced denim” that essentially describes a jeans-jogging pant hybrid, meaning “ath-denim” could be coming to a Nike store near you.

During a recent call with analysts discussing its positive 2016 financial results, Nike president and chief executive officer Mark Parker said the company planned to continue its “relentless flow of innovation” in order to sustain momentum.

The new patent appears to be in line with that promise. It describes a denim fabric that offers “high tenacity” and “moisture management” along with stretch in differing proportions, depending on the desired performance.

Pants made from the fabric are said to have separate but seamless “performance zones,” with the buttocks, thigh and calf areas all likely to have differing fabric weaves, plus “padding for shock absorption.”



An image from Nike’s new patent details “performance areas” of athletic pants made with the denim.

Nike offers a small range of men’s pants, including one denim option geared toward skateboarders, but the new patent is aimed at extreme sports such as BMX and motocross.

“For decades now, denim has been a popular ‘American comfort’ staple in everyone’s closet, both in the U.S. and around the world,” Nike said in its patent application. “While denim is a

relatively tough and durable fabric, conventional denim lacks the resilience and other performance and/or comfort characteristics desired for athletic endeavors, particularly extreme sports.”

With the new patent, Nike said it hopes to offer “denim fabric and gear made from this fabric suitable for extreme sports athletes, providing them with comfort and an outstanding level of protection, while being fashionable and attractive.”

Nike said the denim fabric could be used in the manufacture of all other types of apparel, from women’s leggings to shoes, and noted the fabric can be dyed any color, not just blue.

Moreover, Nike said the combination of synthetic polymers in the fabric would not only create a “lightweight, comfortable, dry feeling, resilient denim” but also one that provides “outstanding resilience and protection against rips, and significantly slows down wear and tear even when exposed against repeated friction against harsh surfaces such as cement, rocks, sand, etc.”

Future iterations of the fabric could offer a “waterless wash,” according to the application, which also alluded to the possibility of fabrics beyond denim getting the same composition.

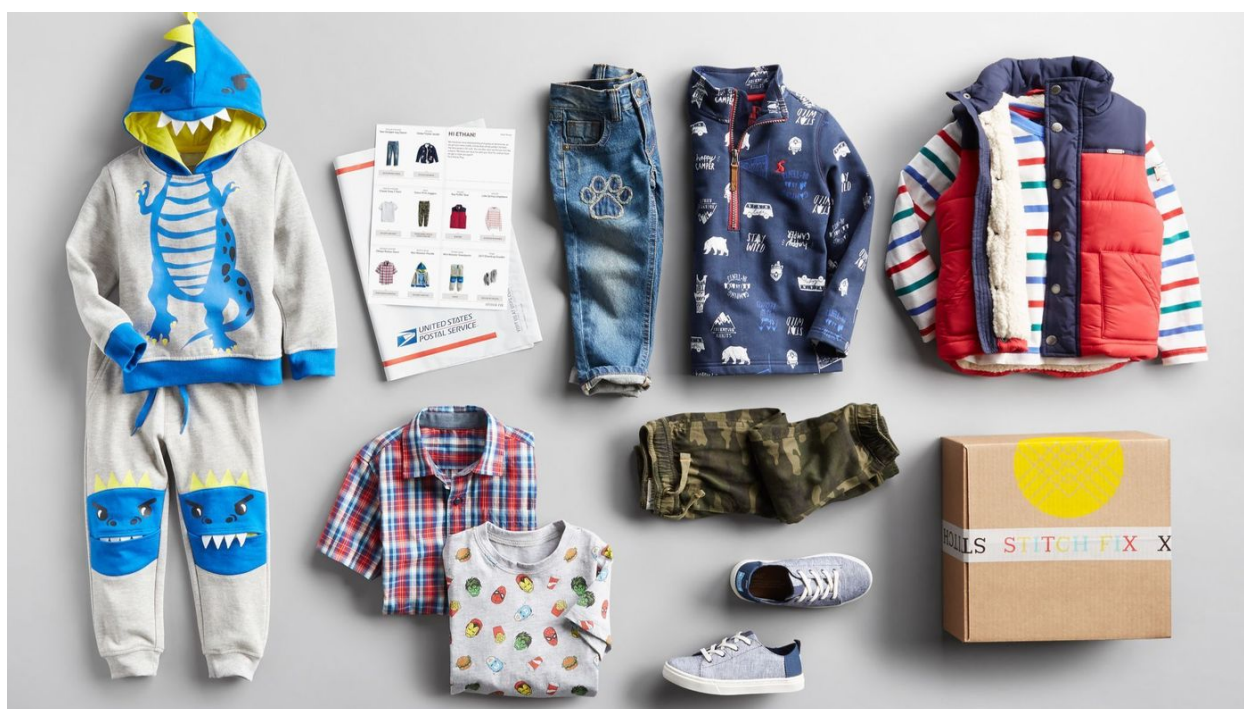
While Nike is a prolific patent filer, this appears to be the company’s first for denim. Nike initially filed for the patent in 2012.

The company could not be immediately reached for comment.



With personalized styling and now kids clothing, Stitch Fix looks to avoid the pitfalls of subscription boxes

Tracey Lien
Los Angeles Times
August 10, 2018



A sample box of clothing from Stitch Fix Kids. (Stitch Fix)

Times are rough in the world of subscription retail.

Birchbox — which ships makeup, skincare and haircare goods — sold to a hedge fund investor in May after struggling for months to find a buyer.

Loot Crate — which ships apparel and collectibles related to video games, comics and pop culture — [laid off more than a quarter](#) of its staff last year.

And Blue Apron, the provider of meal preparation kits that went public a year ago, has seen its stock drop to a third of its IPO price.

One subscription retail service, though, has so far dodged its competitors' pitfalls: Stitch Fix.

The stock price of the personalized online clothes-shopping company has more than doubled since its November IPO. On Tuesday its shares jumped more than 10% on news it would begin selling children's clothing before closing up \$1.87, or 6%, to a record \$32.99.

As of June it had more than 2.7 million customers — up 30% from a year earlier. It reported nearly \$9.5 million in profit in its most recent quarter, which ended April 28, a turnaround from the same period last year, when it was unprofitable.

It has added new arms to its business too — in 2016, it started offering men's clothing. On Tuesday, it announced a service catering to children who wear sizes 2T to 14, ranging in price from \$10 to \$35 per item.

“What Stitch Fix has focused on that others haven't as much is personalization, which is necessary for the survival of any subscription box,” said Lily Varon, an analyst at Forrester Research.

The novelty of a subscription box — in which a customer pays for a company to ship them a mystery box of goods within a certain category, whether it's makeup, fashion or food — wears off fast, Varon said. Which is why any subscription service that wants to succeed needs to also offer customers convenience, provide a product or service that customers frequently use, and have some kind of emotional component.

Stitch Fix, Varon believes, has all three: People frequently buy clothes, it takes the hassle out of going to a store, and the comprehensive questionnaire new clients fill out makes customers feel that Stitch Fix's personal stylists really know who they are.

At signup, customers pay a \$20 styling fee and fill out a lengthy questionnaire that asks about their size, shape, budget and style. Stitch Fix's personal stylists and data scientists then compile and ship a box of five garments and accessories, based on the customer's profile. Customers return what they don't want and pay for what they keep.

Although Stitch Fix says it is not technically a subscription service because customers can make one-off purchases, its customers can use it as a subscription service by electing to have Stitch Fix send them boxes of clothing and accessories on a regular basis.

Stitch Fix also has an advantage over its competitors because of the amount of user data it collects, said Erik Morton, senior vice president of strategic development at CommerceHub.

"The most interesting thing about them ... is that they are using data science to actually manufacture custom clothing for their customers. This is a private label plus data science strategy that could threaten established clothing brands," Morton said.

"Those brands are already worried about Amazon's foray into fashion through their own private labels, and now Stitch Fix, another tech-enabled company, is competing directly with established brands too."

As part of the launch of Stitch Fix Kids, the company announced its own exclusive brand of children's clothing, Rumi + Ryder.

Stitch Fix got its start as a scrappy operation, with co-founder [Katrina Lake asking friends and family to fill out style questionnaires](#), shopping for clothing from retailers herself, and personally shipping boxes of clothes to her clients.

As of 2017, the company employed more than 3,500 full- and part-time stylists and dozens of data scientists, and had five warehouses across the United States.

But it's too soon to consider Stitch Fix an industry stalwart, Varon said. Although the company might be doing better than many of its online subscription counterparts, Varon said its real competition could come from traditional retailers that might decide that they too want to launch or acquire a subscription box service.

"You imagine the kinds of services a Nordstrom or Nike or Under Armour could provide," Varon said. "That's where I see the strongest competition."

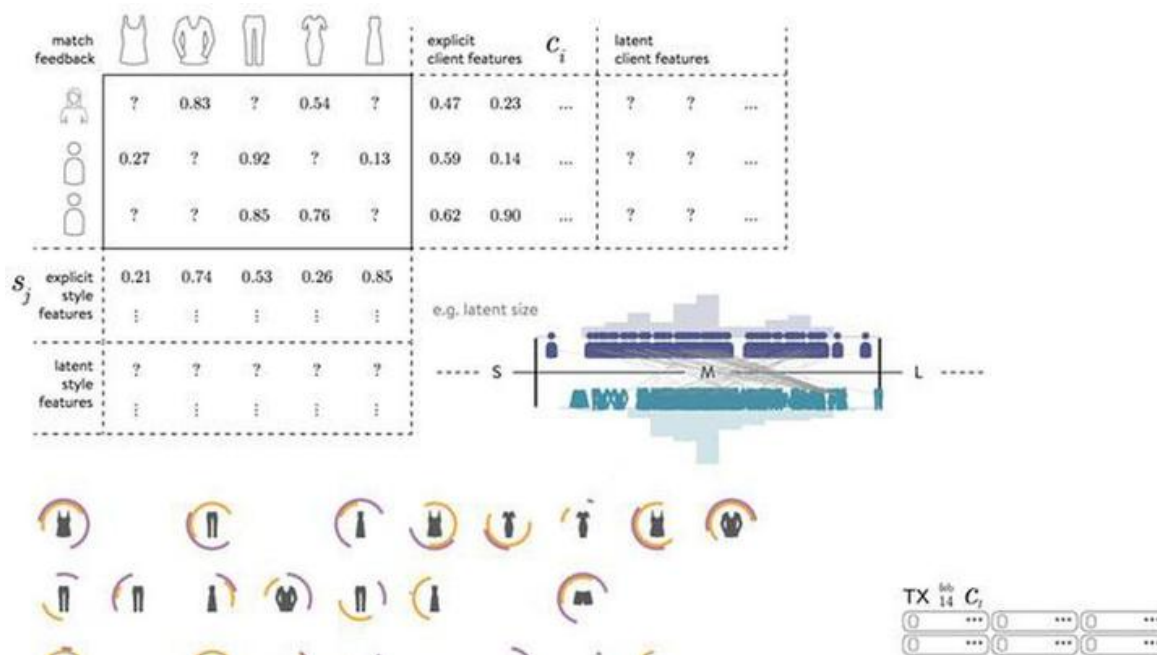
How Stitch Fix uses machine learning to master the science of styling

For Stitch Fix, machine learning has delivered measurable results, including increased revenue, decreased costs, and boosts to customer satisfaction.

By [Natalie Gagliardi](#) for [Between the Lines](#) | May 23, 2018 -- 13:39 GMT (06:39 PDT) | Topic: [Artificial Intelligence](#)

Are the challenges of modern day retail solvable with data science? Personal styling service [Stitch Fix](#) thinks so.

The San Francisco, Calif.-based company has forged a new kind of retail business model that uses data and [AI](#) to serve curated, personalized fashion boxes to its customers.



Visual of a Stitch Fix algorithm.

The result is a data-driven customer feedback loop that's helping Stitch Fix close the gap between customer information and experience.

"We leverage data science to deliver personalization at scale, which we don't see anywhere else in retail," said Cathy Polinsky, the chief technical officer at Stitch Fix.

"Data science is not just part of our culture -- it is our culture and it's woven into every aspect of our business."

While the data is undeniably crucial, Polinsky stressed the yin and yang between [humans and machines](#) when it comes to styling. Machines provide the initial filters for stylists by optimizing and conducting rote calculations that would require an immense amount of human time. However, the human stylists are key to understanding the nuances of customer requests and making sure their experiences are personalized.

"At the core of what we do is a unique combination of data science and human judgement. Our human stylists make our algorithms better and our machine learning helps our stylists perform better," Polinsky said. "By combining the art and science of styling we're able to create a far better client experience than anyone else in retail."

Data science and engineering made equal

Internally, Polinsky said the [data science](#) and engineering teams are equal on the value chain and closely aligned to encourage collaboration and experimentation. Since 2016, the company's engineering team has doubled in size to 120, and Polinsky said the additional bandwidth has made a tangible impact on the team and the company as a whole.

"One of the amazing aspects of Stitch Fix is that no department is 'king.' While some engineering teams at big tech companies can do no wrong, at Stitch Fix, all functions and teams are equally important and valuable," said Polinsky. "The partnership between engineering and data science is essential to constantly improving our client experience."

Machine learning delivers measurable results

Management of the company's technical talent falls in the purview of Eric Colson, the chief algorithms officer for Stitch Fix. In his role, Colson oversees the company's data science and machine learning projects and works to extend the benefits of machine learning across departments.

"We really rely on the algorithms team for framing problems with mathematical equations," Colson said. "For instance, one of our data scientists tinkered with a genetic algorithm and applied it to apparel to predict what would be a successful piece of clothing that doesn't exist today. We brought that to the merchandise team and now they can use that as a tool."

[In terms of ROI](#), Colson said machine learning has delivered measurable results, including increased revenue, decreased costs, and boosts to customer satisfaction. "It hits the top and bottom lines in very real ways," he said.

Maintaining that competitive edge

Meanwhile, Colson said the draw of the company's machine learning agenda has helped it outcompete for data scientists in cut throat, talent-starved Silicon Valley. "It's always a tough field to compete in, but we do really well," Colson said. "We have people who've left the field of astrophysics to work in the world of fashion, and the reason is high impact -- they can see what their work is going towards."

Looking long term, Stitch Fix -- which rang up \$1 billion in revenue in 2017 -- is confident it'll easily maintain a competitive edge against retail upstarts trying to mimic its data-centric business model.

Colson posits that the corporate structure of Stitch Fix, with its value system framed to support a data science team, is something legacy retailers and new age startups will struggle to replicate.

"Other companies don't have our structure and can't easily copy it," Colson said. "We embraced early on the need to leverage data and anticipate client needs. Companies that fail to do the same will be left behind."

Amazon Has Developed an AI Fashion Designer

The retail giant is taking a characteristically algorithmic approach to fashion.

Will Knight Will Knight
MIT Technology Review
August 2017

Amazon isn't synonymous with high fashion yet, but the company may be poised to lead the way when it comes to replacing stylists and designers with ever-so-chic AI algorithms.

Researchers at the e-commerce juggernaut are currently working on several machine-learning systems that could help provide an edge when it comes to spotting, reacting to, and perhaps even shaping the latest fashion trends. The effort points to ways in which Amazon and other companies could try to improve the tracking of trends in other areas of retail—making recommendations based on products popping up in social-media posts, for instance. And it could help the company expand its clothing business or even dominate the area.

“There's been a whole move from companies like Amazon trying to understand how fashion develops in the world,” says [Kavita Bala](#), a professor at Cornell University who took part in a workshop on machine learning and fashion organized by Amazon last week. “This is completely changing the industry.”

A number of forward-thinking retailers are already using social networks like Instagram and Pinterest to track the latest fashion trends and react quickly. And startups like the subscription service Stitch Fix already make personalized recommendations based on user preferences and social-media activity.

Amazon, meanwhile, is making moves to bolster its apparel business, developing its own clothing brands, investing in high-quality photography for products, and launching Prime Wardrobe, which lets customers try on clothes before buying them. Its Echo Look app will even give you feedback on your outfits.

But Amazon appears to be pushing that algorithmic approach even further. For instance, one group of Amazon researchers based in Israel developed machine learning that, by analyzing just a few labels attached to images, can deduce whether a particular look can be considered stylish. The software could conceivably provide fashion feedback or recommendations for adjustments. The work is innovative because computers usually

require extensive labeling in order to learn from visual information. But in many real-world situations, such as an image posted to Instagram, there might be just one label. An Amazon team at Lab126, a research center based in San Francisco, has developed an algorithm that learns about a particular style of fashion from images, and can then generate new items in similar styles from scratch—essentially, a simple AI fashion designer. The approach is crude and hardly ready for *Project Runway*, but it hints at the possibilities.

This work uses a cutting-edge tool called a generative adversarial network, or GAN. It consists of two deep neural networks operating in tandem to learn efficiently from raw data. The GAN internalizes the properties of a particular style simply by looking at lots of examples, and it can then apply that style to an existing item of clothing. GANs, which were developed by a researcher on the Google Brain team, are a hot topic in machine learning today.

Both these projects were revealed at the workshop organized by Amazon. The event included mostly academic researchers who are exploring ways for machines to understand fashion trends. The company declined to comment on the projects.

Some at the workshop showed how the techniques being developed to track fashion trends could provide broader insights into human behavior. Bala and her colleagues are using information gleaned from Instagram as a form of anthropological research. “We’re trying to understand how people live their daily lives,” she says. “It really is unprecedented in human history that we have this extent of visual records.”

Others are exploring ideas that could feed directly into people’s closets. A group from the University of Illinois in Urbana-Champaign demonstrated an algorithm for identifying fashion-focused social-network accounts. A team from the Indian clothing site Myntra showed a program that guesses a person’s correct size for a particular garment from his or her past purchases.

Tim Oates, a professor at the University of Maryland in Baltimore County, presented details of a system for transferring a particular style from one garment to another. He suggests that this approach might be used to conjure up new items of clothing from scratch. “You could train [an algorithm] on your closet, and then you could say here’s a jacket or a pair of pants, and I’d like to adapt it to my style,” Oates says.

Fashion designers probably shouldn’t fret just yet, though. Oates and other point out that it may be a long time before a machine can invent a fashion trend. “People innovate in areas like music, fashion, and cinema,” he says. “What we haven’t seen is a genuinely new music or fashion style that was generated by a computer and really resonated with people.”

That may be so, but when it comes to fashion-forward algorithms, evidently Jeff Bezos likes what he sees.

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Dorner et al.

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(45) **Date of Patent:** **Jan. 2, 2018**

(54) **BLENDED REALITY SYSTEMS AND METHODS**

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G06T 19/00 (2011.01)
G03B 21/20 (2006.01)
G02B 27/01 (2006.01)

(Continued)

(52) **U.S. Cl.**
CPC **G06T 19/006** (2013.01); **G02B 27/01** (2013.01); **G02B 27/026** (2013.01); **G03B 21/2053** (2013.01); **G03B 21/2066** (2013.01); **G06T 7/70** (2017.01); **G06T 15/50** (2013.01); **G02B 2027/014** (2013.01); **G02B 2027/0138** (2013.01); **G06T 2207/10004** (2013.01); **G06T 2207/30201** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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Primary Examiner — Zhengxi Liu

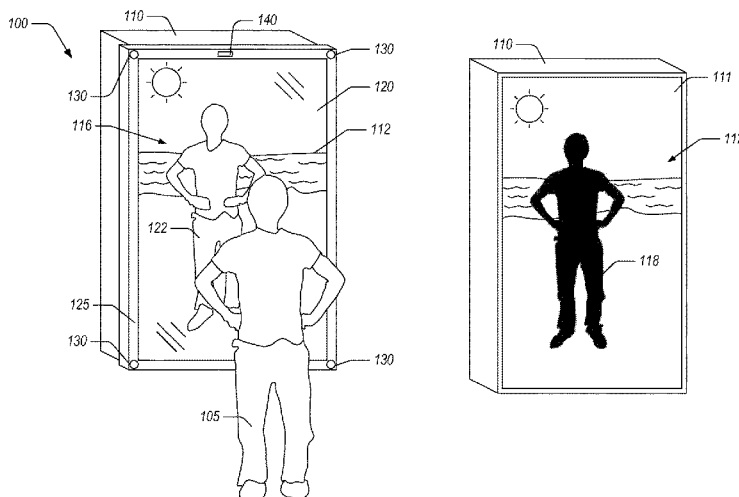
Assistant Examiner — Khoa Vu

(74) *Attorney, Agent, or Firm* — Knobbe Martens Olson & Bear LLP

(57) **ABSTRACT**

Systems and methods are provided for generating a blended reality view to a user, the blended reality view combining images reflected by a mirror with images transmitted from a screen behind the mirror. Systems for generating blended reality views can include a display device with a screen positioned behind a mirror. The display device can generate a pattern of illumination and non-illumination on the screen so that the illuminated portions of the screen substantially transmit through the mirror. Projectors can be used to illuminate objects in front of the mirror so that the illuminated objects are reflected by the mirror. In combination, the portions of the screen transmitted through the mirror and the illuminated objects reflected by the mirror can provide a blended reality view to a user viewing the mirror.

20 Claims, 10 Drawing Sheets



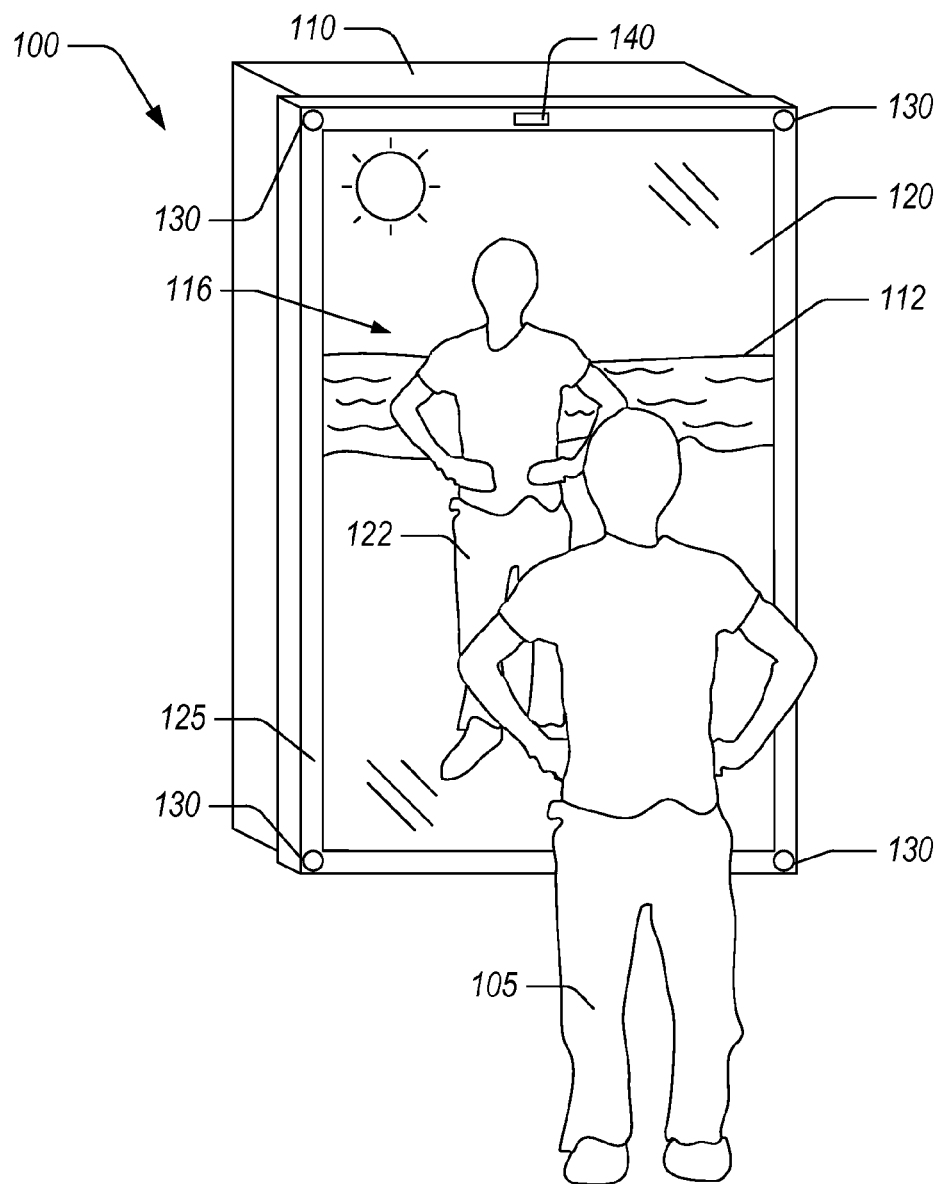


FIG. 1A

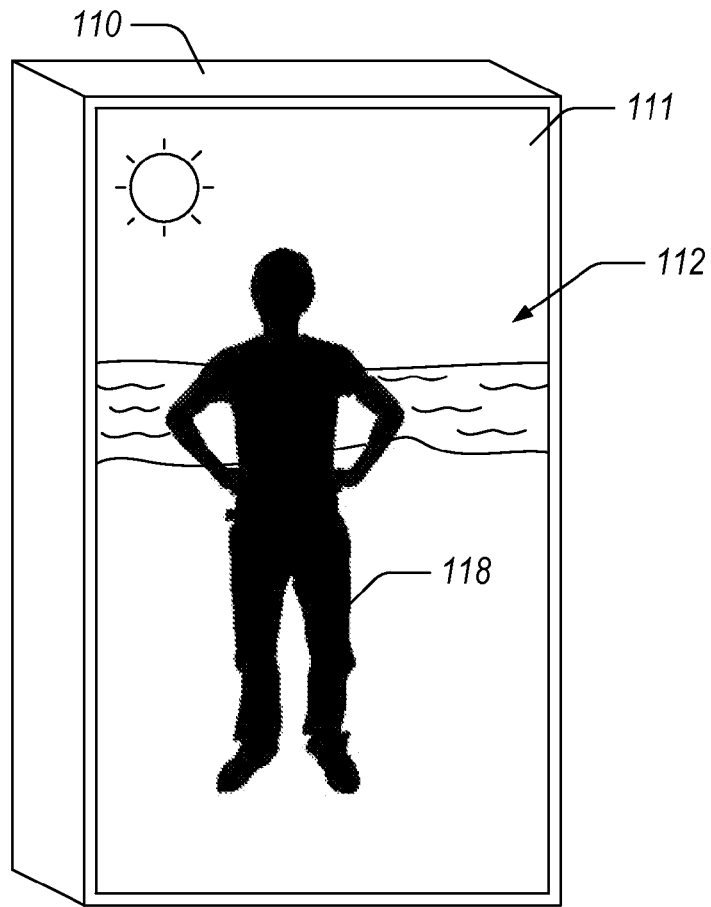


FIG. 1B

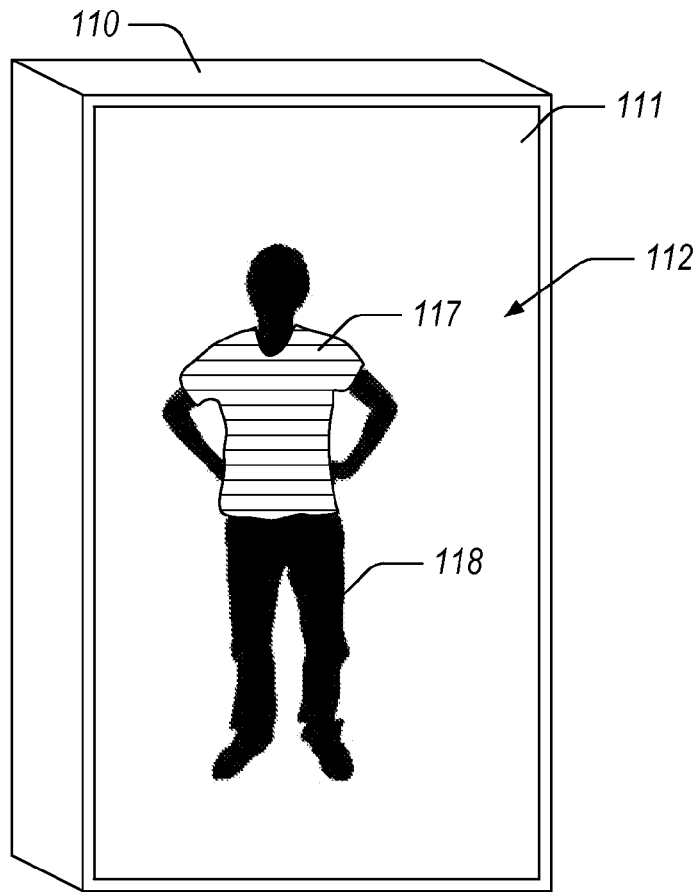


FIG. 1C

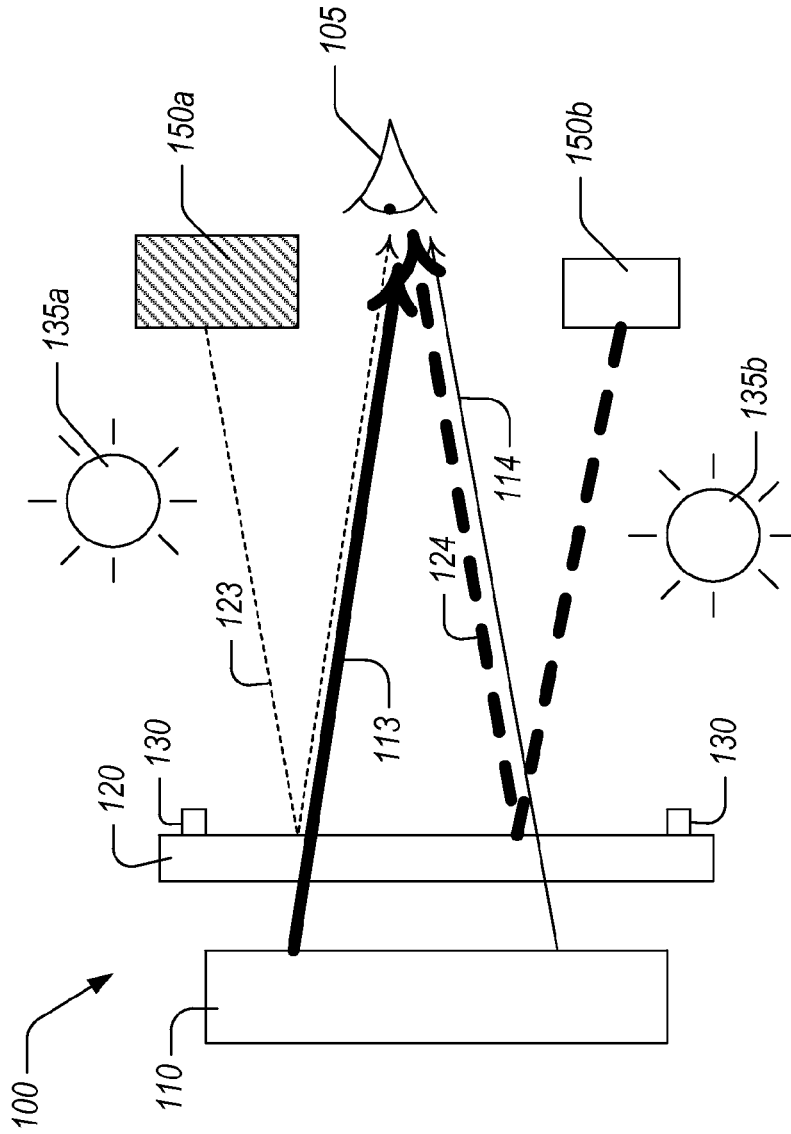


FIG. 2

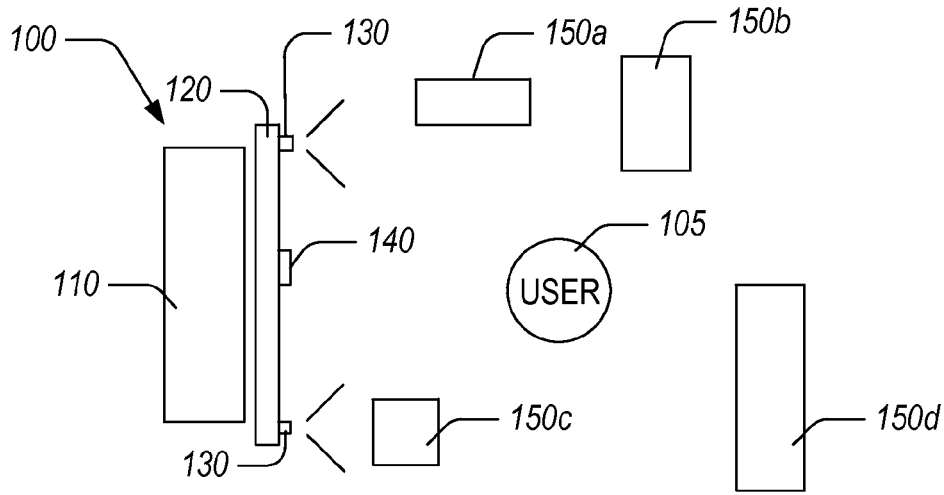


FIG. 3A

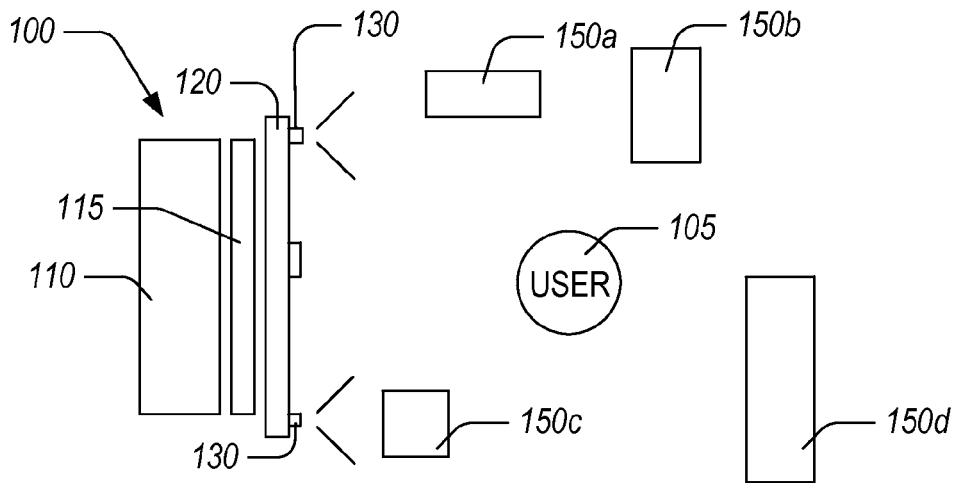


FIG. 3B

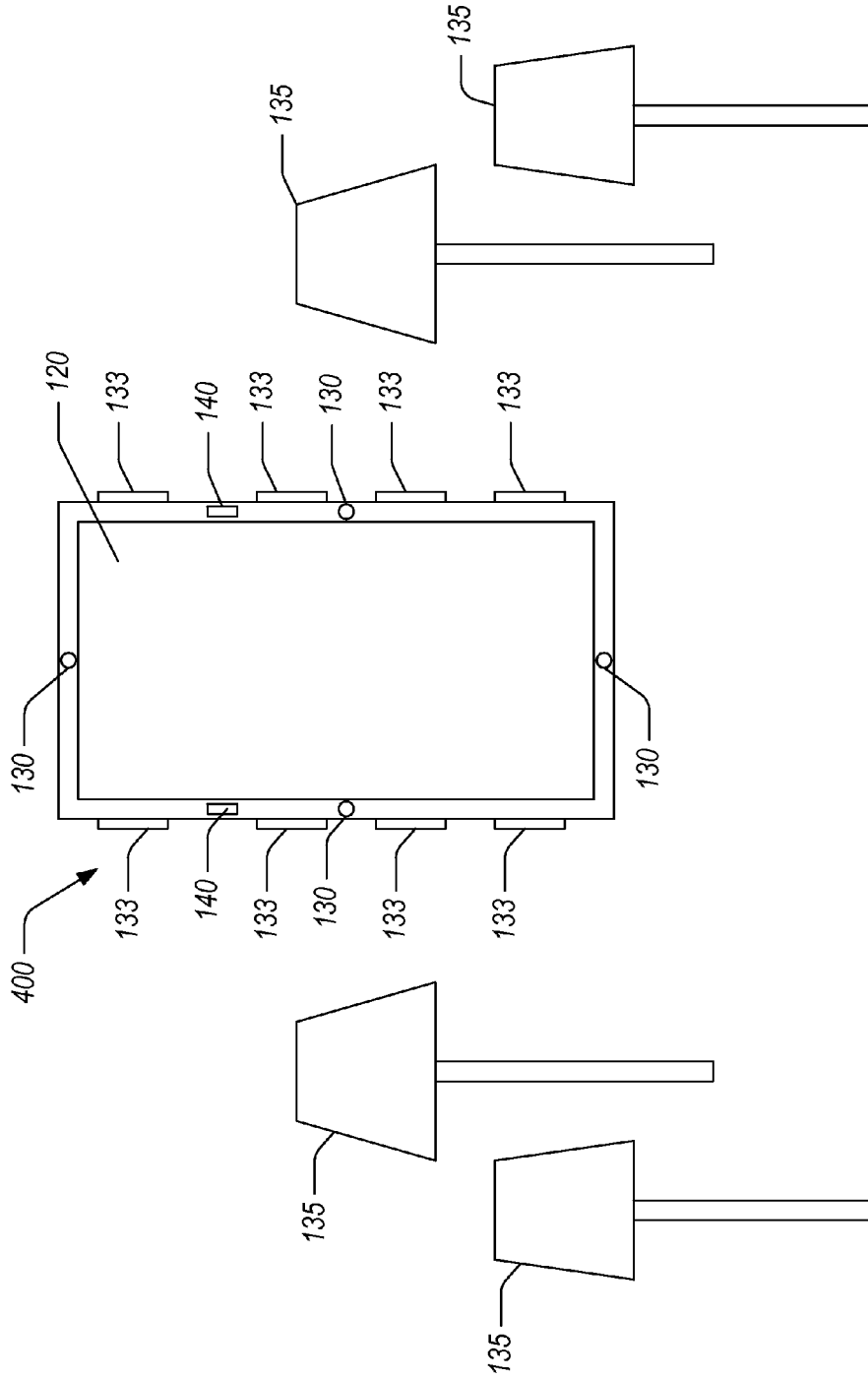


FIG. 4

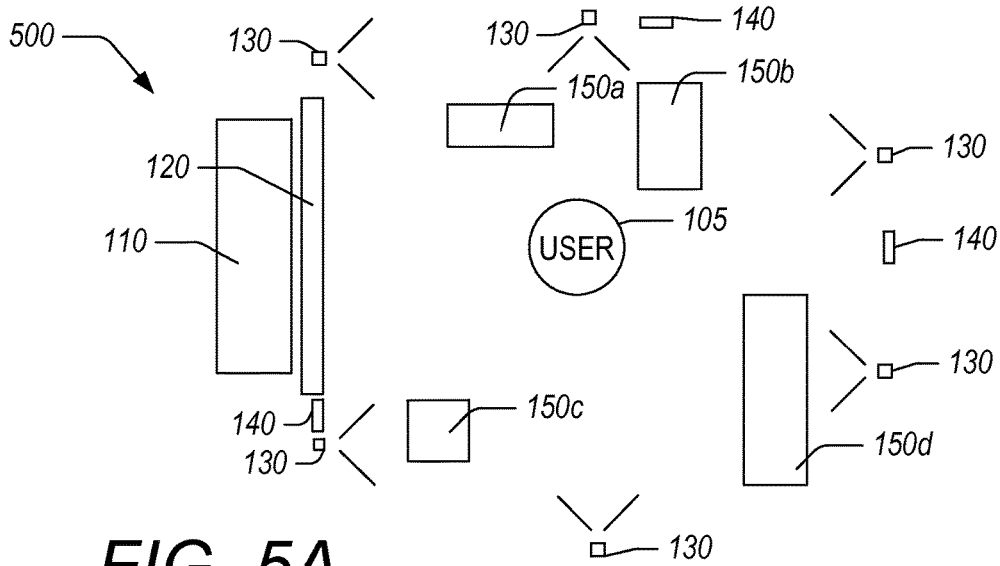


FIG. 5A

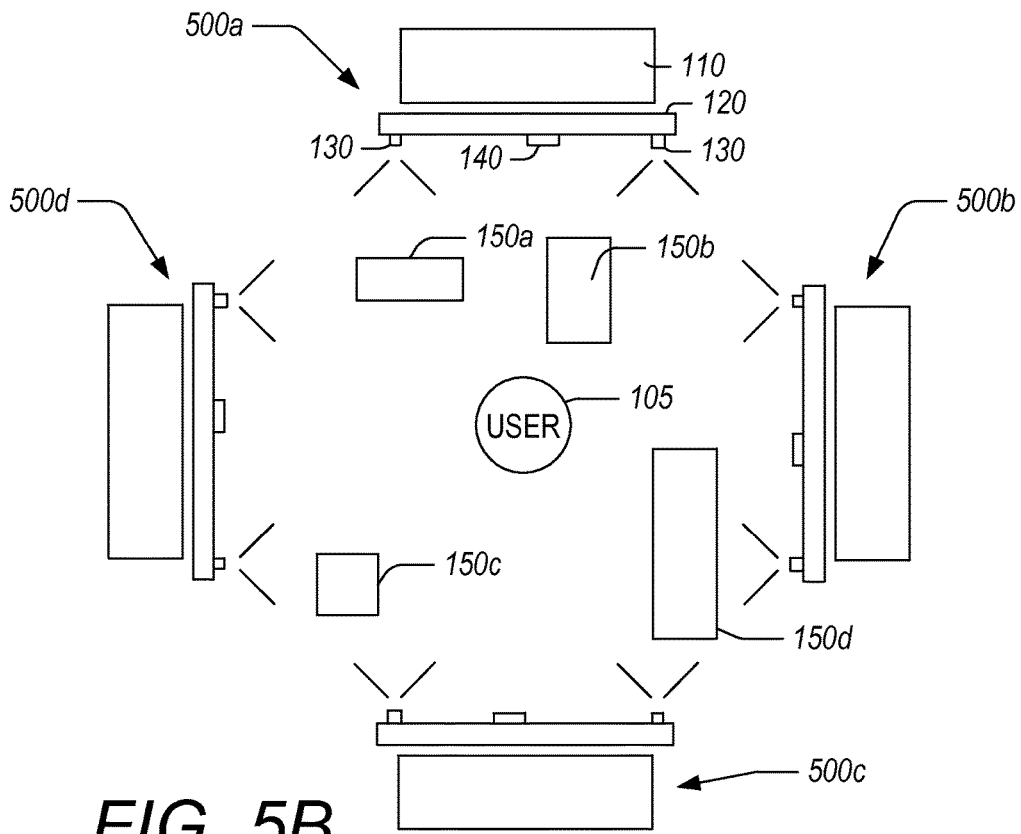


FIG. 5B

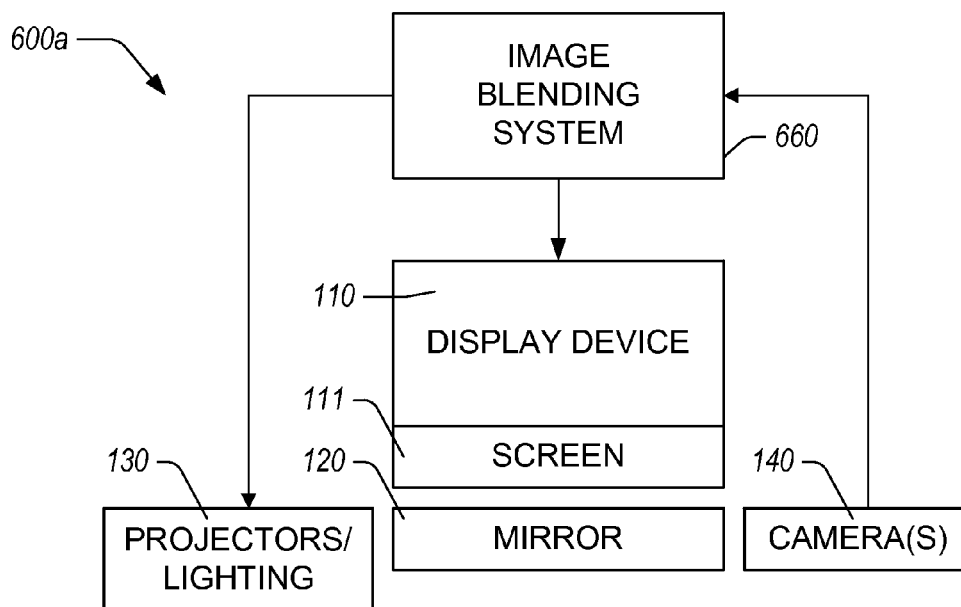


FIG. 6A

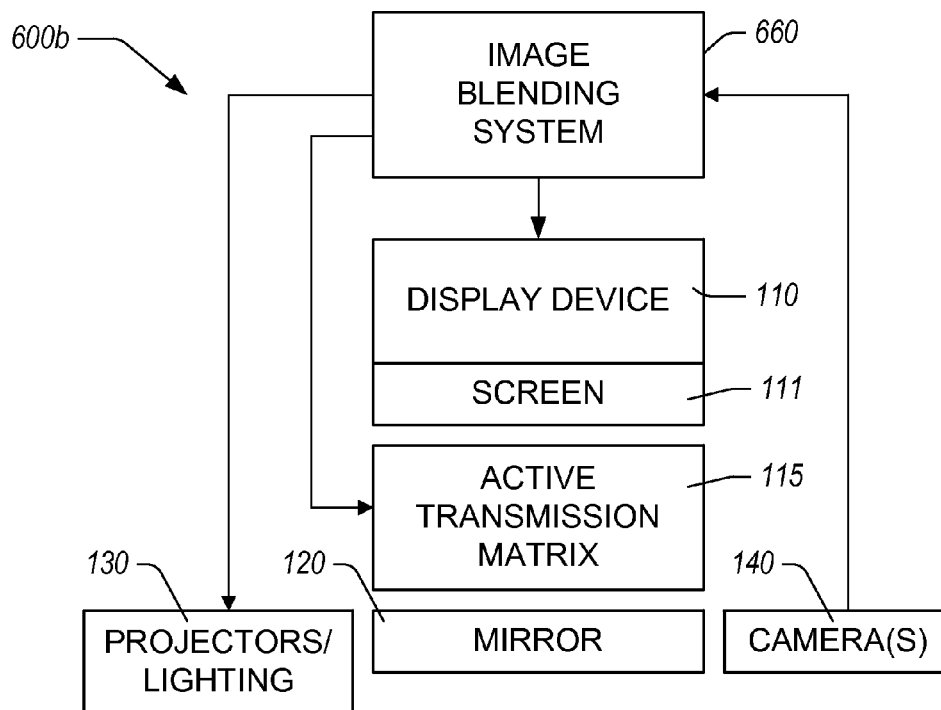
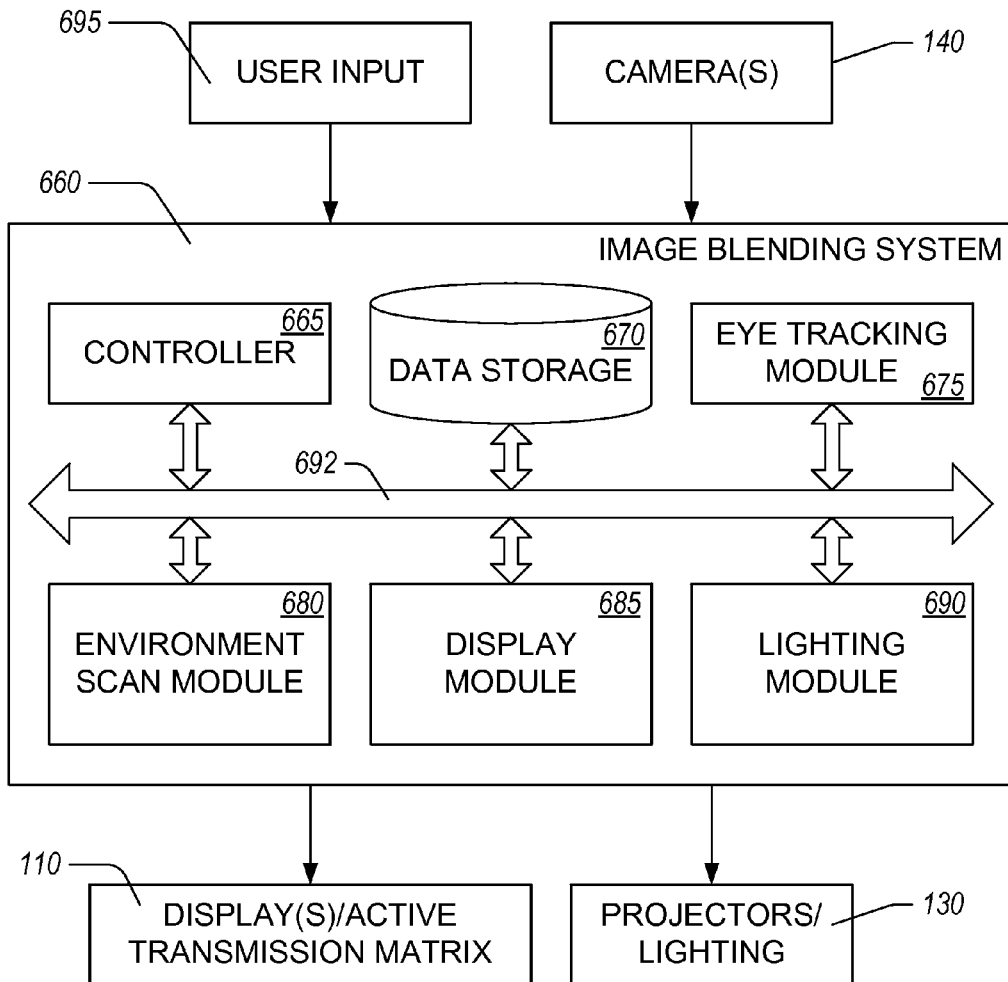


FIG. 6B

**FIG. 7**

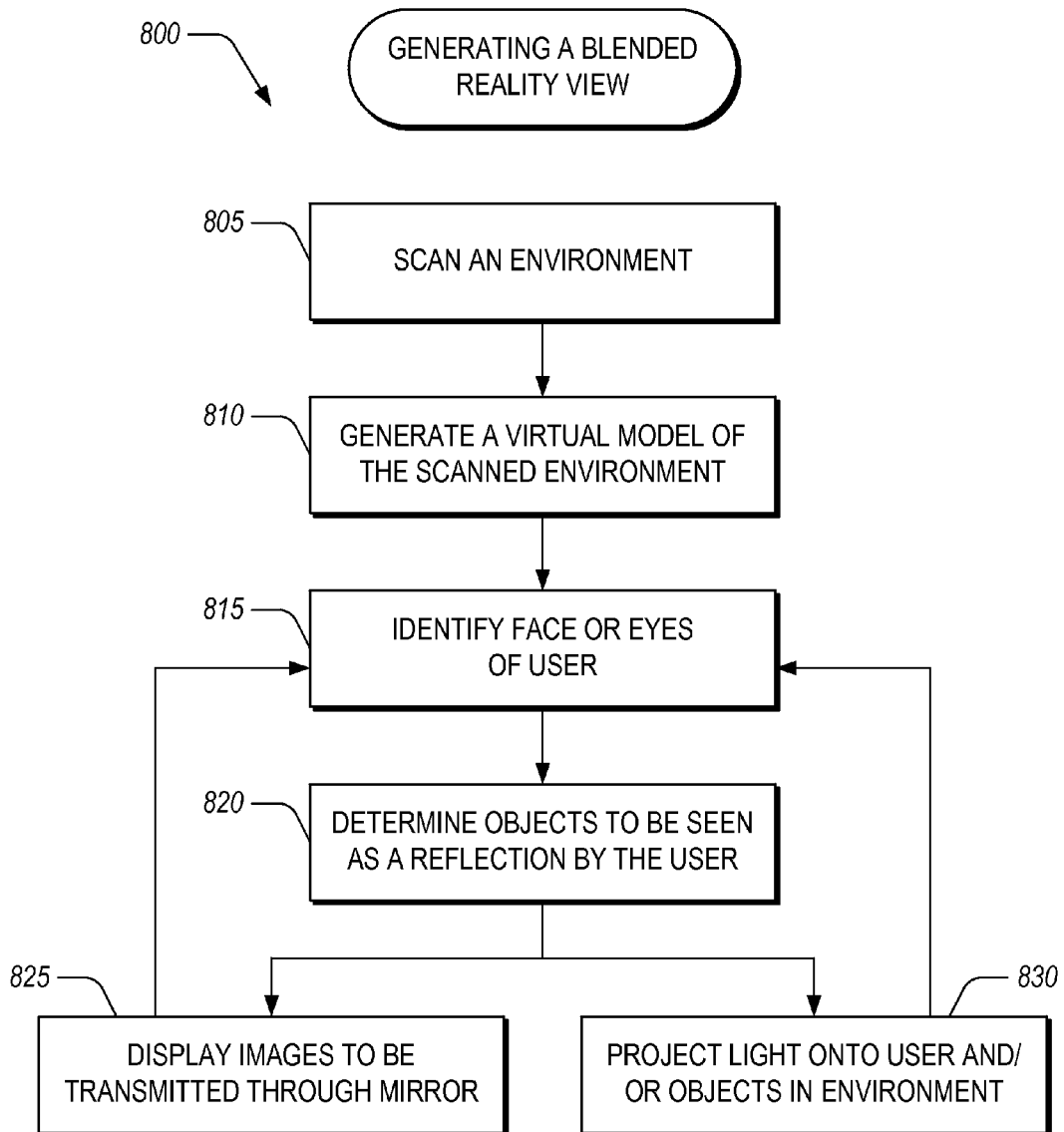


FIG. 8

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BLENDING REALITY SYSTEMS AND METHODS

BACKGROUND

For entertainment and other purposes, unique visual displays can enhance the experiences of users. These visual displays can be used to alter scenes as perceived by users, for example, by adding objects to the scene that do not actually exist. One method of providing such a visual display uses an illusionary technique referred to as "Pepper's ghost" that can produce a virtual object in a scene as a latent or ghost-like image. This illusionary technique uses glass angled relative to a viewer, a display or object out of direct view of a viewer, and tailored lighting schemes. However, such techniques are significantly limited, requiring space that extends beyond a visual display or that significantly increase the size of a visual display. In addition, these techniques can produce unrealistic results as the virtual objects placed in the scene are generally translucent and low contrast.

BRIEF DESCRIPTION OF THE DRAWINGS

Aspects and advantages of the embodiments provided herein are described with reference to the following detailed description in conjunction with the accompanying drawings. Throughout the drawings, reference numbers may be used to indicate correspondence between referenced elements. The drawings are provided to illustrate example embodiments described herein and are not intended to limit the scope of the disclosure.

FIG. 1A illustrates an example blended reality apparatus configured to generate a blended reality view.

FIGS. 1B and 1C illustrate a display of the example blended reality apparatus of FIG. 1A.

FIG. 2 illustrates a diagram of a user simultaneously perceiving reflected light and transmitted light, wherein the respective intensities of the reflected and transmitted light are controlled by a blended reality apparatus.

FIG. 3A illustrates a top view of an example blended reality apparatus, wherein the apparatus includes a plurality of projectors configured to selectively illuminate objects within an environment in front of the mirror.

FIG. 3B illustrates a top view of an example blended reality apparatus, the apparatus including an active transmission matrix between a display and a mirror.

FIG. 4 illustrates an example apparatus configured to generate a blended reality view, the apparatus configured to control lighting within an environment to enhance the blended reality view.

FIG. 5A illustrates a top view of an example apparatus for generating a blended reality view, the apparatus including projectors and cameras positioned around and within an environment in front of a mirror.

FIG. 5B illustrates a top view of a blended reality system comprising a plurality of blended reality apparatuses, each blended reality apparatus configured to generate a blended reality view.

FIGS. 6A and 6B illustrate functional block diagrams of example blended reality systems comprising an image blending system.

FIG. 7 illustrates a functional block diagram of an example imaging blending system.

FIG. 8 illustrates an example method for generating a blended reality view.

DETAILED DESCRIPTION

Generally described, aspects of the present disclosure relate to generating a blended reality view for a user by

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combining reflections from a mirror with light transmitted through the mirror by a display. The present disclosure includes systems and methods configured to blend transmitted and reflected light to form a single scene, as perceived by a user, by controlling the amount of light on either side of a mirror or other reflective element. A blended reality view can be used to provide a visual representation of the user in different settings other than the one the user is actually in. Similarly, the blended reality view can be used to provide a visual representation of items, such as clothes, on the user without the user actually wearing the physical item.

Display systems can be used to provide a view of objects that are not actually in a scene but that are perceived to be there by a user. This can be accomplished using angled glass and lighting techniques. Teleprompters, amusement park rides, heads up displays, visual illusions, and the like employ similar methods for providing a user a view of a portion of reality (e.g., light transmitted from a scene through the angled glass) along with a portion of projected objects (e.g., light reflected from an object or display by the angled glass).

However, challenges arise when it is desirable to combine a reflection of a user with projected images of virtual objects. Using angled glass with special lighting techniques does not provide such a view because the angled glass does not reflect an image of the user back to the user. In addition, attempting to combine a reflected view of the user with a view of projected images can result in undesirable superposition of reflections with projected images, sometimes called "ghosting." Without controlling which objects are seen as reflections by a user, this undesirable combination of reflected images with transmitted or projected images can result in an unclear image being perceived by the user.

In addition, visual displays that employ angled glass to project images to a user can use additional space for a display placed out of the direct line of site of the user. This can increase the size of a visual display making it difficult or cumbersome to install and/or use.

Accordingly, the present disclosure provides systems and methods that generate a blended reality view by controlling the amount of light transmitted through a mirror and the amount of light reflected from the mirror. Blended reality apparatuses and methods described herein reduce or eliminate undesirable superposition of reflected and projected images by controlling the amount of light transmitted through a mirror and an amount of light reflected by the mirror. Using a blended reality apparatus as disclosed herein, a viewer can see reflected light in a first region of a mirror, transmitted light in a second region of the mirror, and a controlled superposition of reflected and transmitted light in a third region of the mirror. Blended reality apparatuses disclosed herein can be configured to control which portions of a mirror provide reflected light to a user, which portions of the mirror provide transmitted light to the user, and which portions of the mirror provide a controlled superposition of reflected and transmitted light to the user. This may be desirable in a situation where a user wants to see how a new outfit would look in a particular setting. To generate a blended reality view, a blended reality apparatus can i) selectively illuminate the user, ii) leave the rest of the room dark, and/or iii) project an image of the particular setting (e.g., a restaurant), the projected image being shown on the display at a location where the user would have seen a reflection of objects or surfaces in the room. Because the user is illuminated, the user can see their reflection. Because the rest of the room is dark but the apparatus is projecting an image of the particular setting, the user can see the setting

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instead of a reflection of the room. Furthermore, the apparatus can also project an image of the new outfit so that the user sees a superposition of their reflection with the projected new outfit so that it appears as though the user is wearing the outfit.

The blended reality systems and methods disclosed herein can provide a blended reality view using a mirror that is transmissive and reflective, a plurality of projectors to selectively illuminate objects in a room in front of the mirror, and a display to selectively transmit images through the mirror. To provide the blended reality view, projectors can selectively illuminate objects in a room and the display can be used to project images through the mirror. Depending on the area of the mirror the user looks at, the light reaching the user's eye can be dominated by light reflected by the mirror, dominated by light transmitted through the mirror, or a combination of reflected and transmitted light. Thus, the blended reality view can be a combination of reflected images and transmitted images where the images are perceived by the user as a single scene. Furthermore, the blended reality systems and methods disclosed herein can provide the blended reality view using an apparatus that is compact relative to designs employing angled glass because the display and mirror can be attached or otherwise combined with one another so that a surface of the mirror is adjacent to and parallel to a surface of the display.

Although the examples and implementations described herein focus, for the purpose of illustration, on displays, projectors, cameras, and mirrors for generating blended reality views, one skilled in the art will appreciate that the techniques described herein may be applied to other processes, methods, or systems. For example, the techniques may be used with other types of visual displays that collect and process image data for purposes other than providing a blended reality view to a user, but instead generate visual impressions for a user or a group of users by combining transmitted images with reflections. Various aspects of the disclosure will now be described with regard to certain examples and embodiments, which are intended to illustrate but not limit the disclosure.

In one aspect, an apparatus can be configured to provide a user a simultaneous view of reflected and transmitted light to create a visual effect for the user that blends reflections with displayed images. The apparatus can include a mirror that is partially-reflective and partially-transmissive and a display device positioned on a first side of the mirror, the display device having a screen configured to generate light transmitted through the mirror. The apparatus can include a plurality of projectors positioned on a periphery of the mirror and oriented to project light onto a user when the user is positioned on a second side of the mirror, opposite the first side. The apparatus can include a camera configured to acquire image data of the user and the environment or scene on the second side the mirror. The apparatus can include an image blending system communicably coupled to the camera, the display device, and the plurality of projectors. The image blending system can be configured to determine a location of a user's eyes based on the image data acquired with the camera, display images with the display device so that portions of the screen are illuminated and portions of the screen are not illuminated, and control the projectors to illuminate portions of the user and/or objects in the scene. When the user views the mirror, the user sees a reflection from the mirror of illuminated objects in the scene and the transmitted images from the display device through the mirror, the transmitted images being perceived as part of the reflected scene.

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Overview of an Example Blended Reality Apparatus

Turning now to FIG. 1A, an example blended reality apparatus **100** is illustrated that is configured to generate a blended reality view **116** for a user **105** by combining light reflected by a mirror **120** with light from a display device **110** transmitted through the mirror **120**. The blended reality apparatus **100** includes a plurality of projectors **130** around or near a frame **125** of the mirror. The plurality of projectors **130** is configured to selectively illuminate objects in front of the mirror **120**. The blended reality apparatus **100** includes one or more cameras **140** on or near the frame **125** of the mirror. The one or more cameras **140** are configured to acquire image data of the user **105** and objects in front of the mirror **120**.

The blended reality apparatus **100** can generate the blended reality view **116** by controlling the illumination of objects in front of the mirror **120** using the projectors **130** and by generating images with the display device **110** behind the mirror **120**. The blended reality view **116** includes a combination of reflected light (e.g., a reflection **122** of the user) and transmitted light (e.g., a beach scene **112** or a shirt **117** projected by the display device **110**, as described herein with reference to FIGS. 1B and 1C, respectively). To generate the blended reality view **116**, the blended reality apparatus **100** can use the one or more cameras **140**. In a scanning phase, the one or more cameras **140** can be used to acquire image data of the environment in front of the mirror **120**, where the environment in front of the mirror **120** includes objects, surfaces, and/or light sources that can be seen reflected in the mirror **120**. In some embodiments, this first phase, or scanning phase, occurs during an initial setup of the blended reality apparatus **100**. From this image data, a three dimensional virtual model of the environment can be generated. For example, simultaneous localization and mapping ("SLAM") techniques can be used to generate the virtual model. SLAM techniques can include acquiring image information of an environment to update an estimate of a position or positions of an object's location in the environment using Kalman filters, particle filters, and Monte Carlo methods. Other methods include combining information from optical cameras, infrared cameras, and/or range finders to determine and track locations of objects. Examples of such techniques can be found, for example, in U.S. Pat. No. 8,744,121 entitled "Device for Identifying and Tracking Multiple Humans Over Time," U.S. Pat. No. 8,717,417 entitled "Three-Dimensional Mapping and Imaging," and U.S. Pat. Pub. No. 2010/0302138 entitled "Methods and Systems for Defining and Modifying a Visual Representation," each of which is incorporated herein by reference in its entirety. In some embodiments, the one or more cameras **140** can be used to update the three dimensional virtual model from time to time, such as when requested by a user, at regular intervals, and/or when changes to the environment are detected.

In addition, during a tracking phase, the one or more cameras **140** can be used to acquire image data of the user **105** when the user is using the blended reality apparatus **100**. The image data of the user **105** can be used to track the user's face and/or to determine the location of the user's eyes in relation to the mirror **120**. The one or more cameras **140** can each have a field of view. The one or more cameras **140** can be configured to image a user positioned within the field of view of at least one of the one or more cameras **140**. The field of views of one or more cameras **140** can overlap to provide regions where image information of the user is acquired from a plurality of angles. Accordingly, the blended reality apparatus **100** can perform the tracking phase when

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the user **105** is positioned within the field of view of at least one camera. In some embodiments, tracking of the user's face and/or the user's eyes may improve when the blended reality apparatus **100** includes a plurality of cameras and the user is positioned within the field of view of at least two cameras. In some embodiments, the blended reality apparatus **100** is configured to track the user's face and/or to determine the location of the user's eyes when the user is positioned in front of the mirror **120** such that the user **105** can see the user's own reflection (e.g., the user **105** is not positioned outside the frame **125** of the mirror **120**). Example systems and methods configured to track a human head, face, and/or form in real time are described, for example, in U.S. Pat. No. 8,594,425 entitled "Analysis of three-dimensional scenes," and U.S. Pat. Pub. No. 2013/0202161 entitled "Enhanced Face Detection Using Depth Information," each of which is incorporated herein by reference in its entirety. In some embodiments, facial tracking is accomplished through the use of the Kanade-Lucas-Tomasi ("KLT") algorithm.

In some embodiments, the user's face can be tracked in real time or near real time with the one or more cameras **140**. With the user's eyes located, reverse ray tracing (e.g., tracing rays of light from the user's eye to the mirror and to the environment) or other techniques can be performed to determine and associate the different parts of the environment the user can see. This information can then be used to control the projectors **130** to selectively illuminate objects and/or surfaces in the environment. This information can also be used to control the display device **110** to selectively illuminate portions of the mirror **120** from behind the mirror **120**.

By way of analogy, in one embodiment, the mirror **120** can be thought of as a single pixel-based screen showing two images to be blended. The first image is the reflection of the user **122** and/or objects in the environment. Objects in the environment can include furniture, clothes, books, toys, devices, and the like. Objects in the environment can also include walls, floors, ceilings, or other structures. Objects in the environment can also include any surface, texture, or other feature visible as a reflection in the mirror **120**. The first image can be calculated based on the user's eye position from the image data acquired with the one or more cameras **140**. For example, reverse ray tracing can be done to determine the objects visible in the mirror using information about the user's eye position and the locations of objects in the environment. The second image is the virtual image **112** generated by the display device **110** where the virtual image **112** is transmitted through the mirror **120**. The blending of the two images can be accomplished by controlling the relative intensities of the light in both images. For example, light intensity and/or color at each pixel in the display and/or light intensity and/or color projected by the projectors on different objects can be varied to achieve a desired mixing of light at the user's eye. At each "pixel" or location on the mirror **120**, the image seen by the user corresponds to the image providing the most light at that pixel. For example, if the first image, or reflection, is to be seen at a particular location on the mirror **120** then the projectors **130** can be configured to illuminate whatever object the user will see when looking at the mirror **120** at that particular location on the mirror **120**. This determination is based on the location of the user's eyes and the three dimensional virtual model of the environment. The display device **110** can be dark, blank, display a solid color (e.g., black, white, blue, or other color), or display a selected pattern at the corresponding location. If on the other hand the second image, or virtual image, is to

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be seen at a particular location on the mirror **120** then the display device **110** can be configured to transmit light from behind the mirror **120** using a pixel or collection of pixels that corresponds to that particular location on the mirror **120**. The projectors **130** can be configured to not illuminate whatever object the user sees when looking at the mirror **120** at that particular location on the mirror **120**. As a result, the user **105** sees at each "pixel" or location on the mirror **120** reflected light or transmitted light. The user then perceives a blending of the two images resulting in a single blended reality scene.

FIG. 2 illustrates a diagram of a user **105** simultaneously perceiving reflected light and transmitted light, wherein the respective intensities of the reflected and transmitted light are controlled by the projectors **130**, the display device **110**, and/or ambient light sources **135a**, **135b**. The blended reality apparatus **100** can be configured to control the light in the environment using the projectors **130**. The light from the projectors **130** can be controlled to control reflected light intensity at the mirror **120** on a "per pixel" basis meaning that the image or light pattern projected by each projector **130** can be configured to result in desired reflected light intensity at particular locations on the mirror **120**. In some embodiments, the blended reality apparatus **100** can also control ambient lighting in the environment using lights **135a**, **135b** in the environment or lights outside of the environment. The lights **135a**, **135b** are generally not controllable on a "per pixel" basis because they are generally diffuse sources of light. However, the intensity and/or color of light from the lights **135a**, **135b** can be controlled. Furthermore, the blended reality apparatus **100** can be configured to control transmitted light using the display device **110**. The display device **110** can also be controlled on a "per pixel" basis.

As shown in FIG. 2, the user **105** will perceive an image based on the light arriving at the user's eye. In the figure, solid lines **113**, **114** represent transmitted light from the display device **110** and dashed lines **123**, **124** represent light reflected from surfaces in the environment. The thickness of the lines corresponds to the relative intensity of the light. When looking at a particular region of the mirror **120**, the user will perceive a transmitted or virtual image if light from the display device **110** transmitted through the mirror **120** in that region dominates the light from a surface **150a** reflected from that region of the mirror **120** (e.g., transmitted light **113** dominates reflected light **123**). To increase the contrast between transmitted light and reflected light, the surface **150a** can be left unilluminated by the projectors **130**. The contrast between transmitted light and reflected light can be the difference in light intensity of the two sources. For example, the contrast between transmitted light and reflected light can be expressed as $(IT-IR)/(IT+IR)$, where IT is the intensity of transmitted light and IR is the intensity of reflected light. When looking at a particular region of the mirror **120**, the user will perceive a reflected image where light from a surface **150b** reflected at the particular location on the mirror **120** dominates light transmitted by the display device **110** through the mirror at the particular location (e.g., the reflected light **124** dominates transmitted light **114**). To increase the contrast between reflected and transmitted light, the surface **150b** can be illuminated by the projectors **130**. In some situations, it may be undesirable for a user to see a combination of reflected light and transmitted light at a single "pixel" or location on the mirror **120**. This undesirable combination can be reduced or eliminated by increasing the contrast between the reflected and transmitted light. To reduce or eliminate undesirable superposition of reflected

and transmitted images, the intensity of the light that is not to be perceived can be reduced or eliminated. In the case of the display device **110**, this can mean not illuminating that portion of the display device **110** or using an active element to block that portion of the display device **110**. Examples of such active elements are described in greater herein with reference to FIGS. 3B and 6B. In the case of reflections from objects in front of the mirror, this can mean not illuminating the surface with the projectors **130** and/or reducing or eliminating ambient lighting. In some situations, it may be desirable for a user to see a combination of reflected light and transmitted light at a location on the mirror **120**. The desirable combination can be controlled by controlling the respective intensities of reflected and transmitted light. As used herein, intensity of light can be used to mean the number of photons per unit area per solid angle (e.g., radiant intensity), or power emitted by a light source weighted according to the sensitivity of the human eye (e.g., luminous intensity), brightness of a light source, or other such measurement used to quantify the power emitted by a light source or perceived by a viewer. In some embodiments, the ratio of intensities of light can be configured to achieve a desired effect. For example, where the user sees reflected light, the ratio of intensities of reflected light to transmitted light can be about 2:1, about 3:1, about 4:1, about 5:1, or greater than about 5:1. Similarly, where the user sees transmitted light, the ratio of intensities of transmitted light to reflected light can be about 2:1, about 3:1, about 4:1, about 5:1, or greater than about 5:1.

In some embodiments, it may be desirable to blend transmitted light with reflected light. This can be accomplished by varying the intensity of illumination provided by the projectors **130** on a surface and the intensity of the light provided by the display device **110**. The relative intensities of reflected and transmitted light can be varied to produce desired effects, such as overlaying a virtual image on a reflected image. For example, this can be used to show the user **105** how an article of clothing or make up would look on the user **105**.

In some embodiments, the blended reality apparatus **100** is configured to illuminate the user **105** and objects in the environment so that the user sees the user's own reflection while reflections of objects in the environment are reduced or eliminated. This can be used to substantially isolate the user's reflection. This can reduce computational costs due at least in part to the blended reality apparatus **100** not determining what to display in each pixel or location of the mirror **120**. Rather, the blended reality apparatus **100** determines the portions of the user to illuminate with the projectors **130** while leaving the rest of the environment without illumination from the projectors **130**. In some implementations, the display device **110** displays a substantially uniform color or pattern to help in isolating the reflection of the user **105**.

To generate a blended reality view where the user sees the user's own reflection along with an artificial scene, the display device **110** of the blended reality apparatus **100** can be configured to project an image or light from targeted pixels and project no relatively little light at other targeted pixels. An example of this is illustrated in FIG. 1B. FIG. 1B illustrates the display device **110** of the blended reality apparatus **100** illustrated in FIG. 1A, with the mirror **120** and other components removed. The display device **110** includes a screen **111** that displays an image **112** (e.g., the beach scene **112**) but with a portion of the screen **111** shown in black. This black portion **118** corresponds to the portion of the mirror **120** where a reflection of the user **105** is to be perceived by the user **105** rather than an image transmitted

by the display device **110**. The black portion **118** can be configured to transmit little or no light so that the light reflected from the mirror **120** at that location on the mirror **120** dominates the light transmitted through the mirror **120** at that location on the mirror **120**. The size, shape, color, and other properties of the black portion **118** can change depending on the targeted or desired blended reality view **116** provided to the user. For example, in some cases the black portion **118** can include projected images, colors, textures, patterns, or the like that are intended to be mixed with reflected images so that the user perceives a combination of transmitted and reflected light. The shape of the black portion **118** can be determined based on the location of the user's eyes as well as the desired or targeted blended reality view **116**. For example, as described herein, the blended reality apparatus **100** can utilize reverse ray tracing or other techniques to determine which portions of the display device **110** to illuminate and how to illuminate those portions. The blended reality apparatus **100** can use images of the user **105** acquired with the one or more cameras **130** to update the shape of the user's body to change the shape of the black portion **118** as the user **105** moves. The blended reality apparatus **100** can be configured to update the shape of the black portion **118** in real time.

To generate a blended reality view where the user sees an article of clothing or other object superimposed on the user's body, the display device **110** of the blended reality apparatus **100** can again be configured to project an image or light from targeted pixels and project no relatively little light at other targeted pixels. An example of this is illustrated in FIG. 1C. The display device **110** in this scenario displays an image of a shirt **117** such that the user **105** views the image of the shirt superimposed on the user's body. The image of the shirt **117** can be adjusted to fit the body of the user by adjusting the size of the shirt based on an analysis of images of the body of the user acquired with the one or more cameras **140**. In some embodiments, a visual approximation can be made to adjust the properties of the shirt **117** as displayed by the display device **110**. The visual approximation can be based on images of the shirt acquired when the shirt was worn by another person, wherein the images of the shirt are adjusted based on the body of the user **105**. The concepts described with reference to FIGS. 1B and 1C can be combined. For example, the blended reality apparatus **100** can be configured to provide a blended reality view that includes a projected scene to change an environment around the user **105** (e.g., the beach scene **112** illustrated in FIG. 1B) and an object to be perceived as being worn by the user **105** (e.g., the shirt **117** illustrated in FIG. 1C).

Additionally, the blended reality apparatus **100** can be configured to substantially isolate a reflection of the user **105** such that a reflection of environment around the user is suppressed. For example, this may be accomplished by using the display device **110** to project a tailored scene **112** around the user **105** (e.g., a substantially uniformly lit scene, a scene that is substantially white, a scene that is substantially black, a scene lacking sharp details, a scene lacking discernible objects, or the like) and/or by not illuminating objects in the environment with the projectors **130**. By isolating the user's reflection, the user **105** may be able to focus more on the user's own reflection due at least in part to a reduction of potentially distracting objects being viewed by the user **105** in the mirror **120**. This can also reduce the computational costs associated with generating a blended reality view that includes objects or scenes to be viewed along with the reflection of the user **105**.

Returning to FIG. 1A, the display device **110** of the blended reality apparatus **100** is positioned on a first side of the mirror **120**. In use, the user **105** can be positioned on a second side of the mirror **120**, opposite the first side, so that the user **105** can see the user's own reflection in the mirror **120**. The display device **110** can be a device having a screen, such as an LCD or plasma television, or the display device **110** can be a projector. In some embodiments, the display device **110** is configured to be parallel to the mirror **120**. In some embodiments, a screen of the display device **110** is configured to have a width that is substantially the same width as the mirror **120** and a height that is substantially the same height as the mirror **120**. In some embodiments, the display device **110** can be configured to project images that can substantially cover the surface area of the mirror **120**. For example and without limitation, the width of the screen or the width of the projected image can be at least 80% and/or less than or equal to about 120% the width of the mirror **120**, at least 90% and/or less than or equal to about 110% the width of the mirror **120**, at least 95% and/or less than or equal to about 105% the width of the mirror **120**, or at least 97% and/or less than or equal to about 103% the width of the mirror **120**. Similarly, the height of the screen or the height of the projected image can be at least 80% and/or less than or equal to about 120% the height of the mirror **120**, at least 90% and/or less than or equal to about 110% the height of the mirror **120**, at least 95% and/or less than or equal to about 105% the height of the mirror **120**, or at least 97% and/or less than or equal to about 103% the height of the mirror **120**. In some embodiments, the display device **110** can be made up of multiple displays and/or screens.

The display device **110** can be attached to the mirror **120** to form a unitary structure. In some embodiments, the display device **110** can be attached to the mirror **120** so that the display device **110** can be removed or replaced without damaging the mirror **120**. The display device **110** can have a surface that is adjacent to and parallel to a surface of the mirror **120**. In this configuration, the blended reality apparatus **100** can have a depth that is a combination of the thickness of the mirror **120** and the thickness of the display device **110**. This can result in a relatively compact apparatus suitable for installation in many environments, such as in a fitting room, in a closet, and/or hung on a wall.

The mirror **120** can be a sheet of material that is reflective and transmissive, such as glass or acrylic. The mirror **120** can be treated to balance transmittance, reflectance, and absorptance properties to achieve targeted or desired results. The mirror **120** can be a half-silvered mirror, similar to a beam splitter, that has balanced reflectance and transmittance properties in the visible spectrum (e.g., the mirror's reflectance and transmittance are about equal in the wavelength range between 350 nm and 700 nm). The mirror **120** can be planar or it can have a curved surface. The front side of the mirror **120** can be designated as the side of the mirror **120** facing the user **105** when the user **105** is viewing their reflection. With this convention, the display device **110** is positioned facing the back side of the mirror **120** so that light emitted from the display device **110** passes through the mirror **120** from the back side to the front side to eventually reach the user **105**. The mirror **120** can include the frame **125** to provide support for the mirror **120** as well as providing a place to attach the one or more cameras **140** and/or the projectors **130**.

The projectors **130** of the blended reality apparatus **100** can be positioned around the mirror **120**, such as integrated into the frame **125** of the mirror **120**. The projectors **130** can

be configured to project light into the environment in front of the mirror (e.g., where the user **105** stands when perceiving the blended reality view **116**). As described in greater detail herein, the projectors **130** can be positioned at other locations. The blended reality apparatus **100** can include at least 2 projectors, at least 3 projectors, at least 4 projectors, at least 5 projectors, at least 6 projectors, at least 7 projectors, at least 8 projectors, more than 8 projectors, or less than 10 projectors. In some embodiments, the projectors **130** can be positioned along at least two orthogonal axes. For example, projectors can be positioned at the midpoints of the frame **125** or at the corners of the frame **125**. The projectors **130** can be configured to generate a combined light output as if positioned at the user's eyes to achieve targeted or desired lighting effects. The combined light output from the projectors **130** can be configured to illuminate desired or targeted surfaces in the environment (including the user) and to leave other surfaces without illumination from the projectors. In some embodiments, the projectors **130** can be coupled to motors or other actuators to change an orientation of the projectors **130**. This can be done to change the pointing direction of the projectors **130** to enable illumination of different objects.

The one or more cameras **140** of the blended reality apparatus **100** can be attached to the mirror **120** or positioned elsewhere. The one or more cameras **140** can be configured to acquire image data of the environment in front of the mirror **120**. The one or more cameras **140** can be configured to acquire image data of the user **105** when positioned in the environment in front of the mirror **120**. The one or more cameras **140** can include image acquisition devices sensitive to different portions of the electromagnetic spectrum. For example, at least one camera can be sensitive to light in the visible portion of the spectrum and at least one camera can be sensitive to light in the infrared portion of the spectrum. The one or more cameras **140** can also include time of flight cameras or other similar sensors configured to determine distances to objects or surfaces in the environment. The one or more cameras **140** can include depth finding or range finding devices configured to determine a distance to one or more objects within a field of view of the respective device. In some embodiments, the one or more cameras **140** can be coupled to motors or other actuators to change an orientation one or more of the cameras **140**. This can be done to change the pointing direction of one or more of the cameras **140** to acquire images of different objects and/or to track movements of the user or objects.

The information acquired with the one or more cameras **140**, such as image and/or depth information, can be used to construct a virtual model of the environment for the blended reality apparatus **100**. The virtual model can include a digital representation of objects and surfaces in the environment and their relative positions, orientations, colors, reflectivities, and the like. The virtual model can be used to determine the patterns of light or images to be generated by the one or more projectors **130** to achieve a targeted or desired reflected image for the user **105**. Example systems and methods for constructing three dimensional virtual models of an environment using image data are described in U.S. Pat. No. 8,594,425 entitled "Analysis of three-dimensional scenes," U.S. Pat. No. 8,717,417 entitled "Three-Dimensional Mapping and Imaging," U.S. Pat. No. 8,326,025 entitled "Method for Determining a Depth Map from Images, Device for Determining a Depth Map," and U.S. Pat. No. 8,649,025 entitled "Methods and Apparatus for Real-Time Digitization of Three-Dimensional Scenes," each of which is incorporated herein by reference in its entirety.

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In some embodiments, the blended reality apparatus **100** can be configured to perform a light-based scan of the environment to determine properties of the environment. This information can be used to determine the light to be projected by the projectors **130** and/or ambient lights. In certain implementations, the blended reality apparatus **100** performs this scan instead of constructing a virtual model of the environment. This can reduce the computational costs of generating a blended reality view. As an example, the blended reality apparatus **100** can be configured to incrementally increase or decrease the intensity of ambient lights or projectors **130** to illuminate the environment. The one or more cameras **140** can acquire images of the environment at the different levels of illumination. Based at least in part on the acquired images, the blended reality apparatus **100** can be configured to determine properties of the environment (e.g., color, reflectivity, etc.). Using these properties, the blended reality apparatus **100** can determine the targeted illumination to be provided by the projectors **130** to generate a targeted blended reality view. In certain implementations, the blended reality apparatus **100** controls the projectors **130** and/or ambient lights to illuminate targeted portions of the environment to characterize the optical properties of those targeted portions. Again, using the characterized optical properties of the environment (e.g., color, reflectivity, etc.), the blended reality apparatus **100** can determine the targeted illumination to be provided by the projectors **130** to generate a targeted blended reality view. In some implementations, the blended reality apparatus **100** can be configured to use depth information acquired with the one or more cameras **140** to determine the illumination pattern provided by the projectors **130**. For example, the depth information can be used to determine which objects are background objects and which objects are foreground objects (e.g., such as the user **105**). The blended reality apparatus **100** can then illuminate the foreground objects with the projectors **130** while leaving the background objects unilluminated. In some implementations, the blended reality apparatus **100** can be configured to project patterns of light onto surfaces in the environment to generate depth maps of the environment. Examples of systems and methods for generating depth maps using projected light and/or acquired images of an environment are described in U.S. Pat. No. 8,493,496 entitled "Depth Mapping Using Projected Patterns," U.S. Pat. No. 8,326,025 entitled "Method for Determining a Depth Map from Images, Device for Determining a Depth Map," and U.S. Pat. No. 8,649,025 entitled "Methods and Apparatus for Real-Time Digitization of Three-Dimensional Scenes," each of which is incorporated by reference herein in its entirety.

The one or more cameras **140** can also be used to identify and track a face of the user **105** to determine the location of the user's eyes. Any suitable method or algorithm can be used to accomplish this. For example, an infrared beam and an infrared camera can be used to determine the location of the users' eyes based on reflected infrared light from the retinas. Other facial and/or eye tracking systems and methods are described in U.S. Pat. No. 8,408,706 entitled "3D Gaze Tracker," U.S. Pat. No. 6,578,962 entitled "Calibration-Free Eye Gaze Tracking," and U.S. Pat. No. 7,197,165 entitled "Eye Tracking Using Image Data," each of which is incorporated herein by reference in its entirety.

The blended reality apparatus **100** can be used in a number of ways. A first example involves reflecting the head and shirt of a user and transmitting an image of clothing on the rest of the user, thereby providing a blended reality view that shows the user what the user was wearing the last time the user wore that shirt. To accomplish this, the blended

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reality apparatus **100** can control the projectors **130** to illuminate the head and shirt of the user so that they are reflected to the user and control the display device **110** to transmit an image or images of the other articles of clothing the user was wearing. A second example involves providing a reflection of the user along with transmitted scenes of different environments. This may be desirable when the user is trying on clothing to provide the user a view of how the outfit would look in different settings. The blended reality apparatus **100** can control the projectors **130** to illuminate the user so that the user sees their own reflection and control the display device **110** to transmit images of different settings. The result can be that the actual surroundings of the user (e.g., the user's closet or a dressing room) are replaced with images of the beach, a restaurant, an office, or the like. The ambient lights can also be adjusted to accomplish a targeted or desired effect.

FIG. 3A illustrates a top view of the example apparatus **100** of FIG. 1A, wherein the apparatus **100** includes a plurality of projectors **130** configured to selectively illuminate surfaces **150a-d** within an environment in front of the mirror **120**. The projectors **130** can be high-contrast projectors configured to project a range of visible wavelengths with high dynamic range. The projectors include modulating panels (e.g., liquid crystal on silicon panels, liquid crystal device panels, digital micromirror device panel, etc.) configured to generate patterns of light for projection. The projectors **130** can be configured to project light at targeted areas. As an example, to illuminate object **150c** so that its reflection is seen in the mirror **120** by the user **105**, each projector **130** can determine (e.g., through an analysis of the virtual model of the environment created by the blended reality apparatus) the pattern of light necessary to illuminate object **150c** but to not illuminate, for example, object **150d**. The combined light output from the projectors **130** can thus illuminate targeted objects or surfaces in the environment while leaving others dark.

FIG. 3B illustrates a top view of the example apparatus **100**, the apparatus **100** including an active transmission matrix **115** between the display **110** and the mirror **120**. The active transmission matrix **115** comprises an active electronic element that can change the optical properties of individual pixels in the matrix. For example, the active transmission matrix **115** can be a liquid crystal matrix configured to control individual pixels, changing selected pixels from opaque to transparent (e.g., a pixel will block or transmit light) to further regulate the light transmitted from the display device **110** through the mirror **120**. This can improve control over reflected and transmitted light perceived by the user. The active transmission matrix **115** can also be a material that can selectively change individual pixels from opaque to reflective or from transmissive to reflective. In some embodiments, the active transmission matrix **115** can be integrated with the mirror **120** or integrated with the display device **110**. In some embodiments, the active transmission matrix **115** is the mirror **120** such that the mirror **120** can change the reflectance of individual pixels on a face of the mirror **120**. For example, the active transmission matrix **115** can include a liquid crystal switchable mirror comprising a solid state thin film device that can be configured to switch between reflective, partially reflective, and transparent states. Examples of such apparatuses are disclosed in U.S. Pat. No. 6,999,649 entitled "Optical Switches Made by Nematic Liquid Crystal Switchable Mirrors, and Apparatus of Manufacture," which is incorporated herein by reference in its entirety. This implementation advantageously provides greater control over

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reflected and transmitted images seen by the user. The active transmission matrix 115 and the projectors 130 can thus combine to enhance the blended reality image by providing greater control over the transmission and reflection of light at the mirror 120.

FIG. 4 illustrates an example apparatus 400 configured to generate a blended reality view, the apparatus 400 configured to control lighting within an environment to enhance the blended reality view. The blended reality apparatus 400 includes hue lights 133 around a periphery of the mirror. The hue lights 133 can be controlled to change the color and/or intensity of light within a room and/or on a wall behind the blended reality apparatus 400 to enhance the generated blended reality view. The hue lights 133 can be any suitable light or combination of lights providing a single color or a range of colors in the visible spectrum. For example, the color and/or intensity of the hue lights 133 can be configured to change based on the blended reality view perceived by the user at the mirror 120. If the blended reality view includes the user on a boat in the ocean, the hue lights 133 can be configured to shine blue shimmering light on the walls, floor, and/or ceiling or other objects to enhance the blended reality experience. The hue lights 133 can include strands of LED lights around a frame of the blended reality apparatus 100 that change depending on what is transmitted and/or reflected by the apparatus 100.

The blended reality apparatus 400 can also be configured to control lighting fixtures 135. The lighting fixtures can be sources of diffuse light or directed light positioned throughout the environment in which the blended reality apparatus 400 will be used. The lighting fixtures 135 can provide isotropic, diffuse, anisotropic, and/or directional light (e.g., spotlights). However, the lighting fixtures 135 and the hue lights 133 differ from the projectors 130 in that the projectors 130 can modulate the light they produce to provide a targeted or desired light output (e.g., by modulating pixels to project a pattern of light that can change over time) whereas the lighting fixtures 135 and/or hue lights 133 can be controlled to change a direction, brightness and/or color of the light, but not to generate a targeted pattern of light output.

FIG. 5A illustrates a top view of an example blended reality apparatus 500 for generating a blended reality view, the blended reality apparatus 500 including projectors 130 and cameras 140 positioned around and within an environment in front of a mirror 120. The projectors and cameras 140 positioned in such a manner can improve the generated blended reality view. For example, cameras 140 positioned around the environment can be used to improve the scan of the environment and the resulting virtual model. An improved virtual model can be used to improve control of the projectors 130 to more exactly illuminate desired surfaces. Similarly, projectors 130 positioned around the environment can be used to improve the targeted illumination of surfaces by providing additional angles and optical pathways to surfaces that may otherwise be occluded. The cameras 140 and projectors 130 can be positioned at various heights with various pointing angles. For example, cameras 140 and/or projectors 130 can be positioned on ceilings, walls, objects, floors, and/or other surfaces. This can advantageously increase the ability to selectively illuminate objects 150a-d and/or not illuminate these objects.

In some embodiments, the additional cameras 140 and projectors 130 can be used to provide additional views of the user in addition to and/or instead of reflected views of the user. For example, cameras 140 positioned behind the user

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can provide a rear view of the user so that the user can see how clothes appear from that angle.

FIG. 5B illustrates a top view of a blended reality system 550 comprising a plurality of apparatuses 500a-d, each blended reality apparatus 500a-d configured to generate a blended reality view for a user 105. Each blended reality apparatus 500a-d can include a display device 110, a mirror 120, projectors 130, and one or more cameras 140. Each blended reality apparatus 500a-d can operate independently to generate blended reality views for the user. In some embodiments, the blended reality apparatuses 500a-d are communicably coupled so that each apparatus 500a-d can receive, for example, image data from the cameras 140 of the other apparatuses and/or control the projectors 130 of the other apparatuses. For an individual blended reality apparatus, this can provide the advantages described with respect to the blended reality apparatus 500 described herein with reference to FIG. 5A. As an example use, the blended reality system 550 can be used in retail outlets in dressing rooms or other areas where users try on clothes prior to purchasing them. The blended reality system 550 can be used to provide a plurality of simultaneous blended reality views for the user, generating an immersive blended reality environment.

FIG. 6A illustrates a functional block diagram of an example blended reality apparatus 600a comprising an image blending system 660. The blended reality apparatus 600a is configured to acquire image data with the camera(s) 140, process that image data with the image blending system 660, and to control the light output of the projectors 140 and/or other lighting (e.g., lighting fixtures or hue lights) to control which objects in an environment are reflected to a user for viewing. In addition, the image blending system 660 controls the display device 110 to generate images at a screen 111 for transmission through the mirror to the user. The combination of the reflected light and the transmitted light forming a blended reality view based on the image information provided by the camera(s) 140. The image information provided by the camera(s) 140 to the image blending system 660 can include scans of the environment in front of the mirror 120, images of the user, and/or depth information for objects and/or surfaces in the environment. In some embodiments, the camera(s) 140 can detect motion of the user or other objects in the environment to allow the image blending system 660 to actively compensate for such movement in real time.

FIG. 6B illustrates a functional block diagram of an example blended reality apparatus 600b comprising the image blending system 660 with an additional active transmission matrix 115 relative to the blended reality apparatus 600a described with reference to FIG. 6A. The active transmission matrix 115 can further be controlled by the image blending system 660 to provide greater control over the transmission of light from the screen 111 of the display device 110 and/or to provide greater control over the reflective properties of the mirror 120.

FIG. 7 illustrates a functional block diagram of an example image blending system 660. The image blending system 660 can receive input from the camera(s) 140 as well as user input 695. The user input 695 can be received via voice commands, motion-based commands, touch interface controls, wireless signals, or the like. The image blending system 660 can include a controller 665 and data storage 670 configured to respectively execute and to store computer executable instructions for performing the functions described herein. The components and modules of the image blending system 660 communicate with one another via communication bus 692 that can include wired communi-

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cation, wireless communication, or a combination of wired and wireless communication. In some embodiments, the components and modules of the image blending system 660 form a single computational system comprising computational hardware. In some embodiments, components of the image blending system 660 can be distributed among other components of a blended reality apparatus. For example, eye tracking functionality can be implemented by an eye tracking module 675 that can be included in one or more cameras 140.

The image blending system 660 includes an eye tracking module 675 configured to analyze image data acquired by the cameras 140 and to determine an eye location of a user. The eye tracking module 675 can use any suitable method for determining eye position such as using an IR beam and IR camera to identify retinal reflections. Other example methods and systems are described in U.S. Pat. No. 8,408,706 entitled "3D Gaze Tracker," U.S. Pat. No. 6,578,962 entitled "Calibration-Free Eye Gaze Tracking," and U.S. Pat. No. 7,197,165 entitled "Eye Tracking Using Image Data," each of which is incorporated herein by reference in its entirety. In some embodiments, the eye tracking module 675 is configured to track eye movements of the user in real time or in near real time. For example, the eye tracking module 675 can be configured to track eye movement of the user with sufficient speed to allow a blended reality apparatus to modify the transmitted and/or reflected light at the mirror so that the user does not notice any lag between the user's movement and updates to the blended reality view provided.

The image blending system 660 includes an environment scan module 680 configured to analyze image data acquired with the cameras 140 of the environment around a blended reality apparatus. The environment scan module 680 can receive image data from the cameras of one or more views of the environment where the blended reality apparatus is used to determine positions and orientations of objects and/or surfaces in the environment. The environment scan module 680 can then construct a digital representation of the environment using a three dimensional virtual model. This model can be used to perform reverse ray tracing or other techniques by the image blending system to determine what light to transmit by the display 110 and what patterns to project with the projectors 130. The environment scan module 680 can be configured to scan the environment upon an initial setup, when commanded by a user, when the image blending system 660 identifies changes to the environment, or at designated times or intervals. The environment scan module 680 can be configured to compare current image data to previously acquired image data to determine if there have been changes to the environment. If changes are detected, the environment scan module 680 can generate a new three dimensional virtual model of the environment. In this way, the virtual model can be updated to provide updated blended reality views when objects or surfaces change in the environment.

The image blending system 660 can include a display module 685 configured to determine the pattern of light to transmit by the display 110 and/or the pattern of pixels to turn off or on by the active transmission matrix. The display module 685 can analyze the virtual model along with the image data from the camera(s) 140 to determine where the user's eyes are and what virtual images are to be provided for the targeted or desired blended reality view. The display module 685 can communicate with the display(s)/active transmission matrix 110 to control transmission of light based on this information.

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The display module 685 can be configured to provide different views for a left and a right eye of a user. This can be used to provide stereoscopic views for the user enhancing the sensation of depth in the transmitted images. In some embodiments, the display 110 can include a lenticular lens array and/or use polarized light in conjunction with polarized glasses to provide the stereoscopic experience for the user. In some implementations, the display module 685 can be configured to selectively blur images based on where the user is looking. This can be done to enhance the effect of depth in a transmitted scene. In certain implementations, blurring can be used by the display module 685 to simulate the depth of field of the user's vision to compensate for focal distances to images that the user is not focusing on.

The image blending system 660 can include a lighting module 690 configured to control each projector and/or other lighting element 130 to generate the desired or targeted light patterns. The targeted light patterns can be configured to selectively illuminate the user and/or other objects or surfaces in the environment so that the user sees the reflection of those objects in the mirror. For each projector 130, the lighting module 690 can determine the targeted light pattern by analyzing the virtual model generated by the environment scan module 680. For example, knowing the position of a particular projector, the lighting module 690 can be configured to determine a light pattern that shines light on a targeted surface while leaving other surfaces without illumination. The lighting module 690 can determine the light output for each projector 140 as well as the combined light output of a plurality or all the projectors 140 to determine the final lighting effect. The lighting module 690 can thus adjust the light output (e.g., light pattern, light intensity, and/or light color) to selectively illuminate objects so they are viewed as reflections in the mirror by the user.

In some embodiments, the lighting module 690 and the display module 685 can work together to supplement and/or enhance the output of the projectors 130 and the display 110. For example, where the display module 685 controls the display 110 to transmit images of a beach scene, the lighting module 690 can generate complementary light patterns to improve the visual appearance of the beach scene by projecting the light patterns on a wall or other surface. The result being that the user sees a combined transmitted image and a reflected image of a beach scene, enhancing the immersive and realistic quality of the blended reality view. Similarly, the display module 685 can control the display 110 to transmit images of objects in the room with modifications while the lighting module 690 can control the projectors to selectively illuminate the objects. The result being that the user sees the reflection of the objects combined with transmitted images on those objects, thus enhancing the blended reality view.

FIG. 8 illustrates an example method 800 for generating a blended reality view. The method can be performed by any of the blended reality apparatuses or systems described herein. For ease of description, the method will be described as being performed by a blended reality apparatus, but each step or combination of steps in the method can be performed by a single component or a combination of components in the blended reality apparatus or system.

In block 805, the blended reality apparatus scans an environment with one or more cameras. The environment can include a room or other location in which the blended reality apparatus is positioned. In some embodiments, the environment includes all objects and/or surfaces in front of the mirror, where the front of the mirror is the part of the mirror viewed by a user to view their reflection. In some

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embodiments, the environment includes additional areas that are not in front of the mirror or which are not visible as reflections when positioned in front of the mirror. The scan of the environment can include acquiring image data, depth information, and/or other information about the positions, orientations, and/or optical characteristics of objects and surfaces within the environment.

In block **810**, the blended reality apparatus generates a virtual model of the scanned environment. The virtual model can be a digital representation of the objects and surfaces within the environment, where the positions and orientations of the objects and surfaces are represented. The virtual model can include information about the optical characteristics of those objects and surfaces for purposes of reverse ray tracing when generating a blended reality view. In some implementations, the virtual model includes information about optical characteristics and/or positions of surfaces of the scanned environment, but it is not a digital representation of the objects and surfaces within the environment.

In block **815**, the blended reality apparatus uses image data from one or more cameras to identify a face and/or eyes of a user. The blended reality apparatus can track the user's face and/or eyes in real time to update the blended reality view to compensate for movements of the user.

In block **820**, the blended reality apparatus determines objects or surfaces to be seen as reflections by the user. To generate the blended reality view, the apparatus blends reflections of objects and/or surfaces in the environment, including portions of the user, with transmitted images. In block **825**, the blended reality apparatus generates images to be transmitted by a display through a mirror to the user. In block **830**, the blended reality apparatus projects light onto the user and/or surfaces in the environment so that these things will be viewed as reflections in the mirror. By controlling the amount, quality, and pattern of light projected by each projector, the reflected images can be controlled selectively reflect portions of the user and/or environment. The reflected images and transmitted images can be perceived by the user simultaneously, resulting in a blended reality view. After performing the steps in blocks **825** and **830**, the method returns to block **815** to update the information related to the position of the face and/or eyes of the user. The method can thus track in real time the position of the face and/or eyes of the user to update the blended reality view so that the view changes as the user moves.

Depending on the embodiment, certain acts, events, or functions of any of the algorithms described herein can be performed in a different sequence, can be added, merged, or left out altogether (e.g., not all described acts or events are necessary for the practice of the algorithm). Moreover, in certain embodiments, acts or events can be performed concurrently, e.g., through multi-threaded processing, interrupt processing, or multiple processors or processor cores or on other parallel architectures, rather than sequentially.

The various illustrative logical blocks, modules, and algorithm steps described in connection with the embodiments disclosed herein can be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. The described functionality can be implemented in varying ways for each particular application, but such imple-

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mentation decisions should not be interpreted as causing a departure from the scope of the disclosure.

The various illustrative logical blocks and modules described in connection with the embodiments disclosed herein can be implemented or performed by a machine, such as a processor configured with specific instructions, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A processor can be a microprocessor, but in the alternative, the processor can be a controller, microcontroller, or state machine, combinations of the same, or the like. A processor can also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

The elements of a method, process, or algorithm described in connection with the embodiments disclosed herein can be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module can reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, hard disk, a removable disk, a CD-ROM, or any other form of computer-readable storage medium known in the art. An exemplary storage medium can be coupled to the processor such that the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium can be integral to the processor. The processor and the storage medium can reside in an ASIC. The ASIC can reside in a user terminal. In the alternative, the processor and the storage medium can reside as discrete components in a user terminal. A software module can comprise computer-executable instructions which cause a hardware processor to execute the computer-executable instructions. The computer-executable instructions can comprise a scripted computer language and/or a compiled computer language. Computer-executable instructions can comprise, for example and without limitation, JAVASCRIPT®, PYTHON™, php, SQL, C, C++, JAVA®, C#, Fortran, BASIC, shell scripts, Perl, or the like.

Conditional language used herein, such as, among others, “can,” “might,” “may,” “e.g.,” and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or states. Thus, such conditional language is not generally intended to imply that features, elements and/or states are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without author input or prompting, whether these features, elements and/or states are included or are to be performed in any particular embodiment. The terms “comprising,” “including,” “having,” “involving,” and the like are synonymous and are used inclusively, in an open-ended fashion, and do not exclude additional elements, features, acts, operations, and so forth. Also, the term “or” is used in its inclusive sense (and not in its exclusive sense) so that when used, for example, to connect a list of elements, the term “or” means one, some, or all of the elements in the list.

Disjunctive language such as the phrase “at least one of X, Y or Z,” unless specifically stated otherwise, is otherwise understood with the context as used in general to present that

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an item, term, etc., may be either X, Y or Z, or any combination thereof (e.g., X, Y and/or Z). Thus, such disjunctive language is not generally intended to, and should not, imply that certain embodiments require at least one of X, at least one of Y or at least one of Z to each be present. 5

Unless otherwise explicitly stated, articles such as “a” or “an” should generally be interpreted to include one or more described items. Accordingly, phrases such as “a device configured to” are intended to include one or more recited devices. Such one or more recited devices can also be collectively configured to carry out the stated recitations. For example, “a processor configured to carry out recitations A, B and C” can include a first processor configured to carry out recitation A working in conjunction with a second processor configured to carry out recitations B and C. 10 15

While the above detailed description has shown, described, and pointed out novel features as applied to various embodiments, it will be understood that various omissions, substitutions, and changes in the form and details of the devices or algorithms illustrated can be made without departing from the spirit of the disclosure. As will be recognized, certain embodiments described herein can be embodied within a form that does not provide all of the features and benefits set forth herein, as some features can be used or practiced separately from others. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope. 20 25

What is claimed is:

1. An apparatus to provide a view of reflected and transmitted light to create a visual effect that combines reflected images and transmitted images, the apparatus comprising:

- a display configured to display images;
- a mirror having a first side and a second side opposite the first side, the display facing the second side of the mirror, the mirror being partially-reflective and partially-transmissive such that at least a portion of light provided by the display passes through the mirror and is visible from the first side of the mirror;
- a frame surrounding the mirror;
- a plurality of projectors positioned on the frame and configured to illuminate a user and object elements facing the first side of the mirror;
- a camera configured to acquire image data of the user and object elements; and
- an image blending system communicably coupled to the display, the plurality of projectors, and the camera, the image blending system configured to:
 - in a scanning phase, analyze image data received from the camera to determine locations of the user and object elements;
 - in a tracking phase, analyze the image data received from the camera to determine a location of the user’s eyes, the location of the user’s eyes including a height and a distance of the user’s eyes relative to the mirror;
- control the plurality of projectors to illuminate at least some of the user and object elements such that light from the illuminated user and object elements is reflected by the mirror to form reflected light, the reflected light visible from the first side of the mirror within a first portion of the first side of the mirror; and
- control the display to output display light, wherein a first portion of the display light corresponds to an image,

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wherein the first portion of the display light passes from the second side of the mirror to the first side of the mirror such that the first portion of the display light is visible from the first side of the mirror within a second portion of the first side of the mirror,

wherein a second portion of the display light passes from the second side of the mirror to the first side of the mirror at a location corresponding to the first portion of the first side of the mirror, and

wherein the second portion of the display light has a light intensity lower than a light intensity of the reflected light such that the reflected light is visible instead of the second portion of the display light;

wherein at least a portion of the reflected light and the display light combine to form a composite image.

2. The apparatus of claim 1 further comprising a lighting fixture, wherein the image blending system is further configured to control the intensity of light output by the lighting fixture to enhance the composite image.

3. The apparatus of claim 1 further comprising an active transmission matrix comprising a two-dimensional array of pixels, the active transmission matrix positioned between a screen of the display and the mirror, wherein the image blending system is further configured to control the transmissive properties of the two-dimensional array of pixels of the active transmission matrix to control the display light transmitted through the mirror to improve control of a contrast between the reflected light and the display light.

4. A method of generating a combined image at a targeted location that combines reflected images and transmitted images, the method comprising:

- acquiring image data of surfaces in an environment;
- generating a virtual three dimensional model of the surfaces in the environment by analyzing the acquired image data;
- acquiring image data of an object positioned within the environment;
- identifying a target on the object by analyzing the acquired image data;
- generating images that are transmitted through a mirror from a first side of the mirror to a second side of the mirror such that the images are visible to the identified target on the object from the second side of the mirror; and

projecting light onto selected surfaces in the environment to selectively illuminate the selected surfaces such that light from the illuminated selected surfaces is reflected by the mirror to form reflected light, the reflected light visible from the second side of the mirror within a first portion of the second side of the mirror,

wherein a light intensity associated with the images within the first portion of the second side of the mirror is lower than a light intensity of the reflected light such that the reflected light is visible instead of the images within the first portion of the second side of the mirror, and

wherein a combined image is visible to the identified target, the combined image comprising an image associated with the reflected light and the images transmitted through the mirror.

5. The method of claim 4, wherein generating the virtual three dimensional model of the surfaces in the environment comprises determining distances to the surfaces.

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6. The method of claim 4 further comprising modifying light within the environment to enhance the combined image.

7. The method of claim 4, wherein identifying the target on the object is performed in real time to modify the generated images and the projected light based on movements of the identified target.

8. The method of claim 4 further comprising determining for each of a plurality of projectors a pattern of light to project to selectively illuminate the selected surfaces.

9. An apparatus comprising:

a display device comprising a screen;

a planar reflective surface positioned adjacent to the screen of the display device, the planar reflective surface configured to allow transmission of light from the screen through the planar reflective surface to a viewing side of the planar reflective surface;

a plurality of projectors configured to project light onto surfaces on the viewing side of the planar reflective surface;

an image acquisition device positioned to acquire images of the surfaces on the viewing side of the planar reflective surface; and

an image blending system configured to:

receive acquired images from the image acquisition system;

control the plurality of projectors to selectively illuminate surfaces on the viewing side of the planar reflective surface such that light from the illuminated surfaces is reflected by the planar reflective surface to form reflected light; and

control the display device to illuminate a portion of the screen and to leave a portion of the screen blank such that display light corresponding to the illuminated portion of the screen passes through the planar reflective surface to the viewing side of the planar reflective surface within a first portion of the viewing side of the planar reflective surface,

wherein a light intensity of the display light is greater than a light intensity of the reflected light within the first portion of the viewing side of the planar reflective surface such that the display light is visible instead of the reflected light within the first portion of the viewing side of the planar reflective surface, and

wherein at a targeted location on the viewing side of the planar reflective surface a combined image forms, the combined image comprising the reflected light and the display light.

10. The apparatus of claim 9, wherein the plurality of projectors are adjacent to a periphery of the planar reflective surface.

11. The apparatus of claim 10, wherein the plurality of projectors includes four projectors positioned at corners of the planar reflective surface.

12. The apparatus of claim 9, wherein a surface of the screen is parallel to a surface of the planar reflective surface.

13. The apparatus of claim 9 further comprising a light source configured to vary an intensity of light output by the light source based on instructions from the image blending system.

14. The apparatus of claim 9, wherein the screen has a width that is at least 90% of the width of the planar reflective surface.

15. The apparatus of claim 9, wherein the display device is attached to the planar reflective surface.

16. The apparatus of claim 9 further comprising an active transmission matrix positioned between the screen of the display device and the planar reflective surface.

17. The apparatus of claim 9, wherein the screen is configured to output polarized light.

18. The apparatus of claim 17, wherein the screen is configured to alternately output light of orthogonal polarizations.

19. The apparatus of claim 9 further comprising a lenticular array positioned between the screen and the planar reflective surface.

20. The apparatus of claim 9, wherein the image acquisition device comprises a camera configured to detect infrared light.

* * * * *

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Hi-Mirror.com

Privacy Policy

https://www.himirror.com/us_en/policy

Effective Date

June 15th, 2018

COMPANY PRIVACY POLICY SCOPE

Cal-Comp Big Data, Inc (“CCBD,” “we,” “us,” “our,” or the “Company”) is committed to protecting the privacy of individuals who visit our Web sites (“Visitors”) and individuals who register and use our products (“Customers”). This Privacy Policy applies to our products, which includes HiMirror Series, Smart Body Scale and HiSkin (collectively, “Products”); our websites; and our mobile applications, including HiMirror, HiSkin, and HiFit for HiMirror (collectively, “Mobile Applications”). This Privacy Policy describes how the Company collects, uses, shares and secures the personal information you provide. It also describes your choices regarding use, access and correction of your personal information.

COLLECTION

Information Provided by You

We may collect the following personal information from you:

- Contact Information, such as name, email address, mailing address, or phone number;
- Demographic information, such as age, gender and zip code;
- Billing Information, such as credit card number and billing address;
- Unique Identifiers, such as username, account number, password, facial recognition, or voice print;
- Preference Information, such as order history, or marketing preferences;
- Current skin and body conditions, such as if wearing pacemaker and pregnant status;
- Information about your business, such as company name, industry, job title;
- Information you provide to us through our Products, such as photographs of your choosing or voice samples.

Data Supplementation

We may receive information about you from other sources, including third parties. We may use and combine this information with other personal information that we have collected from you.

Examples of the types of information that may be obtained from third parties or public sources include:

- Mailing address about you from third party sources, such as the U.S. Postal Service, to verify your address so that we can properly fulfill shipping requests
- Information about your music preferences when you link a music playlist account to our Products

Passive Collection

As is true of most websites, we collect certain web-browsing information automatically. This information may include browser type, timestamp, IP address, and referrer/requested URL pages.

Tracking Technologies

We and our partners use cookies or similar technologies to analyze trends, administer the website, track users' movements around the website, and to gather demographic information about our user base as a whole. You can control the use of cookies at the individual browser level, but if you choose to disable cookies, it may limit your use of certain features or functions on our website or service.

Mobile Application

When you download and use our mobile apps, we automatically collect information on the type of device you use, operating system version, and the device identifier, such as MAC address.

We ask for and collect location-based information from your mobile device while downloading and using our Mobile Applications or services. You may opt-out of location collection at any time by editing the setting at the device level.

We use mobile analytics software to allow us to better understand the functionality of our Mobile Application on your phone. This software may record information such as how often you use the application, the events that occur within the application, aggregated usage, performance data, and where the application was downloaded from. We may link the information we store within the analytics software to any personal information you submit within the Mobile Application.

USE

We use the information we collect from you for several purposes including:

- Fulfill your service request
- Send you an order confirmation
- Send you requested product or service information
- Send product updates or warranty information
- Respond to customer service requests

- Administer your account
- Send you a catalog
- Send you a newsletter
- Send you marketing communications
- Respond to your questions and concerns
- Improve our website and marketing efforts
- Conduct research and analysis
- Display content based upon your interests
- Provide you localized content

SHARING

Sharing with Third Parties other than Service Providers

We may share your information with third-party business partners, for instance, for the purpose of enhancing our products and services or so that they can market their products or services to you. If you do not want us to share your personal information with these companies, contact us at Hi@himirror.com.

Sharing with Service Providers

We may share your information with third parties who provide services on our behalf to help with our business activities. These companies are authorized to use your personal information only as necessary to provide these services to us. These services may include:

- Fulfilling orders and delivering packages
- Payment processing
- Providing customer service
- Sending marketing communications
- Conducting research and analysis

We may share your information we collect to countries other than the country in which the information was originally collected (which may include countries outside the European Economic Area (“EEA”)). It may also be processed by staffs operating outside the EEA who work for us or one of our suppliers. We will take all steps reasonably necessary to ensure that your information is treated securely and in accordance with this Privacy Policy and applicable law.

LINKS TO OTHER SITE/SERVICES

Our Products contains links to other websites or services owned or operated by other companies. If you choose to visit any linked websites or use any linked services, we encourage you to review their privacy statements carefully, as they

may differ from ours. We do not exercise control over third party websites and we are not responsible for their content or privacy practices.

Our Products may offer some service in connection with a third party via co-branded features, such as for providing music streaming service or offering voice control feature when using our HiMirror Series Products. Where you have provided personal information in a service or feature that is co-branded with another company, then that personal information will be made available to both the Company and the co-branding partner. Whereas our data practices and your choice options are described in this Privacy Policy, we encourage you to consult the co-branding partner's privacy policy to ensure that you understand how it intends to use your information and how you may exercise control over it.

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In certain situations, the Company may be required to disclose personal data in response to lawful requests by public authorities, including to meet national security or law enforcement requirements.

We may also disclose your personal information as required by law, such as to comply with a subpoena or other legal process, when we believe in good faith that disclosure is necessary to protect our rights, protect your safety or the safety of others, investigate fraud, or respond to a government request. If the Company is involved in a merger, acquisition, or sale of all or a portion of its assets, you will be notified via email and/or a prominent notice on our website, of any change in ownership, uses of your personal information, and choices you may have regarding your personal information. We may also disclose your personal information to any other third party with your prior consent.

SECURITY

The security of your personal information is important to us. We follow generally accepted standards to protect the personal information submitted to us, both during transmission and once it is received. We may encrypt our services by using a secure protocol. If you have any questions about the security of your personal information, you can contact us at Hi@himirror.com.

We may retain your information for as long as your account is active or as needed to provide you services, comply with our legal obligations, resolve disputes and enforce our agreements.

ACCESS

Upon request, we will provide you with information about whether we hold, or process on behalf of a third party, any of your personal information. To request this information please go to the About/ Contact us section of the mobile Apps or

go to the Contact Us section on the official website. You may access and correct your personal information by logging in to your account.

You may also exercise the following rights:

- Delete your personal information
- Restrict to process your personal information
- Transmit your personal information to another controller
- Object to process your personal information, including profiling

You may exercise the above rights by contacting our Customer Service at https://www.himirror.com/support/us_en/Help/ticket/new by completing a Customer Support Ticket. In certain circumstances we may be required by law to retain your personal information, or may need to retain your personal information in order to continue providing a service.

We will respond to these requests within a reasonable timeframe.

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You may sign-up to receive email or newsletter or other communications from us. If you would like to discontinue receiving this information, you may update your email preferences by using the “Unsubscribe” link found in emails we send to you or at your member profile on our website https://www.himirror.com/member/us_en/changeProfile or by contacting us at Hi@himirror.com.

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We reserve the right to change our Privacy Policy from time to time, and we may update this Privacy Policy to reflect changes to our information practices. If we make any materials changes, we will notify you by email (sent to the email address specific in your account) and by means of a notice on the website prior to the change becoming effective. We encourage you to periodically review this privacy policy for the latest information on our privacy practices.

DISPUTE RESOLUTION

If you have an unresolved privacy or data use concern that we have not addressed satisfactorily, please contact our U.S.-based third party dispute resolution provider (free of charge) at <https://feedback-form.truste.com/watchdog/request>.

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FOR PUBLICATION

UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

IN RE ZAPPOS.COM, INC., CUSTOMER
DATA SECURITY BREACH
LITIGATION,

No. 16-16860

D.C. No.
3:12-cv-00325-
RCJ-VPC

THERESA STEVENS; KRISTIN
O'BRIEN; TERRI WADSWORTH;
DAHLIA HABASHY; PATTI HASNER;
SHARI SIMON; STEPHANIE PRIERA;
KATHRYN VORHOFF; DENISE
RELETHFORD; ROBERT REE,
Plaintiffs-Appellants,

OPINION

v.

ZAPPOS.COM., INC.,
Defendant-Appellee.

Appeal from the United States District Court
for the District of Nevada
Robert Clive Jones, Senior District Judge, Presiding

Argued and Submitted December 5, 2017
San Francisco, California

Filed March 8, 2018

Before: John B. Owens and Michelle T. Friedland, Circuit Judges, and Elaine E. Bucklo, * District Judge.

Opinion by Judge Friedland

SUMMARY**

Article III Standing

The panel reversed the district court’s dismissal, for lack of Article III standing, of plaintiffs’ claims alleging that they were harmed by hacking of their accounts at the online retailer Zappos.com.

The panel held that under *Krottner v. Starbucks Corp.*, 628 F.3d 1139 (9th Cir. 2010), plaintiffs sufficiently alleged standing based on the risk of identity theft. The panel rejected Zappos’s argument that *Krottner* was no longer good law after *Clapper v. Amnesty International USA*, 568 U.S. 398 (2013). And the panel held that plaintiffs sufficiently alleged an injury in fact under *Krottner*, based on a substantial risk that the Zappos hackers will commit identity fraud or identity theft. The panel assessed plaintiffs’ standing as of the time the complaints were filed, not as of the present. The panel further held that plaintiffs sufficiently alleged that the risk of future harm they faced was “fairly traceable” to the conduct being challenged; and the risk from

* The Honorable Elaine E. Bucklo, United States District Judge for the Northern District of Illinois, sitting by designation.

** This summary constitutes no part of the opinion of the court. It has been prepared by court staff for the convenience of the reader.

the injury of identity theft was also redressable by relief that could be obtained through this litigation.

The panel addressed an issue raised by sealed briefing in a concurrently filed memorandum disposition.

COUNSEL

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Stephen J. Newman (argued), David W. Moon, Brian C. Frontino, and Julia B. Strickland, Stroock & Stroock & Lavan LLP, Los Angeles, California; Robert McCoy, Kaempfer Crowell, Las Vegas, Nevada; for Defendant-Appellee.

OPINION

FRIEDLAND, Circuit Judge:

In January 2012, hackers breached the servers of online retailer Zappos.com, Inc. (“Zappos”) and allegedly stole the names, account numbers, passwords, email addresses, billing and shipping addresses, telephone numbers, and credit and debit card information of more than 24 million Zappos customers. Several of those customers filed putative class actions in federal courts across the country, asserting that Zappos had not adequately protected their personal information. Their lawsuits were consolidated for pretrial proceedings.

Although some of the plaintiffs alleged that the hackers used stolen information about them to conduct subsequent financial transactions, the plaintiffs who are the focus of this appeal (“Plaintiffs”) did not. This appeal concerns claims based on the hacking incident itself, not any subsequent illegal activity.

The district court dismissed Plaintiffs’ claims for lack of Article III standing. In this appeal, Plaintiffs contend that the district court erred in doing so, and they press several potential bases for standing, including that the Zappos data breach put them at risk of identity theft.

We addressed standing in an analogous context in *Krottner v. Starbucks Corp.*, 628 F.3d 1139 (9th Cir. 2010). There, we held that employees of Starbucks had standing to sue the company based on the risk of identity theft they faced after a company laptop containing their personal information was stolen. *Id.* at 1140, 1143. We reject Zappos’ argument that *Krottner* is no longer good law after *Clapper v. Amnesty International USA*, 568 U.S. 398 (2013), and hold that, under

Krottner, Plaintiffs have sufficiently alleged standing based on the risk of identity theft.¹

I.

When they bought merchandise on Zappos's website, customers provided personal identifying information ("PII"), including their names, account numbers, passwords, email addresses, billing and shipping addresses, telephone numbers, and credit and debit card information. Sometime before January 16, 2012, hackers targeted Zappos's servers, stealing the PII of more than 24 million of its customers, including their full credit card numbers.² On January 16, Zappos sent an email to its customers, notifying them of the theft of their PII. The company recommended "that they reset their Zappos.com account passwords and change the passwords 'on any other web site where [they] use the same or a similar password.'" Some customers responded almost immediately by filing putative class actions in federal district courts across the country.

¹ We address an issue raised by sealed briefing in a concurrently filed memorandum disposition.

² Although Zappos asserts in its briefs that the hackers stole only the last four digits of customers' credit card numbers, it has presented its arguments as a facial, not a factual, attack on standing. *See Safe Air for Everyone v. Meyer*, 373 F.3d 1035, 1039 (9th Cir. 2004) (distinguishing facial from factual attacks on standing). Where, as here, "a defendant in its motion to dismiss under Federal Rule of Civil Procedure 12(b)(1) asserts that the allegations in the complaint are insufficient to establish subject matter jurisdiction as a matter of law (to be distinguished from a claim that the allegations on which jurisdiction depends are not true as a matter of fact), we take the allegations in the plaintiff's complaint as true." *Whisnant v. United States*, 400 F.3d 1177, 1179 (9th Cir. 2005).

In these suits, Plaintiffs alleged an “imminent” risk of identity theft or fraud from the Zappos breach. Relying on definitions from the United States Government Accountability Office (“GAO”), they characterized “identity theft” and “identity fraud” as “encompassing various types of criminal activities, such as when PII is used to commit fraud or other crimes,” including “credit card fraud, phone or utilities fraud, bank fraud and government fraud.”³

The Judicial Panel on Multidistrict Litigation transferred several putative class action lawsuits alleging harms from the Zappos data breach to the District of Nevada for pretrial proceedings. After several years of pleadings-stage litigation, including a hiatus for mediation, the district court granted in part and denied in part Zappos’s motion to dismiss the Third Amended Consolidated Complaint (“Complaint”) and granted Zappos’s motion to strike the Complaint’s class allegations. The court distinguished between two groups of plaintiffs: (1) plaintiffs named only in the Third Amended Complaint who alleged that they had already suffered financial losses from identity theft caused by Zappos’s breach, and (2) plaintiffs named in earlier complaints who did not allege having already suffered financial losses from identity theft.

³ Plaintiffs did not provide a precise cite but appear to be referring to the description of identity theft in a report entitled *Personal Information*, which explains that “[t]he term ‘identity theft’ is broad and encompasses many types of criminal activities, including fraud on existing accounts—such as unauthorized use of a stolen credit card number—or fraudulent creation of new accounts—such as using stolen data to open a credit card account in someone else’s name.” U.S. Gov’t Accountability Office, GAO-07-737, *Personal Information: Data Breaches are Frequent, but Evidence of Resulting Identity Theft is Limited; However, the Full Extent is Unknown 2* (2007).

The district court ruled that the first group of plaintiffs had Article III standing because they alleged “that actual fraud occurred as a direct result of the breach.” But the court ruled that the second group of plaintiffs (again, here referred to as “Plaintiffs”) lacked Article III standing and dismissed their claims without leave to amend because Plaintiffs had “failed to allege instances of actual identity theft or fraud.” The parties then agreed to dismiss all remaining claims with prejudice, and Plaintiffs appealed.

II.

We review the district court’s standing determination de novo. *See Maya v. Centex Corp.*, 658 F.3d 1060, 1067 (9th Cir. 2011). To have Article III standing,

a plaintiff must show (1) it has suffered an “injury in fact” that is (a) concrete and particularized and (b) actual or imminent, not conjectural or hypothetical; (2) the injury is fairly traceable to the challenged action of the defendant; and (3) it is likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision.

Friends of the Earth, Inc. v. Laidlaw Env'tl. Servs. (TOC), Inc., 528 U.S. 167, 180–81 (2000); *see also Spokeo, Inc. v. Robins*, 136 S. Ct. 1540, 1547 (2016). A plaintiff threatened with future injury has standing to sue “if the threatened injury is ‘certainly impending,’ or there is a ‘substantial risk that the harm will occur.’” *Susan B. Anthony List v. Driehaus*, 134 S. Ct. 2334, 2341 (2014) (quoting *Clapper v. Amnesty Int’l USA*, 568 U.S. 398, 414 & n.5 (2013)) (internal quotation marks omitted).

III.

We addressed the Article III standing of victims of data theft in *Krottner v. Starbucks Corp.*, 628 F.3d 1139 (9th Cir. 2010). In *Krottner*, a thief stole a laptop containing “the unencrypted names, addresses, and social security numbers of approximately 97,000 Starbucks employees.” *Id.* at 1140. “Starbucks sent a letter to . . . affected employees alerting them to the theft and stating that Starbucks had no indication that the private information ha[d] been misused,” but advising them to “monitor [their] financial accounts carefully for suspicious activity and take appropriate steps to protect [themselves] against potential identity theft.” *Id.* at 1140–41 (internal quotation marks omitted). Some employees sued, and the only harm that most alleged was an “increased risk of future identity theft.” *Id.* at 1142. We determined this was sufficient for Article III standing, holding that the plaintiffs had “alleged a credible threat of real and immediate harm” because the laptop with their PII had been stolen. *Id.* at 1143.

A.

Before analyzing whether *Krottner* controls this case, we must determine whether *Krottner* remains good law after the Supreme Court’s more recent decision in *Clapper v. Amnesty International USA*, 568 U.S. 398 (2013), which addressed a question of standing based on the risk of future harm.

As a three-judge panel, we are bound by opinions of our court on issues of federal law unless those opinions are “clearly irreconcilable” with a later decision by the Supreme Court. *Miller v. Gammie*, 335 F.3d 889, 900 (9th Cir. 2003) (en banc). This is the first case to require us to consider

whether *Clapper* and *Krottner* are clearly irreconcilable, and we conclude that they are not.

The plaintiffs in *Clapper* challenged surveillance procedures authorized by the Foreign Intelligence Surveillance Act of 1978—specifically, in 50 U.S.C. § 1881a (2012) (amended 2018).⁴ *Clapper*, 568 U.S. at 401. The plaintiffs, who were “attorneys and human rights, labor, legal, and media organizations whose work allegedly require[d] them to engage in sensitive and sometimes privileged telephone and e-mail communications with . . . individuals located abroad,” sued for declaratory relief to invalidate § 1881a and an injunction against surveillance conducted pursuant to that section. *Id.* at 401, 406. The plaintiffs argued that they had Article III standing to challenge § 1881a “because there [was] an objectively reasonable likelihood that their communications [would] be acquired under § 1881a at some point in the future.” *Id.* at 401. The Supreme Court rejected this basis for standing, explaining that “an objectively reasonable likelihood” of injury was insufficient, and that the alleged harm needed to “satisfy the well-established requirement that threatened injury must be ‘certainly impending.’” *Id.* (quoting *Whitmore v. Arkansas*, 495 U.S. 149, 158 (1990)).

⁴ 50 U.S.C. § 1881a authorizes electronic surveillance of foreign nationals located abroad under a reduced government burden compared with traditional electronic foreign intelligence surveillance. *Compare* 50 U.S.C. § 1805 (2012) (amended 2018) (requiring “probable cause to believe . . . the target of the electronic surveillance is a foreign power or an agent of a foreign power”), *with* 50 U.S.C. § 1881a (requiring that surveillance not intentionally target people in the United States or United States nationals but not requiring any showing that the surveillance target is a foreign power or agent of a foreign power).

The Court then held that the plaintiffs' theory of injury was too speculative to constitute a "certainly impending" injury. *Id.* at 410. The plaintiffs had not alleged that any of their communications had yet been intercepted. *Id.* at 411. The Court characterized their alleged injury as instead resting on a series of inferences, including that:

(1) the Government will decide to target the communications of non-U.S. persons with whom they communicate; (2) in doing so, the Government will choose to invoke its authority under § 1881a rather than utilizing another method of surveillance; (3) the Article III judges who serve on the Foreign Intelligence Surveillance Court will conclude that the Government's proposed surveillance procedures satisfy § 1881a's many safeguards and are consistent with the Fourth Amendment; (4) the Government will succeed in intercepting the communications of respondents' contacts; and (5) respondents will be parties to the particular communications that the Government intercepts.

Id. at 410. The Court declined to speculate about what it described as independent choices by the government about whom to target for surveillance and what basis to invoke for such targeting, or about whether the Foreign Intelligence Surveillance Court would approve any such surveillance. *Id.* at 412–13. The plaintiffs' multi-link chain of inferences was thus "too speculative" to constitute a cognizable injury in fact. *Id.* at 401.

Unlike in *Clapper*, the plaintiffs' alleged injury in *Krottner* did not require a speculative multi-link chain of inferences. See *Krottner*, 628 F.3d at 1143. The *Krottner* laptop thief had all the information he needed to open accounts or spend money in the plaintiffs' names—actions that *Krottner* collectively treats as “identity theft.” *Id.* at 1142. Moreover, *Clapper*'s standing analysis was “especially rigorous” because the case arose in a sensitive national security context involving intelligence gathering and foreign affairs, and because the plaintiffs were asking the courts to declare actions of the executive and legislative branches unconstitutional. *Clapper*, 568 U.S. at 408 (quoting *Raines v. Byrd*, 521 U.S. 811, 819 (1997)). *Krottner* presented no such national security or separation of powers concerns.

And although the Supreme Court focused in *Clapper* on whether the injury was “certainly impending,” it acknowledged that other cases had focused on whether there was a “substantial risk” of injury.⁵ *Id.* at 414 & n.5. Since *Clapper*, the Court reemphasized in *Susan B. Anthony List v. Driehaus*, 134 S. Ct. 2334 (2014), that “[a]n allegation of future injury may suffice if the threatened injury is ‘certainly impending,’ or there is a ‘substantial risk that the harm will occur.’” *Id.* at 2341 (quoting *Clapper*, 568 U.S. at 414 & n.5) (internal quotation marks omitted).

⁵ The Court noted that the plaintiffs in *Clapper* had not alleged a substantial risk because their theory of injury relied on too many inferences. *Clapper*, 568 U.S. at 414 n.5.

For all these reasons, we hold that *Krottner* is not clearly irreconcilable with *Clapper* and thus remains binding.⁶ See *Miller*, 335 F.3d at 900.

B.

We also conclude that *Krottner* controls the result here. In *Krottner*, we held that the plaintiffs had “alleged a credible threat of real and immediate harm stemming from the theft of a laptop containing their unencrypted personal data.” 628 F.3d at 1143. The threat would have been “far less credible,” we explained, “if no laptop had been stolen, and [they] had sued based on the risk that it would be stolen

⁶ Our conclusion that *Krottner* is not clearly irreconcilable with *Clapper* is consistent with post-*Clapper* decisions in our sister circuits holding that data breaches in which hackers targeted PII created a risk of harm sufficient to support standing. For example, the D.C. Circuit held in *Attias v. Carefirst, Inc.*, 865 F.3d 620 (D.C. Cir. 2017), cert. denied, No. 17-641, 2018 WL 942459 (U.S. Feb. 20, 2018), that “[n]o long sequence of uncertain contingencies involving multiple independent actors has to occur before the plaintiffs [who were victims of a data breach] will suffer any harm; a substantial risk of harm exists already, simply by virtue of the hack and the nature of the data that the plaintiffs allege was taken.” *Id.* at 629; see also *Remijas v. Neiman Marcus Grp., LLC*, 794 F.3d 688, 693 (7th Cir. 2015) (“Why else would hackers break into a store’s database and steal consumers’ private information? Presumably, the purpose of the hack is, sooner or later, to make fraudulent charges or assume those consumers’ identities.”). The Eighth Circuit did hold in *In re SuperValu, Inc., Customer Data Security Breach Litigation*, 870 F.3d 763 (8th Cir. 2017), that allegations of the theft of credit card information were insufficient to support standing. *Id.* at 771–72. But no other PII, such as addresses, telephone numbers, or passwords, was stolen in that case. See *id.* at 766, 770. The Eighth Circuit acknowledged cases like *Attias* and *Remijas* but opined that standing questions in data breach cases “ultimately turn[] on the substance of the allegations before each court”—particularly, the types of data allegedly stolen. *Id.* at 769.

at some point in the future.” *Id.* But the sensitivity of the personal information, combined with its theft, led us to conclude that the plaintiffs had adequately alleged an injury in fact supporting standing. *Id.* The sensitivity of the stolen data in this case is sufficiently similar to that in *Krottner* to require the same conclusion here.

Plaintiffs allege that the type of information accessed in the Zappos breach can be used to commit identity theft, including by placing them at higher risk of “phishing” and “pharming,” which are ways for hackers to exploit information they already have to get even more PII. Plaintiffs also allege that their credit card numbers were within the information taken in the breach—which was not true in *Krottner*.⁷ And Congress has treated credit card numbers as sufficiently sensitive to warrant legislation prohibiting merchants from printing such numbers on receipts—specifically to reduce the risk of identity theft. *See* 15 U.S.C. § 1681c(g) (2012). Although there is no allegation in this case that the stolen information included social security numbers, as there was in *Krottner*, the information taken in the data breach still gave hackers the means to commit fraud or identity theft, as Zappos itself effectively acknowledged by urging affected customers to change their passwords on any other account where they may have used “the same or a similar password.”⁸

⁷ Plaintiffs include in the Complaint some emails sent to Zappos from other customers saying that their credit cards were fraudulently used following the breach.

⁸ We use the terms “identity fraud” and “identity theft” in accordance with the GAO definition Plaintiffs rely on in the Complaint. *See supra* note 3 and accompanying text.

Indeed, the plaintiffs who alleged that the hackers had already commandeered their accounts or identities using information taken from Zappos specifically alleged that they suffered financial losses because of the Zappos data breach (which is why the district court held that they had standing). Although those plaintiffs' claims are not at issue in this appeal, their alleged harm undermines Zappos's assertion that the data stolen in the breach cannot be used for fraud or identity theft. In addition, two plaintiffs whose claims are at issue in this appeal say that the hackers took over their AOL accounts and sent advertisements to people in their address books.⁹ Though not a financial harm, these alleged attacks further support Plaintiffs' contention that the hackers accessed information that could be used to help commit identity fraud or identity theft. We thus conclude that Plaintiffs have sufficiently alleged an injury in fact under *Krottner*.

Zappos contends that even if the stolen data was as sensitive as that in *Krottner*, too much time has passed since the breach for any harm to be imminent. Zappos is mistaken. Our jurisdiction "depends upon the state of things at the time of the action brought."¹⁰ *Mollan v. Torrance*, 22 U.S. 537, 539 (1824). The initial complaint against Zappos was filed on the same day that Zappos provided notice of the breach. Other Plaintiffs' complaints were filed soon thereafter. We

⁹ The district court held that these plaintiffs nonetheless lacked standing because they had not suffered "additional misuse" or "actual damages" from the data breach.

¹⁰ Consistent with this principle, *Krottner* did not discuss the two-year gap between the breach and the appeal, focusing instead on the sensitivity of the stolen information. *See* 628 F.3d at 1143.

therefore assess Plaintiffs' standing as of January 2012, not as of the present.¹¹

Plaintiffs also specifically allege that “[a] person whose PII has been obtained and compromised may not see the full extent of identity theft or identity fraud for years.” And “it may take some time for the victim to become aware of the theft.”

Assessing the sum of their allegations in light of *Krottner*, Plaintiffs have sufficiently alleged an injury in fact based on a substantial risk that the Zappos hackers will commit identity fraud or identity theft.¹²

¹¹ Of course, as litigation proceeds beyond the pleadings stage, the Complaint's allegations will not sustain Plaintiffs' standing on their own. *See Lujan v. Defs. of Wildlife*, 504 U.S. 555, 561 (1992) (“[E]ach element [of Article III standing] must be supported in the same way as any other matter on which the plaintiff bears the burden of proof, *i.e.*, with the manner and degree of evidence required at the successive stages of the litigation.”). In opposing a motion for summary judgment, for example, Plaintiffs would need to come forward with evidence to support standing. *See id.* But the passage of time does not change the relevant moment as to which Plaintiffs must establish that they had standing or heighten Plaintiffs' burden in opposing the motion to dismiss. *See id.*; *Mollan*, 22 U.S. at 539. A case may also, of course, become moot as time progresses. But there is no reason to doubt that Plaintiffs still have a live controversy against Zappos here. *Cf. Z Channel Ltd. P'ship v. Home Box Office, Inc.*, 931 F.2d 1338, 1341 (9th Cir. 1991) (“If [a plaintiff] is entitled to collect damages in the event that it succeeds on the merits, the case does not become moot even though declaratory and injunctive relief are no longer of any use.”).

¹² This conclusion is consistent with the Fourth Circuit's decision in *Beck v. McDonald*, 848 F.3d 262 (4th Cir. 2017), *cert. denied sub nom. Beck v. Shulkin*, 137 S. Ct. 2307 (2017). The plaintiffs in *Beck*, patients with personal data on a laptop stolen from a hospital, did not allege that the “thief intentionally targeted the personal information compromised

C.

The remaining Article III standing requirements are also satisfied. Plaintiffs sufficiently allege that the risk of future harm they face is “‘fairly traceable’ to the conduct being challenged”—here, Zappos’s failure to prevent the breach. *Wittman v. Personhuballah*, 136 S. Ct. 1732, 1736 (2016) (quoting *Lujan v. Defs. of Wildlife*, 504 U.S. 555, 560–61 (1992)).

That hackers might have stolen Plaintiffs’ PII in unrelated breaches, and that Plaintiffs might suffer identity theft or fraud caused by the data stolen in those other breaches (rather than the data stolen from Zappos), is less about standing and more about the merits of causation and damages. As the Seventh Circuit recognized in *Remijas v. Neiman Marcus Group, LLC*, 794 F.3d 688 (7th Cir. 2015), that “some other store *might* [also] have caused the plaintiffs’ private information to be exposed does nothing to negate the plaintiffs’ standing to sue” for the breach in

in the data breaches.” *Id.* at 274. The Fourth Circuit held that the absence of such an allegation “render[ed] their contention of an enhanced risk of future identity theft too speculative.” *Id.* Here, by contrast, Plaintiffs allege that hackers specifically targeted their PII on Zappos’s servers. It is true that in *Beck* the Fourth Circuit opined that “‘as the breaches fade further into the past,’ the Plaintiffs’ threatened injuries become more and more speculative.” *Id.* at 275 (quoting *Chambliss v. Carefirst, Inc.*, 189 F. Supp. 3d 564, 570 (D. Md. 2016), and citing *In re Zappos.com, Inc.*, 108 F. Supp. 3d 949, 958 (D. Nev. 2015)). But the time since the data breach appears to have mattered in *Beck* because the court concluded that the plaintiffs lacked standing after the breach in the first place, so it made sense to consider whether any subsequent events suggested a greater injury than was initially apparent. *See id.* at 274.

question.¹³ *Id.* at 696; *cf. Price Waterhouse v. Hopkins*, 490 U.S. 228, 263 (1989) (O'Connor, J., concurring in the judgment) (“[I]n multiple causation cases, . . . the common law of torts has long shifted the burden of proof to multiple defendants to prove that their negligent actions were not the ‘but-for’ cause of the plaintiff’s injury.” (citing *Summers v. Tice*, 199 P.2d 1, 3–4 (Cal. 1948))), *superseded on other grounds by* 42 U.S.C. § 2000e-2(m) (2012).

The injury from the risk of identity theft is also redressable by relief that could be obtained through this litigation. *See Lujan*, 504 U.S. at 561. If Plaintiffs succeed on the merits, any proven injury could be compensated through damages. *See Remijas*, 794 F.3d at 696–97. And at least some of their requested injunctive relief would limit the extent of the threatened injury by helping Plaintiffs to

¹³ *Clapper* is not to the contrary. In *Clapper*, the Supreme Court held that, even assuming the plaintiffs were going to be surveilled, any future surveillance could not be traced to the challenged statute because the risk of being surveilled did not increase with the addition of the new statutory tool. 568 U.S. at 413 (“[B]ecause respondents can only speculate as to whether any (asserted) interception would be under § 1881a or some other authority, they cannot satisfy the ‘fairly traceable’ requirement.”). There were many surveillance options, all of which were in the hands of one actor: the government. Thus, a plaintiff’s risk of surveillance hinged on whether the government chose to surveil him in the first place. In contrast, with each new hack comes a new hacker, each of whom independently could choose to use the data to commit identity theft. This means that each hacking incident adds to the overall risk of identity theft. And again, as explained above, the key injury recognized in *Krottner* is the risk of being subject to identity theft, not actual identity theft.

monitor their credit and the like.¹⁴ *See Monsanto Co. v. Geertson Seed Farms*, 561 U.S. 139, 154–55 (2010).

IV.

For the foregoing reasons, we **REVERSE** the district court's judgment as to Plaintiffs' standing and **REMAND**.

¹⁴ Plaintiffs need only one viable basis for standing. *See Douglas Cty. v. Babbitt*, 48 F.3d 1495, 1500 (9th Cir. 1995). Because Plaintiffs sufficiently allege standing from the risk of future identity theft, we do not reach their other asserted bases for standing.

**PREPARED STATEMENT OF
THE FEDERAL TRADE COMMISSION**

on

Data Breach on the Rise: Protecting Personal Information From Harm

Before the

COMMITTEE ON HOMELAND SECURITY AND GOVERNMENTAL AFFAIRS

UNITED STATES SENATE

Washington, D.C.

April 2, 2014

I. INTRODUCTION

Chairman Carper, Ranking Member Coburn, and members of the Committee, I am Edith Ramirez, Chairwoman of the Federal Trade Commission (“FTC” or “Commission”).¹ I appreciate the opportunity to present the Commission’s testimony on data security, and for your leadership, Chairman Carper, on this important issue.

Consumers’ data is at risk. Recent publicly announced data breaches² remind us that hackers and others seek to exploit vulnerabilities, obtain unauthorized access to consumers’ sensitive information, and potentially misuse it in ways that can cause serious harm to consumers as well as businesses. These threats affect more than payment card data; breaches reported in recent years have also compromised Social Security numbers, account passwords, health data, information about children, and other types of personal information.

Data security is of critical importance to consumers. If companies do not protect the personal information they collect and store, that information could fall into the wrong hands, resulting in fraud, identity theft, and other harm, along with a potential loss of consumer confidence in the marketplace. As one example, the Bureau of Justice Statistics estimates that 16.6 million persons – or 7 percent of all U.S. residents ages 16 and older – were victims of identity theft in 2012.³

¹ This written statement presents the views of the Federal Trade Commission. My oral statements and responses to questions are my own and do not necessarily reflect the views of the Commission or of any other Commissioner.

² See Elizabeth A. Harris & Nicole Perlroth, *For Target, the Breach Numbers Grow*, N.Y. Times, Jan. 10, 2014, available at <http://www.nytimes.com/2014/01/11/business/target-breach-affected-70-million-customers.html> (discussing recently-announced breaches involving payment card information by Target and Neiman Marcus); Nicole Perlroth, *Michaels Stores Is Investigating Data Breach*, N.Y. Times, Jan. 25, 2014, available at <http://www.nytimes.com/2014/01/26/technology/michaels-stores-is-investigating-data-breach.html> (announcement of potential security breach involving payment card information).

³ See Bureau of Justice Statistics, *Victims of Identity Theft, 2012* (Dec. 2013), available at <http://www.bjs.gov/content/pub/pdf/vit12.pdf>.

As the nation's leading privacy enforcement agency, the Commission has undertaken substantial efforts for over a decade to promote data security and privacy in the private sector through civil law enforcement, education, and policy initiatives. The Commission is here today to reiterate its longstanding, bipartisan call for enactment of a strong federal data security and breach notification law. Never has the need for legislation been greater. With reports of data breaches on the rise, and with a significant number of Americans suffering from identity theft, Congress must act. This testimony provides an overview of the Commission's data security efforts, and restates the FTC's support for data security legislation.

II. THE COMMISSION'S DATA SECURITY PROGRAM

A. Law Enforcement

The Commission enforces several statutes and rules that impose obligations upon businesses to protect consumer data. The Commission's Safeguards Rule, which implements the Gramm-Leach-Bliley Act ("GLB Act"), for example, provides data security requirements for non-bank financial institutions.⁴ The Fair Credit Reporting Act ("FCRA") requires consumer reporting agencies to use reasonable procedures to ensure that the entities to which they disclose sensitive consumer information have a permissible purpose for receiving that information,⁵ and imposes safe disposal obligations on entities that maintain consumer report information.⁶ The Children's Online Privacy Protection Act (COPPA) requires reasonable security for children's information collected online.⁷ Reasonableness is the foundation of the data security provisions of each of these laws.

⁴ 16 C.F.R. Part 314, implementing 15 U.S.C. § 6801(b).

⁵ 15 U.S.C. § 1681e.

⁶ *Id.* at § 1681w. The FTC's implementing rule is at 16 C.F.R. Part 682.

⁷ 15 U.S.C. §§ 6501-6506; *see also* 16 C.F.R. Part 312 ("COPPA Rule").

In addition, the Commission enforces the proscription against unfair or deceptive acts or practices in Section 5 of the FTC Act.⁸ A company acts deceptively if it makes materially misleading statements or omissions.⁹ Using its deception authority, the Commission has settled more than 30 matters challenging companies' express and implied claims about the security they provide for consumers' personal data. Further, a company engages in unfair acts or practices if its data security practices cause or are likely to cause substantial injury to consumers that is neither reasonably avoidable by consumers nor outweighed by countervailing benefits to consumers or to competition.¹⁰ The Commission has settled more than 20 cases alleging that a company's failure to reasonably safeguard consumer data was an unfair practice.¹¹

The FTC conducts its data security investigations to determine whether a company's data security measures are reasonable and appropriate in light of the sensitivity and volume of consumer information it holds, the size and complexity of its data operations, and the cost of available tools to improve security and reduce vulnerabilities. The Commission's 50 settlements with businesses that it charged with failing to provide reasonable protections for consumers' personal information have halted harmful data security practices; required companies to accord strong protections for consumer data; and raised awareness about the risks to data, the need for reasonable and appropriate security, and the types of security failures that raise concerns.¹² And they have addressed the risks to a wide variety of consumer data, such as Social Security

⁸ 15 U.S.C. § 45(a).

⁹ See Federal Trade Commission Policy Statement on Deception, appended to *Cliffdale Assocs., Inc.*, 103 F.T.C. 110, 174 (1984).

¹⁰ See Federal Trade Commission Policy Statement on Unfairness, appended to *Int'l Harvester Co.*, 104 F.T.C. 949, 1070 (1984) ("FTC Unfairness Statement").

¹¹ Some of the Commission's data security settlements allege both deception and unfairness, as well as allegations under statutes such as the FCRA, GLB Act, and COPPA.

¹² See Commission Statement Marking the FTC's 50th Data Security Settlement, Jan. 31, 2014, available at <http://www.ftc.gov/system/files/documents/cases/140131gmrstatement.pdf>.

numbers, health data, data about children, credit card information, bank account information, usernames, and passwords, in a broad range of sectors and platforms.

In each of these cases, the Commission has examined a company's practices as a whole and challenged alleged data security failures that were multiple and systemic. Through these settlements, the Commission has made clear that reasonable and appropriate security is a continuous process of assessing and addressing risks; that there is no one-size-fits-all data security program; that the Commission does not require perfect security; and that the mere fact that a breach occurred does not mean that a company has violated the law.

In its most recent cases, the FTC entered into settlements with Credit Karma¹³ and Fandango¹⁴ to resolve allegations that the companies misrepresented the security of their mobile applications ("apps"). Credit Karma's mobile app allows consumers to monitor and access their credit scores, credit reports, and other credit report and financial data, and has been downloaded over one million times. Fandango's mobile app has over 18.5 million downloads and allows consumers to purchase movie tickets. According to the complaints, despite claims that the companies provided reasonable security to consumers' data, Credit Karma and Fandango did not securely transmit consumers' sensitive personal information through their mobile apps. In particular, the apps failed to authenticate and secure the connections used to transmit this data, and left consumers' information vulnerable to exposure – including Social Security numbers, birthdates, and credit report information in the Credit Karma app, and credit card information in the Fandango app. The Commission's settlement agreements prohibit Credit Karma and Fandango from making misrepresentations about privacy and security, and require the companies

¹³ *Credit Karma, Inc.*, No. 132-3091 (F.T.C. March 28, 2014) (proposed consent agreement), available at <http://www.ftc.gov/enforcement/cases-proceedings/132-3091/credit-karma-inc>.

¹⁴ *Fandango, LLC*, No. 132-3089 (F.T.C. March 28, 2014) (proposed consent agreement), available at <http://www.ftc.gov/enforcement/cases-proceedings/132-3089/fandango-llc>.

to implement comprehensive information security programs and undergo independent audits for the next 20 years.

The FTC also recently announced a case against TRENDnet, which involved a video camera designed to allow consumers to monitor their homes remotely.¹⁵ The complaint alleges that TRENDnet marketed its SecurView cameras for purposes ranging from home security to baby monitoring. Although TRENDnet claimed that the cameras were “secure,” they had faulty software that left them open to online viewing, and in some instances listening, by anyone with the cameras’ Internet address. This resulted in hackers posting 700 consumers’ live feeds on the Internet. Under the FTC settlement, TRENDnet must maintain a comprehensive security program, obtain outside audits, notify consumers about the security issues and the availability of software updates to correct them, and provide affected customers with free technical support for the next two years.

The FTC also has brought a number of cases alleging that unreasonable security practices allowed hackers to gain access to consumers’ credit and debit card information, leading to many millions of dollars of fraud loss.¹⁶ The Commission’s settlement with TJX provides a good example of the FTC’s examination of reasonableness in the data security context.¹⁷ According to the complaint, TJX engaged in a number of practices that, taken together, failed to reasonably protect consumer information. Among other things, it (1) failed to implement measures to limit

¹⁵ *TRENDnet, Inc.*, No. C-4426(F.T.C. Jan. 16, 2014) (consent order), available at <http://www.ftc.gov/enforcement/cases-proceedings/122-3090/trendnet-inc-matter>.

¹⁶ See, e.g., *Dave & Buster’s, Inc.*, No. C-4291 (F.T.C. May 20, 2010) (consent order), available at <http://www.ftc.gov/enforcement/cases-and-proceedings/cases/2010/06/dave-busters-incin-matter>; *DSW, Inc.*, No. C-4157 (F.T.C. Mar. 7, 2006) (consent order), available at <http://www.ftc.gov/enforcement/cases-and-proceedings/cases/2006/03/dsw-incin-matter>; *BJ’s Wholesale Club, Inc.*, No. C-4148 (F.T.C. Sept. 20, 2005) (consent order), available at <http://www.ftc.gov/enforcement/cases-and-proceedings/cases/2005/09/bjs-wholesale-club-inc-matter>.

¹⁷ *The TJX Cos., Inc.*, No. C-4227 (F.T.C. July 29, 2008) (consent order), available at <http://www.ftc.gov/enforcement/cases-and-proceedings/cases/2008/08/tjx-companies-inc-matter>.

wireless access to its stores, allowing a hacker to connect wirelessly to its networks without authorization; (2) did not require network administrators to use strong passwords; (3) failed to use a firewall or otherwise limit access to the Internet on networks processing cardholder data; and (4) lacked procedures to detect and prevent unauthorized access, such as by updating antivirus software and responding on security warnings and intrusion alerts. As a result, a hacker obtained tens of millions of credit and debit payment cards, as well as the personal information of approximately 455,000 consumers who returned merchandise to the stores. As this matter illustrates, the FTC's approach to reasonableness looks to see whether companies have implemented basic, fundamental safeguards that are reasonable and appropriate in light of the sensitivity and volume of the data it holds, the size and complexity of its data operations, and the cost of available tools.

B. Policy Initiatives

The Commission also undertakes policy initiatives to promote privacy and data security. For example, the FTC hosts workshops on business practices and technologies affecting consumer data. The FTC is in the midst of hosting its Spring Privacy Series to examine the privacy implications of a number of new technologies in the marketplace.¹⁸ The first seminar, held in February, included a panel of industry, technical experts, and privacy advocates and examined the privacy and security implications of mobile device tracking, where retailers and other companies rely on technology that can reveal information about consumers' visits to and movements within a location.¹⁹

¹⁸ Press Release, *FTC to Host Spring Seminars on Emerging Consumer Privacy Issues*, Dec. 2, 2013, available at <http://www.ftc.gov/news-events/press-releases/2013/12/ftc-host-spring-seminars-emerging-consumer-privacy-issues>.

¹⁹ See Spring Privacy Series, *Mobile Device Tracking*, Feb. 19, 2014, available at <http://www.ftc.gov/news-events/events-calendar/2014/02/spring-privacy-series-mobile-device-tracking>.

In November, the FTC held a workshop on the phenomenon known as the “Internet of Things” – *i.e.*, Internet-connected refrigerators, thermostats, cars, and other products and services that can communicate with each other and/or consumers.²⁰ The workshop brought together academics, industry representatives, and consumer advocates to explore the security and privacy issues from increased connectivity in everyday devices, in areas as diverse as smart homes, connected health and fitness devices, and connected cars. Commission staff is developing a report on privacy and security issues raised at the workshop and in the public comments.

And last June, the Commission hosted a public forum on mobile security issues, including potential threats to U.S. consumers and possible solutions to them.²¹ As the use of mobile technology increases at a rapid rate and consumers take advantage of the technology’s benefits in large numbers, it is important to address threats that exist today as well as those that may emerge in the future. The forum brought together technology researchers, industry members and academics to explore the security of existing and developing mobile technologies and the roles various members of the mobile ecosystem can play in protecting consumers from potential security threats.

C. Consumer Education and Business Guidance

The Commission is also committed to promoting better data security practices through consumer education and business guidance. On the consumer education front, the Commission sponsors OnGuard Online, a website designed to educate consumers about basic computer security.²² OnGuard Online and its Spanish-language counterpart, Alerta en Línea,²³ average

²⁰ FTC Workshop, *Internet of Things: Privacy & Security in a Connected World* (Nov. 19, 2013), available at <http://www.ftc.gov/bcp/workshops/internet-of-things/>.

²¹ FTC Workshop, *Mobile Security: Potential Threats and Solutions* (June 4, 2013), available at <http://www.ftc.gov/bcp/workshops/mobile-security/>.

²² See <http://www.onguardonline.gov>.

more than 2.2 million unique visits per year. Also, for consumers who may have been affected by the recent Target and other breaches, the FTC posted information online about steps they should take to protect themselves.²⁴

The Commission directs its outreach to businesses as well to provide education about applicable legal requirements and reasonable security practices. For example, the FTC widely disseminates its business guide on data security,²⁵ along with an online tutorial based on the guide.²⁶ These resources are designed to provide a variety of businesses – and especially small businesses – with practical, concrete advice as they develop data security programs and plans for their companies. First, companies should know what consumer information they have and what personnel or third parties have, or could have, access to it. Understanding how information moves into, through, and out of a business is essential to assessing its security vulnerabilities. Second, companies should limit the information they collect and retain based on their legitimate business needs, so that needless storage of data does not create unnecessary risks of unauthorized access to the data. Third, businesses should protect the information they maintain by assessing risks and implementing protections in certain key areas – physical security, electronic security, employee training, and oversight of service providers. Fourth, companies should properly

²³ See <http://www.alertaenlinea.gov>.

²⁴ See Nicole Vincent Fleming, *An Unfortunate Fact About Shopping*, FTC Consumer Blog, <http://www.consumer.ftc.gov/blog/unfortunate-fact-about-shopping> (Jan. 27, 2014); Nicole Vincent Fleming, *Are you affected by the recent Target hack?*, FTC Consumer Blog, <https://www.consumer.ftc.gov/blog/are-you-affected-recent-target-hack>. In addition to these materials posted in response to recent breaches, the FTC has long published a victim recovery guide and other resources to explain the immediate steps identity theft victims should take to address the crime; how to obtain a free credit report and correct fraudulent information in credit reports; how to file a police report; and how to protect their personal information. See <http://www.consumer.ftc.gov/features/feature-0014-identity-theft>.

²⁵ See *Protecting Personal Information: A Guide for Business*, available at <http://business.ftc.gov/documents/bus69-protecting-personal-information-guide-business>.

²⁶ See *Protecting Personal Information: A Guide for Business (Interactive Tutorial)*, available at <http://business.ftc.gov/multimedia/videos/protecting-personal-information>.

dispose of information that they no longer need. Finally, companies should have a plan in place to respond to security incidents, should they occur.

The Commission has also released articles directed towards a non-legal audience regarding basic data security issues for businesses.²⁷ For example, because mobile apps and devices often rely on consumer data, the FTC has developed specific security guidance for mobile app developers as they create, release, and monitor their apps.²⁸ The FTC also creates business educational materials on specific topics – such as the risks associated with peer-to-peer (“P2P”) file-sharing programs and companies’ obligations to protect consumer and employee information from these risks²⁹ and how to properly secure and dispose of information on digital copiers.³⁰

III. DATA SECURITY LEGISLATION

The FTC supports federal legislation that would (1) strengthen its existing authority governing data security standards on companies and (2) require companies, in appropriate circumstances, to provide notification to consumers when there is a security breach.³¹

²⁷ See generally <http://www.business.ftc.gov/privacy-and-security/data-security>.

²⁸ See *Mobile App Developers: Start with Security* (Feb. 2013), available at <http://business.ftc.gov/documents/bus83-mobile-app-developers-start-security>.

²⁹ See *Peer-to-Peer File Sharing: A Guide for Business* (Jan. 2010), available at <http://business.ftc.gov/documents/bus46-peer-peer-file-sharing-guide-business>.

³⁰ See *Copier Data Security: A Guide for Business* (Nov. 2010), available at <http://business.ftc.gov/documents/bus43-copier-data-security>.

³¹ See, e.g., Prepared Statement of the Federal Trade Commission, “Privacy and Data Security: Protecting Consumers in the Modern World,” Before the Senate Committee on Commerce, Science, and Transportation, 112th Cong., June 29, 2011, available at http://www.ftc.gov/sites/default/files/documents/public_statements/prepared-statement-federal-trade-commission-privacy-and-data-security-protecting-consumers-modern/110629privacytestimonybrill.pdf; Prepared Statement of the Federal Trade Commission, “Data Security,” Before Subcommittee on Commerce, Manufacturing, and Trade of the House Committee on Energy and Commerce, 112th Cong., June 15, 2011, available at http://www.ftc.gov/sites/default/files/documents/public_statements/prepared-statement-federal-trade-commission-data-security/110615datasecurityhouse.pdf; FTC, *Security in Numbers, SSNs and ID Theft* (Dec. 2008), available at <http://www.ftc.gov/sites/default/files/documents/reports/security-numbers-social-security-numbers-and->

Reasonable and appropriate security practices are critical to preventing data breaches and protecting consumers from identity theft and other harm. Where breaches occur, notifying consumers helps them protect themselves from any harm that is likely to be caused by the misuse of their data. For example, in the case of a breach of Social Security numbers, notifying consumers will enable them to request that fraud alerts be placed in their credit files, obtain copies of their credit reports, scrutinize their monthly account statements, and take other steps to protect themselves. And although most states have breach notification laws in place, having a strong and consistent national requirement would simplify compliance by businesses while ensuring that all consumers are protected.

Legislation in both areas – data security and breach notification – should give the FTC the ability to seek civil penalties to help deter unlawful conduct, jurisdiction over non-profits, and rulemaking authority under the Administrative Procedure Act. Under current laws, the FTC only has the authority to seek civil penalties for data security violations with regard to children’s online information under COPPA or credit report information under the FCRA.³² To help ensure effective deterrence, we urge Congress to allow the FTC to seek civil penalties for all data security and breach notice violations in appropriate circumstances. Likewise, enabling the FTC to bring cases against non-profits³³ would help ensure that whenever personal information is collected from consumers, entities that maintain such data adequately protect it.³⁴

[identity-theft-federal-trade-commission-report/p075414ssnreport.pdf](http://www.ftc.gov/sites/default/files/documents/reports/presidents-identity-theft-task-force-report/081021taskforcereport.pdf); President’s Identity Theft Task Force, *Identity Theft Task Force Report* (Sept. 2008), available at <http://www.ftc.gov/sites/default/files/documents/reports/presidents-identity-theft-task-force-report/081021taskforcereport.pdf>.

³² The FTC can also seek civil penalties for violations of administrative orders. 15 U.S.C. § 45(l).

³³ Non-profits are generally outside the FTC’s jurisdiction. 15 U.S.C. §§ 44 & 45(a).

³⁴ A substantial number of reported breaches have involved non-profit universities and health systems. See Privacy Rights Clearinghouse Chronology of Data Breaches (listing breaches including breaches at non-profits, educational institutions, and health facilities), available at <http://www.privacyrights.org/data-breach/new>.

Finally, rulemaking authority under the Administrative Procedure Act would enable the FTC in implementing the legislation to respond to changes in technology. For example, whereas a decade ago it would be incredibly difficult and expensive for a company to track an individual's precise geolocation, the explosion of mobile devices has made such information readily available. And, as the growing problem of child identity theft has brought to light in recent years, a child's Social Security number alone can be combined with another person's information, such as name or date of birth, in order to commit identity theft.³⁵ Rulemaking authority would allow the Commission to ensure that as technology changes and the risks from the use of certain types of information evolve, companies would be required to give adequate protection to such data.

IV. CONCLUSION

Thank you for the opportunity to provide the Commission's views on data security. The FTC remains committed to promoting reasonable security for consumer data and we look forward to continuing to work with the Committee and Congress on this critical issue.

³⁵ FTC Workshop, *Stolen Futures: A Forum on Child Identity Theft* (July 12, 2011), available at <http://www.ftc.gov/news-events/events-calendar/2011/07/stolen-futures-forum-child-identity-theft>.

Assembly Bill No. 375

CHAPTER 55

An act to add Title 1.81.5 (commencing with Section 1798.100) to Part 4 of Division 3 of the Civil Code, relating to privacy.

[Approved by Governor June 28, 2018. Filed with Secretary of State June 28, 2018.]

LEGISLATIVE COUNSEL'S DIGEST

AB 375, Chau. Privacy: personal information: businesses.

The California Constitution grants a right of privacy. Existing law provides for the confidentiality of personal information in various contexts and requires a business or person that suffers a breach of security of computerized data that includes personal information, as defined, to disclose that breach, as specified.

This bill would enact the California Consumer Privacy Act of 2018. Beginning January 1, 2020, the bill would grant a consumer a right to request a business to disclose the categories and specific pieces of personal information that it collects about the consumer, the categories of sources from which that information is collected, the business purposes for collecting or selling the information, and the categories of 3rd parties with which the information is shared. The bill would require a business to make disclosures about the information and the purposes for which it is used. The bill would grant a consumer the right to request deletion of personal information and would require the business to delete upon receipt of a verified request, as specified. The bill would grant a consumer a right to request that a business that sells the consumer's personal information, or discloses it for a business purpose, disclose the categories of information that it collects and categories of information and the identity of 3rd parties to which the information was sold or disclosed. The bill would require a business to provide this information in response to a verifiable consumer request. The bill would authorize a consumer to opt out of the sale of personal information by a business and would prohibit the business from discriminating against the consumer for exercising this right, including by charging the consumer who opts out a different price or providing the consumer a different quality of goods or services, except if the difference is reasonably related to value provided by the consumer's data. The bill would authorize businesses to offer financial incentives for collection of personal information. The bill would prohibit a business from selling the personal information of a consumer under 16 years of age, unless affirmatively authorized, as specified, to be referred to as the right to opt in. The bill would prescribe requirements for receiving, processing, and satisfying these requests from consumers. The bill would prescribe various definitions for its purposes and would

define “personal information” with reference to a broad list of characteristics and behaviors, personal and commercial, as well as inferences drawn from this information. The bill would prohibit the provisions described above from restricting the ability of the business to comply with federal, state, or local laws, among other things.

The bill would provide for its enforcement by the Attorney General, as specified, and would provide a private right of action in connection with certain unauthorized access and exfiltration, theft, or disclosure of a consumer’s nonencrypted or nonredacted personal information, as defined. The bill would prescribe a method for distribution of proceeds of Attorney General actions. The bill would create the Consumer Privacy Fund in the General Fund with the moneys in the fund, upon appropriation by the Legislature, to be applied to support the purposes of the bill and its enforcement. The bill would provide for the deposit of penalty money into the fund. The bill would require the Attorney General to solicit public participation for the purpose of adopting regulations, as specified. The bill would authorize a business, service provider, or 3rd party to seek the Attorney General’s opinion on how to comply with its provisions. The bill would void a waiver of a consumer’s rights under its provisions. The bill would condition its operation on the withdrawal of a specified initiative from the ballot.

The people of the State of California do enact as follows:

SECTION 1. This measure shall be known and may be cited as “The California Consumer Privacy Act of 2018.”

SEC. 2. The Legislature finds and declares that:

(a) In 1972, California voters amended the California Constitution to include the right of privacy among the “inalienable” rights of all people. The amendment established a legal and enforceable right of privacy for every Californian. Fundamental to this right of privacy is the ability of individuals to control the use, including the sale, of their personal information.

(b) Since California voters approved the right of privacy, the California Legislature has adopted specific mechanisms to safeguard Californians’ privacy, including the Online Privacy Protection Act, the Privacy Rights for California Minors in the Digital World Act, and Shine the Light, a California law intended to give Californians the ‘who, what, where, and when’ of how businesses handle consumers’ personal information.

(c) At the same time, California is one of the world’s leaders in the development of new technologies and related industries. Yet the proliferation of personal information has limited Californians’ ability to properly protect and safeguard their privacy. It is almost impossible to apply for a job, raise a child, drive a car, or make an appointment without sharing personal information.

(d) As the role of technology and data in the every daily lives of consumers increases, there is an increase in the amount of personal information shared by consumers with businesses. California law has not kept pace with these developments and the personal privacy implications surrounding the collection, use, and protection of personal information.

(e) Many businesses collect personal information from California consumers. They may know where a consumer lives and how many children a consumer has, how fast a consumer drives, a consumer's personality, sleep habits, biometric and health information, financial information, precise geolocation information, and social networks, to name a few categories.

(f) The unauthorized disclosure of personal information and the loss of privacy can have devastating effects for individuals, ranging from financial fraud, identity theft, and unnecessary costs to personal time and finances, to destruction of property, harassment, reputational damage, emotional stress, and even potential physical harm.

(g) In March 2018, it came to light that tens of millions of people had their personal data misused by a data mining firm called Cambridge Analytica. A series of congressional hearings highlighted that our personal information may be vulnerable to misuse when shared on the Internet. As a result, our desire for privacy controls and transparency in data practices is heightened.

(h) People desire privacy and more control over their information. California consumers should be able to exercise control over their personal information, and they want to be certain that there are safeguards against misuse of their personal information. It is possible for businesses both to respect consumers' privacy and provide a high level transparency to their business practices.

(i) Therefore, it is the intent of the Legislature to further Californians' right to privacy by giving consumers an effective way to control their personal information, by ensuring the following rights:

(1) The right of Californians to know what personal information is being collected about them.

(2) The right of Californians to know whether their personal information is sold or disclosed and to whom.

(3) The right of Californians to say no to the sale of personal information.

(4) The right of Californians to access their personal information.

(5) The right of Californians to equal service and price, even if they exercise their privacy rights.

SEC. 3. Title 1.81.5 (commencing with Section 1798.100) is added to Part 4 of Division 3 of the Civil Code, to read:

TITLE 1.81.5. CALIFORNIA CONSUMER PRIVACY ACT OF 2018

1798.100. (a) A consumer shall have the right to request that a business that collects a consumer's personal information disclose to that consumer

the categories and specific pieces of personal information the business has collected.

(b) A business that collects a consumer's personal information shall, at or before the point of collection, inform consumers as to the categories of personal information to be collected and the purposes for which the categories of personal information shall be used. A business shall not collect additional categories of personal information or use personal information collected for additional purposes without providing the consumer with notice consistent with this section.

(c) A business shall provide the information specified in subdivision (a) to a consumer only upon receipt of a verifiable consumer request.

(d) A business that receives a verifiable consumer request from a consumer to access personal information shall promptly take steps to disclose and deliver, free of charge to the consumer, the personal information required by this section. The information may be delivered by mail or electronically, and if provided electronically, the information shall be in a portable and, to the extent technically feasible, in a readily useable format that allows the consumer to transmit this information to another entity without hindrance. A business may provide personal information to a consumer at any time, but shall not be required to provide personal information to a consumer more than twice in a 12-month period.

(e) This section shall not require a business to retain any personal information collected for a single, one-time transaction, if such information is not sold or retained by the business or to reidentify or otherwise link information that is not maintained in a manner that would be considered personal information.

(1) Retain any personal information collected for a single, one-time transaction, if the information is not sold or retained by the business.

(2) Reidentify or otherwise link any data that, in the ordinary course of business, is not maintained in a manner that would be considered personal information.

1798.105. (a) A consumer shall have the right to request that a business delete any personal information about the consumer which the business has collected from the consumer.

(b) A business that collects personal information about consumers shall disclose, pursuant to subparagraph (A) of paragraph (5) of subdivision (a) of Section 1798.130, the consumer's rights to request the deletion of the consumer's personal information.

(c) A business that receives a verifiable request from a consumer to delete the consumer's personal information pursuant to subdivision (a) of this section shall delete the consumer's personal information from its records and direct any service providers to delete the consumer's personal information from their records.

(d) A business or a service provider shall not be required to comply with a consumer's request to delete the consumer's personal information if it is necessary for the business or service provider to maintain the consumer's personal information in order to:

(1) Complete the transaction for which the personal information was collected, provide a good or service requested by the consumer, or reasonably anticipated within the context of a business's ongoing business relationship with the consumer, or otherwise perform a contract between the business and the consumer.

(2) Detect security incidents, protect against malicious, deceptive, fraudulent, or illegal activity; or prosecute those responsible for that activity.

(3) Debug to identify and repair errors that impair existing intended functionality.

(4) Exercise free speech, ensure the right of another consumer to exercise his or her right of free speech, or exercise another right provided for by law.

(5) Comply with the California Electronic Communications Privacy Act pursuant to Chapter 3.6 (commencing with Section 1546) of Title 12 of Part 2 of the Penal Code.

(6) Engage in public or peer-reviewed scientific, historical, or statistical research in the public interest that adheres to all other applicable ethics and privacy laws, when the businesses' deletion of the information is likely to render impossible or seriously impair the achievement of such research, if the consumer has provided informed consent.

(7) To enable solely internal uses that are reasonably aligned with the expectations of the consumer based on the consumer's relationship with the business.

(8) Comply with a legal obligation.

(9) Otherwise use the consumer's personal information, internally, in a lawful manner that is compatible with the context in which the consumer provided the information.

1798.110. (a) A consumer shall have the right to request that a business that collects personal information about the consumer disclose to the consumer the following:

(1) The categories of personal information it has collected about that consumer.

(2) The categories of sources from which the personal information is collected.

(3) The business or commercial purpose for collecting or selling personal information.

(4) The categories of third parties with whom the business shares personal information.

(5) The specific pieces of personal information it has collected about that consumer.

(b) A business that collects personal information about a consumer shall disclose to the consumer, pursuant to paragraph (3) of subdivision (a) of Section 1798.130, the information specified in subdivision (a) upon receipt of a verifiable request from the consumer.

(c) A business that collects personal information about consumers shall disclose, pursuant to subparagraph (B) of paragraph (5) of subdivision (a) of Section 1798.130:

(1) The categories of personal information it has collected about that consumer.

(2) The categories of sources from which the personal information is collected.

(3) The business or commercial purpose for collecting or selling personal information.

(4) The categories of third parties with whom the business shares personal information.

(5) The specific pieces of personal information the business has collected about that consumer.

(d) This section does not require a business to do the following:

(1) Retain any personal information about a consumer collected for a single one-time transaction if, in the ordinary course of business, that information about the consumer is not retained.

(2) Reidentify or otherwise link any data that, in the ordinary course of business, is not maintained in a manner that would be considered personal information.

1798.115. (a) A consumer shall have the right to request that a business that sells the consumer's personal information, or that discloses it for a business purpose, disclose to that consumer:

(1) The categories of personal information that the business collected about the consumer.

(2) The categories of personal information that the business sold about the consumer and the categories of third parties to whom the personal information was sold, by category or categories of personal information for each third party to whom the personal information was sold.

(3) The categories of personal information that the business disclosed about the consumer for a business purpose.

(b) A business that sells personal information about a consumer, or that discloses a consumer's personal information for a business purpose, shall disclose, pursuant to paragraph (4) of subdivision (a) of Section 1798.130, the information specified in subdivision (a) to the consumer upon receipt of a verifiable request from the consumer.

(c) A business that sells consumers' personal information, or that discloses consumers' personal information for a business purpose, shall disclose, pursuant to subparagraph (C) of paragraph (5) of subdivision (a) of Section 1798.130:

(1) The category or categories of consumers' personal information it has sold, or if the business has not sold consumers' personal information, it shall disclose that fact.

(2) The category or categories of consumers' personal information it has disclosed for a business purpose, or if the business has not disclosed the consumers' personal information for a business purpose, it shall disclose that fact.

(d) A third party shall not sell personal information about a consumer that has been sold to the third party by a business unless the consumer has

received explicit notice and is provided an opportunity to exercise the right to opt out pursuant to 1798.120.

1798.120. (a) A consumer shall have the right, at any time, to direct a business that sells personal information about the consumer to third parties not to sell the consumer's personal information. This right may be referred to as the right to opt out.

(b) A business that sells consumers' personal information to third parties shall provide notice to consumers, pursuant to subdivision (a) of Section 1798.135, that this information may be sold and that consumers have the right to opt out of the sale of their personal information.

(c) A business that has received direction from a consumer not to sell the consumer's personal information or, in the case of a minor consumer's personal information has not received consent to sell the minor consumer's personal information shall be prohibited, pursuant to paragraph (4) of subdivision (a) of Section 1798.135, from selling the consumer's personal information after its receipt of the consumer's direction, unless the consumer subsequently provides express authorization for the sale of the consumer's personal information.

(d) Notwithstanding subdivision (a), a business shall not sell the personal information of consumers if the business has actual knowledge that the consumer is less than 16 years of age, unless the consumer, in the case of consumers between 13 and 16 years of age, or the consumer's parent or guardian, in the case of consumers who are less than 13 years of age, has affirmatively authorized the sale of the consumer's personal information. A business that willfully disregards the consumer's age shall be deemed to have had actual knowledge of the consumer's age. This right may be referred to as the "right to opt in."

1798.125. (a) (1) A business shall not discriminate against a consumer because the consumer exercised any of the consumer's rights under this title, including, but not limited to, by:

(A) Denying goods or services to the consumer.

(B) Charging different prices or rates for goods or services, including through the use of discounts or other benefits or imposing penalties.

(C) Providing a different level or quality of goods or services to the consumer, if the consumer exercises the consumer's rights under this title.

(D) Suggesting that the consumer will receive a different price or rate for goods or services or a different level or quality of goods or services.

(2) Nothing in this subdivision prohibits a business from charging a consumer a different price or rate, or from providing a different level or quality of goods or services to the consumer, if that difference is reasonably related to the value provided to the consumer by the consumer's data.

(b) (1) A business may offer financial incentives, including payments to consumers as compensation, for the collection of personal information, the sale of personal information, or the deletion of personal information. A business may also offer a different price, rate, level, or quality of goods or services to the consumer if that price or difference is directly related to the value provided to the consumer by the consumer's data.

(2) A business that offers any financial incentives pursuant to subdivision (a), shall notify consumers of the financial incentives pursuant to Section 1798.135.

(3) A business may enter a consumer into a financial incentive program only if the consumer gives the business prior opt-in consent pursuant to Section 1798.135 which clearly describes the material terms of the financial incentive program, and which may be revoked by the consumer at any time.

(4) A business shall not use financial incentive practices that are unjust, unreasonable, coercive, or usurious in nature.

1798.130. (a) In order to comply with Sections 1798.100, 1798.105, 1798.110, 1798.115, and 1798.125, in a form that is reasonably accessible to consumers, a business shall:

(1) Make available to consumers two or more designated methods for submitting requests for information required to be disclosed pursuant to Sections 1798.110 and 1798.115, including, at a minimum, a toll-free telephone number, and if the business maintains an Internet Web site, a Web site address.

(2) Disclose and deliver the required information to a consumer free of charge within 45 days of receiving a verifiable request from the consumer. The business shall promptly take steps to determine whether the request is a verifiable request, but this shall not extend the business's duty to disclose and deliver the information within 45 days of receipt of the consumer's request. The time period to provide the required information may be extended once by an additional 45 days when reasonably necessary, provided the consumer is provided notice of the extension within the first 45-day period. The disclosure shall cover the 12-month period preceding the business's receipt of the verifiable request and shall be made in writing and delivered through the consumer's account with the business, if the consumer maintains an account with the business, or by mail or electronically at the consumer's option if the consumer does not maintain an account with the business, in a readily useable format that allows the consumer to transmit this information from one entity to another entity without hindrance. The business shall not require the consumer to create an account with the business in order to make a verifiable request.

(3) For purposes of subdivision (b) of Section 1798.110:

(A) To identify the consumer, associate the information provided by the consumer in the verifiable request to any personal information previously collected by the business about the consumer.

(B) Identify by category or categories the personal information collected about the consumer in the preceding 12 months by reference to the enumerated category or categories in subdivision (c) that most closely describes the personal information collected.

(4) For purposes of subdivision (b) of Section 1798.115:

(A) Identify the consumer and associate the information provided by the consumer in the verifiable request to any personal information previously collected by the business about the consumer.

(B) Identify by category or categories the personal information of the consumer that the business sold in the preceding 12 months by reference to the enumerated category in subdivision (c) that most closely describes the personal information, and provide the categories of third parties to whom the consumer's personal information was sold in the preceding 12 months by reference to the enumerated category or categories in subdivision (c) that most closely describes the personal information sold. The business shall disclose the information in a list that is separate from a list generated for the purposes of subparagraph (C).

(C) Identify by category or categories the personal information of the consumer that the business disclosed for a business purpose in the preceding 12 months by reference to the enumerated category or categories in subdivision (c) that most closely describes the personal information, and provide the categories of third parties to whom the consumer's personal information was disclosed for a business purpose in the preceding 12 months by reference to the enumerated category or categories in subdivision (c) that most closely describes the personal information disclosed. The business shall disclose the information in a list that is separate from a list generated for the purposes of subparagraph (B).

(5) Disclose the following information in its online privacy policy or policies if the business has an online privacy policy or policies and in any California-specific description of consumers' privacy rights, or if the business does not maintain those policies, on its Internet Web site, and update that information at least once every 12 months:

(A) A description of a consumer's rights pursuant to Sections 1798.110, 1798.115, and 1798.125 and one or more designated methods for submitting requests.

(B) For purposes of subdivision (c) of Section 1798.110, a list of the categories of personal information it has collected about consumers in the preceding 12 months by reference to the enumerated category or categories in subdivision (c) that most closely describe the personal information collected.

(C) For purposes of paragraphs (1) and (2) of subdivision (c) of Section 1798.115, two separate lists:

(i) A list of the categories of personal information it has sold about consumers in the preceding 12 months by reference to the enumerated category or categories in subdivision (c) that most closely describe the personal information sold, or if the business has not sold consumers' personal information in the preceding 12 months, the business shall disclose that fact.

(ii) A list of the categories of personal information it has disclosed about consumers for a business purpose in the preceding 12 months by reference to the enumerated category in subdivision (c) that most closely describe the personal information disclosed, or if the business has not disclosed consumers' personal information for a business purpose in the preceding 12 months, the business shall disclose that fact.

(6) Ensure that all individuals responsible for handling consumer inquiries about the business's privacy practices or the business's compliance with

this title are informed of all requirements in Sections 1798.110, 1798.115, 1798.125, and this section, and how to direct consumers to exercise their rights under those sections.

(7) Use any personal information collected from the consumer in connection with the business's verification of the consumer's request solely for the purposes of verification.

(b) A business is not obligated to provide the information required by Sections 1798.110 and 1798.115 to the same consumer more than twice in a 12-month period.

(c) The categories of personal information required to be disclosed pursuant to Sections 1798.110 and 1798.115 shall follow the definition of personal information in Section 1798.140.

1798.135. (a) A business that is required to comply with Section 1798.120 shall, in a form that is reasonably accessible to consumers:

(1) Provide a clear and conspicuous link on the business' Internet homepage, titled "Do Not Sell My Personal Information," to an Internet Web page that enables a consumer, or a person authorized by the consumer, to opt out of the sale of the consumer's personal information. A business shall not require a consumer to create an account in order to direct the business not to sell the consumer's personal information.

(2) Include a description of a consumer's rights pursuant to Section 1798.120, along with a separate link to the "Do Not Sell My Personal Information" Internet Web page in:

(A) Its online privacy policy or policies if the business has an online privacy policy or policies.

(B) Any California-specific description of consumers' privacy rights.

(3) Ensure that all individuals responsible for handling consumer inquiries about the business's privacy practices or the business's compliance with this title are informed of all requirements in Section 1798.120 and this section and how to direct consumers to exercise their rights under those sections.

(4) For consumers who exercise their right to opt out of the sale of their personal information, refrain from selling personal information collected by the business about the consumer.

(5) For a consumer who has opted out of the sale of the consumer's personal information, respect the consumer's decision to opt out for at least 12 months before requesting that the consumer authorize the sale of the consumer's personal information.

(6) Use any personal information collected from the consumer in connection with the submission of the consumer's opt-out request solely for the purposes of complying with the opt-out request.

(b) Nothing in this title shall be construed to require a business to comply with the title by including the required links and text on the homepage that the business makes available to the public generally, if the business maintains a separate and additional homepage that is dedicated to California consumers and that includes the required links and text, and the business takes reasonable steps to ensure that California consumers are directed to the

homepage for California consumers and not the homepage made available to the public generally.

(c) A consumer may authorize another person solely to opt out of the sale of the consumer's personal information on the consumer's behalf, and a business shall comply with an opt out request received from a person authorized by the consumer to act on the consumer's behalf, pursuant to regulations adopted by the Attorney General.

1798.140. For purposes of this title:

(a) "Aggregate consumer information" means information that relates to a group or category of consumers, from which individual consumer identities have been removed, that is not linked or reasonably linkable to any consumer or household, including via a device. "Aggregate consumer information" does not mean one or more individual consumer records that have been deidentified.

(b) "Biometric information" means an individual's physiological, biological or behavioral characteristics, including an individual's deoxyribonucleic acid (DNA), that can be used, singly or in combination with each other or with other identifying data, to establish individual identity. Biometric information includes, but is not limited to, imagery of the iris, retina, fingerprint, face, hand, palm, vein patterns, and voice recordings, from which an identifier template, such as a faceprint, a minutiae template, or a voiceprint, can be extracted, and keystroke patterns or rhythms, gait patterns or rhythms, and sleep, health, or exercise data that contain identifying information.

(c) "Business" means:

(1) A sole proprietorship, partnership, limited liability company, corporation, association, or other legal entity that is organized or operated for the profit or financial benefit of its shareholders or other owners, that collects consumers' personal information, or on the behalf of which such information is collected and that alone, or jointly with others, determines the purposes and means of the processing of consumers' personal information, that does business in the State of California, and that satisfies one or more of the following thresholds:

(A) Has annual gross revenues in excess of twenty-five million dollars (\$25,000,000), as adjusted pursuant to paragraph (5) of subdivision (a) of Section 1798.185.

(B) Alone or in combination, annually buys, receives for the business' commercial purposes, sells, or shares for commercial purposes, alone or in combination, the personal information of 50,000 or more consumers, households, or devices.

(C) Derives 50 percent or more of its annual revenues from selling consumers' personal information.

(2) Any entity that controls or is controlled by a business, as defined in paragraph (1), and that shares common branding with the business. "Control" or "controlled" means ownership of, or the power to vote, more than 50 percent of the outstanding shares of any class of voting security of a business; control in any manner over the election of a majority of the directors, or of

individuals exercising similar functions; or the power to exercise a controlling influence over the management of a company. “Common branding” means a shared name, servicemark, or trademark.

(d) “Business purpose” means the use of personal information for the business’ or a service provider’s operational purposes, or other notified purposes, provided that the use of personal information shall be reasonably necessary and proportionate to achieve the operational purpose for which the personal information was collected or processed or for another operational purpose that is compatible with the context in which the personal information was collected. Business purposes are:

(1) Auditing related to a current interaction with the consumer and concurrent transactions, including, but not limited to, counting ad impressions to unique visitors, verifying positioning and quality of ad impressions, and auditing compliance with this specification and other standards.

(2) Detecting security incidents, protecting against malicious, deceptive, fraudulent, or illegal activity, and prosecuting those responsible for that activity.

(3) Debugging to identify and repair errors that impair existing intended functionality.

(4) Short-term, transient use, provided the personal information that is not disclosed to another third party and is not used to build a profile about a consumer or otherwise alter an individual consumer’s experience outside the current interaction, including, but not limited to, the contextual customization of ads shown as part of the same interaction.

(5) Performing services on behalf of the business or service provider, including maintaining or servicing accounts, providing customer service, processing or fulfilling orders and transactions, verifying customer information, processing payments, providing financing, providing advertising or marketing services, providing analytic services, or providing similar services on behalf of the business or service provider.

(6) Undertaking internal research for technological development and demonstration.

(7) Undertaking activities to verify or maintain the quality or safety of a service or device that is owned, manufactured, manufactured for, or controlled by the business, and to improve, upgrade, or enhance the service or device that is owned, manufactured, manufactured for, or controlled by the business.

(e) “Collects,” “collected,” or “collection” means buying, renting, gathering, obtaining, receiving, or accessing any personal information pertaining to a consumer by any means. This includes receiving information from the consumer, either actively or passively, or by observing the consumer’s behavior.

(f) “Commercial purposes” means to advance a person’s commercial or economic interests, such as by inducing another person to buy, rent, lease, join, subscribe to, provide, or exchange products, goods, property, information, or services, or enabling or effecting, directly or indirectly, a

commercial transaction. “Commercial purposes” do not include for the purpose of engaging in speech that state or federal courts have recognized as noncommercial speech, including political speech and journalism.

(g) “Consumer” means a natural person who is a California resident, as defined in Section 17014 of Title 18 of the California Code of Regulations, as that section read on September 1, 2017, however identified, including by any unique identifier.

(h) “Deidentified” means information that cannot reasonably identify, relate to, describe, be capable of being associated with, or be linked, directly or indirectly, to a particular consumer, provided that a business that uses deidentified information:

(1) Has implemented technical safeguards that prohibit reidentification of the consumer to whom the information may pertain.

(2) Has implemented business processes that specifically prohibit reidentification of the information.

(3) Has implemented business processes to prevent inadvertent release of deidentified information.

(4) Makes no attempt to reidentify the information.

(i) “Designated methods for submitting requests” means a mailing address, email address, Internet Web page, Internet Web portal, toll-free telephone number, or other applicable contact information, whereby consumers may submit a request or direction under this title, and any new, consumer-friendly means of contacting a business, as approved by the Attorney General pursuant to Section 1798.185.

(j) “Device” means any physical object that is capable of connecting to the Internet, directly or indirectly, or to another device.

(k) “Health insurance information” means a consumer’s insurance policy number or subscriber identification number, any unique identifier used by a health insurer to identify the consumer, or any information in the consumer’s application and claims history, including any appeals records, if the information is linked or reasonably linkable to a consumer or household, including via a device, by a business or service provider.

(l) “Homepage” means the introductory page of an Internet Web site and any Internet Web page where personal information is collected. In the case of an online service, such as a mobile application, homepage means the application’s platform page or download page, a link within the application, such as from the application configuration, “About,” “Information,” or settings page, and any other location that allows consumers to review the notice required by subdivision (a) of Section 1798.145, including, but not limited to, before downloading the application.

(m) “Infer” or “inference” means the derivation of information, data, assumptions, or conclusions from facts, evidence, or another source of information or data.

(n) “Person” means an individual, proprietorship, firm, partnership, joint venture, syndicate, business trust, company, corporation, limited liability company, association, committee, and any other organization or group of persons acting in concert.

(o) (1) “Personal information” means information that identifies, relates to, describes, is capable of being associated with, or could reasonably be linked, directly or indirectly, with a particular consumer or household. Personal information includes, but is not limited to, the following:

(A) Identifiers such as a real name, alias, postal address, unique personal identifier, online identifier Internet Protocol address, email address, account name, social security number, driver’s license number, passport number, or other similar identifiers.

(B) Any categories of personal information described in subdivision (e) of Section 1798.80.

(C) Characteristics of protected classifications under California or federal law.

(D) Commercial information, including records of personal property, products or services purchased, obtained, or considered, or other purchasing or consuming histories or tendencies.

(E) Biometric information.

(F) Internet or other electronic network activity information, including, but not limited to, browsing history, search history, and information regarding a consumer’s interaction with an Internet Web site, application, or advertisement.

(G) Geolocation data.

(H) Audio, electronic, visual, thermal, olfactory, or similar information.

(I) Professional or employment-related information.

(J) Education information, defined as information that is not publicly available personally identifiable information as defined in the Family Educational Rights and Privacy Act (20 U.S.C. section 1232g, 34 C.F.R. Part 99).

(K) Inferences drawn from any of the information identified in this subdivision to create a profile about a consumer reflecting the consumer’s preferences, characteristics, psychological trends, preferences, predispositions, behavior, attitudes, intelligence, abilities, and aptitudes.

(2) “Personal information” does not include publicly available information. For these purposes, “publicly available” means information that is lawfully made available from federal, state, or local government records, if any conditions associated with such information. “Publicly available” does not mean biometric information collected by a business about a consumer without the consumer’s knowledge. Information is not “publicly available” if that data is used for a purpose that is not compatible with the purpose for which the data is maintained and made available in the government records or for which it is publicly maintained. “Publicly available” does not include consumer information that is deidentified or aggregate consumer information.

(p) “Probabilistic identifier” means the identification of a consumer or a device to a degree of certainty of more probable than not based on any categories of personal information included in, or similar to, the categories enumerated in the definition of personal information.

(q) “Processing” means any operation or set of operations that are performed on personal data or on sets of personal data, whether or not by automated means.

(r) “Pseudonymize” or “Pseudonymization” means the processing of personal information in a manner that renders the personal information no longer attributable to a specific consumer without the use of additional information, provided that the additional information is kept separately and is subject to technical and organizational measures to ensure that the personal information is not attributed to an identified or identifiable consumer.

(s) “Research” means scientific, systematic study and observation, including basic research or applied research that is in the public interest and that adheres to all other applicable ethics and privacy laws or studies conducted in the public interest in the area of public health. Research with personal information that may have been collected from a consumer in the course of the consumer’s interactions with a business’ service or device for other purposes shall be:

(1) Compatible with the business purpose for which the personal information was collected.

(2) Subsequently pseudonymized and deidentified, or deidentified and in the aggregate, such that the information cannot reasonably identify, relate to, describe, be capable of being associated with, or be linked, directly or indirectly, to a particular consumer.

(3) Made subject to technical safeguards that prohibit reidentification of the consumer to whom the information may pertain.

(4) Subject to business processes that specifically prohibit reidentification of the information.

(5) Made subject to business processes to prevent inadvertent release of deidentified information.

(6) Protected from any reidentification attempts.

(7) Used solely for research purposes that are compatible with the context in which the personal information was collected.

(8) Not be used for any commercial purpose.

(9) Subjected by the business conducting the research to additional security controls limit access to the research data to only those individuals in a business as are necessary to carry out the research purpose.

(t) (1) “Sell,” “selling,” “sale,” or “sold,” means selling, renting, releasing, disclosing, disseminating, making available, transferring, or otherwise communicating orally, in writing, or by electronic or other means, a consumer’s personal information by the business to another business or a third party for monetary or other valuable consideration.

(2) For purposes of this title, a business does not sell personal information when:

(A) A consumer uses or directs the business to intentionally disclose personal information or uses the business to intentionally interact with a third party, provided the third party does not also sell the personal information, unless that disclosure would be consistent with the provisions of this title. An intentional interaction occurs when the consumer intends

to interact with the third party, via one or more deliberate interactions. Hovering over, muting, pausing, or closing a given piece of content does not constitute a consumer's intent to interact with a third party.

(B) The business uses or shares an identifier for a consumer who has opted out of the sale of the consumer's personal information for the purposes of alerting third parties that the consumer has opted out of the sale of the consumer's personal information.

(C) The business uses or shares with a service provider personal information of a consumer that is necessary to perform a business purposes if both of the following conditions are met: services that the service provider performs on the business' behalf, provided that the service provider also does not sell the personal information.

(i) The business has provided notice that information being used or shared in its terms and conditions consistent with Section 1798.135.

(ii) The service provider does not further collect, sell, or use the personal information of the consumer except as necessary to perform the business purpose.

(D) The business transfers to a third party the personal information of a consumer as an asset that is part of a merger, acquisition, bankruptcy, or other transaction in which the third party assumes control of all or part of the business provided that information is used or shared consistently with Sections 1798.110 and 1798.115. If a third party materially alters how it uses or shares the personal information of a consumer in a manner that is materially inconsistent with the promises made at the time of collection, it shall provide prior notice of the new or changed practice to the consumer. The notice shall be sufficiently prominent and robust to ensure that existing consumers can easily exercise their choices consistently with Section 1798.120. This subparagraph does not authorize a business to make material, retroactive privacy policy changes or make other changes in their privacy policy in a manner that would violate the Unfair and Deceptive Practices Act (Chapter 5 (commencing with Section 17200) of Part 2 of Division 7 of the Business and Professions Code).

(u) "Service" or "services" means work, labor, and services, including services furnished in connection with the sale or repair of goods.

(v) "Service provider" means a sole proprietorship, partnership, limited liability company, corporation, association, or other legal entity that is organized or operated for the profit or financial benefit of its shareholders or other owners, that processes information on behalf of a business and to which the business discloses a consumer's personal information for a business purpose pursuant to a written contract, provided that the contract prohibits the entity receiving the information from retaining, using, or disclosing the personal information for any purpose other than for the specific purpose of performing the services specified in the contract for the business, or as otherwise permitted by this title, including retaining, using, or disclosing the personal information for a commercial purpose other than providing the services specified in the contract with the business.

(w) "Third party" means a person who is not any of the following:

(1) The business that collects personal information from consumers under this title.

(2) A person to whom the business discloses a consumer's personal information for a business purpose pursuant to a written contract, provided that the contract:

(A) Prohibits the person receiving the personal information from:

(i) Selling the personal information.

(ii) Retaining, using, or disclosing the personal information for any purpose other than for the specific purpose of performing the services specified in the contract, including retaining, using, or disclosing the personal information for a commercial purpose other than providing the services specified in the contract.

(iii) Retaining, using, or disclosing the information outside of the direct business relationship between the person and the business.

(B) Includes a certification made by the person receiving the personal information that the person understands the restrictions in subparagraph (A) and will comply with them.

A person covered by paragraph (2) that violates any of the restrictions set forth in this title shall be liable for the violations. A business that discloses personal information to a person covered by paragraph (2) in compliance with paragraph (2) shall not be liable under this title if the person receiving the personal information uses it in violation of the restrictions set forth in this title, provided that, at the time of disclosing the personal information, the business does not have actual knowledge, or reason to believe, that the person intends to commit such a violation.

(x) "Unique identifier" or "Unique personal identifier" means a persistent identifier that can be used to recognize a consumer, a family, or a device that is linked to a consumer or family, over time and across different services, including, but not limited to, a device identifier; an Internet Protocol address; cookies, beacons, pixel tags, mobile ad identifiers, or similar technology; customer number, unique pseudonym, or user alias; telephone numbers, or other forms of persistent or probabilistic identifiers that can be used to identify a particular consumer or device. For purposes of this subdivision, "family" means a custodial parent or guardian and any minor children over which the parent or guardian has custody.

(y) "Verifiable consumer request" means a request that is made by a consumer, by a consumer on behalf of the consumer's minor child, or by a natural person or a person registered with the Secretary of State, authorized by the consumer to act on the consumer's behalf, and that the business can reasonably verify, pursuant to regulations adopted by the Attorney General pursuant to paragraph (7) of subdivision (a) of Section 1798.185 to be the consumer about whom the business has collected personal information. A business is not obligated to provide information to the consumer pursuant to Sections 1798.110 and 1798.115 if the business cannot verify, pursuant to this subdivision and regulations adopted by the Attorney General pursuant to paragraph (7) of subdivision (a) of Section 1798.185, that the consumer making the request is the consumer about whom the business has collected

information or is a person authorized by the consumer to act on such consumer's behalf.

1798.145. (a) The obligations imposed on businesses by this title shall not restrict a business's ability to:

- (1) Comply with federal, state, or local laws.
- (2) Comply with a civil, criminal, or regulatory inquiry, investigation, subpoena, or summons by federal, state, or local authorities.
- (3) Cooperate with law enforcement agencies concerning conduct or activity that the business, service provider, or third party reasonably and in good faith believes may violate federal, state, or local law.
- (4) Exercise or defend legal claims.
- (5) Collect, use, retain, sell, or disclose consumer information that is deidentified or in the aggregate consumer information.
- (6) Collect or sell a consumer's personal information if every aspect of that commercial conduct takes place wholly outside of California. For purposes of this title, commercial conduct takes place wholly outside of California if the business collected that information while the consumer was outside of California, no part of the sale of the consumer's personal information occurred in California, and no personal information collected while the consumer was in California is sold. This paragraph shall not permit a business from storing, including on a device, personal information about a consumer when the consumer is in California and then collecting that personal information when the consumer and stored personal information is outside of California.

(b) The obligations imposed on businesses by Sections 1798.110 to 1798.135, inclusive, shall not apply where compliance by the business with the title would violate an evidentiary privilege under California law and shall not prevent a business from providing the personal information of a consumer to a person covered by an evidentiary privilege under California law as part of a privileged communication.

(c) This act shall not apply to protected or health information that is collected by a covered entity governed by the Confidentiality of Medical Information Act (Part 2.6 (commencing with Section 56 of Division 1)) or governed by the privacy, security, and breach notification rules issued by the federal Department of Health and Human Services, Parts 160 and 164 of Title 45 of the Code of Federal Regulations, established pursuant to the Health Insurance Portability and Availability Act of 1996. For purposes of this subdivision, the definition of "medical information" in Section 56.05 shall apply and the definitions of "protected health information" and "covered entity" from the federal privacy rule shall apply.

(d) This title shall not apply to the sale of personal information to or from a consumer reporting agency if that information is to be reported in, or used to generate, a consumer report as defined by subdivision (d) of Section 1681a of Title 15 of the United States Code, and use of that information is limited by the federal Fair Credit Reporting Act (15 U.S.C. Sec. 1681 et seq.).

(e) This title shall not apply to personal information collected, processed, sold, or disclosed pursuant to the federal Gramm-Leach-Bliley Act (Public Law 106-102), and implementing regulations, if it is in conflict with that law.

(f) This title shall not apply to personal information collected, processed, sold, or disclosed pursuant to the Driver's Privacy Protection Act of 1994 (18 U.S.C. Sec. 2721 et seq.), if it is in conflict with that act.

(g) Notwithstanding a business' obligations to respond to and honor consumer rights requests pursuant to this title:

(1) A time period for a business to respond to any verified consumer request may be extended by up to 90 additional days where necessary, taking into account the complexity and number of the requests. The business shall inform the consumer of any such extension within 45 days of receipt of the request, together with the reasons for the delay.

(2) If the business does not take action on the request of the consumer, the business shall inform the consumer, without delay and at the latest within the time period permitted of response by this section, of the reasons for not taking action and any rights the consumer may have to appeal the decision to the business.

(3) If requests from a consumer are manifestly unfounded or excessive, in particular because of their repetitive character, a business may either charge a reasonable fee, taking into account the administrative costs of providing the information or communication or taking the action requested, or refuse to act on the request and notify the consumer of the reason for refusing the request. The business shall bear the burden of demonstrating that any verified consumer request is manifestly unfounded or excessive.

(h) A business that discloses personal information to a service provider shall not be liable under this title if the service provider receiving the personal information uses it in violation of the restrictions set forth in the title, provided that, at the time of disclosing the personal information, the business does not have actual knowledge, or reason to believe, that the service provider intends to commit such a violation. A service provider shall likewise not be liable under this title for the obligations of a business for which it provides services as set forth in this title.

(i) This title shall not be construed to require a business to reidentify or otherwise link information that is not maintained in a manner that would be considered personal information.

(j) The rights afforded to consumers and the obligations imposed on the business in this title shall not adversely affect the rights and freedoms of other consumers.

1798.150. (a) (1) Any consumer whose nonencrypted or nonredacted personal information, as defined in subparagraph (A) of paragraph (1) of subdivision (d) of Section 1798.81.5, is subject to an unauthorized access and exfiltration, theft, or disclosure as a result of the business' violation of the duty to implement and maintain reasonable security procedures and practices appropriate to the nature of the information to protect the personal information may institute a civil action for any of the following:

(A) To recover damages in an amount not less than one hundred dollars (\$100) and not greater than seven hundred and fifty (\$750) per consumer per incident or actual damages, whichever is greater.

(B) Injunctive or declaratory relief.

(C) Any other relief the court deems proper.

(2) In assessing the amount of statutory damages, the court shall consider any one or more of the relevant circumstances presented by any of the parties to the case, including, but not limited to, the nature and seriousness of the misconduct, the number of violations, the persistence of the misconduct, the length of time over which the misconduct occurred, the willfulness of the defendant's misconduct, and the defendant's assets, liabilities, and net worth.

(b) Actions pursuant to this section may be brought by a consumer if all of the following requirements are met:

(1) Prior to initiating any action against a business for statutory damages on an individual or class-wide basis, a consumer shall provide a business 30 days' written notice identifying the specific provisions of this title the consumer alleges have been or are being violated. In the event a cure is possible, if within the 30 days the business actually cures the noticed violation and provides the consumer an express written statement that the violations have been cured and that no further violations shall occur, no action for individual statutory damages or class-wide statutory damages may be initiated against the business. No notice shall be required prior to an individual consumer initiating an action solely for actual pecuniary damages suffered as a result of the alleged violations of this title. If a business continues to violate this title in breach of the express written statement provided to the consumer under this section, the consumer may initiate an action against the business to enforce the written statement and may pursue statutory damages for each breach of the express written statement, as well as any other violation of the title that postdates the written statement.

(2) A consumer bringing an action as defined in paragraph (1) of subdivision (c) shall notify the Attorney General within 30 days that the action has been filed.

(3) The Attorney General, upon receiving such notice shall, within 30 days, do one of the following:

(A) Notify the consumer bringing the action of the Attorney General's intent to prosecute an action against the violation. If the Attorney General does not prosecute within six months, the consumer may proceed with the action.

(B) Refrain from acting within the 30 days, allowing the consumer bringing the action to proceed.

(C) Notify the consumer bringing the action that the consumer shall not proceed with the action.

(c) Nothing in this act shall be interpreted to serve as the basis for a private right of action under any other law. This shall not be construed to

relieve any party from any duties or obligations imposed under other law or the United States or California Constitution.

1798.155. Any business or third party may seek the opinion of the Attorney General for guidance on how to comply with the provisions of this title.

(a) A business shall be in violation of this title if it fails to cure any alleged violation within 30 days after being notified of alleged noncompliance. Any business, service provider, or other person that violates this title shall be liable for a civil penalty as provided in Section 17206 of the Business and Professions Code in a civil action brought in the name of the people of the State of California by the Attorney General. The civil penalties provided for in this section shall be exclusively assessed and recovered in a civil action brought in the name of the people of the State of California by the Attorney General.

(b) Notwithstanding Section 17206 of the Business and Professions Code, any person, business, or service provider that intentionally violates this title may be liable for a civil penalty of up to seven thousand five hundred dollars (\$7,500) for each violation.

(c) Notwithstanding Section 17206 of the Business and Professions Code, any civil penalty assessed pursuant to Section 17206 for a violation of this title, and the proceeds of any settlement of an action brought pursuant to subdivision (a), shall be allocated as follows:

(1) Twenty percent to the Consumer Privacy Fund, created within the General Fund pursuant to subdivision (a) of Section 1798.109, with the intent to fully offset any costs incurred by the state courts and the Attorney General in connection with this title.

(2) Eighty percent to the jurisdiction on whose behalf the action leading to the civil penalty was brought.

(d) It is the intent of the Legislature that the percentages specified in subdivision (c) be adjusted as necessary to ensure that any civil penalties assessed for a violation of this title fully offset any costs incurred by the state courts and the Attorney General in connection with this title, including a sufficient amount to cover any deficit from a prior fiscal year.

1798.160. (a) A special fund to be known as the “Consumer Privacy Fund” is hereby created within the General Fund in the State Treasury, and is available upon appropriation by the Legislature to offset any costs incurred by the state courts in connection with actions brought to enforce this title and any costs incurred by the Attorney General in carrying out the Attorney General’s duties under this title.

(b) Funds transferred to the Consumer Privacy Fund shall be used exclusively to offset any costs incurred by the state courts and the Attorney General in connection with this title. These funds shall not be subject to appropriation or transfer by the Legislature for any other purpose, unless the Director of Finance determines that the funds are in excess of the funding needed to fully offset the costs incurred by the state courts and the Attorney General in connection with this title, in which case the Legislature may appropriate excess funds for other purposes.

1798.175. This title is intended to further the constitutional right of privacy and to supplement existing laws relating to consumers' personal information, including, but not limited to, Chapter 22 (commencing with Section 22575) of Division 8 of the Business and Professions Code and Title 1.81 (commencing with Section 1798.80). The provisions of this title are not limited to information collected electronically or over the Internet, but apply to the collection and sale of all personal information collected by a business from consumers. Wherever possible, law relating to consumers' personal information should be construed to harmonize with the provisions of this title, but in the event of a conflict between other laws and the provisions of this title, the provisions of the law that afford the greatest protection for the right of privacy for consumers shall control.

1798.180. This title is a matter of statewide concern and supersedes and preempts all rules, regulations, codes, ordinances, and other laws adopted by a city, county, city and county, municipality, or local agency regarding the collection and sale of consumers' personal information by a business.

1798.185. (a) On or before January 1, 2020, the Attorney General shall solicit broad public participation to adopt regulations to further the purposes of this title, including, but not limited to, the following areas:

(1) Updating as needed additional categories of personal information to those enumerated in subdivision (c) of Section 1798.130 and subdivision (o) of Section 1798.140 in order to address changes in technology, data collection practices, obstacles to implementation, and privacy concerns.

(2) Updating as needed the definition of unique identifiers to address changes in technology, data collection, obstacles to implementation, and privacy concerns, and additional categories to the definition of designated methods for submitting requests to facilitate a consumer's ability to obtain information from a business pursuant to Section 1798.130.

(3) Establishing any exceptions necessary to comply with state or federal law, including, but not limited to, those relating to trade secrets and intellectual property rights, within one year of passage of this title and as needed thereafter.

(4) Establishing rules and procedures for the following, within one year of passage of this title and as needed thereafter:

(A) To facilitate and govern the submission of a request by a consumer to opt out of the sale of personal information pursuant to paragraph (1) of subdivision (a) of Section 1798.145.

(B) To govern business compliance with a consumer's opt-out request.

(C) The development and use of a recognizable and uniform opt-out logo or button by all businesses to promote consumer awareness of the opportunity to opt out of the sale of personal information.

(5) Adjusting the monetary threshold in subparagraph (A) of paragraph (1) of subdivision (b) of Section 1798.106 in January of every odd-numbered year to reflect any increase in the Consumer Price Index.

(6) Establishing rules, procedures, and any exceptions necessary to ensure that the notices and information that businesses are required to provide pursuant to this title are provided in a manner that may be easily understood

by the average consumer, are accessible to consumers with disabilities, and are available in the language primarily used to interact with the consumer, including establishing rules and guidelines regarding financial incentive offerings, within one year of passage of this title and as needed thereafter.

(7) Establishing rules and procedures to further the purposes of Sections 1798.110 and 1798.115 and to facilitate a consumer's or the consumer's authorized agent's ability to obtain information pursuant to Section 1798.130, with the goal of minimizing the administrative burden on consumers, taking into account available technology, security concerns, and the burden on the business, to govern a business' determination that a request for information received by a consumer is a verifiable request, including treating a request submitted through a password-protected account maintained by the consumer with the business while the consumer is logged into the account as a verifiable request and providing a mechanism for a consumer who does not maintain an account with the business to request information through the business' authentication of the consumer's identity, within one year of passage of this title and as needed thereafter.

(b) The Attorney General may adopt additional regulations as necessary to further the purposes of this title.

1798.190. If a series of steps or transactions were component parts of a single transaction intended from the beginning to be taken with the intention of avoiding the reach of this title, including the disclosure of information by a business to a third party in order to avoid the definition of sell, a court shall disregard the intermediate steps or transactions for purposes of effectuating the purposes of this title.

1798.192. Any provision of a contract or agreement of any kind that purports to waive or limit in any way a consumer's rights under this title, including, but not limited to, any right to a remedy or means of enforcement, shall be deemed contrary to public policy and shall be void and unenforceable. This section shall not prevent a consumer from declining to request information from a business, declining to opt out of a business' sale of the consumer's personal information, or authorizing a business to sell the consumer's personal information after previously opting out.

1798.194. This title shall be liberally construed to effectuate its purposes.

1798.196. This title is intended to supplement federal and state law, if permissible, but shall not apply if such application is preempted by, or in conflict with, federal law or the California Constitution.

1798.198. (a) Subject to limitation provided in subdivision (b), this title shall be operative January 1, 2020.

(b) This act shall become operative only if initiative measure No. 17-0039, The Consumer Right to Privacy Act of 2018, is withdrawn from the ballot pursuant to Section 9604 of the Elections Code.

SEC. 4. (a) The provisions of this bill are severable. If any provision of this bill or its application is held invalid, that invalidity shall not affect

other provisions or applications that can be given effect without the invalid provision or application.

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(Legislative acts)

REGULATIONS

REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**of 27 April 2016****on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)****(Text with EEA relevance)**

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 16 thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee ⁽¹⁾,

Having regard to the opinion of the Committee of the Regions ⁽²⁾,

Acting in accordance with the ordinary legislative procedure ⁽³⁾,

Whereas:

- (1) The protection of natural persons in relation to the processing of personal data is a fundamental right. Article 8(1) of the Charter of Fundamental Rights of the European Union (the 'Charter') and Article 16(1) of the Treaty on the Functioning of the European Union (TFEU) provide that everyone has the right to the protection of personal data concerning him or her.
- (2) The principles of, and rules on the protection of natural persons with regard to the processing of their personal data should, whatever their nationality or residence, respect their fundamental rights and freedoms, in particular their right to the protection of personal data. This Regulation is intended to contribute to the accomplishment of an area of freedom, security and justice and of an economic union, to economic and social progress, to the strengthening and the convergence of the economies within the internal market, and to the well-being of natural persons.
- (3) Directive 95/46/EC of the European Parliament and of the Council ⁽⁴⁾ seeks to harmonise the protection of fundamental rights and freedoms of natural persons in respect of processing activities and to ensure the free flow of personal data between Member States.

⁽¹⁾ OJ C 229, 31.7.2012, p. 90.

⁽²⁾ OJ C 391, 18.12.2012, p. 127.

⁽³⁾ Position of the European Parliament of 12 March 2014 (not yet published in the Official Journal) and position of the Council at first reading of 8 April 2016 (not yet published in the Official Journal). Position of the European Parliament of 14 April 2016.

⁽⁴⁾ Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data (OJ L 281, 23.11.1995, p. 31).

- (4) The processing of personal data should be designed to serve mankind. The right to the protection of personal data is not an absolute right; it must be considered in relation to its function in society and be balanced against other fundamental rights, in accordance with the principle of proportionality. This Regulation respects all fundamental rights and observes the freedoms and principles recognised in the Charter as enshrined in the Treaties, in particular the respect for private and family life, home and communications, the protection of personal data, freedom of thought, conscience and religion, freedom of expression and information, freedom to conduct a business, the right to an effective remedy and to a fair trial, and cultural, religious and linguistic diversity.
- (5) The economic and social integration resulting from the functioning of the internal market has led to a substantial increase in cross-border flows of personal data. The exchange of personal data between public and private actors, including natural persons, associations and undertakings across the Union has increased. National authorities in the Member States are being called upon by Union law to cooperate and exchange personal data so as to be able to perform their duties or carry out tasks on behalf of an authority in another Member State.
- (6) Rapid technological developments and globalisation have brought new challenges for the protection of personal data. The scale of the collection and sharing of personal data has increased significantly. Technology allows both private companies and public authorities to make use of personal data on an unprecedented scale in order to pursue their activities. Natural persons increasingly make personal information available publicly and globally. Technology has transformed both the economy and social life, and should further facilitate the free flow of personal data within the Union and the transfer to third countries and international organisations, while ensuring a high level of the protection of personal data.
- (7) Those developments require a strong and more coherent data protection framework in the Union, backed by strong enforcement, given the importance of creating the trust that will allow the digital economy to develop across the internal market. Natural persons should have control of their own personal data. Legal and practical certainty for natural persons, economic operators and public authorities should be enhanced.
- (8) Where this Regulation provides for specifications or restrictions of its rules by Member State law, Member States may, as far as necessary for coherence and for making the national provisions comprehensible to the persons to whom they apply, incorporate elements of this Regulation into their national law.
- (9) The objectives and principles of Directive 95/46/EC remain sound, but it has not prevented fragmentation in the implementation of data protection across the Union, legal uncertainty or a widespread public perception that there are significant risks to the protection of natural persons, in particular with regard to online activity. Differences in the level of protection of the rights and freedoms of natural persons, in particular the right to the protection of personal data, with regard to the processing of personal data in the Member States may prevent the free flow of personal data throughout the Union. Those differences may therefore constitute an obstacle to the pursuit of economic activities at the level of the Union, distort competition and impede authorities in the discharge of their responsibilities under Union law. Such a difference in levels of protection is due to the existence of differences in the implementation and application of Directive 95/46/EC.
- (10) In order to ensure a consistent and high level of protection of natural persons and to remove the obstacles to flows of personal data within the Union, the level of protection of the rights and freedoms of natural persons with regard to the processing of such data should be equivalent in all Member States. Consistent and homogenous application of the rules for the protection of the fundamental rights and freedoms of natural persons with regard to the processing of personal data should be ensured throughout the Union. Regarding the processing of personal data for compliance with a legal obligation, for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller, Member States should be allowed to maintain or introduce national provisions to further specify the application of the rules of this Regulation. In conjunction with the general and horizontal law on data protection implementing Directive 95/46/EC, Member States have several sector-specific laws in areas that need more specific provisions. This Regulation also provides a margin of manoeuvre for Member States to specify its rules, including for the processing of special categories of personal data ('sensitive data'). To that extent, this Regulation does not exclude Member State law that sets out the circumstances for specific processing situations, including determining more precisely the conditions under which the processing of personal data is lawful.

- (11) Effective protection of personal data throughout the Union requires the strengthening and setting out in detail of the rights of data subjects and the obligations of those who process and determine the processing of personal data, as well as equivalent powers for monitoring and ensuring compliance with the rules for the protection of personal data and equivalent sanctions for infringements in the Member States.
- (12) Article 16(2) TFEU mandates the European Parliament and the Council to lay down the rules relating to the protection of natural persons with regard to the processing of personal data and the rules relating to the free movement of personal data.
- (13) In order to ensure a consistent level of protection for natural persons throughout the Union and to prevent divergences hampering the free movement of personal data within the internal market, a Regulation is necessary to provide legal certainty and transparency for economic operators, including micro, small and medium-sized enterprises, and to provide natural persons in all Member States with the same level of legally enforceable rights and obligations and responsibilities for controllers and processors, to ensure consistent monitoring of the processing of personal data, and equivalent sanctions in all Member States as well as effective cooperation between the supervisory authorities of different Member States. The proper functioning of the internal market requires that the free movement of personal data within the Union is not restricted or prohibited for reasons connected with the protection of natural persons with regard to the processing of personal data. To take account of the specific situation of micro, small and medium-sized enterprises, this Regulation includes a derogation for organisations with fewer than 250 employees with regard to record-keeping. In addition, the Union institutions and bodies, and Member States and their supervisory authorities, are encouraged to take account of the specific needs of micro, small and medium-sized enterprises in the application of this Regulation. The notion of micro, small and medium-sized enterprises should draw from Article 2 of the Annex to Commission Recommendation 2003/361/EC ⁽¹⁾.
- (14) The protection afforded by this Regulation should apply to natural persons, whatever their nationality or place of residence, in relation to the processing of their personal data. This Regulation does not cover the processing of personal data which concerns legal persons and in particular undertakings established as legal persons, including the name and the form of the legal person and the contact details of the legal person.
- (15) In order to prevent creating a serious risk of circumvention, the protection of natural persons should be technologically neutral and should not depend on the techniques used. The protection of natural persons should apply to the processing of personal data by automated means, as well as to manual processing, if the personal data are contained or are intended to be contained in a filing system. Files or sets of files, as well as their cover pages, which are not structured according to specific criteria should not fall within the scope of this Regulation.
- (16) This Regulation does not apply to issues of protection of fundamental rights and freedoms or the free flow of personal data related to activities which fall outside the scope of Union law, such as activities concerning national security. This Regulation does not apply to the processing of personal data by the Member States when carrying out activities in relation to the common foreign and security policy of the Union.
- (17) Regulation (EC) No 45/2001 of the European Parliament and of the Council ⁽²⁾ applies to the processing of personal data by the Union institutions, bodies, offices and agencies. Regulation (EC) No 45/2001 and other Union legal acts applicable to such processing of personal data should be adapted to the principles and rules established in this Regulation and applied in the light of this Regulation. In order to provide a strong and coherent data protection framework in the Union, the necessary adaptations of Regulation (EC) No 45/2001 should follow after the adoption of this Regulation, in order to allow application at the same time as this Regulation.
- (18) This Regulation does not apply to the processing of personal data by a natural person in the course of a purely personal or household activity and thus with no connection to a professional or commercial activity. Personal or

⁽¹⁾ Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (C(2003) 1422) (OJ L 124, 20.5.2003, p. 36).

⁽²⁾ Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data (OJ L 8, 12.1.2001, p. 1).

household activities could include correspondence and the holding of addresses, or social networking and online activity undertaken within the context of such activities. However, this Regulation applies to controllers or processors which provide the means for processing personal data for such personal or household activities.

- (19) The protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security and the free movement of such data, is the subject of a specific Union legal act. This Regulation should not, therefore, apply to processing activities for those purposes. However, personal data processed by public authorities under this Regulation should, when used for those purposes, be governed by a more specific Union legal act, namely Directive (EU) 2016/680 of the European Parliament and of the Council ⁽¹⁾. Member States may entrust competent authorities within the meaning of Directive (EU) 2016/680 with tasks which are not necessarily carried out for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and prevention of threats to public security, so that the processing of personal data for those other purposes, in so far as it is within the scope of Union law, falls within the scope of this Regulation.

With regard to the processing of personal data by those competent authorities for purposes falling within scope of this Regulation, Member States should be able to maintain or introduce more specific provisions to adapt the application of the rules of this Regulation. Such provisions may determine more precisely specific requirements for the processing of personal data by those competent authorities for those other purposes, taking into account the constitutional, organisational and administrative structure of the respective Member State. When the processing of personal data by private bodies falls within the scope of this Regulation, this Regulation should provide for the possibility for Member States under specific conditions to restrict by law certain obligations and rights when such a restriction constitutes a necessary and proportionate measure in a democratic society to safeguard specific important interests including public security and the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security. This is relevant for instance in the framework of anti-money laundering or the activities of forensic laboratories.

- (20) While this Regulation applies, inter alia, to the activities of courts and other judicial authorities, Union or Member State law could specify the processing operations and processing procedures in relation to the processing of personal data by courts and other judicial authorities. The competence of the supervisory authorities should not cover the processing of personal data when courts are acting in their judicial capacity, in order to safeguard the independence of the judiciary in the performance of its judicial tasks, including decision-making. It should be possible to entrust supervision of such data processing operations to specific bodies within the judicial system of the Member State, which should, in particular ensure compliance with the rules of this Regulation, enhance awareness among members of the judiciary of their obligations under this Regulation and handle complaints in relation to such data processing operations.
- (21) This Regulation is without prejudice to the application of Directive 2000/31/EC of the European Parliament and of the Council ⁽²⁾, in particular of the liability rules of intermediary service providers in Articles 12 to 15 of that Directive. That Directive seeks to contribute to the proper functioning of the internal market by ensuring the free movement of information society services between Member States.
- (22) Any processing of personal data in the context of the activities of an establishment of a controller or a processor in the Union should be carried out in accordance with this Regulation, regardless of whether the processing itself takes place within the Union. Establishment implies the effective and real exercise of activity through stable arrangements. The legal form of such arrangements, whether through a branch or a subsidiary with a legal personality, is not the determining factor in that respect.

⁽¹⁾ Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and the free movement of such data and repealing Council Framework Decision 2008/977/JHA (see page 89 of this Official Journal).

⁽²⁾ Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('Directive on electronic commerce') (OJ L 178, 17.7.2000, p. 1).

- (23) In order to ensure that natural persons are not deprived of the protection to which they are entitled under this Regulation, the processing of personal data of data subjects who are in the Union by a controller or a processor not established in the Union should be subject to this Regulation where the processing activities are related to offering goods or services to such data subjects irrespective of whether connected to a payment. In order to determine whether such a controller or processor is offering goods or services to data subjects who are in the Union, it should be ascertained whether it is apparent that the controller or processor envisages offering services to data subjects in one or more Member States in the Union. Whereas the mere accessibility of the controller's, processor's or an intermediary's website in the Union, of an email address or of other contact details, or the use of a language generally used in the third country where the controller is established, is insufficient to ascertain such intention, factors such as the use of a language or a currency generally used in one or more Member States with the possibility of ordering goods and services in that other language, or the mentioning of customers or users who are in the Union, may make it apparent that the controller envisages offering goods or services to data subjects in the Union.
- (24) The processing of personal data of data subjects who are in the Union by a controller or processor not established in the Union should also be subject to this Regulation when it is related to the monitoring of the behaviour of such data subjects in so far as their behaviour takes place within the Union. In order to determine whether a processing activity can be considered to monitor the behaviour of data subjects, it should be ascertained whether natural persons are tracked on the internet including potential subsequent use of personal data processing techniques which consist of profiling a natural person, particularly in order to take decisions concerning her or him or for analysing or predicting her or his personal preferences, behaviours and attitudes.
- (25) Where Member State law applies by virtue of public international law, this Regulation should also apply to a controller not established in the Union, such as in a Member State's diplomatic mission or consular post.
- (26) The principles of data protection should apply to any information concerning an identified or identifiable natural person. Personal data which have undergone pseudonymisation, which could be attributed to a natural person by the use of additional information should be considered to be information on an identifiable natural person. To determine whether a natural person is identifiable, account should be taken of all the means reasonably likely to be used, such as singling out, either by the controller or by another person to identify the natural person directly or indirectly. To ascertain whether means are reasonably likely to be used to identify the natural person, account should be taken of all objective factors, such as the costs of and the amount of time required for identification, taking into consideration the available technology at the time of the processing and technological developments. The principles of data protection should therefore not apply to anonymous information, namely information which does not relate to an identified or identifiable natural person or to personal data rendered anonymous in such a manner that the data subject is not or no longer identifiable. This Regulation does not therefore concern the processing of such anonymous information, including for statistical or research purposes.
- (27) This Regulation does not apply to the personal data of deceased persons. Member States may provide for rules regarding the processing of personal data of deceased persons.
- (28) The application of pseudonymisation to personal data can reduce the risks to the data subjects concerned and help controllers and processors to meet their data-protection obligations. The explicit introduction of 'pseudonymisation' in this Regulation is not intended to preclude any other measures of data protection.
- (29) In order to create incentives to apply pseudonymisation when processing personal data, measures of pseudonymisation should, whilst allowing general analysis, be possible within the same controller when that controller has taken technical and organisational measures necessary to ensure, for the processing concerned, that this Regulation is implemented, and that additional information for attributing the personal data to a specific data subject is kept separately. The controller processing the personal data should indicate the authorised persons within the same controller.

- (30) Natural persons may be associated with online identifiers provided by their devices, applications, tools and protocols, such as internet protocol addresses, cookie identifiers or other identifiers such as radio frequency identification tags. This may leave traces which, in particular when combined with unique identifiers and other information received by the servers, may be used to create profiles of the natural persons and identify them.
- (31) Public authorities to which personal data are disclosed in accordance with a legal obligation for the exercise of their official mission, such as tax and customs authorities, financial investigation units, independent administrative authorities, or financial market authorities responsible for the regulation and supervision of securities markets should not be regarded as recipients if they receive personal data which are necessary to carry out a particular inquiry in the general interest, in accordance with Union or Member State law. The requests for disclosure sent by the public authorities should always be in writing, reasoned and occasional and should not concern the entirety of a filing system or lead to the interconnection of filing systems. The processing of personal data by those public authorities should comply with the applicable data-protection rules according to the purposes of the processing.
- (32) Consent should be given by a clear affirmative act establishing a freely given, specific, informed and unambiguous indication of the data subject's agreement to the processing of personal data relating to him or her, such as by a written statement, including by electronic means, or an oral statement. This could include ticking a box when visiting an internet website, choosing technical settings for information society services or another statement or conduct which clearly indicates in this context the data subject's acceptance of the proposed processing of his or her personal data. Silence, pre-ticked boxes or inactivity should not therefore constitute consent. Consent should cover all processing activities carried out for the same purpose or purposes. When the processing has multiple purposes, consent should be given for all of them. If the data subject's consent is to be given following a request by electronic means, the request must be clear, concise and not unnecessarily disruptive to the use of the service for which it is provided.
- (33) It is often not possible to fully identify the purpose of personal data processing for scientific research purposes at the time of data collection. Therefore, data subjects should be allowed to give their consent to certain areas of scientific research when in keeping with recognised ethical standards for scientific research. Data subjects should have the opportunity to give their consent only to certain areas of research or parts of research projects to the extent allowed by the intended purpose.
- (34) Genetic data should be defined as personal data relating to the inherited or acquired genetic characteristics of a natural person which result from the analysis of a biological sample from the natural person in question, in particular chromosomal, deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) analysis, or from the analysis of another element enabling equivalent information to be obtained.
- (35) Personal data concerning health should include all data pertaining to the health status of a data subject which reveal information relating to the past, current or future physical or mental health status of the data subject. This includes information about the natural person collected in the course of the registration for, or the provision of, health care services as referred to in Directive 2011/24/EU of the European Parliament and of the Council ⁽¹⁾ to that natural person; a number, symbol or particular assigned to a natural person to uniquely identify the natural person for health purposes; information derived from the testing or examination of a body part or bodily substance, including from genetic data and biological samples; and any information on, for example, a disease, disability, disease risk, medical history, clinical treatment or the physiological or biomedical state of the data subject independent of its source, for example from a physician or other health professional, a hospital, a medical device or an in vitro diagnostic test.
- (36) The main establishment of a controller in the Union should be the place of its central administration in the Union, unless the decisions on the purposes and means of the processing of personal data are taken in another establishment of the controller in the Union, in which case that other establishment should be considered to be

⁽¹⁾ Directive 2011/24/EU of the European Parliament and of the Council of 9 March 2011 on the application of patients' rights in cross-border healthcare (OJ L 88, 4.4.2011, p. 45).

the main establishment. The main establishment of a controller in the Union should be determined according to objective criteria and should imply the effective and real exercise of management activities determining the main decisions as to the purposes and means of processing through stable arrangements. That criterion should not depend on whether the processing of personal data is carried out at that location. The presence and use of technical means and technologies for processing personal data or processing activities do not, in themselves, constitute a main establishment and are therefore not determining criteria for a main establishment. The main establishment of the processor should be the place of its central administration in the Union or, if it has no central administration in the Union, the place where the main processing activities take place in the Union. In cases involving both the controller and the processor, the competent lead supervisory authority should remain the supervisory authority of the Member State where the controller has its main establishment, but the supervisory authority of the processor should be considered to be a supervisory authority concerned and that supervisory authority should participate in the cooperation procedure provided for by this Regulation. In any case, the supervisory authorities of the Member State or Member States where the processor has one or more establishments should not be considered to be supervisory authorities concerned where the draft decision concerns only the controller. Where the processing is carried out by a group of undertakings, the main establishment of the controlling undertaking should be considered to be the main establishment of the group of undertakings, except where the purposes and means of processing are determined by another undertaking.

- (37) A group of undertakings should cover a controlling undertaking and its controlled undertakings, whereby the controlling undertaking should be the undertaking which can exert a dominant influence over the other undertakings by virtue, for example, of ownership, financial participation or the rules which govern it or the power to have personal data protection rules implemented. An undertaking which controls the processing of personal data in undertakings affiliated to it should be regarded, together with those undertakings, as a group of undertakings.
- (38) Children merit specific protection with regard to their personal data, as they may be less aware of the risks, consequences and safeguards concerned and their rights in relation to the processing of personal data. Such specific protection should, in particular, apply to the use of personal data of children for the purposes of marketing or creating personality or user profiles and the collection of personal data with regard to children when using services offered directly to a child. The consent of the holder of parental responsibility should not be necessary in the context of preventive or counselling services offered directly to a child.
- (39) Any processing of personal data should be lawful and fair. It should be transparent to natural persons that personal data concerning them are collected, used, consulted or otherwise processed and to what extent the personal data are or will be processed. The principle of transparency requires that any information and communication relating to the processing of those personal data be easily accessible and easy to understand, and that clear and plain language be used. That principle concerns, in particular, information to the data subjects on the identity of the controller and the purposes of the processing and further information to ensure fair and transparent processing in respect of the natural persons concerned and their right to obtain confirmation and communication of personal data concerning them which are being processed. Natural persons should be made aware of risks, rules, safeguards and rights in relation to the processing of personal data and how to exercise their rights in relation to such processing. In particular, the specific purposes for which personal data are processed should be explicit and legitimate and determined at the time of the collection of the personal data. The personal data should be adequate, relevant and limited to what is necessary for the purposes for which they are processed. This requires, in particular, ensuring that the period for which the personal data are stored is limited to a strict minimum. Personal data should be processed only if the purpose of the processing could not reasonably be fulfilled by other means. In order to ensure that the personal data are not kept longer than necessary, time limits should be established by the controller for erasure or for a periodic review. Every reasonable step should be taken to ensure that personal data which are inaccurate are rectified or deleted. Personal data should be processed in a manner that ensures appropriate security and confidentiality of the personal data, including for preventing unauthorised access to or use of personal data and the equipment used for the processing.
- (40) In order for processing to be lawful, personal data should be processed on the basis of the consent of the data subject concerned or some other legitimate basis, laid down by law, either in this Regulation or in other Union or

Member State law as referred to in this Regulation, including the necessity for compliance with the legal obligation to which the controller is subject or the necessity for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract.

- (41) Where this Regulation refers to a legal basis or a legislative measure, this does not necessarily require a legislative act adopted by a parliament, without prejudice to requirements pursuant to the constitutional order of the Member State concerned. However, such a legal basis or legislative measure should be clear and precise and its application should be foreseeable to persons subject to it, in accordance with the case-law of the Court of Justice of the European Union (the ‘Court of Justice’) and the European Court of Human Rights.
- (42) Where processing is based on the data subject’s consent, the controller should be able to demonstrate that the data subject has given consent to the processing operation. In particular in the context of a written declaration on another matter, safeguards should ensure that the data subject is aware of the fact that and the extent to which consent is given. In accordance with Council Directive 93/13/EEC ⁽¹⁾ a declaration of consent pre-formulated by the controller should be provided in an intelligible and easily accessible form, using clear and plain language and it should not contain unfair terms. For consent to be informed, the data subject should be aware at least of the identity of the controller and the purposes of the processing for which the personal data are intended. Consent should not be regarded as freely given if the data subject has no genuine or free choice or is unable to refuse or withdraw consent without detriment.
- (43) In order to ensure that consent is freely given, consent should not provide a valid legal ground for the processing of personal data in a specific case where there is a clear imbalance between the data subject and the controller, in particular where the controller is a public authority and it is therefore unlikely that consent was freely given in all the circumstances of that specific situation. Consent is presumed not to be freely given if it does not allow separate consent to be given to different personal data processing operations despite it being appropriate in the individual case, or if the performance of a contract, including the provision of a service, is dependent on the consent despite such consent not being necessary for such performance.
- (44) Processing should be lawful where it is necessary in the context of a contract or the intention to enter into a contract.
- (45) Where processing is carried out in accordance with a legal obligation to which the controller is subject or where processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority, the processing should have a basis in Union or Member State law. This Regulation does not require a specific law for each individual processing. A law as a basis for several processing operations based on a legal obligation to which the controller is subject or where processing is necessary for the performance of a task carried out in the public interest or in the exercise of an official authority may be sufficient. It should also be for Union or Member State law to determine the purpose of processing. Furthermore, that law could specify the general conditions of this Regulation governing the lawfulness of personal data processing, establish specifications for determining the controller, the type of personal data which are subject to the processing, the data subjects concerned, the entities to which the personal data may be disclosed, the purpose limitations, the storage period and other measures to ensure lawful and fair processing. It should also be for Union or Member State law to determine whether the controller performing a task carried out in the public interest or in the exercise of official authority should be a public authority or another natural or legal person governed by public law, or, where it is in the public interest to do so, including for health purposes such as public health and social protection and the management of health care services, by private law, such as a professional association.
- (46) The processing of personal data should also be regarded to be lawful where it is necessary to protect an interest which is essential for the life of the data subject or that of another natural person. Processing of personal data

⁽¹⁾ Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts (OJ L 95, 21.4.1993, p. 29).

based on the vital interest of another natural person should in principle take place only where the processing cannot be manifestly based on another legal basis. Some types of processing may serve both important grounds of public interest and the vital interests of the data subject as for instance when processing is necessary for humanitarian purposes, including for monitoring epidemics and their spread or in situations of humanitarian emergencies, in particular in situations of natural and man-made disasters.

- (47) The legitimate interests of a controller, including those of a controller to which the personal data may be disclosed, or of a third party, may provide a legal basis for processing, provided that the interests or the fundamental rights and freedoms of the data subject are not overriding, taking into consideration the reasonable expectations of data subjects based on their relationship with the controller. Such legitimate interest could exist for example where there is a relevant and appropriate relationship between the data subject and the controller in situations such as where the data subject is a client or in the service of the controller. At any rate the existence of a legitimate interest would need careful assessment including whether a data subject can reasonably expect at the time and in the context of the collection of the personal data that processing for that purpose may take place. The interests and fundamental rights of the data subject could in particular override the interest of the data controller where personal data are processed in circumstances where data subjects do not reasonably expect further processing. Given that it is for the legislator to provide by law for the legal basis for public authorities to process personal data, that legal basis should not apply to the processing by public authorities in the performance of their tasks. The processing of personal data strictly necessary for the purposes of preventing fraud also constitutes a legitimate interest of the data controller concerned. The processing of personal data for direct marketing purposes may be regarded as carried out for a legitimate interest.
- (48) Controllers that are part of a group of undertakings or institutions affiliated to a central body may have a legitimate interest in transmitting personal data within the group of undertakings for internal administrative purposes, including the processing of clients' or employees' personal data. The general principles for the transfer of personal data, within a group of undertakings, to an undertaking located in a third country remain unaffected.
- (49) The processing of personal data to the extent strictly necessary and proportionate for the purposes of ensuring network and information security, i.e. the ability of a network or an information system to resist, at a given level of confidence, accidental events or unlawful or malicious actions that compromise the availability, authenticity, integrity and confidentiality of stored or transmitted personal data, and the security of the related services offered by, or accessible via, those networks and systems, by public authorities, by computer emergency response teams (CERTs), computer security incident response teams (CSIRTs), by providers of electronic communications networks and services and by providers of security technologies and services, constitutes a legitimate interest of the data controller concerned. This could, for example, include preventing unauthorised access to electronic communications networks and malicious code distribution and stopping 'denial of service' attacks and damage to computer and electronic communication systems.
- (50) The processing of personal data for purposes other than those for which the personal data were initially collected should be allowed only where the processing is compatible with the purposes for which the personal data were initially collected. In such a case, no legal basis separate from that which allowed the collection of the personal data is required. If the processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller, Union or Member State law may determine and specify the tasks and purposes for which the further processing should be regarded as compatible and lawful. Further processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes should be considered to be compatible lawful processing operations. The legal basis provided by Union or Member State law for the processing of personal data may also provide a legal basis for further processing. In order to ascertain whether a purpose of further processing is compatible with the purpose for which the personal data are initially collected, the controller, after having met all the requirements for the lawfulness of the original processing, should take into account, inter alia: any link between those purposes and the purposes of the intended further processing; the context in which the personal data have been collected, in particular the reasonable expectations of data subjects based on their relationship with the controller as to their

further use; the nature of the personal data; the consequences of the intended further processing for data subjects; and the existence of appropriate safeguards in both the original and intended further processing operations.

Where the data subject has given consent or the processing is based on Union or Member State law which constitutes a necessary and proportionate measure in a democratic society to safeguard, in particular, important objectives of general public interest, the controller should be allowed to further process the personal data irrespective of the compatibility of the purposes. In any case, the application of the principles set out in this Regulation and in particular the information of the data subject on those other purposes and on his or her rights including the right to object, should be ensured. Indicating possible criminal acts or threats to public security by the controller and transmitting the relevant personal data in individual cases or in several cases relating to the same criminal act or threats to public security to a competent authority should be regarded as being in the legitimate interest pursued by the controller. However, such transmission in the legitimate interest of the controller or further processing of personal data should be prohibited if the processing is not compatible with a legal, professional or other binding obligation of secrecy.

- (51) Personal data which are, by their nature, particularly sensitive in relation to fundamental rights and freedoms merit specific protection as the context of their processing could create significant risks to the fundamental rights and freedoms. Those personal data should include personal data revealing racial or ethnic origin, whereby the use of the term 'racial origin' in this Regulation does not imply an acceptance by the Union of theories which attempt to determine the existence of separate human races. The processing of photographs should not systematically be considered to be processing of special categories of personal data as they are covered by the definition of biometric data only when processed through a specific technical means allowing the unique identification or authentication of a natural person. Such personal data should not be processed, unless processing is allowed in specific cases set out in this Regulation, taking into account that Member States law may lay down specific provisions on data protection in order to adapt the application of the rules of this Regulation for compliance with a legal obligation or for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller. In addition to the specific requirements for such processing, the general principles and other rules of this Regulation should apply, in particular as regards the conditions for lawful processing. Derogations from the general prohibition for processing such special categories of personal data should be explicitly provided, inter alia, where the data subject gives his or her explicit consent or in respect of specific needs in particular where the processing is carried out in the course of legitimate activities by certain associations or foundations the purpose of which is to permit the exercise of fundamental freedoms.
- (52) Derogating from the prohibition on processing special categories of personal data should also be allowed when provided for in Union or Member State law and subject to suitable safeguards, so as to protect personal data and other fundamental rights, where it is in the public interest to do so, in particular processing personal data in the field of employment law, social protection law including pensions and for health security, monitoring and alert purposes, the prevention or control of communicable diseases and other serious threats to health. Such a derogation may be made for health purposes, including public health and the management of health-care services, especially in order to ensure the quality and cost-effectiveness of the procedures used for settling claims for benefits and services in the health insurance system, or for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes. A derogation should also allow the processing of such personal data where necessary for the establishment, exercise or defence of legal claims, whether in court proceedings or in an administrative or out-of-court procedure.
- (53) Special categories of personal data which merit higher protection should be processed for health-related purposes only where necessary to achieve those purposes for the benefit of natural persons and society as a whole, in particular in the context of the management of health or social care services and systems, including processing by the management and central national health authorities of such data for the purpose of quality control, management information and the general national and local supervision of the health or social care system, and ensuring continuity of health or social care and cross-border healthcare or health security, monitoring and alert purposes, or for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes, based on Union or Member State law which has to meet an objective of public interest, as well as for studies conducted in the public interest in the area of public health. Therefore, this Regulation should provide for harmonised conditions for the processing of special categories of personal data concerning health, in respect of specific needs, in particular where the processing of such data is carried out for certain health-related purposes

by persons subject to a legal obligation of professional secrecy. Union or Member State law should provide for specific and suitable measures so as to protect the fundamental rights and the personal data of natural persons. Member States should be allowed to maintain or introduce further conditions, including limitations, with regard to the processing of genetic data, biometric data or data concerning health. However, this should not hamper the free flow of personal data within the Union when those conditions apply to cross-border processing of such data.

- (54) The processing of special categories of personal data may be necessary for reasons of public interest in the areas of public health without consent of the data subject. Such processing should be subject to suitable and specific measures so as to protect the rights and freedoms of natural persons. In that context, 'public health' should be interpreted as defined in Regulation (EC) No 1338/2008 of the European Parliament and of the Council ⁽¹⁾, namely all elements related to health, namely health status, including morbidity and disability, the determinants having an effect on that health status, health care needs, resources allocated to health care, the provision of, and universal access to, health care as well as health care expenditure and financing, and the causes of mortality. Such processing of data concerning health for reasons of public interest should not result in personal data being processed for other purposes by third parties such as employers or insurance and banking companies.
- (55) Moreover, the processing of personal data by official authorities for the purpose of achieving the aims, laid down by constitutional law or by international public law, of officially recognised religious associations, is carried out on grounds of public interest.
- (56) Where in the course of electoral activities, the operation of the democratic system in a Member State requires that political parties compile personal data on people's political opinions, the processing of such data may be permitted for reasons of public interest, provided that appropriate safeguards are established.
- (57) If the personal data processed by a controller do not permit the controller to identify a natural person, the data controller should not be obliged to acquire additional information in order to identify the data subject for the sole purpose of complying with any provision of this Regulation. However, the controller should not refuse to take additional information provided by the data subject in order to support the exercise of his or her rights. Identification should include the digital identification of a data subject, for example through authentication mechanism such as the same credentials, used by the data subject to log-in to the on-line service offered by the data controller.
- (58) The principle of transparency requires that any information addressed to the public or to the data subject be concise, easily accessible and easy to understand, and that clear and plain language and, additionally, where appropriate, visualisation be used. Such information could be provided in electronic form, for example, when addressed to the public, through a website. This is of particular relevance in situations where the proliferation of actors and the technological complexity of practice make it difficult for the data subject to know and understand whether, by whom and for what purpose personal data relating to him or her are being collected, such as in the case of online advertising. Given that children merit specific protection, any information and communication, where processing is addressed to a child, should be in such a clear and plain language that the child can easily understand.
- (59) Modalities should be provided for facilitating the exercise of the data subject's rights under this Regulation, including mechanisms to request and, if applicable, obtain, free of charge, in particular, access to and rectification or erasure of personal data and the exercise of the right to object. The controller should also provide means for requests to be made electronically, especially where personal data are processed by electronic means. The controller should be obliged to respond to requests from the data subject without undue delay and at the latest within one month and to give reasons where the controller does not intend to comply with any such requests.

⁽¹⁾ Regulation (EC) No 1338/2008 of the European Parliament and of the Council of 16 December 2008 on Community statistics on public health and health and safety at work (OJ L 354, 31.12.2008, p. 70).

- (60) The principles of fair and transparent processing require that the data subject be informed of the existence of the processing operation and its purposes. The controller should provide the data subject with any further information necessary to ensure fair and transparent processing taking into account the specific circumstances and context in which the personal data are processed. Furthermore, the data subject should be informed of the existence of profiling and the consequences of such profiling. Where the personal data are collected from the data subject, the data subject should also be informed whether he or she is obliged to provide the personal data and of the consequences, where he or she does not provide such data. That information may be provided in combination with standardised icons in order to give in an easily visible, intelligible and clearly legible manner, a meaningful overview of the intended processing. Where the icons are presented electronically, they should be machine-readable.
- (61) The information in relation to the processing of personal data relating to the data subject should be given to him or her at the time of collection from the data subject, or, where the personal data are obtained from another source, within a reasonable period, depending on the circumstances of the case. Where personal data can be legitimately disclosed to another recipient, the data subject should be informed when the personal data are first disclosed to the recipient. Where the controller intends to process the personal data for a purpose other than that for which they were collected, the controller should provide the data subject prior to that further processing with information on that other purpose and other necessary information. Where the origin of the personal data cannot be provided to the data subject because various sources have been used, general information should be provided.
- (62) However, it is not necessary to impose the obligation to provide information where the data subject already possesses the information, where the recording or disclosure of the personal data is expressly laid down by law or where the provision of information to the data subject proves to be impossible or would involve a disproportionate effort. The latter could in particular be the case where processing is carried out for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes. In that regard, the number of data subjects, the age of the data and any appropriate safeguards adopted should be taken into consideration.
- (63) A data subject should have the right of access to personal data which have been collected concerning him or her, and to exercise that right easily and at reasonable intervals, in order to be aware of, and verify, the lawfulness of the processing. This includes the right for data subjects to have access to data concerning their health, for example the data in their medical records containing information such as diagnoses, examination results, assessments by treating physicians and any treatment or interventions provided. Every data subject should therefore have the right to know and obtain communication in particular with regard to the purposes for which the personal data are processed, where possible the period for which the personal data are processed, the recipients of the personal data, the logic involved in any automatic personal data processing and, at least when based on profiling, the consequences of such processing. Where possible, the controller should be able to provide remote access to a secure system which would provide the data subject with direct access to his or her personal data. That right should not adversely affect the rights or freedoms of others, including trade secrets or intellectual property and in particular the copyright protecting the software. However, the result of those considerations should not be a refusal to provide all information to the data subject. Where the controller processes a large quantity of information concerning the data subject, the controller should be able to request that, before the information is delivered, the data subject specify the information or processing activities to which the request relates.
- (64) The controller should use all reasonable measures to verify the identity of a data subject who requests access, in particular in the context of online services and online identifiers. A controller should not retain personal data for the sole purpose of being able to react to potential requests.
- (65) A data subject should have the right to have personal data concerning him or her rectified and a 'right to be forgotten' where the retention of such data infringes this Regulation or Union or Member State law to which the controller is subject. In particular, a data subject should have the right to have his or her personal data erased and no longer processed where the personal data are no longer necessary in relation to the purposes for which they are collected or otherwise processed, where a data subject has withdrawn his or her consent or objects to the processing of personal data concerning him or her, or where the processing of his or her personal data does not otherwise comply with this Regulation. That right is relevant in particular where the data subject has given

his or her consent as a child and is not fully aware of the risks involved by the processing, and later wants to remove such personal data, especially on the internet. The data subject should be able to exercise that right notwithstanding the fact that he or she is no longer a child. However, the further retention of the personal data should be lawful where it is necessary, for exercising the right of freedom of expression and information, for compliance with a legal obligation, for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller, on the grounds of public interest in the area of public health, for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes, or for the establishment, exercise or defence of legal claims.

- (66) To strengthen the right to be forgotten in the online environment, the right to erasure should also be extended in such a way that a controller who has made the personal data public should be obliged to inform the controllers which are processing such personal data to erase any links to, or copies or replications of those personal data. In doing so, that controller should take reasonable steps, taking into account available technology and the means available to the controller, including technical measures, to inform the controllers which are processing the personal data of the data subject's request.
- (67) Methods by which to restrict the processing of personal data could include, inter alia, temporarily moving the selected data to another processing system, making the selected personal data unavailable to users, or temporarily removing published data from a website. In automated filing systems, the restriction of processing should in principle be ensured by technical means in such a manner that the personal data are not subject to further processing operations and cannot be changed. The fact that the processing of personal data is restricted should be clearly indicated in the system.
- (68) To further strengthen the control over his or her own data, where the processing of personal data is carried out by automated means, the data subject should also be allowed to receive personal data concerning him or her which he or she has provided to a controller in a structured, commonly used, machine-readable and interoperable format, and to transmit it to another controller. Data controllers should be encouraged to develop interoperable formats that enable data portability. That right should apply where the data subject provided the personal data on the basis of his or her consent or the processing is necessary for the performance of a contract. It should not apply where processing is based on a legal ground other than consent or contract. By its very nature, that right should not be exercised against controllers processing personal data in the exercise of their public duties. It should therefore not apply where the processing of the personal data is necessary for compliance with a legal obligation to which the controller is subject or for the performance of a task carried out in the public interest or in the exercise of an official authority vested in the controller. The data subject's right to transmit or receive personal data concerning him or her should not create an obligation for the controllers to adopt or maintain processing systems which are technically compatible. Where, in a certain set of personal data, more than one data subject is concerned, the right to receive the personal data should be without prejudice to the rights and freedoms of other data subjects in accordance with this Regulation. Furthermore, that right should not prejudice the right of the data subject to obtain the erasure of personal data and the limitations of that right as set out in this Regulation and should, in particular, not imply the erasure of personal data concerning the data subject which have been provided by him or her for the performance of a contract to the extent that and for as long as the personal data are necessary for the performance of that contract. Where technically feasible, the data subject should have the right to have the personal data transmitted directly from one controller to another.
- (69) Where personal data might lawfully be processed because processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller, or on grounds of the legitimate interests of a controller or a third party, a data subject should, nevertheless, be entitled to object to the processing of any personal data relating to his or her particular situation. It should be for the controller to demonstrate that its compelling legitimate interest overrides the interests or the fundamental rights and freedoms of the data subject.
- (70) Where personal data are processed for the purposes of direct marketing, the data subject should have the right to object to such processing, including profiling to the extent that it is related to such direct marketing, whether with regard to initial or further processing, at any time and free of charge. That right should be explicitly brought to the attention of the data subject and presented clearly and separately from any other information.

- (71) The data subject should have the right not to be subject to a decision, which may include a measure, evaluating personal aspects relating to him or her which is based solely on automated processing and which produces legal effects concerning him or her or similarly significantly affects him or her, such as automatic refusal of an online credit application or e-recruiting practices without any human intervention. Such processing includes 'profiling' that consists of any form of automated processing of personal data evaluating the personal aspects relating to a natural person, in particular to analyse or predict aspects concerning the data subject's performance at work, economic situation, health, personal preferences or interests, reliability or behaviour, location or movements, where it produces legal effects concerning him or her or similarly significantly affects him or her. However, decision-making based on such processing, including profiling, should be allowed where expressly authorised by Union or Member State law to which the controller is subject, including for fraud and tax-evasion monitoring and prevention purposes conducted in accordance with the regulations, standards and recommendations of Union institutions or national oversight bodies and to ensure the security and reliability of a service provided by the controller, or necessary for the entering or performance of a contract between the data subject and a controller, or when the data subject has given his or her explicit consent. In any case, such processing should be subject to suitable safeguards, which should include specific information to the data subject and the right to obtain human intervention, to express his or her point of view, to obtain an explanation of the decision reached after such assessment and to challenge the decision. Such measure should not concern a child.

In order to ensure fair and transparent processing in respect of the data subject, taking into account the specific circumstances and context in which the personal data are processed, the controller should use appropriate mathematical or statistical procedures for the profiling, implement technical and organisational measures appropriate to ensure, in particular, that factors which result in inaccuracies in personal data are corrected and the risk of errors is minimised, secure personal data in a manner that takes account of the potential risks involved for the interests and rights of the data subject and that prevents, inter alia, discriminatory effects on natural persons on the basis of racial or ethnic origin, political opinion, religion or beliefs, trade union membership, genetic or health status or sexual orientation, or that result in measures having such an effect. Automated decision-making and profiling based on special categories of personal data should be allowed only under specific conditions.

- (72) Profiling is subject to the rules of this Regulation governing the processing of personal data, such as the legal grounds for processing or data protection principles. The European Data Protection Board established by this Regulation (the 'Board') should be able to issue guidance in that context.
- (73) Restrictions concerning specific principles and the rights of information, access to and rectification or erasure of personal data, the right to data portability, the right to object, decisions based on profiling, as well as the communication of a personal data breach to a data subject and certain related obligations of the controllers may be imposed by Union or Member State law, as far as necessary and proportionate in a democratic society to safeguard public security, including the protection of human life especially in response to natural or manmade disasters, the prevention, investigation and prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security, or of breaches of ethics for regulated professions, other important objectives of general public interest of the Union or of a Member State, in particular an important economic or financial interest of the Union or of a Member State, the keeping of public registers kept for reasons of general public interest, further processing of archived personal data to provide specific information related to the political behaviour under former totalitarian state regimes or the protection of the data subject or the rights and freedoms of others, including social protection, public health and humanitarian purposes. Those restrictions should be in accordance with the requirements set out in the Charter and in the European Convention for the Protection of Human Rights and Fundamental Freedoms.
- (74) The responsibility and liability of the controller for any processing of personal data carried out by the controller or on the controller's behalf should be established. In particular, the controller should be obliged to implement appropriate and effective measures and be able to demonstrate the compliance of processing activities with this Regulation, including the effectiveness of the measures. Those measures should take into account the nature, scope, context and purposes of the processing and the risk to the rights and freedoms of natural persons.

- (75) The risk to the rights and freedoms of natural persons, of varying likelihood and severity, may result from personal data processing which could lead to physical, material or non-material damage, in particular: where the processing may give rise to discrimination, identity theft or fraud, financial loss, damage to the reputation, loss of confidentiality of personal data protected by professional secrecy, unauthorised reversal of pseudonymisation, or any other significant economic or social disadvantage; where data subjects might be deprived of their rights and freedoms or prevented from exercising control over their personal data; where personal data are processed which reveal racial or ethnic origin, political opinions, religion or philosophical beliefs, trade union membership, and the processing of genetic data, data concerning health or data concerning sex life or criminal convictions and offences or related security measures; where personal aspects are evaluated, in particular analysing or predicting aspects concerning performance at work, economic situation, health, personal preferences or interests, reliability or behaviour, location or movements, in order to create or use personal profiles; where personal data of vulnerable natural persons, in particular of children, are processed; or where processing involves a large amount of personal data and affects a large number of data subjects.
- (76) The likelihood and severity of the risk to the rights and freedoms of the data subject should be determined by reference to the nature, scope, context and purposes of the processing. Risk should be evaluated on the basis of an objective assessment, by which it is established whether data processing operations involve a risk or a high risk.
- (77) Guidance on the implementation of appropriate measures and on the demonstration of compliance by the controller or the processor, especially as regards the identification of the risk related to the processing, their assessment in terms of origin, nature, likelihood and severity, and the identification of best practices to mitigate the risk, could be provided in particular by means of approved codes of conduct, approved certifications, guidelines provided by the Board or indications provided by a data protection officer. The Board may also issue guidelines on processing operations that are considered to be unlikely to result in a high risk to the rights and freedoms of natural persons and indicate what measures may be sufficient in such cases to address such risk.
- (78) The protection of the rights and freedoms of natural persons with regard to the processing of personal data require that appropriate technical and organisational measures be taken to ensure that the requirements of this Regulation are met. In order to be able to demonstrate compliance with this Regulation, the controller should adopt internal policies and implement measures which meet in particular the principles of data protection by design and data protection by default. Such measures could consist, inter alia, of minimising the processing of personal data, pseudonymising personal data as soon as possible, transparency with regard to the functions and processing of personal data, enabling the data subject to monitor the data processing, enabling the controller to create and improve security features. When developing, designing, selecting and using applications, services and products that are based on the processing of personal data or process personal data to fulfil their task, producers of the products, services and applications should be encouraged to take into account the right to data protection when developing and designing such products, services and applications and, with due regard to the state of the art, to make sure that controllers and processors are able to fulfil their data protection obligations. The principles of data protection by design and by default should also be taken into consideration in the context of public tenders.
- (79) The protection of the rights and freedoms of data subjects as well as the responsibility and liability of controllers and processors, also in relation to the monitoring by and measures of supervisory authorities, requires a clear allocation of the responsibilities under this Regulation, including where a controller determines the purposes and means of the processing jointly with other controllers or where a processing operation is carried out on behalf of a controller.
- (80) Where a controller or a processor not established in the Union is processing personal data of data subjects who are in the Union whose processing activities are related to the offering of goods or services, irrespective of whether a payment of the data subject is required, to such data subjects in the Union, or to the monitoring of their behaviour as far as their behaviour takes place within the Union, the controller or the processor should designate a representative, unless the processing is occasional, does not include processing, on a large scale, of special categories of personal data or the processing of personal data relating to criminal convictions and offences, and is unlikely to result in a risk to the rights and freedoms of natural persons, taking into account the

nature, context, scope and purposes of the processing or if the controller is a public authority or body. The representative should act on behalf of the controller or the processor and may be addressed by any supervisory authority. The representative should be explicitly designated by a written mandate of the controller or of the processor to act on its behalf with regard to its obligations under this Regulation. The designation of such a representative does not affect the responsibility or liability of the controller or of the processor under this Regulation. Such a representative should perform its tasks according to the mandate received from the controller or processor, including cooperating with the competent supervisory authorities with regard to any action taken to ensure compliance with this Regulation. The designated representative should be subject to enforcement proceedings in the event of non-compliance by the controller or processor.

- (81) To ensure compliance with the requirements of this Regulation in respect of the processing to be carried out by the processor on behalf of the controller, when entrusting a processor with processing activities, the controller should use only processors providing sufficient guarantees, in particular in terms of expert knowledge, reliability and resources, to implement technical and organisational measures which will meet the requirements of this Regulation, including for the security of processing. The adherence of the processor to an approved code of conduct or an approved certification mechanism may be used as an element to demonstrate compliance with the obligations of the controller. The carrying-out of processing by a processor should be governed by a contract or other legal act under Union or Member State law, binding the processor to the controller, setting out the subject-matter and duration of the processing, the nature and purposes of the processing, the type of personal data and categories of data subjects, taking into account the specific tasks and responsibilities of the processor in the context of the processing to be carried out and the risk to the rights and freedoms of the data subject. The controller and processor may choose to use an individual contract or standard contractual clauses which are adopted either directly by the Commission or by a supervisory authority in accordance with the consistency mechanism and then adopted by the Commission. After the completion of the processing on behalf of the controller, the processor should, at the choice of the controller, return or delete the personal data, unless there is a requirement to store the personal data under Union or Member State law to which the processor is subject.
- (82) In order to demonstrate compliance with this Regulation, the controller or processor should maintain records of processing activities under its responsibility. Each controller and processor should be obliged to cooperate with the supervisory authority and make those records, on request, available to it, so that it might serve for monitoring those processing operations.
- (83) In order to maintain security and to prevent processing in infringement of this Regulation, the controller or processor should evaluate the risks inherent in the processing and implement measures to mitigate those risks, such as encryption. Those measures should ensure an appropriate level of security, including confidentiality, taking into account the state of the art and the costs of implementation in relation to the risks and the nature of the personal data to be protected. In assessing data security risk, consideration should be given to the risks that are presented by personal data processing, such as accidental or unlawful destruction, loss, alteration, unauthorised disclosure of, or access to, personal data transmitted, stored or otherwise processed which may in particular lead to physical, material or non-material damage.
- (84) In order to enhance compliance with this Regulation where processing operations are likely to result in a high risk to the rights and freedoms of natural persons, the controller should be responsible for the carrying-out of a data protection impact assessment to evaluate, in particular, the origin, nature, particularity and severity of that risk. The outcome of the assessment should be taken into account when determining the appropriate measures to be taken in order to demonstrate that the processing of personal data complies with this Regulation. Where a data-protection impact assessment indicates that processing operations involve a high risk which the controller cannot mitigate by appropriate measures in terms of available technology and costs of implementation, a consultation of the supervisory authority should take place prior to the processing.
- (85) A personal data breach may, if not addressed in an appropriate and timely manner, result in physical, material or non-material damage to natural persons such as loss of control over their personal data or limitation of their rights, discrimination, identity theft or fraud, financial loss, unauthorised reversal of pseudonymisation, damage to reputation, loss of confidentiality of personal data protected by professional secrecy or any other significant economic or social disadvantage to the natural person concerned. Therefore, as soon as the controller becomes

aware that a personal data breach has occurred, the controller should notify the personal data breach to the supervisory authority without undue delay and, where feasible, not later than 72 hours after having become aware of it, unless the controller is able to demonstrate, in accordance with the accountability principle, that the personal data breach is unlikely to result in a risk to the rights and freedoms of natural persons. Where such notification cannot be achieved within 72 hours, the reasons for the delay should accompany the notification and information may be provided in phases without undue further delay.

- (86) The controller should communicate to the data subject a personal data breach, without undue delay, where that personal data breach is likely to result in a high risk to the rights and freedoms of the natural person in order to allow him or her to take the necessary precautions. The communication should describe the nature of the personal data breach as well as recommendations for the natural person concerned to mitigate potential adverse effects. Such communications to data subjects should be made as soon as reasonably feasible and in close cooperation with the supervisory authority, respecting guidance provided by it or by other relevant authorities such as law-enforcement authorities. For example, the need to mitigate an immediate risk of damage would call for prompt communication with data subjects whereas the need to implement appropriate measures against continuing or similar personal data breaches may justify more time for communication.
- (87) It should be ascertained whether all appropriate technological protection and organisational measures have been implemented to establish immediately whether a personal data breach has taken place and to inform promptly the supervisory authority and the data subject. The fact that the notification was made without undue delay should be established taking into account in particular the nature and gravity of the personal data breach and its consequences and adverse effects for the data subject. Such notification may result in an intervention of the supervisory authority in accordance with its tasks and powers laid down in this Regulation.
- (88) In setting detailed rules concerning the format and procedures applicable to the notification of personal data breaches, due consideration should be given to the circumstances of that breach, including whether or not personal data had been protected by appropriate technical protection measures, effectively limiting the likelihood of identity fraud or other forms of misuse. Moreover, such rules and procedures should take into account the legitimate interests of law-enforcement authorities where early disclosure could unnecessarily hamper the investigation of the circumstances of a personal data breach.
- (89) Directive 95/46/EC provided for a general obligation to notify the processing of personal data to the supervisory authorities. While that obligation produces administrative and financial burdens, it did not in all cases contribute to improving the protection of personal data. Such indiscriminate general notification obligations should therefore be abolished, and replaced by effective procedures and mechanisms which focus instead on those types of processing operations which are likely to result in a high risk to the rights and freedoms of natural persons by virtue of their nature, scope, context and purposes. Such types of processing operations may be those which in particular, involve using new technologies, or are of a new kind and where no data protection impact assessment has been carried out before by the controller, or where they become necessary in the light of the time that has elapsed since the initial processing.
- (90) In such cases, a data protection impact assessment should be carried out by the controller prior to the processing in order to assess the particular likelihood and severity of the high risk, taking into account the nature, scope, context and purposes of the processing and the sources of the risk. That impact assessment should include, in particular, the measures, safeguards and mechanisms envisaged for mitigating that risk, ensuring the protection of personal data and demonstrating compliance with this Regulation.
- (91) This should in particular apply to large-scale processing operations which aim to process a considerable amount of personal data at regional, national or supranational level and which could affect a large number of data subjects and which are likely to result in a high risk, for example, on account of their sensitivity, where in accordance with the achieved state of technological knowledge a new technology is used on a large scale as well as to other processing operations which result in a high risk to the rights and freedoms of data subjects, in particular where those operations render it more difficult for data subjects to exercise their rights. A data

protection impact assessment should also be made where personal data are processed for taking decisions regarding specific natural persons following any systematic and extensive evaluation of personal aspects relating to natural persons based on profiling those data or following the processing of special categories of personal data, biometric data, or data on criminal convictions and offences or related security measures. A data protection impact assessment is equally required for monitoring publicly accessible areas on a large scale, especially when using optic-electronic devices or for any other operations where the competent supervisory authority considers that the processing is likely to result in a high risk to the rights and freedoms of data subjects, in particular because they prevent data subjects from exercising a right or using a service or a contract, or because they are carried out systematically on a large scale. The processing of personal data should not be considered to be on a large scale if the processing concerns personal data from patients or clients by an individual physician, other health care professional or lawyer. In such cases, a data protection impact assessment should not be mandatory.

- (92) There are circumstances under which it may be reasonable and economical for the subject of a data protection impact assessment to be broader than a single project, for example where public authorities or bodies intend to establish a common application or processing platform or where several controllers plan to introduce a common application or processing environment across an industry sector or segment or for a widely used horizontal activity.
- (93) In the context of the adoption of the Member State law on which the performance of the tasks of the public authority or public body is based and which regulates the specific processing operation or set of operations in question, Member States may deem it necessary to carry out such assessment prior to the processing activities.
- (94) Where a data protection impact assessment indicates that the processing would, in the absence of safeguards, security measures and mechanisms to mitigate the risk, result in a high risk to the rights and freedoms of natural persons and the controller is of the opinion that the risk cannot be mitigated by reasonable means in terms of available technologies and costs of implementation, the supervisory authority should be consulted prior to the start of processing activities. Such high risk is likely to result from certain types of processing and the extent and frequency of processing, which may result also in a realisation of damage or interference with the rights and freedoms of the natural person. The supervisory authority should respond to the request for consultation within a specified period. However, the absence of a reaction of the supervisory authority within that period should be without prejudice to any intervention of the supervisory authority in accordance with its tasks and powers laid down in this Regulation, including the power to prohibit processing operations. As part of that consultation process, the outcome of a data protection impact assessment carried out with regard to the processing at issue may be submitted to the supervisory authority, in particular the measures envisaged to mitigate the risk to the rights and freedoms of natural persons.
- (95) The processor should assist the controller, where necessary and upon request, in ensuring compliance with the obligations deriving from the carrying out of data protection impact assessments and from prior consultation of the supervisory authority.
- (96) A consultation of the supervisory authority should also take place in the course of the preparation of a legislative or regulatory measure which provides for the processing of personal data, in order to ensure compliance of the intended processing with this Regulation and in particular to mitigate the risk involved for the data subject.
- (97) Where the processing is carried out by a public authority, except for courts or independent judicial authorities when acting in their judicial capacity, where, in the private sector, processing is carried out by a controller whose core activities consist of processing operations that require regular and systematic monitoring of the data subjects on a large scale, or where the core activities of the controller or the processor consist of processing on a large scale of special categories of personal data and data relating to criminal convictions and offences, a person with expert knowledge of data protection law and practices should assist the controller or processor to monitor internal compliance with this Regulation. In the private sector, the core activities of a controller relate to its primary activities and do not relate to the processing of personal data as ancillary activities. The necessary level of expert knowledge should be determined in particular according to the data processing operations carried out

and the protection required for the personal data processed by the controller or the processor. Such data protection officers, whether or not they are an employee of the controller, should be in a position to perform their duties and tasks in an independent manner.

- (98) Associations or other bodies representing categories of controllers or processors should be encouraged to draw up codes of conduct, within the limits of this Regulation, so as to facilitate the effective application of this Regulation, taking account of the specific characteristics of the processing carried out in certain sectors and the specific needs of micro, small and medium enterprises. In particular, such codes of conduct could calibrate the obligations of controllers and processors, taking into account the risk likely to result from the processing for the rights and freedoms of natural persons.
- (99) When drawing up a code of conduct, or when amending or extending such a code, associations and other bodies representing categories of controllers or processors should consult relevant stakeholders, including data subjects where feasible, and have regard to submissions received and views expressed in response to such consultations.
- (100) In order to enhance transparency and compliance with this Regulation, the establishment of certification mechanisms and data protection seals and marks should be encouraged, allowing data subjects to quickly assess the level of data protection of relevant products and services.
- (101) Flows of personal data to and from countries outside the Union and international organisations are necessary for the expansion of international trade and international cooperation. The increase in such flows has raised new challenges and concerns with regard to the protection of personal data. However, when personal data are transferred from the Union to controllers, processors or other recipients in third countries or to international organisations, the level of protection of natural persons ensured in the Union by this Regulation should not be undermined, including in cases of onward transfers of personal data from the third country or international organisation to controllers, processors in the same or another third country or international organisation. In any event, transfers to third countries and international organisations may only be carried out in full compliance with this Regulation. A transfer could take place only if, subject to the other provisions of this Regulation, the conditions laid down in the provisions of this Regulation relating to the transfer of personal data to third countries or international organisations are complied with by the controller or processor.
- (102) This Regulation is without prejudice to international agreements concluded between the Union and third countries regulating the transfer of personal data including appropriate safeguards for the data subjects. Member States may conclude international agreements which involve the transfer of personal data to third countries or international organisations, as far as such agreements do not affect this Regulation or any other provisions of Union law and include an appropriate level of protection for the fundamental rights of the data subjects.
- (103) The Commission may decide with effect for the entire Union that a third country, a territory or specified sector within a third country, or an international organisation, offers an adequate level of data protection, thus providing legal certainty and uniformity throughout the Union as regards the third country or international organisation which is considered to provide such level of protection. In such cases, transfers of personal data to that third country or international organisation may take place without the need to obtain any further authorisation. The Commission may also decide, having given notice and a full statement setting out the reasons to the third country or international organisation, to revoke such a decision.
- (104) In line with the fundamental values on which the Union is founded, in particular the protection of human rights, the Commission should, in its assessment of the third country, or of a territory or specified sector within a third country, take into account how a particular third country respects the rule of law, access to justice as well as international human rights norms and standards and its general and sectoral law, including legislation concerning public security, defence and national security as well as public order and criminal law. The adoption of an adequacy decision with regard to a territory or a specified sector in a third country should take into account clear and objective criteria, such as specific processing activities and the scope of applicable legal standards and legislation in force in the third country. The third country should offer guarantees ensuring an adequate level of

protection essentially equivalent to that ensured within the Union, in particular where personal data are processed in one or several specific sectors. In particular, the third country should ensure effective independent data protection supervision and should provide for cooperation mechanisms with the Member States' data protection authorities, and the data subjects should be provided with effective and enforceable rights and effective administrative and judicial redress.

- (105) Apart from the international commitments the third country or international organisation has entered into, the Commission should take account of obligations arising from the third country's or international organisation's participation in multilateral or regional systems in particular in relation to the protection of personal data, as well as the implementation of such obligations. In particular, the third country's accession to the Council of Europe Convention of 28 January 1981 for the Protection of Individuals with regard to the Automatic Processing of Personal Data and its Additional Protocol should be taken into account. The Commission should consult the Board when assessing the level of protection in third countries or international organisations.
- (106) The Commission should monitor the functioning of decisions on the level of protection in a third country, a territory or specified sector within a third country, or an international organisation, and monitor the functioning of decisions adopted on the basis of Article 25(6) or Article 26(4) of Directive 95/46/EC. In its adequacy decisions, the Commission should provide for a periodic review mechanism of their functioning. That periodic review should be conducted in consultation with the third country or international organisation in question and take into account all relevant developments in the third country or international organisation. For the purposes of monitoring and of carrying out the periodic reviews, the Commission should take into consideration the views and findings of the European Parliament and of the Council as well as of other relevant bodies and sources. The Commission should evaluate, within a reasonable time, the functioning of the latter decisions and report any relevant findings to the Committee within the meaning of Regulation (EU) No 182/2011 of the European Parliament and of the Council ⁽¹⁾ as established under this Regulation, to the European Parliament and to the Council.
- (107) The Commission may recognise that a third country, a territory or a specified sector within a third country, or an international organisation no longer ensures an adequate level of data protection. Consequently the transfer of personal data to that third country or international organisation should be prohibited, unless the requirements in this Regulation relating to transfers subject to appropriate safeguards, including binding corporate rules, and derogations for specific situations are fulfilled. In that case, provision should be made for consultations between the Commission and such third countries or international organisations. The Commission should, in a timely manner, inform the third country or international organisation of the reasons and enter into consultations with it in order to remedy the situation.
- (108) In the absence of an adequacy decision, the controller or processor should take measures to compensate for the lack of data protection in a third country by way of appropriate safeguards for the data subject. Such appropriate safeguards may consist of making use of binding corporate rules, standard data protection clauses adopted by the Commission, standard data protection clauses adopted by a supervisory authority or contractual clauses authorised by a supervisory authority. Those safeguards should ensure compliance with data protection requirements and the rights of the data subjects appropriate to processing within the Union, including the availability of enforceable data subject rights and of effective legal remedies, including to obtain effective administrative or judicial redress and to claim compensation, in the Union or in a third country. They should relate in particular to compliance with the general principles relating to personal data processing, the principles of data protection by design and by default. Transfers may also be carried out by public authorities or bodies with public authorities or bodies in third countries or with international organisations with corresponding duties or functions, including on the basis of provisions to be inserted into administrative arrangements, such as a memorandum of understanding, providing for enforceable and effective rights for data subjects. Authorisation by the competent supervisory authority should be obtained when the safeguards are provided for in administrative arrangements that are not legally binding.
- (109) The possibility for the controller or processor to use standard data-protection clauses adopted by the Commission or by a supervisory authority should prevent controllers or processors neither from including the

⁽¹⁾ Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers (OJ L 55, 28.2.2011, p. 13).

standard data-protection clauses in a wider contract, such as a contract between the processor and another processor, nor from adding other clauses or additional safeguards provided that they do not contradict, directly or indirectly, the standard contractual clauses adopted by the Commission or by a supervisory authority or prejudice the fundamental rights or freedoms of the data subjects. Controllers and processors should be encouraged to provide additional safeguards via contractual commitments that supplement standard protection clauses.

- (110) A group of undertakings, or a group of enterprises engaged in a joint economic activity, should be able to make use of approved binding corporate rules for its international transfers from the Union to organisations within the same group of undertakings, or group of enterprises engaged in a joint economic activity, provided that such corporate rules include all essential principles and enforceable rights to ensure appropriate safeguards for transfers or categories of transfers of personal data.
- (111) Provisions should be made for the possibility for transfers in certain circumstances where the data subject has given his or her explicit consent, where the transfer is occasional and necessary in relation to a contract or a legal claim, regardless of whether in a judicial procedure or whether in an administrative or any out-of-court procedure, including procedures before regulatory bodies. Provision should also be made for the possibility for transfers where important grounds of public interest laid down by Union or Member State law so require or where the transfer is made from a register established by law and intended for consultation by the public or persons having a legitimate interest. In the latter case, such a transfer should not involve the entirety of the personal data or entire categories of the data contained in the register and, when the register is intended for consultation by persons having a legitimate interest, the transfer should be made only at the request of those persons or, if they are to be the recipients, taking into full account the interests and fundamental rights of the data subject.
- (112) Those derogations should in particular apply to data transfers required and necessary for important reasons of public interest, for example in cases of international data exchange between competition authorities, tax or customs administrations, between financial supervisory authorities, between services competent for social security matters, or for public health, for example in the case of contact tracing for contagious diseases or in order to reduce and/or eliminate doping in sport. A transfer of personal data should also be regarded as lawful where it is necessary to protect an interest which is essential for the data subject's or another person's vital interests, including physical integrity or life, if the data subject is incapable of giving consent. In the absence of an adequacy decision, Union or Member State law may, for important reasons of public interest, expressly set limits to the transfer of specific categories of data to a third country or an international organisation. Member States should notify such provisions to the Commission. Any transfer to an international humanitarian organisation of personal data of a data subject who is physically or legally incapable of giving consent, with a view to accomplishing a task incumbent under the Geneva Conventions or to complying with international humanitarian law applicable in armed conflicts, could be considered to be necessary for an important reason of public interest or because it is in the vital interest of the data subject.
- (113) Transfers which can be qualified as not repetitive and that only concern a limited number of data subjects, could also be possible for the purposes of the compelling legitimate interests pursued by the controller, when those interests are not overridden by the interests or rights and freedoms of the data subject and when the controller has assessed all the circumstances surrounding the data transfer. The controller should give particular consideration to the nature of the personal data, the purpose and duration of the proposed processing operation or operations, as well as the situation in the country of origin, the third country and the country of final destination, and should provide suitable safeguards to protect fundamental rights and freedoms of natural persons with regard to the processing of their personal data. Such transfers should be possible only in residual cases where none of the other grounds for transfer are applicable. For scientific or historical research purposes or statistical purposes, the legitimate expectations of society for an increase of knowledge should be taken into consideration. The controller should inform the supervisory authority and the data subject about the transfer.
- (114) In any case, where the Commission has taken no decision on the adequate level of data protection in a third country, the controller or processor should make use of solutions that provide data subjects with enforceable and effective rights as regards the processing of their data in the Union once those data have been transferred so that that they will continue to benefit from fundamental rights and safeguards.

- (115) Some third countries adopt laws, regulations and other legal acts which purport to directly regulate the processing activities of natural and legal persons under the jurisdiction of the Member States. This may include judgments of courts or tribunals or decisions of administrative authorities in third countries requiring a controller or processor to transfer or disclose personal data, and which are not based on an international agreement, such as a mutual legal assistance treaty, in force between the requesting third country and the Union or a Member State. The extraterritorial application of those laws, regulations and other legal acts may be in breach of international law and may impede the attainment of the protection of natural persons ensured in the Union by this Regulation. Transfers should only be allowed where the conditions of this Regulation for a transfer to third countries are met. This may be the case, inter alia, where disclosure is necessary for an important ground of public interest recognised in Union or Member State law to which the controller is subject.
- (116) When personal data moves across borders outside the Union it may put at increased risk the ability of natural persons to exercise data protection rights in particular to protect themselves from the unlawful use or disclosure of that information. At the same time, supervisory authorities may find that they are unable to pursue complaints or conduct investigations relating to the activities outside their borders. Their efforts to work together in the cross-border context may also be hampered by insufficient preventative or remedial powers, inconsistent legal regimes, and practical obstacles like resource constraints. Therefore, there is a need to promote closer cooperation among data protection supervisory authorities to help them exchange information and carry out investigations with their international counterparts. For the purposes of developing international cooperation mechanisms to facilitate and provide international mutual assistance for the enforcement of legislation for the protection of personal data, the Commission and the supervisory authorities should exchange information and cooperate in activities related to the exercise of their powers with competent authorities in third countries, based on reciprocity and in accordance with this Regulation.
- (117) The establishment of supervisory authorities in Member States, empowered to perform their tasks and exercise their powers with complete independence, is an essential component of the protection of natural persons with regard to the processing of their personal data. Member States should be able to establish more than one supervisory authority, to reflect their constitutional, organisational and administrative structure.
- (118) The independence of supervisory authorities should not mean that the supervisory authorities cannot be subject to control or monitoring mechanisms regarding their financial expenditure or to judicial review.
- (119) Where a Member State establishes several supervisory authorities, it should establish by law mechanisms for ensuring the effective participation of those supervisory authorities in the consistency mechanism. That Member State should in particular designate the supervisory authority which functions as a single contact point for the effective participation of those authorities in the mechanism, to ensure swift and smooth cooperation with other supervisory authorities, the Board and the Commission.
- (120) Each supervisory authority should be provided with the financial and human resources, premises and infrastructure necessary for the effective performance of their tasks, including those related to mutual assistance and cooperation with other supervisory authorities throughout the Union. Each supervisory authority should have a separate, public annual budget, which may be part of the overall state or national budget.
- (121) The general conditions for the member or members of the supervisory authority should be laid down by law in each Member State and should in particular provide that those members are to be appointed, by means of a transparent procedure, either by the parliament, government or the head of State of the Member State on the basis of a proposal from the government, a member of the government, the parliament or a chamber of the parliament, or by an independent body entrusted under Member State law. In order to ensure the independence of the supervisory authority, the member or members should act with integrity, refrain from any action that is incompatible with their duties and should not, during their term of office, engage in any incompatible occupation, whether gainful or not. The supervisory authority should have its own staff, chosen by the supervisory authority or an independent body established by Member State law, which should be subject to the exclusive direction of the member or members of the supervisory authority.
- (122) Each supervisory authority should be competent on the territory of its own Member State to exercise the powers and to perform the tasks conferred on it in accordance with this Regulation. This should cover in particular the

processing in the context of the activities of an establishment of the controller or processor on the territory of its own Member State, the processing of personal data carried out by public authorities or private bodies acting in the public interest, processing affecting data subjects on its territory or processing carried out by a controller or processor not established in the Union when targeting data subjects residing on its territory. This should include handling complaints lodged by a data subject, conducting investigations on the application of this Regulation and promoting public awareness of the risks, rules, safeguards and rights in relation to the processing of personal data.

- (123) The supervisory authorities should monitor the application of the provisions pursuant to this Regulation and contribute to its consistent application throughout the Union, in order to protect natural persons in relation to the processing of their personal data and to facilitate the free flow of personal data within the internal market. For that purpose, the supervisory authorities should cooperate with each other and with the Commission, without the need for any agreement between Member States on the provision of mutual assistance or on such cooperation.
- (124) Where the processing of personal data takes place in the context of the activities of an establishment of a controller or a processor in the Union and the controller or processor is established in more than one Member State, or where processing taking place in the context of the activities of a single establishment of a controller or processor in the Union substantially affects or is likely to substantially affect data subjects in more than one Member State, the supervisory authority for the main establishment of the controller or processor or for the single establishment of the controller or processor should act as lead authority. It should cooperate with the other authorities concerned, because the controller or processor has an establishment on the territory of their Member State, because data subjects residing on their territory are substantially affected, or because a complaint has been lodged with them. Also where a data subject not residing in that Member State has lodged a complaint, the supervisory authority with which such complaint has been lodged should also be a supervisory authority concerned. Within its tasks to issue guidelines on any question covering the application of this Regulation, the Board should be able to issue guidelines in particular on the criteria to be taken into account in order to ascertain whether the processing in question substantially affects data subjects in more than one Member State and on what constitutes a relevant and reasoned objection.
- (125) The lead authority should be competent to adopt binding decisions regarding measures applying the powers conferred on it in accordance with this Regulation. In its capacity as lead authority, the supervisory authority should closely involve and coordinate the supervisory authorities concerned in the decision-making process. Where the decision is to reject the complaint by the data subject in whole or in part, that decision should be adopted by the supervisory authority with which the complaint has been lodged.
- (126) The decision should be agreed jointly by the lead supervisory authority and the supervisory authorities concerned and should be directed towards the main or single establishment of the controller or processor and be binding on the controller and processor. The controller or processor should take the necessary measures to ensure compliance with this Regulation and the implementation of the decision notified by the lead supervisory authority to the main establishment of the controller or processor as regards the processing activities in the Union.
- (127) Each supervisory authority not acting as the lead supervisory authority should be competent to handle local cases where the controller or processor is established in more than one Member State, but the subject matter of the specific processing concerns only processing carried out in a single Member State and involves only data subjects in that single Member State, for example, where the subject matter concerns the processing of employees' personal data in the specific employment context of a Member State. In such cases, the supervisory authority should inform the lead supervisory authority without delay about the matter. After being informed, the lead supervisory authority should decide, whether it will handle the case pursuant to the provision on cooperation between the lead supervisory authority and other supervisory authorities concerned ('one-stop-shop mechanism'), or whether the supervisory authority which informed it should handle the case at local level. When deciding whether it will handle the case, the lead supervisory authority should take into account whether there is an establishment of the controller or processor in the Member State of the supervisory authority which informed it in order to ensure effective enforcement of a decision *vis-à-vis* the controller or processor. Where the lead supervisory authority decides to handle the case, the supervisory authority which informed it should have the

possibility to submit a draft for a decision, of which the lead supervisory authority should take utmost account when preparing its draft decision in that one-stop-shop mechanism.

- (128) The rules on the lead supervisory authority and the one-stop-shop mechanism should not apply where the processing is carried out by public authorities or private bodies in the public interest. In such cases the only supervisory authority competent to exercise the powers conferred to it in accordance with this Regulation should be the supervisory authority of the Member State where the public authority or private body is established.
- (129) In order to ensure consistent monitoring and enforcement of this Regulation throughout the Union, the supervisory authorities should have in each Member State the same tasks and effective powers, including powers of investigation, corrective powers and sanctions, and authorisation and advisory powers, in particular in cases of complaints from natural persons, and without prejudice to the powers of prosecutorial authorities under Member State law, to bring infringements of this Regulation to the attention of the judicial authorities and engage in legal proceedings. Such powers should also include the power to impose a temporary or definitive limitation, including a ban, on processing. Member States may specify other tasks related to the protection of personal data under this Regulation. The powers of supervisory authorities should be exercised in accordance with appropriate procedural safeguards set out in Union and Member State law, impartially, fairly and within a reasonable time. In particular each measure should be appropriate, necessary and proportionate in view of ensuring compliance with this Regulation, taking into account the circumstances of each individual case, respect the right of every person to be heard before any individual measure which would affect him or her adversely is taken and avoid superfluous costs and excessive inconveniences for the persons concerned. Investigatory powers as regards access to premises should be exercised in accordance with specific requirements in Member State procedural law, such as the requirement to obtain a prior judicial authorisation. Each legally binding measure of the supervisory authority should be in writing, be clear and unambiguous, indicate the supervisory authority which has issued the measure, the date of issue of the measure, bear the signature of the head, or a member of the supervisory authority authorised by him or her, give the reasons for the measure, and refer to the right of an effective remedy. This should not preclude additional requirements pursuant to Member State procedural law. The adoption of a legally binding decision implies that it may give rise to judicial review in the Member State of the supervisory authority that adopted the decision.
- (130) Where the supervisory authority with which the complaint has been lodged is not the lead supervisory authority, the lead supervisory authority should closely cooperate with the supervisory authority with which the complaint has been lodged in accordance with the provisions on cooperation and consistency laid down in this Regulation. In such cases, the lead supervisory authority should, when taking measures intended to produce legal effects, including the imposition of administrative fines, take utmost account of the view of the supervisory authority with which the complaint has been lodged and which should remain competent to carry out any investigation on the territory of its own Member State in liaison with the competent supervisory authority.
- (131) Where another supervisory authority should act as a lead supervisory authority for the processing activities of the controller or processor but the concrete subject matter of a complaint or the possible infringement concerns only processing activities of the controller or processor in the Member State where the complaint has been lodged or the possible infringement detected and the matter does not substantially affect or is not likely to substantially affect data subjects in other Member States, the supervisory authority receiving a complaint or detecting or being informed otherwise of situations that entail possible infringements of this Regulation should seek an amicable settlement with the controller and, if this proves unsuccessful, exercise its full range of powers. This should include: specific processing carried out in the territory of the Member State of the supervisory authority or with regard to data subjects on the territory of that Member State; processing that is carried out in the context of an offer of goods or services specifically aimed at data subjects in the territory of the Member State of the supervisory authority; or processing that has to be assessed taking into account relevant legal obligations under Member State law.
- (132) Awareness-raising activities by supervisory authorities addressed to the public should include specific measures directed at controllers and processors, including micro, small and medium-sized enterprises, as well as natural persons in particular in the educational context.

- (133) The supervisory authorities should assist each other in performing their tasks and provide mutual assistance, so as to ensure the consistent application and enforcement of this Regulation in the internal market. A supervisory authority requesting mutual assistance may adopt a provisional measure if it receives no response to a request for mutual assistance within one month of the receipt of that request by the other supervisory authority.
- (134) Each supervisory authority should, where appropriate, participate in joint operations with other supervisory authorities. The requested supervisory authority should be obliged to respond to the request within a specified time period.
- (135) In order to ensure the consistent application of this Regulation throughout the Union, a consistency mechanism for cooperation between the supervisory authorities should be established. That mechanism should in particular apply where a supervisory authority intends to adopt a measure intended to produce legal effects as regards processing operations which substantially affect a significant number of data subjects in several Member States. It should also apply where any supervisory authority concerned or the Commission requests that such matter should be handled in the consistency mechanism. That mechanism should be without prejudice to any measures that the Commission may take in the exercise of its powers under the Treaties.
- (136) In applying the consistency mechanism, the Board should, within a determined period of time, issue an opinion, if a majority of its members so decides or if so requested by any supervisory authority concerned or the Commission. The Board should also be empowered to adopt legally binding decisions where there are disputes between supervisory authorities. For that purpose, it should issue, in principle by a two-thirds majority of its members, legally binding decisions in clearly specified cases where there are conflicting views among supervisory authorities, in particular in the cooperation mechanism between the lead supervisory authority and supervisory authorities concerned on the merits of the case, in particular whether there is an infringement of this Regulation.
- (137) There may be an urgent need to act in order to protect the rights and freedoms of data subjects, in particular when the danger exists that the enforcement of a right of a data subject could be considerably impeded. A supervisory authority should therefore be able to adopt duly justified provisional measures on its territory with a specified period of validity which should not exceed three months.
- (138) The application of such mechanism should be a condition for the lawfulness of a measure intended to produce legal effects by a supervisory authority in those cases where its application is mandatory. In other cases of cross-border relevance, the cooperation mechanism between the lead supervisory authority and supervisory authorities concerned should be applied and mutual assistance and joint operations might be carried out between the supervisory authorities concerned on a bilateral or multilateral basis without triggering the consistency mechanism.
- (139) In order to promote the consistent application of this Regulation, the Board should be set up as an independent body of the Union. To fulfil its objectives, the Board should have legal personality. The Board should be represented by its Chair. It should replace the Working Party on the Protection of Individuals with Regard to the Processing of Personal Data established by Directive 95/46/EC. It should consist of the head of a supervisory authority of each Member State and the European Data Protection Supervisor or their respective representatives. The Commission should participate in the Board's activities without voting rights and the European Data Protection Supervisor should have specific voting rights. The Board should contribute to the consistent application of this Regulation throughout the Union, including by advising the Commission, in particular on the level of protection in third countries or international organisations, and promoting cooperation of the supervisory authorities throughout the Union. The Board should act independently when performing its tasks.
- (140) The Board should be assisted by a secretariat provided by the European Data Protection Supervisor. The staff of the European Data Protection Supervisor involved in carrying out the tasks conferred on the Board by this Regulation should perform its tasks exclusively under the instructions of, and report to, the Chair of the Board.
- (141) Every data subject should have the right to lodge a complaint with a single supervisory authority, in particular in the Member State of his or her habitual residence, and the right to an effective judicial remedy in accordance

with Article 47 of the Charter if the data subject considers that his or her rights under this Regulation are infringed or where the supervisory authority does not act on a complaint, partially or wholly rejects or dismisses a complaint or does not act where such action is necessary to protect the rights of the data subject. The investigation following a complaint should be carried out, subject to judicial review, to the extent that is appropriate in the specific case. The supervisory authority should inform the data subject of the progress and the outcome of the complaint within a reasonable period. If the case requires further investigation or coordination with another supervisory authority, intermediate information should be given to the data subject. In order to facilitate the submission of complaints, each supervisory authority should take measures such as providing a complaint submission form which can also be completed electronically, without excluding other means of communication.

- (142) Where a data subject considers that his or her rights under this Regulation are infringed, he or she should have the right to mandate a not-for-profit body, organisation or association which is constituted in accordance with the law of a Member State, has statutory objectives which are in the public interest and is active in the field of the protection of personal data to lodge a complaint on his or her behalf with a supervisory authority, exercise the right to a judicial remedy on behalf of data subjects or, if provided for in Member State law, exercise the right to receive compensation on behalf of data subjects. A Member State may provide for such a body, organisation or association to have the right to lodge a complaint in that Member State, independently of a data subject's mandate, and the right to an effective judicial remedy where it has reasons to consider that the rights of a data subject have been infringed as a result of the processing of personal data which infringes this Regulation. That body, organisation or association may not be allowed to claim compensation on a data subject's behalf independently of the data subject's mandate.
- (143) Any natural or legal person has the right to bring an action for annulment of decisions of the Board before the Court of Justice under the conditions provided for in Article 263 TFEU. As addressees of such decisions, the supervisory authorities concerned which wish to challenge them have to bring action within two months of being notified of them, in accordance with Article 263 TFEU. Where decisions of the Board are of direct and individual concern to a controller, processor or complainant, the latter may bring an action for annulment against those decisions within two months of their publication on the website of the Board, in accordance with Article 263 TFEU. Without prejudice to this right under Article 263 TFEU, each natural or legal person should have an effective judicial remedy before the competent national court against a decision of a supervisory authority which produces legal effects concerning that person. Such a decision concerns in particular the exercise of investigative, corrective and authorisation powers by the supervisory authority or the dismissal or rejection of complaints. However, the right to an effective judicial remedy does not encompass measures taken by supervisory authorities which are not legally binding, such as opinions issued by or advice provided by the supervisory authority. Proceedings against a supervisory authority should be brought before the courts of the Member State where the supervisory authority is established and should be conducted in accordance with that Member State's procedural law. Those courts should exercise full jurisdiction, which should include jurisdiction to examine all questions of fact and law relevant to the dispute before them.

Where a complaint has been rejected or dismissed by a supervisory authority, the complainant may bring proceedings before the courts in the same Member State. In the context of judicial remedies relating to the application of this Regulation, national courts which consider a decision on the question necessary to enable them to give judgment, may, or in the case provided for in Article 267 TFEU, must, request the Court of Justice to give a preliminary ruling on the interpretation of Union law, including this Regulation. Furthermore, where a decision of a supervisory authority implementing a decision of the Board is challenged before a national court and the validity of the decision of the Board is at issue, that national court does not have the power to declare the Board's decision invalid but must refer the question of validity to the Court of Justice in accordance with Article 267 TFEU as interpreted by the Court of Justice, where it considers the decision invalid. However, a national court may not refer a question on the validity of the decision of the Board at the request of a natural or legal person which had the opportunity to bring an action for annulment of that decision, in particular if it was directly and individually concerned by that decision, but had not done so within the period laid down in Article 263 TFEU.

- (144) Where a court seized of proceedings against a decision by a supervisory authority has reason to believe that proceedings concerning the same processing, such as the same subject matter as regards processing by the same controller or processor, or the same cause of action, are brought before a competent court in another Member State, it should contact that court in order to confirm the existence of such related proceedings. If related proceedings are pending before a court in another Member State, any court other than the court first

seized may stay its proceedings or may, on request of one of the parties, decline jurisdiction in favour of the court first seized if that court has jurisdiction over the proceedings in question and its law permits the consolidation of such related proceedings. Proceedings are deemed to be related where they are so closely connected that it is expedient to hear and determine them together in order to avoid the risk of irreconcilable judgments resulting from separate proceedings.

- (145) For proceedings against a controller or processor, the plaintiff should have the choice to bring the action before the courts of the Member States where the controller or processor has an establishment or where the data subject resides, unless the controller is a public authority of a Member State acting in the exercise of its public powers.
- (146) The controller or processor should compensate any damage which a person may suffer as a result of processing that infringes this Regulation. The controller or processor should be exempt from liability if it proves that it is not in any way responsible for the damage. The concept of damage should be broadly interpreted in the light of the case-law of the Court of Justice in a manner which fully reflects the objectives of this Regulation. This is without prejudice to any claims for damage deriving from the violation of other rules in Union or Member State law. Processing that infringes this Regulation also includes processing that infringes delegated and implementing acts adopted in accordance with this Regulation and Member State law specifying rules of this Regulation. Data subjects should receive full and effective compensation for the damage they have suffered. Where controllers or processors are involved in the same processing, each controller or processor should be held liable for the entire damage. However, where they are joined to the same judicial proceedings, in accordance with Member State law, compensation may be apportioned according to the responsibility of each controller or processor for the damage caused by the processing, provided that full and effective compensation of the data subject who suffered the damage is ensured. Any controller or processor which has paid full compensation may subsequently institute recourse proceedings against other controllers or processors involved in the same processing.
- (147) Where specific rules on jurisdiction are contained in this Regulation, in particular as regards proceedings seeking a judicial remedy including compensation, against a controller or processor, general jurisdiction rules such as those of Regulation (EU) No 1215/2012 of the European Parliament and of the Council ⁽¹⁾ should not prejudice the application of such specific rules.
- (148) In order to strengthen the enforcement of the rules of this Regulation, penalties including administrative fines should be imposed for any infringement of this Regulation, in addition to, or instead of appropriate measures imposed by the supervisory authority pursuant to this Regulation. In a case of a minor infringement or if the fine likely to be imposed would constitute a disproportionate burden to a natural person, a reprimand may be issued instead of a fine. Due regard should however be given to the nature, gravity and duration of the infringement, the intentional character of the infringement, actions taken to mitigate the damage suffered, degree of responsibility or any relevant previous infringements, the manner in which the infringement became known to the supervisory authority, compliance with measures ordered against the controller or processor, adherence to a code of conduct and any other aggravating or mitigating factor. The imposition of penalties including administrative fines should be subject to appropriate procedural safeguards in accordance with the general principles of Union law and the Charter, including effective judicial protection and due process.
- (149) Member States should be able to lay down the rules on criminal penalties for infringements of this Regulation, including for infringements of national rules adopted pursuant to and within the limits of this Regulation. Those criminal penalties may also allow for the deprivation of the profits obtained through infringements of this Regulation. However, the imposition of criminal penalties for infringements of such national rules and of administrative penalties should not lead to a breach of the principle of *ne bis in idem*, as interpreted by the Court of Justice.
- (150) In order to strengthen and harmonise administrative penalties for infringements of this Regulation, each supervisory authority should have the power to impose administrative fines. This Regulation should indicate

⁽¹⁾ Regulation (EU) No 1215/2012 of the European Parliament and of the Council of 12 December 2012 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (OJ L 351, 20.12.2012, p. 1).

infringements and the upper limit and criteria for setting the related administrative fines, which should be determined by the competent supervisory authority in each individual case, taking into account all relevant circumstances of the specific situation, with due regard in particular to the nature, gravity and duration of the infringement and of its consequences and the measures taken to ensure compliance with the obligations under this Regulation and to prevent or mitigate the consequences of the infringement. Where administrative fines are imposed on an undertaking, an undertaking should be understood to be an undertaking in accordance with Articles 101 and 102 TFEU for those purposes. Where administrative fines are imposed on persons that are not an undertaking, the supervisory authority should take account of the general level of income in the Member State as well as the economic situation of the person in considering the appropriate amount of the fine. The consistency mechanism may also be used to promote a consistent application of administrative fines. It should be for the Member States to determine whether and to which extent public authorities should be subject to administrative fines. Imposing an administrative fine or giving a warning does not affect the application of other powers of the supervisory authorities or of other penalties under this Regulation.

- (151) The legal systems of Denmark and Estonia do not allow for administrative fines as set out in this Regulation. The rules on administrative fines may be applied in such a manner that in Denmark the fine is imposed by competent national courts as a criminal penalty and in Estonia the fine is imposed by the supervisory authority in the framework of a misdemeanour procedure, provided that such an application of the rules in those Member States has an equivalent effect to administrative fines imposed by supervisory authorities. Therefore the competent national courts should take into account the recommendation by the supervisory authority initiating the fine. In any event, the fines imposed should be effective, proportionate and dissuasive.
- (152) Where this Regulation does not harmonise administrative penalties or where necessary in other cases, for example in cases of serious infringements of this Regulation, Member States should implement a system which provides for effective, proportionate and dissuasive penalties. The nature of such penalties, criminal or administrative, should be determined by Member State law.
- (153) Member States law should reconcile the rules governing freedom of expression and information, including journalistic, academic, artistic and or literary expression with the right to the protection of personal data pursuant to this Regulation. The processing of personal data solely for journalistic purposes, or for the purposes of academic, artistic or literary expression should be subject to derogations or exemptions from certain provisions of this Regulation if necessary to reconcile the right to the protection of personal data with the right to freedom of expression and information, as enshrined in Article 11 of the Charter. This should apply in particular to the processing of personal data in the audiovisual field and in news archives and press libraries. Therefore, Member States should adopt legislative measures which lay down the exemptions and derogations necessary for the purpose of balancing those fundamental rights. Member States should adopt such exemptions and derogations on general principles, the rights of the data subject, the controller and the processor, the transfer of personal data to third countries or international organisations, the independent supervisory authorities, cooperation and consistency, and specific data-processing situations. Where such exemptions or derogations differ from one Member State to another, the law of the Member State to which the controller is subject should apply. In order to take account of the importance of the right to freedom of expression in every democratic society, it is necessary to interpret notions relating to that freedom, such as journalism, broadly.
- (154) This Regulation allows the principle of public access to official documents to be taken into account when applying this Regulation. Public access to official documents may be considered to be in the public interest. Personal data in documents held by a public authority or a public body should be able to be publicly disclosed by that authority or body if the disclosure is provided for by Union or Member State law to which the public authority or public body is subject. Such laws should reconcile public access to official documents and the reuse of public sector information with the right to the protection of personal data and may therefore provide for the necessary reconciliation with the right to the protection of personal data pursuant to this Regulation. The reference to public authorities and bodies should in that context include all authorities or other bodies covered by Member State law on public access to documents. Directive 2003/98/EC of the European Parliament and of the Council ⁽¹⁾ leaves intact and in no way affects the level of protection of natural persons with regard to the

⁽¹⁾ Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information (OJ L 345, 31.12.2003, p. 90).

processing of personal data under the provisions of Union and Member State law, and in particular does not alter the obligations and rights set out in this Regulation. In particular, that Directive should not apply to documents to which access is excluded or restricted by virtue of the access regimes on the grounds of protection of personal data, and parts of documents accessible by virtue of those regimes which contain personal data the re-use of which has been provided for by law as being incompatible with the law concerning the protection of natural persons with regard to the processing of personal data.

- (155) Member State law or collective agreements, including ‘works agreements’, may provide for specific rules on the processing of employees’ personal data in the employment context, in particular for the conditions under which personal data in the employment context may be processed on the basis of the consent of the employee, the purposes of the recruitment, the performance of the contract of employment, including discharge of obligations laid down by law or by collective agreements, management, planning and organisation of work, equality and diversity in the workplace, health and safety at work, and for the purposes of the exercise and enjoyment, on an individual or collective basis, of rights and benefits related to employment, and for the purpose of the termination of the employment relationship.
- (156) The processing of personal data for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes should be subject to appropriate safeguards for the rights and freedoms of the data subject pursuant to this Regulation. Those safeguards should ensure that technical and organisational measures are in place in order to ensure, in particular, the principle of data minimisation. The further processing of personal data for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes is to be carried out when the controller has assessed the feasibility to fulfil those purposes by processing data which do not permit or no longer permit the identification of data subjects, provided that appropriate safeguards exist (such as, for instance, pseudonymisation of the data). Member States should provide for appropriate safeguards for the processing of personal data for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes. Member States should be authorised to provide, under specific conditions and subject to appropriate safeguards for data subjects, specifications and derogations with regard to the information requirements and rights to rectification, to erasure, to be forgotten, to restriction of processing, to data portability, and to object when processing personal data for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes. The conditions and safeguards in question may entail specific procedures for data subjects to exercise those rights if this is appropriate in the light of the purposes sought by the specific processing along with technical and organisational measures aimed at minimising the processing of personal data in pursuance of the proportionality and necessity principles. The processing of personal data for scientific purposes should also comply with other relevant legislation such as on clinical trials.
- (157) By coupling information from registries, researchers can obtain new knowledge of great value with regard to widespread medical conditions such as cardiovascular disease, cancer and depression. On the basis of registries, research results can be enhanced, as they draw on a larger population. Within social science, research on the basis of registries enables researchers to obtain essential knowledge about the long-term correlation of a number of social conditions such as unemployment and education with other life conditions. Research results obtained through registries provide solid, high-quality knowledge which can provide the basis for the formulation and implementation of knowledge-based policy, improve the quality of life for a number of people and improve the efficiency of social services. In order to facilitate scientific research, personal data can be processed for scientific research purposes, subject to appropriate conditions and safeguards set out in Union or Member State law.
- (158) Where personal data are processed for archiving purposes, this Regulation should also apply to that processing, bearing in mind that this Regulation should not apply to deceased persons. Public authorities or public or private bodies that hold records of public interest should be services which, pursuant to Union or Member State law, have a legal obligation to acquire, preserve, appraise, arrange, describe, communicate, promote, disseminate and provide access to records of enduring value for general public interest. Member States should also be authorised to provide for the further processing of personal data for archiving purposes, for example with a view to providing specific information related to the political behaviour under former totalitarian state regimes, genocide, crimes against humanity, in particular the Holocaust, or war crimes.

- (159) Where personal data are processed for scientific research purposes, this Regulation should also apply to that processing. For the purposes of this Regulation, the processing of personal data for scientific research purposes should be interpreted in a broad manner including for example technological development and demonstration, fundamental research, applied research and privately funded research. In addition, it should take into account the Union's objective under Article 179(1) TFEU of achieving a European Research Area. Scientific research purposes should also include studies conducted in the public interest in the area of public health. To meet the specificities of processing personal data for scientific research purposes, specific conditions should apply in particular as regards the publication or otherwise disclosure of personal data in the context of scientific research purposes. If the result of scientific research in particular in the health context gives reason for further measures in the interest of the data subject, the general rules of this Regulation should apply in view of those measures.
- (160) Where personal data are processed for historical research purposes, this Regulation should also apply to that processing. This should also include historical research and research for genealogical purposes, bearing in mind that this Regulation should not apply to deceased persons.
- (161) For the purpose of consenting to the participation in scientific research activities in clinical trials, the relevant provisions of Regulation (EU) No 536/2014 of the European Parliament and of the Council ⁽¹⁾ should apply.
- (162) Where personal data are processed for statistical purposes, this Regulation should apply to that processing. Union or Member State law should, within the limits of this Regulation, determine statistical content, control of access, specifications for the processing of personal data for statistical purposes and appropriate measures to safeguard the rights and freedoms of the data subject and for ensuring statistical confidentiality. Statistical purposes mean any operation of collection and the processing of personal data necessary for statistical surveys or for the production of statistical results. Those statistical results may further be used for different purposes, including a scientific research purpose. The statistical purpose implies that the result of processing for statistical purposes is not personal data, but aggregate data, and that this result or the personal data are not used in support of measures or decisions regarding any particular natural person.
- (163) The confidential information which the Union and national statistical authorities collect for the production of official European and official national statistics should be protected. European statistics should be developed, produced and disseminated in accordance with the statistical principles as set out in Article 338(2) TFEU, while national statistics should also comply with Member State law. Regulation (EC) No 223/2009 of the European Parliament and of the Council ⁽²⁾ provides further specifications on statistical confidentiality for European statistics.
- (164) As regards the powers of the supervisory authorities to obtain from the controller or processor access to personal data and access to their premises, Member States may adopt by law, within the limits of this Regulation, specific rules in order to safeguard the professional or other equivalent secrecy obligations, in so far as necessary to reconcile the right to the protection of personal data with an obligation of professional secrecy. This is without prejudice to existing Member State obligations to adopt rules on professional secrecy where required by Union law.
- (165) This Regulation respects and does not prejudice the status under existing constitutional law of churches and religious associations or communities in the Member States, as recognised in Article 17 TFEU.
- (166) In order to fulfil the objectives of this Regulation, namely to protect the fundamental rights and freedoms of natural persons and in particular their right to the protection of personal data and to ensure the free movement

⁽¹⁾ Regulation (EU) No 536/2014 of the European Parliament and of the Council of 16 April 2014 on clinical trials on medicinal products for human use, and repealing Directive 2001/20/EC (OJ L 158, 27.5.2014, p. 1).

⁽²⁾ Regulation (EC) No 223/2009 of the European Parliament and of the Council of 11 March 2009 on European statistics and repealing Regulation (EC, Euratom) No 1101/2008 of the European Parliament and of the Council on the transmission of data subject to statistical confidentiality to the Statistical Office of the European Communities, Council Regulation (EC) No 322/97 on Community Statistics, and Council Decision 89/382/EEC, Euratom establishing a Committee on the Statistical Programmes of the European Communities (OJ L 87, 31.3.2009, p. 164).

of personal data within the Union, the power to adopt acts in accordance with Article 290 TFEU should be delegated to the Commission. In particular, delegated acts should be adopted in respect of criteria and requirements for certification mechanisms, information to be presented by standardised icons and procedures for providing such icons. It is of particular importance that the Commission carry out appropriate consultations during its preparatory work, including at expert level. The Commission, when preparing and drawing-up delegated acts, should ensure a simultaneous, timely and appropriate transmission of relevant documents to the European Parliament and to the Council.

- (167) In order to ensure uniform conditions for the implementation of this Regulation, implementing powers should be conferred on the Commission when provided for by this Regulation. Those powers should be exercised in accordance with Regulation (EU) No 182/2011. In that context, the Commission should consider specific measures for micro, small and medium-sized enterprises.
- (168) The examination procedure should be used for the adoption of implementing acts on standard contractual clauses between controllers and processors and between processors; codes of conduct; technical standards and mechanisms for certification; the adequate level of protection afforded by a third country, a territory or a specified sector within that third country, or an international organisation; standard protection clauses; formats and procedures for the exchange of information by electronic means between controllers, processors and supervisory authorities for binding corporate rules; mutual assistance; and arrangements for the exchange of information by electronic means between supervisory authorities, and between supervisory authorities and the Board.
- (169) The Commission should adopt immediately applicable implementing acts where available evidence reveals that a third country, a territory or a specified sector within that third country, or an international organisation does not ensure an adequate level of protection, and imperative grounds of urgency so require.
- (170) Since the objective of this Regulation, namely to ensure an equivalent level of protection of natural persons and the free flow of personal data throughout the Union, cannot be sufficiently achieved by the Member States and can rather, by reason of the scale or effects of the action, be better achieved at Union level, the Union may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 of the Treaty on European Union (TEU). In accordance with the principle of proportionality as set out in that Article, this Regulation does not go beyond what is necessary in order to achieve that objective.
- (171) Directive 95/46/EC should be repealed by this Regulation. Processing already under way on the date of application of this Regulation should be brought into conformity with this Regulation within the period of two years after which this Regulation enters into force. Where processing is based on consent pursuant to Directive 95/46/EC, it is not necessary for the data subject to give his or her consent again if the manner in which the consent has been given is in line with the conditions of this Regulation, so as to allow the controller to continue such processing after the date of application of this Regulation. Commission decisions adopted and authorisations by supervisory authorities based on Directive 95/46/EC remain in force until amended, replaced or repealed.
- (172) The European Data Protection Supervisor was consulted in accordance with Article 28(2) of Regulation (EC) No 45/2001 and delivered an opinion on 7 March 2012 ⁽¹⁾.
- (173) This Regulation should apply to all matters concerning the protection of fundamental rights and freedoms *vis-à-vis* the processing of personal data which are not subject to specific obligations with the same objective set out in Directive 2002/58/EC of the European Parliament and of the Council ⁽²⁾, including the obligations on the controller and the rights of natural persons. In order to clarify the relationship between this Regulation and Directive 2002/58/EC, that Directive should be amended accordingly. Once this Regulation is adopted, Directive 2002/58/EC should be reviewed in particular in order to ensure consistency with this Regulation,

⁽¹⁾ OJ C 192, 30.6.2012, p. 7.

⁽²⁾ Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications) (OJ L 201, 31.7.2002, p. 37).

HAVE ADOPTED THIS REGULATION:

CHAPTER I

General provisions

Article 1

Subject-matter and objectives

1. This Regulation lays down rules relating to the protection of natural persons with regard to the processing of personal data and rules relating to the free movement of personal data.
2. This Regulation protects fundamental rights and freedoms of natural persons and in particular their right to the protection of personal data.
3. The free movement of personal data within the Union shall be neither restricted nor prohibited for reasons connected with the protection of natural persons with regard to the processing of personal data.

Article 2

Material scope

1. This Regulation applies to the processing of personal data wholly or partly by automated means and to the processing other than by automated means of personal data which form part of a filing system or are intended to form part of a filing system.
2. This Regulation does not apply to the processing of personal data:
 - (a) in the course of an activity which falls outside the scope of Union law;
 - (b) by the Member States when carrying out activities which fall within the scope of Chapter 2 of Title V of the TEU;
 - (c) by a natural person in the course of a purely personal or household activity;
 - (d) by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security.
3. For the processing of personal data by the Union institutions, bodies, offices and agencies, Regulation (EC) No 45/2001 applies. Regulation (EC) No 45/2001 and other Union legal acts applicable to such processing of personal data shall be adapted to the principles and rules of this Regulation in accordance with Article 98.
4. This Regulation shall be without prejudice to the application of Directive 2000/31/EC, in particular of the liability rules of intermediary service providers in Articles 12 to 15 of that Directive.

Article 3

Territorial scope

1. This Regulation applies to the processing of personal data in the context of the activities of an establishment of a controller or a processor in the Union, regardless of whether the processing takes place in the Union or not.

2. This Regulation applies to the processing of personal data of data subjects who are in the Union by a controller or processor not established in the Union, where the processing activities are related to:

- (a) the offering of goods or services, irrespective of whether a payment of the data subject is required, to such data subjects in the Union; or
- (b) the monitoring of their behaviour as far as their behaviour takes place within the Union.

3. This Regulation applies to the processing of personal data by a controller not established in the Union, but in a place where Member State law applies by virtue of public international law.

Article 4

Definitions

For the purposes of this Regulation:

- (1) 'personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person;
- (2) 'processing' means any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means, such as collection, recording, organisation, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction;
- (3) 'restriction of processing' means the marking of stored personal data with the aim of limiting their processing in the future;
- (4) 'profiling' means any form of automated processing of personal data consisting of the use of personal data to evaluate certain personal aspects relating to a natural person, in particular to analyse or predict aspects concerning that natural person's performance at work, economic situation, health, personal preferences, interests, reliability, behaviour, location or movements;
- (5) 'pseudonymisation' means the processing of personal data in such a manner that the personal data can no longer be attributed to a specific data subject without the use of additional information, provided that such additional information is kept separately and is subject to technical and organisational measures to ensure that the personal data are not attributed to an identified or identifiable natural person;
- (6) 'filing system' means any structured set of personal data which are accessible according to specific criteria, whether centralised, decentralised or dispersed on a functional or geographical basis;
- (7) 'controller' means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data; where the purposes and means of such processing are determined by Union or Member State law, the controller or the specific criteria for its nomination may be provided for by Union or Member State law;
- (8) 'processor' means a natural or legal person, public authority, agency or other body which processes personal data on behalf of the controller;
- (9) 'recipient' means a natural or legal person, public authority, agency or another body, to which the personal data are disclosed, whether a third party or not. However, public authorities which may receive personal data in the

framework of a particular inquiry in accordance with Union or Member State law shall not be regarded as recipients; the processing of those data by those public authorities shall be in compliance with the applicable data protection rules according to the purposes of the processing;

- (10) 'third party' means a natural or legal person, public authority, agency or body other than the data subject, controller, processor and persons who, under the direct authority of the controller or processor, are authorised to process personal data;
- (11) 'consent' of the data subject means any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her;
- (12) 'personal data breach' means a breach of security leading to the accidental or unlawful destruction, loss, alteration, unauthorised disclosure of, or access to, personal data transmitted, stored or otherwise processed;
- (13) 'genetic data' means personal data relating to the inherited or acquired genetic characteristics of a natural person which give unique information about the physiology or the health of that natural person and which result, in particular, from an analysis of a biological sample from the natural person in question;
- (14) 'biometric data' means personal data resulting from specific technical processing relating to the physical, physiological or behavioural characteristics of a natural person, which allow or confirm the unique identification of that natural person, such as facial images or dactyloscopic data;
- (15) 'data concerning health' means personal data related to the physical or mental health of a natural person, including the provision of health care services, which reveal information about his or her health status;
- (16) 'main establishment' means:
 - (a) as regards a controller with establishments in more than one Member State, the place of its central administration in the Union, unless the decisions on the purposes and means of the processing of personal data are taken in another establishment of the controller in the Union and the latter establishment has the power to have such decisions implemented, in which case the establishment having taken such decisions is to be considered to be the main establishment;
 - (b) as regards a processor with establishments in more than one Member State, the place of its central administration in the Union, or, if the processor has no central administration in the Union, the establishment of the processor in the Union where the main processing activities in the context of the activities of an establishment of the processor take place to the extent that the processor is subject to specific obligations under this Regulation;
- (17) 'representative' means a natural or legal person established in the Union who, designated by the controller or processor in writing pursuant to Article 27, represents the controller or processor with regard to their respective obligations under this Regulation;
- (18) 'enterprise' means a natural or legal person engaged in an economic activity, irrespective of its legal form, including partnerships or associations regularly engaged in an economic activity;
- (19) 'group of undertakings' means a controlling undertaking and its controlled undertakings;
- (20) 'binding corporate rules' means personal data protection policies which are adhered to by a controller or processor established on the territory of a Member State for transfers or a set of transfers of personal data to a controller or processor in one or more third countries within a group of undertakings, or group of enterprises engaged in a joint economic activity;
- (21) 'supervisory authority' means an independent public authority which is established by a Member State pursuant to Article 51;

- (22) ‘supervisory authority concerned’ means a supervisory authority which is concerned by the processing of personal data because:
- (a) the controller or processor is established on the territory of the Member State of that supervisory authority;
 - (b) data subjects residing in the Member State of that supervisory authority are substantially affected or likely to be substantially affected by the processing; or
 - (c) a complaint has been lodged with that supervisory authority;
- (23) ‘cross-border processing’ means either:
- (a) processing of personal data which takes place in the context of the activities of establishments in more than one Member State of a controller or processor in the Union where the controller or processor is established in more than one Member State; or
 - (b) processing of personal data which takes place in the context of the activities of a single establishment of a controller or processor in the Union but which substantially affects or is likely to substantially affect data subjects in more than one Member State.
- (24) ‘relevant and reasoned objection’ means an objection to a draft decision as to whether there is an infringement of this Regulation, or whether envisaged action in relation to the controller or processor complies with this Regulation, which clearly demonstrates the significance of the risks posed by the draft decision as regards the fundamental rights and freedoms of data subjects and, where applicable, the free flow of personal data within the Union;
- (25) ‘information society service’ means a service as defined in point (b) of Article 1(1) of Directive (EU) 2015/1535 of the European Parliament and of the Council ⁽¹⁾;
- (26) ‘international organisation’ means an organisation and its subordinate bodies governed by public international law, or any other body which is set up by, or on the basis of, an agreement between two or more countries.

CHAPTER II

Principles

Article 5

Principles relating to processing of personal data

1. Personal data shall be:
 - (a) processed lawfully, fairly and in a transparent manner in relation to the data subject (‘lawfulness, fairness and transparency’);
 - (b) collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes; further processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes shall, in accordance with Article 89(1), not be considered to be incompatible with the initial purposes (‘purpose limitation’);
 - (c) adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed (‘data minimisation’);
 - (d) accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that personal data that are inaccurate, having regard to the purposes for which they are processed, are erased or rectified without delay (‘accuracy’);

⁽¹⁾ Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (OJ L 241, 17.9.2015, p. 1).

- (e) kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed; personal data may be stored for longer periods insofar as the personal data will be processed solely for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1) subject to implementation of the appropriate technical and organisational measures required by this Regulation in order to safeguard the rights and freedoms of the data subject ('storage limitation');
 - (f) processed in a manner that ensures appropriate security of the personal data, including protection against unauthorised or unlawful processing and against accidental loss, destruction or damage, using appropriate technical or organisational measures ('integrity and confidentiality').
2. The controller shall be responsible for, and be able to demonstrate compliance with, paragraph 1 ('accountability').

Article 6

Lawfulness of processing

1. Processing shall be lawful only if and to the extent that at least one of the following applies:
- (a) the data subject has given consent to the processing of his or her personal data for one or more specific purposes;
 - (b) processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract;
 - (c) processing is necessary for compliance with a legal obligation to which the controller is subject;
 - (d) processing is necessary in order to protect the vital interests of the data subject or of another natural person;
 - (e) processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller;
 - (f) processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data, in particular where the data subject is a child.

Point (f) of the first subparagraph shall not apply to processing carried out by public authorities in the performance of their tasks.

2. Member States may maintain or introduce more specific provisions to adapt the application of the rules of this Regulation with regard to processing for compliance with points (c) and (e) of paragraph 1 by determining more precisely specific requirements for the processing and other measures to ensure lawful and fair processing including for other specific processing situations as provided for in Chapter IX.

3. The basis for the processing referred to in point (c) and (e) of paragraph 1 shall be laid down by:

- (a) Union law; or
- (b) Member State law to which the controller is subject.

The purpose of the processing shall be determined in that legal basis or, as regards the processing referred to in point (e) of paragraph 1, shall be necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller. That legal basis may contain specific provisions to adapt the application of rules of this Regulation, inter alia: the general conditions governing the lawfulness of processing by the controller; the types of data which are subject to the processing; the data subjects concerned; the entities to, and the purposes for which, the personal data may be disclosed; the purpose limitation; storage periods; and processing operations and processing procedures, including measures to ensure lawful and fair processing such as those for other specific

processing situations as provided for in Chapter IX. The Union or the Member State law shall meet an objective of public interest and be proportionate to the legitimate aim pursued.

4. Where the processing for a purpose other than that for which the personal data have been collected is not based on the data subject's consent or on a Union or Member State law which constitutes a necessary and proportionate measure in a democratic society to safeguard the objectives referred to in Article 23(1), the controller shall, in order to ascertain whether processing for another purpose is compatible with the purpose for which the personal data are initially collected, take into account, *inter alia*:

- (a) any link between the purposes for which the personal data have been collected and the purposes of the intended further processing;
- (b) the context in which the personal data have been collected, in particular regarding the relationship between data subjects and the controller;
- (c) the nature of the personal data, in particular whether special categories of personal data are processed, pursuant to Article 9, or whether personal data related to criminal convictions and offences are processed, pursuant to Article 10;
- (d) the possible consequences of the intended further processing for data subjects;
- (e) the existence of appropriate safeguards, which may include encryption or pseudonymisation.

Article 7

Conditions for consent

1. Where processing is based on consent, the controller shall be able to demonstrate that the data subject has consented to processing of his or her personal data.
2. If the data subject's consent is given in the context of a written declaration which also concerns other matters, the request for consent shall be presented in a manner which is clearly distinguishable from the other matters, in an intelligible and easily accessible form, using clear and plain language. Any part of such a declaration which constitutes an infringement of this Regulation shall not be binding.
3. The data subject shall have the right to withdraw his or her consent at any time. The withdrawal of consent shall not affect the lawfulness of processing based on consent before its withdrawal. Prior to giving consent, the data subject shall be informed thereof. It shall be as easy to withdraw as to give consent.
4. When assessing whether consent is freely given, utmost account shall be taken of whether, *inter alia*, the performance of a contract, including the provision of a service, is conditional on consent to the processing of personal data that is not necessary for the performance of that contract.

Article 8

Conditions applicable to child's consent in relation to information society services

1. Where point (a) of Article 6(1) applies, in relation to the offer of information society services directly to a child, the processing of the personal data of a child shall be lawful where the child is at least 16 years old. Where the child is below the age of 16 years, such processing shall be lawful only if and to the extent that consent is given or authorised by the holder of parental responsibility over the child.

Member States may provide by law for a lower age for those purposes provided that such lower age is not below 13 years.

2. The controller shall make reasonable efforts to verify in such cases that consent is given or authorised by the holder of parental responsibility over the child, taking into consideration available technology.
3. Paragraph 1 shall not affect the general contract law of Member States such as the rules on the validity, formation or effect of a contract in relation to a child.

Article 9

Processing of special categories of personal data

1. Processing of personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation shall be prohibited.
2. Paragraph 1 shall not apply if one of the following applies:
 - (a) the data subject has given explicit consent to the processing of those personal data for one or more specified purposes, except where Union or Member State law provide that the prohibition referred to in paragraph 1 may not be lifted by the data subject;
 - (b) processing is necessary for the purposes of carrying out the obligations and exercising specific rights of the controller or of the data subject in the field of employment and social security and social protection law in so far as it is authorised by Union or Member State law or a collective agreement pursuant to Member State law providing for appropriate safeguards for the fundamental rights and the interests of the data subject;
 - (c) processing is necessary to protect the vital interests of the data subject or of another natural person where the data subject is physically or legally incapable of giving consent;
 - (d) processing is carried out in the course of its legitimate activities with appropriate safeguards by a foundation, association or any other not-for-profit body with a political, philosophical, religious or trade union aim and on condition that the processing relates solely to the members or to former members of the body or to persons who have regular contact with it in connection with its purposes and that the personal data are not disclosed outside that body without the consent of the data subjects;
 - (e) processing relates to personal data which are manifestly made public by the data subject;
 - (f) processing is necessary for the establishment, exercise or defence of legal claims or whenever courts are acting in their judicial capacity;
 - (g) processing is necessary for reasons of substantial public interest, on the basis of Union or Member State law which shall be proportionate to the aim pursued, respect the essence of the right to data protection and provide for suitable and specific measures to safeguard the fundamental rights and the interests of the data subject;
 - (h) processing is necessary for the purposes of preventive or occupational medicine, for the assessment of the working capacity of the employee, medical diagnosis, the provision of health or social care or treatment or the management of health or social care systems and services on the basis of Union or Member State law or pursuant to contract with a health professional and subject to the conditions and safeguards referred to in paragraph 3;
 - (i) processing is necessary for reasons of public interest in the area of public health, such as protecting against serious cross-border threats to health or ensuring high standards of quality and safety of health care and of medicinal products or medical devices, on the basis of Union or Member State law which provides for suitable and specific measures to safeguard the rights and freedoms of the data subject, in particular professional secrecy;

(j) processing is necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1) based on Union or Member State law which shall be proportionate to the aim pursued, respect the essence of the right to data protection and provide for suitable and specific measures to safeguard the fundamental rights and the interests of the data subject.

3. Personal data referred to in paragraph 1 may be processed for the purposes referred to in point (h) of paragraph 2 when those data are processed by or under the responsibility of a professional subject to the obligation of professional secrecy under Union or Member State law or rules established by national competent bodies or by another person also subject to an obligation of secrecy under Union or Member State law or rules established by national competent bodies.

4. Member States may maintain or introduce further conditions, including limitations, with regard to the processing of genetic data, biometric data or data concerning health.

Article 10

Processing of personal data relating to criminal convictions and offences

Processing of personal data relating to criminal convictions and offences or related security measures based on Article 6(1) shall be carried out only under the control of official authority or when the processing is authorised by Union or Member State law providing for appropriate safeguards for the rights and freedoms of data subjects. Any comprehensive register of criminal convictions shall be kept only under the control of official authority.

Article 11

Processing which does not require identification

1. If the purposes for which a controller processes personal data do not or do no longer require the identification of a data subject by the controller, the controller shall not be obliged to maintain, acquire or process additional information in order to identify the data subject for the sole purpose of complying with this Regulation.

2. Where, in cases referred to in paragraph 1 of this Article, the controller is able to demonstrate that it is not in a position to identify the data subject, the controller shall inform the data subject accordingly, if possible. In such cases, Articles 15 to 20 shall not apply except where the data subject, for the purpose of exercising his or her rights under those articles, provides additional information enabling his or her identification.

CHAPTER III

Rights of the data subject

Section 1

Transparency and modalities

Article 12

Transparent information, communication and modalities for the exercise of the rights of the data subject

1. The controller shall take appropriate measures to provide any information referred to in Articles 13 and 14 and any communication under Articles 15 to 22 and 34 relating to processing to the data subject in a concise, transparent, intelligible and easily accessible form, using clear and plain language, in particular for any information addressed specifically to a child. The information shall be provided in writing, or by other means, including, where appropriate, by electronic means. When requested by the data subject, the information may be provided orally, provided that the identity of the data subject is proven by other means.

2. The controller shall facilitate the exercise of data subject rights under Articles 15 to 22. In the cases referred to in Article 11(2), the controller shall not refuse to act on the request of the data subject for exercising his or her rights under Articles 15 to 22, unless the controller demonstrates that it is not in a position to identify the data subject.

3. The controller shall provide information on action taken on a request under Articles 15 to 22 to the data subject without undue delay and in any event within one month of receipt of the request. That period may be extended by two further months where necessary, taking into account the complexity and number of the requests. The controller shall inform the data subject of any such extension within one month of receipt of the request, together with the reasons for the delay. Where the data subject makes the request by electronic form means, the information shall be provided by electronic means where possible, unless otherwise requested by the data subject.

4. If the controller does not take action on the request of the data subject, the controller shall inform the data subject without delay and at the latest within one month of receipt of the request of the reasons for not taking action and on the possibility of lodging a complaint with a supervisory authority and seeking a judicial remedy.

5. Information provided under Articles 13 and 14 and any communication and any actions taken under Articles 15 to 22 and 34 shall be provided free of charge. Where requests from a data subject are manifestly unfounded or excessive, in particular because of their repetitive character, the controller may either:

- (a) charge a reasonable fee taking into account the administrative costs of providing the information or communication or taking the action requested; or
- (b) refuse to act on the request.

The controller shall bear the burden of demonstrating the manifestly unfounded or excessive character of the request.

6. Without prejudice to Article 11, where the controller has reasonable doubts concerning the identity of the natural person making the request referred to in Articles 15 to 21, the controller may request the provision of additional information necessary to confirm the identity of the data subject.

7. The information to be provided to data subjects pursuant to Articles 13 and 14 may be provided in combination with standardised icons in order to give in an easily visible, intelligible and clearly legible manner a meaningful overview of the intended processing. Where the icons are presented electronically they shall be machine-readable.

8. The Commission shall be empowered to adopt delegated acts in accordance with Article 92 for the purpose of determining the information to be presented by the icons and the procedures for providing standardised icons.

Section 2

Information and access to personal data

Article 13

Information to be provided where personal data are collected from the data subject

1. Where personal data relating to a data subject are collected from the data subject, the controller shall, at the time when personal data are obtained, provide the data subject with all of the following information:

- (a) the identity and the contact details of the controller and, where applicable, of the controller's representative;
- (b) the contact details of the data protection officer, where applicable;
- (c) the purposes of the processing for which the personal data are intended as well as the legal basis for the processing;

- (d) where the processing is based on point (f) of Article 6(1), the legitimate interests pursued by the controller or by a third party;
- (e) the recipients or categories of recipients of the personal data, if any;
- (f) where applicable, the fact that the controller intends to transfer personal data to a third country or international organisation and the existence or absence of an adequacy decision by the Commission, or in the case of transfers referred to in Article 46 or 47, or the second subparagraph of Article 49(1), reference to the appropriate or suitable safeguards and the means by which to obtain a copy of them or where they have been made available.

2. In addition to the information referred to in paragraph 1, the controller shall, at the time when personal data are obtained, provide the data subject with the following further information necessary to ensure fair and transparent processing:

- (a) the period for which the personal data will be stored, or if that is not possible, the criteria used to determine that period;
- (b) the existence of the right to request from the controller access to and rectification or erasure of personal data or restriction of processing concerning the data subject or to object to processing as well as the right to data portability;
- (c) where the processing is based on point (a) of Article 6(1) or point (a) of Article 9(2), the existence of the right to withdraw consent at any time, without affecting the lawfulness of processing based on consent before its withdrawal;
- (d) the right to lodge a complaint with a supervisory authority;
- (e) whether the provision of personal data is a statutory or contractual requirement, or a requirement necessary to enter into a contract, as well as whether the data subject is obliged to provide the personal data and of the possible consequences of failure to provide such data;
- (f) the existence of automated decision-making, including profiling, referred to in Article 22(1) and (4) and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.

3. Where the controller intends to further process the personal data for a purpose other than that for which the personal data were collected, the controller shall provide the data subject prior to that further processing with information on that other purpose and with any relevant further information as referred to in paragraph 2.

4. Paragraphs 1, 2 and 3 shall not apply where and insofar as the data subject already has the information.

Article 14

Information to be provided where personal data have not been obtained from the data subject

1. Where personal data have not been obtained from the data subject, the controller shall provide the data subject with the following information:

- (a) the identity and the contact details of the controller and, where applicable, of the controller's representative;
- (b) the contact details of the data protection officer, where applicable;
- (c) the purposes of the processing for which the personal data are intended as well as the legal basis for the processing;
- (d) the categories of personal data concerned;
- (e) the recipients or categories of recipients of the personal data, if any;

(f) where applicable, that the controller intends to transfer personal data to a recipient in a third country or international organisation and the existence or absence of an adequacy decision by the Commission, or in the case of transfers referred to in Article 46 or 47, or the second subparagraph of Article 49(1), reference to the appropriate or suitable safeguards and the means to obtain a copy of them or where they have been made available.

2. In addition to the information referred to in paragraph 1, the controller shall provide the data subject with the following information necessary to ensure fair and transparent processing in respect of the data subject:

- (a) the period for which the personal data will be stored, or if that is not possible, the criteria used to determine that period;
- (b) where the processing is based on point (f) of Article 6(1), the legitimate interests pursued by the controller or by a third party;
- (c) the existence of the right to request from the controller access to and rectification or erasure of personal data or restriction of processing concerning the data subject and to object to processing as well as the right to data portability;
- (d) where processing is based on point (a) of Article 6(1) or point (a) of Article 9(2), the existence of the right to withdraw consent at any time, without affecting the lawfulness of processing based on consent before its withdrawal;
- (e) the right to lodge a complaint with a supervisory authority;
- (f) from which source the personal data originate, and if applicable, whether it came from publicly accessible sources;
- (g) the existence of automated decision-making, including profiling, referred to in Article 22(1) and (4) and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.

3. The controller shall provide the information referred to in paragraphs 1 and 2:

- (a) within a reasonable period after obtaining the personal data, but at the latest within one month, having regard to the specific circumstances in which the personal data are processed;
- (b) if the personal data are to be used for communication with the data subject, at the latest at the time of the first communication to that data subject; or
- (c) if a disclosure to another recipient is envisaged, at the latest when the personal data are first disclosed.

4. Where the controller intends to further process the personal data for a purpose other than that for which the personal data were obtained, the controller shall provide the data subject prior to that further processing with information on that other purpose and with any relevant further information as referred to in paragraph 2.

5. Paragraphs 1 to 4 shall not apply where and insofar as:

- (a) the data subject already has the information;
- (b) the provision of such information proves impossible or would involve a disproportionate effort, in particular for processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes, subject to the conditions and safeguards referred to in Article 89(1) or in so far as the obligation referred to in paragraph 1 of this Article is likely to render impossible or seriously impair the achievement of the objectives of that processing. In such cases the controller shall take appropriate measures to protect the data subject's rights and freedoms and legitimate interests, including making the information publicly available;
- (c) obtaining or disclosure is expressly laid down by Union or Member State law to which the controller is subject and which provides appropriate measures to protect the data subject's legitimate interests; or
- (d) where the personal data must remain confidential subject to an obligation of professional secrecy regulated by Union or Member State law, including a statutory obligation of secrecy.

*Article 15***Right of access by the data subject**

1. The data subject shall have the right to obtain from the controller confirmation as to whether or not personal data concerning him or her are being processed, and, where that is the case, access to the personal data and the following information:
 - (a) the purposes of the processing;
 - (b) the categories of personal data concerned;
 - (c) the recipients or categories of recipient to whom the personal data have been or will be disclosed, in particular recipients in third countries or international organisations;
 - (d) where possible, the envisaged period for which the personal data will be stored, or, if not possible, the criteria used to determine that period;
 - (e) the existence of the right to request from the controller rectification or erasure of personal data or restriction of processing of personal data concerning the data subject or to object to such processing;
 - (f) the right to lodge a complaint with a supervisory authority;
 - (g) where the personal data are not collected from the data subject, any available information as to their source;
 - (h) the existence of automated decision-making, including profiling, referred to in Article 22(1) and (4) and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.
2. Where personal data are transferred to a third country or to an international organisation, the data subject shall have the right to be informed of the appropriate safeguards pursuant to Article 46 relating to the transfer.
3. The controller shall provide a copy of the personal data undergoing processing. For any further copies requested by the data subject, the controller may charge a reasonable fee based on administrative costs. Where the data subject makes the request by electronic means, and unless otherwise requested by the data subject, the information shall be provided in a commonly used electronic form.
4. The right to obtain a copy referred to in paragraph 3 shall not adversely affect the rights and freedoms of others.

Section 3

Rectification and erasure*Article 16***Right to rectification**

The data subject shall have the right to obtain from the controller without undue delay the rectification of inaccurate personal data concerning him or her. Taking into account the purposes of the processing, the data subject shall have the right to have incomplete personal data completed, including by means of providing a supplementary statement.

*Article 17***Right to erasure ('right to be forgotten')**

1. The data subject shall have the right to obtain from the controller the erasure of personal data concerning him or her without undue delay and the controller shall have the obligation to erase personal data without undue delay where one of the following grounds applies:
 - (a) the personal data are no longer necessary in relation to the purposes for which they were collected or otherwise processed;

- (b) the data subject withdraws consent on which the processing is based according to point (a) of Article 6(1), or point (a) of Article 9(2), and where there is no other legal ground for the processing;
- (c) the data subject objects to the processing pursuant to Article 21(1) and there are no overriding legitimate grounds for the processing, or the data subject objects to the processing pursuant to Article 21(2);
- (d) the personal data have been unlawfully processed;
- (e) the personal data have to be erased for compliance with a legal obligation in Union or Member State law to which the controller is subject;
- (f) the personal data have been collected in relation to the offer of information society services referred to in Article 8(1).

2. Where the controller has made the personal data public and is obliged pursuant to paragraph 1 to erase the personal data, the controller, taking account of available technology and the cost of implementation, shall take reasonable steps, including technical measures, to inform controllers which are processing the personal data that the data subject has requested the erasure by such controllers of any links to, or copy or replication of, those personal data.

3. Paragraphs 1 and 2 shall not apply to the extent that processing is necessary:

- (a) for exercising the right of freedom of expression and information;
- (b) for compliance with a legal obligation which requires processing by Union or Member State law to which the controller is subject or for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller;
- (c) for reasons of public interest in the area of public health in accordance with points (h) and (i) of Article 9(2) as well as Article 9(3);
- (d) for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1) in so far as the right referred to in paragraph 1 is likely to render impossible or seriously impair the achievement of the objectives of that processing; or
- (e) for the establishment, exercise or defence of legal claims.

Article 18

Right to restriction of processing

1. The data subject shall have the right to obtain from the controller restriction of processing where one of the following applies:

- (a) the accuracy of the personal data is contested by the data subject, for a period enabling the controller to verify the accuracy of the personal data;
- (b) the processing is unlawful and the data subject opposes the erasure of the personal data and requests the restriction of their use instead;
- (c) the controller no longer needs the personal data for the purposes of the processing, but they are required by the data subject for the establishment, exercise or defence of legal claims;
- (d) the data subject has objected to processing pursuant to Article 21(1) pending the verification whether the legitimate grounds of the controller override those of the data subject.

2. Where processing has been restricted under paragraph 1, such personal data shall, with the exception of storage, only be processed with the data subject's consent or for the establishment, exercise or defence of legal claims or for the protection of the rights of another natural or legal person or for reasons of important public interest of the Union or of a Member State.

3. A data subject who has obtained restriction of processing pursuant to paragraph 1 shall be informed by the controller before the restriction of processing is lifted.

Article 19

Notification obligation regarding rectification or erasure of personal data or restriction of processing

The controller shall communicate any rectification or erasure of personal data or restriction of processing carried out in accordance with Article 16, Article 17(1) and Article 18 to each recipient to whom the personal data have been disclosed, unless this proves impossible or involves disproportionate effort. The controller shall inform the data subject about those recipients if the data subject requests it.

Article 20

Right to data portability

1. The data subject shall have the right to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format and have the right to transmit those data to another controller without hindrance from the controller to which the personal data have been provided, where:
 - (a) the processing is based on consent pursuant to point (a) of Article 6(1) or point (a) of Article 9(2) or on a contract pursuant to point (b) of Article 6(1); and
 - (b) the processing is carried out by automated means.
2. In exercising his or her right to data portability pursuant to paragraph 1, the data subject shall have the right to have the personal data transmitted directly from one controller to another, where technically feasible.
3. The exercise of the right referred to in paragraph 1 of this Article shall be without prejudice to Article 17. That right shall not apply to processing necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller.
4. The right referred to in paragraph 1 shall not adversely affect the rights and freedoms of others.

Section 4

Right to object and automated individual decision-making

Article 21

Right to object

1. The data subject shall have the right to object, on grounds relating to his or her particular situation, at any time to processing of personal data concerning him or her which is based on point (e) or (f) of Article 6(1), including profiling based on those provisions. The controller shall no longer process the personal data unless the controller demonstrates compelling legitimate grounds for the processing which override the interests, rights and freedoms of the data subject or for the establishment, exercise or defence of legal claims.
2. Where personal data are processed for direct marketing purposes, the data subject shall have the right to object at any time to processing of personal data concerning him or her for such marketing, which includes profiling to the extent that it is related to such direct marketing.
3. Where the data subject objects to processing for direct marketing purposes, the personal data shall no longer be processed for such purposes.

4. At the latest at the time of the first communication with the data subject, the right referred to in paragraphs 1 and 2 shall be explicitly brought to the attention of the data subject and shall be presented clearly and separately from any other information.
5. In the context of the use of information society services, and notwithstanding Directive 2002/58/EC, the data subject may exercise his or her right to object by automated means using technical specifications.
6. Where personal data are processed for scientific or historical research purposes or statistical purposes pursuant to Article 89(1), the data subject, on grounds relating to his or her particular situation, shall have the right to object to processing of personal data concerning him or her, unless the processing is necessary for the performance of a task carried out for reasons of public interest.

Article 22

Automated individual decision-making, including profiling

1. The data subject shall have the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her.
2. Paragraph 1 shall not apply if the decision:
 - (a) is necessary for entering into, or performance of, a contract between the data subject and a data controller;
 - (b) is authorised by Union or Member State law to which the controller is subject and which also lays down suitable measures to safeguard the data subject's rights and freedoms and legitimate interests; or
 - (c) is based on the data subject's explicit consent.
3. In the cases referred to in points (a) and (c) of paragraph 2, the data controller shall implement suitable measures to safeguard the data subject's rights and freedoms and legitimate interests, at least the right to obtain human intervention on the part of the controller, to express his or her point of view and to contest the decision.
4. Decisions referred to in paragraph 2 shall not be based on special categories of personal data referred to in Article 9(1), unless point (a) or (g) of Article 9(2) applies and suitable measures to safeguard the data subject's rights and freedoms and legitimate interests are in place.

Section 5

Restrictions

Article 23

Restrictions

1. Union or Member State law to which the data controller or processor is subject may restrict by way of a legislative measure the scope of the obligations and rights provided for in Articles 12 to 22 and Article 34, as well as Article 5 in so far as its provisions correspond to the rights and obligations provided for in Articles 12 to 22, when such a restriction respects the essence of the fundamental rights and freedoms and is a necessary and proportionate measure in a democratic society to safeguard:
 - (a) national security;
 - (b) defence;
 - (c) public security;

- (d) the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security;
- (e) other important objectives of general public interest of the Union or of a Member State, in particular an important economic or financial interest of the Union or of a Member State, including monetary, budgetary and taxation matters, public health and social security;
- (f) the protection of judicial independence and judicial proceedings;
- (g) the prevention, investigation, detection and prosecution of breaches of ethics for regulated professions;
- (h) a monitoring, inspection or regulatory function connected, even occasionally, to the exercise of official authority in the cases referred to in points (a) to (e) and (g);
- (i) the protection of the data subject or the rights and freedoms of others;
- (j) the enforcement of civil law claims.

2. In particular, any legislative measure referred to in paragraph 1 shall contain specific provisions at least, where relevant, as to:

- (a) the purposes of the processing or categories of processing;
- (b) the categories of personal data;
- (c) the scope of the restrictions introduced;
- (d) the safeguards to prevent abuse or unlawful access or transfer;
- (e) the specification of the controller or categories of controllers;
- (f) the storage periods and the applicable safeguards taking into account the nature, scope and purposes of the processing or categories of processing;
- (g) the risks to the rights and freedoms of data subjects; and
- (h) the right of data subjects to be informed about the restriction, unless that may be prejudicial to the purpose of the restriction.

CHAPTER IV

Controller and processor

Section 1

General obligations

Article 24

Responsibility of the controller

1. Taking into account the nature, scope, context and purposes of processing as well as the risks of varying likelihood and severity for the rights and freedoms of natural persons, the controller shall implement appropriate technical and organisational measures to ensure and to be able to demonstrate that processing is performed in accordance with this Regulation. Those measures shall be reviewed and updated where necessary.

2. Where proportionate in relation to processing activities, the measures referred to in paragraph 1 shall include the implementation of appropriate data protection policies by the controller.

3. Adherence to approved codes of conduct as referred to in Article 40 or approved certification mechanisms as referred to in Article 42 may be used as an element by which to demonstrate compliance with the obligations of the controller.

*Article 25***Data protection by design and by default**

1. Taking into account the state of the art, the cost of implementation and the nature, scope, context and purposes of processing as well as the risks of varying likelihood and severity for rights and freedoms of natural persons posed by the processing, the controller shall, both at the time of the determination of the means for processing and at the time of the processing itself, implement appropriate technical and organisational measures, such as pseudonymisation, which are designed to implement data-protection principles, such as data minimisation, in an effective manner and to integrate the necessary safeguards into the processing in order to meet the requirements of this Regulation and protect the rights of data subjects.
2. The controller shall implement appropriate technical and organisational measures for ensuring that, by default, only personal data which are necessary for each specific purpose of the processing are processed. That obligation applies to the amount of personal data collected, the extent of their processing, the period of their storage and their accessibility. In particular, such measures shall ensure that by default personal data are not made accessible without the individual's intervention to an indefinite number of natural persons.
3. An approved certification mechanism pursuant to Article 42 may be used as an element to demonstrate compliance with the requirements set out in paragraphs 1 and 2 of this Article.

*Article 26***Joint controllers**

1. Where two or more controllers jointly determine the purposes and means of processing, they shall be joint controllers. They shall in a transparent manner determine their respective responsibilities for compliance with the obligations under this Regulation, in particular as regards the exercising of the rights of the data subject and their respective duties to provide the information referred to in Articles 13 and 14, by means of an arrangement between them unless, and in so far as, the respective responsibilities of the controllers are determined by Union or Member State law to which the controllers are subject. The arrangement may designate a contact point for data subjects.
2. The arrangement referred to in paragraph 1 shall duly reflect the respective roles and relationships of the joint controllers *vis-à-vis* the data subjects. The essence of the arrangement shall be made available to the data subject.
3. Irrespective of the terms of the arrangement referred to in paragraph 1, the data subject may exercise his or her rights under this Regulation in respect of and against each of the controllers.

*Article 27***Representatives of controllers or processors not established in the Union**

1. Where Article 3(2) applies, the controller or the processor shall designate in writing a representative in the Union.
2. The obligation laid down in paragraph 1 of this Article shall not apply to:
 - (a) processing which is occasional, does not include, on a large scale, processing of special categories of data as referred to in Article 9(1) or processing of personal data relating to criminal convictions and offences referred to in Article 10, and is unlikely to result in a risk to the rights and freedoms of natural persons, taking into account the nature, context, scope and purposes of the processing; or
 - (b) a public authority or body.

3. The representative shall be established in one of the Member States where the data subjects, whose personal data are processed in relation to the offering of goods or services to them, or whose behaviour is monitored, are.
4. The representative shall be mandated by the controller or processor to be addressed in addition to or instead of the controller or the processor by, in particular, supervisory authorities and data subjects, on all issues related to processing, for the purposes of ensuring compliance with this Regulation.
5. The designation of a representative by the controller or processor shall be without prejudice to legal actions which could be initiated against the controller or the processor themselves.

Article 28

Processor

1. Where processing is to be carried out on behalf of a controller, the controller shall use only processors providing sufficient guarantees to implement appropriate technical and organisational measures in such a manner that processing will meet the requirements of this Regulation and ensure the protection of the rights of the data subject.
2. The processor shall not engage another processor without prior specific or general written authorisation of the controller. In the case of general written authorisation, the processor shall inform the controller of any intended changes concerning the addition or replacement of other processors, thereby giving the controller the opportunity to object to such changes.
3. Processing by a processor shall be governed by a contract or other legal act under Union or Member State law, that is binding on the processor with regard to the controller and that sets out the subject-matter and duration of the processing, the nature and purpose of the processing, the type of personal data and categories of data subjects and the obligations and rights of the controller. That contract or other legal act shall stipulate, in particular, that the processor:
 - (a) processes the personal data only on documented instructions from the controller, including with regard to transfers of personal data to a third country or an international organisation, unless required to do so by Union or Member State law to which the processor is subject; in such a case, the processor shall inform the controller of that legal requirement before processing, unless that law prohibits such information on important grounds of public interest;
 - (b) ensures that persons authorised to process the personal data have committed themselves to confidentiality or are under an appropriate statutory obligation of confidentiality;
 - (c) takes all measures required pursuant to Article 32;
 - (d) respects the conditions referred to in paragraphs 2 and 4 for engaging another processor;
 - (e) taking into account the nature of the processing, assists the controller by appropriate technical and organisational measures, insofar as this is possible, for the fulfilment of the controller's obligation to respond to requests for exercising the data subject's rights laid down in Chapter III;
 - (f) assists the controller in ensuring compliance with the obligations pursuant to Articles 32 to 36 taking into account the nature of processing and the information available to the processor;
 - (g) at the choice of the controller, deletes or returns all the personal data to the controller after the end of the provision of services relating to processing, and deletes existing copies unless Union or Member State law requires storage of the personal data;
 - (h) makes available to the controller all information necessary to demonstrate compliance with the obligations laid down in this Article and allow for and contribute to audits, including inspections, conducted by the controller or another auditor mandated by the controller.

With regard to point (h) of the first subparagraph, the processor shall immediately inform the controller if, in its opinion, an instruction infringes this Regulation or other Union or Member State data protection provisions.

4. Where a processor engages another processor for carrying out specific processing activities on behalf of the controller, the same data protection obligations as set out in the contract or other legal act between the controller and the processor as referred to in paragraph 3 shall be imposed on that other processor by way of a contract or other legal act under Union or Member State law, in particular providing sufficient guarantees to implement appropriate technical and organisational measures in such a manner that the processing will meet the requirements of this Regulation. Where that other processor fails to fulfil its data protection obligations, the initial processor shall remain fully liable to the controller for the performance of that other processor's obligations.

5. Adherence of a processor to an approved code of conduct as referred to in Article 40 or an approved certification mechanism as referred to in Article 42 may be used as an element by which to demonstrate sufficient guarantees as referred to in paragraphs 1 and 4 of this Article.

6. Without prejudice to an individual contract between the controller and the processor, the contract or the other legal act referred to in paragraphs 3 and 4 of this Article may be based, in whole or in part, on standard contractual clauses referred to in paragraphs 7 and 8 of this Article, including when they are part of a certification granted to the controller or processor pursuant to Articles 42 and 43.

7. The Commission may lay down standard contractual clauses for the matters referred to in paragraph 3 and 4 of this Article and in accordance with the examination procedure referred to in Article 93(2).

8. A supervisory authority may adopt standard contractual clauses for the matters referred to in paragraph 3 and 4 of this Article and in accordance with the consistency mechanism referred to in Article 63.

9. The contract or the other legal act referred to in paragraphs 3 and 4 shall be in writing, including in electronic form.

10. Without prejudice to Articles 82, 83 and 84, if a processor infringes this Regulation by determining the purposes and means of processing, the processor shall be considered to be a controller in respect of that processing.

Article 29

Processing under the authority of the controller or processor

The processor and any person acting under the authority of the controller or of the processor, who has access to personal data, shall not process those data except on instructions from the controller, unless required to do so by Union or Member State law.

Article 30

Records of processing activities

1. Each controller and, where applicable, the controller's representative, shall maintain a record of processing activities under its responsibility. That record shall contain all of the following information:

- (a) the name and contact details of the controller and, where applicable, the joint controller, the controller's representative and the data protection officer;
- (b) the purposes of the processing;
- (c) a description of the categories of data subjects and of the categories of personal data;

- (d) the categories of recipients to whom the personal data have been or will be disclosed including recipients in third countries or international organisations;
 - (e) where applicable, transfers of personal data to a third country or an international organisation, including the identification of that third country or international organisation and, in the case of transfers referred to in the second subparagraph of Article 49(1), the documentation of suitable safeguards;
 - (f) where possible, the envisaged time limits for erasure of the different categories of data;
 - (g) where possible, a general description of the technical and organisational security measures referred to in Article 32(1).
2. Each processor and, where applicable, the processor's representative shall maintain a record of all categories of processing activities carried out on behalf of a controller, containing:
- (a) the name and contact details of the processor or processors and of each controller on behalf of which the processor is acting, and, where applicable, of the controller's or the processor's representative, and the data protection officer;
 - (b) the categories of processing carried out on behalf of each controller;
 - (c) where applicable, transfers of personal data to a third country or an international organisation, including the identification of that third country or international organisation and, in the case of transfers referred to in the second subparagraph of Article 49(1), the documentation of suitable safeguards;
 - (d) where possible, a general description of the technical and organisational security measures referred to in Article 32(1).
3. The records referred to in paragraphs 1 and 2 shall be in writing, including in electronic form.
4. The controller or the processor and, where applicable, the controller's or the processor's representative, shall make the record available to the supervisory authority on request.
5. The obligations referred to in paragraphs 1 and 2 shall not apply to an enterprise or an organisation employing fewer than 250 persons unless the processing it carries out is likely to result in a risk to the rights and freedoms of data subjects, the processing is not occasional, or the processing includes special categories of data as referred to in Article 9(1) or personal data relating to criminal convictions and offences referred to in Article 10.

Article 31

Cooperation with the supervisory authority

The controller and the processor and, where applicable, their representatives, shall cooperate, on request, with the supervisory authority in the performance of its tasks.

Section 2

Security of personal data

Article 32

Security of processing

1. Taking into account the state of the art, the costs of implementation and the nature, scope, context and purposes of processing as well as the risk of varying likelihood and severity for the rights and freedoms of natural persons, the controller and the processor shall implement appropriate technical and organisational measures to ensure a level of security appropriate to the risk, including inter alia as appropriate:

- (a) the pseudonymisation and encryption of personal data;

- (b) the ability to ensure the ongoing confidentiality, integrity, availability and resilience of processing systems and services;
 - (c) the ability to restore the availability and access to personal data in a timely manner in the event of a physical or technical incident;
 - (d) a process for regularly testing, assessing and evaluating the effectiveness of technical and organisational measures for ensuring the security of the processing.
2. In assessing the appropriate level of security account shall be taken in particular of the risks that are presented by processing, in particular from accidental or unlawful destruction, loss, alteration, unauthorised disclosure of, or access to personal data transmitted, stored or otherwise processed.
3. Adherence to an approved code of conduct as referred to in Article 40 or an approved certification mechanism as referred to in Article 42 may be used as an element by which to demonstrate compliance with the requirements set out in paragraph 1 of this Article.
4. The controller and processor shall take steps to ensure that any natural person acting under the authority of the controller or the processor who has access to personal data does not process them except on instructions from the controller, unless he or she is required to do so by Union or Member State law.

Article 33

Notification of a personal data breach to the supervisory authority

1. In the case of a personal data breach, the controller shall without undue delay and, where feasible, not later than 72 hours after having become aware of it, notify the personal data breach to the supervisory authority competent in accordance with Article 55, unless the personal data breach is unlikely to result in a risk to the rights and freedoms of natural persons. Where the notification to the supervisory authority is not made within 72 hours, it shall be accompanied by reasons for the delay.
2. The processor shall notify the controller without undue delay after becoming aware of a personal data breach.
3. The notification referred to in paragraph 1 shall at least:
- (a) describe the nature of the personal data breach including where possible, the categories and approximate number of data subjects concerned and the categories and approximate number of personal data records concerned;
 - (b) communicate the name and contact details of the data protection officer or other contact point where more information can be obtained;
 - (c) describe the likely consequences of the personal data breach;
 - (d) describe the measures taken or proposed to be taken by the controller to address the personal data breach, including, where appropriate, measures to mitigate its possible adverse effects.
4. Where, and in so far as, it is not possible to provide the information at the same time, the information may be provided in phases without undue further delay.
5. The controller shall document any personal data breaches, comprising the facts relating to the personal data breach, its effects and the remedial action taken. That documentation shall enable the supervisory authority to verify compliance with this Article.

Article 34

Communication of a personal data breach to the data subject

1. When the personal data breach is likely to result in a high risk to the rights and freedoms of natural persons, the controller shall communicate the personal data breach to the data subject without undue delay.

2. The communication to the data subject referred to in paragraph 1 of this Article shall describe in clear and plain language the nature of the personal data breach and contain at least the information and measures referred to in points (b), (c) and (d) of Article 33(3).
3. The communication to the data subject referred to in paragraph 1 shall not be required if any of the following conditions are met:
 - (a) the controller has implemented appropriate technical and organisational protection measures, and those measures were applied to the personal data affected by the personal data breach, in particular those that render the personal data unintelligible to any person who is not authorised to access it, such as encryption;
 - (b) the controller has taken subsequent measures which ensure that the high risk to the rights and freedoms of data subjects referred to in paragraph 1 is no longer likely to materialise;
 - (c) it would involve disproportionate effort. In such a case, there shall instead be a public communication or similar measure whereby the data subjects are informed in an equally effective manner.
4. If the controller has not already communicated the personal data breach to the data subject, the supervisory authority, having considered the likelihood of the personal data breach resulting in a high risk, may require it to do so or may decide that any of the conditions referred to in paragraph 3 are met.

Section 3

Data protection impact assessment and prior consultation

Article 35

Data protection impact assessment

1. Where a type of processing in particular using new technologies, and taking into account the nature, scope, context and purposes of the processing, is likely to result in a high risk to the rights and freedoms of natural persons, the controller shall, prior to the processing, carry out an assessment of the impact of the envisaged processing operations on the protection of personal data. A single assessment may address a set of similar processing operations that present similar high risks.
2. The controller shall seek the advice of the data protection officer, where designated, when carrying out a data protection impact assessment.
3. A data protection impact assessment referred to in paragraph 1 shall in particular be required in the case of:
 - (a) a systematic and extensive evaluation of personal aspects relating to natural persons which is based on automated processing, including profiling, and on which decisions are based that produce legal effects concerning the natural person or similarly significantly affect the natural person;
 - (b) processing on a large scale of special categories of data referred to in Article 9(1), or of personal data relating to criminal convictions and offences referred to in Article 10; or
 - (c) a systematic monitoring of a publicly accessible area on a large scale.
4. The supervisory authority shall establish and make public a list of the kind of processing operations which are subject to the requirement for a data protection impact assessment pursuant to paragraph 1. The supervisory authority shall communicate those lists to the Board referred to in Article 68.
5. The supervisory authority may also establish and make public a list of the kind of processing operations for which no data protection impact assessment is required. The supervisory authority shall communicate those lists to the Board.
6. Prior to the adoption of the lists referred to in paragraphs 4 and 5, the competent supervisory authority shall apply the consistency mechanism referred to in Article 63 where such lists involve processing activities which are related to the offering of goods or services to data subjects or to the monitoring of their behaviour in several Member States, or may substantially affect the free movement of personal data within the Union.

7. The assessment shall contain at least:
 - (a) a systematic description of the envisaged processing operations and the purposes of the processing, including, where applicable, the legitimate interest pursued by the controller;
 - (b) an assessment of the necessity and proportionality of the processing operations in relation to the purposes;
 - (c) an assessment of the risks to the rights and freedoms of data subjects referred to in paragraph 1; and
 - (d) the measures envisaged to address the risks, including safeguards, security measures and mechanisms to ensure the protection of personal data and to demonstrate compliance with this Regulation taking into account the rights and legitimate interests of data subjects and other persons concerned.
8. Compliance with approved codes of conduct referred to in Article 40 by the relevant controllers or processors shall be taken into due account in assessing the impact of the processing operations performed by such controllers or processors, in particular for the purposes of a data protection impact assessment.
9. Where appropriate, the controller shall seek the views of data subjects or their representatives on the intended processing, without prejudice to the protection of commercial or public interests or the security of processing operations.
10. Where processing pursuant to point (c) or (e) of Article 6(1) has a legal basis in Union law or in the law of the Member State to which the controller is subject, that law regulates the specific processing operation or set of operations in question, and a data protection impact assessment has already been carried out as part of a general impact assessment in the context of the adoption of that legal basis, paragraphs 1 to 7 shall not apply unless Member States deem it to be necessary to carry out such an assessment prior to processing activities.
11. Where necessary, the controller shall carry out a review to assess if processing is performed in accordance with the data protection impact assessment at least when there is a change of the risk represented by processing operations.

Article 36

Prior consultation

1. The controller shall consult the supervisory authority prior to processing where a data protection impact assessment under Article 35 indicates that the processing would result in a high risk in the absence of measures taken by the controller to mitigate the risk.
2. Where the supervisory authority is of the opinion that the intended processing referred to in paragraph 1 would infringe this Regulation, in particular where the controller has insufficiently identified or mitigated the risk, the supervisory authority shall, within period of up to eight weeks of receipt of the request for consultation, provide written advice to the controller and, where applicable to the processor, and may use any of its powers referred to in Article 58. That period may be extended by six weeks, taking into account the complexity of the intended processing. The supervisory authority shall inform the controller and, where applicable, the processor, of any such extension within one month of receipt of the request for consultation together with the reasons for the delay. Those periods may be suspended until the supervisory authority has obtained information it has requested for the purposes of the consultation.
3. When consulting the supervisory authority pursuant to paragraph 1, the controller shall provide the supervisory authority with:
 - (a) where applicable, the respective responsibilities of the controller, joint controllers and processors involved in the processing, in particular for processing within a group of undertakings;
 - (b) the purposes and means of the intended processing;
 - (c) the measures and safeguards provided to protect the rights and freedoms of data subjects pursuant to this Regulation;
 - (d) where applicable, the contact details of the data protection officer;

- (e) the data protection impact assessment provided for in Article 35; and
- (f) any other information requested by the supervisory authority.

4. Member States shall consult the supervisory authority during the preparation of a proposal for a legislative measure to be adopted by a national parliament, or of a regulatory measure based on such a legislative measure, which relates to processing.

5. Notwithstanding paragraph 1, Member State law may require controllers to consult with, and obtain prior authorisation from, the supervisory authority in relation to processing by a controller for the performance of a task carried out by the controller in the public interest, including processing in relation to social protection and public health.

Section 4

Data protection officer

Article 37

Designation of the data protection officer

1. The controller and the processor shall designate a data protection officer in any case where:
 - (a) the processing is carried out by a public authority or body, except for courts acting in their judicial capacity;
 - (b) the core activities of the controller or the processor consist of processing operations which, by virtue of their nature, their scope and/or their purposes, require regular and systematic monitoring of data subjects on a large scale; or
 - (c) the core activities of the controller or the processor consist of processing on a large scale of special categories of data pursuant to Article 9 and personal data relating to criminal convictions and offences referred to in Article 10.
2. A group of undertakings may appoint a single data protection officer provided that a data protection officer is easily accessible from each establishment.
3. Where the controller or the processor is a public authority or body, a single data protection officer may be designated for several such authorities or bodies, taking account of their organisational structure and size.
4. In cases other than those referred to in paragraph 1, the controller or processor or associations and other bodies representing categories of controllers or processors may or, where required by Union or Member State law shall, designate a data protection officer. The data protection officer may act for such associations and other bodies representing controllers or processors.
5. The data protection officer shall be designated on the basis of professional qualities and, in particular, expert knowledge of data protection law and practices and the ability to fulfil the tasks referred to in Article 39.
6. The data protection officer may be a staff member of the controller or processor, or fulfil the tasks on the basis of a service contract.
7. The controller or the processor shall publish the contact details of the data protection officer and communicate them to the supervisory authority.

Article 38

Position of the data protection officer

1. The controller and the processor shall ensure that the data protection officer is involved, properly and in a timely manner, in all issues which relate to the protection of personal data.

2. The controller and processor shall support the data protection officer in performing the tasks referred to in Article 39 by providing resources necessary to carry out those tasks and access to personal data and processing operations, and to maintain his or her expert knowledge.
3. The controller and processor shall ensure that the data protection officer does not receive any instructions regarding the exercise of those tasks. He or she shall not be dismissed or penalised by the controller or the processor for performing his tasks. The data protection officer shall directly report to the highest management level of the controller or the processor.
4. Data subjects may contact the data protection officer with regard to all issues related to processing of their personal data and to the exercise of their rights under this Regulation.
5. The data protection officer shall be bound by secrecy or confidentiality concerning the performance of his or her tasks, in accordance with Union or Member State law.
6. The data protection officer may fulfil other tasks and duties. The controller or processor shall ensure that any such tasks and duties do not result in a conflict of interests.

Article 39

Tasks of the data protection officer

1. The data protection officer shall have at least the following tasks:
 - (a) to inform and advise the controller or the processor and the employees who carry out processing of their obligations pursuant to this Regulation and to other Union or Member State data protection provisions;
 - (b) to monitor compliance with this Regulation, with other Union or Member State data protection provisions and with the policies of the controller or processor in relation to the protection of personal data, including the assignment of responsibilities, awareness-raising and training of staff involved in processing operations, and the related audits;
 - (c) to provide advice where requested as regards the data protection impact assessment and monitor its performance pursuant to Article 35;
 - (d) to cooperate with the supervisory authority;
 - (e) to act as the contact point for the supervisory authority on issues relating to processing, including the prior consultation referred to in Article 36, and to consult, where appropriate, with regard to any other matter.
2. The data protection officer shall in the performance of his or her tasks have due regard to the risk associated with processing operations, taking into account the nature, scope, context and purposes of processing.

Section 5

Codes of conduct and certification

Article 40

Codes of conduct

1. The Member States, the supervisory authorities, the Board and the Commission shall encourage the drawing up of codes of conduct intended to contribute to the proper application of this Regulation, taking account of the specific features of the various processing sectors and the specific needs of micro, small and medium-sized enterprises.
2. Associations and other bodies representing categories of controllers or processors may prepare codes of conduct, or amend or extend such codes, for the purpose of specifying the application of this Regulation, such as with regard to:
 - (a) fair and transparent processing;

- (b) the legitimate interests pursued by controllers in specific contexts;
- (c) the collection of personal data;
- (d) the pseudonymisation of personal data;
- (e) the information provided to the public and to data subjects;
- (f) the exercise of the rights of data subjects;
- (g) the information provided to, and the protection of, children, and the manner in which the consent of the holders of parental responsibility over children is to be obtained;
- (h) the measures and procedures referred to in Articles 24 and 25 and the measures to ensure security of processing referred to in Article 32;
- (i) the notification of personal data breaches to supervisory authorities and the communication of such personal data breaches to data subjects;
- (j) the transfer of personal data to third countries or international organisations; or
- (k) out-of-court proceedings and other dispute resolution procedures for resolving disputes between controllers and data subjects with regard to processing, without prejudice to the rights of data subjects pursuant to Articles 77 and 79.

3. In addition to adherence by controllers or processors subject to this Regulation, codes of conduct approved pursuant to paragraph 5 of this Article and having general validity pursuant to paragraph 9 of this Article may also be adhered to by controllers or processors that are not subject to this Regulation pursuant to Article 3 in order to provide appropriate safeguards within the framework of personal data transfers to third countries or international organisations under the terms referred to in point (e) of Article 46(2). Such controllers or processors shall make binding and enforceable commitments, via contractual or other legally binding instruments, to apply those appropriate safeguards including with regard to the rights of data subjects.

4. A code of conduct referred to in paragraph 2 of this Article shall contain mechanisms which enable the body referred to in Article 41(1) to carry out the mandatory monitoring of compliance with its provisions by the controllers or processors which undertake to apply it, without prejudice to the tasks and powers of supervisory authorities competent pursuant to Article 55 or 56.

5. Associations and other bodies referred to in paragraph 2 of this Article which intend to prepare a code of conduct or to amend or extend an existing code shall submit the draft code, amendment or extension to the supervisory authority which is competent pursuant to Article 55. The supervisory authority shall provide an opinion on whether the draft code, amendment or extension complies with this Regulation and shall approve that draft code, amendment or extension if it finds that it provides sufficient appropriate safeguards.

6. Where the draft code, or amendment or extension is approved in accordance with paragraph 5, and where the code of conduct concerned does not relate to processing activities in several Member States, the supervisory authority shall register and publish the code.

7. Where a draft code of conduct relates to processing activities in several Member States, the supervisory authority which is competent pursuant to Article 55 shall, before approving the draft code, amendment or extension, submit it in the procedure referred to in Article 63 to the Board which shall provide an opinion on whether the draft code, amendment or extension complies with this Regulation or, in the situation referred to in paragraph 3 of this Article, provides appropriate safeguards.

8. Where the opinion referred to in paragraph 7 confirms that the draft code, amendment or extension complies with this Regulation, or, in the situation referred to in paragraph 3, provides appropriate safeguards, the Board shall submit its opinion to the Commission.

9. The Commission may, by way of implementing acts, decide that the approved code of conduct, amendment or extension submitted to it pursuant to paragraph 8 of this Article have general validity within the Union. Those implementing acts shall be adopted in accordance with the examination procedure set out in Article 93(2).

10. The Commission shall ensure appropriate publicity for the approved codes which have been decided as having general validity in accordance with paragraph 9.
11. The Board shall collate all approved codes of conduct, amendments and extensions in a register and shall make them publicly available by way of appropriate means.

Article 41

Monitoring of approved codes of conduct

1. Without prejudice to the tasks and powers of the competent supervisory authority under Articles 57 and 58, the monitoring of compliance with a code of conduct pursuant to Article 40 may be carried out by a body which has an appropriate level of expertise in relation to the subject-matter of the code and is accredited for that purpose by the competent supervisory authority.
2. A body as referred to in paragraph 1 may be accredited to monitor compliance with a code of conduct where that body has:
 - (a) demonstrated its independence and expertise in relation to the subject-matter of the code to the satisfaction of the competent supervisory authority;
 - (b) established procedures which allow it to assess the eligibility of controllers and processors concerned to apply the code, to monitor their compliance with its provisions and to periodically review its operation;
 - (c) established procedures and structures to handle complaints about infringements of the code or the manner in which the code has been, or is being, implemented by a controller or processor, and to make those procedures and structures transparent to data subjects and the public; and
 - (d) demonstrated to the satisfaction of the competent supervisory authority that its tasks and duties do not result in a conflict of interests.
3. The competent supervisory authority shall submit the draft criteria for accreditation of a body as referred to in paragraph 1 of this Article to the Board pursuant to the consistency mechanism referred to in Article 63.
4. Without prejudice to the tasks and powers of the competent supervisory authority and the provisions of Chapter VIII, a body as referred to in paragraph 1 of this Article shall, subject to appropriate safeguards, take appropriate action in cases of infringement of the code by a controller or processor, including suspension or exclusion of the controller or processor concerned from the code. It shall inform the competent supervisory authority of such actions and the reasons for taking them.
5. The competent supervisory authority shall revoke the accreditation of a body as referred to in paragraph 1 if the conditions for accreditation are not, or are no longer, met or where actions taken by the body infringe this Regulation.
6. This Article shall not apply to processing carried out by public authorities and bodies.

Article 42

Certification

1. The Member States, the supervisory authorities, the Board and the Commission shall encourage, in particular at Union level, the establishment of data protection certification mechanisms and of data protection seals and marks, for the purpose of demonstrating compliance with this Regulation of processing operations by controllers and processors. The specific needs of micro, small and medium-sized enterprises shall be taken into account.

2. In addition to adherence by controllers or processors subject to this Regulation, data protection certification mechanisms, seals or marks approved pursuant to paragraph 5 of this Article may be established for the purpose of demonstrating the existence of appropriate safeguards provided by controllers or processors that are not subject to this Regulation pursuant to Article 3 within the framework of personal data transfers to third countries or international organisations under the terms referred to in point (f) of Article 46(2). Such controllers or processors shall make binding and enforceable commitments, via contractual or other legally binding instruments, to apply those appropriate safeguards, including with regard to the rights of data subjects.
3. The certification shall be voluntary and available via a process that is transparent.
4. A certification pursuant to this Article does not reduce the responsibility of the controller or the processor for compliance with this Regulation and is without prejudice to the tasks and powers of the supervisory authorities which are competent pursuant to Article 55 or 56.
5. A certification pursuant to this Article shall be issued by the certification bodies referred to in Article 43 or by the competent supervisory authority, on the basis of criteria approved by that competent supervisory authority pursuant to Article 58(3) or by the Board pursuant to Article 63. Where the criteria are approved by the Board, this may result in a common certification, the European Data Protection Seal.
6. The controller or processor which submits its processing to the certification mechanism shall provide the certification body referred to in Article 43, or where applicable, the competent supervisory authority, with all information and access to its processing activities which are necessary to conduct the certification procedure.
7. Certification shall be issued to a controller or processor for a maximum period of three years and may be renewed, under the same conditions, provided that the relevant requirements continue to be met. Certification shall be withdrawn, as applicable, by the certification bodies referred to in Article 43 or by the competent supervisory authority where the requirements for the certification are not or are no longer met.
8. The Board shall collate all certification mechanisms and data protection seals and marks in a register and shall make them publicly available by any appropriate means.

Article 43

Certification bodies

1. Without prejudice to the tasks and powers of the competent supervisory authority under Articles 57 and 58, certification bodies which have an appropriate level of expertise in relation to data protection shall, after informing the supervisory authority in order to allow it to exercise its powers pursuant to point (h) of Article 58(2) where necessary, issue and renew certification. Member States shall ensure that those certification bodies are accredited by one or both of the following:
 - (a) the supervisory authority which is competent pursuant to Article 55 or 56;
 - (b) the national accreditation body named in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council ⁽¹⁾ in accordance with EN-ISO/IEC 17065/2012 and with the additional requirements established by the supervisory authority which is competent pursuant to Article 55 or 56.
2. Certification bodies referred to in paragraph 1 shall be accredited in accordance with that paragraph only where they have:
 - (a) demonstrated their independence and expertise in relation to the subject-matter of the certification to the satisfaction of the competent supervisory authority;

⁽¹⁾ Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30).

- (b) undertaken to respect the criteria referred to in Article 42(5) and approved by the supervisory authority which is competent pursuant to Article 55 or 56 or by the Board pursuant to Article 63;
- (c) established procedures for the issuing, periodic review and withdrawal of data protection certification, seals and marks;
- (d) established procedures and structures to handle complaints about infringements of the certification or the manner in which the certification has been, or is being, implemented by the controller or processor, and to make those procedures and structures transparent to data subjects and the public; and
- (e) demonstrated, to the satisfaction of the competent supervisory authority, that their tasks and duties do not result in a conflict of interests.

3. The accreditation of certification bodies as referred to in paragraphs 1 and 2 of this Article shall take place on the basis of criteria approved by the supervisory authority which is competent pursuant to Article 55 or 56 or by the Board pursuant to Article 63. In the case of accreditation pursuant to point (b) of paragraph 1 of this Article, those requirements shall complement those envisaged in Regulation (EC) No 765/2008 and the technical rules that describe the methods and procedures of the certification bodies.

4. The certification bodies referred to in paragraph 1 shall be responsible for the proper assessment leading to the certification or the withdrawal of such certification without prejudice to the responsibility of the controller or processor for compliance with this Regulation. The accreditation shall be issued for a maximum period of five years and may be renewed on the same conditions provided that the certification body meets the requirements set out in this Article.

5. The certification bodies referred to in paragraph 1 shall provide the competent supervisory authorities with the reasons for granting or withdrawing the requested certification.

6. The requirements referred to in paragraph 3 of this Article and the criteria referred to in Article 42(5) shall be made public by the supervisory authority in an easily accessible form. The supervisory authorities shall also transmit those requirements and criteria to the Board. The Board shall collate all certification mechanisms and data protection seals in a register and shall make them publicly available by any appropriate means.

7. Without prejudice to Chapter VIII, the competent supervisory authority or the national accreditation body shall revoke an accreditation of a certification body pursuant to paragraph 1 of this Article where the conditions for the accreditation are not, or are no longer, met or where actions taken by a certification body infringe this Regulation.

8. The Commission shall be empowered to adopt delegated acts in accordance with Article 92 for the purpose of specifying the requirements to be taken into account for the data protection certification mechanisms referred to in Article 42(1).

9. The Commission may adopt implementing acts laying down technical standards for certification mechanisms and data protection seals and marks, and mechanisms to promote and recognise those certification mechanisms, seals and marks. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 93(2).

CHAPTER V

Transfers of personal data to third countries or international organisations

Article 44

General principle for transfers

Any transfer of personal data which are undergoing processing or are intended for processing after transfer to a third country or to an international organisation shall take place only if, subject to the other provisions of this Regulation, the conditions laid down in this Chapter are complied with by the controller and processor, including for onward transfers of personal data from the third country or an international organisation to another third country or to another international organisation. All provisions in this Chapter shall be applied in order to ensure that the level of protection of natural persons guaranteed by this Regulation is not undermined.

Article 45

Transfers on the basis of an adequacy decision

1. A transfer of personal data to a third country or an international organisation may take place where the Commission has decided that the third country, a territory or one or more specified sectors within that third country, or the international organisation in question ensures an adequate level of protection. Such a transfer shall not require any specific authorisation.

2. When assessing the adequacy of the level of protection, the Commission shall, in particular, take account of the following elements:

- (a) the rule of law, respect for human rights and fundamental freedoms, relevant legislation, both general and sectoral, including concerning public security, defence, national security and criminal law and the access of public authorities to personal data, as well as the implementation of such legislation, data protection rules, professional rules and security measures, including rules for the onward transfer of personal data to another third country or international organisation which are complied with in that country or international organisation, case-law, as well as effective and enforceable data subject rights and effective administrative and judicial redress for the data subjects whose personal data are being transferred;
- (b) the existence and effective functioning of one or more independent supervisory authorities in the third country or to which an international organisation is subject, with responsibility for ensuring and enforcing compliance with the data protection rules, including adequate enforcement powers, for assisting and advising the data subjects in exercising their rights and for cooperation with the supervisory authorities of the Member States; and
- (c) the international commitments the third country or international organisation concerned has entered into, or other obligations arising from legally binding conventions or instruments as well as from its participation in multilateral or regional systems, in particular in relation to the protection of personal data.

3. The Commission, after assessing the adequacy of the level of protection, may decide, by means of implementing act, that a third country, a territory or one or more specified sectors within a third country, or an international organisation ensures an adequate level of protection within the meaning of paragraph 2 of this Article. The implementing act shall provide for a mechanism for a periodic review, at least every four years, which shall take into account all relevant developments in the third country or international organisation. The implementing act shall specify its territorial and sectoral application and, where applicable, identify the supervisory authority or authorities referred to in point (b) of paragraph 2 of this Article. The implementing act shall be adopted in accordance with the examination procedure referred to in Article 93(2).

4. The Commission shall, on an ongoing basis, monitor developments in third countries and international organisations that could affect the functioning of decisions adopted pursuant to paragraph 3 of this Article and decisions adopted on the basis of Article 25(6) of Directive 95/46/EC.

5. The Commission shall, where available information reveals, in particular following the review referred to in paragraph 3 of this Article, that a third country, a territory or one or more specified sectors within a third country, or an international organisation no longer ensures an adequate level of protection within the meaning of paragraph 2 of this Article, to the extent necessary, repeal, amend or suspend the decision referred to in paragraph 3 of this Article by means of implementing acts without retro-active effect. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 93(2).

On duly justified imperative grounds of urgency, the Commission shall adopt immediately applicable implementing acts in accordance with the procedure referred to in Article 93(3).

6. The Commission shall enter into consultations with the third country or international organisation with a view to remedying the situation giving rise to the decision made pursuant to paragraph 5.

7. A decision pursuant to paragraph 5 of this Article is without prejudice to transfers of personal data to the third country, a territory or one or more specified sectors within that third country, or the international organisation in question pursuant to Articles 46 to 49.

8. The Commission shall publish in the *Official Journal of the European Union* and on its website a list of the third countries, territories and specified sectors within a third country and international organisations for which it has decided that an adequate level of protection is or is no longer ensured.

9. Decisions adopted by the Commission on the basis of Article 25(6) of Directive 95/46/EC shall remain in force until amended, replaced or repealed by a Commission Decision adopted in accordance with paragraph 3 or 5 of this Article.

Article 46

Transfers subject to appropriate safeguards

1. In the absence of a decision pursuant to Article 45(3), a controller or processor may transfer personal data to a third country or an international organisation only if the controller or processor has provided appropriate safeguards, and on condition that enforceable data subject rights and effective legal remedies for data subjects are available.

2. The appropriate safeguards referred to in paragraph 1 may be provided for, without requiring any specific authorisation from a supervisory authority, by:

- (a) a legally binding and enforceable instrument between public authorities or bodies;
- (b) binding corporate rules in accordance with Article 47;
- (c) standard data protection clauses adopted by the Commission in accordance with the examination procedure referred to in Article 93(2);
- (d) standard data protection clauses adopted by a supervisory authority and approved by the Commission pursuant to the examination procedure referred to in Article 93(2);
- (e) an approved code of conduct pursuant to Article 40 together with binding and enforceable commitments of the controller or processor in the third country to apply the appropriate safeguards, including as regards data subjects' rights; or
- (f) an approved certification mechanism pursuant to Article 42 together with binding and enforceable commitments of the controller or processor in the third country to apply the appropriate safeguards, including as regards data subjects' rights.

3. Subject to the authorisation from the competent supervisory authority, the appropriate safeguards referred to in paragraph 1 may also be provided for, in particular, by:

- (a) contractual clauses between the controller or processor and the controller, processor or the recipient of the personal data in the third country or international organisation; or
- (b) provisions to be inserted into administrative arrangements between public authorities or bodies which include enforceable and effective data subject rights.

4. The supervisory authority shall apply the consistency mechanism referred to in Article 63 in the cases referred to in paragraph 3 of this Article.

5. Authorisations by a Member State or supervisory authority on the basis of Article 26(2) of Directive 95/46/EC shall remain valid until amended, replaced or repealed, if necessary, by that supervisory authority. Decisions adopted by the Commission on the basis of Article 26(4) of Directive 95/46/EC shall remain in force until amended, replaced or repealed, if necessary, by a Commission Decision adopted in accordance with paragraph 2 of this Article.

Article 47

Binding corporate rules

1. The competent supervisory authority shall approve binding corporate rules in accordance with the consistency mechanism set out in Article 63, provided that they:

- (a) are legally binding and apply to and are enforced by every member concerned of the group of undertakings, or group of enterprises engaged in a joint economic activity, including their employees;

- (b) expressly confer enforceable rights on data subjects with regard to the processing of their personal data; and
 - (c) fulfil the requirements laid down in paragraph 2.
2. The binding corporate rules referred to in paragraph 1 shall specify at least:
- (a) the structure and contact details of the group of undertakings, or group of enterprises engaged in a joint economic activity and of each of its members;
 - (b) the data transfers or set of transfers, including the categories of personal data, the type of processing and its purposes, the type of data subjects affected and the identification of the third country or countries in question;
 - (c) their legally binding nature, both internally and externally;
 - (d) the application of the general data protection principles, in particular purpose limitation, data minimisation, limited storage periods, data quality, data protection by design and by default, legal basis for processing, processing of special categories of personal data, measures to ensure data security, and the requirements in respect of onward transfers to bodies not bound by the binding corporate rules;
 - (e) the rights of data subjects in regard to processing and the means to exercise those rights, including the right not to be subject to decisions based solely on automated processing, including profiling in accordance with Article 22, the right to lodge a complaint with the competent supervisory authority and before the competent courts of the Member States in accordance with Article 79, and to obtain redress and, where appropriate, compensation for a breach of the binding corporate rules;
 - (f) the acceptance by the controller or processor established on the territory of a Member State of liability for any breaches of the binding corporate rules by any member concerned not established in the Union; the controller or the processor shall be exempt from that liability, in whole or in part, only if it proves that that member is not responsible for the event giving rise to the damage;
 - (g) how the information on the binding corporate rules, in particular on the provisions referred to in points (d), (e) and (f) of this paragraph is provided to the data subjects in addition to Articles 13 and 14;
 - (h) the tasks of any data protection officer designated in accordance with Article 37 or any other person or entity in charge of the monitoring compliance with the binding corporate rules within the group of undertakings, or group of enterprises engaged in a joint economic activity, as well as monitoring training and complaint-handling;
 - (i) the complaint procedures;
 - (j) the mechanisms within the group of undertakings, or group of enterprises engaged in a joint economic activity for ensuring the verification of compliance with the binding corporate rules. Such mechanisms shall include data protection audits and methods for ensuring corrective actions to protect the rights of the data subject. Results of such verification should be communicated to the person or entity referred to in point (h) and to the board of the controlling undertaking of a group of undertakings, or of the group of enterprises engaged in a joint economic activity, and should be available upon request to the competent supervisory authority;
 - (k) the mechanisms for reporting and recording changes to the rules and reporting those changes to the supervisory authority;
 - (l) the cooperation mechanism with the supervisory authority to ensure compliance by any member of the group of undertakings, or group of enterprises engaged in a joint economic activity, in particular by making available to the supervisory authority the results of verifications of the measures referred to in point (j);
 - (m) the mechanisms for reporting to the competent supervisory authority any legal requirements to which a member of the group of undertakings, or group of enterprises engaged in a joint economic activity is subject in a third country which are likely to have a substantial adverse effect on the guarantees provided by the binding corporate rules; and
 - (n) the appropriate data protection training to personnel having permanent or regular access to personal data.

3. The Commission may specify the format and procedures for the exchange of information between controllers, processors and supervisory authorities for binding corporate rules within the meaning of this Article. Those implementing acts shall be adopted in accordance with the examination procedure set out in Article 93(2).

Article 48

Transfers or disclosures not authorised by Union law

Any judgment of a court or tribunal and any decision of an administrative authority of a third country requiring a controller or processor to transfer or disclose personal data may only be recognised or enforceable in any manner if based on an international agreement, such as a mutual legal assistance treaty, in force between the requesting third country and the Union or a Member State, without prejudice to other grounds for transfer pursuant to this Chapter.

Article 49

Derogations for specific situations

1. In the absence of an adequacy decision pursuant to Article 45(3), or of appropriate safeguards pursuant to Article 46, including binding corporate rules, a transfer or a set of transfers of personal data to a third country or an international organisation shall take place only on one of the following conditions:

- (a) the data subject has explicitly consented to the proposed transfer, after having been informed of the possible risks of such transfers for the data subject due to the absence of an adequacy decision and appropriate safeguards;
- (b) the transfer is necessary for the performance of a contract between the data subject and the controller or the implementation of pre-contractual measures taken at the data subject's request;
- (c) the transfer is necessary for the conclusion or performance of a contract concluded in the interest of the data subject between the controller and another natural or legal person;
- (d) the transfer is necessary for important reasons of public interest;
- (e) the transfer is necessary for the establishment, exercise or defence of legal claims;
- (f) the transfer is necessary in order to protect the vital interests of the data subject or of other persons, where the data subject is physically or legally incapable of giving consent;
- (g) the transfer is made from a register which according to Union or Member State law is intended to provide information to the public and which is open to consultation either by the public in general or by any person who can demonstrate a legitimate interest, but only to the extent that the conditions laid down by Union or Member State law for consultation are fulfilled in the particular case.

Where a transfer could not be based on a provision in Article 45 or 46, including the provisions on binding corporate rules, and none of the derogations for a specific situation referred to in the first subparagraph of this paragraph is applicable, a transfer to a third country or an international organisation may take place only if the transfer is not repetitive, concerns only a limited number of data subjects, is necessary for the purposes of compelling legitimate interests pursued by the controller which are not overridden by the interests or rights and freedoms of the data subject, and the controller has assessed all the circumstances surrounding the data transfer and has on the basis of that assessment provided suitable safeguards with regard to the protection of personal data. The controller shall inform the supervisory authority of the transfer. The controller shall, in addition to providing the information referred to in Articles 13 and 14, inform the data subject of the transfer and on the compelling legitimate interests pursued.

2. A transfer pursuant to point (g) of the first subparagraph of paragraph 1 shall not involve the entirety of the personal data or entire categories of the personal data contained in the register. Where the register is intended for consultation by persons having a legitimate interest, the transfer shall be made only at the request of those persons or if they are to be the recipients.

3. Points (a), (b) and (c) of the first subparagraph of paragraph 1 and the second subparagraph thereof shall not apply to activities carried out by public authorities in the exercise of their public powers.
4. The public interest referred to in point (d) of the first subparagraph of paragraph 1 shall be recognised in Union law or in the law of the Member State to which the controller is subject.
5. In the absence of an adequacy decision, Union or Member State law may, for important reasons of public interest, expressly set limits to the transfer of specific categories of personal data to a third country or an international organisation. Member States shall notify such provisions to the Commission.
6. The controller or processor shall document the assessment as well as the suitable safeguards referred to in the second subparagraph of paragraph 1 of this Article in the records referred to in Article 30.

Article 50

International cooperation for the protection of personal data

In relation to third countries and international organisations, the Commission and supervisory authorities shall take appropriate steps to:

- (a) develop international cooperation mechanisms to facilitate the effective enforcement of legislation for the protection of personal data;
- (b) provide international mutual assistance in the enforcement of legislation for the protection of personal data, including through notification, complaint referral, investigative assistance and information exchange, subject to appropriate safeguards for the protection of personal data and other fundamental rights and freedoms;
- (c) engage relevant stakeholders in discussion and activities aimed at furthering international cooperation in the enforcement of legislation for the protection of personal data;
- (d) promote the exchange and documentation of personal data protection legislation and practice, including on jurisdictional conflicts with third countries.

CHAPTER VI

Independent supervisory authorities

Section 1

Independent status

Article 51

Supervisory authority

1. Each Member State shall provide for one or more independent public authorities to be responsible for monitoring the application of this Regulation, in order to protect the fundamental rights and freedoms of natural persons in relation to processing and to facilitate the free flow of personal data within the Union ('supervisory authority').
2. Each supervisory authority shall contribute to the consistent application of this Regulation throughout the Union. For that purpose, the supervisory authorities shall cooperate with each other and the Commission in accordance with Chapter VII.
3. Where more than one supervisory authority is established in a Member State, that Member State shall designate the supervisory authority which is to represent those authorities in the Board and shall set out the mechanism to ensure compliance by the other authorities with the rules relating to the consistency mechanism referred to in Article 63.
4. Each Member State shall notify to the Commission the provisions of its law which it adopts pursuant to this Chapter, by 25 May 2018 and, without delay, any subsequent amendment affecting them.

*Article 52***Independence**

1. Each supervisory authority shall act with complete independence in performing its tasks and exercising its powers in accordance with this Regulation.
2. The member or members of each supervisory authority shall, in the performance of their tasks and exercise of their powers in accordance with this Regulation, remain free from external influence, whether direct or indirect, and shall neither seek nor take instructions from anybody.
3. Member or members of each supervisory authority shall refrain from any action incompatible with their duties and shall not, during their term of office, engage in any incompatible occupation, whether gainful or not.
4. Each Member State shall ensure that each supervisory authority is provided with the human, technical and financial resources, premises and infrastructure necessary for the effective performance of its tasks and exercise of its powers, including those to be carried out in the context of mutual assistance, cooperation and participation in the Board.
5. Each Member State shall ensure that each supervisory authority chooses and has its own staff which shall be subject to the exclusive direction of the member or members of the supervisory authority concerned.
6. Each Member State shall ensure that each supervisory authority is subject to financial control which does not affect its independence and that it has separate, public annual budgets, which may be part of the overall state or national budget.

*Article 53***General conditions for the members of the supervisory authority**

1. Member States shall provide for each member of their supervisory authorities to be appointed by means of a transparent procedure by:
 - their parliament;
 - their government;
 - their head of State; or
 - an independent body entrusted with the appointment under Member State law.
2. Each member shall have the qualifications, experience and skills, in particular in the area of the protection of personal data, required to perform its duties and exercise its powers.
3. The duties of a member shall end in the event of the expiry of the term of office, resignation or compulsory retirement, in accordance with the law of the Member State concerned.
4. A member shall be dismissed only in cases of serious misconduct or if the member no longer fulfils the conditions required for the performance of the duties.

*Article 54***Rules on the establishment of the supervisory authority**

1. Each Member State shall provide by law for all of the following:
 - (a) the establishment of each supervisory authority;

- (b) the qualifications and eligibility conditions required to be appointed as member of each supervisory authority;
- (c) the rules and procedures for the appointment of the member or members of each supervisory authority;
- (d) the duration of the term of the member or members of each supervisory authority of no less than four years, except for the first appointment after 24 May 2016, part of which may take place for a shorter period where that is necessary to protect the independence of the supervisory authority by means of a staggered appointment procedure;
- (e) whether and, if so, for how many terms the member or members of each supervisory authority is eligible for reappointment;
- (f) the conditions governing the obligations of the member or members and staff of each supervisory authority, prohibitions on actions, occupations and benefits incompatible therewith during and after the term of office and rules governing the cessation of employment.

2. The member or members and the staff of each supervisory authority shall, in accordance with Union or Member State law, be subject to a duty of professional secrecy both during and after their term of office, with regard to any confidential information which has come to their knowledge in the course of the performance of their tasks or exercise of their powers. During their term of office, that duty of professional secrecy shall in particular apply to reporting by natural persons of infringements of this Regulation.

Section 2

Competence, tasks and powers

Article 55

Competence

1. Each supervisory authority shall be competent for the performance of the tasks assigned to and the exercise of the powers conferred on it in accordance with this Regulation on the territory of its own Member State.
2. Where processing is carried out by public authorities or private bodies acting on the basis of point (c) or (e) of Article 6(1), the supervisory authority of the Member State concerned shall be competent. In such cases Article 56 does not apply.
3. Supervisory authorities shall not be competent to supervise processing operations of courts acting in their judicial capacity.

Article 56

Competence of the lead supervisory authority

1. Without prejudice to Article 55, the supervisory authority of the main establishment or of the single establishment of the controller or processor shall be competent to act as lead supervisory authority for the cross-border processing carried out by that controller or processor in accordance with the procedure provided in Article 60.
2. By derogation from paragraph 1, each supervisory authority shall be competent to handle a complaint lodged with it or a possible infringement of this Regulation, if the subject matter relates only to an establishment in its Member State or substantially affects data subjects only in its Member State.
3. In the cases referred to in paragraph 2 of this Article, the supervisory authority shall inform the lead supervisory authority without delay on that matter. Within a period of three weeks after being informed the lead supervisory authority shall decide whether or not it will handle the case in accordance with the procedure provided in Article 60, taking into account whether or not there is an establishment of the controller or processor in the Member State of which the supervisory authority informed it.

4. Where the lead supervisory authority decides to handle the case, the procedure provided in Article 60 shall apply. The supervisory authority which informed the lead supervisory authority may submit to the lead supervisory authority a draft for a decision. The lead supervisory authority shall take utmost account of that draft when preparing the draft decision referred to in Article 60(3).
5. Where the lead supervisory authority decides not to handle the case, the supervisory authority which informed the lead supervisory authority shall handle it according to Articles 61 and 62.
6. The lead supervisory authority shall be the sole interlocutor of the controller or processor for the cross-border processing carried out by that controller or processor.

Article 57

Tasks

1. Without prejudice to other tasks set out under this Regulation, each supervisory authority shall on its territory:
 - (a) monitor and enforce the application of this Regulation;
 - (b) promote public awareness and understanding of the risks, rules, safeguards and rights in relation to processing. Activities addressed specifically to children shall receive specific attention;
 - (c) advise, in accordance with Member State law, the national parliament, the government, and other institutions and bodies on legislative and administrative measures relating to the protection of natural persons' rights and freedoms with regard to processing;
 - (d) promote the awareness of controllers and processors of their obligations under this Regulation;
 - (e) upon request, provide information to any data subject concerning the exercise of their rights under this Regulation and, if appropriate, cooperate with the supervisory authorities in other Member States to that end;
 - (f) handle complaints lodged by a data subject, or by a body, organisation or association in accordance with Article 80, and investigate, to the extent appropriate, the subject matter of the complaint and inform the complainant of the progress and the outcome of the investigation within a reasonable period, in particular if further investigation or coordination with another supervisory authority is necessary;
 - (g) cooperate with, including sharing information and provide mutual assistance to, other supervisory authorities with a view to ensuring the consistency of application and enforcement of this Regulation;
 - (h) conduct investigations on the application of this Regulation, including on the basis of information received from another supervisory authority or other public authority;
 - (i) monitor relevant developments, insofar as they have an impact on the protection of personal data, in particular the development of information and communication technologies and commercial practices;
 - (j) adopt standard contractual clauses referred to in Article 28(8) and in point (d) of Article 46(2);
 - (k) establish and maintain a list in relation to the requirement for data protection impact assessment pursuant to Article 35(4);
 - (l) give advice on the processing operations referred to in Article 36(2);
 - (m) encourage the drawing up of codes of conduct pursuant to Article 40(1) and provide an opinion and approve such codes of conduct which provide sufficient safeguards, pursuant to Article 40(5);
 - (n) encourage the establishment of data protection certification mechanisms and of data protection seals and marks pursuant to Article 42(1), and approve the criteria of certification pursuant to Article 42(5);
 - (o) where applicable, carry out a periodic review of certifications issued in accordance with Article 42(7);

- (p) draft and publish the criteria for accreditation of a body for monitoring codes of conduct pursuant to Article 41 and of a certification body pursuant to Article 43;
- (q) conduct the accreditation of a body for monitoring codes of conduct pursuant to Article 41 and of a certification body pursuant to Article 43;
- (r) authorise contractual clauses and provisions referred to in Article 46(3);
- (s) approve binding corporate rules pursuant to Article 47;
- (t) contribute to the activities of the Board;
- (u) keep internal records of infringements of this Regulation and of measures taken in accordance with Article 58(2); and
- (v) fulfil any other tasks related to the protection of personal data.

2. Each supervisory authority shall facilitate the submission of complaints referred to in point (f) of paragraph 1 by measures such as a complaint submission form which can also be completed electronically, without excluding other means of communication.

3. The performance of the tasks of each supervisory authority shall be free of charge for the data subject and, where applicable, for the data protection officer.

4. Where requests are manifestly unfounded or excessive, in particular because of their repetitive character, the supervisory authority may charge a reasonable fee based on administrative costs, or refuse to act on the request. The supervisory authority shall bear the burden of demonstrating the manifestly unfounded or excessive character of the request.

Article 58

Powers

1. Each supervisory authority shall have all of the following investigative powers:

- (a) to order the controller and the processor, and, where applicable, the controller's or the processor's representative to provide any information it requires for the performance of its tasks;
- (b) to carry out investigations in the form of data protection audits;
- (c) to carry out a review on certifications issued pursuant to Article 42(7);
- (d) to notify the controller or the processor of an alleged infringement of this Regulation;
- (e) to obtain, from the controller and the processor, access to all personal data and to all information necessary for the performance of its tasks;
- (f) to obtain access to any premises of the controller and the processor, including to any data processing equipment and means, in accordance with Union or Member State procedural law.

2. Each supervisory authority shall have all of the following corrective powers:

- (a) to issue warnings to a controller or processor that intended processing operations are likely to infringe provisions of this Regulation;
- (b) to issue reprimands to a controller or a processor where processing operations have infringed provisions of this Regulation;
- (c) to order the controller or the processor to comply with the data subject's requests to exercise his or her rights pursuant to this Regulation;

- (d) to order the controller or processor to bring processing operations into compliance with the provisions of this Regulation, where appropriate, in a specified manner and within a specified period;
- (e) to order the controller to communicate a personal data breach to the data subject;
- (f) to impose a temporary or definitive limitation including a ban on processing;
- (g) to order the rectification or erasure of personal data or restriction of processing pursuant to Articles 16, 17 and 18 and the notification of such actions to recipients to whom the personal data have been disclosed pursuant to Article 17(2) and Article 19;
- (h) to withdraw a certification or to order the certification body to withdraw a certification issued pursuant to Articles 42 and 43, or to order the certification body not to issue certification if the requirements for the certification are not or are no longer met;
- (i) to impose an administrative fine pursuant to Article 83, in addition to, or instead of measures referred to in this paragraph, depending on the circumstances of each individual case;
- (j) to order the suspension of data flows to a recipient in a third country or to an international organisation.

3. Each supervisory authority shall have all of the following authorisation and advisory powers:

- (a) to advise the controller in accordance with the prior consultation procedure referred to in Article 36;
- (b) to issue, on its own initiative or on request, opinions to the national parliament, the Member State government or, in accordance with Member State law, to other institutions and bodies as well as to the public on any issue related to the protection of personal data;
- (c) to authorise processing referred to in Article 36(5), if the law of the Member State requires such prior authorisation;
- (d) to issue an opinion and approve draft codes of conduct pursuant to Article 40(5);
- (e) to accredit certification bodies pursuant to Article 43;
- (f) to issue certifications and approve criteria of certification in accordance with Article 42(5);
- (g) to adopt standard data protection clauses referred to in Article 28(8) and in point (d) of Article 46(2);
- (h) to authorise contractual clauses referred to in point (a) of Article 46(3);
- (i) to authorise administrative arrangements referred to in point (b) of Article 46(3);
- (j) to approve binding corporate rules pursuant to Article 47.

4. The exercise of the powers conferred on the supervisory authority pursuant to this Article shall be subject to appropriate safeguards, including effective judicial remedy and due process, set out in Union and Member State law in accordance with the Charter.

5. Each Member State shall provide by law that its supervisory authority shall have the power to bring infringements of this Regulation to the attention of the judicial authorities and where appropriate, to commence or engage otherwise in legal proceedings, in order to enforce the provisions of this Regulation.

6. Each Member State may provide by law that its supervisory authority shall have additional powers to those referred to in paragraphs 1, 2 and 3. The exercise of those powers shall not impair the effective operation of Chapter VII.

Article 59

Activity reports

Each supervisory authority shall draw up an annual report on its activities, which may include a list of types of infringement notified and types of measures taken in accordance with Article 58(2). Those reports shall be transmitted to the national parliament, the government and other authorities as designated by Member State law. They shall be made available to the public, to the Commission and to the Board.

CHAPTER VII

Cooperation and consistency

Section 1

Cooperation*Article 60***Cooperation between the lead supervisory authority and the other supervisory authorities concerned**

1. The lead supervisory authority shall cooperate with the other supervisory authorities concerned in accordance with this Article in an endeavour to reach consensus. The lead supervisory authority and the supervisory authorities concerned shall exchange all relevant information with each other.
2. The lead supervisory authority may request at any time other supervisory authorities concerned to provide mutual assistance pursuant to Article 61 and may conduct joint operations pursuant to Article 62, in particular for carrying out investigations or for monitoring the implementation of a measure concerning a controller or processor established in another Member State.
3. The lead supervisory authority shall, without delay, communicate the relevant information on the matter to the other supervisory authorities concerned. It shall without delay submit a draft decision to the other supervisory authorities concerned for their opinion and take due account of their views.
4. Where any of the other supervisory authorities concerned within a period of four weeks after having been consulted in accordance with paragraph 3 of this Article, expresses a relevant and reasoned objection to the draft decision, the lead supervisory authority shall, if it does not follow the relevant and reasoned objection or is of the opinion that the objection is not relevant or reasoned, submit the matter to the consistency mechanism referred to in Article 63.
5. Where the lead supervisory authority intends to follow the relevant and reasoned objection made, it shall submit to the other supervisory authorities concerned a revised draft decision for their opinion. That revised draft decision shall be subject to the procedure referred to in paragraph 4 within a period of two weeks.
6. Where none of the other supervisory authorities concerned has objected to the draft decision submitted by the lead supervisory authority within the period referred to in paragraphs 4 and 5, the lead supervisory authority and the supervisory authorities concerned shall be deemed to be in agreement with that draft decision and shall be bound by it.
7. The lead supervisory authority shall adopt and notify the decision to the main establishment or single establishment of the controller or processor, as the case may be and inform the other supervisory authorities concerned and the Board of the decision in question, including a summary of the relevant facts and grounds. The supervisory authority with which a complaint has been lodged shall inform the complainant on the decision.
8. By derogation from paragraph 7, where a complaint is dismissed or rejected, the supervisory authority with which the complaint was lodged shall adopt the decision and notify it to the complainant and shall inform the controller thereof.
9. Where the lead supervisory authority and the supervisory authorities concerned agree to dismiss or reject parts of a complaint and to act on other parts of that complaint, a separate decision shall be adopted for each of those parts of the matter. The lead supervisory authority shall adopt the decision for the part concerning actions in relation to the controller, shall notify it to the main establishment or single establishment of the controller or processor on the territory of its Member State and shall inform the complainant thereof, while the supervisory authority of the complainant shall adopt the decision for the part concerning dismissal or rejection of that complaint, and shall notify it to that complainant and shall inform the controller or processor thereof.
10. After being notified of the decision of the lead supervisory authority pursuant to paragraphs 7 and 9, the controller or processor shall take the necessary measures to ensure compliance with the decision as regards processing activities in the context of all its establishments in the Union. The controller or processor shall notify the measures taken for complying with the decision to the lead supervisory authority, which shall inform the other supervisory authorities concerned.

11. Where, in exceptional circumstances, a supervisory authority concerned has reasons to consider that there is an urgent need to act in order to protect the interests of data subjects, the urgency procedure referred to in Article 66 shall apply.

12. The lead supervisory authority and the other supervisory authorities concerned shall supply the information required under this Article to each other by electronic means, using a standardised format.

Article 61

Mutual assistance

1. Supervisory authorities shall provide each other with relevant information and mutual assistance in order to implement and apply this Regulation in a consistent manner, and shall put in place measures for effective cooperation with one another. Mutual assistance shall cover, in particular, information requests and supervisory measures, such as requests to carry out prior authorisations and consultations, inspections and investigations.

2. Each supervisory authority shall take all appropriate measures required to reply to a request of another supervisory authority without undue delay and no later than one month after receiving the request. Such measures may include, in particular, the transmission of relevant information on the conduct of an investigation.

3. Requests for assistance shall contain all the necessary information, including the purpose of and reasons for the request. Information exchanged shall be used only for the purpose for which it was requested.

4. The requested supervisory authority shall not refuse to comply with the request unless:

- (a) it is not competent for the subject-matter of the request or for the measures it is requested to execute; or
- (b) compliance with the request would infringe this Regulation or Union or Member State law to which the supervisory authority receiving the request is subject.

5. The requested supervisory authority shall inform the requesting supervisory authority of the results or, as the case may be, of the progress of the measures taken in order to respond to the request. The requested supervisory authority shall provide reasons for any refusal to comply with a request pursuant to paragraph 4.

6. Requested supervisory authorities shall, as a rule, supply the information requested by other supervisory authorities by electronic means, using a standardised format.

7. Requested supervisory authorities shall not charge a fee for any action taken by them pursuant to a request for mutual assistance. Supervisory authorities may agree on rules to indemnify each other for specific expenditure arising from the provision of mutual assistance in exceptional circumstances.

8. Where a supervisory authority does not provide the information referred to in paragraph 5 of this Article within one month of receiving the request of another supervisory authority, the requesting supervisory authority may adopt a provisional measure on the territory of its Member State in accordance with Article 55(1). In that case, the urgent need to act under Article 66(1) shall be presumed to be met and require an urgent binding decision from the Board pursuant to Article 66(2).

9. The Commission may, by means of implementing acts, specify the format and procedures for mutual assistance referred to in this Article and the arrangements for the exchange of information by electronic means between supervisory authorities, and between supervisory authorities and the Board, in particular the standardised format referred to in paragraph 6 of this Article. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 93(2).

Article 62

Joint operations of supervisory authorities

1. The supervisory authorities shall, where appropriate, conduct joint operations including joint investigations and joint enforcement measures in which members or staff of the supervisory authorities of other Member States are involved.

2. Where the controller or processor has establishments in several Member States or where a significant number of data subjects in more than one Member State are likely to be substantially affected by processing operations, a supervisory authority of each of those Member States shall have the right to participate in joint operations. The supervisory authority which is competent pursuant to Article 56(1) or (4) shall invite the supervisory authority of each of those Member States to take part in the joint operations and shall respond without delay to the request of a supervisory authority to participate.
3. A supervisory authority may, in accordance with Member State law, and with the seconding supervisory authority's authorisation, confer powers, including investigative powers on the seconding supervisory authority's members or staff involved in joint operations or, in so far as the law of the Member State of the host supervisory authority permits, allow the seconding supervisory authority's members or staff to exercise their investigative powers in accordance with the law of the Member State of the seconding supervisory authority. Such investigative powers may be exercised only under the guidance and in the presence of members or staff of the host supervisory authority. The seconding supervisory authority's members or staff shall be subject to the Member State law of the host supervisory authority.
4. Where, in accordance with paragraph 1, staff of a seconding supervisory authority operate in another Member State, the Member State of the host supervisory authority shall assume responsibility for their actions, including liability, for any damage caused by them during their operations, in accordance with the law of the Member State in whose territory they are operating.
5. The Member State in whose territory the damage was caused shall make good such damage under the conditions applicable to damage caused by its own staff. The Member State of the seconding supervisory authority whose staff has caused damage to any person in the territory of another Member State shall reimburse that other Member State in full any sums it has paid to the persons entitled on their behalf.
6. Without prejudice to the exercise of its rights *vis-à-vis* third parties and with the exception of paragraph 5, each Member State shall refrain, in the case provided for in paragraph 1, from requesting reimbursement from another Member State in relation to damage referred to in paragraph 4.
7. Where a joint operation is intended and a supervisory authority does not, within one month, comply with the obligation laid down in the second sentence of paragraph 2 of this Article, the other supervisory authorities may adopt a provisional measure on the territory of its Member State in accordance with Article 55. In that case, the urgent need to act under Article 66(1) shall be presumed to be met and require an opinion or an urgent binding decision from the Board pursuant to Article 66(2).

Section 2

Consistency

Article 63

Consistency mechanism

In order to contribute to the consistent application of this Regulation throughout the Union, the supervisory authorities shall cooperate with each other and, where relevant, with the Commission, through the consistency mechanism as set out in this Section.

Article 64

Opinion of the Board

1. The Board shall issue an opinion where a competent supervisory authority intends to adopt any of the measures below. To that end, the competent supervisory authority shall communicate the draft decision to the Board, when it:
 - (a) aims to adopt a list of the processing operations subject to the requirement for a data protection impact assessment pursuant to Article 35(4);
 - (b) concerns a matter pursuant to Article 40(7) whether a draft code of conduct or an amendment or extension to a code of conduct complies with this Regulation;

- (c) aims to approve the criteria for accreditation of a body pursuant to Article 41(3) or a certification body pursuant to Article 43(3);
 - (d) aims to determine standard data protection clauses referred to in point (d) of Article 46(2) and in Article 28(8);
 - (e) aims to authorise contractual clauses referred to in point (a) of Article 46(3); or
 - (f) aims to approve binding corporate rules within the meaning of Article 47.
2. Any supervisory authority, the Chair of the Board or the Commission may request that any matter of general application or producing effects in more than one Member State be examined by the Board with a view to obtaining an opinion, in particular where a competent supervisory authority does not comply with the obligations for mutual assistance in accordance with Article 61 or for joint operations in accordance with Article 62.
3. In the cases referred to in paragraphs 1 and 2, the Board shall issue an opinion on the matter submitted to it provided that it has not already issued an opinion on the same matter. That opinion shall be adopted within eight weeks by simple majority of the members of the Board. That period may be extended by a further six weeks, taking into account the complexity of the subject matter. Regarding the draft decision referred to in paragraph 1 circulated to the members of the Board in accordance with paragraph 5, a member which has not objected within a reasonable period indicated by the Chair, shall be deemed to be in agreement with the draft decision.
4. Supervisory authorities and the Commission shall, without undue delay, communicate by electronic means to the Board, using a standardised format any relevant information, including as the case may be a summary of the facts, the draft decision, the grounds which make the enactment of such measure necessary, and the views of other supervisory authorities concerned.
5. The Chair of the Board shall, without undue delay inform by electronic means:
- (a) the members of the Board and the Commission of any relevant information which has been communicated to it using a standardised format. The secretariat of the Board shall, where necessary, provide translations of relevant information; and
 - (b) the supervisory authority referred to, as the case may be, in paragraphs 1 and 2, and the Commission of the opinion and make it public.
6. The competent supervisory authority shall not adopt its draft decision referred to in paragraph 1 within the period referred to in paragraph 3.
7. The supervisory authority referred to in paragraph 1 shall take utmost account of the opinion of the Board and shall, within two weeks after receiving the opinion, communicate to the Chair of the Board by electronic means whether it will maintain or amend its draft decision and, if any, the amended draft decision, using a standardised format.
8. Where the supervisory authority concerned informs the Chair of the Board within the period referred to in paragraph 7 of this Article that it does not intend to follow the opinion of the Board, in whole or in part, providing the relevant grounds, Article 65(1) shall apply.

Article 65

Dispute resolution by the Board

1. In order to ensure the correct and consistent application of this Regulation in individual cases, the Board shall adopt a binding decision in the following cases:
- (a) where, in a case referred to in Article 60(4), a supervisory authority concerned has raised a relevant and reasoned objection to a draft decision of the lead authority or the lead authority has rejected such an objection as being not relevant or reasoned. The binding decision shall concern all the matters which are the subject of the relevant and reasoned objection, in particular whether there is an infringement of this Regulation;

- (b) where there are conflicting views on which of the supervisory authorities concerned is competent for the main establishment;
- (c) where a competent supervisory authority does not request the opinion of the Board in the cases referred to in Article 64(1), or does not follow the opinion of the Board issued under Article 64. In that case, any supervisory authority concerned or the Commission may communicate the matter to the Board.
2. The decision referred to in paragraph 1 shall be adopted within one month from the referral of the subject-matter by a two-thirds majority of the members of the Board. That period may be extended by a further month on account of the complexity of the subject-matter. The decision referred to in paragraph 1 shall be reasoned and addressed to the lead supervisory authority and all the supervisory authorities concerned and binding on them.
3. Where the Board has been unable to adopt a decision within the periods referred to in paragraph 2, it shall adopt its decision within two weeks following the expiration of the second month referred to in paragraph 2 by a simple majority of the members of the Board. Where the members of the Board are split, the decision shall be adopted by the vote of its Chair.
4. The supervisory authorities concerned shall not adopt a decision on the subject matter submitted to the Board under paragraph 1 during the periods referred to in paragraphs 2 and 3.
5. The Chair of the Board shall notify, without undue delay, the decision referred to in paragraph 1 to the supervisory authorities concerned. It shall inform the Commission thereof. The decision shall be published on the website of the Board without delay after the supervisory authority has notified the final decision referred to in paragraph 6.
6. The lead supervisory authority or, as the case may be, the supervisory authority with which the complaint has been lodged shall adopt its final decision on the basis of the decision referred to in paragraph 1 of this Article, without undue delay and at the latest by one month after the Board has notified its decision. The lead supervisory authority or, as the case may be, the supervisory authority with which the complaint has been lodged, shall inform the Board of the date when its final decision is notified respectively to the controller or the processor and to the data subject. The final decision of the supervisory authorities concerned shall be adopted under the terms of Article 60(7), (8) and (9). The final decision shall refer to the decision referred to in paragraph 1 of this Article and shall specify that the decision referred to in that paragraph will be published on the website of the Board in accordance with paragraph 5 of this Article. The final decision shall attach the decision referred to in paragraph 1 of this Article.

Article 66

Urgency procedure

1. In exceptional circumstances, where a supervisory authority concerned considers that there is an urgent need to act in order to protect the rights and freedoms of data subjects, it may, by way of derogation from the consistency mechanism referred to in Articles 63, 64 and 65 or the procedure referred to in Article 60, immediately adopt provisional measures intended to produce legal effects on its own territory with a specified period of validity which shall not exceed three months. The supervisory authority shall, without delay, communicate those measures and the reasons for adopting them to the other supervisory authorities concerned, to the Board and to the Commission.
2. Where a supervisory authority has taken a measure pursuant to paragraph 1 and considers that final measures need urgently be adopted, it may request an urgent opinion or an urgent binding decision from the Board, giving reasons for requesting such opinion or decision.
3. Any supervisory authority may request an urgent opinion or an urgent binding decision, as the case may be, from the Board where a competent supervisory authority has not taken an appropriate measure in a situation where there is an urgent need to act, in order to protect the rights and freedoms of data subjects, giving reasons for requesting such opinion or decision, including for the urgent need to act.
4. By derogation from Article 64(3) and Article 65(2), an urgent opinion or an urgent binding decision referred to in paragraphs 2 and 3 of this Article shall be adopted within two weeks by simple majority of the members of the Board.

*Article 67***Exchange of information**

The Commission may adopt implementing acts of general scope in order to specify the arrangements for the exchange of information by electronic means between supervisory authorities, and between supervisory authorities and the Board, in particular the standardised format referred to in Article 64.

Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 93(2).

*Section 3***European data protection board***Article 68***European Data Protection Board**

1. The European Data Protection Board (the 'Board') is hereby established as a body of the Union and shall have legal personality.
2. The Board shall be represented by its Chair.
3. The Board shall be composed of the head of one supervisory authority of each Member State and of the European Data Protection Supervisor, or their respective representatives.
4. Where in a Member State more than one supervisory authority is responsible for monitoring the application of the provisions pursuant to this Regulation, a joint representative shall be appointed in accordance with that Member State's law.
5. The Commission shall have the right to participate in the activities and meetings of the Board without voting right. The Commission shall designate a representative. The Chair of the Board shall communicate to the Commission the activities of the Board.
6. In the cases referred to in Article 65, the European Data Protection Supervisor shall have voting rights only on decisions which concern principles and rules applicable to the Union institutions, bodies, offices and agencies which correspond in substance to those of this Regulation.

*Article 69***Independence**

1. The Board shall act independently when performing its tasks or exercising its powers pursuant to Articles 70 and 71.
2. Without prejudice to requests by the Commission referred to in point (b) of Article 70(1) and in Article 70(2), the Board shall, in the performance of its tasks or the exercise of its powers, neither seek nor take instructions from anybody.

*Article 70***Tasks of the Board**

1. The Board shall ensure the consistent application of this Regulation. To that end, the Board shall, on its own initiative or, where relevant, at the request of the Commission, in particular:
 - (a) monitor and ensure the correct application of this Regulation in the cases provided for in Articles 64 and 65 without prejudice to the tasks of national supervisory authorities;

- (b) advise the Commission on any issue related to the protection of personal data in the Union, including on any proposed amendment of this Regulation;
- (c) advise the Commission on the format and procedures for the exchange of information between controllers, processors and supervisory authorities for binding corporate rules;
- (d) issue guidelines, recommendations, and best practices on procedures for erasing links, copies or replications of personal data from publicly available communication services as referred to in Article 17(2);
- (e) examine, on its own initiative, on request of one of its members or on request of the Commission, any question covering the application of this Regulation and issue guidelines, recommendations and best practices in order to encourage consistent application of this Regulation;
- (f) issue guidelines, recommendations and best practices in accordance with point (e) of this paragraph for further specifying the criteria and conditions for decisions based on profiling pursuant to Article 22(2);
- (g) issue guidelines, recommendations and best practices in accordance with point (e) of this paragraph for establishing the personal data breaches and determining the undue delay referred to in Article 33(1) and (2) and for the particular circumstances in which a controller or a processor is required to notify the personal data breach;
- (h) issue guidelines, recommendations and best practices in accordance with point (e) of this paragraph as to the circumstances in which a personal data breach is likely to result in a high risk to the rights and freedoms of the natural persons referred to in Article 34(1).
- (i) issue guidelines, recommendations and best practices in accordance with point (e) of this paragraph for the purpose of further specifying the criteria and requirements for personal data transfers based on binding corporate rules adhered to by controllers and binding corporate rules adhered to by processors and on further necessary requirements to ensure the protection of personal data of the data subjects concerned referred to in Article 47;
- (j) issue guidelines, recommendations and best practices in accordance with point (e) of this paragraph for the purpose of further specifying the criteria and requirements for the personal data transfers on the basis of Article 49(1);
- (k) draw up guidelines for supervisory authorities concerning the application of measures referred to in Article 58(1), (2) and (3) and the setting of administrative fines pursuant to Article 83;
- (l) review the practical application of the guidelines, recommendations and best practices referred to in points (e) and (f);
- (m) issue guidelines, recommendations and best practices in accordance with point (e) of this paragraph for establishing common procedures for reporting by natural persons of infringements of this Regulation pursuant to Article 54(2);
- (n) encourage the drawing-up of codes of conduct and the establishment of data protection certification mechanisms and data protection seals and marks pursuant to Articles 40 and 42;
- (o) carry out the accreditation of certification bodies and its periodic review pursuant to Article 43 and maintain a public register of accredited bodies pursuant to Article 43(6) and of the accredited controllers or processors established in third countries pursuant to Article 42(7);
- (p) specify the requirements referred to in Article 43(3) with a view to the accreditation of certification bodies under Article 42;
- (q) provide the Commission with an opinion on the certification requirements referred to in Article 43(8);
- (r) provide the Commission with an opinion on the icons referred to in Article 12(7);
- (s) provide the Commission with an opinion for the assessment of the adequacy of the level of protection in a third country or international organisation, including for the assessment whether a third country, a territory or one or more specified sectors within that third country, or an international organisation no longer ensures an adequate level of protection. To that end, the Commission shall provide the Board with all necessary documentation, including correspondence with the government of the third country, with regard to that third country, territory or specified sector, or with the international organisation.

- (t) issue opinions on draft decisions of supervisory authorities pursuant to the consistency mechanism referred to in Article 64(1), on matters submitted pursuant to Article 64(2) and to issue binding decisions pursuant to Article 65, including in cases referred to in Article 66;
 - (u) promote the cooperation and the effective bilateral and multilateral exchange of information and best practices between the supervisory authorities;
 - (v) promote common training programmes and facilitate personnel exchanges between the supervisory authorities and, where appropriate, with the supervisory authorities of third countries or with international organisations;
 - (w) promote the exchange of knowledge and documentation on data protection legislation and practice with data protection supervisory authorities worldwide.
 - (x) issue opinions on codes of conduct drawn up at Union level pursuant to Article 40(9); and
 - (y) maintain a publicly accessible electronic register of decisions taken by supervisory authorities and courts on issues handled in the consistency mechanism.
2. Where the Commission requests advice from the Board, it may indicate a time limit, taking into account the urgency of the matter.
3. The Board shall forward its opinions, guidelines, recommendations, and best practices to the Commission and to the committee referred to in Article 93 and make them public.
4. The Board shall, where appropriate, consult interested parties and give them the opportunity to comment within a reasonable period. The Board shall, without prejudice to Article 76, make the results of the consultation procedure publicly available.

Article 71

Reports

1. The Board shall draw up an annual report regarding the protection of natural persons with regard to processing in the Union and, where relevant, in third countries and international organisations. The report shall be made public and be transmitted to the European Parliament, to the Council and to the Commission.
2. The annual report shall include a review of the practical application of the guidelines, recommendations and best practices referred to in point (l) of Article 70(1) as well as of the binding decisions referred to in Article 65.

Article 72

Procedure

1. The Board shall take decisions by a simple majority of its members, unless otherwise provided for in this Regulation.
2. The Board shall adopt its own rules of procedure by a two-thirds majority of its members and organise its own operational arrangements.

Article 73

Chair

1. The Board shall elect a chair and two deputy chairs from amongst its members by simple majority.
2. The term of office of the Chair and of the deputy chairs shall be five years and be renewable once.

*Article 74***Tasks of the Chair**

1. The Chair shall have the following tasks:
 - (a) to convene the meetings of the Board and prepare its agenda;
 - (b) to notify decisions adopted by the Board pursuant to Article 65 to the lead supervisory authority and the supervisory authorities concerned;
 - (c) to ensure the timely performance of the tasks of the Board, in particular in relation to the consistency mechanism referred to in Article 63.
2. The Board shall lay down the allocation of tasks between the Chair and the deputy chairs in its rules of procedure.

*Article 75***Secretariat**

1. The Board shall have a secretariat, which shall be provided by the European Data Protection Supervisor.
2. The secretariat shall perform its tasks exclusively under the instructions of the Chair of the Board.
3. The staff of the European Data Protection Supervisor involved in carrying out the tasks conferred on the Board by this Regulation shall be subject to separate reporting lines from the staff involved in carrying out tasks conferred on the European Data Protection Supervisor.
4. Where appropriate, the Board and the European Data Protection Supervisor shall establish and publish a Memorandum of Understanding implementing this Article, determining the terms of their cooperation, and applicable to the staff of the European Data Protection Supervisor involved in carrying out the tasks conferred on the Board by this Regulation.
5. The secretariat shall provide analytical, administrative and logistical support to the Board.
6. The secretariat shall be responsible in particular for:
 - (a) the day-to-day business of the Board;
 - (b) communication between the members of the Board, its Chair and the Commission;
 - (c) communication with other institutions and the public;
 - (d) the use of electronic means for the internal and external communication;
 - (e) the translation of relevant information;
 - (f) the preparation and follow-up of the meetings of the Board;
 - (g) the preparation, drafting and publication of opinions, decisions on the settlement of disputes between supervisory authorities and other texts adopted by the Board.

*Article 76***Confidentiality**

1. The discussions of the Board shall be confidential where the Board deems it necessary, as provided for in its rules of procedure.

2. Access to documents submitted to members of the Board, experts and representatives of third parties shall be governed by Regulation (EC) No 1049/2001 of the European Parliament and of the Council ⁽¹⁾.

CHAPTER VIII

Remedies, liability and penalties

Article 77

Right to lodge a complaint with a supervisory authority

1. Without prejudice to any other administrative or judicial remedy, every data subject shall have the right to lodge a complaint with a supervisory authority, in particular in the Member State of his or her habitual residence, place of work or place of the alleged infringement if the data subject considers that the processing of personal data relating to him or her infringes this Regulation.

2. The supervisory authority with which the complaint has been lodged shall inform the complainant on the progress and the outcome of the complaint including the possibility of a judicial remedy pursuant to Article 78.

Article 78

Right to an effective judicial remedy against a supervisory authority

1. Without prejudice to any other administrative or non-judicial remedy, each natural or legal person shall have the right to an effective judicial remedy against a legally binding decision of a supervisory authority concerning them.

2. Without prejudice to any other administrative or non-judicial remedy, each data subject shall have the right to an effective judicial remedy where the supervisory authority which is competent pursuant to Articles 55 and 56 does not handle a complaint or does not inform the data subject within three months on the progress or outcome of the complaint lodged pursuant to Article 77.

3. Proceedings against a supervisory authority shall be brought before the courts of the Member State where the supervisory authority is established.

4. Where proceedings are brought against a decision of a supervisory authority which was preceded by an opinion or a decision of the Board in the consistency mechanism, the supervisory authority shall forward that opinion or decision to the court.

Article 79

Right to an effective judicial remedy against a controller or processor

1. Without prejudice to any available administrative or non-judicial remedy, including the right to lodge a complaint with a supervisory authority pursuant to Article 77, each data subject shall have the right to an effective judicial remedy where he or she considers that his or her rights under this Regulation have been infringed as a result of the processing of his or her personal data in non-compliance with this Regulation.

2. Proceedings against a controller or a processor shall be brought before the courts of the Member State where the controller or processor has an establishment. Alternatively, such proceedings may be brought before the courts of the Member State where the data subject has his or her habitual residence, unless the controller or processor is a public authority of a Member State acting in the exercise of its public powers.

⁽¹⁾ Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents (OJ L 145, 31.5.2001, p. 43).

*Article 80***Representation of data subjects**

1. The data subject shall have the right to mandate a not-for-profit body, organisation or association which has been properly constituted in accordance with the law of a Member State, has statutory objectives which are in the public interest, and is active in the field of the protection of data subjects' rights and freedoms with regard to the protection of their personal data to lodge the complaint on his or her behalf, to exercise the rights referred to in Articles 77, 78 and 79 on his or her behalf, and to exercise the right to receive compensation referred to in Article 82 on his or her behalf where provided for by Member State law.
2. Member States may provide that any body, organisation or association referred to in paragraph 1 of this Article, independently of a data subject's mandate, has the right to lodge, in that Member State, a complaint with the supervisory authority which is competent pursuant to Article 77 and to exercise the rights referred to in Articles 78 and 79 if it considers that the rights of a data subject under this Regulation have been infringed as a result of the processing.

*Article 81***Suspension of proceedings**

1. Where a competent court of a Member State has information on proceedings, concerning the same subject matter as regards processing by the same controller or processor, that are pending in a court in another Member State, it shall contact that court in the other Member State to confirm the existence of such proceedings.
2. Where proceedings concerning the same subject matter as regards processing of the same controller or processor are pending in a court in another Member State, any competent court other than the court first seized may suspend its proceedings.
3. Where those proceedings are pending at first instance, any court other than the court first seized may also, on the application of one of the parties, decline jurisdiction if the court first seized has jurisdiction over the actions in question and its law permits the consolidation thereof.

*Article 82***Right to compensation and liability**

1. Any person who has suffered material or non-material damage as a result of an infringement of this Regulation shall have the right to receive compensation from the controller or processor for the damage suffered.
2. Any controller involved in processing shall be liable for the damage caused by processing which infringes this Regulation. A processor shall be liable for the damage caused by processing only where it has not complied with obligations of this Regulation specifically directed to processors or where it has acted outside or contrary to lawful instructions of the controller.
3. A controller or processor shall be exempt from liability under paragraph 2 if it proves that it is not in any way responsible for the event giving rise to the damage.
4. Where more than one controller or processor, or both a controller and a processor, are involved in the same processing and where they are, under paragraphs 2 and 3, responsible for any damage caused by processing, each controller or processor shall be held liable for the entire damage in order to ensure effective compensation of the data subject.
5. Where a controller or processor has, in accordance with paragraph 4, paid full compensation for the damage suffered, that controller or processor shall be entitled to claim back from the other controllers or processors involved in the same processing that part of the compensation corresponding to their part of responsibility for the damage, in accordance with the conditions set out in paragraph 2.

6. Court proceedings for exercising the right to receive compensation shall be brought before the courts competent under the law of the Member State referred to in Article 79(2).

Article 83

General conditions for imposing administrative fines

1. Each supervisory authority shall ensure that the imposition of administrative fines pursuant to this Article in respect of infringements of this Regulation referred to in paragraphs 4, 5 and 6 shall in each individual case be effective, proportionate and dissuasive.

2. Administrative fines shall, depending on the circumstances of each individual case, be imposed in addition to, or instead of, measures referred to in points (a) to (h) and (j) of Article 58(2). When deciding whether to impose an administrative fine and deciding on the amount of the administrative fine in each individual case due regard shall be given to the following:

- (a) the nature, gravity and duration of the infringement taking into account the nature scope or purpose of the processing concerned as well as the number of data subjects affected and the level of damage suffered by them;
- (b) the intentional or negligent character of the infringement;
- (c) any action taken by the controller or processor to mitigate the damage suffered by data subjects;
- (d) the degree of responsibility of the controller or processor taking into account technical and organisational measures implemented by them pursuant to Articles 25 and 32;
- (e) any relevant previous infringements by the controller or processor;
- (f) the degree of cooperation with the supervisory authority, in order to remedy the infringement and mitigate the possible adverse effects of the infringement;
- (g) the categories of personal data affected by the infringement;
- (h) the manner in which the infringement became known to the supervisory authority, in particular whether, and if so to what extent, the controller or processor notified the infringement;
- (i) where measures referred to in Article 58(2) have previously been ordered against the controller or processor concerned with regard to the same subject-matter, compliance with those measures;
- (j) adherence to approved codes of conduct pursuant to Article 40 or approved certification mechanisms pursuant to Article 42; and
- (k) any other aggravating or mitigating factor applicable to the circumstances of the case, such as financial benefits gained, or losses avoided, directly or indirectly, from the infringement.

3. If a controller or processor intentionally or negligently, for the same or linked processing operations, infringes several provisions of this Regulation, the total amount of the administrative fine shall not exceed the amount specified for the gravest infringement.

4. Infringements of the following provisions shall, in accordance with paragraph 2, be subject to administrative fines up to 10 000 000 EUR, or in the case of an undertaking, up to 2 % of the total worldwide annual turnover of the preceding financial year, whichever is higher:

- (a) the obligations of the controller and the processor pursuant to Articles 8, 11, 25 to 39 and 42 and 43;
- (b) the obligations of the certification body pursuant to Articles 42 and 43;
- (c) the obligations of the monitoring body pursuant to Article 41(4).

5. Infringements of the following provisions shall, in accordance with paragraph 2, be subject to administrative fines up to 20 000 000 EUR, or in the case of an undertaking, up to 4 % of the total worldwide annual turnover of the preceding financial year, whichever is higher:

- (a) the basic principles for processing, including conditions for consent, pursuant to Articles 5, 6, 7 and 9;
- (b) the data subjects' rights pursuant to Articles 12 to 22;
- (c) the transfers of personal data to a recipient in a third country or an international organisation pursuant to Articles 44 to 49;
- (d) any obligations pursuant to Member State law adopted under Chapter IX;
- (e) non-compliance with an order or a temporary or definitive limitation on processing or the suspension of data flows by the supervisory authority pursuant to Article 58(2) or failure to provide access in violation of Article 58(1).

6. Non-compliance with an order by the supervisory authority as referred to in Article 58(2) shall, in accordance with paragraph 2 of this Article, be subject to administrative fines up to 20 000 000 EUR, or in the case of an undertaking, up to 4 % of the total worldwide annual turnover of the preceding financial year, whichever is higher.

7. Without prejudice to the corrective powers of supervisory authorities pursuant to Article 58(2), each Member State may lay down the rules on whether and to what extent administrative fines may be imposed on public authorities and bodies established in that Member State.

8. The exercise by the supervisory authority of its powers under this Article shall be subject to appropriate procedural safeguards in accordance with Union and Member State law, including effective judicial remedy and due process.

9. Where the legal system of the Member State does not provide for administrative fines, this Article may be applied in such a manner that the fine is initiated by the competent supervisory authority and imposed by competent national courts, while ensuring that those legal remedies are effective and have an equivalent effect to the administrative fines imposed by supervisory authorities. In any event, the fines imposed shall be effective, proportionate and dissuasive. Those Member States shall notify to the Commission the provisions of their laws which they adopt pursuant to this paragraph by 25 May 2018 and, without delay, any subsequent amendment law or amendment affecting them.

Article 84

Penalties

1. Member States shall lay down the rules on other penalties applicable to infringements of this Regulation in particular for infringements which are not subject to administrative fines pursuant to Article 83, and shall take all measures necessary to ensure that they are implemented. Such penalties shall be effective, proportionate and dissuasive.

2. Each Member State shall notify to the Commission the provisions of its law which it adopts pursuant to paragraph 1, by 25 May 2018 and, without delay, any subsequent amendment affecting them.

CHAPTER IX

Provisions relating to specific processing situations

Article 85

Processing and freedom of expression and information

1. Member States shall by law reconcile the right to the protection of personal data pursuant to this Regulation with the right to freedom of expression and information, including processing for journalistic purposes and the purposes of academic, artistic or literary expression.

2. For processing carried out for journalistic purposes or the purpose of academic artistic or literary expression, Member States shall provide for exemptions or derogations from Chapter II (principles), Chapter III (rights of the data subject), Chapter IV (controller and processor), Chapter V (transfer of personal data to third countries or international organisations), Chapter VI (independent supervisory authorities), Chapter VII (cooperation and consistency) and Chapter IX (specific data processing situations) if they are necessary to reconcile the right to the protection of personal data with the freedom of expression and information.

3. Each Member State shall notify to the Commission the provisions of its law which it has adopted pursuant to paragraph 2 and, without delay, any subsequent amendment law or amendment affecting them.

Article 86

Processing and public access to official documents

Personal data in official documents held by a public authority or a public body or a private body for the performance of a task carried out in the public interest may be disclosed by the authority or body in accordance with Union or Member State law to which the public authority or body is subject in order to reconcile public access to official documents with the right to the protection of personal data pursuant to this Regulation.

Article 87

Processing of the national identification number

Member States may further determine the specific conditions for the processing of a national identification number or any other identifier of general application. In that case the national identification number or any other identifier of general application shall be used only under appropriate safeguards for the rights and freedoms of the data subject pursuant to this Regulation.

Article 88

Processing in the context of employment

1. Member States may, by law or by collective agreements, provide for more specific rules to ensure the protection of the rights and freedoms in respect of the processing of employees' personal data in the employment context, in particular for the purposes of the recruitment, the performance of the contract of employment, including discharge of obligations laid down by law or by collective agreements, management, planning and organisation of work, equality and diversity in the workplace, health and safety at work, protection of employer's or customer's property and for the purposes of the exercise and enjoyment, on an individual or collective basis, of rights and benefits related to employment, and for the purpose of the termination of the employment relationship.

2. Those rules shall include suitable and specific measures to safeguard the data subject's human dignity, legitimate interests and fundamental rights, with particular regard to the transparency of processing, the transfer of personal data within a group of undertakings, or a group of enterprises engaged in a joint economic activity and monitoring systems at the work place.

3. Each Member State shall notify to the Commission those provisions of its law which it adopts pursuant to paragraph 1, by 25 May 2018 and, without delay, any subsequent amendment affecting them.

Article 89

Safeguards and derogations relating to processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes

1. Processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes, shall be subject to appropriate safeguards, in accordance with this Regulation, for the rights and freedoms of the data subject. Those safeguards shall ensure that technical and organisational measures are in place in particular in

order to ensure respect for the principle of data minimisation. Those measures may include pseudonymisation provided that those purposes can be fulfilled in that manner. Where those purposes can be fulfilled by further processing which does not permit or no longer permits the identification of data subjects, those purposes shall be fulfilled in that manner.

2. Where personal data are processed for scientific or historical research purposes or statistical purposes, Union or Member State law may provide for derogations from the rights referred to in Articles 15, 16, 18 and 21 subject to the conditions and safeguards referred to in paragraph 1 of this Article in so far as such rights are likely to render impossible or seriously impair the achievement of the specific purposes, and such derogations are necessary for the fulfilment of those purposes.

3. Where personal data are processed for archiving purposes in the public interest, Union or Member State law may provide for derogations from the rights referred to in Articles 15, 16, 18, 19, 20 and 21 subject to the conditions and safeguards referred to in paragraph 1 of this Article in so far as such rights are likely to render impossible or seriously impair the achievement of the specific purposes, and such derogations are necessary for the fulfilment of those purposes.

4. Where processing referred to in paragraphs 2 and 3 serves at the same time another purpose, the derogations shall apply only to processing for the purposes referred to in those paragraphs.

Article 90

Obligations of secrecy

1. Member States may adopt specific rules to set out the powers of the supervisory authorities laid down in points (e) and (f) of Article 58(1) in relation to controllers or processors that are subject, under Union or Member State law or rules established by national competent bodies, to an obligation of professional secrecy or other equivalent obligations of secrecy where this is necessary and proportionate to reconcile the right of the protection of personal data with the obligation of secrecy. Those rules shall apply only with regard to personal data which the controller or processor has received as a result of or has obtained in an activity covered by that obligation of secrecy.

2. Each Member State shall notify to the Commission the rules adopted pursuant to paragraph 1, by 25 May 2018 and, without delay, any subsequent amendment affecting them.

Article 91

Existing data protection rules of churches and religious associations

1. Where in a Member State, churches and religious associations or communities apply, at the time of entry into force of this Regulation, comprehensive rules relating to the protection of natural persons with regard to processing, such rules may continue to apply, provided that they are brought into line with this Regulation.

2. Churches and religious associations which apply comprehensive rules in accordance with paragraph 1 of this Article shall be subject to the supervision of an independent supervisory authority, which may be specific, provided that it fulfils the conditions laid down in Chapter VI of this Regulation.

CHAPTER X

Delegated acts and implementing acts

Article 92

Exercise of the delegation

1. The power to adopt delegated acts is conferred on the Commission subject to the conditions laid down in this Article.

2. The delegation of power referred to in Article 12(8) and Article 43(8) shall be conferred on the Commission for an indeterminate period of time from 24 May 2016.
3. The delegation of power referred to in Article 12(8) and Article 43(8) may be revoked at any time by the European Parliament or by the Council. A decision of revocation shall put an end to the delegation of power specified in that decision. It shall take effect the day following that of its publication in the *Official Journal of the European Union* or at a later date specified therein. It shall not affect the validity of any delegated acts already in force.
4. As soon as it adopts a delegated act, the Commission shall notify it simultaneously to the European Parliament and to the Council.
5. A delegated act adopted pursuant to Article 12(8) and Article 43(8) shall enter into force only if no objection has been expressed by either the European Parliament or the Council within a period of three months of notification of that act to the European Parliament and the Council or if, before the expiry of that period, the European Parliament and the Council have both informed the Commission that they will not object. That period shall be extended by three months at the initiative of the European Parliament or of the Council.

Article 93

Committee procedure

1. The Commission shall be assisted by a committee. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011.
2. Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply.
3. Where reference is made to this paragraph, Article 8 of Regulation (EU) No 182/2011, in conjunction with Article 5 thereof, shall apply.

CHAPTER XI

Final provisions

Article 94

Repeal of Directive 95/46/EC

1. Directive 95/46/EC is repealed with effect from 25 May 2018.
2. References to the repealed Directive shall be construed as references to this Regulation. References to the Working Party on the Protection of Individuals with regard to the Processing of Personal Data established by Article 29 of Directive 95/46/EC shall be construed as references to the European Data Protection Board established by this Regulation.

Article 95

Relationship with Directive 2002/58/EC

This Regulation shall not impose additional obligations on natural or legal persons in relation to processing in connection with the provision of publicly available electronic communications services in public communication networks in the Union in relation to matters for which they are subject to specific obligations with the same objective set out in Directive 2002/58/EC.

*Article 96***Relationship with previously concluded Agreements**

International agreements involving the transfer of personal data to third countries or international organisations which were concluded by Member States prior to 24 May 2016, and which comply with Union law as applicable prior to that date, shall remain in force until amended, replaced or revoked.

*Article 97***Commission reports**

1. By 25 May 2020 and every four years thereafter, the Commission shall submit a report on the evaluation and review of this Regulation to the European Parliament and to the Council. The reports shall be made public.
2. In the context of the evaluations and reviews referred to in paragraph 1, the Commission shall examine, in particular, the application and functioning of:
 - (a) Chapter V on the transfer of personal data to third countries or international organisations with particular regard to decisions adopted pursuant to Article 45(3) of this Regulation and decisions adopted on the basis of Article 25(6) of Directive 95/46/EC;
 - (b) Chapter VII on cooperation and consistency.
3. For the purpose of paragraph 1, the Commission may request information from Member States and supervisory authorities.
4. In carrying out the evaluations and reviews referred to in paragraphs 1 and 2, the Commission shall take into account the positions and findings of the European Parliament, of the Council, and of other relevant bodies or sources.
5. The Commission shall, if necessary, submit appropriate proposals to amend this Regulation, in particular taking into account of developments in information technology and in the light of the state of progress in the information society.

*Article 98***Review of other Union legal acts on data protection**

The Commission shall, if appropriate, submit legislative proposals with a view to amending other Union legal acts on the protection of personal data, in order to ensure uniform and consistent protection of natural persons with regard to processing. This shall in particular concern the rules relating to the protection of natural persons with regard to processing by Union institutions, bodies, offices and agencies and on the free movement of such data.

*Article 99***Entry into force and application**

1. This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.
2. It shall apply from 25 May 2018.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 27 April 2016.

For the European Parliament

The President

M. SCHULZ

For the Council

The President

J.A. HENNIS-PLASSCHAERT



Brussels, 25.4.2018
COM(2018) 237 final

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN
ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE
REGIONS**

Artificial Intelligence for Europe

{SWD(2018) 137 final}

1. INTRODUCTION – EMBRACING CHANGE

Artificial intelligence (AI) is already part of our lives – it is not science fiction. From using a virtual personal assistant to organise our working day, to travelling in a self-driving vehicle, to our phones suggesting songs or restaurants that we might like, AI is a reality.

Beyond making our lives easier, **AI is helping us to solve some of the world's biggest challenges: from treating chronic diseases or reducing fatality rates in traffic accidents¹ to fighting climate change or anticipating cybersecurity threats.**

In Denmark, AI is helping save lives by allowing emergency services to diagnose cardiac arrests or other conditions based on the sound of a caller's voice. In Austria, it is helping radiologists detect tumours more accurately by instantly comparing x-rays with a large amount of other medical data.

Many farms across Europe are already using AI to monitor the movement, temperature and feed consumption of their animals. The AI system can then automatically adapt the heating and feeding machinery to help farmers monitor their animals' welfare and to free them up for other tasks. And AI is also helping European manufacturers to become more efficient and to help factories return to Europe.²

These are some of the many examples of what we know AI can do across all sectors, from energy to education, from financial services to construction. Countless more examples that cannot be imagined today will emerge over the next decade.

Like the steam engine or electricity in the past, AI is transforming our world, our society and our industry³. Growth in computing power, availability of data and progress in algorithms have turned AI into one of the **most strategic technologies of the 21st century**. The stakes could not be higher. **The way we approach AI will define the world we live in.** Amid fierce global competition, **a solid European framework is needed.**

What is artificial intelligence?

Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals.

AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications).

We are using AI on a daily basis, e.g. to translate languages, generate subtitles in videos or to block email spam.

Many AI technologies require data to improve their performance. Once they perform well, they can help improve and automate decision making in the same domain. For example, an AI system will be trained and then used to spot cyber-attacks on the basis of data from the concerned network or system.

¹ It is estimated that around 90% of road accidents are caused by human errors. See Commission's report on Saving Lives: Boosting Car Safety in the EU (COM(2016) 0787 final).

² Why AI is the future of growth, Accenture, 2016. The economic impact of the automation of knowledge work, robots and self-driving vehicles could reach between EUR 6.5 and EUR 12 trillion annually by 2025 (including improved productivity and higher quality of life in ageing populations). Source: Disruptive technologies: Advances that will transform life, business, and the global economy, McKinsey Global Institute, 2013.

³ AI is part of the Commission's strategy to digitise industry (COM(2016) 180 final) and a renewed EU Industrial Policy Strategy (COM(2017) 479 final).

The European Union (EU) should have a **coordinated approach** to make the most of the opportunities offered by AI and to address the new challenges that it brings. **The EU can lead the way in developing and using AI for good and for all**, building on its values and its strengths. It can capitalise on:

- **world-class researchers, labs and startups**. The EU is also strong in **robotics** and has **world-leading industry**, notably in the transport, healthcare and manufacturing sectors that should be at the forefront of AI adoption;
- the **Digital Single Market**. Common rules, for example on data protection and the free flow of data in the EU, cybersecurity and connectivity help companies to do business, scale up across borders and encourage investments; and
- a **wealth of industrial, research and public sector data** which can be unlocked to feed AI systems. In parallel to this Communication, the Commission is taking action to make data sharing easier and to **open up more data – the raw material for AI – for re-use**. This includes data from the public sector in particular, such as on public utilities and the environment, as well as research and health data.

European leaders have put AI at the top of their agendas. On 10 April 2018, 24 Member States⁴ and Norway committed to working together on AI. Building on this **strong political endorsement**, it is time to make significant efforts to ensure that:

- **Europe is competitive in the AI landscape**, with bold investments that match its economic weight. This is about supporting research and innovation to develop the next generation of AI technologies, and deployment to ensure that companies – in particular small and medium-sized enterprises which make up 99% of business in the EU – are able to adopt AI.
- **No one is left behind in the digital transformation**. AI is changing the nature of work: jobs will be created, others will disappear, most will be transformed. Modernisation of education, at all levels, should be a priority for governments. All Europeans should have every opportunity to acquire the skills they need. Talent should be nurtured, gender balance and diversity encouraged.
- **New technologies are based on values**. The General Data Protection Regulation will become a reality on 25 May 2018. It is a major step for building trust, essential in the long term for both people and companies. This is where the **EU's sustainable approach to technologies** creates a competitive edge, by embracing change on the basis of the Union's values⁵. As with any transformative technology, some AI applications may raise new ethical and legal questions, for example related to liability or potentially biased decision-making. The EU must therefore ensure that AI is developed and applied in an appropriate framework which promotes innovation and respects the Union's values and fundamental rights as well as ethical principles such as accountability and transparency. The EU is also well placed to lead this debate on the global stage.

This is how the EU can make a difference – and be the champion of **an approach to AI that benefits people and society as a whole**.

⁴ Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

⁵ Article 2 of the Treaty on EU: "The Union is founded on the values of respect for human dignity, freedom, democracy, equality, the rule of law and respect for human rights, including the rights of persons belonging to minorities". The Member States share a "society in which pluralism, non-discrimination, tolerance, justice, solidarity and equality between women and men prevail."

to collectively steer the process to ensure that its benefits are widely shared, that all citizens are suitably equipped to take full advantage of this technology and that a broader reflection on potentially deeper societal changes is taking place.

In 2018, in order to support the efforts of Member States which are responsible for labour and education policies, the Commission will:

- set up **dedicated (re-)training schemes** in connection with the Blueprint on sectoral cooperation on skills⁴⁷ – which brings together businesses, trade unions, higher education institutions and public authorities – for professional profiles which are at risk of being automated, with financial support from the European Social Fund⁴⁸;
- gather detailed analysis and expert inputs to **anticipate the changes on the labour market and the skills mismatch** across the EU, and inform decision-making at EU, national and local levels. More specifically, the Commission will (i) publish a foresight report on the impact of AI in education; (ii) launch pilots to predict the training requirements for future competence profiles; and (iii) publish an expert **report addressing the labour market impacts of AI, with recommendations**;
- support Digital Opportunity **Traineeships (2018-20) in advanced digital skills** for students and fresh graduates;
- encourage, through the Digital Skills and Jobs Coalition, **business-education partnerships** to take steps to attract and retain more AI talent and to foster continued collaboration; and
- invite **social partners** to include AI and its impact on the economy and employment, including the importance of diversity and gender balance in AI jobs, in their joint work programmes at sectoral and cross-sectoral level where relevant.

The **European Institute of Innovation and Technology** will integrate **AI across curricula in the education courses it supports**, in order to contribute to developing a talent pool for AI in Europe.

Proposals under the next EU multiannual financial framework (2021-2027) will include strengthened support for the acquisition of advanced digital skills including AI-specific expertise.

The Commission also intends to broaden the scope of the current European Globalisation Adjustment Fund beyond redundancies caused by delocalisation, including to those resulting from digitisation and automation.

3.3. Ensuring an appropriate ethical and legal framework

An environment of trust and accountability around the development and use of AI is needed.

The **values** set out in Article 2 of the Treaty on European Union constitute the foundation of the rights enjoyed by those living in the Union. In addition, the **EU Charter of Fundamental**

⁴⁷ <http://ec.europa.eu/social/main.jsp?catId=1415&langId=en>

⁴⁸ The cooperation now focuses on the automotive, maritime technology, space, textile and tourism sectors, and will address six other sectors in the future: additive manufacturing; construction; green technologies and renewable energy; maritime shipping; paper-based value chain; steel industry.

Rights brings together all the personal, civic, political, economic and social rights enjoyed by people within the EU in a single text.

The EU has a strong and balanced regulatory framework to build on, which can set the global standard for a sustainable approach to this technology. The Union has **high standards in terms of safety and product liability**. The first EU-wide rules on **network and information systems security** and stronger rules on the **protection of personal data** will become a reality in May 2018.

The **General Data Protection Regulation** ensures a high standard of personal data protection, including the principles of data protection by design and by default. It guarantees the free flow of personal data within the Union. It contains provisions on decision-making based solely on automated processing, including profiling. In such cases, data subjects have the **right to be provided with meaningful information** about the logic involved in the decision.⁴⁹ The General Data Protection Regulation also gives individuals the right not to be subject solely to automated decision-making, except in certain situations.⁵⁰ The Commission will closely follow the Regulation's application in the context of AI and calls on the national data protection authorities and the European Data Protection Board to do the same.

The Commission has also put forward a series of proposals under the **Digital Single Market** strategy that will be a key enabler for the development of AI, such as the Regulation on the free flow of non-personal data, and that will strengthen trust in the online world, such as the ePrivacy Regulation and the Cybersecurity Act. These proposals need to be adopted as soon as possible. This is essential as **citizens and businesses alike need to be able to trust the technology they interact with**, have a predictable legal environment and rely on effective safeguards protecting fundamental rights and freedoms.

To further strengthen trust, people also need to understand how the technology works, hence the importance of research into the **explainability of AI systems**. Indeed, in order to increase transparency and minimise the risk of bias or error, AI systems should be developed in a manner which allows humans to understand (the basis of) their actions.

Like every technology or tool, AI can be used to positive but also to malicious ends. Whilst AI clearly generates new opportunities, it also poses challenges and risks, for example in the areas of safety and liability, security (criminal use or attacks), bias⁵¹ and discrimination.

Reflection will be needed on interactions between AI and intellectual property rights, from the perspective of both intellectual property offices and users, with a view to fostering innovation and legal certainty in a balanced way.⁵²

Draft AI ethics guidelines

As a first step to address ethical concerns, **draft AI ethics guidelines will be developed by the end of the year**, with due regard to the Charter of Fundamental Rights of the European Union. The Commission will bring together all relevant stakeholders in order to help develop these draft guidelines.

⁴⁹ Articles 13 (2) f), 14 (2) g) and 15 (1) h) of the General Data Protection Regulation.

⁵⁰ Article 22 of the General Data Protection Regulation.

⁵¹ Depending on the data input that is used to train AI systems, their outputs can be biased.

⁵² Using AI to create works can have implications on intellectual property, with questions arising for instance on patentability, copyright and right ownership.

The draft guidelines will address issues such as the future of work, fairness, safety, security, social inclusion and algorithmic transparency. More broadly, they will look at the impact on fundamental rights, including privacy, dignity, consumer protection and non-discrimination. They will build on the work of the European Group on Ethics in Science and New Technologies⁵³ and take inspiration from other similar efforts.⁵⁴ Companies, academic institutions, and other organisations from civil society bodies will be invited to contribute. In parallel, the Commission will continue its work towards progress on ethics at international level⁵⁵.

While self-regulation can provide a first set of benchmarks against which emerging applications and outcomes can be assessed, public authorities must ensure that the regulatory frameworks for developing and using of AI technologies are in line with these values and fundamental rights. The Commission will monitor developments and, if necessary, review existing legal frameworks to better adapt them to specific challenges, in particular to ensure the respect of the Union's basic values and fundamental rights.

Safety and liability

The emergence of AI, in particular the complex enabling ecosystem and the feature of autonomous decision-making, requires a reflection about the suitability of some established rules on safety and civil law questions on liability.

For instance, advanced robots and Internet of Things products empowered by AI may act in ways that were not envisaged at the time when the system was first put into operation. Given AI's widespread uses, both horizontal and sectoral rules may need to be reviewed⁵⁶.

The EU safety framework⁵⁷ already addresses the intended use and foreseeable (mis)use of products when placed on the market. This has led to the development of a solid body of standards in the area of AI-enabled devices that is continuously being adapted in line with technological progress..

The further development and promotion of such safety standards and support in EU and international standardisation organisations will help enable European businesses to benefit from a competitive advantage, and increase consumer trust⁵⁸.

⁵³ The European Group on Ethics in Science and New Technologies is an advisory group of the Commission.

⁵⁴ At the EU level, the EU Fundamental Rights Agency will carry out an assessment of the current challenges faced by producers and users of new technology with respect of fundamental rights compliance. The European Group on Ethics in Science and New Technologies also published a relevant statement on AI, Robotics and 'Autonomous' Systems on 9 March 2018. Examples of international efforts: Asilomar AI principles (<https://futureoflife.org/ai-principles/>), Montréal Declaration for Responsible AI draft principles (<https://www.montrealdeclaration-responsibleai.com/>), UNI Global Union Top 10 Principles for Ethical AI (<http://www.thefutureworldofwork.org/opinions/10-principles-for-ethical-ai/>).

⁵⁵ The European Commission's International Dialogue on Bioethics and Ethics in Science and New Technologies brings together the National Ethics Councils of EU Member States and of third countries, to work together on those matters of common concern.

⁵⁶ For any new regulatory proposals that shall be needed to address emerging issues resulting from AI and related technologies, the Commission applies the Innovation Principle, a set of tools and guidelines that was developed to ensure that all Commission initiatives are innovation friendly: https://ec.europa.eu/epsc/publications/strategic-notes/towards-innovation-principle-endorsed-better-regulation_en

⁵⁷ For example, the Machinery Directive, the Radio Equipment Directive, the General Product Safety Directive as well as specific safety rules for example for medical devices or toys.

⁵⁸ Standards should also cover interoperability, which is crucial for offering consumers greater choices and ensuring fair competition.

The Commission is currently assessing whether the safety and national and EU liability frameworks are fit for purpose in light of these new challenges or whether any gaps should be addressed. A high level of safety and an efficient redress mechanism for victims in case of damages helps to build user trust and social acceptance of these technologies.

Evaluations of the Product Liability Directive⁵⁹ and the Machinery Directive have already been conducted.⁶⁰ An initial assessment was also carried out on the current liability frameworks in light of AI and emerging technologies.⁶¹ An expert group will help the Commission to analyse these challenges further.⁶²

Empowering individuals and consumers to make the most of AI

The large-scale use of AI-enabled tools in business-to-consumer transactions needs to be fair, transparent and compliant with consumer legislation. Consumers should receive clear information on the use, features and properties of AI-enabled products. Individuals should be able to control the data generated by using these tools and should know whether they are communicating with a machine or another human. In particular, when interacting with an automated system, consideration should be given to when users should be informed on how to reach a human and how to ensure that a system's decisions can be checked or corrected.

The Commission will:

- set a framework for stakeholders and experts – the European AI Alliance – to develop **draft AI ethics guidelines**, with due regard to fundamental rights, **by the end of the year**, in cooperation with the European Group on Ethics in Science and New Technologies;
- **issue a guidance document on the interpretation of the Product Liability Directive** in light of technological developments **by mid-2019**. This will seek to ensure legal clarity for consumers and producers in case of defective products;
- publish, **by mid-2019**, a **report on the broader implications** for, potential **gaps in and orientations for**, the **liability and safety frameworks** for AI, Internet of Things and robotics;
- support research in the development of **explainable AI** and implement a pilot project proposed by the European Parliament on **Algorithmic Awareness Building**⁶³, to gather a solid evidence-base and support the design of policy responses to the challenges brought by automated decision-making, including biases and discrimination (2018-2019); and
- support national and EU-level **consumer organisations and data protection supervising authorities** in building an understanding of AI-powered applications with the input of the European Consumer Consultative Group and of the European Data Protection Board.

⁵⁹ The Product Liability Directive states that if a defective product causes any damage to consumers or their property, the producer has to provide compensation irrespectively of whether there is negligence or fault on their part.

⁶⁰ The evaluation of the Machinery Directive indicates that some provisions do not explicitly address certain aspects of emerging digital technologies, and the Commission will examine whether this requires legislative changes. On the evaluation of the Product Liability Directive, the Commission will issue an interpretative guidance document, clarifying important concepts in the Directive.

⁶¹ See the Staff Working Document on Liability accompanying this Communication (SWD (2018)137).

⁶² http://ec.europa.eu/newsroom/just/item-detail.cfm?item_id=615947

⁶³ <https://ec.europa.eu/digital-single-market/en/algorithmic-awareness-building>