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(54) Knitted glove

(57) A double layer knitted glove is disclosed, the glove comprising a first yarn and a second yarn, the knitted glove comprising at least eight glove components, the components including: five digit components, an upper palm component, a lower palm component, and a wrist component, wherein one or more of the components comprises at least one functional zone comprising a single layer. Also disclosed is a knitted glove wherein each component comprises a plurality of courses, each course comprising a first yarn and wherein more than 50% of the courses of each component are plaited with a second yarn to provide a double layer component and wherein, in at least one component, predetermined functional zones of the component are single layer. Finally, a method for producing a double layer knitted glove is also disclosed. The inventive gloves are flexible, comfortable with enhanced fit and also functional.

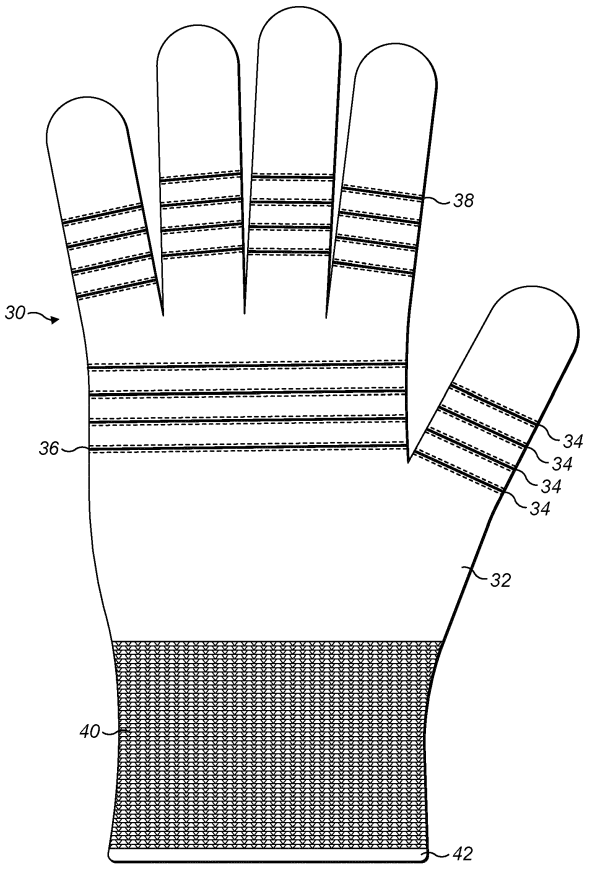

FIG. 3

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Description

[0001] The present invention relates to knitted gloves and methods of making such gloves. In particular, the present invention relates to knitted gloves exhibiting enhanced flexibility.

[0002] Knitted gloves are known and may be produced using knitting machines specifically constructed in order to knit such gloves. For example Shima Seiki Manufacturing Limited (Wakayama City, Japan) produces such knitting machines which can knit the various components of a glove in one integral garment under computer control. The use of the Shima automatic seamless glove knitting machine New SFG is described in the New SFG instruction manual 20th Edition (June 2009).

[0003] Modified versions of conventional knitted gloves have also been described.

[0004] US-B-6155084 describes protective articles (including gloves) manufactured using a continuous, one step process incorporating two or more dissimilar yarns or materials each having dissimilar mechanical properties and characteristics.

[0005] US-A-5965223 describes a knitted protective fabric using two or more layers of dissimilar cut resistant materials also produced in a continuous one step process involving, for example, knitting the fabric and plaiting the layers of yarn used in the production process.

[0006] US-A-5547733 discloses a textile fabric for rapidly moving moisture away from the skin. The composite fabric includes an inner fabric layer made of yarn primarily composed of polyester which has been rendered hydrophilic and an outer fabric layer made of yarn comprising polyester which has been rendered hydrophobic. The inner and outer fabric layers are concurrently knitted using a plaited construction so the layers are distinct and separate yet integrated with one another.

[0007] Unfortunately, gloves in the prior art often do not take detailed account of the comfort, flexibility and fit of a particular glove (especially for industrial use).

[0008] US-B-7555921 attempts to address this problem by providing knitted gloves by creating each of the 15 sections of the glove using a separate knitting course and providing varying stitch dimensions with one or two yarns in one or more sections. Unfortunately, embodiments of US-B-7555921 which involve plaiting (also known as plating) two yarns together are intended solely to improve comfort and not to provide additional dexterity and other functional properties of the glove.

[0009] There is therefore a need for a knitted glove which provides both enhanced fit, comfort and also provides for functional properties of the glove such as warmth, moisture absorption and other properties. It is an aim of the present invention to address this need and to overcome the problems of the prior art.

[0010] The present invention accordingly provides in a first aspect, a double layer knitted glove comprising a first yarn and a second yarn, the knitted glove comprising at least eight glove components, the components including: five digit components, an upper palm component, a lower palm component, and a wrist component, wherein one or more of the components comprises at least one functional zone comprising a single layer.

[0011] This is advantageous because such a glove offers flexibility, dexterity, enhanced grip and improved aesthetics.

[0012] Preferably, at least the five digit components and the upper palm component each comprise at least one functional zone.

[0013] Preferably, each functional zone comprises one or more courses. Preferably, the functional zones extend on both sides of the glove.

[0014] Preferably, the lower palm and/or the wrist component each comprise at least one functional zone.

[0015] It is preferred if more than 50% of the courses of each component of the glove are double layer.

[0016] In other words, a double layer glove according to the invention comprises components, each component being preferably more than 50% double layer. In preferred embodiments of the invention, each component is more than 60% double layer, more than 66% double layer, more than 70% double layer, more than 80% double layer, and most preferably more than 90% double layer.

[0017] Thus, the present invention accordingly provides in a second aspect, a knitted glove comprising eight components, the components comprising: five digit components (i.e. four finger components and a thumb component), an upper palm component, a lower palm component, and a wrist component, wherein each component comprises a plurality of courses, each course comprising a first yarn and wherein more than 50% of the courses of each component are plaited with a second yarn to provide a double layer and wherein, in at least one component, predetermined functional zones of the component are single layer.

[0018] A knitted glove may, of course comprise more than eight components depending upon how the components are defined.

[0019] Preferably more than 60% of the courses of each component are plaited with the second yarn, more preferably more than 66% or more than 70%, most preferably more than 80%. In the most preferred embodiment at least 90% of the courses of each component are plaited with the second yarn.

[0020] This is greatly beneficial because it enables a double layer component to be produced in the glove which

enables much greater production flexibility in providing functional components of the glove for example moisture absorption, cut resistance, punch resistance, grip, feel and warmth. These functional characteristics may be provided by incorporating dissimilar yarns within each double layer component. For example the first yarn having one property for example comfort (e.g. cotton or polyester) and a second yarn providing cut resistance (e.g. metal fibres, glass fibres or aramid fibres).

[0021] Preferably, the (predetermined) functional zones comprise courses which are not plaited with the second yarn. In practice this means that the functional zones of the component would usually be single layer. Careful selection of the functional zones and their position within each component of the glove enables the comfort and flexibility of the glove to be significantly improved. For example if the functional zones are produced on the front side of the fingers (in particular at the areas where the joints of the fingers are situated when the glove is worn) this enables the front side of the fingers to collapse more easily when wearing the glove, enhancing both comfort and flexibility. Similarly if the functional zones of the component are on the backside of the fingers especially where the joints are situated, this also enables easier flexing of the fingers when the glove is worn. Functional zones on the palm side (in particular the upper palm and finger and thumb or the backside of the glove e.g. at those positions where the hand of the wearer of the glove will bend and/or flex) offer additional grip and also improve the flexibility of the glove by making it easier for the glove to collapse or stretch. The great benefit of this feature is that a knitted glove according to the invention offers improved dexterity, flexibility and most importantly tends to reduce the fatigue in a wearer. This is very important in an industrial setting where fatigue can lead to accidents. Furthermore, the functional zones of the knitted glove offer better grip and improved aesthetics.

[0022] Because of the nature of the invention, all of these advantages can be provided without using variable stitch density (although of course this may be used if desired for other reasons).

[0023] The functional zones will generally comprise a predetermined number of courses starting at a predetermined course in the or each component having a functional zone. The course at which the functional zone starts depends upon the sizing of the glove. However, it will generally be intended to provide a functional zone at areas of bend and/or flex in a glove once worn.

[0024] Generally, the preferred predetermined number of courses is at least one course. Preferably, the predetermined number of courses will be eight or fewer, five or fewer, four or fewer, three or fewer, two or fewer. The most preferred predetermined number of courses is one course. Consequently, the glove according to the present invention, will tend to have a double layer over the great majority of its structure with only small predetermined number of courses having a single layer. Surprisingly this provides significantly enhanced flexibility, dexterity and reduced fatigue even though there are only a few courses of single layer.

[0025] Generally, there will be a plurality (e.g. 2 or more, 3 or more or 4 or more) of functional zones in each component where there is a functional zone.

[0026] Generally, the first yarn and second yarn will be independently selected from monofilament yarns, multifilament yarns, spun yarns, textured filament yarns and/or multi component yarns or combinations thereof.

[0027] The first yarn and second yarn may be the same or different, thus the two layers of the glove may be composed of the same or different yarns. The difference may lie in the material, colour or count/denier of the yarns or technology from which the yarns are manufactured. The yarns may or may not be coated.

[0028] If desired, the first and second yarn may be selected so they have dissimilar but complementary properties to enhance other aspects of the glove (for example cut resistance, comfort, moisture absorption or puncture resistance).

[0029] Generally, the material of the first yarn and/or second yarn will be selected from any of natural, regenerated and/or synthetic fibre or a combination thereof. In particular, the material of the first yarn and/or second yarn will preferably be selected from one or more of cotton, polyamide (e.g. nylon), acrylic, aramid (meta- or para-), polyolefin, polyester, linen, polyvinyl alcohol, metal, glass fibre, silk, wool, acetate yarns, PTFE, carbon fibre, steel fibre, mineral fibre, glass fibre, PBI, PBO, Rayon(™), viscose, and/or bamboo fibres, or a combination thereof.

[0030] In a preferred embodiment, the knitted glove further comprises a polymeric coating. In particular, it is preferred if the knitted glove further comprises an elastomeric polymeric coating. The polymeric coating may be selected from one or more layers comprising natural rubber, synthetic rubber, polyurethane, carboxylated acrylonitrile butadiene, butyl latex, polychloroprene, polyvinyl alcohol, non-carboxylated acrylonitrile and/or polyvinyl chloride, or combinations thereof.

[0031] The knitted glove may have a polymeric coating that is porous or non porous i.e. may have a relatively solid polymeric coating or may have a porous polymeric coating (e.g. a foam coated coating).

[0032] In a third aspect, the present invention provides a method for producing a double layer knitted glove from a first yarn and a second yarn, the method comprising, knitting a glove comprising at least eight components, the components comprising five digit components, an upper palm component, a lower palm component, and a wrist component wherein one or more of the components comprises at least one functional zone comprising a single layer.

[0033] In a fourth aspect, the present invention provides a method for producing a knitted glove comprising eight components, the components comprising five digit components, an upper palm component, a lower palm component, and a wrist component, wherein each component is knitted by knitting a plurality of courses, each course comprising a

first yarn and plaiting more than 50% of the courses of each component with a second yarn to provide a double layer component and wherein, in at least one component, predetermined functional zones of the component are single layer.

[0034] Preferably, the knitting method is weft knitting. The gauge of weft knitting will preferably be between 5 to 18 gauge or more than 18 gauge (the higher gauge resulting in much finer knit and requiring thinner yarns).

[0035] The method generally comprises the steps of programming a knitting machine to knit a glove comprising at least the eight glove components. The method may also be used to knit sleeve/gauntlet or any other article. The gauge of glove knitting will preferably be between 5 and 18 (or higher).

[0036] The method also preferably comprises coating at least a portion of the knitted glove with a polymeric coating (preferably an elastomeric coating as discussed above).

[0037] The preferred methods of coating the knitted glove include dip coating in which a coagulant solution may (or may not) be first applied to the knitted glove. Thereafter the knitted glove is dipped in a polymeric latex or sol (e.g. plastisol), dried and cured.

[0038] The knitted gloves according to the present invention have uses in many areas in which gloves are used but find particular use in industrial fields to provide protective gloves.

[0039] In order that the present invention may be better understood, it will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 illustrates the conventional components of a knitted glove.
Figure 2 illustrates plaiting (also known as plating) in weft knitting.
Figure 3 illustrates an embodiment of the glove according to the present invention.
Figures 4 and 5 illustrate the back and palm sides respectively of an embodiment of the glove according to the present invention coated on the palm and parts of the digits with an elastomeric coating.

[0040] Figure 1 illustrates the various component of the knitted glove according to the invention. These components are used, for example, in the instructions to the New SFG Shima glove knitting machines. The components are the little ("pinky") finger 1, the ring finger 2, the middle finger 3, the index finger 4, the thumb 5, the upper palm 6, the lower palm 7 and the wrist portion 8.

[0041] Figure 2 illustrates a plaiting stitch during weft knitting in which a latch needle 14 (the latch needle is illustrated schematically: the latch of the needle is not shown) gathers a loop of a first yarn 10 and a second yarn 12 during downward movement of the latch needle 14. The technical face 18 of the fabric is situated on the side of first yarn 10 and the technical back 16 of the fabric is situated on the side of the second yarn 12.

[0042] Figure 2 shows an illustration of plaited weft fabric according to David Spencer Knitting Technology (3rd edition) (2001).

[0043] Figure 3 illustrates the palm side of a knitted glove according to an embodiment of the present invention. The back side of the glove is substantially the same. The knitted glove 30 comprises over most of its structure a double layer fabric 32 comprising a black Nylon yarn (first yarn) and light green coloured Nylon yarn). At points of flex on thumb component 5 the plaiting is discontinued at a plurality of single courses 34 (the plaiting is also discontinued at the same parts on the back side). Similarly, at single courses 36 the plaiting is discontinued in the upper palm portion. Finally the plaiting is discontinued at single courses 38 in the digit components (1,2,3,4). Each of the single courses 34, 36, 38 are situated at points of flex of the glove when worn and these form predetermined functional zones. The single courses 34, 36 ,38 are separated on the same component by eight courses of double layer knit. The glove 30 also has a wrist component 40 and a finishing section 42.

[0044] The glove 30 is knitted with the first yarn outermost and the second yarn innermost. After knitting the glove is turned inside out so the second yarn is visible on the outside of the glove.

[0045] Figures 4 and 5 illustrate a glove 50, 52 as in Figure 4 but dip coated in a nitrile rubber porous coating prepared as discussed in EP-A-2181826 (see, in particular the Examples) with an elastomeric coating 52 on the palm and palm side of the fingers and on portions of the back side of the fingers/thumb and palm components.

[0046] The invention is further illustrated by the following example which illustrates the production of the glove of Figure 3.

[0047] The glove was knitted on an NewSFG knitting machine (Shima Seiki) using the plaiting attachment (U3). The purpose of U3 device is to introduce the plaiting yarn at regular intervals.

[0048] According to Shima's instruction manual if setting is selected 0 then there will be no plaiting yarn. The option of introducing plaiting pattern can be used to introduce plaiting yarn in all courses OR every second course OR every third course and so on up to every ninth course.

[0049] The output according to Shima's specification will be a single layer glove with double layer occurring at regular intervals for only a single course.

[0050] In contrast, and according to the invention, the plaiting feeder/yarn is stopped at specified locations of each glove component, instead of introducing plaiting yarn intermittently as per Shima's instruction mentioned above. Con-

sequently, the glove according to the invention is a double layer glove with single layer occurring at specified courses for specified number of courses.

[0051] As an example for this invention Table 1 indicates that the plaiting yarn (yarn 2) being stopped at specified courses for specified number of courses and again started.

Table 1

Glove Component	Stitch Setting	No. of Courses	Yarn1 Principal Yarn	Yarn2 (Plaiting Yarn)	
				Plaiting yarn inserted	Plaiting stopped at courses
1 (Pinky finger)	34	1-90	1-90	1-50, 52-60, 62-70, 72-80, 82-90	51,61,71, 81
2 (Ring finger)	34	1-108	1-108	1-60, 62-70, 72-80,82-90, 92-108	61,71,81, 91
3 (Middle finger)	34	1-118	1-118	1-70, 72-80, 82-90, 92-100, 102-118	71,81,91, 101
4 (Index finger)	34	1-104	1-104	1-60, 62-70, 72-80, 82-90,92-104	71,81,91, 101
5 (Thumb)	34	1-64	1-64	1-20, 22-30, 32-40, 42-50, 52-64	21,31,41, 51
6 (Upper palm)	34	1-92	1-92	1-50, 52-60, 62-70, 72-80, 82-92	51,61,71. 81
7 (Lower palm)	34	1-50	1-50	1-50	
8 (Wrist)	34	1-80	1-80	1-80	

[0052] The knitted glove offers dexterity, flexibility, reduced fatigue, better grip, and better aesthetics. This is achieved without using variable stitch density.

Claims

1. A double layer knitted glove comprising a first yarn and a second yarn, the knitted glove comprising at least eight glove components, the components including:

   five digit components,
   an upper palm component,
   a lower palm component, and
   a wrist component,
   wherein one or more of the components comprises at least one functional zone comprising a single layer.

2. A knitted glove as claimed in claim 1, wherein at least the five digit components and the upper palm component each comprise at least one functional zone.

3. A knitted glove as claimed in either claim 1 or claim 2, wherein each functional zone comprises one or more courses.

4. A knitted glove as claimed in any one of the preceding claims, wherein the functional zones extend on both sides of the glove.

5. A knitted glove as claimed in any one of the preceding claims, wherein the lower palm and/or the wrist component each comprise at least one functional zone.

6. A knitted glove comprising at least eight components, the components comprising:

five digit components,
an upper palm component,
a lower palm component, and
a wrist component,
wherein each component comprises a plurality of courses, each course comprising a first yarn and wherein more than 50% of the courses of each component are plaited with a second yarn to provide a double layer component and wherein, in at least one component,
predetermined functional zones of the component are single layer.

7. A knitted glove as claimed in claim 6, wherein at least 70% of the courses of each component are plaited with the second yarn.

8. A knitted glove as claimed in either claim 6 or claim 7, wherein the predetermined functional zones comprise courses which are not plaited with the second yarn.

9. A knitted glove as claimed in any one of claims 6 to 8, wherein the first yarn and second yarn are independently selected from monofilament yarns, multifilament yarns, spun yarns, textured filament yarns, multicomponent yarns or combinations thereof.

10. A knitted glove as claimed in any one of claims 6 to 9, wherein the material of the first yarn and/or second yarn is independently selected from one or more of cotton, polyamide, acrylic, aramid (meta- or para-), PTFE, polyolefin, polyester, linen, polyvinyl alcohol, metal, glass fibre, silk and/or wool.

11. A knitted glove as claimed in any one of claims 6 to 10, further comprising a polymeric coating.

12. A method for producing a double layer knitted glove from a first yarn and a second yarn, the method comprising,
knitting a glove comprising at least eight components,
the components comprising five digit components,
an upper palm component,
a lower palm component, and
a wrist component
wherein one or more of the components comprises at least one functional zone comprising a single layer.

13. A method as claimed in claim 12, wherein the knitting method is weft knitting.

14. A method as claimed in either claim 12 or claim 13, further comprising coating at least a portion of the knitted glove with a polymeric coating.

15. A method as claimed in any one of claims 12 to 14, wherein the gauge of glove knitting machine is in the range 5 to 22.

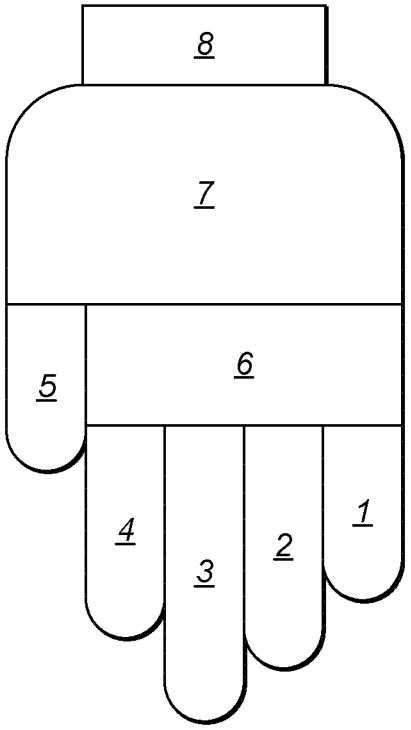

FIG. 1

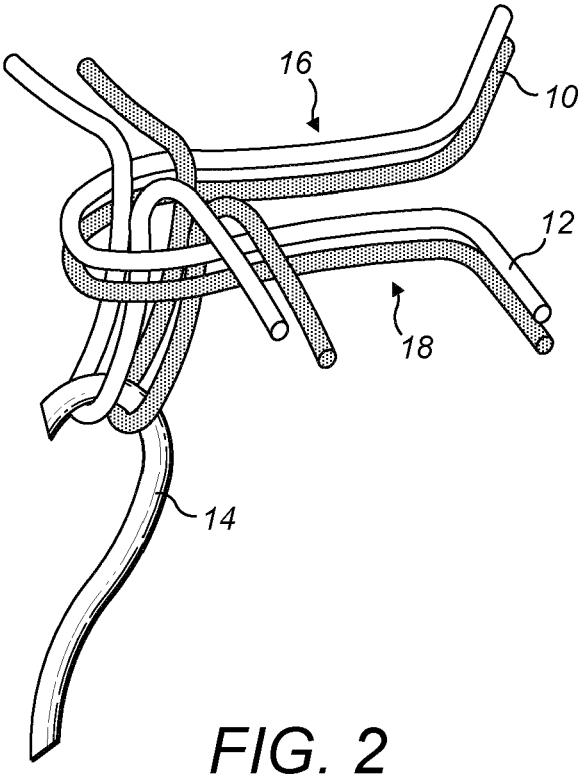

FIG. 2

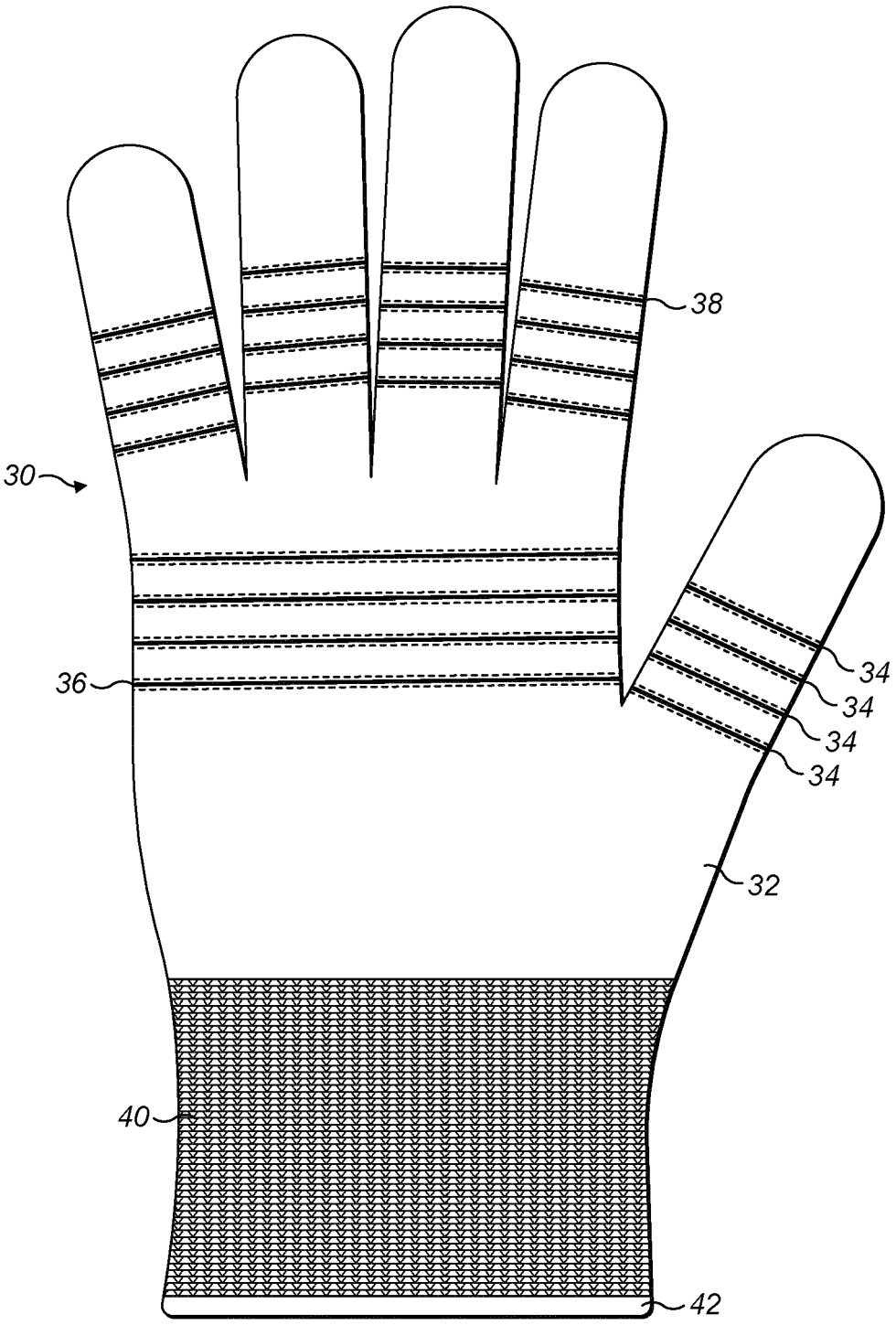

FIG. 3

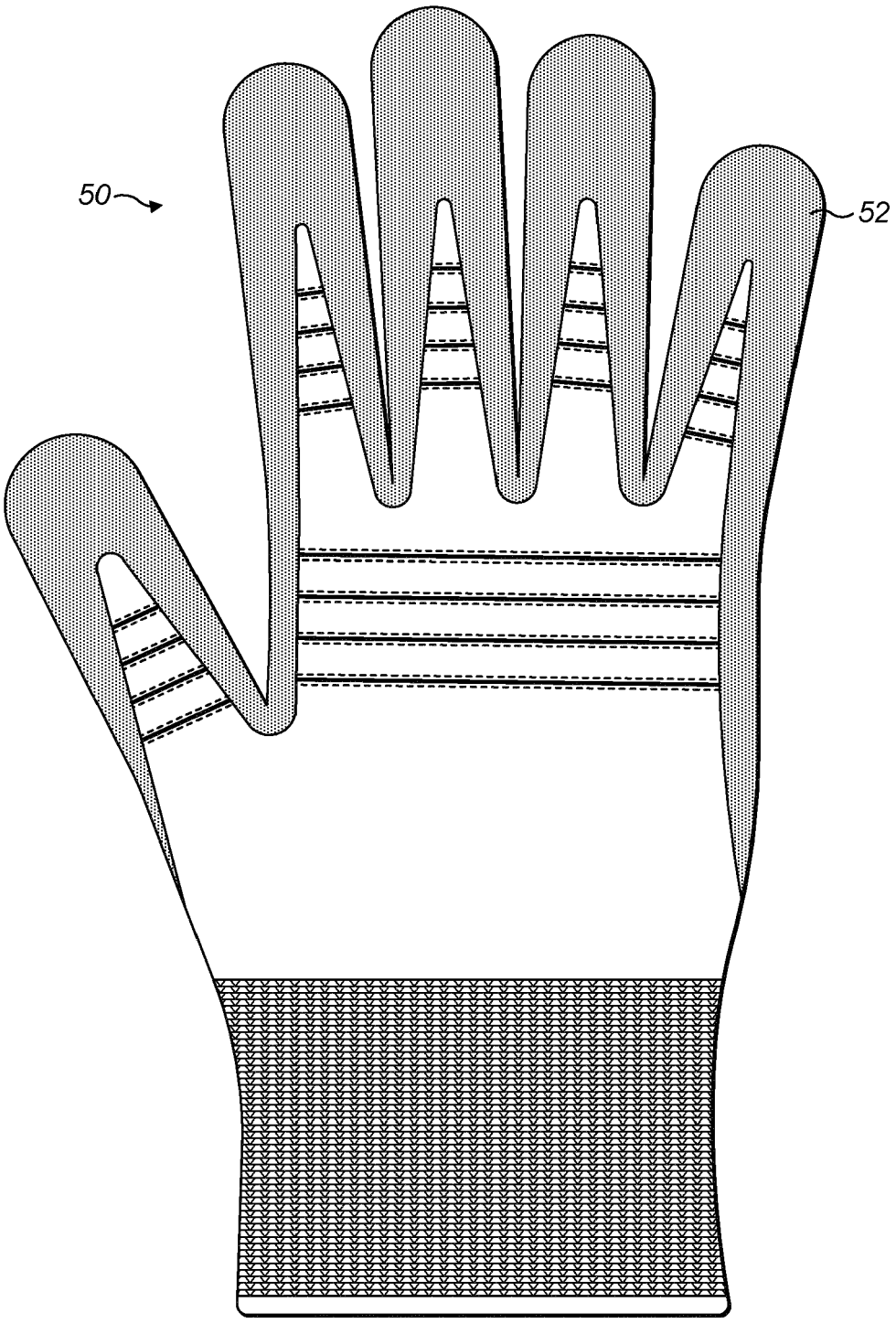

FIG. 4

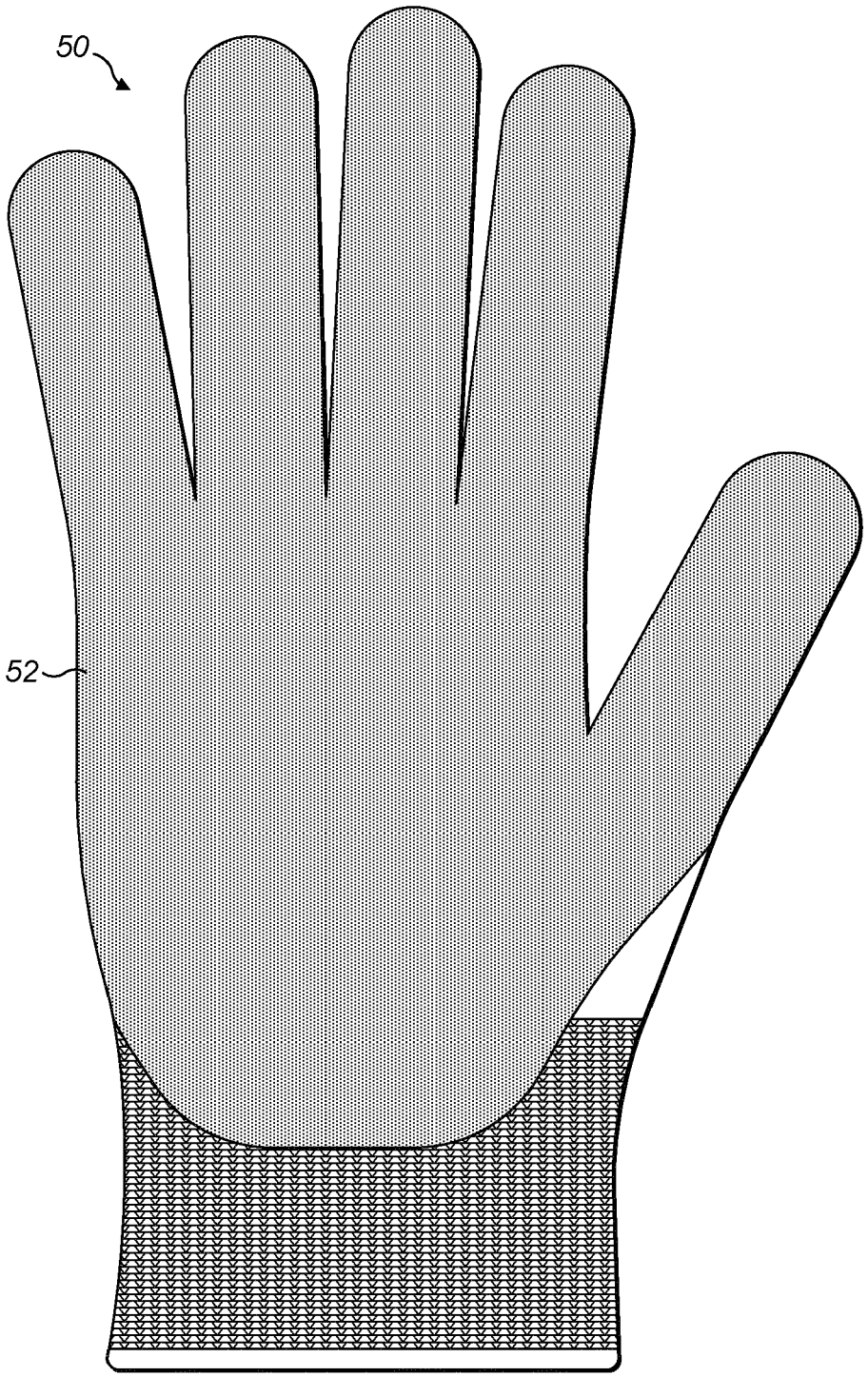

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 4791

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
E	WO 2012/019738 A2 (PROFAS GMBH & CO KG [DE]; BECKER MARIELIES [DE]; KESTING WOLFGANG [DE]) 16 February 2012 (2012-02-16) * page 6, paragraph 2 - page 11, paragraph 4; claims 1, 5, 12-14; figure 1 * -----	1-15	INV. D04B1/28
X A	WO 2009/032866 A1 (ANSELL HEALTHCARE PROD LLC [US]; THOMPSON ERIC [US]; NARASIMHAN DAVE [) 12 March 2009 (2009-03-12) * paragraph [0044]; claims 1, 5, 8, 14, 15, 18; figure 1; table 1 * -----	1-5, 12-15 6-11	
X	US 2 318 772 A (GLUCK FRED S) 11 May 1943 (1943-05-11) * page 1, column 2, line 34 - page 3, column 2, line 24; claim 1; figures 1, 2, 4, 7 * -----	1-3, 5-10,12, 13	
			TECHNICAL FIELDS SEARCHED (IPC) D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 June 2012	Sterle, Dieter

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- US 5547733 A **[0006]**
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- **DAVID SPENCER.** Knitting Technology. 2001 **[0042]**