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(54) **GLOVE**

(57) An object of the present invention is to provide a glove that is superior in impact resistance, water proofing property and chemical resistance, in which adhesiveness of an impact-resistant pad is relatively high. The glove of the present invention comprises: a glove main body that is stretchable and made of fiber; a coating layer that comprises a synthetic resin or a rubber as a principal component and covers an external face of the glove main body; at least one impact-resistant pad that comprises a synthetic resin or a rubber as a principal component and is arranged to at least a part of a dorsal side portion of an external face side of the coating layer on the glove main body; and an adhesive layer that bonds the coating layer and the impact-resistant pad together, wherein an adhesive constituting the adhesive layer is a moisture-curing urethane-based hot-melt adhesive. It is preferred that the impact-resistant pad is arranged on a portion corresponding to a joint of at least one finger. The impact-resistant pad is preferably provided with a base layer that is overlaid on the coating layer, and a protruding part that is arranged to protrude from an external face of the base layer. It is preferred that the average thickness of the base layer is no less than 0.1 mm and no greater than 1 mm.

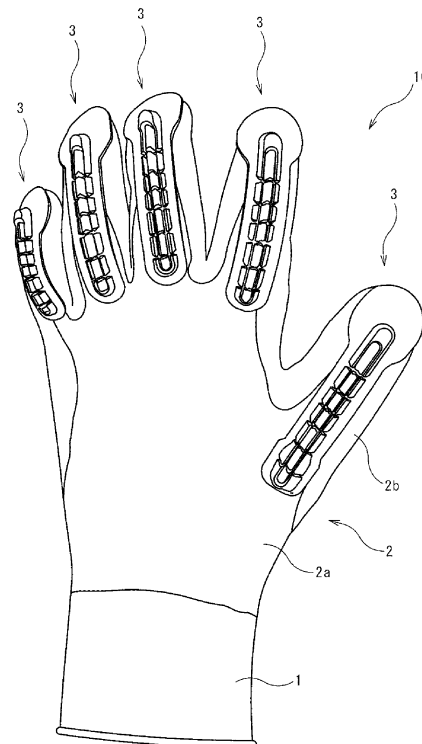


FIG. 1

Description

Field of Invention

5 **[0001]** The present invention relates to a glove.

Description of the Related Art

10 **[0002]** As a glove to be used in labor such as civil engineering and construction works, a glove with a high-strength protection portion (impact-resistant pad) arranged to an outer side thereof has been known (refer to Japanese Unexamined Patent Application, Publication No. 2005-325456).

[0003] The glove disclosed in the above-cited publication is capable of protecting a worker's hand due to having a protection portion formed from a resin or the like bonded to a glove main body constituted of a stretchable fiber material, at a position between the fingertip and the first joint of a finger, and a position between adjacent joints of a finger.

15 **[0004]** However, due to direct bonding of the protection portion to the fiber material, the conventional glove fails to obtain sufficient adhesiveness between the protection portion and the fiber material. As a result, in light of prevention of dislocation and detachment of the protection portion, a position at which the protection portion is arranged is limited to a part not likely to be bent during use of the glove, and it is therefore difficult to sufficiently protect parts of the fingers to be bent, such as joints. In addition, at the parts of the glove main body without the protection portion bonded, the fiber material is exposed to the surface of the glove. Thus, water resistance and chemical resistance of the conventional glove are insufficient.

[PRIOR ART DOCUMENTS]

25 [Patent Documents]

[0005] Patent Document 1: Japanese Unexamined Patent Application Publication No. 2005-325456

[Summary of Invention]

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[PROBLEMS TO BE SOLVED BY THE INVENTION]

[0006] The present invention has been made in view of the aforementioned circumstances, and an object of the present invention is to provide a glove that is superior in impact resistance, water resistance and chemical resistance, in which adhesiveness of an impact-resistant pad is relatively high.

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[MEANS FOR SOLVING THE PROBLEMS]

40 **[0007]** According to an aspect of the invention made for solving the aforementioned problems, a glove comprises: a glove main body that is stretchable and made of fiber; a coating layer that comprises a synthetic resin or a rubber as a principal component and covers an external face of the glove main body; at least one impact-resistant pad that comprises a synthetic resin or a rubber as a principal component and is arranged to at least a part of a dorsal side portion of an external face side of the coating layer on the glove main body; and an adhesive layer that bonds the coating layer and the impact-resistant pad together.

45 **[0008]** In regard to the glove, the coating layer that comprises a synthetic resin or a rubber as a principal component and the impact-resistant pad that comprises a synthetic resin or a rubber as a principal component are bonded together through the adhesive layer. Thus, adhesion of the impact-resistant pad involves adhesion between the resins, adhesion between the rubbers, or adhesion between the rubber and the resin. Accordingly, the impact-resistant pad is enabled to be bonded more firmly than in the case of being directly bonded to the glove main body made of fiber. Therefore, the impact-resistant pad is not likely to be detached even when arranged at a portion to be bent, whereby protection of the portion to be bent of the glove is easily enabled by means of the impact-resistant pad. In addition, in regard to the glove, the coating layer covers the external face of the glove main body. Furthermore, in regard to the glove, since the impact-resistant pad is bonded through the adhesive layer, fixing of the impact-resistant pad is enabled without making holes on the coating layer, unlike the case of fixing the impact-resistant pad by sewing. As a result, owing to the coating layer, the glove is superior in water resistance and chemical resistance. Moreover, since the glove does not require using a sewing thread, deterioration of texture due to irregularities on the internal face of the glove main body caused by the sewing thread is enabled to be inhibited. Using, as an adhesive constituting the adhesive layer, the moisture-curing urethane-based hot-melt adhesive superior in processibility and adhesive force with respect to the rubber and the resin

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enables the effect of preventing dislocation and detachment of the impact-resistant pad to be improved.

[0009] It is preferred that the impact-resistant pad is arranged on a portion corresponding to a joint of at least one finger. Thus arranging the impact-resistant pad on a portion corresponding to a joint of at least one finger enables the protection effect to be improved.

[0010] It is also preferred that the impact-resistant pad is provided with a base layer that is overlaid on the coating layer, and a protruding part that is arranged to protrude from an external face of the base layer. Such a constitution in which the impact-resistant pad is provided with the base layer and the protruding part enables bending flexibility of the impact-resistant pad to be maintained by the base layer, while impact resistance thereof is enabled to be improved by the protruding part.

[0011] It is preferred that the average thickness of the base layer is no less than 0.1 mm and no greater than 1 mm. Due to the thickness of the base layer falling within the above range, the bending flexibility of the impact-resistant pad is enabled to be further improved, while the impact resistance is maintained.

[0012] It is preferred that a bonding strength at 25 °C between the coating layer and the impact-resistant pad is no less than 20 N/cm. Due to the bonding strength between the coating layer and the impact-resistant pad being no less than the lower limit, protection of the portion to be bent of the glove with the impact-resistant pad is more easily enabled by the greater bonding strength.

[0013] It is preferred that a bending stress of the glove at a position where the impact-resistant pad is arranged is no greater than 1.6 MPa. Due to the bending stress of the glove at a position where the impact-resistant pad is arranged being no greater than the upper limit, the glove is enabled to be superior in labor efficiency by the higher flexibility, while the portion to be bent of the glove is protected by the impact-resistant pad.

[0014] The term "principal component" as referred to herein means a component which is of the highest content, for example a component of which content is no less than 50% by mass. The term "dorsal side" as referred to means a side of the glove that covers the back of the hand when the wearer wears the glove. The term "average thickness" as referred to means an average of values measured at 10 positions for a distance between the external face and the internal face, by observing a cross-section by using a digital microscope (e.g., VHX-900 available from Keyence Corporation).

[0015] The "bonding strength between the coating layer and the impact-resistant pad" is a value obtained by: cutting out a test piece of 10 mm in width and 60 mm in length including the bonded portion between the coating layer and the impact-resistant pad; conducting a 180° peeling test by using the test piece at a pulling rate of 50 mm/min with a travel distance of 100 mm; and dividing an arithmetic average value of load values of a plurality of peaks and a plurality of valleys of a load measured in the 180° peeling test by an average width of the bonded portion.

[0016] In addition, the bending stress of the glove at a position where the impact-resistant pad is arranged may be calculated by conducting a three-point bending test pursuant to JIS-K-7171 (2008), by using a test piece of 10 mm in width cut off from the coating layer with the impact-resistant pad being bonded. It is to be noted that a direction of bending corresponds to the direction of finger flexion. A thickness employed in the three-point bending test is a distance between the internal face of the glove main body and the external face of the lowermost portion of the impact-resistant pad (e.g., the base layer if the impact-resistant pad is provided with the base layer).

[EFFECTS OF THE INVENTION]

[0017] As explained in the foregoing, in regard to the glove according to the present invention, a bonding strength of the impact-resistant pad is relatively high, and the impact resistance, water proofing property, and chemical resistance are superior.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0018]

Fig. 1 is a schematic view of a glove according to an embodiment of the present invention taken from the dorsal side; Fig. 2 is an enlarged schematic view of a part where an impact-resistant pad is arranged to a finger portion of the glove illustrated in Fig. 1; Fig. 3 is a schematic cross-sectional view taken along a line A-A of the glove illustrated in Fig. 2; and Fig. 4 is a schematic view taken from the dorsal side of a glove according to an embodiment different from that illustrated in Fig. 1.

[Description of Embodiments]

[0019] Embodiments of the present invention will be described in detail hereafter, with appropriate reference to the

drawings.

First Embodiment

[0020] A glove 10 illustrated in Fig. 1 includes: a glove main body 1 that is stretchable and made of fiber; a coating layer 2 that covers an external face of the glove main body 1; a plurality of impact-resistant pads 3 arranged to the finger portion on an external face side of the coating layer 2 on the dorsal side of the glove main body 1, and adhesive layers 4 that bonds the coating layer 2 and the impact-resistant pad 3 together. Figs. 2 and 3 show the part where one of the impact-resistant pads is arranged to the finger portion of the glove 10.

Glove Main Body

[0021] The glove main body 1 is obtained by knitting or weaving a yarn made of fiber, and is stretchable. The globe main body 1 is preferably knitted seamlessly. When the glove main body 1 is not seamless, the glove main body 1 is to be formed by sewing two or more pieces of fabric together. In this case, a seam is generally formed on a lateral face or on a palm side of the lateral face of the glove, and the seam may lead to formation of a hole on the coated fabric on the lateral face, a palm face, etc. which are likely to be subjected to hydraulic pressure during use, whereby water proofing property may be impaired. Whereas, by forming the glove main body 1 seamlessly and overlaying the coating layer 2 on the glove main body 1, a defect in the coating layer 2 due to sewing for obtaining the glove shape can be prevented.

[0022] The glove main body 1 includes: a main body portion formed in a pouch-like shape to cover a back-hand side and a palm of a wearer's hand; a finger portion extending from the main body portion to cover wearer's fingers; and a cylindrical cuff portion extending from the main body portion in an opposite direction from the finger portion to cover a wearer's wrist. The main body portion includes a palm portion and a back-hand portion. The finger portion includes a first finger portion, a second finger portion, a third finger portion, a fourth finger portion, and a fifth finger portion that cover a wearer's first finger (thumb), second finger (index finger), third finger (middle finger), fourth finger (ring finger), and fifth finger (pinky finger) respectively. The first to fifth finger portions are each formed in a cylindrical shape with a closed fingertip end. In addition, the cuff portion has an opening through which a wearer's hand can be inserted.

[0023] The fiber composing the glove main body 1 is exemplified by: natural fibers such as cotton and linen; synthetic fibers such as a polyamide fiber, a polyester fiber, a polypropylene fiber, a rayon fiber, an acrylic fiber, an aramid fiber, a high-strength polyethylene fiber, and a polyurethane fiber; metallic fibers such as stainless steel; inorganic fibers such as a glass fiber; a conductive fiber; and the like. These fibers may be used alone or in combination of two or more types thereof. As fibers used in combination of two, composite fibers obtained by covering stainless fibers with nylon or the like may be exemplified. The abovementioned fiber is selected according to a required function such as heat-retaining properties, thermal insulation properties, cut resistance, moisture-retaining properties, cushioning properties, and the like. For example, for obtaining cut resistance: metallic fibers such as a stainless fiber; a super high-strength polyethylene fiber; an aramid fiber; a glass fiber; and the like can be selected. In addition, a yarn made of the aforementioned fiber is not particularly limited, and a spun yarn, a crimped filament yarn, a fancy yarn such as a loop yarn and a chenille yarn, a straight filament yarn, and the like may be used.

[0024] The lower limit of the average thickness of the glove main body 1 is preferably 0.1 mm, and more preferably 0.2 mm. Meanwhile, the upper limit of the average thickness of the glove main body 1 is preferably 4 mm, and more preferably 3 mm. When the average thickness of the glove main body 1 is less than the lower limit, durability of the glove 10 may be lowered. To the contrary, when the average thickness of the glove main body 1 is greater than the upper limit, the bending flexibility of the glove 10 is decreased due to the increased thickness, whereby workability during use may be lowered. The average thickness of the glove main body 1 (A in Fig. 3) is calculated based on values obtained by, in a finger region of the glove, making a slit of 20 mm at an angle of approximately 45° with respect to a longitudinal direction of the finger portion, and measuring at 10 positions at intervals of 2 mm on a cross-section of the slit.

Coating Layer

[0025] The coating layer 2 covers the external face of the glove main body 1. Specifically, the coating layer 2 includes: a first coating layer 2a that covers the palm portion, a back-hand portion and the finger portion of the external face of the glove main body 1; and a second coating layer 2b that covers an external face of the first coating layer 2a on the palm portion and the finger portion. It is to be noted that the coating layer 2 is not limited to the two-layer structure and may also be in a single layer structure or a multilayer structure with three or more layers. The concept of "covering the external face of the glove main body" as referred to is not limited to covering the entire glove main body, and encompasses covering a part of the glove main body, for example a part except for the cuff portion as shown in Fig. 1.

[0026] The coating layer 2 comprises a synthetic resin or rubber as a principal component. The synthetic resin is exemplified by polyvinyl chloride, polyurethane, polyvinylidene chloride, polyvinyl alcohol, chlorinated polyethylene, an

ethylene-vinyl alcohol copolymer, a vinyl chloride-vinyl acetate copolymer, and a mixture thereof. Of these, polyvinyl chloride and polyurethane are preferred in light of bonding strength, and polyvinyl chloride is particularly preferred in light of processability. The rubber is exemplified by a natural rubber, an isoprene rubber, an acrylic rubber, a chloroprene rubber, a butyl rubber, a butadiene rubber, a fluorine rubber, a styrene-butadiene copolymer, an acrylonitrile-butadiene rubber, a chlorosulfonated polyethylene, an epichlorohydrin rubber, a urethane rubber, an ethylene-propylene rubber, a silicone rubber, and a mixture thereof. Of these, a natural rubber, an isoprene rubber, a chloroprene rubber, a butadiene rubber, a styrene-butadiene copolymer and an acrylonitrile-butadiene rubber are preferred, and a natural rubber and an acrylonitrile-butadiene rubber are particularly preferred in light of cost efficiency, processability, elasticity, durability, weather resistance, etc. Furthermore, an acrylonitrile-butadiene rubber is particularly preferred in light of oil resistance.

[0027] To the coating layer 2, for example an antimicrobial, a crosslinking agent, a vulcanization accelerator, an antioxidant, a thickening agent, a plasticizer, a pigment, a frothing agent, a foam stabilizer and the like may have been added.

[0028] Materials for the first coating layer 2a and for the second coating layer 2b may be identical; however, by using different materials for these layers, characteristics of the glove 10 can be partially varied. Furthermore, by employing different colors for the first coating layer 2a and for the second coating layer 2b, design can be improved.

[0029] It is preferred that the coating layer 2 has penetrated into the glove main body 1 as shown in in Fig. 3. Due to the coating layer 2 thus having penetrated into the glove main body 1, the bonding strength between the glove main body 1 and the coating layer 2 is improved. Meanwhile, it is preferred that the coating layer 2 has not reached the internal face of the glove main body 1. Due to the coating layer 2 having not reached the internal face of the glove main body 1, deterioration of texture of the glove main body 1 may be prevented.

[0030] The lower limit of the average thickness of the first coating layer 2a is preferably 0.2 mm, and more preferably 0.3 mm. Meanwhile, the upper limit of the average thickness of the first coating layer 2a is preferably 2 mm, and more preferably 1.5 mm. The lower limit of an average thickness of the second coating layer 2b (B in Fig. 3; the same applies to the first coating layer 2a) is preferably 0.1 mm and more preferably 0.2 mm. Meanwhile, the upper limit of the average thickness of the second coating layer 2b is preferably 2 mm, and more preferably 1.5 mm. When the average thickness of the first coating layer 2a or the second coating layer 2b is less than the lower limit, strength of the coating layer 2 may be insufficient. To the contrary, when the average thickness of the first coating layer 2a or the second coating layer 2b is greater than the upper limit, bending flexibility of the glove 10 may be insufficient. The average thickness of the coating layer 2 is calculated based on values obtained by, on the dorsal side of the finger region of the glove, making a slit of 20 mm at an angle of approximately 45° with respect to the longitudinal direction of the finger portion, and measuring at 10 positions at intervals of 2 mm on a cross-section of the slit.

[0031] A region of the external face of the coating layer 2 in which the impact-resistant pad 3 is arranged preferably has a great surface roughness. Due to such a great surface roughness of the aforementioned region, the bonding strength between the adhesive layer 4 and the coating layer 2 is improved owing to the anchoring effect. The lower limit of the arithmetic average roughness Ra of the surface of the aforementioned region is preferably 0.05 μm , and more preferably 0.1 μm . Meanwhile, the upper limit of the arithmetic average roughness Ra of the surface of the aforementioned region is preferably 1 μm , and more preferably 0.3 μm . When the arithmetic average roughness Ra of the surface of the aforementioned region is less than the lower limit, a sufficient anchoring effect may not be produced by the adhesive layer 4. To the contrary, when the arithmetic average roughness Ra of the surface of the aforementioned region is greater than the upper limit, a difference of thickness between a thick part and a thin part of the coating layer 2 is too large, whereby reduction of the bending flexibility, or reduction of the water resistance and chemical resistance of the glove 10 may be caused. In addition, production cost of the glove 10 may be excessive. It is to be noted that the term "arithmetic average roughness Ra" as referred to means a value obtained by: obtaining a roughness curve by using an interference surface profilometer (e.g. Talysurf CCI Lite available from Taylor Hobson, Ltd. with 20x lens) with a cut-off of 0.08 mm; from the roughness curve, extracting a portion in a reference length (0.83 mm) in a direction of an average line thereof; and summing and averaging absolute values of deviations from the average line to the measured curve in the extracted portion.

Impact-Resistant Pad

[0032] The plurality of impact-resistant pads 3 are each arranged to the finger portion in the dorsal side portion of the external face side of the coating layer 2 on the glove main body 1. Specifically, one impact-resistant pad 3 is arranged to each of the individual finger portions (first finger portion, second finger portion, third finger portion, fourth finger portion, and fifth finger portion).

[0033] The impact-resistant pad 3 is bonded to the coating layer 2 through the adhesive layer 4. In other words, the impact-resistant pad 3 is not sewn onto the coating layer 2. In addition, as illustrated in Figs. 2 and 3, the impact-resistant pad 3 is provided with: a base layer 3a that is overlaid on the coating layer 2; and a protruding part 3b that is arranged to protrude from an external face of the base layer 3a.

[0034] The impact-resistant pad 3 is arranged to an entirety of each finger portion along the longitudinal direction as shown in Fig. 1. In other words, the plurality of impact-resistant pads 3 are each arranged also to a portion corresponding to a joint of each finger. Thus arranging the impact-resistant pad 3 to the portion corresponding to a joint of the finger enables the protection effect to be improved.

[0035] The impact-resistant pad 3 comprises a synthetic resin or a rubber as a principal component. Examples of the synthetic resin include polyvinyl chloride, polyurethane, polyvinylidene chloride, polyvinyl alcohol, chlorinated polyethylene, an ethylene-vinyl acetate copolymer, a vinyl chloride-vinyl acetate copolymer, and a mixture thereof. Of these, polyvinyl chloride and polyurethane are preferred and polyvinyl chloride is particularly preferred in light of processability. The rubber is exemplified by a natural rubber, an isoprene rubber, an acrylic rubber, a chloroprene rubber, a butyl rubber, a butadiene rubber, a fluorine rubber, a styrene-butadiene copolymer, an acrylonitrile-butadiene rubber, a chlorosulfonated polyethylene, an epichlorohydrin rubber, a urethane rubber, an ethylene-propylene rubber, a silicone rubber, and a mixture thereof. Of these, a natural rubber, an isoprene rubber, a chloroprene rubber, a butadiene rubber, a styrene-butadiene copolymer and an acrylonitrile-butadiene rubber are preferred, and a natural rubber and an acrylonitrile-butadiene rubber are particularly preferred in light of cost efficiency, processability, elasticity, durability, weather resistance, etc. Furthermore, an acrylonitrile-butadiene rubber is particularly preferred in light of oil resistance.

[0036] In addition, to the impact-resistant pad 3, a cross-linking agent, a stabilizer, an antimicrobial agent, an antioxidant, a thickening agent, a plasticizer, a pigment and the like may be added. In particular, the impact-resistant pad 3 preferably contains a plasticizer in light of improvement of formability. As the plasticizer, for example, a non-phthalic acid plasticizer is used. Furthermore, the impact-resistant pad 3 preferably contains a pigment in light of improvement of visibility.

[0037] The lower limit of the content of the plasticizer is preferably 50 parts by mass and more preferably 60 parts by mass with respect to 100 parts by mass of the synthetic resin. Meanwhile, the upper limit of the content of the plasticizer is preferably 200 parts by mass and more preferably 100 parts by mass. When the content of the plasticizer is less than the lower limit, an effect of improving formability and bending flexibility may be insufficient. To the contrary, when the plasticizer content is greater than the upper limit, hardness of the impact-resistant pad 3 may be insufficient and bleeding of the plasticizer may be caused.

[0038] It is to be noted that materials for the base layer 3a and for the protruding part 3b may be different; however, it is preferred that at least the type of the synthetic resin is the same. When the type of the resin is the same, integral molding of the base layer 3a and the protruding part 3b is facilitated. In addition, by including different types of pigment in the base layer 3a and in the protruding part 3b, design of the glove 10 can be improved. Furthermore, when the hardness of the protruding part 3b is less than that of the base layer 3a, impact resistance can be improved while maintaining the strength of the impact-resistant pad 3.

[0039] In light of labor efficiency during use of the glove, it is preferred that the glove is flexible at the position where the impact-resistant pad 3 is arranged. The upper limit of a bending stress of the glove at a position where the impact-resistant pad 3 is arranged is preferably 1.6 MPa, and more preferably 1.5 MPa. When the bending stress of the glove at a position where the impact-resistant pad 3 is arranged is greater than the upper limit, the bending flexibility of the glove 10 is insufficient, whereby the labor efficiency during use of the glove may be reduced. Meanwhile, the lower limit of the bending stress of the glove at a position where the impact-resistant pad 3 is arranged is not particularly limited and is typically 0.1 MPa.

Base Layer

[0040] The base layer 3a is strip-shaped, a longitudinal direction of which corresponds to the longitudinal direction of the finger portion of the glove 10. A planar shape of the base layer 3a has rounded corners and a fingertip end side expanded in width and longitudinal directions to have a circular arc shape. The expanded part does not have the protruding part 3b, and only the base layer 3a covers wearer's entire nail.

[0041] An edge of the base layer 3a is offset outward from an edge of the protruding part 3b. The lower limit of an amount of offset (S in Fig. 3) in a part other than the expanded part is preferably 0.5 mm and more preferably 1.0 mm. Meanwhile, the upper limit of the amount of offset is preferably 3 mm and more preferably 2.5 mm. When the amount of offset is less than the lower limit, the bonding strength may be insufficient. To the contrary, when the amount of offset is greater than the upper limit, the base layer 3a increases in width and is required to be arranged in a relatively largely curved manner, whereby the bonding strength may be reduced particularly in the edge portion. It is to be noted that, since the impact-resistant pad 3 is bonded to the coating layer 2 through the adhesive layer 4, the glove 10 does not require a gap on the base layer 3a for stitching. Thus, the amount of offset can be relatively small, whereby the bonding strength is less likely to be reduced in the edge portion.

[0042] Due to the moisture-curing urethane-based hot melt adhesive being used for bonding the base layer 3a to the coating layer 2, the great adhesive force enables the base layer 3a to be thin. As a result, an increase in the bending flexibility of the glove 10 is enabled. The lower limit of the average thickness of the base layer 3a (T1 in Fig. 3) is preferably 0.1 mm, and more preferably 0.3 mm. Meanwhile, the upper limit of the average thickness of the base layer 3a is

preferably 1 mm, more preferably 0.8 mm, and still more preferably 0.7 mm. When the average thickness of the base layer 3a is less than the lower limit, the impact resistance may be insufficient when an impact is applied directly to the base layer 3a, and productivity may be reduced due to inferior processability. To the contrary, when the average thickness of the base layer 3a is greater than the upper limit, the bending flexibility of the glove 10 may be insufficient.

[0043] The lower limit of the hardness of the base layer 3a is preferably A30, and more preferably A40, in terms of a measurement value of durometer hardness Type A. On the other hand, the upper limit of the hardness of the base layer 3a is preferably A80, and more preferably A70. When the hardness of the base layer 3a is less than the lower limit, the impact resistance may be insufficient. To the contrary, when the hardness of the base layer 3a is greater than the upper limit, the bending flexibility of the glove 10 may be reduced. It is to be noted that the term "hardness" as referred to means a hardness measured pursuant to JIS-K6253-3 (2012) and ISO7619 (2010).

[0044] The lower limit of the arithmetic average roughness Ra of the internal face (face on the side of the glove main body 1) of the base layer 3a is preferably 0.05 μm , and more preferably 0.1 μm . Meanwhile, the upper limit of the arithmetic average roughness Ra is preferably 1 μm , and more preferably 0.3 μm . When the arithmetic average roughness Ra is less than the lower limit, the sufficient anchoring effect may not be produced by the adhesive layer 4. To the contrary, when the arithmetic average roughness Ra is greater than the upper limit, the adhesive layer 4 reaches deep inside the base layer 3a and becomes stiff, whereby the bending flexibility of the glove 10 may be reduced.

Protruding Part

[0045] The protruding part 3b is arranged to protrude from the external face of the base layer 3a (opposite side to the glove main body 1). In addition, the protruding part 3b is composed of a plurality of blocks segmented by: a plurality of V-shaped or U-shaped first troughs V1 along the longitudinal direction of a finger portion; and a large number of V-shaped or U-shaped second troughs V2 perpendicular to the longitudinal direction. Specifically, the protruding part 3b has a plurality of blocks that are rectangular in a planar view and segmented by two first troughs V1 and a plurality of second troughs V2 that intersect perpendicularly with the two first troughs V1 in a planar view. In addition, the protruding part 3b has, on a distal side and a proximal side (wrist side) thereof, blocks that are each formed in a U-shape in a planar view, protrude outward in the longitudinal direction of the finger portion, and are arranged to oppose each other across other plurality of blocks. The blocks other than these blocks that are rectangular in a planar view are arranged in three rows at a regular interval along the longitudinal direction.

[0046] It is preferred that a bottom of the first trough V1 is positioned above the external face of the base layer 3a, while a bottom of the second trough V2 corresponds to the external face of the base layer 3a. Such a configuration enables the bending flexibility to be improved while the impact resistance of the impact-resistant pad 3 is maintained. A difference in height between the external face of the base layer 3a and the bottom of the first trough V1 (T2 in Fig. 3) may be, for example, no less than 0.05 mm and no greater than 0.5 mm.

[0047] In addition, it is preferred that one of the second troughs V2 is provided to the portion corresponding to a joint of the finger. Such a configuration facilitates the glove 10 to be bent along with the movement of the fingers.

[0048] Among the blocks constituting the protruding part 3b, blocks in a central row between two first troughs V1 each have a greater thickness (protruding amount) than blocks in both side rows (right and left rows). In addition, a cross section, which is perpendicular to the longitudinal direction of the finger portion, of the block in the central row is trapezoidal, and such a cross section of the block in the both side rows is triangular.

[0049] A length in the longitudinal direction of the protruding part 3b (a distance between a distal end of the most distal block and a proximal end of the most proximal block) is, for example, no less than 50% and no greater than 90% of a length of the finger portion. In addition, a length in the width direction of the protruding part 3b (a distance between a left end of a block in the left row and a right end of a block in the right row) is, for example, no less than 5% and no greater than 50% of a width of the finger portion. Furthermore, a length in the longitudinal direction of the block that is rectangular in a planar view may be, for example, no less than 1 mm and no greater than 10 mm, and a length thereof in a transverse direction (width direction) may be, for example, no less than 0.1 mm and no greater than 3 mm.

[0050] The lower limit of the hardness of the protruding part 3b is preferably A30, and more preferably A40. On the other hand, the upper limit of the hardness of the protruding part 3b is preferably A70, and more preferably A60. When the hardness of the protruding part 3b is less than the lower limit, the impact resistance may be insufficient. To the contrary, when the hardness of the protruding part 3b is greater than the upper limit, impact absorbing properties may be reduced.

[0051] The lower limit of the maximum thickness of the impact-resistant pad 3 (T in Fig. 3; distance between the internal face of the base layer 3a and the maximum protruding position of the protruding part 3b) is preferably 1 mm and more preferably 3 mm. Meanwhile, the upper limit of the maximum thickness of the impact-resistant pad 3 is preferably 9 mm, and more preferably 7 mm. When the maximum thickness of the impact-resistant pad 3 is less than the lower limit, the impact resistance may be insufficient. To the contrary, when the maximum thickness of the impact-resistant pad 3 is greater than the upper limit, the flexibility of the impact-resistant pad 3 may be insufficient.

Adhesive Layer

[0052] The adhesive layer 4 bonds the coating layer 2 and the impact-resistant pad 3 together. Specifically, the adhesive layer 4 is arranged to the internal face of the impact-resistant pad 3, i.e., the internal face of the base layer 3a.

The adhesive layer 4 may be arranged to a part of the internal face of the impact-resistant pad 3, but, in light of bonding strength, is preferably arranged to an entirety of the internal face of the impact-resistant pad 3.

[0053] The adhesive constituting the adhesive layer 4 is a moisture-curing urethane-based hot-melt adhesive.

[0054] The moisture-curing urethane-based hot melt adhesive is a solvent-free one-component adhesive comprising a urethane prepolymer, which has an isocyanate group at a terminal, as a principal component.

[0055] Examples of polyol used in the urethane prepolymer include polyester polyol, polyether polyol, polyalkylene polyol, polycarbonate polyol, and the like. In addition, examples of the isocyanate group include: aromatic diisocyanate compounds such as diphenylmethane diisocyanate and tolylene diisocyanate; aliphatic diisocyanate compounds such as hexamethylene diisocyanate; and the like. Of these, in light of processibility and the bonding strength, it is preferred to use an aromatic moisture-curing urethane-based hot melt adhesive which has an isocyanate group of the aromatic diisocyanate compound at a terminal.

[0056] The moisture-curing urethane-based hot melt adhesive may contain: an organic metal catalyst e.g., a tin compound such as dibutyltin dilaurylate, and a titanium compound; a curing catalyst e.g., a tertiary amine compound such as triethylamine and triethylene diamine; and the like. In addition, the moisture-curing urethane-based hot melt adhesive may also contain additives such as a plasticizer, a tackifier, various types of fillers, a pigment, a wax, a moisture removing agent, a storage stabilizer, an antioxidant, and a carbon dioxide scavenger, and the like as needed.

[0057] The moisture-curing urethane-based hot melt adhesive prior to curing is semi-crosslinked, and has characteristics of liquefying under heat and hardening upon cooling. By way of these characteristics, bonding using the moisture-curing urethane-based hot melt adhesive is carried out as follows. First, the moisture-curing urethane-based hot melt adhesive is heated to liquefy and applied to one bonding face. Subsequently, the moisture-curing urethane-based hot melt adhesive, which has hardened naturally after the applying, is heated to reliquefy. Finally, the other bonding face is overlapped thereon, with pressurizing and cooling. The objects to be bonded are thus enabled to be bonded together.

[0058] Urethane, which is the principal component of the moisture-curing urethane-based hot melt adhesive 3, has an isocyanate group at a molecular terminal. The terminal isocyanate group reacts with moisture and the like in the air, to thereby generate an unstable carbamic acid group. The carbamic acid group further degrades into amines and carbon dioxide. An amine thus generated reacts rapidly with other isocyanate group to form a urea bond and a cross-linked structure, whereby urethane in the moisture-curing urethane-based hot melt adhesive is polymerized. By thus crosslinking the moisture-curing urethane-based hot melt adhesive by virtue of the above-described characteristics, the bonding strength of the bonded portion of the impact-resistant pad 3 is increased, and chemical resistance is improved to thereby enable inhibition of decrease in bonding strength due to chemicals.

[0059] The lower limit of the average thickness of the adhesive layer 4 (H in Fig. 3) is preferably 0.05 mm, and more preferably 0.1 mm. The upper limit of the average thickness of the adhesive layer 4 is preferably 0.5 mm, and more preferably 0.3 mm. When the average thickness of the adhesive layer 4 is less than the lower limit, the bonding strength of the impact-resistant pad 3 may be insufficient. To the contrary, when the average thickness of the adhesive layer 4 is greater than the upper limit, the bending flexibility of the glove 10 may be insufficient.

[0060] The lower limit of a post-curing thermal deformation temperature of the moisture-curing urethane-based hot melt adhesive is preferably 80 °C, more preferably 100 °C, and still more preferably 150 °C. When the thermal deformation temperature of the adhesive layer 4 is less than the lower limit, the bonded portion between the coating layer 2 and the impact-resistant pad 3 is more likely to deform particularly in a high-temperature environment, whereby the bonding strength may be reduced. Meanwhile, the upper limit of the thermal deformation temperature of the adhesive layer 4 is not particularly limited and may be, for example, 300 °C.

[0061] The lower limit of the bonding strength at 25 °C between the coating layer 2 and the impact-resistant pad 3 is preferably 20 N/cm, more preferably 25 N/cm, and still more preferably 30 N/cm. When the bonding strength at 25 °C between the coating layer 2 and the impact-resistant pad 3 is less than the lower limit, the coating layer 2 and the impact-resistant pad 3 may separate during use of the glove. Meanwhile, the upper limit of the bonding strength at 25 °C between the coating layer 2 and the impact-resistant pad 3 is not particularly limited and is, for example, about 70 N/cm.

[0062] Due to bonding the impact-resistant pad 3 using the moisture-curing urethane-based hot melt adhesive, the impact-resistant pad 3 is less likely to be dislocated or detached, whereby the glove 10 is superior in impact resistance. The upper limit of the mean transmitted force measured pursuant to EN1621-1 in terms of impact resistance is preferably 7 kN and more preferably 6 kN. Meanwhile, the lower limit of the mean transmitted force is not particularly limited, and is typically 0.1 kN.

Production Method of Glove

[0063] The glove 10 may be obtained by a production method comprising steps of, for example: covering the external face of the glove main body 1 with the coating layer 2; forming the impact-resistant pad 3; and arranging the impact-resistant pad 3 to at least a part of the dorsal side portion of the external face side of the coating layer 2 on the glove main body 1 through the adhesive layer 4. Each step will be described below.

Covering Step

[0064] In the covering step, the glove main body 1 is fitted on a hand mold, and a composition for forming the coating layer 2 is applied onto the external face of the glove main body 1 and dried, whereby the coating layer 2 covers the glove main body 1. As a process for applying the composition, a well-known process may be employed and examples of which include a process of dipping the glove main body 1 in the composition. It is to be noted that in the case of the coating layer 2 being multilayered as illustrated in Fig. 1, application and drying are performed a plurality of times with different compositions.

Impact-Resistant Pad Forming Step

[0065] In the impact-resistant pad forming step, the impact-resistant pad 3 is formed from a composition containing a synthetic resin. Specific examples of a process for the forming include a process of pouring the composition into a mold and heat molding. It is to be noted that in the case of the impact-resistant pad 3 having a plurality of parts (the base layer 3a and the protruding part 3b) as illustrated in Fig. 1, these parts may be either integrally formed or separately formed and then joined.

Arranging Step

[0066] In the arranging step, the impact-resistant pad 3 is bonded to the coating layer 2 through the adhesive layer 4. As the adhesive constituting the adhesive layer 4, the moisture-curing urethane-based hot-melt adhesive is used. The arranging step includes an applying sub step, a heating sub step, a joining sub step, and a curing substep.

[0067] In the application substep, the moisture-curing urethane-based hot melt adhesive is applied to the internal face of the impact-resistant pad 3. Since the moisture-curing urethane-based hot melt adhesive is solid at a room temperature (25 °C), the application is carried out after heating the adhesive to liquefy. It is to be noted that degreasing, and increasing the surface roughness of, the internal face of the impact-resistant pad 3 are preferably permitted by wiping the internal face of the impact-resistant pad 3 with acetone etc., prior to application of the adhesive.

[0068] The lower limit of the heating temperature for liquefying the adhesive in the application substep is preferably 100 °C and more preferably 110 °C. Meanwhile, the upper limit of the heating temperature is preferably 160 °C and more preferably 150 °C. When the heating temperature is less than the lower limit, the moisture-curing urethane-based hot melt adhesive may not be sufficiently softened, whereby the application may be difficult. To the contrary, when the heating temperature is greater than the upper limit, crosslinking of the moisture-curing urethane-based hot melt adhesive may excessively proceed, resulting in hardening prior to joining of the impact-resistant pad 3, whereby bonding of the impact-resistant pad 3 may be difficult. It is to be noted that a heating time period is not particularly limited as long as the adhesive is liquefied, and may be, for example, no less than 1 min and no greater than 24 hrs.

[0069] After the application substep, the moisture-curing urethane-based hot melt adhesive hardens naturally. Therefore, the moisture-curing urethane-based hot melt adhesive, which has hardened naturally, is heated in the heating substep to reliquefy.

[0070] The lower limit of the heating temperature for reliquefying the adhesive in the heating substep is preferably 80 °C and more preferably 100 °C. Meanwhile, the upper limit of the heating temperature is preferably 150 °C and more preferably 140 °C. When the heating temperature is less than the lower limit, the moisture-curing urethane-based hot melt adhesive is not sufficiently softened, whereby the bonding strength may be insufficient. To the contrary, when the heating temperature is greater than the upper limit, the glove main body 1 may deform under heat depending on the material of the glove main body 1. It is to be noted that a heating time period is not particularly limited as long as the adhesive is liquefied, and may be, for example, no less than 1 min and no greater than 20 min.

[0071] Next, in the joining substep, the impact-resistant pad 3 is joined to the coating layer 2. Specifically, the coating layer 2 is overlapped with the interior face of the impact-resistant pad 3 through the moisture-curing urethane-based hot melt adhesive liquefied in the heating substep, and cooling is conducted with pressurizing. It is to be noted that degreasing, and increasing the surface roughness of, the external face of the coating layer 2 are preferably permitted by wiping the external face of the coating layer 2 with acetone etc., prior to overlapping.

[0072] The lower limit of a compression force in the joining substep is preferably 0.025 kg/cm², and more preferably

0.05 kg/cm². Meanwhile, the upper limit of the compression force is preferably 3 kg/cm², and more preferably 2 kg/cm². In the case of the compression force being less than the lower limit, the bonding strength may be insufficient. To the contrary, when the compression force is greater than the upper limit, deformation of the glove 10 may occur.

[0073] A pressurizing time period in the joining substep is preferably no less than 3 sec. Due to the pressurizing time period of pressurizing being no less than 3 sec, more reliable compression-bonding of the impact-resistant pad 3 to the coating layer 2 is enabled. The upper limit of the pressurizing time period of pressurizing is not particularly limited, and is no greater than 10 min in light of production efficiency.

[0074] The pressurizing takes place simultaneously with cooling, i.e., with no heating. The cooling along with the pressurizing may be forced cooling, but is preferably natural cooling in air, in light of production cost. In other words, the pressurizing is preferably carried out at a room temperature (e.g., 25 °C).

[0075] Finally, after the joining substep, the glove 10 is removed from the mold and cured in the curing substep. A curing procedure for the moisture-curing urethane-based hot melt adhesive is not particularly limited and examples thereof include: a procedure of letting stand in the air; a procedure of humidifying the glove main body 1 and the like; and the like. Of these, the procedure of letting stand in the air is preferred in light of convenience of production. The atmosphere for the curing by letting stand the moisture-curing urethane-based hot melt adhesive is preferably air with moisture. By thus letting stand in the air with moisture, the moisture-curing urethane-based hot melt adhesive undergoes a crosslinking reaction by virtue of the moisture, whereby the bonding strength increases.

[0076] The lower limit of the curing time period is preferably 15 hrs and more preferably 20 hrs. When the curing time period is less than the lower limit, an effect of improving bonding strength may be insufficient. On the other hand, the upper limit of the curing time period is not particularly limited, and is preferably 1 week in light of production efficiency.

[0077] In the case of curing the moisture-curing urethane-based hot melt adhesive by letting stand, the lower limit of moisture in the air during the curing is preferably 15% and more preferably 30%. On the other hand, the upper limit of the moisture in the air during the curing is preferably 95% and more preferably 90%. In the case of the moisture being less than the lower limit, crosslinking of the moisture-curing urethane-based hot melt adhesive may not sufficiently proceed, whereby the effect of increasing the bonding strength may be insufficient. To the contrary, when the moisture is greater than the upper limit, dew condensation and the like may necessitate a drying treatment of the glove 10, resulting in increase in the production cost.

[0078] It is to be noted that a temperature for curing the moisture-curing urethane-based hot melt adhesive is not particularly limited as long as the temperature allows the crosslinking reaction to proceed, and may be, for example, no less than 25 °C and no greater than 50 °C.

Advantages

[0079] In regard to the glove 10, the coating layer 2 that comprises a synthetic resin or a rubber as a principal component and the impact-resistant pad 3 that comprises a synthetic resin or a rubber as a principal component are bonded together through the adhesive layer 4. Thus, bonding of the impact-resistant pad 3 on the glove 10 involves adhesion between the resins, adhesion between the rubbers, or adhesion between the rubber and the resin. Accordingly, the impact-resistant pad 3 is enabled to be bonded more firmly than in the case of being directly bonded to the glove main body 1 made of fiber. Therefore, the impact-resistant pad 3 is not likely to be detached even when arranged at a portion to be bent, whereby protection of the portion to be bent of the glove 10 is easily enabled by means of the impact-resistant pad 3. In addition, in regard to the glove 10, the coating layer 2 covers the external face of the glove main body 1. Furthermore, in regard to the glove 10, since the impact-resistant pad 3 is bonded through the adhesive layer 4, fixing of the impact-resistant pad 3 is enabled without making holes on the coating layer 2, unlike the case of fixing the impact-resistant pad 3 by sewing. As a result, owing to the coating layer 2, the glove 10 is superior in water proofing property and chemical resistance. Moreover, since the glove 10 does not require using a sewing thread, deterioration of texture due to irregularities on the internal face of the glove main body 1 caused by the sewing thread is enabled to be inhibited. Using, as an adhesive constituting the adhesive layer 4, the moisture-curing urethane-based hot-melt adhesive superior in processibility and adhesive force with respect to the rubber and the resin enables the effect of preventing dislocation and detachment of the impact-resistant pad 3 to be improved.

Second Embodiment

[0080] A glove 20 illustrated in Fig. 4 includes: a glove main body 1 that is stretchable and made of fiber; a coating layer 2 that covers an external face of the glove main body 1; a plurality of finger impact-resistant pads 3 arranged to the finger portion on an external face side of the coating layer 2 on a dorsal side of the glove main body 1; and a back-hand impact-resistant pad 23 arranged to a back-hand portion in the dorsal side portion of the external face side of the coating layer 2. The glove main body 1, the coating layer 2, and the finger impact-resistant pad 3 of the glove 20 are identical to the glove main body 1, the coating layer 2, and the impact-resistant pad 3 of the glove 10 illustrated in Fig.

1, and are therefore referred to by the same reference numerals and description thereof is omitted.

Back-Hand Impact-Resistant Pad

[0081] The back-hand impact-resistant pad 23 is arranged to the back-hand portion in the dorsal side portion of the external face side of the coating layer 2, and bonded to the coating layer 2 through the adhesive layer 4 in a similar manner to the finger impact-resistant pad 3.

[0082] The back-hand impact-resistant pad 23 is provided with: a base layer 23a that is overlaid on the coating layer 2; and a protruding part 23b that is arranged to protrude from an external face of the base layer 23a.

[0083] The back-hand impact-resistant pad 23 comprises a synthetic resin or a rubber as a principal component. The synthetic resin or the rubber may be the same as that used for the finger impact-resistant pad 3. Similarly, additives which may be added to the back-hand impact-resistant pad 23 may be the same as those exemplified for the finger impact-resistant pad 3.

Base Layer

[0084] The base layer 23a is plate-like and is arranged to the coating layer 2 through the adhesive layer 4 so as to cover the third joint of each finger and a part of the back-hand portion.

[0085] The lower limit of the average thickness of the base layer 23a is preferably 0.1 mm, and more preferably 0.3 mm. Meanwhile, the upper limit of the average thickness of the base layer 23a is preferably 1 mm and more preferably 0.8 mm. When the average thickness of the base layer 23a is less than the lower limit, the strength of the base layer 23a may be insufficient. To the contrary, when the average thickness of the base layer 23a is greater than the upper limit, the back-hand impact-resistant pad 23 may become unduly thick, leading to lowered workability during use.

[0086] The lower limit of the hardness of the base layer 23a is preferably A40, and more preferably A50. On the other hand, the upper limit of the hardness of the base layer 23a is preferably A80, and more preferably A70. When the hardness of the base layer 23a is less than the lower limit, the impact resistance may be insufficient. To the contrary, when the hardness of the base layer 23a is greater than the upper limit, the bending flexibility of the glove 20 may be reduced.

[0087] The arithmetic average roughness Ra of the internal face (face on the side of the glove main body 1) of the base layer 23a may be the same as that of the base layer 3a of the finger impact-resistant pad 3.

[0088] At least one slit may be formed on the base layer 23a in the longitudinal direction of the finger portion. The slit can provide the back-hand impact-resistant pad 23 with flexibility.

Protruding Part

[0089] The protruding part 23b is arranged to protrude from the external face of the base layer 23a.

[0090] The lower limit of the hardness of the protruding part 23b is preferably A30, and more preferably A40. On the other hand, the upper limit of the hardness of the protruding part 23b is preferably A70, and more preferably A60. In the case of the hardness of the protruding part 23b being less than the lower limit, the strength may be insufficient. To the contrary, when the hardness of the protruding part 23b is greater than the upper limit, the impact resistance may be insufficient.

[0091] The lower limit of the maximum thickness of the back-hand impact-resistant pad 23 is preferably 2 mm, and more preferably 3 mm. Meanwhile, the upper limit of the maximum thickness of the back-hand impact-resistant pad 23 is preferably 9 mm, and more preferably 7 mm. When the maximum thickness of the back-hand impact-resistant pad 23 is less than the lower limit, the impact resistance may be insufficient. To the contrary, when the maximum thickness T of the back-hand impact-resistant pad 23 is greater than the upper limit, the flexibility of the back-hand impact-resistant pad 23 may be insufficient.

Advantages

[0092] The glove 20 is provided with the back-hand impact-resistant pad 23 in addition to the finger impact-resistant pad 3, whereby a wearer's hand can be protected more reliably.

Other Embodiments

[0093] The present invention is not limited to the above embodiments and may be carried out in various modified and improved modes in addition to the aforementioned modes.

[0094] In the above embodiments, a constitution has been described in which the finger impact-resistant pad is arranged

to an entirety of each finger portion along the longitudinal direction; however, the finger impact-resistant pad is not limited thereto. The finger impact-resistant pad may be arranged, for example, so as to cover only a first joint portion, a second joint portion, or a combination thereof in each finger portion; or arranged so as to cover only an area between a fingertip end and the first joint portion, an area between the first joint portion and the second joint portion, an area between the second joint portion and the third joint portion, or a combination thereof. In the case in which the impact-resistant pad covers a plurality of separate portions, the impact-resistant pad is composed of a plurality of blocks segmented to correspond to the portions to be covered (segmented base layer and protruding parts).

[0095] In addition, in the above embodiments, a constitution has been described in which the finger impact-resistant pad has a shape with the expanded part covering wearer's entire nail on the fingertip side; however, the expanded part is not an essential constitutive element and may be omitted. In other words, the finger impact-resistant pad may be strip-shaped, with no expanded part.

[0096] The above-described embodiments are configured such that the impact-resistant pad is arranged at least to the finger portion; however, the glove of the present invention is only required to have the impact-resistant pad arranged at least partially to a dorsal side portion of an external face side of the coating layer on the glove main body, and therefore a mode with the finger portion not having the impact-resistant pad arranged thereto also falls within the intended scope of the present invention. In addition, in the case in which the impact-resistant pad is arranged to the finger portion, not all of the individual finger portions are required to have the impact-resistant pad being arranged thereto. Furthermore, a plurality of impact-resistant pads may be arranged to the back-hand portion. Moreover, the glove may further be provided with an impact-resistant pad that is arranged to a position different from the finger impact-resistant pad and the back-hand impact-resistant pad.

[0097] The impact-resistant pad is only required to be arranged at least partially to the external face side of the coating layer, and a part thereof may be arranged to the glove main body directly. In other words, the impact-resistant pad can partially be arranged to, for example, a region without the coating layer on the dorsal side of the glove main body. However, the impact-resistant pad is preferably entirely arranged to the coating layer. Arranging the impact-resistant pad entirely to the coating layer results in greater bonding strength, since the thin uniform adhesive layer enables uniform bonding.

[0098] Furthermore, the shape of the impact-resistant pad of the present invention is not limited to the shape in the above-described embodiments and may be designed appropriately; and may not necessarily be provided with the base layer and the protruding part. In the case of the impact-resistant pad comprising the base layer and the protruding part, the protruding part is not required to be composed of the plurality of blocks.

[0099] Alternatively, the glove main body may be composed of an inner glove and an outer glove. The inner glove may be knitted from a yarn made of fiber; and the outer glove may comprise a base material that is knitted from a yarn made of fiber as described above and a coating layer that is overlaid on an external face of the base material, comprising a rubber or a resin as a principal component.

[EXAMPLES]

[0100] The present invention is described further in detail hereinafter with reference to Examples and Comparative Examples; however, the present invention is not limited to the following Examples.

Example 1

Glove Main Body

[0101] First, two woolly nylon two-fold yarns (number of filaments per yarn: 24, thickness: 77 dtex) were paralleled and knitted into a glove main body by using a 13 gauges glove knitting machine "N-SFG" manufactured by Shima Seiki Mfg., Ltd.

Coating Layer

[0102] Next, the glove main body was fitted onto a hand mold; heated to approximately 60 °C; dipped up to a wrist portion in a coagulating agent containing 1 part by mass of calcium nitrate dissolved in 100 parts by mass of methanol; and withdrawn. Subsequently, the glove main body with the coagulating agent adhered thereto was dipped in a compound 1 of a formula 1 shown in Table 1 up to the palm portion, the back-hand portion, and the finger portion. The glove main body thus dipped in the compound 1 was withdrawn, dried at 80 °C for 10 min, and then the palm portion and the finger portion were dipped in a compound 2 of a formula 2 shown in Table 1. It is to be noted that the compound 2 was prepared by mixing 30% of air into the formula 2 by an automatic mixer. The average thickness of the glove main body and the coating layer taken together was 0.92 mm. Subsequently, leaching was carried out, followed by drying at 130 °C for 40 min.

Table 1

Blended Components	Formula 1 (parts by mass)	Formula 2 (parts by mass)
NBR Latex	100	100
Sulfur	2.0	2.0
Zinc oxide	1.0	1.0
Vulcanization accelerator (zinc dibutyldithiocarbamate)	0.5	0.5
Antioxidant (2,2-methylenebis(4-ethyl-6-tert-butylphenol))	0.5	0.5
Heat sensitizer (polyether-modified silicone aqueous solution)	0.2	0.2
Foaming agent (N-alkyl monoamide disodium sulfosuccinate)	-	3.0
Foam stabilizer (sodium laurylaminodipropionate)	-	3.0

Impact-Resistant Pad

[0103] A compound obtained by mixing 100 parts by mass of polyvinyl chloride as the synthetic resin, 100 parts by mass of a non-phthalic acid plasticizer and a pigment was poured into a mold; and dried by heating at 250 °C for 1 min, thereby forming protruding parts of the impact-resistant pad. Next, a compound obtained by mixing 100 parts by mass of polyvinyl chloride, 100 parts by mass of a non-phthalic acid plasticizer and a pigment was poured onto the protruding part; and dried by heating at 180 °C for 15 min, thereby integrally forming the base layer and the protruding part of the impact-resistant pad. After cooling, the impact-resistant pad was released from the mold. The average thickness of the base layer of the impact-resistant pad was 0.7 mm.

Bonding

[0104] First, the internal face of the impact-resistant pad and the external face of the coating layer were wiped with acetone, leading to degreasing, and increasing the surface roughness of, the bonding faces.

[0105] Next, an aromatic moisture-curing urethane-based hot melt adhesive ("PUR703.5" available from KLEIBERIT) was heated to 130 °C to liquefy, and then applied to an entirety of the interior face of the impact-resistant pad such that a thickness is 0.15 mm, by using a roll coater ("R2" available from EPIC Ltd.).

[0106] After the applying, the moisture-curing urethane-based hot melt adhesive hardened by natural cooling was heated at 130 °C for 3 min to reliquefy and overlapped with the coating layer, and then compressed at a pressure of 8 kg/10 cm² (=0.8 kg/cm²) for 30 sec with cooling. After the cooling, the glove was removed from the hand mold and left to stand under conditions involving temperature of 50 °C and moisture of 80% for 48 hrs. A glove of Example 1 was thus obtained.

Examples 2 to 6 and Comparative Examples 1 to 3

[0107] Gloves of Examples 2 to 6 and Comparative Examples 1 to 3 were obtained in a similar manner to Example 1, except that the adhesives and the synthetic resins for the impact-resistant pad shown in Table 2 were used. As the aliphatic moisture-curing urethane-based hot melt adhesive, "PUR717.1" available from KLEIBERIT was used, and as the urethane-based thermoplastic elastomer, "G350" available from Konishi Co., Ltd. was used. As the synthetic rubber, an acrylonitrile-butadiene rubber was used.

Evaluation of Bonding Strength

[0108] Examples 1 to 6 and Comparative Examples 1 to 3 were evaluated in terms of the bonding strength. The "bonding strength" was calculated by: cutting out a test piece of 10 mm in width and 60 mm in length including the bonded portion between the coating layer and the impact-resistant pad; conducting a 180° peeling test by using the test piece at a pulling rate of 50 mm/min with a travel distance of 100 mm; and dividing an arithmetic average value of load values of a plurality of peaks and a plurality of valleys of a load measured in the 180° peeling test by an average width

of the bonded portion. The bonding strength of at least 20 N/cm may be determined to be superior. The results are shown in Table 2.

Table 2

	Adhesive	Impact-resistant pad	Bonding strength (N/cm)
Example 1	Aromatic moisture-curing	Polyvinyl chloride	49.7
Example 2		Synthetic rubber	35.1
Example 3	urethane-based hot melt adhesive	Polyurethane	65.8
Example 4	Aliphatic moisture-curing urethane-based hot melt adhesive	Polyvinyl chloride	25.1
Example 5		Synthetic rubber	40.7
Example 6		Polyurethane	56.0
Comparative Example 1	Urethane-based thermoplastic elastomer	Polyvinyl chloride	8.5
Comparative Example 2		Synthetic rubber	15.1
Comparative Example 3		Polyurethane	15.7

[0109] As can be seen from Table 2, Examples 1 to 6, which contained the moisture-curing urethane-based hot melt adhesive as the adhesive, each had the bonding strength of no less than 20 N/cm, indicating superior bonding strength. On the other hand, Comparative Examples 1 to 3, which contained the urethane-based thermoplastic elastomer as the adhesive, each had the bonding strength of less than 20 N/cm, indicating inferior bonding strength. Consequently, it is proven that using the moisture-curing urethane-based hot melt adhesive as the adhesive provides a great bonding strength.

[0110] Comparison of Examples 1 to 3 which contained the aromatic moisture-curing urethane-based hot melt adhesive with Examples 4 to 6 which contained the aliphatic moisture-curing urethane-based hot melt adhesive indicated that, in the case of using the impact-resistant pad formed from polyvinyl chloride and the impact-resistant pad formed from polyurethane, Examples which contained the aromatic moisture-curing urethane-based hot melt adhesive were superior in the bonding strength, whereas similar results were found in the case of using the impact-resistant pad formed from the synthetic rubber. Consequently, it is proven that the aromatic moisture-curing urethane-based hot melt adhesive is preferably used.

Evaluation of Chemical Resistance

[0111] Example 1 was evaluated in terms of chemical resistance. Specifically, the glove of Example 1 was immersed in a chemical under conditions shown in Table 3, and then the bonding strength after immersion was measured in a similar manner to the evaluation of bonding strength. The results are shown in Table 3. Table 3 also shows the bonding strengths without the immersion.

Table 3

Immersion condition			Example 1
Chemicals	Temperature (°C)	Time (h)	Bonding strength (N/cm)
No immersion	-	-	49.7
Kerosene	22	1	34.9
70 mass% ethanol	22	24	23.9
5 mass% NaCl	40	24	33.5

[0112] As can be seen from Table 3, Example 1 had the bonding strength of no less than 20 N/cm even after the immersion in the chemical, with only a small reduction from the bonding strength without the immersion. Consequently,

it is proven that the glove with the moisture-curing urethane-based hot melt adhesive as the adhesive is superior also in chemical resistance.

[0113] In addition, for providing superior chemical resistance and water proofing property, it is necessary to exclude pinholes, in addition to preventing reduction in the bonding strength. In order to check the presence of pinholes, an air-leak test was conducted.

Comparative Example 4

[0114] A glove of Comparative Example 4 was obtained in a similar manner to Example 1 except that the impact-resistant pad was arranged by sewing, instead of using the aromatic moisture-curing urethane-based hot melt adhesive.

[0115] The glove of Comparative Example 4 and the glove of Example 1 were subjected to the air-leak test. The air-leak test was conducted pursuant to EN374-2 (2003), by checking the presence of air bubbles generated from the glove, which had been immersed in water for 2 min under air pressure of 7.5 kPa. The results were as follows.

Example 1: No air bubble observed

Comparative Example 4: Air bubbles observed

[0116] From these results, it is proven that the glove of Example 1 in which the impact-resistant pad was arranged by using the moisture-curing urethane-based hot melt adhesive had no pinhole and was consequently superior in chemical resistance and water proofing property. To the contrary, the glove of Comparative Example 4 in which the impact-resistant pad was arranged by sewing had pinholes and was consequently inferior in chemical resistance and water proofing property.

Evaluation of Bending Flexibility

[0117] For evaluation of the bending flexibility, the following gloves were further provided.

Example 7

[0118] The glove of Example 7 was obtained in a similar manner to Example 1, except that the thickness of the base layer of the impact-resistant pad was 1.4 mm.

Reference Example 1

[0119] The glove of Reference Example 1 was obtained in a similar manner to Example 1, except that the impact-resistant pad was not provided. In other words, the glove of Reference Example 1 had only the coating layer, with no impact-resistant pad.

[0120] Example 1, Example 7 and Reference Example 1 were evaluated in terms of the bending flexibility. For the bending flexibility, bending stress was determined by conducting a three-point bending test pursuant to JIS-K-7171 (2008), by using a test piece of 10 mm in width cut off from the coating layer with the impact-resistant pad being bonded. A direction of bending in determining the bending stress corresponded to the direction of finger flexion. A thickness used in the three-point bending test was a distance between the interior face of the glove main body and the external face of the base layer (C in Fig. 3). A smaller value of the bending stress indicates superior bending flexibility. The results are shown in Table 4.

[0121] Furthermore, ten subjects wearing the gloves of Example 1, Example 7 and Reference Example 1 conducted the sensory evaluation according to the following criteria. The results are shown in Table 4.

A: Soft

B: Somewhat soft

C: Somewhat stiff

D: Stiff

Table 4

	Average thickness		Bending stress (MPa)	Sensory evaluation
	Entirety (mm)	Base layer (mm)		
Example 1	1.77	0.7	0.341	A
Example 7	2.47	1.4	1.650	C
Reference Example 1	0.92	-	0.130	A

[0122] It is to be noted that "entirety" of average thickness shown in Table 4 is an average thickness at a position where the impact-resistant pad is arranged, i.e., an average of a distance between the interior face of the glove main body and the external face of the base layer.

[0123] As can be seen from Table 4, Example 1 in which the average thickness of the base layer was no greater than 1 mm exhibited a smaller bending stress than Example 7 in which the average thickness of the base layer was greater than 1 mm, and Example 1 exhibited in the sensory evaluation a similar softness to Reference Example 1 which had no impact-resistant pad. In other words, it is proven that the average thickness of the base layer being no greater than 1 mm enables the bending flexibility of the impact-resistant pad to be further improved.

Evaluation of Impact Resistance

[0124] For evaluation of the impact resistance, the glove of Example 1 was measured in terms of an average transmission force pursuant to EN1621-1. When the average transmission force is no greater than 7 kN, the impact resistance can be determined to be superior. The evaluation result for Example 1 was 5.5 kN, which proved superior impact resistance. The glove of Example 1 is believed to exhibit superior impact resistance due to using the moisture-curing urethane-based hot melt adhesive for bonding the impact-resistant pad, since the impact-resistant pad is less likely to be dislocated or detached.

[INDUSTRIAL APPLICABILITY]

[0125] As explained in the foregoing, in regard to the glove according to the present invention, a bonding strength of the impact-resistant pad is relatively high, and the impact resistance, water proofing property, and chemical resistance are superior.

Explanation of the Reference Symbols

[0126]

- 1 Glove main body
- 2 Coating layer
- 2a First coating layer
- 2b Second coating layer
- 3, 23 Impact-resistant pad
- 3a, 23a Base layer
- 3b, 23b Protruding part
- 4 Adhesive layer
- 10, 20 Glove
- VI, V2 Trough

Claims

1. A glove comprising:

- a glove main body that is stretchable and made of fiber;
- a coating layer that comprises a synthetic resin or a rubber as a principal component and covers an external face of the glove main body;
- at least one impact-resistant pad that comprises a synthetic resin or a rubber as a principal component and is

arranged to at least a part of a dorsal side portion of an external face side of the coating layer on the glove main body; and
an adhesive layer that bonds the coating layer and the impact-resistant pad together, wherein
an adhesive constituting the adhesive layer is a moisture-curing urethane-based hot-melt adhesive.

- 5
2. The glove according to claim 1, wherein the impact-resistant pad is arranged on a portion corresponding to a joint of at least one finger.
- 10
3. The glove according to claim 1 or 2, wherein the impact-resistant pad comprises:
- a base layer that is overlaid on the coating layer; and
a protruding part that is arranged to protrude from the external face of the base layer.
- 15
4. The glove according to claim 3, wherein an average thickness of the base layer is no less than 0.1 mm and no greater than 1 mm.
5. The glove according to any one of claims 1 to 4, wherein a bonding strength at 25 °C between the coating layer and the impact-resistant pad is no less than 20 N/cm.
- 20
6. The glove according to any one of claims 1 to 5, wherein a bending stress of the glove at a position where the impact-resistant pad is arranged is no greater than 1.6 MPa.
- 25
- 30
- 35
- 40
- 45
- 50
- 55

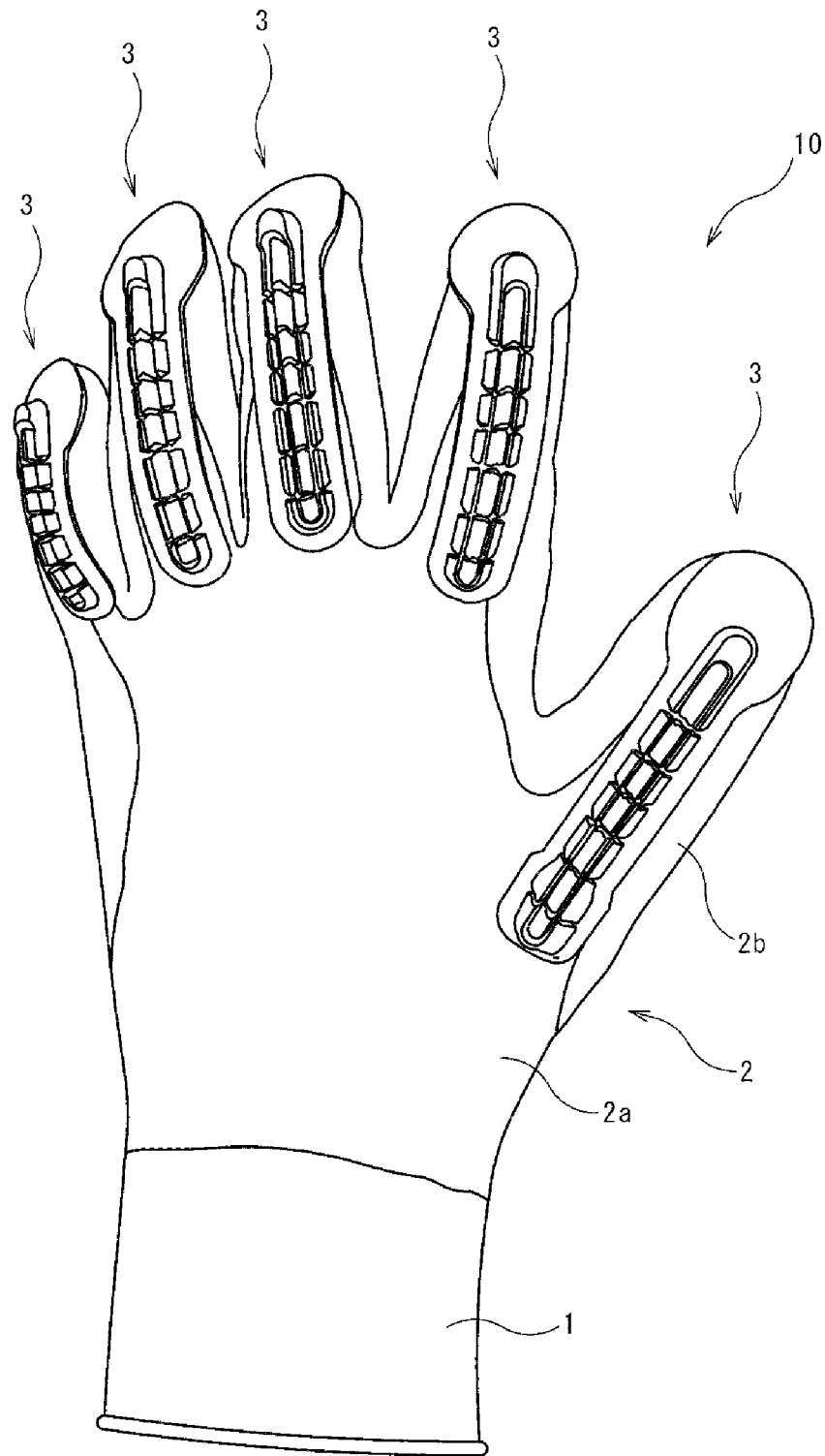


FIG. 1

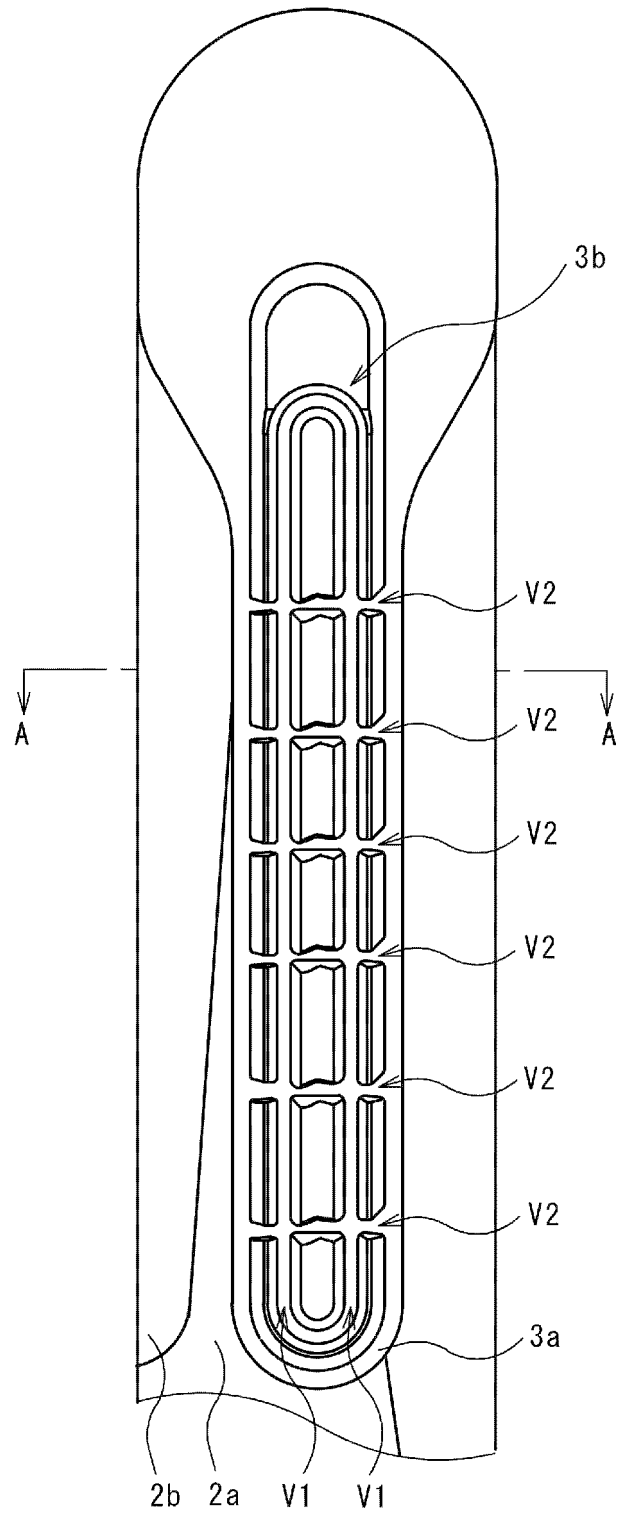
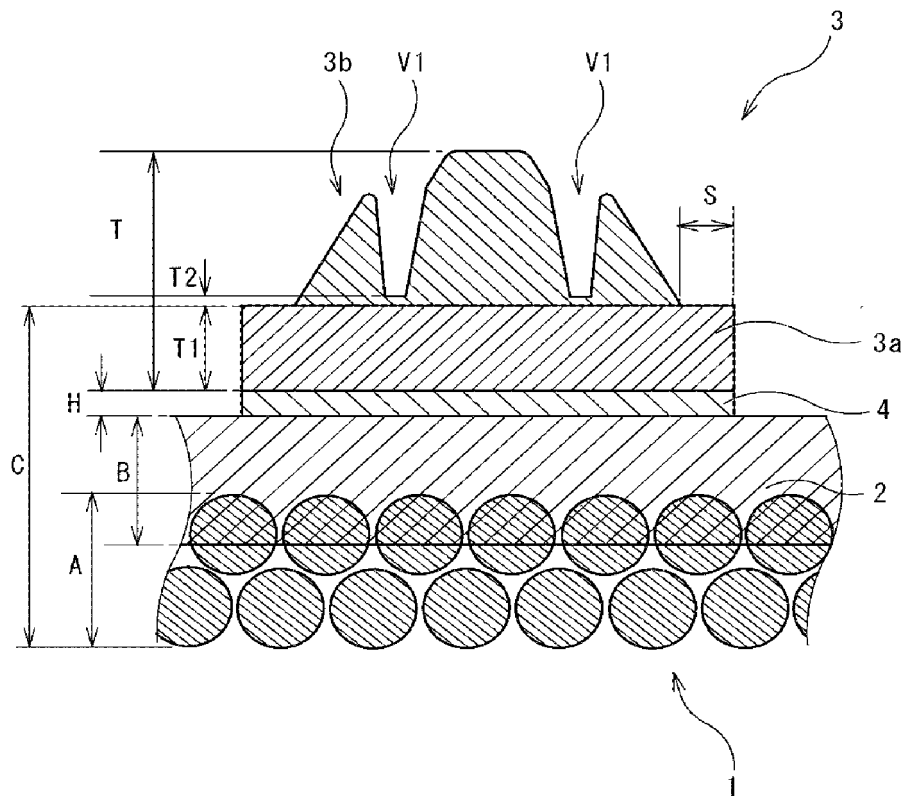


FIG. 2



F I G. 3

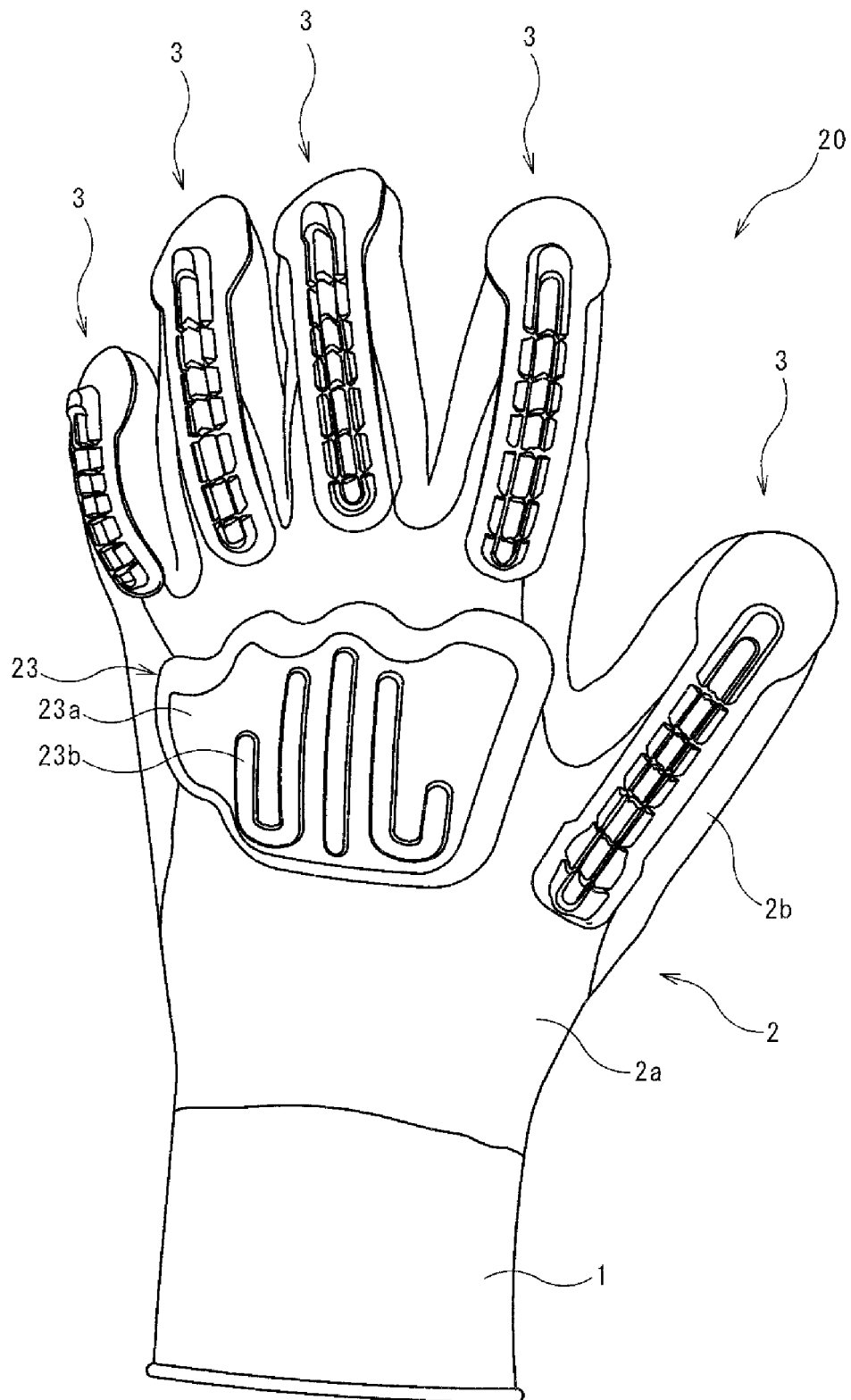


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/040653

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. A41D19/015 (2006.01) i, A41D19/00 (2006.01) i

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)

Int.Cl. A41D19/00-19/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2017

Registered utility model specifications of Japan 1996-2017

Published registered utility model applications of Japan 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2016/0120242 A1 (ANSELL LIMITED) 05 May 2016 & WO 2016/070228 A1	1-6
A	JP 6-93503 A (S T CHEM CO., LTD.) 05 April 1994 (Family: none)	1-6
A	JP 2008-514467 A (ANSELL HEALTHCARE PRODUCTS LLC) 08 May 2008 & US 2006/0068140 A1 & EP 1799450 B1 & CN 101060978 A	1-6



Further documents are listed in the continuation of Box C.



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"&" document member of the same patent family

Date of the actual completion of the international search
26.12.2017Date of mailing of the international search report
16.01.2018Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/040653

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 7-252708 A (OKURA INDUSTRIAL CO., LTD.) 03 October 1995 (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005325456 A [0002] [0005]