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(54) **Glove**

(57) Disclosed is a glove comprising a fibrous glove and a coating layer of a rubber or a vinyl chloride-based resin formed on an outer surface side of the fibrous glove, wherein at least an inner surface side of the fibrous glove includes a microfiber having a diameter of a monofilament of not more than 6 μm. The glove of the present invention is not only excellent in slip resistance on both the outer surface side and the inner surface side, but also excellent in adhesion strength to rubber or resin formed on the outer surface side.

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## Description

**[0001]** The present invention relates to a glove whose outer surface side and inner surface side are both superior in slip resistance, and more particularly, relates to a glove that is superior in slip resistance of the inner surface side of the glove and also is superior in the adhesion strength of the outer surface side of the glove from a coating layer of a rubber or a resin formed on the outer surface side of the glove.

**[0002]** Conventionally, fibrous gloves having a coating layer have been used widely in the fields of metal processing, physical distribution, assembly, packing, civil engineering and construction, precision, medical treatment, plantation, etc.

**[0003]** Among those, in the fields where dust of fibers of fibrous gloves becomes a problem, there have been used long fibers such as polyester and polyamide (nylon). However, such fibers are problematic in that their slip resistance is insufficient due to their smaller frictional resistance with hand skin in comparison with spun yarns of short fibers such as cotton, acrylic fibers and polyester, and therefore fingers slip easily within gloves, resulting in poor workability.

**[0004]** In order to solve this problem, there has been proposed, for example, a glove whose gripping property has been improved by forming a foamed coating of a rubber or a resin on a fibrous glove knitted from elastic fibers and inelastic fibers (for example, JP-A-2008-75201).

**[0005]** Moreover, a highly adherent glove whose outer and inner surface sides are formed of woven and knitted fabrics consisting of ultra finefiber bundles has been proposed (for example, JP-B-4-5763).

**[0006]** The glove disclosed in JP-A-2008-75201 has sufficient slip resistance on its outer surface side because the outer surface side is covered with a foamed coating of a rubber or a resin, but the inner surface side of the glove is not always sufficient in slip resistance. For example, there is a disadvantage that fingers slip in a glove and the glove sometimes comes off during a work in which a large force is applied in the longitudinal direction of a glove, e.g., dragging an object.

**[0007]** The glove disclosed in JP-B-4-5763 is satisfactory in slip resistance on the inner surface side thereof, but the slip resistance of the outer surface side is not sufficient and, as a result, it has a disadvantage that when gripping a heavy object, the heavy object slips down.

**[0008]** In light of the above situations, it is an object of the present invention to provide a glove that has excellent slip resistance on both the outer surface side and the inner surface side thereof and also is superior in adhesion strength of a coating layer.

**[0009]** In order to improve the slip resistance of the inner surface side of a glove for the attainment of the above-described object, the present inventors have tried to form a coating layer of a rubber or a vinyl chloride-based resin on the outer surface side of a fibrous glove whose outer surface side and inner surface side of the glove are made of microfibers. Although the slip resistance of the inner surface side of the glove has been improved, such a coating layer sometimes peels off during use due to low adhesion strength between microfibers and a rubber or a vinyl chloride-based resin, so that satisfactory gloves could not be obtained.

**[0010]** Then, the present inventors have further studied and eventually have found that a glove with sufficient adhesion strength can be obtained by forming a coating layer of a rubber or a vinyl chloride-based resin by a specific method even if the outer surface side is formed of microfibers.

**[0011]** Moreover, the present inventors have further found that a coating layer superior in adhesion strength can be formed not by a specific method but by an ordinary method by including non- microfibers in the outer surface side on which the coating layer is to be formed.

**[0012]** The present invention has been accomplished on the basis of these findings.

**[0013]** The glove of the present invention has the following features:

1. A glove comprising a fibrous glove and a coating layer of a rubber or a vinyl chloride-based resin formed on an outer surface side of the fibrous glove, wherein at least an inner surface side of the fibrous glove includes a microfiber having a diameter of a monofilament of not more than 6 μm.
2. The glove of the above-mentioned 1., wherein an outer surface side of the fibrous glove includes a microfiber.
3. The glove of the above-mentioned 1., wherein an outer surface side of the fibrous glove includes a non-microfiber having a diameter of a monofilament more than 6 μm.
4. The glove of the above-mentioned 3., wherein the non-microfiber comprises at least one member selected from the group consisting of nylon, polyester and cotton.
5. The glove of the above-mentioned 3., wherein the non-microfiber comprises polyurethane elastic yarn covered with at least one member selected from the group consisting of nylon, polyester and cotton.
6. A glove comprising a fibrous glove and a coating layer of a rubber or a vinyl chloride-based resin formed on an outer surface side of the fibrous glove, wherein an inner surface side and an outer surface side of a fibrous glove are knitted separately by plating, 50% by weight or more of a yarn used in the inner surface side comprises a microfiber having a diameter of a monofilament of not more than 6 μm.
7. The glove of any one of the above-mentioned 1. to 5., wherein the microfiber comprises a split fiber.

8. The glove of any one of the above-mentioned 1. to 7., wherein adhesion strength of the coating layer is not less than 0.32 N/mm.

9. A method for producing the glove according to claim 2, comprising the step of:

forming the coating layer of a rubber on the outer surface side of the fibrous glove by a heat sensitive method.

10. A method for producing the glove of the above-mentioned 2., comprising the steps of:

applying an oil-repellent treatment to the outer surface side of the fibrous glove, and
forming the coating layer of a vinyl chloride-based resin thereon.

11. A method for producing the glove of the above-mentioned 3., comprising the step of:

forming the coating layer of a rubber on the outer surface side of the fibrous glove by a heat sensitive method or a coagulation method.

12. A method for producing the glove of the above-mentioned 3., comprising the steps of:

applying or not applying an oil-repellent treatment to the outer surface side of the fibrous glove, and
forming the coating layer of a vinyl chloride-based resin thereon.

**[0014]** The glove of the present invention is superior in slip resistance and is prevented from causing troubles such as slipping off of the glove during use due to the slip of fingers in the glove because the inner surface side thereof contains a microfiber which has high frictional resistance to fingers and the microfiber comes into contact with fingers. On the other hand, since a coating layer of a rubber or a vinyl chloride-based resin has been formed on the outer surface side and the coating layer has excellent adhesion strength to the outer surface side of the glove, a trouble that the coating layer peels off during use is prevented and a high performance glove excellent in slip resistance on both the inner and outer surface sides can be provided.

**[0015]** The glove of the present invention has a feature that it comprises a fibrous glove and a coating layer of a rubber or a vinyl chloride-based resin formed on an outer surface side of the fibrous glove, wherein at least an inner surface side of the fibrous glove includes a microfiber having a diameter of a monofilament of not more than 6 μm.

**[0016]** In the present invention, the term "an outer surface side" indicates a side not in contact with fingers and the term "an inner surface side" indicates a side in contact with fingers.

**[0017]** Further, in the present invention, the term "a diameter" does not indicate a diameter of a bundle of microfibers, but a diameter of a monofilament of microfibers.

**[0018]** Further, in the present invention, the term "sprittable fiber" indicates a fiber before spritting and the term "sprit fiber" indicates a microfiber after spritting.

**[0019]** Furthermore, in the present invention, the terms "a", "an", "the" and the similar terms are to be construed to include the singular and the plural, unless otherwise indicated or contradicted in the context of the present invention.

**[0020]** The fibrous glove usable as a base material in the present invention includes, at least on the inner surface side of the fibrous glove, a microfiber having a diameter of a monofilament (hereinafter, referred simply to as "diameter") of not more than 6 μm. The diameter of the microfiber is not particularly limited in its lower limit, but neither microfibers having a diameter of less than 0.1 μm nor splittable fibers capable of affording such microfibers after splitting are commercially available. Accordingly, the lower limit of the diameter of the microfiber is about 0.1 μm in view of current availability. On the other hand, if the diameter exceeds 6 μm, frictional resistance with fingers becomes small and desired slip resistance cannot be obtained sufficiently.

**[0021]** Generally, microfibers are available commercially in the form of splittable fibers. For example, one splittable fiber is split into several fibers by a hot water treatment with 1 to 5% NaOH at 80 to 100°C for 10 to 40 minutes, thereby becoming microfibers. Polyester and nylon are preferred as such microfibers, and splittable fibers such as NANOFRONT (registered trademark of Teijin Fibers, Ltd.) and COSMOALPHA (registered trademark of KB SEIREN Co., Ltd.) are suitably used as commercial available products.

**[0022]** Although fibers usually have a circular cross-section, splittable fibers can be polygonal microfibers (sprit fibers) after splitting due to the method of their production and the corners of the polygon are considered to effectively contribute to slip resistant effect. Accordingly, microfibers are preferably fibers having corners.

**[0023]** Such microfibers may be used either as a single fiber or as a composite fiber in which a core yarn of nylon, polyester, polyurethane elastic yarns, cotton or the like has been covered with a microfiber usually in 100 to 600 T (twists) /M (the number of windings per meter), preferably 300 to 600 T/M.

**[0024]** When the yarn to be located on the inner surface side is a yarn composed of a microfiber and a non-microfiber

aligned together, the proportion of the microfiber is preferably more than 50% by weight, more preferably, more than 80% by weight, and even more preferably, more than 95% by weight.

**[0025]** In view of the knitting and weaving of a fibrous glove, it is preferred to perform the splitting treatment of splittable fibers into microfibers (sprit fibers) after knitting or weaving a fibrous glove. After the split treatment, dyeing with a direct dye, a disperse dye, an acid dye, or the like may be applied depending upon respective materials.

**[0026]** Although the outer surface side of the fibrous glove may be made of microfibers, it is preferred, in view of the adhesion strength between the fibrous glove and a coating layer of a rubber or a vinyl chloride resin, to include non-microfibers. Although non-microfibers are just required to be fibers larger in diameter than microfibers, those in filaments are about 15 to about 30 μm in diameter are preferred. Examples of such non-microfibers include single yarn and covered composite yarn of synthetic fibers such as acryl, polyester, nylon, aramid and polyethylene; natural fibers such as cotton, hemp and silk; and regenerated fibers such as rayon. Especially, polyurethane elastic yarns covered with at least one member selected from nylon, polyester and cotton are preferred. By the elastic yarns, slip resistance is further improved due to their compressive force and fitting force.

**[0027]** In addition, as the non-microfibers, cut-resistant fibers having a high crystallizability such as ultra high molecular weight polyethylene having high strength, aramide, etc. These fibers tend to slip and by providing the microfibers to the inner surface side of these fibers, slip resistance as well as cut-reisitant property is imparted to both the outer surface side and the inner surface side of a glove, and thus a glove excellent in workability can be provided. Further, by using acrylic fiber, regenerated fibers such as rayon, etc., on the outer surface side, a glove excellent in protection against the cold can be provided.

**[0028]** As the method for including non-microfibers into the fibrous glove, there are excemplified a method for plating non-microfibers to the outer surface side using a seamless knitting machine of 7G or more, a method for sewing a fabric obtained by plating microfibers and non-microfibers by the use of a circular knitting machine and using it so that the non-microfibers are located on the outer surface side, and a method for obtaining two kinds of cloth; one is made of microfibers and the other is made of non-microfibers, and sticking them into a double-material structure. The proportion of the non-microfiber of the outer surface side is preferably more than 50% by weight, more preferably, more than 80% by weight, and even more preferably, more than 95% by weight.

**[0029]** Examples of the rubber in the present invention include natural rubber, isoprene, chloroprene, acrylic ester, styrene-butadiene copolymers, acrylonitrile-butadiene copolymers, polyurethane, butyl rubber, polybutadiene rubber and silicone rubber, and moreover, copolymers having up to 10% by weight of carboxyl modification group and blends thereof are also used. Generally, well-known additives including crosslinking agents such as sulfur and zinc oxide, vulcanization accelerators, antiaging agents, pigments, and thickeners are added to the rubber. In order to provide air permeability or wet gripping property, it is possible to form an open-cell coating by mechanically foaming by the addition of a frothing agent, a foam stabilizer, a foaming agent, etc. and it is also possible to reduce steaming feel by a synergistic effect of the air permeability caused by this coating and the moisture absorbing and quick drying ability of microfibers.

**[0030]** Moreover, the adhesion strength of a rubber coating layer formed by a heat sensitive method can be enhanced by adding a thermosensitive gelling agent such as polyvinyl methyl ether, organopolysiloxane, and surfactants having a cloud point of 30 to 50°C.

**[0031]** Examples of the vinyl chloride-based resin in the present invention include homopolymers of vinyl chloride, copolymers of vinyl chloride with vinyl acetate or the like, and blends thereof. Generally, well-known additives including plasticizers, stabilizers, thickeners and pigments are added to the vinyl chloride-based resin. As in the case of rubber, steaming feel can be reduced, or air permeability or wet gripping property can be enhanced by foaming.

**[0032]** On the outer surface side of a fibrous glove is formed the above-described coating of a rubber or a vinyl chloride-based resin. Although the position where the coating layer is to be formed is not limited particularly, it is usually the palm region or fingertip regions of a glove, such portions being to come into contact with objects and being required to have slip resistance.

**[0033]** The method of forming a coating layer of rubber includes a coagulation method and a heat sensitive method.

**[0034]** In one preferred example of the coagulation method, a fibrous glove is put on a hand-shaped mold made of metal, porcelain, etc. and dipped in a coagulant. Examples of the coagulant include solutions in warm water or methanol containing metal salts such as calcium nitrate, calcium chloride, sodium chloride, and magnesium hydroxide, acetic acid, cyclohexylamine sulfate, etc. The concentration is usually 0.1 to 10 parts by weight based on 100 parts by weight of warm water or methanol. When less than 0.1 part by weight, a rubber formulation liquid tends to permeate easily. When exceeding 10 parts by weight, adhesion strength between a rubber coating and a fibrous glove tends to lower. Accordingly, the concentration of a coagulant is adjusted to a coagulant concentration balanced so that a rubber coating may not fully cover a fiber bundle on the inner surface side of a fibrous glove, in other words, a rubber coating may not permeate a fiber bundle completely and adhesion strength may not lower. Generally, a solution of calcium nitrate in methanol or warm water is used suitably. Next, after pulling up the fibrous glove, excess coagulant is allowed to drop for 3 to 20 seconds with the fingertips of the fibrous glove put on the hand-shaped mold facing downward and then the fingertips of the fibrous glove put on the hand-shaped mold is caused to face upward for 3 to 20 seconds, thereby allowing the

coagulant gathered in the fingertips to become uniform at the dipping surface of the coagulant.

**[0035]** Then, after dipping in a compound of rubber, pulling out, and then drying at about 60 to 130°C for about 6 to 20 minutes, the fibrous glove is removed from the hand-shaped mold, followed by leaching at about 25 to 60°C for about 10 to 60 minutes. Then, if necessary, the glove is put again on a hand-shaped mold having a shape that the thumb, the remaining four fingers and the palm are curved inward so that the center of the palm becomes concave (curve approximately in the shape formed when a person has relaxed hand force) and is subjected to a heat treatment at about 100 to about 140°C for about 20 to about 60 minutes. The heat treatment means vulcanization and the state where moisture has merely removed by drying and a great improvement in strength has not been achieved is an unvulcanized state. Leaching may be carried out after the heat treatment. The heat treatment may be performed directly without removing the glove from the hand-shaped mold after drying. The coating may be formed in which two or three layers including a slip-resistant layer have been stacked. To allow a compound of rubber to permeate a fiber bundle completely, thereby covering the fibrous glove with the rubber to the inner surface side of is undesirable because parts where fibers come into contact with fingers are eliminated, so that feeling of discomfort is raised and slip is caused by sweat inside of the glove.

**[0036]** In the heat sensitive method, a fibrous glove is put on a hand-shaped mold, heated to about 50 to about 90°C, dipped in a compound of rubber, and then dried. Drying conditions, leaching, heat treatment, etc. after the drying are the same as those of the above-described coagulation method.

**[0037]** When the outer surface side of a fibrous glove is made of microfibers, the heat sensitive method is preferred compared to the coagulation method because a glove superior in the adhesion property of a rubber coating can be obtained.

**[0038]** On the other hand, when the outer surface side of a fibrous glove contains non-microfibers, a glove superior in adhesion property can be obtained by either the coagulation method or the heat sensitive method.

**[0039]** Although the method of forming a coating layer of a vinyl chloride-based resin is not restricted particularly, a glove superior in adhesion property in the case where the outer surface side of a fibrous glove is made of microfibers can be obtained by applying oil-repellent treatment with an oil repellent agent in advance to a fibrous glove. Specifically, for example, a fibrous glove is dipped in an oil repellent agent such as fluorine-based resin, silicone-based resin, etc., in an amount of 1 to 3% owf based on the weight of the fibrous glove, wrung and dried at 80 to 130°C. Subsequently, this fibrous glove is put on a hand-shaped mold, then a vinyl chloride-based resin (paste) is applied, and heat treatment is carried out at about 180 to about 210°C for about 10 to about 20 minutes.

**[0040]** In the case of using a polyurethane elastic fiber on the outer surface side of a fibrous glove, since elastic fibers are sensitive to heat and deteriorate easily, it is preferred to use a fiber in which a core yarn made of elastic fiber is covered with nylon, polyester fiber, or the like for the purpose of preventing the elastic fiber from exposing. Thereby, elastic fibers can maintain their elastic force also after heat treatment. In another method, it is also possible to lower the heat treatment temperature to about 140 to about 160°C and thereby secure elastic force after heat treatment by the use of a copolymer of vinyl chloride and vinyl acetate.

**[0041]** In the case of including non-microfibers into the outer surface side of a fibrous glove, a glove with satisfactory adhesion strength can be obtained either by applying oil-repellent treatment in advance or by failing to apply such treatment.

**[0042]** The present invention will be described in more detail below with reference to examples and comparative examples, but the invention is not limited thereby.

**[0043]** Formulations 1 to 5 of coating layers (rubber and vinyl chloride-based resin) to be used for the examples and comparative examples are shown in Tables 1 to 5, and the methods i to v for the formation of coating layers of rubber and vinyl chloride-based resin are shown in Table 6.

(1) Formulations of coating layer

**[0044]**

Table 1

| Formulation 1 | |
|---|---|
| NR latex *1 | 100 parts by wt. ** |
| 10%KOH | 1 parts by wt. ** |
| Colloidal sulfur | 1.0 parts by wt. |
| Zinc oxide | 0.75 parts by wt. |
| Vulcanization accelerator (diethyldithio carbamic acid zinc salt) | 0.2 parts by wt. |

(continued)

| Formulation 1 | |
|---|---|
| Antioxidant (2,2'-methylenebis (4-ethyl 6-tert-butylphenol)) | 1.0 parts by wt. |
| Heat sensitizer (polyvinyl methyl ether) | 1.5 parts by wt. |
| Solid content | 53 % by wt. |
| ** Solid content | |

Table 2

| Formulation 2 | |
|---|---|
| Polyvinyl chloride paste resin *2 | 100 parts by wt. ** |
| Plasticizer *3 | 100 parts by wt. |
| Thickener *4 | 1.0 parts by wt. |
| Stabilizer *5 | 3.0 parts by wt. |
| ** Solid content | |

Table 3

| Formulation 3 | |
|---|---|
| NBR latex | 100 parts by wt. ** |
| Colloidal sulfur | 1.0 parts by wt. |
| Zinc oxide | 0.75 parts by wt. |
| Vulcanization accelerator (diethyldithio carbamic acid zinc salt) | 0.2 parts by wt. |
| Antioxidant (2,2'-methylenebis (4-ethyl 6-tert-butylphenol)) | 1.0 parts by wt. |
| Thickener *6 (polyacrylic acid ester-based) | 0.3 parts by wt. |
| Foam stabilizer (lauryl dipropionic acid sodium salt) | 3.0 parts by wt. |
| Solid content | 38 % by wt. |
| ** Solid content | |

Table 4

| Formulation 4 | |
|---|---|
| NBR latex | 100 parts by wt. ** |
| Colloidal sulfur | 1.0 parts by wt. |
| Zinc oxide | 0.75 parts by wt. |
| Vulcanization accelerator (diethytdithio carbamic acid zinc salt) | 0.2 parts by wt. |
| Antioxidant (2,2'-methylenebis (4-ethyl 6-tert-butylphenol)) | 1.0 parts by wt. |
| Thickener *6 (polyacrylic acid ester-based) | 0.3 parts by wt. |
| Solid content | 40 % by wt. |
| ** Solid content | |

Table 5

| Formulation 5 | |
|---|---|
| NR latex | 100 parts by wt. ** |
| 10%KOH | 1.0 parts by wt. ** |
| Colloidal sulfur | 1.0 parts by wt. |
| Zinc oxide | 0.75 parts by wt. |
| Vulcanization accelerator (diethyldithio carbamic acid zinc salt) | 0.2 parts by wt. |
| Antioxidant (2,2'-methylenebis (4-ethyl 6-tert-butylphenol)) | 1.0 parts by wt. |
| Thickener *6 (polyacrylic acid ester-based) | 0.3 parts by wt. |
| Solid content | 53 % by wt. |
| ** Solid content | |

*1 to *6 in Tables 1 to 5 are as follows, respectively.
*1: LA-TZ produced by SUNWISE, *2: ZEST P21 produced by Shin Dai-Ichi Vinyl Corporation, *3: diisononyl phthalate (DINP), *4: Reolosil QS102 produced by Tokuyama Corporation, *5: SC72 produced by Adeka Corporation, *6: Aron A-7075 produced by Toagosei Co., Ltd.

(2) Methods of forming coating layer

**[0045]**

Table 6

| | Formation methods | Formation conditions |
|---|---|---|
| i | NR heat sensitive method | A fibrous glove was put on a hand-shaped mold A and heated so that the mold temperature would become 80°C, then only the palm was dipped in a natural rubber compound of formulation 1, followed by drying at 75°C for 10 minutes. Then, the fibrous glove was removed from the mold, leached at 30°C for 60 minutes, put on a hand-shaped mold B, then heat treated at 120°C for 20 minutes to give a glove. |
| ii | NR coagulation method | A fibrous glove was put on a hand-shaped mold A and heated so that the mold temperature would become 60°C. Then, it was dipped in a 3 wt% calcium nitrate solution in methanol and further dipped in NR compound of formulation 5, followed by drying at 120°C for 10 minutes. Then, the fibrous glove was removed from the mold, water-leached at 30°C for 60 minutes, put on a hand-shaped mold B, then heat treated at 120°C for 20 minutes to give a glove. |
| iii | NBR coagulation method | A fibrous glove was put on a hand-shaped mold A and heated so that the mold temperature would become 60°C. Then, it was dipped in a 3 wt% calcium nitrate solution in methanol and further dipped in NBR compound prepared by foaming formulation 3 to a volume ratio of 1.5 by using a hand mixer, followed by drying at 120°C for 10 minutes. Then, the fibrous glove was removed from the mold, water-leached at 30°C for 60 minutes, put on a hand-shaped mold B, and then cured at 130°C for 40 minutes to give a glove. |
| iv | NBR coagulation method-2 | A fibrous glove was put on a hand-shaped mold A and heated so that the mold temperature would become 60°C. Then, it was dipped in a 3 wt% calcium nitrate solution in methanol and further dipped in non-foamable formulation 4, followed by drying at 120°C for 10 minutes. Then, the fibrous glove was removed from the mold, water-leached at 30°C for 60 minutes, put on a hand-shaped mold B, then heat treated at 130°C for 40 minutes to give a glove. |

(continued)

| | Formation methods | Formation conditions |
|---|---|---|
| v | PVC application method | A fibrous glove base was caused to fully adsorb 1 wt% aqueous solution of Asahi Guard AG7105 produced by Meisei Chemical Works, Ltd. at 25°C for 10 minutes, then wrung to a water content of 30% by weight, followed by drying at 130°C for 10 minutes. This glove was put on a hand-shaped mold A and the resin compound of formulation 2 was applied only to the palm of a glove. Then, heat treatment was performed at 190°C for 10 minutes to give a glove. |

Hand-shaped mold A:

**[0046]** Since rubber or resin is applied only to the palm of a glove, a hand-shaped mold in which the thumb, the remaining four fingers, and the palm are positioned substantially coplanarly is used as a hand-shaped mold to be used in coating.

Hand-shaped mold B:

**[0047]** In the case of undergoing a step of removing a glove from a hand-shaped mold and leaching it, the mold to be used for the subsequent heat treatment is a mold in a shape that the thumb, the remaining four fingers and the palm are curved inward so that the center of the palm will become concave (curve approximately in the shape formed when a person has relaxed hand force).

(3) Methods of measurement and evaluation of physical properties

**[0048]** The measurement and evaluation of the physical properties of the gloves obtained in the example and the comparative example were performed by the following methods:

Diameter of fiber:

**[0049]** From the monofilaments of microfibers contained in a unit area (50 x 50 μm) on a screen taken by using an optical microscope (VHX-900) manufactured by Keyence Co., five fibers in increasing order of area and other five fibers in decreasing order of area were chosen respectively, and the average of them was calculated, so that a diameter in the case of considering as being a perfect circle was calculated.

Measurement of coefficient of dynamic friction:

**[0050]** A test piece (63.5 mm x 63.5 mm) was cut from the palm surface of a glove, and the coefficient of dynamic friction (μK) thereof was measured. This method is based onASTM D1894. The test piece is attached to a movable weight (200 g, friction surface: 63.5 mm x 63.5 mm) of a measuring device of coefficient of friction, then the movable weight is caused to run just a travel distance of 130 mm at 150 mm/min on a stainless steel plate, then the frictional force in this operation is measured, and a running resistance (coefficient of dynamic friction) produced by the friction between the test piece and the stainless steel plate is calculated according to the following formula. Measurement under WET conditions is performed with the friction surface of the test piece being wetted with 1 g of water uniformly. The higher the value of the coefficient of dynamic friction, the higher the slip-resistant performance is evaluated.

$$\mu K \text{ (coefficient of dynamic friction)} = C/D$$

C is an average frictional force after becoming regular running, and D is the normal reaction of the movable weight.

Slip resistance of the inner surface side of a glove:

**[0051]** Twenty subjects were designated, and when a carton box of 3 kg in weight was held on both sides (side faces) between hands with gloves, the slip resisting effect of the inner surface sides of the gloves was evaluated on five scales using the following criteria:

A: Do not slide at all, B: Do not slide, C: Neutral, D: Slide slightly, E: Slide.

Adhesion strength:

**[0052]** A test piece (25 mm in width, 120 mm in length) extending along the longitudinal direction of fingers was cut out from the palm of a glove and the coating layer and the fibrous glove were peeled from each other over about 20 mm from the finger side of the test piece. The ends of both the parts were clamped by a tensile testing machine so as to form an angle of 180 degrees, and the force applied in peeling is measured. When a chuck was moved over 150 mm at a moving rate of 50 mm/min, the force applied during running from 30 mm to 130 mm was averaged and the average was taken as peel force.

**[0053]** Peel strength is calculated using the following formula.

**[0054]** In the present invention, the higher the value, the larger the adhesion strength is evaluated.

$$T_F = F_F/b$$

**[0055]** $T_F$ is peel strength (N/mm), $F_F$ is peel force (N), and b is the width of a test piece (mm).

**[0056]** In the case of the preparation by formation method (iii) shown in Table 6, the coating layer is spongelike and does not have strength enough for withstanding a peeling test. Then, only in a peeling test, non-foamed NBR was applied onto a coating layer of (iii), thereby reinforcing the coating, and then measurement was carried out. The adhesion strength is preferably 0.32 N/mm or more, more preferably, 0.4 N/mm or more.

**[0057]** A glove has too much enough practical utility when it has adhesion strength of 0.8 N/mm or more. Accordingly, when being 0.8 N/mm or more, the adhesion strength was described as 0.8 N/mm and no further measurement was carried out.

Degree of permeation of coating:

**[0058]** The degree of permeation of a coating (coating layer) was evaluated visually using the following criteria:

Not permeated: The coating has not permeated to the inner surface side of the glove.
Permeated: The coating has permeated to the inner surface side of the glove.

Cut-resistant property:

**[0059]** The cut-resistant property was observed by a level divided in accordance with EN 388.

Warmth:

**[0060]** Twenty subjects were designated, and a working was done with gloves on under a low temperature (8°C), the warmth felt at that time was evaluated on three scales; Good, Average, and Poor.

Example 1

(Preparation of fibrous glove (A))

**[0061]** A fibrous glove knitted by the 18G knitting machine was prepared using three ply yarns of Teijin Nanofiber (NANOFRONT 56dT(dtex)-10F (the number of filaments)). Subsequently, fibers were split under stirring in a 2% aqueous sodium hydroxide solution of a weight 20 times the weight of the glove at 95°C for 10 minutes. Then, the glove was water-leached (twice in a 20-fold water bath at 90°C for 10 minutes) and dried at 60°C for 30 minutes. The diameter of the monofilament of NANOFRONT after splitting was 0.7 μm.

(Preparation of fibrous glove base (B))

**[0062]** A fibrous glove knitted by the 13G knitting machine was prepared using four single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd.

**[0063]** Subsequently, splitting, leaching, and drying were carried out by the same methods as described above. The diameter of the monofilament of microfiber after splitting was 3 μm.

(Preparation of fibrous gloves (C) and (D))

**[0064]** Fibrous gloves were prepared which had been knitted using yarns covered at 300 T/M or 600 T/M (hereinafter described as composite yarn (I) of 300 T/M or composite yarn (II) of 600 T/M) using two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. as sheath yarn and a composite yarn (an elastic yarn (22dT) of polyurethane covered with woolly nylon (78dT-24F)) as core yarn. Subsequently, splitting, leaching, and drying were carried out by the same methods as described above to give a fibrous glove (C) having a diameter of the monofilament of microfiber after splitting of 3 μm (using composite yarn (I) of 300 T/M) and a fibrous glove (D) having a diameter of the monofilament of microfiber after splitting of 3 μm (using composite yarn (II) of 600 T/M).

(Formation of coating layer)

**[0065]** Coating layers of a rubber or a vinyl chloride-based resin was formed on the palms of the above-described fibrous gloves (A) to (D) by the method (i) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 7.

Example 2

**[0066]** Using fibrous gloves (A) to (D) having a diameter of the monofilament of microfiber after splitting of 0.7 μm or 3 μm, coating layers were formed by the method (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 7.

Example 3

(Preparation of fibrous glove (E))

**[0067]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and two ply yarns of woolly nylon (WN)(78dT-24F). Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (E) having a diameter of the monofilament of microfiber after splitting of 3 μm.

(Formation of coating layer)

**[0068]** Using the fibrous glove (E) described above, a coating layer was formed by the methods (i) to (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 7.

Example 4

(Preparation of fibrous glove (F1))

**[0069]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating-knitting two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one composite yarn composed of an elastic fiber 22dT of polyurethane (PU) covered with woolly nylon (WN)(78dT-24F) at 300T/M. Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (F1) having a diameter of the monofilament of microfiber after splitting of 3 μm.

(Formation of coating layer)

**[0070]** Using the fibrous glove (F1) described above, coating layers were formed by the methods (i) to (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 7.

(Preparation of fibrous glove (F2))

**[0071]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating-knitting two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one

composite yarn composed of one elastic fiber 22dT of polyurethane (PU) covered with one woolly polyester (PE) 84dT-36F at 300T/M. Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (F2) having a diameter of the monofilament of microfiber after splitting of 3 $\mu$ m.

(Formation of coating layer)

**[0072]** Using the fibrous glove (F2) described above, a coating layer was formed by method (iv) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the glove obtained are given in Table 7.

(Preparation of fibrous glove (F3))

**[0073]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating-knitting two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one composite yarn composed of one elastic fiber 22dT of polyurethane (PU) covered with one 30-count cotton (CO) at 300T/M. Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (F3) having a diameter of the monofilament of microfiber after splitting of 3 $\mu$ m.

(Formation of coating layer)

**[0074]** Using the fibrous glove (F3) described above, a coating layer was formed by the method (iv) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the gloves obtained are given in Table 7.

Example 5

(Preparation of fibrous gloves (G) and (H))

**[0075]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating composite fiber (I) of 300 T/M or composite fiber (II) of 600 T/M of Example 1 and two ply yarns of woolly nylon (78dT-24F). Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (G) (using composite yarn (I) of 300 T/M) and a fibrous glove (H)(using composite yarn (II) of 600 T/M), having a diameter of the monofilament of microfiber after splitting of 3 $\mu$ m.

(Formation of coating layer)

**[0076]** Subsequently, using the fibrous gloves (G) and (H), coating layers were formed by the methods (i) to (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 7.

Table 7

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Ex. 1 | Microfibers of (A) (0.7 $\mu$m) | (i) | 1.95 | 0.7 | B | 0.8 or more | Not permeated |
| | Microfibers of (B) (3 $\mu$m) | (i) | 0.7 | 0.65 | B | 0.8 or more | Not permeated |
| | Microfibers of (C) (3 $\mu$m) | (i) | 0.51 | 0.41 | C | 0.8 or more | Not permeated |
| | Microfibers of (D) (3 $\mu$m) | (i) | 0.53 | 0.43 | C | 0.8 or more | Not permeated |
| Ex. 2 | Microfibers of (A) (0.7 $\mu$m) | (v) | 1.92 | 0.71 | B | 0.8 or more | Not permeated |
| | Microfibers of (B) (3 $\mu$m) | (v) | 0.7 | 0.55 | B | 0.8 or more | Not permeated |
| | Microfibers of (C) (3 $\mu$m) | (v) | 0.51 | 0.42 | C | 0.8 or more | Not permeated |
| | Microfibers of (D) (3 $\mu$m) | (v) | 0.55 | 0.42 | C | 0.8 or more | Not permeated |
| Ex. 3 | Microfibers of (E) (3 $\mu$m) (Plating with WN) | (i) | 0.66 | 0.66 | B | 0.8 or more | Not permeated |
| | | (ii) | 0.68 | 0.63 | B | 0.52 | Not permeated |
| | | (iii) | 0.67 | 0.68 | B | 0.54 | Not permeated |
| | | (iv) | 0.65 | 0.66 | B | 0.52 | Not permeated |
| | | (v) | 0.68 | 0.7 | B | 0.8 or more | Not permeated |

(continued)

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$ K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$ K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Ex. 4 | Microfibers of (F1) (3 $\mu$ m) (Plating with composite fiber WN/PU) | (i) | 0.67 | 0.64 | A | 0.8 or more | Not permeated |
| | | (ii) | 0.66 | 0.68 | A | | Not permeated |
| | | (iii) | 0.67 | 0.69 | A | 0.48 0.52 | Not permeated |
| | | (iv) | 0.68 | 0.66 | A | 0.52 | Not permeated |
| | | (v) | 0.68 | 0.67 | A | 0.8 or more | Not permeated |
| | Microfibers of (F2) (Plating with composite fiber PE/PU) | (iv) | 0.65 | 0.65 | A | 0.42 | Not permeated |
| | Microfibers of (F3) (Plating with composite fiber CO/PU) | (iv) | 0.67 | 0.68 | A | 0.42 | Not permeated |

(continued)

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$ K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$ K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Ex. 5 | Microfibers of (G) (3 $\mu$m) (Plating with composite fiber I ) | (i) | 0.67 | 0.61 | C | 0.8 or more | Not permeated |
| | | (ii) | 0.59 | 0.6 | C | 0.51 | Not permeated |
| | | (iii) | 0.62 | 0.6 | C | 0.51 | Not permeated |
| | | (iv) | 0.63 | 0.63 | C | 0.52 | Not permeated |
| | | (v) | 0.62 | 0.64 | C | 0.8 or more | Not permeated |
| | Microfibers of (H) (3 $\mu$m) (Plating with composite fiber II) | (i) | 0.62 | 0.68 | C | 0.8 or more | Not permeated |
| | | (ii) | 0.68 | 0.64 | C | 0.51 | Not permeated |
| | | (iii) | 0.65 | 0.62 | C | 0.54 | Not permeated |
| | | (iv) | 0.66 | 0.6 | C | 0.53 | Not permeated |
| | | (v) | 0.63 | 0.61 | C | 0.8 or more | Not permeated |

Comparative Example 1

**[0077]** Using fibrous gloves (B) to (D), having a diameter of the monofilament of microfiber after splitting of 3 μm, coating layers were formed by the method (ii) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 8.

Comparative Example 2

**[0078]** Using the 13G knitting machine, a fibrous glove was prepared by knitting using two high multifilaments (Polyester 176dT-288F, 7 μm in diameter) of Senshin (Taiwan). Subsequently, leaching and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (I) having a diameter of 7 μm.

**[0079]** Then, using the fibrous glove (I), coating layers were formed by the methods (i) to (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the glove obtained are given in Table 8.

Comparative Example 3

**[0080]** Using the 13G knitting machine, there was prepared a fibrous glove knitted by aligning two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and two ply yarns of woolly nylon (78dT). Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove base (J) having a diameter of the monofilament of microfiber after splitting of 3 μm.

**[0081]** Then, using the fibrous glove (J) described above, coating layers were formed by the methods (ii) to (iii) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 8.

Comparative Example 4

**[0082]** Using the 13G knitting machine, there was prepared a fibrous glove knitted by aligning two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one composite yarn composed of an elastic fiber 22dT of polyurethane covered with woolly nylon (78dT-24F) at 300T/M. Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a the fibrous glove (K) having a diameter of the monofilament of microfiber after splitting of 3 μm.

**[0083]** Then, using the fibrous glove (K), coating layers were formed by the methods (ii) and (iii) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 8.

Table 8

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition (μK) | Coefficient of dynamic friction of inner surface side of glove in wet condition (μK) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Comp. Ex. 1 | Microfibers of (B) (3 μm) | (ii) | 0.69 | 0.67 | B | 0.2 | Not permeated |
| | Microfibers of (C) (3 μm) | (ii) | 0.5 | 0.48 | C | 0.22 | Not permeated |
| | Microfibers of (D) (3 μm) | (ii) | 0.52 | 0.49 | C | 0.21 | Not permeated |
| Comp, Ex. 2 | Microfibers of (I) (7 μm) | (i) | 0.30 | 0.29 | E | 0.8 or more | Not permeated |
| | | (ii) | 0.32 | 0.29 | E | 0.62 | Not permeated |
| | | (iii) | 0.30 | 0.30 | E | 0.31 | Not permeated |
| | | (iv) | 0.32 | 0.32 | E | 0.30 | Not permeated |
| | | (v) | 0.33 | 0.31 | E | 0.8 or more | Not permeated |
| Comp. Ex. 3 | Microfibers of (J) (3 μm) (Aligned with WN) | (ii) | 0.38 | 0.34 | E | 0.38 | Not permeated |
| | | (iii) | 0.35 | 0.33 | E | 0.42 | Not permeated |

(continued)

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Comp. Ex. 4 | Microfibers of (K) (3 $\mu$m) (Aligned with composite yarn) | (ii) | 0.35 | 0.36 | D | 0.34 | Not permeated |
| | | (iii) | 0.33 | 0.32 | D | 0.38 | Not permeated |

Comparative Examples 5 to 8

**[0084]** Using a fibrous glove (woolly nylon) (L) knitted by the 13G knitting machine using two ply yarns of woolly nylon 78dT, a fibrous glove (wooly polyester) (M) knitted using two ply yarns of woolly polyester 84dT, a fibrous glove (cotton) (N) knitted using two 30-count cottons, and a fibrous glove (SCY) (O) knitted using three composite yarns composed of an elastic fiber 22dT of polyurethane covered with woolly nylon 78dt-24F at 300T/M, coating layers were formed by the methods (i) to (v) of forming a coating layer described in Table 6. The leaching and drying of the fibrous glove are the same as those of Example 1. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 9.

Table 9

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$ K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$ K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Comp. Ex. 5 | Woolly nylon of (L) | (i) | 0.27 | 0.25 | E | 0.8 or more | Not permeated |
| | | (ii) | 0.27 | 0.20 | E | 0.71 | Not permeated |
| | | (iii) | 0.29 | 0.28 | E | 0.67 | Not permeated |
| | | (iv) | 0.30 | 0.29 | E | 0.67 | Not permeated |
| | | (v) | 0.28 | 0.28 | E | 0.8 or more | Not permeated |

(continued)

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$ K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$ K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating |
|---|---|---|---|---|---|---|---|
| Comp. Ex. 6 | Woolly polyester of (M) | (i) | 0.24 | 0.22 | E | 0.51 | Not permeated |
| | | (ii) | 0.22 | 0.24 | E | 0.48 | Not permeated |
| | | (iii) | 0.23 | 0.22 | E | 0.74 | Not permeated |
| | | (iv) | 0.24 | 0.19 | E | 0.72 | Not permeated |
| | | (v) | 0.24 | 0.21 | E | 0.8 or more | Not permeated |
| Comp. Ex. 7 | Cotton of (N) | (i) | 0.27 | 0.39 | D | 0.8 | Not permeated |
| | | (ii) | 0.27 | 0.30 | D | 0.74 | Not permeated |
| | | (iii) | 0.29 | 0.37 | D | 0.79 | Not permeated |
| | | (iv) | 0.27 | 0.34 | D | 0.80 | Not permeated |
| | | (v) | 0.28 | 0.37 | D | 0.8 or more | Not permeated |
| Comp. Ex. 8 | SCY of (O) | (i) | 0.29 | 0.24 | D | 0.8 | Not permeated |
| | | (ii) | 0.25 | 0.27 | D | 0.68 | Not permeated |
| | | (iii) | 0.28 | 0.25 | D | 0.71 | Not permeated |
| | | (iv) | 0.27 | 0.25 | D | 0.68 | Not permeated |
| | | (v) | 0.30 | 0.26 | D | 0.8 or more | Not permeated |

Examples 6 and 7

**[0085]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfiber and woolly nylon and the outer surface side of which was made of woolly nylon was prepared by plating-knitting a yarn of microfibers (COSMOALPHA 84dT-25F) of KB SEIREN of the number given in Table 10 and woolly nylon 78dT aligned together and woolly nylon. Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous gloves (P) having a diameter of the monofilament of microfiber after splitting of 3 $\mu$m.

(Formation of coating layer)

**[0086]** Using the fibrous gloves (P) described above, coating layers were formed by the method (iv) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the physical properties of the gloves obtained are given in Table 10.

Table 10

| | Inner surface side | | | | Outer surface side | Adhesion strength (N/mm) | Organoleptic evaluation of slip resistance of inner surface side of glove | coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$ K) |
|---|---|---|---|---|---|---|---|---|
| | COSMOALPHA | | WN | Microfibers to whole fibers on inner surface side (Wt. %) | WN | | | |
| | Before splitting (dT*Number) | After splitting (dT) | (dT*Number) | | (dT* Number) | | | |
| Ex. 6 | 84*5 | 310 | 78*1 | 80 | 78*2 | 0.49 | B | 0.65 |
| | 84*4 | 250 | 78*1 | 75 | 78*2 | 0.52 | C | 0.59 |
| | 84*3 | 208 | 78*1 | 73 | 78*2 | 0.50 | C | 0.58 |
| | 84*2 | 130 | 78*1 | 62 | 78*2 | 0.51 | C | 0.52 |
| Ex. 7 | 84*2 | 130 | 78*2 | 45 | 78*2 | 0.51 | E | 0.34 |

Example 8

(Preparation of fibrous glove (Q))

**[0087]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating-knitting two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one composite yarn composed of one elastic fiber 22dT of polyurethane (PU) covered with one Dyneema (Registered trademark of Toyobo Co., Ltd. 22dT-192F) at 200T/M. Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (Q) having a diameter of the monofilament of microfiber after splitting of 3 $\mu$ m.

(Formation of coating layer)

**[0088]** Using the fibrous glove (Q) described above, a coating layer was formed by the methods (i) to (iv) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the glove obtained are given in Table 11.

Example 9

(Preparation of fibrous glove (R))

**[0089]** Using the 10G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating-knitting two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one Kevlar (Registered trademark of Toray-DuPont, 20-count). Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (R) having a diameter of the monofilament of microfiber after splitting of 3 $\mu$ m.

(Formation of coating layer)

**[0090]** Using the fibrous glove (R) described above, a coating layer was formed by the methods (i) to (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the glove obtained are given in Table 11.

Example 10

**[0091]** In Example 4, with respect to the gloves obtained by using a fibrous glove (F1) and forming a coating layer by the methods (i) to (v), the cut-resistant property was evaluated.

**[0092]** The results of the evaluation are given in Table 11.

Table 11

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$ K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$ K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating | Cut-resistant property EN388 (Level) |
|---|---|---|---|---|---|---|---|---|
| Ex. 8 | Microfibers of (Q) (3 $\mu$ m) | (i) | 0.67 | 0.63 | A | 0.54 | Not permeated | 2 |
| | | (ii) | 0.65 | 0.65 | A | 0.53 | Not permeated | 2 |
| | | (iii) | 0.66 | 0.66 | A | 0.43 | Not permeated | 2 |
| | | (iv) | 0.66 | 0.65 | A | 0.41 | Not permeated | 2 |
| Ex. 9 | Microfibers of (R) (3 $\mu$ m) | (i) | 0.6 | 0.6 | B | 0.56 | Not permeated | 2 |
| | | (ii) | 0.63 | 0.61 | B | 0.53 | Not permeated | 2 |
| | | (iii) | 0.61 | 0.62 | B | 0.42 | Not permeated | 2 |
| | | (iv) | 0.6 | 0.61 | B | 0.4 | Not permeated | 2 |
| | | (v) | 0.62 | 0.6 | B | 0.65 | Not permeated | 2 |
| Ex. 10 | Microfibers of (F1) (3 $\mu$ m) (Plating with composite fiber WN/PU) | (i) | 0.67 | 0.64 | A | 0.8 or more | Not permeated | 1 |
| | | (ii) | 0.66 | 0.68 | A | 0.48 | Not permeated | 1 |
| | | (iii) | 0.67 | 0.69 | A | 0.52 | Not permeated | 1 |
| | | (iv) | 0.68 | 0.66 | A | 0.52 | Not permeated | 1 |
| | | (v) | 0.68 | 0.67 | A | 0.8 or more | Not permeated | 1 |

Example 11

(Preparation of fibrous glove (S))

**[0093]** Using the 13G knitting machine, a fibrous glove, the inner surface side of which was made of microfibers was prepared by plating-knitting two single yarns of microfiber (COSMOALPHA 84dT-25F) of KB SEIREN Co., Ltd. and one acryl (Toray Industries, Inc., 40-count). Subsequently, splitting, leaching, and drying were carried out by the same methods as those used in Example 1 to give a fibrous glove (S) having a diameter of the monofilament of microfiber after splitting of 3 $\mu$ m.

(Formation of coating layer)

**[0094]** Using the fibrous glove (S) described above, a coating layer was formed by the methods (i) to (v) of forming a coating layer described in Table 6. The results of the measurement and evaluation of the glove obtained are given in Table 12.

Example 12

**[0095]** In Example 4, with respect to the gloves obtained by using a fibrous glove (F1) and forming a coating layer by the methods (i) to (v), the warmth was evaluated.

**[0096]** The results of the evaluation are given in Table 12.

Table 12

| | Fibrous glove (diameter) | Formation method of coating layer | Coefficient of dynamic friction of inner surface side of glove in dry condition ($\mu$K) | Coefficient of dynamic friction of inner surface side of glove in wet condition ($\mu$K) | Organoleptic evaluation of slip resistance of inner surface side of glove | Adhesion strength (N/mm) | Degree of permeation of coating | Organoleptic evaluation of warmth |
|---|---|---|---|---|---|---|---|---|
| Ex. 11 | Microfibers of (S) (3 $\mu$ m) | (i) | 0.65 | 0.68 | B | 0.8 or more | Not permeated | Good |
| | | (ii) | 0.66 | 0.69 | B | 0.8 or more | Not permeated | Good |
| | | (iii) | 0.65 | 0.65 | B | 0.52 | Not permeated | Good |
| | | (iv) | 0.65 | 0.66 | B | 0.8 or more | Not permeated | Good |
| | | (v) | 0.68 | 0.67 | B | 0.8 or more | Not permeated | Good |
| Ex. 12 | Microfibers of (F1) (3 $\mu$ m) (Plating with composite fiber WN/PU) | (i) | 0.67 | 0.64 | A | 0.8 or more | Not permeated | Poor |
| | | (ii) | 0.66 | 0.68 | A | 0.48 | Not permeated | Poor |
| | | (iii) | 0.67 | 0.69 | A | 0.52 | Not permeated | Poor |
| | | (iv) | 0.68 | 0.66 | A | 0.52 | Not permeated | Poor |
| | | (v) | 0.68 | 0.67 | A | 0.8 or more | Not permeated | Poor |

**[0097]** As is clearly shown by Examples 1 and 2 in Table 7, a glove superior in the slip resistance of the inner surface side of the glove and also superior in adhesion strength (0.32 N/mm or more, preferably 0.4 N/mm or more) can be obtained by using a fibrous glove made of microfibers for both the inner surface side and the outer surface side, and forming a coating layer by a heat sensitive method (i) in the case of forming a coating layer of rubber on the outer surface side (Example 1) or by forming a coating layer by method (v) including applying oil-repellent treatment to the fibrous glove in advance in the case of forming a coating layer of vinyl chloride-based resin (Example 2).

**[0098]** Especially, in the case of the microfibers (C) and (D) in Examples 1 and 2, the coefficient of dynamic friction of the inner surface side covered with microfibers is somewhat low, but compressive force and fitting force have been enhanced by polyurethane elastic fibers and accordingly the slip resistance of the inner surface side of the glove is good.

**[0099]** In the case of the microfibers of (E) in Example 3, the slip resistance of the inner surface side of the glove is good because of the execution of plating with woolly nylon (WN).

**[0100]** In Example 4, which are embodiments where elastic fibers have been added to the fibrous glove base of Example 3, compressive force and fitting force to a hand have been enhanced and the slip resistance of the inner surface side of the glove has been increased more in comparison with the glove of Example 3.

**[0101]** As is clear from Examples 4 and 5, by including non-microfibers in the outer surface side, there can be obtained a glove superior in the adhesion strength of a coating layer of rubber or vinyl chloride-based resin by any of methods (i) to (v) of forming a coating layer.

**[0102]** As is clearly shown by Comparative Example 1 in Table 8, in the case where a coating layer of rubber is formed on the outer surface side of a fibrous glove, both the inner surface side and the outer surface side of which are made of microfibers, a glove superior in adhesion strength cannot be obtained by a coagulation method (ii).

**[0103]** As is clear from Comparative Example 2, when the diameter of the monofilament of microfiber is larger than 6 μm, the slip resistance of the inner surface side of a glove tends to lower, whereas in the case of fibers having a diameter of 7 μm, the adhesion strength of a coating layer of rubber or vinyl chloride-based resin also tends to lower.

**[0104]** Moreover, as is shown by Comparative Examples 3 and 4, in the case of merely aligning microfibers and non-microfibers together, sufficient slip resistance on the inner surface side of a glove cannot be obtained because both types of fibers are mixed randomly and accordingly the proportion of the microfibers in the inner surface side which comes into contact with hand, skin becomes smaller.

**[0105]** Moreover, as is clear from Comparative Examples 5 to 8 in Table 9, the slip resistance of the inner surface side of a glove has been lowered in the case where the inner surface side of the glove is made of not microfibers but non-microfibers of the general purpose grade (the diameter of monofilament is 15 to 30 μm).

**[0106]** Moreover, Examples 6 and 7 in Table 10 show that even if microfibers and non-microfibers have been aligned together, the slip resistance of the inner surface side of a glove is improved when the proportion of microfibers to the whole fibers in the inside of the glove is greater than 50% by weight.

**[0107]** Furthermore, as is clear from the comparison of Examples 8, 9 and Example 10 in Table 11, the gloves of Examples 8, 9 in which microfibers were provided to the inner surface side of a fibrous glove including cut-resistant fibers as the non-microfibers, slip resistance as well as cut-resistant property is imparted to both the outer surface side and the inner surface side of a glove, and therefore, a glove excellent in workability can be provided, as compared with the gloves of Example 10 not containing the cut-resistant fibers.

**[0108]** Furthermore, as is clear from the comparison of Example 11 and Example 12 in Table 12, the gloves of Example 11 in which acrylic fibers were provided to the outer surface side are excellent in warmth, and thus a glove excellent in protection against the cold can be provided.

**[0109]** As described above, according to the present invention, there can be provided a glove having high performance that is superior in slip resistance on both the outer surface side and the inner surface side thereof and also superior in adhesion strength to rubber or resin formed on the outer surface side.

## Claims

1. A glove comprising a fibrous glove and a coating layer of a rubber or a vinyl chloride-based resin formed on an outer surface side of the fibrous glove, wherein at least an inner surface side of the fibrous glove includes a microfiber having a diameter of a monofilament of not more than 6 μm.

2. The glove according to claim 1, wherein an outer surface side of the fibrous glove includes a microfiber.

3. The glove according to claim 1, wherein an outer surface side of the fibrous glove includes a non-microfiber having a diameter of a monofilament more than 6 μm.

4. The glove according to claim 3, wherein the non-microfiber comprises at least one member selected from the group

consisting of nylon, polyester and cotton.

**5.** The glove according to claim 3, wherein the non-microfiber comprises a polyurethane elastic yarn covered with at least one member selected from the group consisting of nylon, polyester and cotton.

**6.** A glove comprising a fibrous glove and a coating layer of a rubber or a vinyl chloride-based resin formed on an outer surface side of the fibrous glove, wherein an inner surface side and an outer surface side of a fibrous glove are knitted separately by plating, 50% by weight or more of a yarn used in the inner surface side comprises a microfiber having a diameter of a monofilament of not more than 6 μM,

**7.** The glove according to any one of claims 1 to 6, wherein the microfiber comprises a split fiber.

**8.** The glove according to any one of claims 1 to 7, wherein adhesion strength of the coating layer is not less than 0.32 N/mm.

**9.** A method for producing the glove according to claims 1 to 8, comprising the step of:

forming the coating layer of a rubber on the outer surface side of the fibrous glove by a heat sensitive method or a coagulation method.

**10.** A method for producing the glove according to any one of claims 1 to 8, comprising the steps of:

applying or not applying an oil-repellent treatment to the outer surface side of the fibrous glove, and forming the coating layer of a vinyl chloride-based resin thereon.

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


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