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(54) **METHOD AND MATERIAL FOR IMPROVING THE INTERNAL GRIP IN GLOVES AND CLOTHING**

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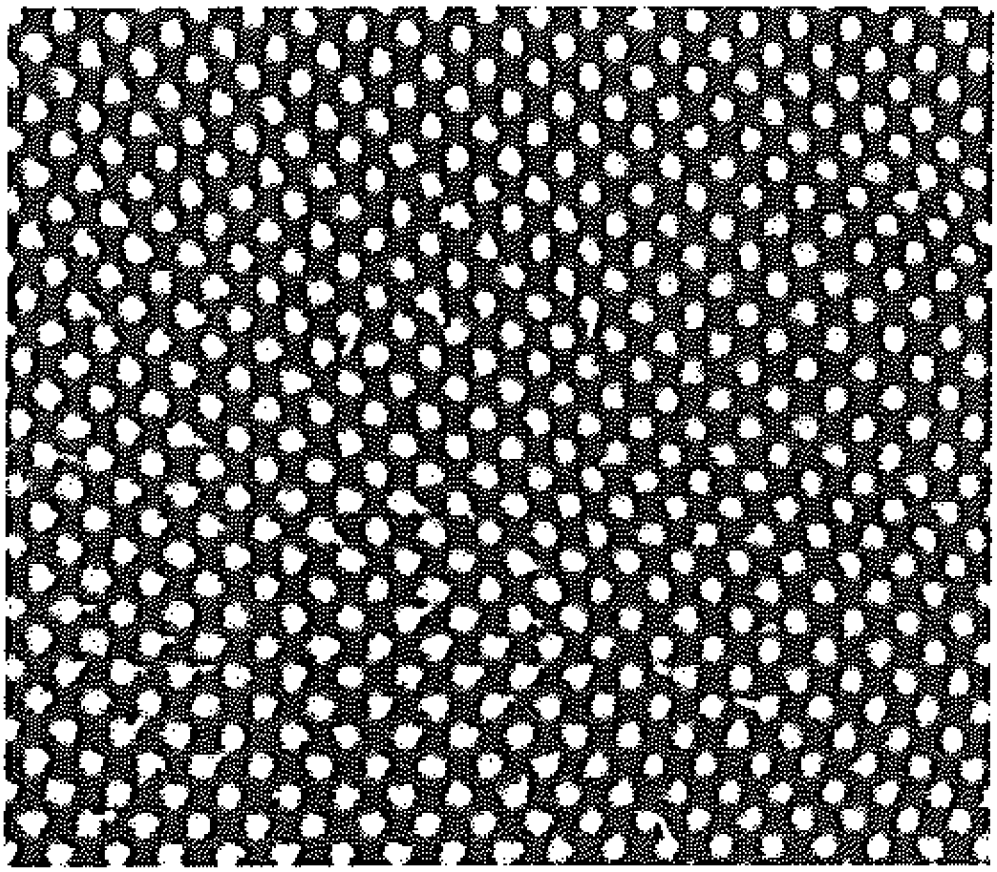
(57) **ABSTRACT**

This application provides for a material configuration and method of manufacture to provide grip and slip resistant in fabrics used in clothing and gloves that require high performance slip resistance against the skin.



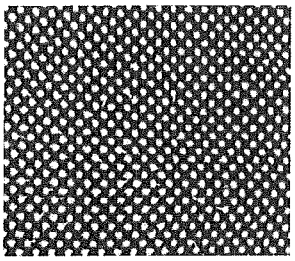


FIG. 1

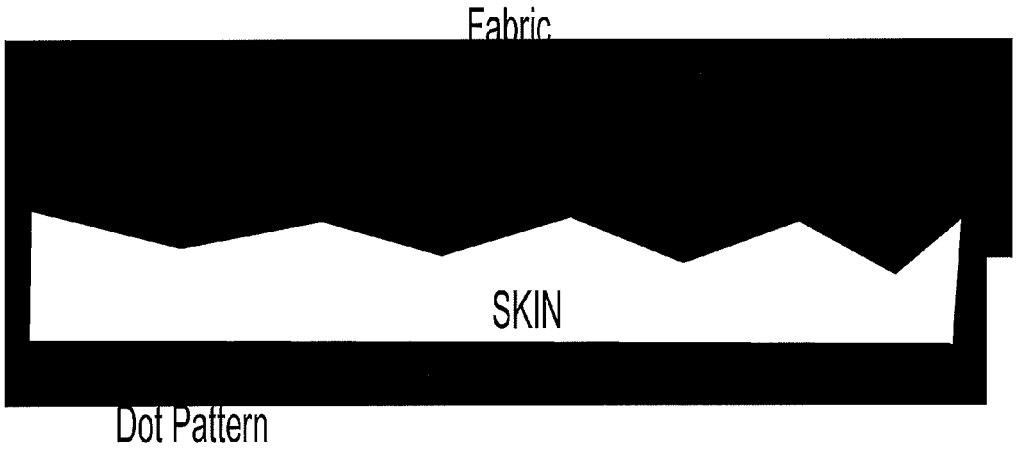


FIG. 2

METHOD AND MATERIAL FOR IMPROVING THE INTERNAL GRIP IN GLOVES AND CLOTHING

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 62/081,142 filed on Nov. 18, 2014, the contents of which are incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] This application relates to the provision of a slip resistant feature for textile fabrics, non-woven fabrics, films, membranes and other soft flexible surfaces to be used in medical coverings, sports apparel, industrial gloves or any other application where internal slippage between the skin and the fabric is a problem.

BACKGROUND

[0003] It is well known that most fabrics slip over the skin. This is a good feature in most circumstances but in certain applications this is a problem. For example in golf, baseball or football, if an athlete's hand slips inside the glove that he is wearing it would hamper his performance.

[0004] Most gloves used in sports are cut and sew type products, are made out of hard fabrics that do not stretch, and typically are less breathable and stiff to wear. In addition, the cut and sew gloves tend to be less comfortable and are often deliberately constructed to be very tight on the hand in an attempt to prevent slippage. Consequently these gloves are so tight that their stitch lines or hems interfere with the comfort of the fingers in region of the fourchettes and are irritating in the finger nail locations as well. Wearing these gloves causes the hands to sweat and feel restricted. Also the cut and sew construction requires a more expensive manufacturing process.

[0005] It is well known that knit gloves are cheaper to manufacture, are much more comfortable, flexible and breathable to wear. However knit fabrics are stretchy and tend to interfere with grip and create excessive internal slippage on the hand. One example of this would be a worker using a knit glove to turn a screw with his screw driver. At a relatively low torque the knit glove fabric will slip against the skin and snag and twist on the wearer's hand, thereby hampering the user's performance in completing the task.

[0006] There is a need for knit gloves and other knit fabric configurations to have a non-slip capability while working against the skin in a way that improves internal grip between the hand/skin and the glove/fabric material without reducing overall comfort and flexibility of the glove/fabric.

BRIEF SUMMARY

[0007] In one embodiment, this application provides fabric structures and methods for their manufacture that provide non slip features without significantly reducing the level of comfort, dexterity and hand flexibility in gloves.

[0008] This application provides for a non-slip coating to be applied on the inside surface of gloves and clothing that will provide a non-slip performance benefit for wearers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** illustrates an example pattern **100** using a PVC dots of 1 mm diameter using a 1 mm gap.

[0010] FIG. **2** illustrates one embodiment of a fabric structure **200** having a raised dot pattern **202** in contact with the skin a person wearing such fabric structure.

DETAILED DESCRIPTION

[0011] This application is directed to a slip resistant feature for textile fabrics, non-woven fabrics, films, membranes and other soft flexible surfaces to be used in medical coverings, sports apparel, industrial gloves or any other application where internal slippage between the skin and the fabric is a problem. More particularly, this application is directed to a glove comprised of a fiber material for substantially covering the hand of a wearer of the glove and having a polymer coating disposed on at least a portion of the interior surface of the glove for contacting the skin of the wearer's hand.

[0012] A polymer plastisol, fluid or solution is created using a raw polymer or blend of polymers that have a suitably high non-slip characteristic. The polymer in the fluid form is loaded into a device that is used to create a laydown pattern. Equipment used for such techniques includes silk screen printing, solvent and melt extrusion plates or dies. Any soluble or molten polymer can be used to form a pattern of dots, squares, hexagons, diamonds or other shapes on the fabric on which they are deposited. Using for example a silk screen technique, the polymer can be wiped through the screen pattern onto the surface of a fabric. The fabric or knit is then covered by the polymer in the pattern that was selected. The material is then dried in air or by using an oven. The raised surfaces of the pattern act with an interference fit when applied against the skin. If more pressure is created by the stretch of the fabric or glove on the skin, then there will be less slip over the hand or skin.

[0013] The glove is comprised of any suitable fiber material. Examples of such fiber materials include, but are not limited to, polyester, nylon, acetate, aramid, cellulose, polyethylene, polypropylene, cotton, wool, bamboo, and combinations thereof. The fiber material is suitably any combination of fibers that can be used in a fabric construction including glass fibers and other mineral fibers.

[0014] The material of the pattern can be any polymer in its solid form as is known in the art. In a preferred embodiment, the material is a non-slip polymer like silicone, pvc, a polyurethane, or the like. The polymer may be in the form of reticulated foam, porous foam, solid, gels, and combinations thereof. In a preferred embodiment, the polymer is in the form of a reticulated or porous foam. Examples of suitable polymer materials include, but are not limited to, polyurethanes, synthetic and natural rubbers, styrene-butadiene resins, polyvinyl alcohol, acrylic polymers, polyvinyl acetates, polyacrylics, polyamides, polyolefins, polysilicones, polyacrylonitrile butadiene rubbers, styrene butadiene rubbers, and combinations thereof. The polymer coating may also include fillers or additives to provide additional functionality to the glove, such as antibacterial properties, insulation, fire retardant properties, cavities, and the like as is known in the art.

[0015] The polymer coating may be applied to at least a portion of the internal surface of the glove or the entire internal surface of the glove. The polymer coating may be applied

to specific locations of the internal surface, such as those locations in which increased contact or grip with the skin of the wearer's hand is desired.

[0016] When making internally non-slip gloves, the glove can be knit on a circular knit machine, processed in a silk screen printing machine, covered by the polymer and dried. The resulting glove is now covered on one side by a solid pattern of reticulated foam or with a solid polymer. The glove can be covered all over or on one side with the non-slip pattern. Once complete the glove is turned inside out so that the polymer pattern that was applied to the outside of the glove is now on the inside surface for use adjacent to the skin.

[0017] If the glove is worn during activities that demand very high shear forces and grip, it will have a much improved non-slip capability against the skin.

EXAMPLE 1

[0018] A 13 gauge nylon knit glove is laid onto a flat surface and all the winkles removed. A silk screen is placed on top of it that has a pattern of dots. A foam plastisol of PVC is placed onto the silk screen and it is wiped through the screen to impregnate the nylon glove below. The nylon glove with the subsequent PVC pattern of polymer is removed and placed in an oven at 80 deg C. for 20 minutes where it is dried. The resulting glove with the foam pattern is then turned inside out. When worn against the skin the glove with the internal dot matrix pattern provides a good non-slip internal finish that does not slip against the skin when rubbed across a rough surface. When a glove without the treatment of this invention is rubbed across a rough surface the fingers slip inside the glove to a location that is up to 2 inches away from the original starting position.

EXAMPLE 2

[0019] When a knit glove with the internal polymer pattern of this invention is used to grip a football at one end of the ball. The finger tips of the hand do not slip on the internal surface of the glove fabric. The ball is consequently easily lifted. Alternatively, a knit glove with no internal pattern treatment of this invention is used to repeat the lifting process. When the ball is lifted at one end, the glove begins to slip off the fingers on the inside surface of the glove. The knit fabric on each finger slips such that the finger tips instead of being in contact with the tip of the inside surface of the glove fingers are now located near the finger knuckles on the midpoint of each finger in the glove. This slippage means that the fingers are no longer able to hold the ball and it falls from the grasp of the hand.

1. A glove comprising:
- a fiber material effective for covering substantially all surfaces of hand of a wearer of the glove and having an external surface and a complementary internal surface; and
- a polymer coating disposed on the fiber material on at least a portion of the internal surface of the glove, wherein the polymer coating is disposed such that coating forms a raised pattern thereon to reduce slippage between the skin of the wearer and the fiber material of the glove.

2. The glove of claim **1** wherein the polymer coating is disposed on the entire internal surface of the glove.

3. The glove of claim **1** wherein the polymer coating is disposed at predetermined locations on the internal surface of the glove.

4. The glove of claim **1** wherein the fiber material is selected from the group consisting of polyester, nylon, acetate, aramid, cellulose, polyethylene, polypropylene, cotton, wool, bamboo, and combinations thereof.

5. The glove of claim **1** where the polymer coating is selected from the group consisting of polyurethanes, synthetic and natural rubbers, styrene-butadiene resins, polyvinyl alcohol, acrylic polymers, polyvinyl acetates, polyacrylics, polyamides, polyolefins, polysilicones, polyacrylonitrile butadiene rubbers, styrene butadiene rubbers, and combinations thereof.

6. An article comprising:
- a substrate material having an external surface and a complementary internal surface configured to be in contact with skin of associated user; and
- a polymer coating disposed on the substrate material on at least a portion of the internal surface of the article, wherein the polymer coating is disposed such that coating forms a raised pattern thereon to reduce slippage between the skin of the wearer and the substrate material of the article.

7. The article of claim **6** wherein the polymer coating is disposed on the entire internal surface of the article.

8. The article of claim **6** wherein the polymer coating is disposed at predetermined locations on the internal surface of the article.

9. The article of claim **6** wherein the fiber material is selected from the group consisting of polyester, nylon, acetate, aramid, cellulose, polyethylene, polypropylene, cotton, wool, bamboo, and combinations thereof.

10. The article of claim **6** where the polymer coating is selected from the group consisting of polyurethanes, synthetic and natural rubbers, styrene-butadiene resins, polyvinyl alcohol, acrylic polymers, polyvinyl acetates, polyacrylics, polyamides, polyolefins, polysilicones, polyacrylonitrile butadiene rubbers, styrene butadiene rubbers, and combinations thereof.

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