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(54) **LATEX GLOVE WITH FABRIC-ADHERENT CUFF REGION**

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(57) **ABSTRACT**

A dipped and cured latex glove article, the inner cuff surface of which is fabric-adherent, and a method of making such a glove comprising dipping a coagulant-coated glove former into an aqueous latex emulsion thereby forming a latex first layer on the former, partially coating the latex first layer on the former with a non-tacky aqueous polymeric emulsion, heating the former to cure the first layer with the second layer, stripping from the former and inverting the article, washing the article, dressing the inverted latex glove article on a glove former such that the fabric-adherent inner cuff surface contacts the former, treating the surface of the article to minimize tackiness, stripping the article from the former, washing the article, and drying the article, after which the article can be packaged and sterilized by exposing the packaged latex glove article to gamma radiation.

LATEX GLOVE WITH FABRIC-ADHERENT CUFF REGION

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a dipped and cured latex glove article, the inner cuff surface of which is fabric-adherent, and a method of making such a glove.

BACKGROUND OF THE INVENTION

[0002] Skin-contacting articles, such as gloves, particularly medical gloves, are commonly used as a protective barrier against the contamination of the user by chemicals, body fluids, and micro-organisms, such as bacteria, viruses and the like. Such articles also protect patients from contamination. In addition, the gloves protect the user from injuries that result from abrasions, cuts, and needle pricks. Consequently, such articles are manufactured in such a way that they are entirely impermeable to such insults. In other words, they are free from defects, such as holes, including pinholes, and tears, and desirably are thin for surgical applications and the like where tactile sensitivity is necessary. This impermeability, however, prevents evaporation of skin-generated moisture and moisture quickly accumulates between the skin and the surface of the glove. When the glove is removed, the skin-generated moisture evaporates quickly, leaving the skin dry and prone to cracking and, consequently, susceptible to infection. Moreover, allergic and other skin irritation reactions are common, due to the presence of naturally occurring offensive proteins in natural rubber latex, coagulants, and other processing chemical residues in the rubber glove. In addition to providing barrier protection, the gloves must be easy to don and doff. Such a characteristic is particularly important in life-saving situations where every second counts. There are three specific aspects of donning related to medical gloves, in particular surgical gloves, namely dry hand donning, damp-hand or wet-hand donning, and double-gloving. If the user encounters difficulty in donning a glove, the user typically gives up trying to don the particular glove and selects a glove with superior donning, wasting time in the process.

[0003] Surgical glove users normally wash their hands, put on their surgical gowns, and then don surgical gloves immediately thereafter in such a manner that the cuff of the surgical glove completely encases the end of the sleeve of the surgical gown. Overlapping the surgical gown with the surgical glove cuff prevents exposure of the surgeon's skin to the patient and prevents contamination with micro-organisms and the like upon contact with the patient's bodily fluids. Unfortunately, movement of the surgeon's hands during surgery generally results in gradually rolling down of the glove at the cuff, which is typically only held in place by the stretch of the latex. The gradual rolling down of the glove results in exposure of the surgeon's skin around the wrist area, requiring immediate attention during surgery.

[0004] Gloves are double-donned when an additional barrier layer is desired. If the outer glove gets cut, torn, or pricked, the surgeon or other user can simply remove the outer glove without having to wash his or her hands and don gloves all over again. Therefore, the ability of a glove to be double-donned is extremely important. Good double-donning properties are achieved when the inside surface of the outer glove and outside surface of the inner glove are smooth such that they can easily slide against each other. However, the outside surface of the glove should not be too smooth, as this would result in poor gripping properties, causing difficulty when holding/handling instruments, such as surgical instruments. Therefore, the outside surface of the glove should have a certain level of tackiness for providing good grip properties and yet not cause difficulty in double gloving to the user. In addition, the inside surface of the glove should be as smooth as possible.

[0005] The processes of donning and flexing of a glove during use involve stretching. Therefore, it is also important that the glove, in particular a medical/surgical glove, be stretchable, i.e., have a tensile strength sufficient to prevent tearing or breakage during donning or use. Any coatings applied to the glove for donnability should not interfere with the tensile strength and stretchability of the rubber elastomer of the glove.

[0006] Other important properties of gloves, particularly surgical gloves, include a good, comfortable feel during use. In order to achieve this, the gloves must fit well without bagginess contouring the shape of the hand. The gloves should stretch uniformly over the surface of the hands. Otherwise, the gloves will pinch the hands. Proper glove fit is achieved by using a former in the shape of the hand to form the glove and soft and stretchable elastomeric materials, so that the hands experience the least amount of stress during use. Unfortunately, soft materials, such as natural rubber and polyisoprene, are inherently tacky and, therefore, require a surface treatment, such as chlorination, siliconization, or a polymer coating to circumvent the tackiness, thereby providing easy donning.

[0007] Tackiness can be minimized and dry- and wet-donning properties can be improved with powder, halogenation, e.g., post-chlorination, or a polymeric coating. U.S. Pat. No. 3,411,982 to Kavalier et al. and U.S. Pat. No. 3,740,262 to Agostinelli disclose that halogenation, such as by post-chlorination, makes the surface of rubber gloves slippery. Agostinelli discloses the use of powder on the inside surface. U.S. Pat. No. 4,304,008 to Joung discloses the use of halogenated natural rubber as the inside layer of the glove and a halogen-resistant silicone as the outside layer of the glove. U.S. Pat. No. 5,534,350 to Liou discloses the use of a waterproof skin-contacting layer of polyurethane polymer on the inside surface of the glove. U.S. Pat. No. 6,019,922 to Hassan et al. discloses powder-free medical gloves, the inside surfaces of which are coated with a cross-linked layer formed from a polymer or copolymer mixed with a micronized high-density polyethylene material and wax to provide improved lubricity. U.S. Pat. No. 6,306,514 to Weikel et al. discloses slip-coated elastomeric flexible articles and a method of making them. The lubricant contains an acetylenic diol and an organo-modified silicone, an amino-modified silicone, or a cationic surfactant. A powder-free glove can be made without chlorination using a coagulant system as disclosed in U.S. Pat. No. 6,352,666 to Nile et al. U.S. Pat. Nos. 6,347,408 and 6,582,788 to Yeh disclose gloves with silicone-impregnated cross-linked polyurethane inner coatings providing good donnability. Acrylic emulsion coatings are disclosed in U.S. Pat. No. 5,712,346 to Lee. Rubber articles are coated with a powder-free/non-tacky coating, which is a copolymer formed by the sequential polymerization of two mixtures of monomers of styrene, alkyl acrylates, acrylic acid, methacrylic acid, and a silicone

oligomer. The sequential polymerization of the two-monomer mixtures produces a core copolymer surrounded by a shell copolymer, in which the two copolymers have differing glass transition temperatures. U.S. Pat. No. 6,284,856 to Lee discloses acrylate, silicone, styrene, and urethane copolymer coatings for natural and synthetic rubber articles to provide improved mold-release characteristics, improved donning characteristics, and improved tactile feel. The co-polymer is formed by the polymerization of a low surface-energy monomer, an alkyl crylate, a hard monomer, and a urethane oligomer, preferably formed by a sequential polymerization process. U.S. Pat. No. 6,709,725 to Lai et al. discloses an elastomeric article made from a natural/synthetic rubber coated with a blend of a film-forming polymer and a wax. The article has improved lubricity and exhibits enhanced donning with respect to dry, damp and wet hands.

[0008] While the art has successfully combated the tackiness of natural/synthetic latex articles, there remains a need for gloves, which provide non-tackiness at the skin-contacting surface, while simultaneously providing stickiness at the interior surface of the cuff in order to adhere the glove firmly to the sleeve of a garment, thereby preventing roll-down of the glove. It is an object of the present invention to provide such a glove. It is another object of the present invention to provide a method of making such a glove. These and other objects and advantages of the present invention will become apparent from the detailed description provided herein.

BRIEF SUMMARY OF THE INVENTION

[0009] The present invention provides a dipped and cured latex glove article comprising an integral glove region and a cuff region. The integral glove region comprises an inner glove surface and an outer glove surface. The cuff region comprises an inner cuff surface and an outer cuff surface. The inner glove surface is coated with a non-tacky lubricious polymeric coating, whereas said inner cuff surface is not coated and is left in the dipped and cured latex state, which is tacky. The outer glove surface and the outer cuff surface are treated to minimize the tackiness of the dipped and cured latex state. Consequently, the inner glove surface enables easy dry- and wet-donning of the glove, and the tacky inner cuff surface adheres to a fabric sleeve when the glove is donned over the end of the sleeve.

[0010] The present invention also provides a dipped and cured latex glove article made from a synthetic latex comprising nitrile, styrene-isoprene-styrene block co-polymer, chloroprene, or a combination of one or more of the foregoing. The inner glove surface and inner cuff surface are coated with synthetic polyisoprene, which is tacky. The inner glove surface is then coated with a non-tacky lubricious polymeric coating, whereas the inner cuff surface is not coated and is left tacky. The outer glove surface and the outer cuff surface are treated to minimize the tackiness of the dipped and cured latex state.

[0011] Accordingly, the present invention also provides a method of making a latex glove article comprising an integral glove region and a cuff region. The method comprises:

[0012] (i) dipping a coagulant-coated glove former into an aqueous latex emulsion, thereby forming a latex first layer on the former,

[0013] (ii) partially coating the latex first layer on the former with a non-tacky aqueous polymeric emulsion, thereby forming a second layer on top of the latex first layer in the integral glove region but not in the cuff region of the latex glove article,

[0014] (iii) heating the former with the first layer and the second layer to cure the first layer with the second layer, after which the cuff region remains tacky and the integral glove region becomes non-tacky,

[0015] (iv) stripping from the former and inverting the latex glove article,

[0016] (v) washing the latex glove article to remove coagulant, aqueous latex surfactants, stabilizers, pH modifiers, and offensive proteins,

[0017] (vi) dressing the inverted latex glove article on a glove former such that the surface of the glove with the tacky cuff region and the non-tacky integral glove region contacts the former,

[0018] (vii) treating the surface of the latex glove article, which is not in contact with the former and which comprises a tacky integral glove region and a tacky cuff region, to minimize tackiness,

[0019] (viii) stripping the latex glove article from the former,

[0020] (ix) washing the latex glove article to remove any residue from (vii), and

[0021] (x) drying the latex glove article at 80° C. for 1 hr. The method can further comprise packaging the latex glove article. The packaged latex glove article then can be sterilized by exposing the packaged latex glove article to gamma radiation.

[0022] The present invention also provides a method of making a synthetic latex glove article. The method comprises:

[0023] (i) dipping a coagulant-coated glove former into an aqueous synthetic latex emulsion comprising nitrile, synthetic styrene-isoprene-styrene block co-polymer, chloroprene, or a combination of one or more of the foregoing, thereby forming a latex first layer on the former,

[0024] (ii) dipping the former with the latex first layer into a synthetic polyisoprene latex emulsion, thereby forming a latex second layer on top of the latex first layer in the integral glove region but not in the cuff region of the latex glove article,

[0025] (iii) partially coating the first layer and the second layer on the former with a non-tacky aqueous polymeric emulsion, thereby forming a third layer on top of the latex first layer and the latex second layer in the integral glove region but not in the cuff region of the latex glove article,

[0026] (iv) heating the former with the first layer, the second layer, and the third layer to cure the first layer, the second layer, and the third layer together, after which the cuff region remains tacky and the integral glove region becomes non-tacky,

[0027] (v) stripping from the former and inverting the latex glove article,

[0028] (vi) washing the latex glove article to remove coagulant, aqueous latex surfactants, stabilizers, pH modifiers, and offensive proteins,

[0029] (vii) dressing the inverted latex glove article on a glove former such that the surface of the glove with the tacky cuff region and the non-tacky integral glove region contacts the former,

[0030] (viii) treating the surface of the latex glove article, which is not in contact with the former and which comprises a tacky integral glove region and a tacky cuff region, to minimize tackiness,

[0031] (ix) stripping the latex glove article from the former,

[0032] (x) washing the latex glove article to remove any residue from (viii), and

[0033] (xi) drying the latex glove article at 80° C. for 1 hr. The method can further comprise packaging the latex glove article. The packaged latex glove article then can be sterilized by exposing the packaged latex glove article to gamma radiation.

DETAILED DESCRIPTION OF THE INVENTION

[0034] The present invention is predicated on the discovery that a fabric-adherent internal cuff region can be generated during the process of dipping a glove former in latex. The fabric-adherent internal cuff is beneficial inasmuch as it adheres to the outer surface of the sleeve of the garment of the wearer, such as the sleeve of a surgical gown or scrubs of a surgeon, thereby preventing roll-down of the glove and the spread of germs, which necessitates re-washing and donning of new gloves. The fabric-adherent internal cuff region is generated in a manufacturing process in which an easy donning coating is applied to the interior surface of the glove to a controlled level, thereby leaving the uncoated internal cuff region of the glove in its natural tacky state. The process also ensures that the tacky state of the fabric-adherent internal cuff region is protected during treatment to remove the tackiness of the outer surface of the glove.

[0035] Thus, the present invention provides a dipped and cured latex glove article comprising an integral glove region and a cuff region. The integral glove region comprises an inner glove surface and an outer glove surface. The cuff region comprises an inner cuff surface and an outer cuff surface. The inner glove surface is coated with a non-tacky lubricious polymeric coating for ease of donnability on a dry or wet hand, whereas the inner cuff surface is not coated and is left in the dipped and cured latex state, which is tacky. The outer glove surface and the outer cuff surface are treated to minimize the tackiness of the dipped and cured latex state and to provide friction for handling of instruments, such as surgical instruments, without slippage. The inner glove surface enables easy dry- and wet-donning of the glove, and the tacky inner cuff surface adheres to a fabric sleeve when the glove is donned over the end of the sleeve.

[0036] The inner cuff region has a width of about 0.5 cm to about 10 cm. Preferably, the inner cuff region has a width of about 1 cm to about 3 cm.

[0037] The latex can be natural or synthetic. An example of a natural latex is polyisoprene. Examples of synthetic latex include polyisoprene, nitrile rubber, styrene-isoprene-styrene block co-polymer, and chloroprene, or a combination of one or more of the foregoing.

[0038] The degree of tackiness exhibited is a function of the type of latex and the composition of the aqueous latex emulsion. For example, natural rubber latex and synthetic polyisoprene latexes exhibit the highest level of tackiness in the as-dipped and cured condition and require substantial surface character modification to produce an easy-to-don glove. Nitrile, synthetic styrene-isoprene-styrene block co-polymer, and polychloroprene latexes have a lower degree of tackiness. Furthermore, the addition of silicone and other oligomeric constituents can decrease the tackiness. Synthetic polyisoprene, chloroprene, nitrile, and synthetic styrene-isoprene-styrene block co-polymer latexes are devoid of offensive proteins normally present in natural rubber latex and are commonly used when allergic reaction is a factor in the application of gloves. Irrespective of the latex composition used, the inner surface of the cuff region of the glove is retained in its original dipped and cured state so as to provide fabric adherence.

[0039] The non-tacky lubricious polymeric coating of the inner glove surface is a cured dip-coated film-forming polymeric emulsion. The emulsion can additionally comprise a wax and a surfactant. The emulsion can be an aqueous polyurethane polymeric emulsion, an aqueous acrylic polymeric emulsion, or an aqueous siliconized polymeric emulsion comprising silicone particles.

[0040] In one embodiment, a dipped and cured synthetic latex glove is provided. The synthetic latex comprises nitrile, styrene-isoprene-styrene block co-polymer, chloroprene, or a combination of one or more of the foregoing. The inner glove surface and inner cuff surface are coated with synthetic polyisoprene, which is tacky. The inner glove surface is then coated with a non-tacky lubricious polymeric coating, whereas the inner cuff surface is not coated and is left tacky. The outer glove surface and the outer cuff surface are treated to minimize the tackiness of the dipped and cured latex state.

[0041] Accordingly, the present invention also provides a method of making a latex glove article comprising an integral glove region and a cuff region. The method comprises dipping a coagulant-coated glove former into an aqueous latex emulsion, which is locally destabilized by the coagulant, thereby forming a latex first layer on the former. The method further comprises partially coating the latex first layer on the former with a non-tacky aqueous polymeric emulsion, thereby forming a second layer on top of the latex first layer in the integral glove region but not in the cuff region of the latex glove article. The second layer can be applied by partially dipping the former with the latex first layer into the non-tacky aqueous polymeric emulsion or by selectively spraying the non-tacky aqueous polymeric emulsion onto the first latex layer. By "selectively" is meant spraying in the integral glove region but not in the cuff region of the latex glove article. Preferably, the second layer is applied by partial dipping. Preferably, the former with the latex first layer is dipped into the non-tacky aqueous polymeric emulsion with the glove fingers pointing downwards up to but not including the cuff region. The cuff region can be about 0.5 cm to about 10 mm, preferably about 1 cm to about 3 cm. The method then comprises heating the former

with the first layer and the second layer to cure the first layer with the second layer, after which the cuff region remains tacky and the integral glove region becomes non-tacky. The non-tacky polymeric second layer is generally compatible with the latex first layer, having similar or better stretch characteristics, and the first and second layers do not separate at their interface, even when the latex article is stretched. If desired, the non-tacky polymeric second layer can be coated with a hand-friendly lubricious coating, which preserves skin moisture, as described in co-pending U.S. Patent Application No. _____, entitled "Glove With Hand-Friendly Coating and Method of Making," filed Dec. 1, 2005 (Applicants: Eng et al., Attorney Docket No. P2563US), which is hereby incorporated by reference in its entirety. The glove article is then stripped from the former and inverted, after which the glove article is washed to remove coagulant, aqueous latex surfactants, stabilizers, pH modifiers, and offensive proteins. The method then comprises dressing the inverted latex glove article on a glove former, such that the surface of the glove with the tacky cuff region and the non-tacky integral glove region contacts the former, and treating the surface of the latex glove article, which is not in contact with the former and which comprises a tacky integral glove region and a tacky cuff region, to minimize tackiness and improve friction properties. Tackiness can be minimized and friction properties can be improved by treating with a chlorination solution (see, e.g., Example 1), by siliconization, or by coating with a polymer. Siliconization is generally accomplished by treating a surface, the tackiness of which is to be minimized, with a silicone-containing emulsion or a solution, depending on the solubility of the siliconizing composition. Water-insoluble siliconizing compositions are emulsified, while siliconizing compositions that have a hydroxyl group are water-soluble and are dissolved in an aqueous treating solution. The method further comprises stripping the latex glove article from the former, washing the latex glove article to remove any residue, such as chlorine reaction residue, and drying the latex glove article at 80° C. for 1 hr. The elasticity of the glove results in a tight contact between the glove and the former, such that the chlorination solution, for example, does not leak between the glove and the former, which would result in the destruction of the tackiness of the cuff region.

[0042] The method can further comprise packaging the latex glove article in pairs or in bulk. If desired, the packaged latex glove articles can be sterilized by exposing the packaged latex glove articles to gamma radiation.

[0043] The present invention also provides a method of making a synthetic latex glove article comprising an integral glove region and a cuff region. The method comprises dipping a coagulant-coated glove former into an aqueous synthetic latex emulsion comprising nitrile, synthetic styrene-isoprene-styrene block co-polymer, chloroprene, or a combination of one or more of the foregoing, thereby forming a latex first layer on the former, and then dipping the former with the latex first layer into a synthetic polyisoprene latex emulsion, thereby forming a latex second layer on top of the latex first layer in the integral glove region but not in the cuff region of the latex glove article. The method further comprises partially coating (partially dipping or selectively spraying as described above) the first layer and the second layer on the former with a non-tacky aqueous polymeric emulsion, thereby forming a third layer on top of the latex first layer and the latex second layer in the integral glove region but not in the cuff region of the latex glove article, and heating the former with the first layer, the second layer, and the third layer to cure the first layer, the second layer, and the third layer together, after which the cuff region remains tacky and the integral glove region becomes non-tacky. The glove is then stripped from the former and inverted. The glove is then washed to remove coagulant, aqueous latex surfactants, stabilizers, pH modifiers, and offensive proteins and dressed onto a glove former such that the surface of the glove with the tacky cuff region and the non-tacky integral glove region contacts the former. The method then further comprises treating (chlorination, siliconization or polymer coating as described above) the surface of the latex glove article, which is not in contact with the former and which comprises a tacky integral glove region and a tacky cuff region, to minimize tackiness, stripping the latex glove article from the former, washing the latex glove article to remove any residue, such as chlorine reaction residue, and drying the latex glove article at 80° C. for 1 hr. This method generates a fabric-adherent cuff region even when the latex first layer is not so tacky due to the type and composition of latex used. Such gloves are chemically resistant and useful in chemotherapeutic applications and the like.

[0044] This method also can further comprise packaging the latex glove article in pairs or in bulk. If desired, the packaged latex glove articles can be sterilized by exposing the packaged latex glove articles to gamma radiation.

[0045] With respect to the above methods, the non-tacky aqueous polymeric emulsion can contain a film-forming polymer or copolymer, a wax, a surfactant and a hardness modifier. Any suitable film-forming polymer can be used. The film-forming polymer forms a continuous polymeric coating that inherently bonds to the coagulated latex surface formed on the former and creates a substantial bond between the latex and the polymer coating during curing. Suitable film-forming polymers or copolymers include polyurethane and acrylic polymers and copolymers. Preferably, the film-forming polymer or copolymer is polyurethane. Suitable polyurethanes include aliphatic polyurethanes and aromatic polyurethanes. Examples of suitable commercially available polyurethanes include, but are not limited to, BEETAFIN™ L9009 (BIP (Oldbury) Limited, Tat Bank Road, Oldbury, West Midlands, United Kingdom), Witcobond™ W-506 (Chemtura Corporation 199, Benson Road, Middlebury, Conn.), and Neorez™ R-972 (DSM Neoresins, Sluisweg 12, 5140 AC Waalwijk, The Netherlands).

[0046] Acrylic polymers and copolymers can be polymerized from a monomer mixture including at least one reactive (co-polymerizable) low surface energy monomer, preferably a silicone oligomer, at least one alkyl acrylate, at least one reactive (co-polymerizable) aliphatic urethane oligomer, and at least one reactive (co-polymerizable) hard monomer.

[0047] The film-forming polymeric emulsion can include a silicone-modified polymer in combination with silicone resin particles so as to provide a non-tacky polymeric layer. Silicone-modified polymers that can be used include those polymeric structures that can have silicone groups covalently attached to the chemical structures. Suitable silicone-modified polymers include, but are not limited to, silicone-modified polyurethanes, acrylics, vinyl, alkyl,

esters, ethylene propylene diene rubber (EPDM), and nitrites. Preferred silicone-modified polymers are silicone-modified polyurethanes.

[0048] Any suitable wax can be used. The wax is generally insoluble in the aqueous coating emulsion, and a fine dispersion of the water-insoluble wax component provides regions in the coatings that provide lubricity and non-tackiness within the coating layer. The wax is preferably a synthetic polymer or copolymer wax, more preferably a polyethylene wax, a high-density polyethylene wax, an oxidized or modified polyethylene wax or high-density polyethylene wax, or a mixture of two or more of such waxes. Preferably, the wax has a melting point of 80° C. or more, more preferably the wax is a polyethylene wax having a melting point of 80° C. or more. Examples of suitable commercially available polyethylene waxes include, but are not limited to, AQUAMAT™ 213 (BYK-Chemie, Wesel, Germany), MICHEM LUBE™ 61335 (Michelman, Inc., Cincinnati, Ohio), and AQUACER™ 502 (BYK-Chemie, Wesel, Germany).

[0049] The ratio of film-forming polymer to wax is preferably at least about 0.5 to 1 up to about 20 to 1. The film-forming polymer and the wax are dispersed in water in the presence of one or more surfactants. There is a wide range of commercially available non-ionic and anionic surfactants including, for example, those sold under the trademarks DARVAN™ (R.T. Vanderbilt Company, Inc, 30 Winfield Street, Norwalk, Conn.) and SYNPERONIC™ (Uniqema, Wilmington, Del.).

[0050] Any suitable hardness modifier can be used. The hardness modifier increases the hardness of the polymeric non-tacky coating. Suitable hardness modifiers can be selected from polymeric compounds including, but not limited to, poly(2-hydroxyethylmethacrylate), acrylic polymers, and melamine-formaldehyde resins. Preferably, the hardness modifier is a polymer or copolymer having a glass transition temperature higher than that of the film-forming polymer.

[0051] In view of the foregoing, when gloves are to be double-donned, a glove with a fabric-adherent cuff region is donned first, such that the fabric-adherent cuff region is over the sleeve. A second glove, which does not have a fabric-adherent cuff region, is then donned second. Since the cuff region of the second glove contacts the already anchored cuff region of the first glove, due to the present of the fabric-adherent cuff region, the second glove also does not roll.

EXAMPLES

[0052] The following examples serve to illustrate the present invention and are not intended to limit its scope in any way.

Example 1

[0053] This example describes the preparation of a glove in accordance with the present invention.

[0054] A surgical glove former was dipped into an aqueous coagulant containing 20% calcium nitrate, 5% calcium carbonate powder, 0.1% Teric 340 (Huntsman, 500 Huntsman Way, Salt Lake City, Utah), and 0.2% cellusize QP30, 000 (Union Carbide, Danbury, Conn.), and dried on the former. The glove was then dipped into pre-vulcanized natural rubber latex with 35% total solid content to form a gelled rubber layer. The glove on the former was leached in hot water at 60° C. for 5 min. The glove was then dipped into an aqueous dispersion containing 10% Beetafin L9009 (BIP (Oldbury) Limited, Tat Bank Road, Oldbury, West Midlands, United Kingdom) 3% Aquamat 213 (BYK-Chemie, Wesel, Germany), and 1% Cymel 373 (Cytec Industries, 1405 Buffalo Street, Olean, N.Y.) up to a level of 3 cm from the edge of the cuff of latex film to form a thin polymeric lining extending from 3 cm below the edge of the cuff. The portion of the glove not coated by the aqueous dispersion retains the natural tackiness of latex, thereby forming the fabric-adherent cuff region. The glove on the former was then heated and cured in an oven at 130° C. for 10 min, after which it was leached in hot water at 80° C. for 30 seconds, dried, and stripped from the former and reversed. The glove was rinsed with water to remove calcium carbonate powder. The outer surface of the glove was treated with 0.5 g/l chlorine water for 10 sec, rinsed with water, dried to completion at 70° C. for 80 min, packed, and sterilized with gamma irradiation.

Example 2

[0055] This example demonstrates the superiority of gloves with a fabric-adherent cuff region.

[0056] In order to measure cuff roll-down resistance, a sleeve of a disposable surgeon's gown was first put on a former having the shape of a human arm. The glove was then put on the arm former with the cuff covering part of the gown's sleeve. The glove was then pulled at a constant speed to detach from the gown's sleeve. The force required was measured as cuff pull force, i.e., the amount of force required to detach the glove from the sleeve. Three separate gloves with fabric-adherent cuff regions evidenced pull forces of 4.0, 4.2 and 4.4 kg, whereas a glove without a fabric-adherent cuff region evidenced a pull force of only 1.0 kg. Thus, this example demonstrates that the fabric-adherent cuff resists cuff roll-down as evidenced by the cuff pull force. Cuff pull force was poor in the absence of a fabric-adherent cuff.

[0057] All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by reference and were set forth in its entirety herein.

[0058] The use of the terms "a" and "an" and "the" and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of

the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0059] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. It should be understood that the illustrated embodiments are exemplary only, and should not be taken as limiting the scope of the invention.

What is claimed is:

1. A dipped and cured latex glove article comprising an integral glove region and a cuff region,

wherein said integral glove region comprises an inner glove surface and an outer glove surface,

wherein said cuff region comprises an inner cuff surface and an outer cuff surface, and

wherein said inner glove surface is coated with a non-tacky lubricious polymeric coating whereas said inner cuff surface is not coated and is left in the dipped and cured latex state, which is tacky, and

wherein said outer glove surface and said outer cuff surface are treated to minimize the tackiness of the dipped and cured latex state,

whereby said inner glove surface enables easy dry- and wet-donning of the glove and the tacky inner cuff surface adheres to a fabric sleeve when the glove is donned over the end of the sleeve.

2. The article of claim 1, wherein said inner cuff region has a width of about 0.5 cm to about 10 cm.

3. The article of claim 1, wherein said inner cuff region has a width of about 1 cm to about 3 cm.

4. The article of claim 1, wherein said non-tacky lubricious polymeric coating is a cured dip-coated film-forming polymeric emulsion.

5. The article of claim 4, wherein the polymeric emulsion comprises a wax and a surfactant.

6. The article of claim 4, wherein the polymeric emulsion is an aqueous polyurethane polymeric emulsion.

7. The article of claim 6, wherein the polymeric emulsion comprises a wax and a surfactant.

8. The article of claim 4, wherein the polymeric emulsion is an aqueous acrylic polymeric emulsion.

9. The article of claim 8, wherein the polymeric emulsion comprises a wax and a surfactant.

10. The article of claim 4, wherein the polymeric emulsion is an aqueous siliconized polymeric emulsion comprising silicone particles.

11. The article of claim 1, wherein the latex is natural.

12. The article of claim 11, wherein the latex is polyisoprene.

13. The article of claim 1, wherein the latex is synthetic.

14. The article of claim 13, wherein the latex is polyisoprene.

15. The article of claim 13, wherein the latex is nitrile rubber.

16. The article of claim 13, wherein the latex is styrene-isoprene-styrene block co-polymer.

17. The article of claim 13, wherein the latex is chloroprene.

18. The article of claim 13, wherein the latex comprises nitrile, styrene-isoprene-styrene block co-polymer, chloroprene, polyisoprene, or a combination of one or more of the foregoing.

19. A dipped and cured synthetic latex glove article,

wherein the synthetic latex comprises nitrile, styrene-isoprene-styrene block co-polymer, chloroprene, or a combination of one or more of the foregoing,

wherein the glove article comprises an integral glove region and a cuff region,

wherein said integral glove region comprises an inner glove surface and an outer glove surface,

wherein said cuff region comprises an inner cuff surface and an outer cuff surface, and

wherein said inner glove surface and inner cuff surface are coated with synthetic polyisoprene, which is tacky,

wherein said inner glove surface is then coated with a non-tacky lubricious polymeric coating whereas said inner cuff surface is not coated and is left tacky, and

wherein said outer glove surface and said outer cuff surface are treated to minimize the tackiness of the dipped and cured latex state,

whereby said inner glove surface enables easy dry- and wet-donning of the glove and the tacky inner cuff surface adheres to a fabric sleeve when the glove is donned over the end of the sleeve.

20. A method of making a latex glove article comprising an integral glove region and a cuff region, which method comprises:

(i) dipping a coagulant-coated glove former into an aqueous latex emulsion, thereby forming a latex first layer on the former,

(ii) partially coating the latex first layer on the former with a non-tacky aqueous polymeric emulsion, thereby forming a second layer on top of the latex first layer in the integral glove region but not in the cuff region of the latex glove article,

(iii) heating the former with the first layer and the second layer to cure the first layer with the second layer, after which the cuff region remains tacky and the integral glove region becomes non-tacky,

(iv) stripping from the former and inverting the latex glove article,

(v) washing the latex glove article to remove coagulant, aqueous latex surfactants, stabilizers, pH modifiers, and offensive proteins,

(vi) dressing the inverted latex glove article on a glove former such that the surface of the glove with the tacky cuff region and the non-tacky integral glove region contacts the former,

(vii) treating the surface of the latex glove article, which is not in contact with the former and which comprises a tacky integral glove region and a tacky cuff region, to minimize tackiness,

(viii) stripping the latex glove article from the former,

(ix) washing the latex glove article to remove any residue from (vii), and

(x) drying the latex glove article at 80° C. for 1 hr, whereupon a latex glove article is made.

21. The method of claim 20, wherein the partially coating in (ii) is done by partially dipping.

22. The method of claim 20, wherein the treating in (vii) is with a chlorination solution.

23. The method of claim 21, wherein the treating in (vii) is with a chlorination solution.

24. The method of claim 20, which further comprises packaging the latex glove article.

25. The method of claim 24, which further comprises sterilizing the packaged latex glove article by exposing the packaged latex glove article to gamma radiation.

26. A method of making a synthetic latex glove article comprising an integral glove region and a cuff region, which method comprises:

(i) dipping a coagulant-coated glove former into an aqueous synthetic latex emulsion comprising nitrile, synthetic styrene-isoprene-styrene block co-polymer, chloroprene, or a combination of one or more of the foregoing, thereby forming a latex first layer on the former,

(ii) dipping the former with the latex first layer into a synthetic polyisoprene latex emulsion, thereby forming a latex second layer on top of the latex first layer in the integral glove region but not in the cuff region of the latex glove article,

(iii) partially coating the first layer and the second layer on the former with a non-tacky aqueous polymeric emulsion, thereby forming a third layer on top of the latex first layer and the latex second layer in the integral glove region but not in the cuff region of the latex glove article,

(iv) heating the former with the first layer, the second layer, and the third layer to cure the first layer, the second layer, and the third layer together, after which the cuff region remains tacky and the integral glove region becomes non-tacky,

(v) stripping from the former and inverting the latex glove article,

(vi) washing the latex glove article to remove coagulant, aqueous latex surfactants, stabilizers, pH modifiers, and offensive proteins,

(vii) dressing the inverted latex glove article on a glove former such that the surface of the glove with the tacky cuff region and the non-tacky integral glove region contacts the former,

(viii) treating the surface of the latex glove article, which is not in contact with the former and which comprises a tacky integral glove region and a tacky cuff region, to minimize tackiness,

(ix) stripping the latex glove article from the former,

(x) washing the latex glove article to remove any residue from (viii), and

(xi) drying the latex glove article at 80° C. for 1 hr, whereupon a latex glove article is made.

27. The method of claim 26, wherein the partially coating in (iii) is done by partially dipping.

28. The method of claim 26, wherein the treating in (viii) is with a chlorination solution.

29. The method of claim 27, wherein the treating in (viii) is with a chlorination solution.

30. The method of claim 26, which further comprises packaging the latex glove article.

31. The method of claim 30, which further comprises sterilizing the packaged latex glove article by exposing the packaged latex glove article to gamma radiation.

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