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(54) **ELASTOMERIC GLOVES HAVING IMPROVED GRIPPING CHARACTERISTICS**

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(57) **ABSTRACT**

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An elastomeric glove having an outer layer that contains a silicone emulsion is provided. For example, in one embodiment, the glove contains a natural rubber latex substrate body, a donning layer that is capable of being chlorinated, and an outer layer formed from a silicone emulsion. It has been unexpectedly discovered that the application of a silicone emulsion to the outer layer can offset the slipperiness normally caused by chlorination and thus enhance the gripping properties of the resulting elastomeric glove. Specifically, it is believed that the silicone emulsion can inhibit the ability of halogen atoms to bond with the elastomeric material of the substrate, thereby limiting the level of slipperiness usually imparted during chlorination.

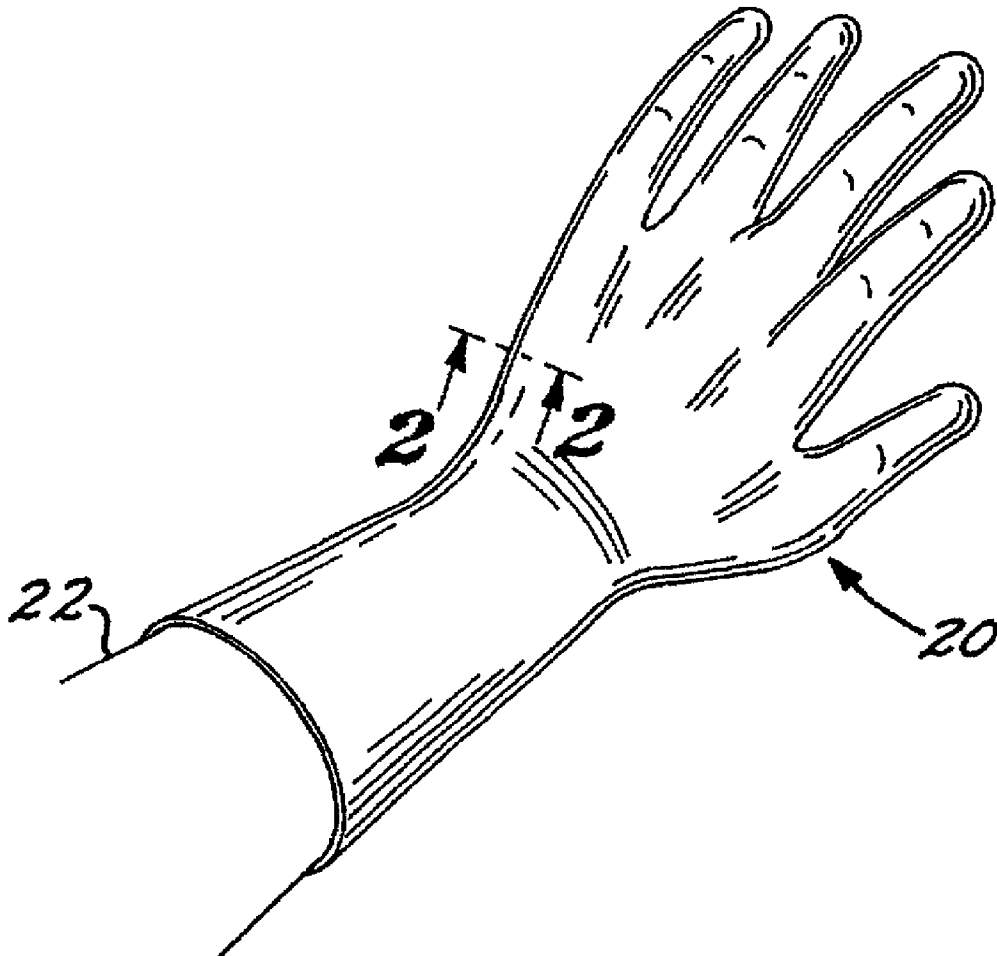
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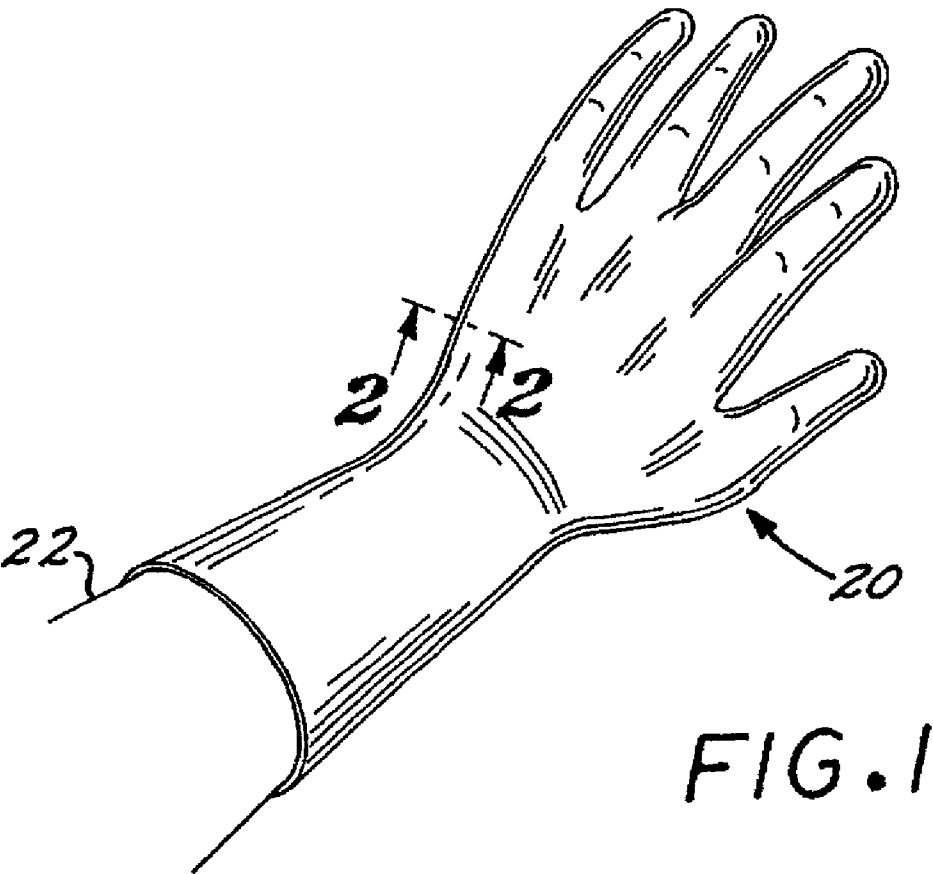
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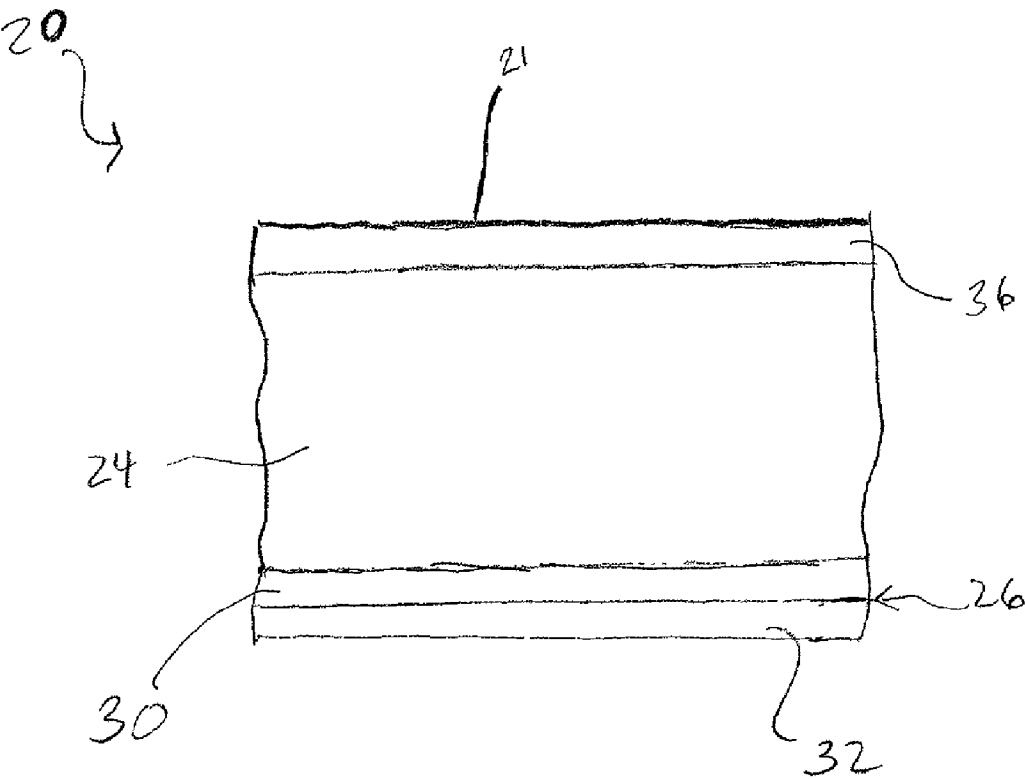


FIG 2

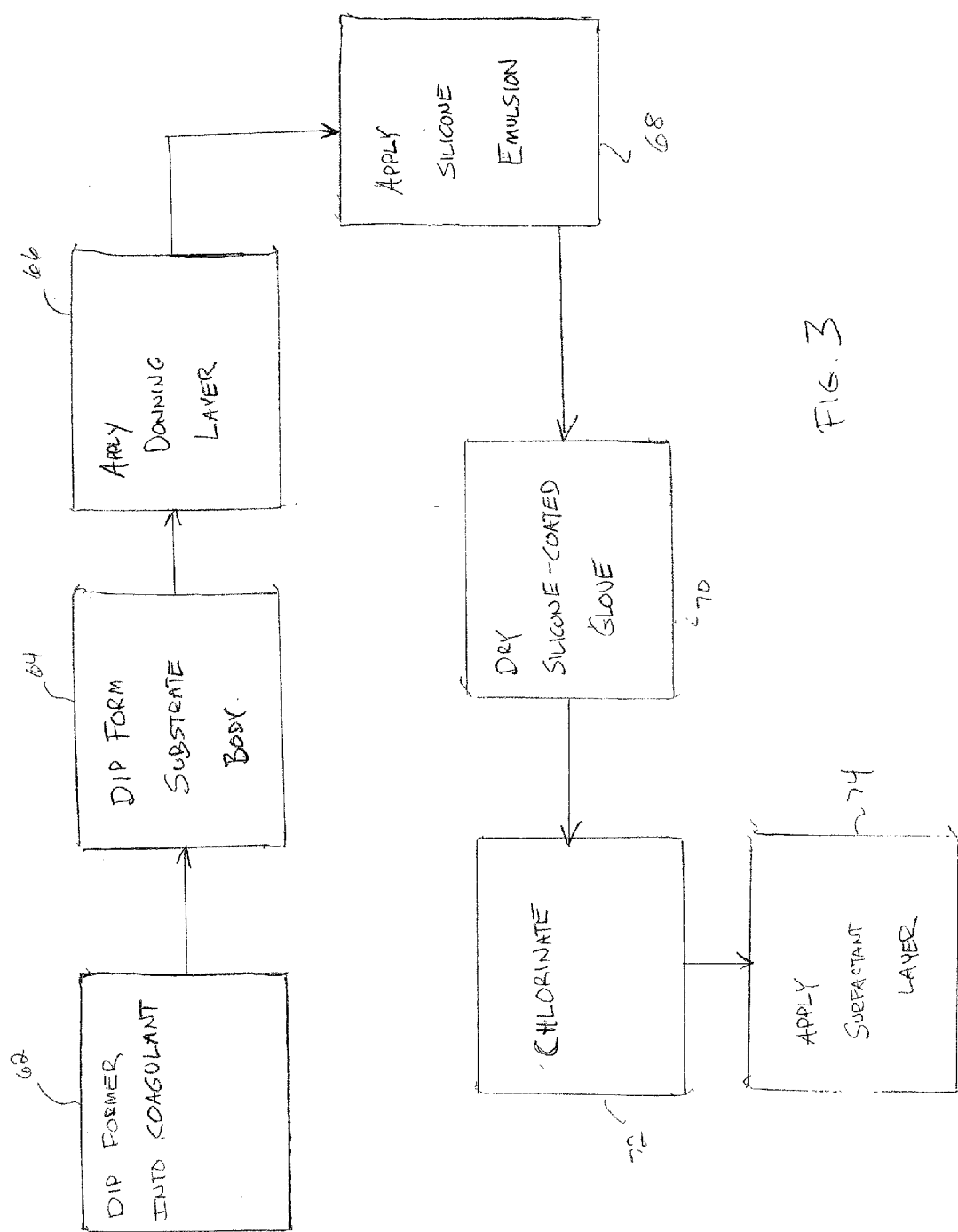


FIG. 3

ELASTOMERIC GLOVES HAVING IMPROVED GRIPPING CHARACTERISTICS

BACKGROUND OF THE INVENTION

[0001] Elastomeric gloves, such as surgical and examination gloves, have traditionally been made of natural or synthetic elastomers to provide a combination of good elasticity and strength. Due to their tight fit over the hand, however, elastomeric gloves are often difficult to don. To overcome this problem, powdered lubricants were traditionally applied to the inside surface of the glove to reduce friction between the skin and the elastomer. As an example, epichlorohydrin-treated maize crosslinked starch was a common powder applied to the inside of elastomeric gloves during manufacture to permit them to be more readily slipped onto the hand of the user.

[0002] Unfortunately, the use of powdered lubricants has drawbacks in specific situations, such as the case of surgical gloves. Specifically, if some of the powder escapes from the inside of the glove into the surgical environment, as for example if the glove is torn during the surgery, the powder may enter the surgical wound and cause further complications for the patient. The powder may also carry infectious agents and/or cause allergenic reactions in the patient.

[0003] As a result, various other techniques were developed to aid in the donnability of elastomeric gloves. For example, the surface of natural rubber latex gloves has been chlorinated to reduce friction between the wearer-contacting surface and a user's skin when donned. Moreover, other techniques have also been developed to enhance the lubricity of a glove's inner surface. One such technique is described in U.S. Pat. No. 5,792,531 to Littleton, et al. For instance, in one example, Littleton, et al. describes forming a donning layer on an S-EB-S glove from an S-I-S mid-block unsaturated block copolymer, chlorinating the resulting glove in a washing machine, and then applying a lubricant to the wearer-contacting surface of the glove that contains cetyl pyridinium chloride and a silicone emulsion (DC 365 from Dow Corning).

[0004] Although chlorination techniques, such as described above, have resulted in a significant improvement in the donning characteristics of many elastomeric gloves, other properties of the glove are sometimes adversely affected. For instance, when chlorinated, the outer, gripping surface of natural rubber latex gloves are unintentionally provided with a slippery feel because the inner and outer surfaces of the glove are simultaneously chlorinated in a washing machine. As a result, a user wearing such a glove often experiences difficulty in gripping and/or handling objects. This may be a particularly significant problem for surgical gloves, which are designed for use by doctors who are commonly required to grip and handle surgical tools.

[0005] As such, a need currently exists for an elastomeric glove that is able to achieve good gripping characteristics, even when chlorinated.

SUMMARY OF THE INVENTION

[0006] In accordance with one embodiment of the present invention, an elastomeric glove is disclosed that defines a wearer-contacting surface and a grip surface. The glove comprises a substrate body including a layer made of an

elastomeric material that is capable of being halogenated (e.g., chlorinated), the substrate body having an inside surface and an outside surface. In some embodiments, the elastomeric material of the substrate body is selected from the group consisting of styrene-ethylene-butylene-styrene block copolymers, styrene-isoprene-styrene block copolymers, styrene-butadiene-styrene block copolymers, styrene-isoprene block copolymers, styrene-butadiene block copolymers, natural rubber latex, nitrile rubbers, isoprene rubbers, chloroprene rubbers, polyvinyl chlorides, silicone rubbers, and combinations thereof.

[0007] The glove further comprises an outer layer overlying the outside surface of the substrate body and forming the grip surface of the glove, the outer layer being formed from a silicone emulsion. As is described in more detail below, the silicone emulsion may allow the grip surface of the glove to maintain some degree of tack, even after the glove is exposed to a halogen-containing compound. In some embodiments, the silicone emulsion contains a polysiloxane having at least one functional group selected from the group consisting of amino, carboxyl, hydroxyl, ether, polyether, aldehyde, ketone, amide, ester, thiol groups, and combinations thereof. Moreover, the silicone emulsion may have a solids content of from about 0.1 weight % to about 10 weight %. In another embodiment, the silicone emulsion may have a solids content of from about 0.25 weight % to about 5 weight %. Further, in still another embodiment, the silicone emulsion may have a solids content of from about 0.3 weight % to about 1.0 weight %.

[0008] Besides the above-mentioned layers, the elastomeric glove may also contain other additional layers. For example, in one embodiment, the elastomeric glove further comprises a donning layer that overlies the inside surface of the substrate body. The donning layer may facilitate donning of the glove onto the hand of a user. In some embodiments, the donning layer contains a donning polymer that is halogenated (e.g., chlorinated). The glove may also contain a lubricant that coats the donning layer. When utilized, the lubricant may further facilitate damp donning of the glove.

[0009] In accordance with another embodiment of the present invention, a method for enhancing the gripping properties of an elastomeric glove is disclosed. The method comprises providing an elastomeric glove that contains a substrate body having a layer made of an elastomeric material, the substrate body having an inside surface and an outside surface. The glove further contains a donning layer that overlies the inside surface of the substrate body. The method also comprises applying a silicone emulsion to the substrate body so that the emulsion coats the outside surface of the substrate body. Thereafter, the elastomeric glove is exposed to a halogen-containing compound, such as a chlorine-containing compound. The silicone emulsion inhibits halogenation of the outer surface of the substrate body to improve the gripping characteristics thereof.

[0010] Other features and aspects of the present invention are discussed in greater detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended drawings, in which:

[0012] FIG. 1 is a perspective view of one embodiment of an elastomeric glove made according to the invention;

[0013] FIG. 2 is a cross-sectional view of the glove illustrated in FIG. 1 taken along a line 2-2; and

[0014] FIG. 3 is a block flow diagram illustrating one embodiment of a method for forming an elastomeric glove of the present invention.

[0015] Repeat use of reference characters in the present specification and drawings is intended to represent the same or analogous features or elements of the invention.

DETAILED DESCRIPTION OF REPRESENTATIVE EMBODIMENTS

[0016] Reference now will be made in detail to various embodiments of the invention, one or more examples of which are set forth below. Each example is provided by way of explanation, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations may be made in the present invention without departing from the scope or spirit of the invention. For instance, features illustrated or described as part of one embodiment, may be used on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention cover such modifications and variations.

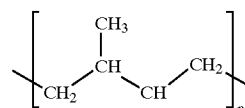
[0017] In general, the present invention is directed to an elastomeric glove having an outer layer that contains a silicone emulsion. For example, in one embodiment, the glove contains a natural rubber latex substrate body, a donning layer that is capable of being chlorinated, and an outer layer formed from a silicone emulsion. It has been unexpectedly discovered that the application of a silicone emulsion to the outer layer of the glove may offset the slipperiness normally caused by chlorination and thus enhance the gripping properties of the resulting elastomeric glove. Specifically, it is believed that the silicone emulsion may inhibit the ability of halogen atoms to bond with the elastomeric material of the substrate, thereby limiting the level of slipperiness usually imparted during chlorination.

[0018] Referring to FIGS. 1-2, for example, one embodiment of an elastomeric glove 20 is illustrated that may be placed on the hand of a user 22. The glove 20 includes a substrate body 24 having the basic shape of the glove. The substrate body 24 may generally be formed from any of a variety of natural and/or synthetic elastomeric materials known in the art. For instance, some examples of suitable elastomeric materials include, but are not limited to, S-EB-S (styrene-ethylene-butylene-styrene) block copolymers, S-I-S (styrene-isoprene-styrene) block copolymers, S-B-S (styrene-butadiene-styrene) block copolymers, S-I (styrene-isoprene) block copolymers, S-B (styrene-butadiene) block copolymers, natural rubber latex, nitrile rubbers, isoprene rubbers, chloroprene rubbers, polyvinyl chlorides, silicone rubbers, and combinations thereof. Other suitable elastomeric materials that may be used to form the substrate body 24 may be described in U.S. Pat. No. 5,112,900 to Buddenhagen, et al.; U.S. Pat. No. 5,407,715 to Buddenhagen, et al.; U.S. Pat. No. 5,900,452 to Plamthottam; U.S. Pat. No. 6,288,159 to Plamthottam; and U.S. Pat. No. 6,306,514 to Weikel, et al., which are incorporated herein in their entirety by reference thereto for all purposes.

[0019] In one embodiment, the substrate body 24 is formed from natural rubber latex. To form the substrate body

24 from natural latex, a former is initially dipped into a coagulant bath that facilitates later stripping of the glove from the former. The coagulant bath may include compounds well known in the art, such as calcium carbonate and calcium nitrate. Thereafter, the coagulant-coated former is dried and subsequently dipped into one or more latex baths. The resulting latex layer(s) are then typically leached in water to extract a large percentage of the water-soluble impurities in the latex and coagulant. The coated former is then dried to cure (i.e., crosslink) the rubber. It should be understood that the conditions, process, and materials used in forming natural rubber gloves are well known in the art, and are not critical to the practice of the present invention.

[0020] Regardless of the particular material used to form the substrate body 24, the glove 20 also includes an outer layer 36 that covers the outer surface of the substrate body 24 during use and forms a gripping surface 21 of the glove 20. The outer layer 36 contains a silicone emulsion that imparts enhanced tackiness to the gripping surface 21. As used herein, the term "silicone" generally refers to a broad family of synthetic polymers that have a repeating silicon-oxygen backbone, including, but not limited to, polydimethylsiloxane and polysiloxanes having hydrogen-bonding functional groups selected from the group consisting of amino, carboxyl, hydroxyl, ether, polyether, aldehyde, ketone, amide, ester, and thiol groups. The silicone emulsion generally contains one or more silicone elastomers that are capable of interfering with the bonding of halogen atoms with elastomeric material used to form the substrate body 24 during halogenation. For instance, natural rubber latex is a colloidal suspension of polyisoprene, which generally has the following structure:



[0021] Typically, upon halogenation, the halogen atoms (e.g., chlorine, bromine, and the like) react with the polyisoprene to reduce the tackiness of the latex. However, it has been discovered in accordance with the present invention that the silicone emulsion applied to the outer layer 36 may interfere with the reaction of polyisoprene with the halogen atoms, thereby inhibiting the slipperiness normally imparted to the outer layer 36. Specifically, it is believed that, in some instances, the relatively hydrophobic silicone repels the water-based halogenation solutions often utilized, and in this manner, inhibits halogenation of the grip surface 21. In other instances, it is believed that the silicone contains functional groups that bond to the reactive sites that would otherwise form bonds with halogen atoms during halogenation. By reducing the level of halogen atom bonding, the gripping properties of the resulting glove 20 are greatly improved.

[0022] Generally, any silicone capable of enhancing the grip characteristics of the glove 20 may be used in the silicone emulsion. In some embodiments, polydimethylsiloxane and/or modified polysiloxanes may be used as the silicone component of the emulsion in the present invention. For instance, some suitable modified polysiloxanes that may be used in the present invention include, but are not limited

to, phenyl-modified polysiloxanes, vinyl-modified polysiloxanes, methyl-modified polysiloxanes, fluoro-modified polysiloxanes, alkyl-modified polysiloxanes, alkoxy-modified polysiloxanes, amino-modified polysiloxanes, and combinations thereof.

[0023] Some suitable phenyl-modified polysiloxanes include, but are not limited to, dimethyldiphenylpolysiloxane copolymers; dimethyl, methylphenylpolysiloxane copolymers; polymethylphenylsiloxane; and methylphenyl, dimethylsiloxane copolymers. Phenyl modified polysiloxanes that have a relatively low phenyl content (less than about 50 mole %) may be particularly effective in the present invention. For example, the phenyl-modified polysiloxane may be a diphenyl-modified silicone, such as a diphenylsiloxane-modified dimethylpolysiloxane. In some embodiments, the phenyl-modified polysiloxanes contain phenyl units in an amount from about 0.5 mole % to about 50 mole %, in some embodiments in an amount less than about 25 mole %, and in some embodiments, in an amount less than about 15 mole %. In one particular embodiment, a diphenylsiloxane-modified dimethylpolysiloxane may be used that contains diphenylsiloxane units in an amount less than about 5 mole %, and particularly in an amount less than about 2 mole %. The diphenylsiloxane-modified dimethylpolysiloxane may be synthesized by reacting diphenylsiloxane with dimethylsiloxane.

[0024] As indicated above, fluoro-modified polysiloxanes may also be used in the present invention. For instance, one suitable fluoro-modified polysiloxane that may be used is a trifluoropropyl modified polysiloxane, such as a trifluoropropylsiloxane modified dimethylpolysiloxane. A trifluoropropylsiloxane modified dimethylpolysiloxane may be synthesized by reacting methyl, 3,3,3 trifluoropropylsiloxane with dimethylsiloxane. The fluoro-modified silicones may contain from about 5 mole % to about 95 mole % of fluoro groups, such as trifluoropropylsiloxane units. In another embodiment, the fluoro-modified silicones may contain from about 40 mole % to about 60 mole % of fluoro groups. In one particular embodiment, a trifluoropropylsiloxane-modified dimethylpolysiloxane may be used that contains 50 mole % trifluoropropylsiloxane units.

[0025] Besides the above-mentioned modified polysiloxanes, other modified polysiloxanes may also be utilized in the present invention. For instance, some suitable vinyl-modified polysiloxanes include, but are not limited to, vinyl dimethyl terminated polydimethylsiloxanes; vinylmethyl, dimethylpolysiloxane copolymers; vinylidimethyl terminated vinylmethyl, dimethylpolysiloxane copolymers; divinylmethyl terminated polydimethylsiloxanes; and vinylphenylmethyl terminated polydimethylsiloxanes. Further, some methyl-modified polysiloxanes that may be used include, but are not limited to, dimethylhydro terminated polydimethylsiloxanes; methylhydro, dimethylpolysiloxane copolymers; methylhydro terminated methyloctyl siloxane copolymers; and methylhydro, phenylmethyl siloxane copolymers. In addition, some examples of amino-modified polysiloxanes include, but are not limited to, polymethyl(3-aminopropyl)-siloxane and polymethyl[3-(2-aminoethyl)aminopropyl]-siloxane.

[0026] The particular polysiloxanes described above are meant to include hetero- or co-polymers formed from polymerization or copolymerization of dimethylsiloxane cyclics

and diphenylsiloxane cyclics or trifluoropropylsiloxane cyclics with appropriate endcapping units. Thus, for example, the terms "diphenyl modified dimethylpolysiloxanes" and "copolymers of diphenylpolysiloxane and dimethylpolysiloxane" may be used interchangeably. Moreover, other examples of suitable polysiloxanes are believed to be described in U.S. Pat. No. 5,742,943 to Chen and U.S. Pat. No. 6,306,514 to Weikel, et al., which are incorporated herein in their entirety by reference thereto for all purposes.

[0027] Besides containing a silicone, the silicone emulsion also generally contains one or more emulsifying surfactants. Nonionic, anionic, cationic, and amphoteric surfactants may all be suitable for use in the present invention. For example, in some embodiments, it may be desired to utilize one or more nonionic surfactants. Nonionic surfactants typically have a hydrophobic base, such as a long chain alkyl group or an alkylated aryl group, and a hydrophilic chain comprising a certain number (e.g., 1 to about 30) of ethoxy and/or propoxy moieties. Examples of some classes of nonionic surfactants that may be used include, but are not limited to, ethoxylated alkylphenols, ethoxylated and propoxylated fatty alcohols, polyethylene glycol ethers of methyl glucose, polyethylene glycol ethers of sorbitol, ethylene oxide-propylene oxide block copolymers, ethoxylated esters of fatty (C_8 - C_{18}) acids, condensation products of ethylene oxide with long chain amines or amides, condensation products of ethylene oxide with alcohols, and mixtures thereof.

[0028] Various specific examples of suitable nonionic surfactants include, but are not limited to, methyl gluceth-10, PEG-20 methyl glucose distearate, PEG-20 methyl glucose sesquisteate, C_{11-15} parath-20, ceteth-8, ceteth-12, dodecynol-12, laureth-15, PEG-20 castor oil, polysorbate 20, steareth-20, polyoxyethylene-10 cetyl ether, polyoxyethylene-10 stearyl ether, polyoxyethylene-20 cetyl ether, polyoxyethylene-10 oleyl ether, polyoxyethylene-20 oleyl ether, an ethoxylated nonylphenol, ethoxylated octylphenol, ethoxylated dodecylphenol, or ethoxylated fatty (C_6 - C_{22}) alcohol, including 3 to 20 ethylene oxide moieties, polyoxyethylene-20 isohexadecyl ether, polyoxyethylene-23 glycerol laurate, polyoxyethylene-20 glyceryl stearate, PPG-10 methyl glucose ether, PPG-20 methyl glucose ether, polyoxyethylene-20 sorbitan monoesters, polyoxyethylene-80 castor oil, polyoxyethylene-15 tridecyl ether, polyoxyethylene-6 tridecyl ether, laureth-2, laureth-3, laureth-4, PEG-3 castor oil, PEG 600 dioleate, PEG 400 dioleate, 2,6,8-trimethyl-4-nonyloxypolyethylene oxyethanol; 2,6,8-trimethyl-4-nonyloxypolyethylene oxyethanol; alkyleneoxypolyethyleneoxyethanol; alkyleneoxypolyethyleneoxyethanol; alkyleneoxypolyethyleneoxyethanol; octylphenoxy polyethoxy ethanol; and nonylphenoxy polyethoxy ethanol, and mixtures thereof.

[0029] Additional nonionic surfactants that may be used include water soluble alcohol ethylene oxide condensates are the condensation products of a secondary aliphatic alcohol containing between about 8 to about 18 carbon atoms in a straight or branched chain configuration condensed with between about 5 to about 30 moles of ethylene oxide. Such nonionic surfactants are commercially available under the trade name Tergitol® from Union Carbide Corp., Danbury, Conn. Specific examples of such commercially available nonionic surfactants of the foregoing type are C_{11} - C_{15} secondary alkanols condensed with either 9 moles of

ethylene oxide (Tergitol® 15-S-9) or 12 moles of ethylene oxide (Tergitol® 15-S-12) marketed by Union Carbide Corp., (Danbury, Conn.).

[0030] Other suitable nonionic surfactants include the polyethylene oxide condensates of one mole of alkyl phenol containing from about 8 to 18 carbon atoms in a straight- or branched chain alkyl group with about 5 to 30 moles of ethylene oxide. Specific examples of alkyl phenol ethoxylates include nonyl condensed with about 9.5 moles of ethylene oxide per mole of nonyl phenol, dinonyl phenol condensed with about 12 moles of ethylene oxide per mole of phenol, dinonyl phenol condensed with about 15 moles of ethylene oxide per mole of phenol and diisooctylphenol condensed with about 15 moles of ethylene oxide per mole of phenol. Commercially available nonionic surfactants of this type include Igepal® CO-630 (a nonyl phenol ethoxylate) marketed by ISP Corp. (Wayne, N.J.). Suitable nonionic ethoxylated octyl and nonyl phenols include those having from about 7 to about 13 ethoxy units.

[0031] In addition to nonionic surfactants, the silicone emulsion may also other types of surfactants. For instance, in some embodiments, amphoteric surfactants may also be used. For instance, one class of amphoteric surfactants that may be used in the present invention are derivatives of secondary and tertiary amines having aliphatic radicals that are straight chain or branched, wherein one of the aliphatic substituents contains from about 8 to 18 carbon atoms and at least one of the aliphatic substituents contains an anionic water-solubilizing group, such as a carboxy, sulfonate, or sulfate group. Some examples of amphoteric surfactants include, but are not limited to, sodium 3-(dodecylamino)propionate, sodium 3-(dodecylamino)-propane-1-sulfonate, sodium 2-(dodecylamino)ethyl sulfate, sodium 2-(dimethylamino)octadecanoate, disodium 3-(N-carboxymethyl-dodecylamino)propane-1-sulfonate, disodium octadecyliminodiacetate, sodium 1-carboxymethyl-2-undecylimidazole, and sodium N, N-bis(2-hydroxyethyl)-2-sulfato-3-dodecoxypropylamine.

[0032] Additional classes of suitable amphoteric surfactants include phosphobetaines and the phosphitaines. For instance, some examples of such amphoteric surfactants include, but are not limited to, sodium coconut N-methyl taurate, sodium oleyl N-methyl taurate, sodium tall oil acid N-methyl taurate, sodium palmitoyl N-methyl taurate, cocodimethylcarboxymethylbetaine, lauryldimethylcarboxymethylbetaine, lauryldimethylcarboxyethylbetaine, cetyldimethylcarboxymethylbetaine, lauryl-bis-(2-hydroxyethyl)carboxymethylbetaine, oleyldimethylgamma-carboxypropylbetaine, lauryl-bis-(2-hydroxypropyl)-carboxyethylbetaine, cocoamidodimethylpropylsultaine, stearylamidodimethylpropylsultaine, laurylamido-bis-(2-hydroxyethyl)propylsultaine, di-sodium oleamide PEG-2 sulfosuccinate, TEA oleamide PEG-2 sulfosuccinate, disodium oleamide MEA sulfosuccinate, disodium oleamide MIPA sulfosuccinate, disodium ricinoleamide MEA sulfosuccinate, disodium undecylenamide MEA sulfosuccinate, disodium wheat germamido MEA sulfosuccinate, disodium wheat germamido PEG-2 sulfosuccinate, disodium isostearamide MEA sulfosuccinate, cocoamphoglycinate, cocoamphocarboxyglycinate, lauroamphoglycinate, lauroamphocarboxyglycinate, capryloamphocarboxyglycinate, cocoamphopropionate, cocoamphocarboxypropionate, lauroamphocarboxypropionate,

capryloamphocarboxypropionate, dihydroxyethyl tallow glycinate, cocoamido disodium 3-hydroxypropyl phosphobetaine, lauric myristic amido disodium 3-hydroxypropyl phosphobetaine, lauric myristic amido glyceryl phosphobetaine, lauric myristic amido carboxy disodium 3-hydroxypropyl phosphobetaine, cocoamido propyl monosodium phosphitaine, lauric myristic amido propyl monosodium phosphitaine, and mixtures thereof.

[0033] In certain instances, it may also be desired to utilize one or more anionic surfactants within the silicone emulsion. Suitable anionic surfactants include, but are not limited to, alkyl sulfates, alkyl ether sulfates, alkyl ether sulfonates, sulfate esters of an alkylphenoxy polyoxyethylene ethanol, alpha-olefin sulfonates, beta-alkoxy alkane sulfonates, alkyl lauryl sulfonates, alkyl monoglyceride sulfates, alkyl monoglyceride sulfonates, alkyl carbonates, alkyl ether carboxylates, fatty acids, sulfosuccinates, sarcosinates, octoxynol or nonoxynol phosphates, taurates, fatty taurides, fatty acid amide polyoxyethylene sulfates, isethionates, or mixtures thereof.

[0034] Particular examples of some suitable anionic surfactants include, but are not limited to, C₈-C₁₈ alkyl sulfates, C₈-C₁₈ fatty acid salts, C₈-C₁₈ alkyl ether sulfates having one or two moles of ethoxylation, C₈-C₁₈ alkamine oxides, C₈-C₁₈ alkoyl sarcosinates, C₈-C₁₈ sulfoacetates, C₈-C₁₈ sulfosuccinates, C₈-C₁₈ alkyl diphenyl oxide disulfonates, C₈-C₁₈ alkyl carbonates, C₈-C₁₈ alpha-olefin sulfonates, methyl ester sulfonates, and blends thereof. The C₈-C₁₈ alkyl group may be straight chain (e.g., lauryl) or branched (e.g., 2-ethylhexyl). The cation of the anionic surfactant may be an alkali metal (e.g., sodium or potassium), ammonium, C₁-C₄ alkylammonium (e.g., mono-, di-, tri), or C₁-C₃ alkanolammonium (e.g., mono-, di-, tri).

[0035] Specific examples of such anionic surfactants include, but are not limited to, lauryl sulfates, octyl sulfates, 2-ethylhexyl sulfates, lauramine oxide, decyl sulfates, tridecyl sulfates, cocoates, lauroyl sarcosinates, lauryl sulfosuccinates, linear C₁₀ diphenyl oxide disulfonates, lauryl sulfosuccinates, lauryl ether sulfates (1 and 2 moles ethylene oxide), myristyl sulfates, oleates, stearates, tallates, ricinoleates, cetyl sulfates, and similar surfactants.

[0036] Cationic surfactants, such as cetylpyridinium chloride, methylbenzethonium chloride, hexadecylpyridinium chloride, benzalkonium chloride, hexadecyltrimethylammonium chloride, dodecylpyridinium chloride, the corresponding bromides, a hydroxyethylheptadecylimidazolium halide, coconut alkyldimethylammonium betaine, and coco amino-propyl betaine, may also be used in the silicone emulsion.

[0037] The amount of surfactant utilized in the silicone emulsion may generally vary depending on the relative amounts of the other components present within the emulsion. When utilized, the surfactant may be present in the emulsion in an amount from about 0.001% to about 10% by weight of the silicone emulsion used to form the outer layer 36. In another embodiment, the surfactant may be present in an amount from about 0.001% to about 5% by weight of the silicone emulsion. In still another embodiment, the surfactant may be present in an amount from about 0.01% to about 1% by weight of the silicone emulsion. For example, in one particular embodiment, a nonionic surfactant may be present in the emulsion in an amount between about 0.001% to about 5% by weight of the silicone emulsion.

[0038] The silicone emulsion may also include one or more solvents. Usually, the silicone emulsion contains at least one aqueous solvent, such as water. The silicone emulsion may also contain non-aqueous solvents that, although not required, sometimes aid in dissolving certain components of the emulsion. Examples of some suitable non-aqueous solvents include, but are not limited to, glycols, such as propylene glycol, butylene glycol, triethylene glycol, hexylene glycol, polyethylene glycols, ethoxydiglycol, and dipropylene glycol; alcohols, such as ethanol, n-propanol, and isopropanol; triglycerides; ethyl acetate; acetone; triacetin; and combinations thereof. The amount of solvent utilized in the silicone emulsion may generally vary depending on the relative amounts of the other components present within the formulation. When utilized, the solvent is typically present in the formulation in an amount from about 20% to about 99.99% by weight of the silicone emulsion used to form the outer layer 36. In another embodiment, the solvent may be present in an amount from about 70% to about 98% by weight of the silicone emulsion.

[0039] The solids content of the outer layer 36 may generally be varied to achieve the desired gripping properties. For example, the silicone emulsion used to form the outer layer 36 may have a solids content of from about 0.1 weight % to about 10 weight %. In another embodiment, the silicone emulsion may have a solids content of from about 0.25 weight % to about 5 weight %. In still another embodiment, the silicone emulsion may have a solids content of from about 0.3 weight % to about 1.0 weight %. To lower the solids content of a commercially available silicone emulsion, for example, additional amounts of solvent may be utilized. By varying the solids content of the silicone emulsion, the presence of the silicone in the glove may be controlled. For example, to form a glove with a higher degree of gripping properties, the silicone emulsion used in such layer may have a relatively high solids content so that a greater percentage of the silicone is incorporated into the layer during the forming process. The thickness of the outer layer 36 may also vary. For example, the thickness may range from about 0.001 millimeters to about 0.4 millimeters. In another embodiment, the thickness may range from about 0.01 millimeters to about 0.30 millimeters. In still another embodiment, the thickness may range from about 0.01 millimeters to about 0.20 millimeters.

[0040] In one particular embodiment, the silicone emulsion is DC 365, which is a pre-emulsified silicone (35% solids content) that is commercially available from Dow Corning Corporation (Midland, Mich.) and believed to contain 40-70% water (aqueous solvent), 30-60% methyl-modified polydimethylsiloxane (silicone), 1-5% propylene glycol (non-aqueous solvent), 1-5% polyethylene glycol sorbitan monolaurate (nonionic surfactant), and 1-5% octylphenoxy polyethoxy ethanol (nonionic surfactant). In another embodiment, the silicone emulsion is SM 2140 (25% solids content), which is a pre-emulsified silicone that is commercially available from GE Silicones (Waterford, N.Y.) and believed to contain 30-60% water (aqueous solvent), 30-60% amino-modified dimethylpolysiloxane (silicone), 1-5% ethoxylated nonyl phenol (nonionic surfactant), 1-5% trimethyl-4-nonyloxypolyethyleneoxy ethanol (nonionic surfactant), and minor percentages of acetaldehyde, formaldehyde, and 1,4 dioxane. If desired, these pre-emulsified silicones may be diluted with water or other solvents prior to use in the outer layer 36.

[0041] Besides the outer layer 36 and the substrate body 24, the glove 20 may also contain other layers. For example, as shown in FIGS. 1-2, the glove 20 may contain a coating 26 that contacts the body of the user 22 during use. In this embodiment, the coating 26 includes a donning layer 30 overlying and contacting the substrate body 24 and a surfactant layer 32 overlying and contacting the donning layer 30.

[0042] The donning layer 30 may contain any of a variety of different elastomeric polymers that are capable of facilitating donning of the glove. Some examples of suitable materials for the donning layer 30 include, but are not limited to, polybutadienes (e.g., syndiotactic 1,2 polybutadiene), polyurethanes, halogenated copolymers, and the like. For instance, in one embodiment, an unsaturated styrene-isoprene (SIS) having tri- or radial-blocks may be utilized. In some embodiments, the SIS block copolymer has a polystyrene end block content of from about 10% to about 20% by weight of the total weight of the SIS block copolymer. In another embodiment, the SIS block copolymer has a polystyrene end block content of from about 15% to about 18% by weight, of the total weight of the SIS block copolymer. Moreover, the molecular weight of the polystyrene end blocks is typically at least about 5,000 grams per mole. Some examples of suitable mid-block unsaturated SIS block copolymers include, but are not limited to, Kraton® D1107 available from Kraton Polymers and Vector® 511 and Vector® 4111 available from Dexco Polymers of Houston, Tex.

[0043] Another suitable donning material is 1,2 polybutadiene (e.g., syndiotactic 1,2 polybutadiene). In one embodiment, for example, the donning layer 30 is formed from a solution that contains 5.0 weight % Presto Emulsion (15% solids), 2.0 weight % magnesium carbonate, 3.0 weight % compounded natural rubber latex, and 90.0 weight % deionized water. The "Presto Emulsion" is manufactured by Ortec, Inc. of Easley, S.C. and is an emulsion of 1,2 syndiotactic polybutadiene in toluene and water. Other examples of donning materials that may be utilized in the donning layer 30 may be described in U.S. Pat. No. 5,792, 531 to Littleton, et al., which is incorporated herein in its entirety by reference thereto for all purposes.

[0044] A lubricant 32 may also coat the donning layer 30 to aid in donning the article when the user's body is either wet or dry. The lubricant 32, for example, may include a cationic surfactant (e.g., cetyl pyridinium chloride), an anionic surfactant (e.g., sodium lauryl sulfate), a nonionic surfactant, and the like. For instance, in one embodiment, the lubricant 32 contains a quaternary ammonium compound, such as that available Goldschmidt Chemical Corp. of Dublin, Ohio under the trade name Verisoft BTMS, and a silicone emulsion, such as that obtained from General Electric Silicone under the trade name AF-60. Verisoft BTMS contains behnlyl trimethyl sulfate and cetyl alcohol, while AF-60 contains polydimethylsiloxane, acetaldehyde, and small percentages of emulsifiers. In another embodiment, the lubricant 32 contains a silicone emulsion that may be the same or different than the silicone emulsion used to form the outer layer 36. For example, in some embodiments, the lubricant layer 32 may contain DC 365 (Dow Corning) or SM 2140 (GE Silicones).

[0045] An elastomeric article made in accordance with the present invention may generally be formed using a variety of

processes known in the art. In fact, any process capable of making an elastomeric article may be utilized in the present invention. For example, elastomeric article formation techniques may utilize dipping, spraying, halogenation, drying, curing, as well as any other technique known in the art. In this regard, referring to **FIG. 3**, one embodiment of a method of dip-forming a glove will now be described in more detail. Although a batch process is described and shown herein, it should be understood that semi-batch and continuous processes may also be utilized in the present invention.

[0046] Initially, any well-known former, such as formers made from metals, ceramics, or plastics, is provided. The former is dried to remove water residue by conveying it through a preheated oven (not shown). The preheated former is then dipped into a bath containing a coagulant, a powder source, a surfactant, and water (illustrated as **62**). The coagulant may contain calcium ions (e.g., calcium nitrate) to break the protection system of the emulsion, thereby allowing the latex to deposit on the former. The powder may be calcium carbonate powder, which later acts as a release agent. The surfactant provides good wetting to avoid forming a meniscus and trapping air between the form and deposited latex, particularly in the cuff area. As noted above, the former has been preheated in the drying step and the residual heat dries off the water leaving, for example, calcium nitrate, calcium carbonate powder, and surfactant on the surface of the former. Other suitable coagulant solutions are also described in U.S. Pat. No. 4,310,928 to Joung, which is incorporated herein in its entirety by reference thereto for all purposes.

[0047] The coated former is then dipped into a tank containing a natural rubber latex bath (illustrated as **64**). The bath contains, for example, natural rubber latex, stabilizers, antioxidants, curing activators, organic accelerators, vulcanizers, and the like. The stabilizers are sometimes of the phosphate-type surfactants. The antioxidants may be the phenol type, for example, 2,2'-methylenebis (4-methyl-6-tert-butylphenol). The curing activator may be zinc oxide. The organic accelerator may be dithiocarbamate. The vulcanizer may be sulfur or a sulfur-containing compound. If these materials are used, the stabilizer, antioxidant, activator, accelerator and vulcanizer may be dispersed into water to avoid crumb formation by using a ball mill. This dispersion is then mixed into the latex. The former is dipped into one or more latex baths a sufficient number of times to build up the desired thickness on the former. By way of example, the substrate body **24** may have a thickness of from about 0.004 to about 0.012 inches.

[0048] A bead roll station (not shown) may, in some embodiments, be utilized to impart a cuff to the glove. For instance, the bead roll station may contain one or more bead rolls such that the former is indexed therethrough to be provided with cuffs. The latex-coated former is then dipped into a leaching tank in which hot water is circulated to remove the water-soluble components, such as residual calcium nitrates and proteins contained in the natural latex (not shown). This leaching process may continue for about twelve minutes with the tank water being about 120° F. Further, the latex-coated former may then be dipped into a solution to form the donning layer **30** of the glove (illustrated as numeral **66**). In one embodiment, for example, the

glove is inverted once again and then dipped into a composition of 1,2 syndiotactic polybutadiene.

[0049] Thereafter, the latex-coated former is sent to a curing station where the natural rubber is vulcanized, typically in an oven, thereby heat curing the rubber (not shown). The curing station initially evaporates any remaining water in the latex coating of the former and then proceeds to the higher temperature vulcanization. The drying may occur from about 85° C. to about 95° C., with a vulcanization step occurring at temperatures from about 110° C. to about 120° C. For example, in one embodiment, the gloves may be cured in a single oven at a temperature of 115° C. for about 20 minutes. If desired, the oven may be divided into four different zones with a former being conveyed through the zones of increasing temperature. One example is an oven having four zones with the first two zones being dedicated to drying and the second two zones being primarily the vulcanization step. Each of the zones may have a slightly higher temperature, for example, the first zone at about 80° C., the second zone at about 95° C., a third zone at about 105° C., and a final zone at about 115° C. The residence time of the former within a zone in this case may be about ten minutes or so. The accelerator and vulcanizer contained in the latex coating of the former are used to cross-link the natural rubber therein. The vulcanizer forms sulfur bridges between different rubber segments and the accelerator is used to speed up sulfur bridge formation.

[0050] Upon being cured, the former may then be transferred to a stripping station (not shown). The stripping station may involve automatic or manual removal of the glove from the former. For example, in one embodiment, the glove is manually removed from the former by turning the glove inside-out as it is stripped from the former. Optionally, after being removed from the former, the glove may be rinsed in water.

[0051] In accordance with the present invention, a silicone emulsion may then be applied to enhance the gripping properties of the glove. For example, in one embodiment, a silicone emulsion (e.g., DC 365) is first thoroughly mixed with water using a high shear mixer to achieve a homogeneous solution having the desired solids content. Thereafter, the resulting emulsion may then be applied to the grip surface of the glove in a variety of different ways. For instance, in one embodiment, the glove is immersed in a tumbler for a certain period of time (e.g., 1-10 minutes) during which the grip surface of the glove is rinsed with the silicone emulsion (illustrated as **68**). Alternatively, the grip surface of the glove may be sprayed with the silicone emulsion using a conventional spray nozzle. Once applied with the silicone emulsion, the silicone-coated glove is then dried (illustrated as numeral **70**). For example, in some embodiments, the silicone-coated glove may be dried at a temperature of from about 20° C. to about 200° C., and in some embodiments, from about 35° C. to about 115° C.

[0052] After the drying process, the glove is then inverted and halogenated (illustrated as numeral **72**). The halogenation (e.g., chlorination) may be performed in any suitable manner known to those skilled in the art. Such methods include (1) direct injection of chlorine gas into a water mixture, (2) mixing high density bleaching powder and aluminum chloride in water, (3) brine electrolysis to produce chlorinated water, and (4) acidified bleach. Examples of

such methods are described in U.S. Pat. No. 3,411,982 to Kavalir; U.S. Pat. No. 3,740,262 to Agostinelli; U.S. Pat. No. 3,992,221 to Homsy, et al.; U.S. Pat. No. 4,597,108 to Momose; and U.S. Pat. No. 4,851,266 to Momose, U.S. Pat. No. 5,792,531 to Littleton, et al., which are incorporated herein in their entirety by reference thereto for all purposes. In one embodiment, for example, chlorine gas is injected into a water stream and then fed into a chlorinator (a closed vessel) containing the glove. The concentration of chlorine may be monitored and controlled to control the degree of chlorination. The chlorine concentration is typically at least about 100 ppm, in some embodiments from about 200 ppm to about 3500 ppm, and in some embodiments, from about 300 ppm to about 600 ppm, e.g., about 400 ppm. The time duration of the chlorination step may also be controlled to control the degree of chlorination and may range, for example, from about 1 to about 10 minutes, e.g., 4 minutes. Due to the silicone emulsion applied to the grip surface, chlorination will generally occur to a much greater extent on the wearer-contacting surface, i.e., the donning side of the glove, than on the grip surface of the glove.

[0053] Still within the chlorinator, the chlorinated glove may then be rinsed with tap water at about room temperature (not shown). This rinse cycle may be repeated as necessary. Once all water is removed, the glove is tumbled to drain excess water.

[0054] A lubricant solution may then be added into the chlorinator containing the glove that is then tumbled for about five minutes (illustrated as numeral 74). This coats the donning side with the lubricant solution to form the lubricant layer 32. In one embodiment, for example, the lubricant layer 32 may contain a silicone emulsion that may be the same as the silicone emulsion used to form the outer layer 36, e.g., DC 365 (Dow Corning) or SM 2140 (GE Silicones), which are described in detail above. The lubricant solution is drained from the chlorinator and may be reused if desired.

[0055] The coated glove is then put into a drier and dried from about 10 to 60 minutes (e.g., 40 minutes) at from about 20° C. to about 80° C. (e.g., 40° C.) to dry the donning surface (not shown). The glove is then reinverted and the grip surface is dried from about 20 to 100 minutes (e.g., 60 minutes) at from about 20° C. to about 80° C. (e.g., 40° C.).

[0056] Although various constructions and techniques for forming elastomeric articles have been described above, it should be understood that the present invention is not limited to any particular construction or technique for forming the article. For example, the layers described above may not be utilized in all instances. Additionally, other layers not specifically referred to above may be utilized in the present invention.

[0057] Thus, as discussed above, a silicone emulsion may be used to form an outer layer of a glove to enhance its gripping characteristics. Specifically, it is believed that the silicone emulsion may inhibit the ability of halogen atoms to bond with the elastomeric material of the substrate, thereby limiting the level of slipperiness usually imparted during chlorination. Surprisingly, it has been discovered that the materials often used to enhance wet lubricity of the wearer-contacting surface may have the opposite effect when used to form the outer layer of the glove. This discovery not only enables the gripping properties of the glove to be enhanced, but also allows for the potential of using the same material for the lubricant layer on the wearer-contacting surface and for the outer layer on the grip surface, thereby reducing costs and enhancing process efficiency.

[0058] The present invention may be better understood with reference to the following examples.

EXAMPLE 1

[0059] The ability to form an elastomeric glove in accordance with the present invention was demonstrated. Initially, a pre-heated, glove-shaped former was dipped into a coagulant solution that contained calcium nitrate, calcium carbonate, a surfactant, and water. The coated former was then dipped into a dip tank containing compounded, pre-vulcanized natural rubber latex. After dipping, the former was removed from the natural rubber latex dip tank and leached with water. The latex-coated former was then dipped into a solution containing 5.0 weight % of a 1,2 syndiotactic polybutadiene emulsion (15 weight % solids), 3.0 weight % compounded natural rubber latex, 2.0 weight % magnesium carbonate, and 90.0 weight % water to form the donning layer of the glove. Thereafter, the latex-coated former was cured in an oven at a temperature of 115° C. for about 20 minutes. The glove was manually removed from the former by turning the glove inside-out as it was stripped from its corresponding former. After being removed from the former, the glove was also rinsed in deionized water. The thickness of the resulting glove was 0.25 millimeters.

[0060] To enhance the gripping properties of the outer surface, 1.5 grams of DC 365 (35% solids content) was added per 98.5 grams of water to achieve a homogeneous solution having a solids content of 0.5%. The glove was then immersed in a tumbler for 5 minutes that was injected with the diluted DC 365 emulsion. Once applied with the silicone emulsion, the glove was then dried for 45 minutes at about 80° C.

[0061] After the drying process, the glove was turned inside out and placed into a chlorinator. Chlorine gas mixed with a water stream was injected into the chlorinator to chlorinate the donning surface of the glove. The chlorine concentration was 400 ppm and the pH was 1.74. The glove was immersed in the chlorine solution for 2 minutes. In this particular example, cetyl pyridinium chloride was also added to the chlorine solution at a concentration of 0.25% by weight of the solution. After chlorination, the glove was inverted and dried at a temperature of about 80° C. for 45 minutes.

[0062] The glove sample described above was then tested to determine the gripping characteristics of the glove. Specifically, the glove was first donned on a wet hand. After donning the glove, the wearer was asked to rate the tackiness of the gripping surface of the glove on a scale from 1 to 5, with 4 representing optimum tackiness.

[0063] Specifically, the rating scale is set forth in more detail below:

Grip (Tackiness) Rating Scale		
Rating	Description	Example
5	Failed	Grip is too tacky, fingers stick together
4	Excellent	Optimum grip
3	Acceptable	Acceptable grip
2	Poor	Grip is too slick to handle instruments
1	Failed	Very slippery

[0064] 15-30 samples were tested. It was determined that the average grip rating for the samples was between 2 to 3.

EXAMPLE 2

[0065] A glove was formed as set forth above in Example 1, except that the silicone emulsion applied to the outer surface was formed by adding 2.65 grams of DC 365 (35 weight % solids content) per 97.35 grams of water to achieve a homogeneous solution having a solids content of 0.9%.

[0066] The glove sample described above was then tested as set forth in Example 1 to determine the gripping characteristics of the glove. It was determined that the grip rating was 3.

EXAMPLE 3

[0067] A glove was formed as set forth above in Example 1, except that chlorination was conducted at a chlorine concentration of 400 ppm for 4 minutes. After chlorination, the glove was rinsed (soft water and deionized water). A DC 365 solution (1.5 weight % solids content) was then applied to the donning surface of the glove as a lubricant layer using a tumbling process. Specifically, 4.28 grams of DC 365 (35% solids content) was added per 95.72 grams of water to achieve a homogeneous solution having a solids content of 1.5%. The glove was then immersed in a tumbler for 5 minutes that was injected with the diluted DC 365 emulsion. The glove was then dried at 40° C. for 40 minutes, inverted, and dried again at 40° C. for 60 minutes.

[0068] The glove sample described above was then tested as set forth in Example 1 to determine the gripping characteristics of the glove. It was determined that the grip rating was 3.

EXAMPLE 4

[0069] A glove was formed as set forth above in Example 1, except that chlorination was conducted at a chlorine concentration of 400 ppm for 4 minutes. After chlorination, the glove was rinsed (soft water and deionized water). A SM 2140 solution (1.0 weight % solids content) was applied to the donning surface of the glove as a lubricant layer using a tumbling process. Specifically, 4 grams of SM 2140 (25% solids content) was added per 96 grams of water to achieve a homogeneous solution having a solids content of 1.0%. The glove was then immersed in a tumbler for 5 minutes that was injected with the diluted SM 2140 emulsion. The glove was then dried at 55° C. for 40 minutes, inverted, and dried again at 55° C. for 60 minutes.

[0070] The glove sample described above was then tested as set forth in Example 1 to determine the gripping characteristics of the glove. It was determined that the grip rating was 3.

EXAMPLE 5

[0071] The ability to form an elastomeric glove in accordance with the present invention was demonstrated. Initially, a pre-heated, glove-shaped former was dipped into a coagulant solution that contained calcium nitrate, calcium carbonate, a surfactant, and water. The coated former was then dipped into a dip tank containing compounded, pre-vulcanized natural rubber latex. After dipping, the former was removed from the natural rubber latex dip tank and leached with water. The latex-coated former was then dipped into a solution containing 5.0 weight % of a 1,2 syndiotactic

polybutadiene emulsion (15 weight % solids), 3.0 weight % compounded natural rubber latex, 2.0 weight % magnesium carbonate, and 90.0 weight % water to form the donning layer of the glove. Thereafter, the latex-coated former was cured in an oven at a temperature of 115° C. for about 20 minutes. The glove was manually removed from the former by turning the glove inside-out as it was stripped from its corresponding former. After being removed from the former, the glove was also rinsed in deionized water. The thickness of the resulting glove was 0.25 millimeters.

[0072] To enhance the gripping properties of the outer surface, 0.86-1.14 grams of DC 365 (35% solids content) was added per 98.86-99.14 grams of water to achieve a homogeneous solution having a solids content of 0.3-0.4%. The glove was then immersed in a tumbler for 4 minutes that was injected with the diluted DC 365 emulsion. Once applied with the silicone emulsion, the glove was then dried for 40 minutes at 40° C.

[0073] After the drying process, the glove was turned inside out and placed into a chlorinator. Chlorine gas mixed with a water stream was injected into the chlorinator to chlorinate the donning surface of the glove. The chlorine concentration was 400 ppm and the pH was 1.74. The glove was immersed in the chlorine solution for 6 minutes. After chlorination, the glove was rinsed (soft water and deionized water). A SM 2140 (GE Silicones) was then applied to the donning surface of the glove using a tumbling process. Specifically, 1.2-1.6 grams of SM 2140 (25% solids content) was added per 98.4-98.8 grams of water to achieve a homogeneous solution having a solids content of 0.3-0.4%. The glove was then immersed in a tumbler for 4 minutes that was injected with the diluted SM 2140 emulsion. The glove was then dried at 55° C. for 40 minutes, inverted, and dried again at 55° C. for 60 minutes.

[0074] The glove sample described above was then tested as set forth in Example 1 to determine the gripping characteristics of the glove. It was determined that the grip rating was 3.

[0075] While the invention has been described in detail with respect to the specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive of alterations to, variations of, and equivalents to these embodiments. Accordingly, the scope of the present invention should be assessed as that of the appended claims and any equivalents thereto.

What is claimed is:

1. An elastomeric glove defining a wearer-contacting surface and a grip surface, said glove comprising:

a substrate body including a layer made of an elastomeric material, said substrate body having an inside surface and an outside surface; and

an outer layer overlying the outside surface of said substrate body and forming the grip surface of the glove, said outer layer being formed from a silicone emulsion, wherein said silicone emulsion has a solids content of from about 0.1 weight % to about 10 weight %.

2. An elastomeric glove as defined in claim 1, wherein said silicone emulsion contains a polysiloxane having at least one functional group selected from the group consist-

ing of amino, carboxyl, hydroxyl, ether, polyether, aldehyde, ketone, amide, ester, thiol groups, and combinations thereof.

3. An elastomeric glove as defined in claim 1, wherein said silicone emulsion contains at least one emulsifying surfactant.

4. An elastomeric glove as defined in claim 1, wherein said silicone emulsion has a solids content of from about 0.25 weight % to about 5 weight %.

5. An elastomeric glove as defined in claim 1, wherein said silicone emulsion has a solids content of from about 0.3 weight % to about 1.0 weight %.

6. An elastomeric glove as defined in claim 1, wherein the elastomeric material of said substrate body is selected from the group consisting of styrene-ethylene-butylene-styrene block copolymers, styrene-isoprene-styrene block copolymers, styrene-butadiene-styrene block copolymers, styrene-isoprene block copolymers, styrene-butadiene block copolymers, natural rubber latex, nitrile rubbers, isoprene rubbers, chloroprene rubbers, polyvinyl chlorides, silicone rubbers, and combinations thereof.

7. An elastomeric glove as defined in claim 6, wherein the elastomeric material of said substrate body is natural rubber latex.

8. An elastomeric glove as defined in claim 1, further comprising a donning layer that overlies the inside surface of said substrate body.

9. An elastomeric glove as defined in claim 8, wherein said donning layer contains a donning polymer that is halogenated.

10. An elastomeric glove as defined in claim 9, further comprising a lubricant that coats the donning layer.

11. An elastomeric glove defining a wearer-contacting surface and a grip surface, said glove comprising:

a substrate body including a layer made of an elastomeric material, said substrate body having an inside surface and an outside surface;

a donning layer overlying the inside surface of said substrate body, said donning layer comprising a donning polymer that is chlorinated; and

an outer layer overlying the outside surface of said substrate body and forming the grip surface of the glove, said outer layer being formed from a silicone emulsion.

12. An elastomeric glove as defined in claim 11, wherein said silicone emulsion contains a polysiloxane having at least one functional group selected from the group consisting of amino, carboxyl, hydroxyl, ether, polyether, aldehyde, ketone, amide, ester, thiol groups, and combinations thereof.

13. An elastomeric glove as defined in claim 11, wherein said silicone emulsion has a solids content of from about 0.1 weight % to about 10 weight %.

14. An elastomeric glove as defined in claim 11, wherein said silicone emulsion has a solids content of from about 0.25 weight % to about 5 weight %.

15. An elastomeric glove as defined in claim 11, wherein said silicone emulsion has a solids content of from about 0.3 weight % to about 1.0 weight %.

16. An elastomeric glove as defined in claim 11, wherein the elastomeric material of said substrate body is selected from the group consisting of styrene-ethylene-butylene-styrene block copolymers, styrene-isoprene-styrene block copolymers, styrene-butadiene-styrene block copolymers, styrene-isoprene block copolymers, styrene-butadiene block copolymers, natural rubber latex, nitrile rubbers, isoprene

rubbers, chloroprene rubbers, polyvinyl chlorides, silicone rubbers, and combinations thereof.

17. An elastomeric glove as defined in claim 16, wherein the elastomeric material of said substrate body is natural rubber latex.

18. An elastomeric glove as defined in claim 11, further comprising a lubricant that coats said donning layer.

19. An elastomeric glove defining a wearer-contacting surface and a grip surface, said glove comprising:

a substrate body including a layer made of an elastomeric material, said substrate body having an outside surface; and

an outer layer overlying the outside surface of said substrate body and forming the grip surface of the glove, said outer layer being formed primarily from a silicone emulsion, wherein said silicone emulsion has a solids content of from about 0.1 weight % to about 10 weight %.

20. A method for enhancing the gripping properties of an elastomeric glove, said method comprising:

providing an elastomeric glove that contains a substrate body having a layer made of an elastomeric material, said substrate body having an inside surface and an outside surface, said elastomeric glove further containing a donning layer that overlies the inside surface of said substrate body;

applying a silicone emulsion to the substrate body so that said emulsion coats the outside surface of said substrate body; and

thereafter, exposing a halogen-containing compound to the elastomeric glove.

21. A method as defined in claim 20, wherein said silicone emulsion contains a polysiloxane having at least functional group selected from the group consisting of amino, carboxyl, hydroxyl, ether, polyether, aldehyde, ketone, amide, ester, thiol groups, and combinations thereof.

22. A method as defined in claim 20, wherein said silicone emulsion has a solids content of from about 0.1 weight % to about 10 weight %.

23. A method as defined in claim 20, wherein said silicone emulsion has a solids content of from about 0.25 weight % to about 5 weight %.

24. A method as defined in claim 20, wherein said silicone emulsion has a solids content of from about 0.3 weight % to about 1.0 weight %.

25. A method as defined in claim 20, wherein the elastomeric material of said substrate body is selected from the group consisting of styrene-ethylene-butylene-styrene block copolymers, styrene-isoprene-styrene block copolymers, styrene-butadiene-styrene block copolymers, styrene-isoprene block copolymers, styrene-butadiene block copolymers, natural rubber latex, nitrile rubbers, isoprene rubbers, chloroprene rubbers, polyvinyl chlorides, silicone rubbers, and combinations thereof.

26. A method as defined in claim 25, wherein the elastomeric material of said substrate body is natural rubber latex.

27. A method as defined in claim 20, wherein said donning layer contains a donning polymer that is halogenated.

28. A method as defined in claim 20, wherein the halogen of said halogen-containing compound is chlorine.

29. A method as defined in claim 20, further comprising applying a lubricant to coat said donning layer.