KNITTED GLOVES HAVING A SINGLE LAYER WITH A PLURALITY OF YARNS

Inventors: Sean Sweeney, Jackson, NJ (US); Eric Thompson, Central, SC (US); James H. Moreland, Central, SC (US); Cherlyn N. Nelson, Seneca, SC (US); Steven M. York, Avon, IN (US); Norberto Hector Perales Solis, Ciudad Juarez (MX); Chris Barmore, Maynard, MA (US)

Correspondence Address:
DIEHL SERVILLA LLC
33 WOOD AVE SOUTH, SECOND FLOOR, SUITE 210
ISELIN, NJ 08830 (US)

Assignee: Ansell Healthcare Products LLC, Red Bank, NJ (US)

Appl. No.: 12/769,829

Filed: Apr. 29, 2010

Related U.S. Application Data:

Publication Classification
Int. Cl. A41F 19/00 (2006.01)

U.S. Cl. 2/167

ABSTRACT
A seamless, single layer, multi-yarn glove or glove liner is disclosed. The glove or glove liner includes a first type of yarn and a second type of yarn that is different from the first type of yarn. The glove or glove liner has a single layer that includes the first type of yarn and the second type of yarn knitted together to form a hand-like structure that includes a thumb section, a plurality of finger sections and a palm section. The first type of yarn is different that the second type of yarn. For example, the first type of yarn may be a cut resistant yarn and the second type of yarn may be an inexpensive elastic yarn such as Spandex. Gloves suitable for use by carpenters, electricians, HVAC handlers, laborers, masons, and plumbers are also provided. Methods of using these gloves are also provided.
FIG. 51

FIG. 52
KNITTED GLOVES HAVING A SINGLE LAYER WITH A PLURALITY OF YARNS

CROSS-REFERENCE TO RELATED APPLICATIONS


FIELD

[0002] The present invention relates to knitted gloves and knitted glove liners having a single layer and an elastomeric coating. In specific embodiments, gloves suitable for use by carpenters, electricians, HVAC technicians, laborers, masons, and plumbers are provided.

BACKGROUND

[0003] The importance of gloves in protecting the hands of today’s work force is growing. For example, many gloves are now incorporating cut resistant high performance yarns to provide cut protection to persons wearing the glove. Known gloves, particularly those providing increased functionality typically have multiple plies or layers to incorporate the different types of yarns required. Alternatively, known gloves rely on reinforced areas to incorporate the different types of yarns required.

[0004] Existing gloves that incorporate multiple types of yarns are therefore expensive because of the extra plies and layers used in the manufacturing process. Further the extra plies and layers in the gloves frequently can have a cost in performance. For example, gloves having extra plies and layers often have decrease dexterity because of the thickness of the layers. The thickness in the layers can contribute to less than optimum breathing capability of a glove as well.

[0005] In addition, there is increased interest in providing glove protection that is adapted to the specific needs of a specific end-user, particularly those employed in the commercial trades such as carpenters, laborers, HVAC technicians, electricians, masons, and plumbers. Each of these professions has specific needs in terms of sweat management, impact resistance, thermal protection (from heat and/or cold), vibration dampening, abrasion resistance, grip, puncture resistance, dexterity and cut resistance which are based on the conditions of the work environment and the materials handled in the particular occupation.

[0006] Thus, there is a continuing need for gloves and glove liners that are specifically suitable for specific trades.

SUMMARY

[0007] Provided are protective knitted gloves and liners having a single layer of at least two different yarns. Methods of protecting hands by wearing gloves provided herein are also provided. In one aspect, a knitted glove that includes a first type of yarn and a second type of yarn is provided. This glove is continuously knit, which simplifies processing steps and any need for manual handling of the glove to incorporate a second type of yarn. The first type of yarn is different than the second type of yarn. The glove includes a single layer that includes the first type of yarn and the second type of yarn knitted together to form a hand-like structure. The hand-like structure typically includes a thumb section, a plurality of finger sections and a palm section. In a further aspect, the thumb section, the plurality of finger sections and the palm sections are seamless, including the interface between each of these sections. In another aspect, the difference between the first yarn and the second yarn is the color of the yarns. Alternatively, entirely different types of yarns can be used in the single layer of the knitted glove. For example, the first yarn can be a cut resistant yarn and the second yarn can be a standard elastic yarn, such as spandex, which is not cut resistant. The cut resistant yarn can be, for example, Dynema or Kevlar.

[0008] The glove may also optionally include a coating over at least a part of the single knitted ply. The coating can be made from a natural rubber latex or synthetic rubber latex, or other elastomeric polymer coatings. The coating can be applied by dipping the knitted glove into the coating material or by spraying the coating onto the glove. Coating the knitted gloves can improve the grip of the glove in handling dry and oily items when the coating is on the outside of the glove. The coating can be, by way of example only, polyurethane, nitrile, carboxylated acrylonitrile butadiene, PVC; the coating can be unfouled or foamed.

[0009] The glove may also optionally include a cuff section attached to the palm section. There can also be a slit in the cuff section. A strap can be provided on the cuff section. Velcro can be provided on the strap and on the cuff section to allow the strap to be secured. The strap can be formed of comfortable material such as neoprene.

[0010] The different yarns in the single knitted layer of the glove can be provided anywhere in the glove. For example, the first yarn and the second yarn can be in a single layer in the thumb section. Additionally, the first yarn and the second yarn can be in the single layer in one of the finger sections. Further, the first yarn can be in the single knitted layer in one of the finger sections and the second yarn can be in the same single knitted layer in another of the finger sections. Also, the first yarn and the second yarn can be in the single knitted layer in the palm section.

[0011] In other aspects, the first yarn can be provided in the single layer in the thumb section and the second yarn can be provided in the single knitted layer in either one of the plurality of finger sections or in the palm section. Also, the first yarn can be provided in the single knitted layer in the palm section and the second yarn can be provided in the single knitted layer in one of the plurality of finger sections.

[0012] The glove, in a further aspect, can also include only the knitted single layer without any reinforced areas.

DESCRIPTION OF THE DRAWINGS

[0013] The following description of the figures provides non-limiting embodiments that shall serve to illustrate various aspects of the present invention that can be used alone or in combinations.

[0014] FIG. 1 illustrates a glove having a knitted continuous single layer with two different yarns;

[0015] FIG. 2 illustrates a section of a glove showing integration of two different yarns into a single layer;

[0016] FIG. 3 illustrates further aspects of a glove;

[0017] FIG. 4 illustrates a glove having a strap around its cuff;
[0018] FIGS. 5A and 5B illustrate each side of a glove with multiple zones, each of which can be made with one or more different types of yarns;
[0019] FIG. 6 further illustrates the construction of an exemplary protective glove;
[0020] FIG. 7 illustrates a tab of a glove;
[0021] FIGS. 8A, 8B, and 9 further illustrate a tab of a glove;
[0022] FIGS. 10 and 11 illustrate a glove with knuckle protection;
[0023] FIG. 12 illustrates a pair of carpenter’s gloves;
[0024] FIGS. 13 and 14 illustrate knitted liners having two types of yarns in a single layer for use with, for example, gloves for carpenters, laborers, masons, and/or plumbers;
[0025] FIG. 15 illustrates knitted liners of carpenter’s and/or plumber’s gloves after a dipping process;
[0026] FIG. 16 illustrates carpenter’s and/or plumber’s gloves after additional materials have been added;
[0027] FIGS. 17, 18, and 19 illustrate further details of a cuff construction;
[0028] FIG. 20 further illustrates carpenter’s gloves;
[0029] FIG. 21 illustrates a pair of electrician’s gloves;
[0030] FIGS. 22 and 23 illustrate knitted liners having two types of yarns in a single layer;
[0031] FIG. 24 illustrates knitted liners after a dipping process;
[0032] FIG. 25 illustrates electrician’s gloves after additional materials have been added;
[0033] FIG. 26 further illustrates electrician’s gloves;
[0034] FIG. 27 illustrates another pair of electrician’s gloves;
[0035] FIG. 28 illustrates knitted liners of electrician’s gloves having two types of yarns in a single layer; and platting;
[0036] FIG. 29 illustrates knitted liners after a dipping process;
[0037] FIG. 30 illustrates electrician’s and/or HVAC technician’s gloves after additional materials have been added;
[0038] FIG. 31 further illustrates electrician’s gloves;
[0039] FIG. 32 illustrates a pair of HVAC technician’s gloves;
[0040] FIG. 33 illustrates knitted liners of HVAC technician’s gloves;
[0041] FIG. 34 illustrates knitted liners after a dipping process;
[0042] FIG. 35 illustrates HVAC technician’s gloves after additional materials have been added;
[0043] FIG. 36 further illustrates a pair of HVAC technician’s gloves;
[0044] FIG. 37 illustrates another pair of HVAC technician’s gloves;
[0045] FIGS. 38-39 illustrate knitted liners of HVAC technician’s gloves;
[0046] FIG. 40 illustrates knitted liners after a dipping process;
[0047] FIG. 41 further illustrates an HVAC technician’s glove;
[0048] FIG. 42 illustrates a pair of laborer’s gloves;
[0049] FIG. 43 illustrates knitted liners having padding in selected areas;
[0050] FIG. 44 illustrates knitted liners having microdotting;
[0051] FIG. 45 illustrates knitted liners after a dipping process;
[0052] FIG. 46 illustrates laborer’s gloves after additional materials have been added;
[0053] FIG. 47 illustrates further detail of the laborer’s gloves;
[0054] FIG. 48 illustrates a pair of mason’s gloves;
[0055] FIG. 49 illustrates knitted liners of the pair of mason’s gloves having padding;
[0056] FIG. 50 illustrates knitted liners having microdotting;
[0057] FIG. 51 illustrates knitted liners after a dipping process;
[0058] FIG. 52 illustrates mason’s gloves after additional materials have been added;
[0059] FIG. 53 illustrates further detail of the mason’s glove;
[0060] FIG. 54 illustrates another mason’s glove;
[0061] FIG. 55 illustrates a pair of plumber’s gloves;
[0062] FIG. 56 illustrates knitted liners after a dipping process;
[0063] FIG. 57 illustrates plumber’s gloves after additional materials have been added;
[0064] FIG. 58 illustrates another pair of plumber’s gloves;
[0065] FIG. 59 illustrates plumber’s gloves after additional materials have been added; and
[0066] FIG. 60 further illustrates plumber’s gloves.

DETAILED DESCRIPTION

[0067] Gloves provided are suitable for comfortably working for long periods of time handling tools, fine instruments, wires, piping, small and large mechanical parts where dexterity and hand protection are needed. Such gloves provide multiple functionalities in a single ply of knit. The use of multiple colors, for example, can provide visual indicators for safety purposes. The use of cut resistant yarns in targeted areas, for another example, provide protection where needed while using lower cost and potentially more comfortable yarns in other areas. Gloves provide one or more of sweat management, dexterity, cut resistance, puncture resistance, impact resistance, thermal protection, vibration resistance, and grip. Methods of protecting hands and handling tools and equipment comprise wearing these gloves.

[0068] Turning to the figures, FIG. 1 illustrates a glove 10 having a thumb section 12, a plurality of finger sections 14, 16, 18 and 20 and a palm section 22. The glove 10 can also be a glove liner. The glove 10 or glove liner includes only a single layer of at least two knitted yarns. Thus, in one aspect, there is no second layer of knitted yarns. Also, in another aspect, there are no reinforced patches attached to the single layer of knitted yarns that the glove 10 comprises. As desired, however, the glove 10 or glove liner can also be used as a single knitted layer in a multi-layer glove or with reinforced patches.

[0069] The glove 10, as illustrated in FIG. 1, includes two different types of yarns. The first yarn is shown in the figure by a first texture depicted in the thumb section 12, in the finger sections 14, 16, 18 and 20 and in the lower palm section 22. The second yarn is shown in the figure by a second texture depicted in the upper palm section 24.

[0070] The first yarn is different from the second yarn. The first and second yarns can differ in color. Thus, as depicted in FIG. 1, the yarn in the upper palm section 24 can be darker than the yarns used in the thumb section 12, in the finger sections 14, 16, 18 and 20 and in the lower palm section 22. Such a color difference can be implemented in unlimited variations among any area(s) of the glove 10. Further, more
than two yarns having differing properties such as color can be used in any area of the glove 10.  

[0071] The different colored yarns can be used in any desired combination in any part of the glove 10 to provide a unique look. Additionally, the different colored yarns can be used in any desired combination in any part of the glove 10 to provide additional functionality. Thus, for example, if it was desired to highlight the index finger 14 to assist a wearer of the glove 10 in some fashion, the index finger 14 can be made with a first yarn having a first color and the rest of the glove 10, including the thumb section 12, the finger sections 16, 18 and 20 and the upper and lower palm sections 22 and 24, could be made with a yarn having a second color. Other areas of the single layer glove 10 can be highlighted in a similar fashion by knitting two different yarns together into a single layer.

[0072] If different functionality is required in different parts of the glove, two different yarns having different functional properties can be incorporated into the single layer of the glove 10 in certain aspects. Thus, if it is important to provide cut resistance to the fingers only, including the thumb, then the thumb section 12 and the finger sections 14, 16, 18 and 20 can be a cut resistant yarn, such as an ultra high molecular weight polyethylene (UHMWPE) (sold, for example, under the trade name Dyneema® or a para-aramid (sold, for example, under the trade name Kevlar®) or any other cut resistant yarn. In conjunction with this, the upper and lower palm sections 22 and 24 could be a low cost elastic yarn. By way of example, the low cost elastic yarn can be spandex (sold under the trade name Lycra®).

[0073] In another aspect, a first yarn having a first characteristic such as cut resistance and a second yarn having a different characteristic, such as abrasion, can be knitted together into a single layer, and can be used in any part of the glove 10. Thus, a unique combination of characteristics—cut resistance and moisture absorption—can be obtained.

[0074] FIG. 2 illustrates a section of a glove where the integration of two different yarns into a layer of a glove is shown. Six rows of yarns are shown in FIG. 2, including rows 40, 42, 44, 46, 48, and 50, where the row follows the path of the yarn. Only the top of the yarn in row 40 is shown and only the bottom of the yard in row 50 is shown. A first yarn is used in rows 40, 42 and 44, which are knitted together using standard knitting techniques, as shown in FIG. 2. A second yarn different from the first yarn is used in rows 46, 48, and 50. This is indicated by the contrasting color of the rows 46, 48, and 50. This is accomplished by instructing a knitting machine to introduce the new yarn into the rows 46, 48, and 50, and by knitting the different yarns together in the glove 10 as illustrated. As previously described, the yarn in rows 40, 42 and 44 can differ in color from the yarn in rows 46, 48, and 50. Alternatively, the yarn in rows 40, 42 and 44 can be a low cost elastic yarn such as spandex while the yarn introduced in rows 46, 48, and 50 can be a higher performance yarn such as Kevlar or Dyneema.

[0075] Another combination can be the use of a yarn having a high absorption rate, such as wool, in rows 40, 42 and 44 and the use of a high performance, cut resistant yarn, such as Kevlar or Dyneema in rows 46, 48, and 50. Other combinations are possible.

[0076] Another combination can be the use of a yarn having a high absorption rate, such as wool, in rows 40, 42 and 44 and the use of a high performance, cut resistant yarn, such as Kevlar or Dyneema in rows 46, 48, and 50. Other combinations are possible.

[0077] For example, the first yarn used in rows 40, 42 and 44 could be a cut resistant yarn and the second yarn used in rows 46, 48, and 50 could be an abrasion resistant yarn. Thus, the cut resistant yarn could be Kevlar or Dyneema or wire-containing. The abrasion resistant yarns are made from a material able to withstand the effects of wear. In an aspect, abrasion resistant yarns include a high hardness material such as fiberglass or other materials having a Mohs hardness of 3 or greater. An examples of abrasion resistant yarns that can be used in rows 46 and 48 include 2/70/34 textured nylon 66 filament and 2/70/34 textured nylon 6.

[0078] Another combination of yarns that can be used in the glove 10 includes a first type of cut resistant yarn and a second type of cut resistant yarn. Thus, the first cut resistant yarn can be used in rows 40, 42 and 44 while the second cut resistant yarn can be used in rows 46, 48, and 50. The first cut resistant yarn can be Kevlar and the second cut resistant yarn can be Dyneema.

[0079] Another combination of yarns that can be used in the glove 10 is a cut resistant yarn and a comfort thermal regulating yarn. Thus, the cut resistant yarn can be used in rows 40, 42 and 44 while the comfort thermal regulating yarn can be used in rows 46, 48, and 50. The cut resistant yarn can be Kevlar or Dyneema. The comfort thermal regulating yarn includes a phase change material. Examples of the comfort thermal regulating yarn include the Outlast® Acrylic and the Outlast® Viscoe yarns.

[0080] Another combination of yarns that can be used in the glove 10 is a cut resistant yarn and an antimicrobial yarn. Thus, the cut resistant yarn can be used in rows 40, 42 and 44 while the antimicrobial yarn can be used in rows 46, 48, and 50. The cut resistant yarn can be Kevlar or Dynneema. The antimicrobial yarn includes antimicrobial ingredients embedded in fibers. Examples of antimicrobial yarns include A.M. Y® yarns from Unifi or yarns treated with AEGIS Microbe Shield® technology from AEGIS Environments.

[0081] Further combinations of yarns can be used in the glove 10. Thus, a plied yarn and a non-plied yarn can be used in the glove 10. The plied yarn can be used in rows 40, 42 and 44 while the non-plied yarn can be used in rows 46, 48, and 50. Examples of plied yarns include 16/2 Kevlar® or 10/3 cotton. Examples of non-plied yarns include 16/1 Kevlar® or 10/1 cotton.

[0082] Another combination of yarns that can be used in the glove 10 is a spun yarn and a filament yarn. The spun yarn can be used in rows 40, 42 and 44 while the filament yarn can be used in rows 46, 48, and 50. Examples of spun yarns include 16/1 Dyneema®-nylon blend or 14/1/16/1 Dyneema®-nylon blend, as shown in FIG. 2. Examples of filament yarns include 2/70/34 airjet textured nylon 66 or 2/70/68 Nilit® Aquarius textured nylon 66.

[0083] Another combination of yarns that can be used in the glove 10 is a composite (gimped) yarn and a noncomposite yarn. The composite (gimped) yarn can be used in rows 40, 42 and 44 while the noncomposite yarn can be used in rows 46, 48, and 50. Examples of composite (gimped) yarns include Powerguard® yarns containing Kevlar®, modacrylic, and glass from Culinera-Savguard. Examples of noncomposite yarns include 16/1 Kevlar® or 14/1 cotton.

[0084] Another combination of yarns that can be used in the glove 10 is a synthetic yarn and a natural yarn. The synthetic yarn can be used in rows 40, 42 and 44 while the natural yarn can be used in rows 46, 48, and 50. Examples of synthetic yarns include 12/2 polyester or 4/70/34 nylon 66 or 40 denier spandex. Examples of natural yarns include 14/1 alpaca or 8/1 bamboo or 20/2 cotton.

[0085] Another combination of yarns that can be used in the glove 10 is a first synthetic blended yarn and a second syn-
thetic blended yarn. The first blended synthetic yarn can be used in rows 40, 42 and 44 while the second blended synthetic yarn can be used in rows 46, 48, and 50. Examples of blended synthetic yarns that can be used include 16/2 Kevlar®/nylon/Spandex blend or 14/1 Dynema®/nylon blend.

[0086] Another combination of yarns that can be used in the glove 10 is a first composite yarn and a second composite yarn. The first composite yarn can be used in rows 40, 42 and 44 while the second composite yarn can be used in rows 46, 48, and 50. Examples of composite yarns that can be used include steel core wrapped by nylon 66 filament yarn or fiberglass core wrapped by spun polyester and steel.

[0087] Another combination of yarns that can be used in the glove 10 is a first synthetic yarn and a second synthetic yarn. The first synthetic yarn can be used in rows 40, 42 and 44 while the second synthetic yarn can be used in rows 46, 48, and 50. Examples of synthetic yarns that can be used include 10/2 nylon 66 or 2/70/68 nylon 6.

[0088] Another combination of yarns that can be used in the glove 10 is a first natural yarn and a second natural yarn. The first natural yarn can be used in rows 40, 42 and 44 while the second natural yarn can be used in rows 46, 48, and 50. Examples of natural yarns that can be used include 40/1 cotton or 10/2 wool or 20/2 cashmere.

[0089] Another combination of yarns that can be used in the glove 10 is a textured yarn and a non-textured yarn. The textured yarn can be used in rows 40, 42 and 44 while the non-textured yarn can be used in rows 46, 48, and 50. Examples of textured yarns that can be used include 2/70/34 air-jet textured nylon 66 or 2/100/92 false-twist textured nylon 66. Examples of non-textured yarns that can be used include 70/68 flat nylon 66 or 940 denier Innegra™ S polypropylene from Innegra.

[0090] The knitting structure shown in FIG. 2 and the knitting of the second yarn to the first yarn in a single layer of a glove can be accomplished in a satisfactory manner using a SWG-type knitting machine. SWG-type knitting machines are available from Shima Seiki. It is believed that gloves in the various aspects can also be made in a satisfactory manner with other types of knitting machines.

[0091] The yarn type or a color change previously described can be accomplished by either knitting the two different yarns together, floating the unused yarn out of the way until the pattern calls for that color, or by leaving a tail (string) at the changeover. This may vary according to the yarn feeder used.

[0092] In some cases, such as making stripes of alternating colors, the yarn of one color can simply be pulled out of the way and floated down the glove while the other color stripe is knitted. When a new yarn starts, in some cases, there may be just a small tail of unknit yarn at the start or end of the knitting, which appears as a small string inside the glove.

[0093] Referring to FIG. 1, a cuff 26 can be provided on the glove 10. The cuff 26 can be formed as an integral part of the single layer of knitted yarns shown in FIG. 1. Alternatively, the cuff 26 can be attached to the palm section 22. For example, the cuff 26 can be sewn to the palm section 22. When the cuff section 26 is sewn to the palm section, the thumb section, the plurality of finger sections and the palm sections and the interface between each of these sections. When the cuff section 26 is formed as an integral part of the single layer of knitted yarns shown in FIG. 1, then the interface between the cuff section 26 and the palm section 22 is also seamless.

[0094] FIG. 3 also illustrates a glove 50 with a cuff 52. A slit 54 can be provided in the cuff. The slit allows the glove 50 to be easily put on a hand as well as permitting easy removal of the glove 50 from a hand. Referring to FIG. 4, a strap 60 can be provided around the cuff 52 to allow the glove 50 to be securely placed on a hand. The strap 60 can include a plate 62, shown in FIG. 5A, that allows the strap 60 to be secured once the glove is placed on a hand. The strap 60 can be sewn into the cuff 52. FIGS. 3 and 4 also illustrate the glove 50 having a coating 64. A single layer, multi-yarn glove liner, having the construction as described herein can be dipped in a coating material using conventional techniques. The coating can be from a natural rubber latex or a synthetic latex either of which is foamed or unfoamed. Nitrile, and more specifically, carboxylated acrylonitrile butadiene is desirable for its chemical resistance.

[0095] Foam nitrile further provides grip. A polyurethane coating provides breathability. The coating used can depend on the preferred characteristics of the glove. It may also depend on the type of yarns used. The coating can be selectively applied over any desired area of the glove.

[0096] FIG. 5A shows a front or palm side that contacts the palm and FIG. 5B shows a back or knuckles side that contacts the knuckles of a glove 70, both sides can be divided into multiple zones. In FIGS. 5A and 5B, nine zones, including finger components 1, 2, 3, 4, thumb component 6, palm components 5, 5, and 7, and wrist component 8 are shown. Any of the zones can be a different yarn to accomplish the desired function in the glove 70. Thus, any two zones shown in FIGS. 5A and 5B can be made with a different yarn in a single layer of multiple yarns to form the two zones. So zones 5 and 7 may be formed from a single layer of knitted yarns with zone 7 a thicker yarn to provide improved protection to the hand and zone 5 can be a thinner yarn to provide improved dexterity to a part of the hand that flexes more than other parts. Of course, each of the zones can also be manufactured from with a single layer using two or more different yarns.

[0097] The gloves described herein may also be a glove liner used to form the inner layer of a protective glove. Glove liners can range from very thick 7 gauge plaited liners to ultra-thin 18 gauge single layer liners (including 10 gauge, 15 gauge, 15 gauge). All size glove liners can be formed in a single layer with two different yarns, but preferably liners including 13 gauge and smaller yarns are formed. Thus, liners having 15 gauge yarns or smaller yarns arranged in a single layer are also preferable. Liners having 18 gauge yarns or smaller yarns arranged in a single layer are also useful.

[0098] In one aspect, the articles shown in the drawings are used as glove liners that are coated with nitrile or polyurethane to provide the final glove product. In this case, in a further aspect, the glove liner is a single layer of knitted yarns that does not include a second layer of yarns or any further reinforced areas of yarn sewn or knitted into the glove liner, so that a truly single layer glove liner is provided.

[0099] In addition to the use of two different yarns to form a glove or glove liner having a single layer, it is also contemplated to use three different yarns to form a glove or a glove liner having a single layer or to form a portion of a glove or glove liner having a single layer. As before, these multi-yarn single layers of knitted yarns are preferably continuous. Thus, it is contemplated that any combination of three of the different yarns previously mentioned herein can be used to form a single layer glove or glove liner. By way of example only, two
different cut resistant yarns can be knitted into a single layer with a moisture absorbent yarn.

Gloves with Indicia

[0100] In a further aspect, FIG. 6 shows a tab 150 for donning and doffing the glove that is coded with indicia to provide information about properties of the glove. Reference to “indicium” means something that conveys unique information about the properties of the glove. Properties of the glove can include size, cut resistance, yarn content, latex content, and the like. The indicia may be, for example, a component having a particular shape such as a circle, triangle, or square to denote size, such as large, medium, or small. The indicia may also be, as an example, a colored portion of the tab. Turning to FIG. 7, in a detailed embodiment, the indicia is a colored component 161 of the tab 150 in the form of a dot, circle, or other geometric shape. A different color represents a different property or characteristic of the glove. The indicia will preferably be different colors such as red, orange, yellow, blue, green, violet, black or white to denote different sizes such as 5, 6, 7, 8, 9, 10, 11, and 12.

[0101] The tab with indicia 150 is shown in FIG. 6 to be fastened at or on the cuff 8. The tab with indicia 150 can be positioned as a single tab at or about at the center of the cuff on the palm side of the cuff. The tab with indicia 150 may also be placed elsewhere on the outside of the cuff, for instance, off-center closer to the thumb or anywhere else where a tab is helpful for donning or doffing the glove. In one aspect, the tab 150 has a portion extending over the edge of the cuff 8. The amount of the portion extending over the cuff 8 can be from a very short length to one inch. It may be desirable to configure the cuff with a triangular or other suitable shape to accommodate the extended portion of the tab.

[0102] As a further aspect, two tabs may be provided at the same position or close to the same position on a cuff at the inside and the outside of the cuff. This allows a person to have a better grip at the cuff for donning and doffing the glove.

[0103] The tab with indicia 150 can be provided with a component of a specific color to indicate a property or characteristic of the glove. The tab with indicia 150 is manufactured from a material that is preferably flexible and non-irritating to the skin. The tab with indicia 150 comprises at least one element that conveys information, such as a coded shape or color. Turning to FIG. 7, the tab with indicia 150 comprises a carrier 162, a thumb contour 165, and a color component 161. The tab with indicia 150 being attached to the cuff 8. In one embodiment, the carrier 162 may be sewn to the cuff 8. For instance, along a stitch line 163. The carrier 162 may also be bonded or stapled to the cuff. In a further embodiment, the carrier 162 may be an integral part of the cuff, for instance, by knitting a desired configuration into the cuff at a desired location. Also, a pocket knitted into the cuff can be affixed with a tab with indicia. The elements of the tab with indicia 150 may be made of one or a combination of materials such as a natural or a synthetic rubber, a polymer, a woven or a knitted cloth, or of any flexible material that provides a grip to a user. The color component 161 may be provided in a color that indicates a glove property or a characteristic. For instance, the color component 161 may indicate a size of the glove. As an example, a color component 161 that is green may indicate a glove that is size 9. Other elements of the tab 150 may be made of the same color as the color component 161 for further visual reinforcement of the code. That is, the carrier 162 and/or the thumb contour 165 may be the same color as the color component 161. A color or shape may also indicate if a glove is a right hand glove or a left hand glove.

[0104] The color component 161 may be a piece of material, for instance, in the shape of a circle, that has a specific color and that is part of the carrier 162 or has been fixed to the carrier 162. For instance, a hole, partial or complete, in the carrier in a shape such as a circle can receive a material of a specific color to form the color component 161. The tab 150 may be formed, for instance, in a molding process, from a first polymer of a first color to make the carrier 162 and with a second polymer of a second color as the color component 161 with a second color. It may be desirable to provide the color component 161 with a specific shape that indicates a property of the glove, for instance, shapes such as circle, square, and triangle to indicate for instance sizes small, medium and large may be used.

[0105] The color component 161 may be a piece of material separate from the carrier 162. It may be a polymer, a natural rubber, metal, yarn, wood or any other material that can be colored and affixed to the carrier 162. The color component 161 may also be part of the carrier 162 that is treated locally with a dye, a pigment or an ink or any other coloring that will create the color component 161 on the carrier 162.

[0106] As a further aspect, the color component 161 is positioned away from the edge of the cuff 8. Thus, a person grabbing the tab 150 with their fingers to don the glove on their hand will still be able to see the color component 161.

[0107] In yet a further aspect, a thumb contour 165 is located on or as part of the carrier 162. Should it be desired, the thumb contour 165 can be affixed directly to the cuff or made integrally with the cuff. The color and/or shape of the thumb contour may indicate a property of the glove. The thumb contour 165 itself provides a grip for a user for donning or doffing the glove. In a further aspect, the thumb contour 165 is made of a material that provides a non-slippery grip of a glove user. Preferably the thumb contour material is resistant to oil and chemicals. Furthermore, the thumb contour preferably has a pleasant texture or feel for a user. In one embodiment, the thumb contour 165 is made of neoprene. In another embodiment, the thumb contour is 165 textured.

[0108] In a further embodiment, the thumb contour 165 has a slight dimple to receive the thumb or a finger of a user to provide a better grip. This is illustrated in FIGS. 8A, 8B, and 9. FIG. 8A shows the thumb contour 165 from a top view, having a width W and a length L. FIG. 8B shows the thumb contour in a cross-sectional view 166, where a dip or dimple in the thumb contour has a thickness T at its edge where it is substantially flush with the intermediate layer 164 and a maximum depth D relative to its edge. This provides excellent fit for a finger or a thumb for donning or doffing the glove. In one embodiment, the thumb contour 165 has an oval shape with a length L in the range of 0.75 to 1.25 inches, preferably about 1 inch, and a width W in the range of 0.25 to 0.27 inches, preferably about one-half inch. The dimensions may be smaller or greater, depending on the size of the glove and/or the size of a thumb of a user. The shape of the thumb contour 165 may also be circular, rectangular, or polygonal. The thumb contour 165 is preferably flexible and compressible under compression by a thumb and a finger of a user. Alternatively, the thumb contour may also be made of substantially inlexible material. The depth D of the dip or dimple may vary. In a specific embodiment, D is in the range of 1/24
inch to ⅛ inch. The thumb contour 165 may also have no dip or dimple. The dip or dimple depth may also be greater than ⅛ inch.

[0109] The thumb contour 165 has a thickness T at its edges. In an embodiment, T is ⅛ inch and D is ⅛ inch. In another embodiment, T is ⅛ inch and D is negligible. T may also be greater for instance ⅛ inch or even greater.

[0110] FIG. 9 shows a color-coded tab 150 from a top view. The top view shows the carrier 162, the stitch-line 163, the color component 161, and the thumb contour 165. In one embodiment, the top of the thumb contour 166 aligns at its edges with the top of the carrier 162 to provide a flush alignment.

[0111] The carrier 162 may be less compressible than the thumb contour 165 to provide the user with a feel of a positive grip on the tab. Thus the carrier 162 can be made with a material that is harder than the thumb contour 165. By having the thumb contour 165 made from a material like neoprene, the tab with indicia 150 may provide a comfortable experience of gripping the tab, which can facilitate donning and doffing the glove. In a further embodiment, the thumb contour 165 is omitted and the carrier 162 provides a gripping location, which may have a measurable dip. The grip is then provided by the profile of the carrier 162 only.

[0112] In one embodiment, the carrier 162 can be omitted and only the thumb contour 165 is provided for donning and doffing the glove. In such a case, the thumb contour 165 is coded by color or shape or otherwise and/or provided with a coded component that signifies a property of the glove. The thumb contour 165 in such an embodiment may also have a dip or a dimple and may be compressible between two fingers or a thumb and a finger. In such an embodiment, the thumb contour 165 may be neoprene. The thumb contour may also be rigid. It may be stitched or bonded to the cuff. The cuff can have with a pocket for affixing the thumb contour.

[0113] In yet another embodiment, as shown in FIG. 6, a glove is provided with a cushioned patch 151 on the knuckle side. The cushioned patch 151 can cover one or more of the following locations: the top of the hand, the knuckles of the fingers, the knuckle of the thumb, areas of the fingers. In one embodiment, the cushioned patch 151 only covers the knuckles of the fingers. The patch may be manufactured from a rubber, a polymer, a yarn, a metal or any other material that may protect the knuckles from an impact. The patch may be stitched or bonded to the glove. A pocket on the glove can be configured to receive and store the patch. A user may have to put his hand into fairly narrow spaces with unknown or unseen edges, angles or objects. During entering such spaces with a hand or manipulating an object in such a space one can easily hit and hurt the knuckles or other outside parts of the hand by direct impact with an object, as one is unable to see directly what is going on. A patch is helpful to dull or diminish the effect of an impact in those situations and helps to protect the user. The patch 151 can include a logo or other writings to indicate the source of the glove of other information about the glove.

[0114] In one embodiment, the cushioned patch 151 only covers the knuckles of the fingers that are most exposed to being hit: the index finger, the middle finger and the fourth finger or ring finger, but not the little finger or pinky and not the thumb. In a further embodiment, the cushioned patch may only cover the knuckles of two fingers or even one finger. In yet another embodiment, the cushioned patch may cover the four fingers and not the thumb. In yet another embodiment, the cushioned patch may cover all of the fingers and the thumb.

[0115] In one embodiment, a single cushioned patch covers only one knuckle. This is shown in FIG. 10 wherein the knuckle side of glove 1900 has an individual patch on each knuckle, for instance 1901 for the thumb knuckle, 1902 for the index finger knuckle, 1903 for the middle finger knuckle, 1904 for the fourth finger knuckle and 1905 for the little finger knuckle. The patches may be of any shape, including circle, oval, and rectangular.

[0116] In another embodiment a cushioned patch may cover only two knuckles. This is illustrated in FIG. 11 wherein the knuckle side of glove 2000 has patch 2001 that covers two knuckles (index and middle finger), patch 2002 also covers two knuckles (the fourth and the little finger), and patch 2004 covers the middle finger and the fourth finger.

[0117] Preferably, the cushioned patch 151 is not bulky, almost or substantially flush with the glove surface and substantially flexible so it does not limit the movement of the hand in the glove, nor does the patch diminish access to narrow spaces because of the added patch. In one embodiment, the patch is formed of substantially rigid material with an optional a layer of padding under the rigid material to further dull the impact to the hand when hitting an object. The cushioned patch 151 in an embodiment is provided with a logo that identifies a company or an organization. The logo is preferrably placed in such a manner that the user will see the logo as being upside-down, as shown in FIG. 6.

Trade-Specific Gloves

[0118] Turning to gloves for specific trades, disclosed herein are gloves for carpenters, electricians, HVAC technicians, laborers, masons, and plumbers. Provided are gloves having a single layer with two different yarns, the single layer including four finger sections, a thumb section and a palm section, each of these sections having a palm side and a knuckle side. When worn on a hand, the knuckle side contacts the knuckles on the back side of a hand and the palm side contacts the palm in the front side of the hand. The gloves comprise at least one elastomeric, or polymeric, coating that is generally applied by palm-dipping. In one embodiment, on the palm side, a polyurethane coating covering all of the four finger sections, at least 75% of the surface area of the palm section and at least 75% of the surface area of the thumb section is provided. One or more embodiments may provide, on the knuckle side, that the polyurethane coating substantially covers the tips of the four finger sections and of the thumb section and 15% to 25% of the surface area of each of the four finger sections and of the thumb section. The remaining portions of the four finger sections, the thumb section and the palm section are not coated by the polyurethane coating. Reference to “substantially covers” a desired area means that the glove is prepared in such a way to ensure the desired area contacts the polyurethane coating, but due to handling and other factors, allowance is made for the fact that the coating may not adhere to miniscule parts of the desired area such that complete coverage may not be achieved.

[0119] In some instances, the same single ply knitted liner design can be used for gloves for different trades. For example, knitted liners are illustrated in FIGS. 13 and 14, where knitted liners 50 and 52 are formed from a single layer of knitted yarns. The knitted liner 50 is shown palm (front) side up, so it is a left handed glove. The knitted liner 52 is
shown knuckle (back) side up, so it is a right handed glove. The knitted liners 50 and 52 can be made with a standard SWG garment knitting machine. These liners can be used in gloves for carpenters, laborers, masons, and/or plumbers.

Although the single layer of knitted yarns can use a single type of yarn, preferred embodiments provide that the knitted liners 50 and 52 are formed from a single layer of knitted yarns that includes two different yarns. Further the knitted liners 50 and 52 can be a single layer of knitted yarns that includes three or more different yarns. A single layer, multi-yarns glove or glove liner is described in co-pending U.S. Ser. No. 12/708,553, entitled KNITTED GLOVE HAVING A SINGLE LAYER WITH A PLURALITY OF YARNS, filed on Apr. 28, 2010, which is incorporated herein by reference in its entirety.

As shown in FIG. 13, each of the glove liners 50 and 52 is preferably divided into nine sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and 8. In a preferred embodiment, the knitted liners 50 and 52 are constructed as a single layer from two yarns differing only in color. As an example, the yarn may be a Dynema®/nylon blended yarn having approximately 50% of each type of fiber. By way of example, Dynema® blended yarns available from Pharr can be used. Dynema® is white and can be blended with a dyed nylon to achieve a desired color. In one example, the nylon is dyed blue, which when blended with the white Dynema® provides a grey/white heather colored first yarn. In another example, the nylon is dyed grey, which when blended with the white Dynema® provides a grey/white heather color second yarn. The first and second yarns are then knitted into a single layer glove liner, preferably in a seamless fashion using a single jersey stitch. FIG. 14 illustrates another knit liner in another aspect. In FIG. 14, the bottom parts of fingers 55, 56 and 57 (components 3, 2, and 1, respectively), nearest components 5 and 5, are stitched with the same yarn used in forefinger 54 (component 4). Typically, anywhere from 4 to 20 rows of yarn are stitched in this manner, while to upper portions of the fingers 55, 56 and 57 (components 3, 2, and 1, respectively) are stitched with the second yarn used in components 6, 7 and optionally in 8).

The knitted glove liner having a single layer includes two different yarns that are preferably cut resistant. Cut resistant yarns include fibers that comprise, for example, an ultra high molecular weight polyethylene (UHMWPE) (sold, for example, under the trade name Dynema®) or a para-aramid (sold, for example, under the trade name Kevlar®) or any other cut resistance yarn. Wire-containing yarns are also considered cut resistant. Due to the difficulties associated with dying such cut resistant fibers or wires, when a certain color is desired, the cut resistant fiber or wire can be combined with other components, fibers, and/or filaments to form a composite yarn that provides the desired color naturally or by dying. In one or more embodiments, the cut resistant yarns are in the range of 13 to 18 gauge, specifically 15 gauge.

In addition to the yarns described above, the following yarns may be used in the gloves in any pairwise combination to provide the desired functional properties in the knitted liner of the glove: abrasion resistant yarn to improve wear-resistance (e.g., 2/70/34 textured nylon 66 filament or 2/70/34 textured nylon 6), phase change yarn to improve comfort by absorbing and releasing latent heat (e.g., Outlast® Acrylic and Outlast® Viscose), antimicrobial yarn (e.g., A.M. Y.® yarns from Unifi or yarns treated with AEGIS Microbe Shield® technology from AEGIS Environments), plied yarn (e.g., 16/2 Kevlar® or 10/3 cotton), non-plied yarn (e.g., 16/1 Kevlar® or 10/1 cotton), spun yarn (e.g., 16/1 Dynema®/nylon blend, 14/1 cotton or 36/1 DRYENERGY™ polyester/cotton from Achieve o2), filament yarn (e.g., 2/70/34 air-jet textured nylon 66 or Feb. 70, 1968 Nihilo® Aquarius textured nylon 66), composite (gimped) yarn (Powerguard® yarns containing Kevlar®, modacrylic and glass from Caldor/Saveguard), non-composite yarn (e.g., 16/1 Kevlar® or 14/1 cotton), synthetic yarn (e.g., 12/2 polyester or 470/34 nylon 66 or 40 denier spandex), natural yarn (e.g., 14/1 alpaca, 8/1 bamboo or 20/2 cotton), blended synthetic yarn (e.g., 16/2 Kevlar®/nylon/spandex blend or 14/1 Dynema/nylon blend), composite yarn (e.g., steel core wrapped by nylon 66 filament or fiberglass core wrapped by spun polyester and steel), synthetic yarn (e.g., 10/2 nylon 66 or Feb. 70, 1968 nylon 6), natural yarn (e.g., 40/1 cotton, 10/2 wool or 20/2 cashemire), textured yarn (e.g., 2/70/34 air-jet textured nylon 66 or 2/100/92 false-twist textured nylon 66), non-textured yarn (e.g., 70/68 flat nylon 66 or 940 denier Innegra™ S polypropylene from Innegra).

The glove components can be knitted with varying stitch sizes to provide a tailored fit to the hand. For example, the fingers and thumb components start with a tight stitch at the tips, and then progress to a looser stitch at the knuckle areas. For the middle palm component, looser stitches are also provided in the knuckle area. The lower palm component has tighter stitches approaching the base of the hand. The knitted gloves having variable stitch dimensions are disclosed in U.S. Pat. Nos. 7,434,422; 7,213,419; and 6,962,064, all of which are incorporated by reference herein in their entireties.

As shown in FIGS. 13 and 14, a three-fingered palm zone 5, which is attached to the forefinger 54, middle finger 55, and ring finger 56, is used in both glove liners 50 and 52. A four-fingered palm zone 5 is then attached to the pinky 57 and the three-fingered palm zone 5. This provides a better fit for the glove liners 50 and 52 and increased dexterity for the wearer of the gloves. While a single layer glove liner is preferably used, a glove liner that has more than one layer can also be used. More generally, any type of glove liner can be used. Thus, in other aspects, any knitted glove liner can be used for the glove liners of FIGS. 13 and 14.

In detailed embodiments, the palm section comprises a first palm zone, a second palm zone, and a third palm zone, and the four finger sections comprise a forefinger section, a middle finger section, a ring finger section, and a pinky finger section. For example, the first palm zone is attached to the forefinger, middle finger, and ring finger sections, the second palm component is attached to the pinky finger section and the first palm component, and the third palm component is attached to the second palm component and the thumb. In some configurations, the presence of the first palm zone permits an ergonomic enhancement to the glove by creating the pinky component that is attached only to the second palm zone, thereby placing it in a dropped position as compared to the rest of the fingers (that is, provided as a “dropped pinky”). In a specific embodiment when the palm section of the glove is configured with three zones, the polymer coating substantially covers the first zone and the second zone on the palm side and covers at least 75% of the surface area of the second zone on the palm side. The remaining portion of the second zone on the palm side is not covered by the polymer coating. Also, the first, second, and third zones on the knuckle side are not covered by the polymer coating.
In a further aspect, a forefinger section of the four finger sections and a first zone of the palm section comprise the first cut resistant yarn having a first color and remaining sections of the single layer in the knitted glove liner comprise the second cut resistant yarn having a second color. In other embodiments, at least one of the palm components only is the first color.

The glove may also optionally include an elastomeric, or polymer, coating over at least a part of the single knitted ply. The knitted glove liner may be coated with additional materials to enhance the performance of the glove. These coating materials include, for example, non-slip coatings to enhance grip, puncture-resistant coatings and cut-resistant coatings to further enhance the cut-resistant properties of the knitted liner. The coating materials will typically be impervious polymeric materials, and are therefore only coated on the surfaces of the glove that are involved in grip or are most likely to come into contact with sharp objects. The coating can be formed from a natural rubber latex or synthetic rubber latex, or other elastomeric polymer coatings. The coating can be applied by dipping the knitted glove into the coating material or by spraying the coating onto the glove. Coating the knitted gloves improves the grip of the glove in handling dry and oily items when the coating is on the outside of the glove. The coating can be, by way of example only, polyurethane, nitrile, carboxylated acrylonitrile butadiene, PVC; alone or in combinations, and the coating being unfoamed or foamed.

The coating may be applied to the knitted liner by any suitable means known in the art. Preferably, the knitted liner is dipped in the liquid polymer or suitable latex emulsion to form the desired pattern of coverage and the polymer is allowed to set under conditions appropriate for the coating material selected. This coating process is within the skill of the art. Further, any combination of the polymer coatings described herein can be used with any combination of the yarns previously described. In a preferred aspect, the coatings applied are formed by coating the liner with a coagulant and dipping the coated liner into an aqueous latex compound to achieve the coverages shown in the figures. The coagulant coating preferably includes soft water, calcium nitrate and sodium diaminotoluene sulfoxycetal (AY 65% Surfacant).

The aqueous latex compound coating preferably includes the coagulant 6322 (an aqueous dispersion of butadiene acrylonitrile copolymer), Darvan WAQ 50% (sodium lauryl sulfate and water), MB-2 ES (mixture of cure materials), Zinc Oxide, Akrosperse E-98 blue pigment, Aercosol RM-5000 (solvent-free hydrophobically modified polyethylene oxide urethane), and MEHP-50 (Culminial® methyhydroxypropylocellulose).

The gloves are preferably manufactured using a dip process. The process includes the following steps. The liners are loaded onto a hand mold. Then the loaded liner is dipped into the coagulant solution. Then, loaded liner is drained, turned up and allowed to air dry. Next the loaded liner is palm-dipped into the nitrile latex compound coating to a desired depth. After that step, the loaded liner is again drained, turned up and allowed to air dry. Then the loaded liner is oven dried. After drying, the loaded liner is oven cured. Then, the dipped liners are stripped from the mold and subjected to appropriate QA inspection and packaging.

The gloves can also include a cuff section attached to the palm section. Cuff designs can also be used across the different gloves as needed. In a specific embodiment, the knitted glove liner includes the cuff section in its single layer. The cuff section can be configured to ease donning and enhance comfort. A fastener attached to the cuff helps to secure the glove to a hand. A split in the cuff can be provided to make donning the glove easier. Also, an insert of thin material covering the split can be provided to prevent materials from entering the glove. Exemplary fasteners include, but are not limited to, a strap having its own fasteners, a snap, hook and loop fasteners (also referred to as Velcro®), a button, and the like.

FIGS. 17, 18, and 19 illustrate the details of a preferred embodiment of the cuff 100 of any of the gloves as desired. In FIG. 17, a split 112 in the cuff 110 allows the cuff 110 to expand, improving ease of donning and removing the glove from the hand. In a preferred embodiment, an insert 114 of thin material attached to the sides of the cuff 110 along the split 112 spans the gap formed by split 112. Reinforcement can be attached to cuff 110 along the split 112 to prevent tearing. FIG. 18 illustrates the strap 116 that is applied to the cuff 110. FIG. 19 illustrates the strap 116 applied to the cuff 110 wherein the strap 116 is wrapped around the cuff 110 to secure the glove to a carpenter’s hand. The cuff usually has an elastic yarn (Lycenta and polyester blend) well-inserted into the component. The last few courses the cuff can be a colored yarn that is indicative of glove size and then finished with a heat fusible yarn to prevent unraveling.

Carpenter’s Gloves

Commercial carpenters need occupational gloves to protect their hands but also to operate a variety of power tools. This requires a glove that not only provides a high degree of dexterity but also has good sweat management characteristics, as power tools generate a substantial amount of heat during use. In addition, using sharp tools and handling of construction materials with sharp corners and edges make puncture and cut resistance important in an occupational glove for a carpenter. Grip is also of high importance in protective gloves for commercial carpenters. Resistance to abrasion is also somewhat important. Gloves provided herein are suitable for carpenters to comfortably work for long periods of time performing tasks such as handling tools and materials while providing the desired dexterity, sweat management, cut resistance, puncture resistance and grip features. Such gloves also provide adequate abrasion resistance, impact resistance and vibration resistance as well as adequate hot and cold protection.

In one aspect, the carpenter’s glove is fabricated and constructed to provide a high level of sweat management, dexterity, cut resistance, puncture resistance and grip. In another aspect, the sweat management and cut resistance features of the glove are provided by a knitted glove liner that is fabricated as a single-ply layer comprised of a yarn that is cut resistant. The single-ply knitted layer may also comprise a first yarn that is cut resistant and a second yarn such as wool or cotton, which provides breathability or absorption. The second yarn may also provide other performance characteristics desirable in an occupational glove, such as flexibility or stretch.

Typically, in the carpenter’s glove, the coating will be placed on the palm side of the fingers, leaving the knitted liner exposed on a substantial portion of the knuckle side of the glove. A detailed embodiment provides that the polymer
coating on the knitted glove liner for the carpenter's glove has a thickness in the range of 54 mils to 60 mils (or 55-59, or even 57 mils).

[0137] FIG. 12 illustrates a pair of gloves, where each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16 to 19, a knuckle side section 20 (only shown on glove 12), and a palm side section 26 (only shown on glove 10). Preferably, the fingers 16 to 19 are narrow to improve dexterity. It is preferred that the fingers and thumb of the glove conform to actual finger and thumb dimensions to improve dexterity.

[0138] The gloves 10 and 12 further comprise an optional cuff 22. The cuff 22 can be part of the knitted structure of the glove or, alternatively, can be attached to gloves 10 and 12 at a point distal to knuckle side section 20 and palm side section 26. The cuff 22 can be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively, the cuff may be made of a different material than the knitted liner and attached by means such as sewing. Cuff 22 encircles the wearer's wrist and preferably further includes a strap and fastener for securing gloves 10 and 12 to the wearer's hand. Additional reinforcement elastic may be attached to the cuff prior to the addition of the fastening system. Cuff designs as shown in FIGS. 17, 18, and 19 are also suitable.

[0139] The preferred gauge for the Dyneema®/nylon blended yarn in this embodiment is in the range of 13 to 18, specifically 15. Referring to FIG. 13 and the table below, the knitting pattern of the glove liners 50 and 52 in the illustrated zones in a preferred aspect using these two yarns is described.

<table>
<thead>
<tr>
<th>Component</th>
<th>Yarn</th>
<th>Gauge</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>2</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>3</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>4</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Gravy/white heather</td>
</tr>
<tr>
<td>5</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Gravy/white heather</td>
</tr>
<tr>
<td>6</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>7</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>8</td>
<td>Dyneema®/Nylon Blend (50/50)</td>
<td>15</td>
<td>Blue/white heather</td>
</tr>
</tbody>
</table>

[0140] Further as shown in FIG. 13, the forefinger 54 or component 4 is knitted in a single layer fashion with a different color than the other fingers 55 to 57 and the thumb 58.

[0141] In addition to the combination of yarns specified in the table above, other combinations of yarns are possible. For example, two different color 13 gauge Dynenema yarns can be used to knit the glove liners 50 and 52; two different color 13 gauge Kevlar® yarns can be used to knit the glove liners 50 and 52; two different color 15 gauge Kevlar® yarns can be used to knit the glove liners 50 and 52. However, the two different color 15 gauge Dyneema yarns in a single layer liner is preferred.

[0142] FIG. 15 illustrates the glove liners after dipping, where the glove liners 50 and 52 are coated with a polymer material 70. The polymer material improves grip and puncture resistance. The polymer material 70 may cover the palm section and interior parts of the fingers sections as indicated. It may also extend over the distal tips of the plurality of fingers 72 to 75 and the thumb section 76 on the back (or exterior) side of the glove liners 50 and 52, as indicated. In one aspect, the entire front section (or palm side) of the fingers 72 to 75 are covered with the polymer material 70, as shown on the glove liner 50 in FIG. 15. In one aspect, 75% to 95% of the surface area of the palm section 78 of the glove liner 50—excluding components 5, 5, and 7—is covered with the polymer material. In a preferred aspect, between 90% and 95% of the surface area of the palm section 78 of the glove liner 50 is covered with polymer material. Further, between 75% and 95% of the surface area of the thumb section 76 on the palm side of the glove liners is covered with polymer material 70 and, more preferably between 90% and 95% of the surface area of the thumb section 76 on the palm side is covered. In a further aspect, the cuff section 82 is not covered.

[0143] From the component perspective, the components 1, 2, 3, 4, 5, and 5 on the palm side 78 of the glove liners 50 and 52 are covered with the polymer material 70. Component 8 on the palm side of the glove is not covered with the polymer material 70. Components 6 and 7 on the palm side of the glove are partially covered with the polymer material 70. In one aspect, more than 50% of the surface areas of the components 6 and 7 on the palm side of the glove are covered with the polymer material 70. In a preferred embodiment, between 75% to 95% of component 6 is covered with the polymer material 70 and, more preferably between 90% and 95% of component 6 is covered with the polymer material 70. In a preferred embodiment, between 70% to 90% of component 7 is covered with the polymer material 70 and, more preferably between 85% and 90% of component 6 is covered with the polymer material 70.

[0144] On the knuckle side of the glove, shown on glove 52 of FIG. 15, a different coverage is provided. In one aspect, only a portion of the fingers sections 70 to 75 and a portion of the thumb section 76 are covered with the polymer material 70, as shown on the glove liner 52 in FIG. 15. In one aspect, none of the palm section 78 and none of the cuff section 82 is covered with the polymer material 70. Further, on the finger sections 70 to 75 and on the thumb section 76, only a portion of the tip of these sections is covered with the polymer material 70. In a preferred embodiment, between 10% and 40% of the finger sections 70 to 75 and of the thumb section 76, including the tips of those sections, of the knuckle side of the glove 52 are covered with the polymer material 70. In a further preferred embodiment, between 15% and 25% of the finger sections 70 to 75 and of the thumb section 76, including the tips of those sections, of the knuckle side of the glove 52 are covered with the polymer material 70.

[0145] From the component perspective, the zones 5, 5, 7, and 8 on the knuckle side of the glove 52 are not covered with
the polymer material 70. Components 1, 2, 3, 4 and 6 are covered as previously described with respect to sections 75, 74, 73, 72 and 76, respectively, on the knuckle side of the glove 52.

[0146] For clarification, the glove liners 50 and 52 in FIG. 15 are to be considered flat for the previous discussion of coverage of polymer materials. This way, there is no meaningful side portion of the glove and the previous discussion completely describes the coverage of the glove liners 50 and 52 with the polymer material 70. The areas of coverage are an important trade off because they have an impact on the breathability of the gloves as well as the cut resistance, puncture resistance and abrasion resistances of the present gloves.

[0147] With regard to a starting latex for forming the coating, the latex compound properties preferably include a 10-20% foam. This results in the formation of a microporous coating. Additionally, the latex compound preferably has a viscosity in the range of 4000-5000 cPs. The coating applied to the glove preferably has an abrasion property of 11,000 revolutions. This parameter is measured using the Taber method wherein the 11,000 revolutions refer to revolutions of a rotating turntable before a failure is detected. The thickness of the coating 70 applied to the glove is in the range of 54 mils to 60 mils and is preferably 57 mils.

[0148] FIG. 16 further illustrates the attachment of additional materials to the gloves. Optionally, means for fastening 90 the glove to the hand of the wearer are illustrated on both gloves 92 and 94. The fastening means 90 includes a strap 96 attached to cuff 98. The strap 96 is threaded through a loop 100 and folded back on itself and secured to itself with Velcro®.

[0149] FIG. 20 illustrates both sides of a carpenter’s glove, including the application of the polymer coating and the materials to the cuff. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 98. Components 4, 5, and 5 are knitted in a single layer fashion with a different yarn than components 1, 2, 3, 6, and 7. Component 5 is a three-fingered palm component, which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. In an aspect, the gloves are coated with a polymer material 70. The polymer material improves grip and puncture resistance. The polymer material 70 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of components 1, 2, 3, 4, and 6 as well as on the back (or exterior) side, as indicated. A strap 96 attached to cuff 98. The strap 96 is threaded through a loop 100 and folded back on itself and secured to itself with Velcro® tab.

Example 1

[0150] The following describes a carpenter glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7 and 8 are knitted in a single layer of yarn having a first color and a 15 gauge Dynemir® yarn having a second color in the pattern shown in FIG. 13. The knitted, single layer glove liner having two different types of yarn is then placed on a former and dipped into a coagulant that includes soft water, calcium nitrate and sodium diamyl sulfosuccinate (AY 65% Surfactant). Then, after further processing, the glove liner is dipped into an aqueous latex compound coating that includes Synthomer 6322 (an aqueous dispersion of butadiene acrylonitrile copolymer), Darvan WAQ 20% (sodium lauryl sulfate and water), MB-2 ES, Zinc Oxide, Akrosperse E-98 blue pigment, Acrysol RM-5000 (solvent-free hydrophobically modified polyethylene oxide urethane), and MHPC-50 (Culminar® methylhydroxypropylcellulose). The latex compound properties include a 10-20% foam and a viscosity in the range of 4000-5000 cPs.

[0151] The glove in this example is also stitched with a variable stitch. Components 1, 2, 3, 4, and 6 are stitched in three different sections. The first section, nearest the tip of the finger, is uniformly knitted with a tight stitch. The first course of the second section, which is knitted after the first section, is knitted with a stitch looser than used in the first section, and the remaining courses of the second section are knitted with a stitch that is increasingly looser. These stitches can be loosened in a linear pattern or in any other pattern. The first course in the third section is stitched at the same tension as the last course in the second section. The remaining courses of the third section are knitted with a stitch that is increasingly tighter. These stitches can be tightened in a linear pattern or in any other pattern. In the case of FIG. 13, component 1 includes 68 knitting courses. The first section includes two courses, the second section includes forty-three courses and the third section includes twenty-three sections. Component 2 includes 86 knitting courses. The first section includes two courses, the second section includes fifty-two courses and the third section includes thirty-two courses. Component 3 includes 90 knitting courses. The first section includes two courses, the second section includes fifty-eight courses and the third section includes thirty courses. Component 4 includes 78 knitting courses. The first section includes two courses, the second section includes forty-nine courses and the third section includes twenty-seven sections. Component 6 includes 72 knitting courses. The first section includes two courses, the second section includes thirty-four courses and the third section includes thirty-six sections.

[0152] Component 5 includes a single section of nine courses, all knitted with a stitch of uniform tension. The tension is preferably loose, as loose as the loosest stitches used in the finger components.

[0153] Component 5 includes 36 courses in three sections, similar to the finger components. The first section, nearest component 5, has nine courses and is knitted with stitches of uniform tension. The tension is preferably tight, as tight as the tightest stitches used in the figure components. The next section has eighteen courses. The first course in this section is knitted with a stitch that is loose, somewhat looser than the loose stitches used in the finger components. The remaining courses are knitted with increasingly tighter stitches. Again, the pattern of increasing tension can be linear or the increasing tension can be applied selectively at different courses. The last section has nine courses. The first course in this section is knitted with the same tension as the last course in the previous section. The remaining courses are knitted with increasingly looser stitches. The pattern of increasing tension can be linear or the increasing tension can be applied selectively at different courses.

[0154] Component 7 has fifty-four courses divided into two sections. The first section has ten courses, nearest component 5, which are uniformly knitted with a loose stitch. The next course, in the second section, is knitted with a stitch having the same tension as the last course in the first section. The remaining courses in the second section are knitted using a stitch that has increasing tension. The pattern of increasing tension can be linear or the increasing tension can be applied
selectively at different courses. The tension of the last course is slightly tighter than the tightest stitch in the finger components.

[0155] The cuff section, component 8, has fifty-four courses, all uniformly knitted using a loose stitch. The tension of stitches in these courses is as loose as the loosest stitches in the finger components.

Electricians Gloves

[0156] Commercial electricians need occupational gloves to protect their hands and to operate a variety of hand tools. This requires a glove that not only provides a high degree of dexterity but also has good sweat management and puncture resistance characteristics. Grip is also of importance in protective gloves for commercial electricians. Cut, vibration, impact, abrasion, and hot and cold resistance are somewhat important. Gloves provided herein are suitable for enabling electricians to comfortably work for long periods of time performing tasks typically required of electricians, including handling tools and materials while providing the desired dexterity, sweat management, and puncture resistance. Such gloves also provide adequate abrasion, cut, vibration, and impact resistance.

[0157] In one aspect, the electrician’s glove is fabricated and constructed to provide a high level of sweat management, dexterity, cut resistance, puncture resistance, and abrasion resistance, and grip. With regard to puncture resistance, at least one area of reinforcement comprising a plaiting yarn is provided on at least one portion of the glove fingers and thumb. The glove comprises a knitted glove liner that is fabricated as a single-ply layer comprised of a yarn that is preferably cut resistant. The single-ply knitted layer may also comprise a first yarn that is cut resistant and a second yarn that is stretchable such as spandex (Lycore®), which aids in dexterity and flexibility of the glove. The second yarn may also provide other performance characteristics desirable in an occupational glove, such as moisture management. In one example, all of the finger and thumb components comprise reinforced areas formed by a yarn plaiting on top of the singly-ply layer. In a specific embodiment, the electrician’s glove can include a knitted glove liner having a single layer with two different yarns that are wire-free, the single layer including four finger sections, a thumb section and a palm section, each of these sections having a palm side and a knuckle side. The glove also provides reinforced areas, generally on the tips of the finger and thumb components, formed by plaiting a yarn over the single-ply. The knitted glove liner having a single layer for the electrician’s glove preferably includes two different wire-free yarns that are cut resistant.

[0158] Typically, in the electrician’s glove, the coating will be placed on the finger tips and/or the palm side of the fingers, leaving the knitted liner exposed on a substantial portion of the knuckle side of the glove.

[0159] In one aspect, the polymer coating on the knitted glove liner has a thickness in the range of 51 to 57 mils (or even 54 mils).

[0160] FIG. 21 illustrates a pair of gloves, wherein that each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16, 17, 18, 19, a knuckle side section 20 (only shown on glove 12), and a palm side section 26 (only shown on glove 10).

[0161] Gloves 10 and 12 further comprise an optional cuff 22. The cuff 22 can be part of the knitted structure of the glove or, alternatively, can be attached to gloves 10 and 12 at a point distal to knuckle side section 20 and palm side section 26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively the cuff may be made of a different material than the knitted liner and attached by means such as sewing. The cuff 22 encircles the wearer’s wrist. Additional reinforcement elastic may be attached to the cuff prior to addition of the fastening system. Cuff designs as shown in FIGS. 17, 18, and 19 are also suitable.

[0162] Gloves 10 and 12 can be palm-dipped with a polymer coating 30. The polymer material improves grip and puncture resistance. Areas of reinforcement 31 are provided, which are formed by plaiting a yarn such as nylon over the single ply of the knitted liner in selected areas.

[0163] Formation of knitted liners for gloves 10 and 12 is illustrated in FIGS. 22 and 23. FIG. 22 illustrates a pair of knitted glove liners 50 and 52 that are first formed from a single layer of knitted yarns. The knitted liner 50 is shown palm (front) side up, so it is a left-handed glove. The knitted liner 52 is shown knuckle (back) side up, so it is a right handed glove. The knitted liners 50 and 52 can be made with a standard SWG garment knitting machine. A plaiting yarn can be plaited into the knitted liner in selected areas 31 to provide areas of reinforcement as a second layer over the single layer. The plaiting yarn can be provided in the first 1 to 15 courses (or 2, 4, 6, 8, 10, 12 or even 14) depending on the needs of the wearer.

[0164] Although the single layer of knitted yarns can use a single type of yarn, preferred embodiments provide that the knitted liners 50 and 52 are formed from a single layer of knitted yarns that includes two different yarns. Further the knitted liners 50 and 52 can be a single layer of knitted yarns that includes three or more different yarns. A single layer, multi-yarns glove or glove liner is described in co-pending U.S. Ser. No. 12/768,953.

[0165] As shown in FIG. 22, each of the glove liners 50 and 52 is preferably divided into three sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and 8. In a preferred embodiment, the knitted liners 50 and 52 are constructed as a single layer from two yarns differing only in color. The yarn may be a Dynene®/nylon blended yarn having approximately 50/50% by weight respectively of each type of fiber. By way of example, Dynene® blended yarns available from Pharr can be used. Dynene® is white and can be blended with a dyed nylon to achieve a desired color. In one example, the nylon is dyed blue, which when blended with the white Dynene® provides a blue/white heather colored first yarn. In another example, the nylon is dyed grey, which when blended with the white Dynene® provides a grey/white heather color second yarn. The first and second yarns are then knitted into a single layer glove liner, preferably in a seamless fashion using a single jersey stitch. An exemplary plaiting yarn is a nylon yarn.

[0166] The preferred gauge for the Dynene®/nylon blended yarn in this embodiment is in the range of 13 to 18, specifically 15. Referring to FIG. 22 and the table below, the knitting pattern of the glove liners 50 and 52 in the illustrated zones in a preferred aspect using these two yarns is described.
Further as shown in FIG. 22, the forefinger 54 or component 4 is knitted in a single layer fashion with a different color than the other fingers 55, 56, and 57 and the thumb 58. FIG. 23 illustrates a knit liner in another aspect. In FIG. 23, the bottom parts of fingers 55, 56, and 57 (components 3, 2, and 1, respectively), nearest components 5 and 5., are stitched with the same yarn used in forefinger 54 (component 4). Typically, anywhere from 4 to 20 rows of yarn are stitched in this manner, while to upper portions of the fingers 55, 56 and 57 (components 3, 2, and 1, respectively) are stitched with the second yarn used in components 6 and 7. Reinforced areas 31 have plaited yarn.

In addition to the combination of yarns specified in the table above, other combinations of yarns are possible. For example, two different color 18 gauge Dyneema yarns can be used to knit the glove liners 50 and 52; two different color 18 gauge Kevlar® yarns can be used to knit the glove liners 50 and 52; and two different color 15 gauge Dyneema yarns in a single layer liner are preferred.

Additionally, while a single layer glove liner is used as part of a preferred electrician’s glove, a glove liner that has more than one layer can also be used. More generally, any type of glove liner can be used for the glove liner of FIGS. 22 and 23.

Turning to FIGS. 21 and 24, the polymer coating 30 is palm-dipped onto the liner. The polymer material may also extend over the distal tips of the plurality of fingers and thumb sections 14 on the back (or exterior) side of the gloves 10 and 12, as indicated.

With regard to a starting latex for forming the coating, the latex compound properties preferably includes a 21-30% foam. This results in the formation of a microporous coating. Additionally, the latex compound preferably has a viscosity in the range of 3000-4000 cPs. The coating applied to the glove preferably has an abrasion property of up to 5,000 revolutions. This parameter is measured using the Taber method wherein the 5,000 revolutions refers to revolutions of a rotating turntable before a failure is detected. The thickness of the coating applied to the palm-dipped coated glove is in the range of 51 to 57 mils and is preferably 54 mils.

FIG. 25 further illustrates the attachment of additional materials to the gloves of embodiments. Optionally, a cuff 22 is affixed to the knitted liner. On the knuckle side, a patch 100 is stitched to the glove. This patch can provide further padding functions as well as serve as a location for a logo.

FIG. 26 illustrates both sides of an electrician’s glove, including the application of the polymer coating and the materials to the cuff. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. Components 4, 5, and 5 are knitted in a single layer fashion with a different yarn than components 1, 2, 3, 6, and 7. Areas of reinforcement 31 are provided in the tips of the finger and thumb components. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. In an aspect, the gloves are coated with a polymer material 30. The polymer material improves grip and puncture resistance. The polymer material 30 may cover the palm side the finger, thumb, and palm components as indicated. It may also extend over the distal tips of components 1, 2, 3, 4, and 6, as indicated.

Turning to another aspect as shown in FIG. 27, gloves 40 and 42 further comprise an optional cuff 22. Each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16, 17, 18, 19, a knuckle side section 20 (only shown on glove 42), and a palm side section 26 (only shown on glove 40). The cuff 22 can be part of the knitted structure of the glove or, alternatively, can be attached to gloves 40 and 42 at a point distal to knuckle side section 20 and palm side section 26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively the cuff may be made of a different material than the knitted liner and attached by means such as sewing. The cuff 22 encircles the wearer’s wrist and preferably further includes a strap and fastener 24. Additional reinforcement elastic may be attached to the cuff prior to addition of the fastening system.

Gloves 40 and 42 can be palm-dipped coated with polymer material 30. The polymer material improves grip and puncture resistance. Areas of reinforcement 31 are provided, which are formed by plaiting a yarn such as nylon over the single ply of the knitted liner in selected areas. The knit shape and size can be varied 21 on the knuckle side 20 to increase the breathability of the glove. Alternatively, the areas of the palm components on the knuckle side can be plaited to improve abrasion resistance.

The formation of the gloves 40 and 42 is illustrated further in FIG. 28. FIG. 28 illustrates a pair of knitted glove liners that are formed from a single layer of knitted yarns and areas of plaiting. On the palm side of components 1, 2, 3, 4, 5, 6, and most of 7, a first yarn of a first color is used. The remainder of 7 and 8 are formed by a second yarn of a second color. On the knuckle side of components 1, 2, 3, 4, 5, 6, parts
of 5 and 7, the first yarn of the first color is used. The remainder of 5 and 7 and 8 are formed by the second yarn of the second color.

[0177] The plaiting yarn can be plaited into the knitted liner in selected areas to provide areas of reinforcement as a second layer over the single layer. On the palm side of the finger and the thumb, the plaiting yarn can be provided in the first 1 to 15 courses (or 2, 4, 6, 8, 10, 12 or even 14). On the knuckle side, the plaiting yarn can be provided in the first 1 to 5 courses, or so. Also on the knuckle side, the plaiting yarn can be provided on portions of the palm components 5 and 7 and of the cuff 8. Alternatively on the knuckle side, variable stitch in the palm components 5 and 7 and of the cuff 8 can be used to change the stitch size and increase breathability of the knitted liner.

[0178] In FIG. 29, on the palm side of the grove, the polymer coating 30 substantially covers the palm side of each of the thumb, fingers, and palm components 1, 2, 3, 4, 5, 6, and 7, leaving the cuff component 8 uncoated. On the knuckle side of the grove, a different coverage compared to the palm side is provided. In one aspect, only portions of the finger sections 16, 17, 18, and 19 and the thumb section 14 are covered with the polymer material 30. In one aspect, none of the palm sections of the knuckle side 20 and none of the cuff 22 is covered with the polymer material 30. Further, on the finger sections 16, 17, 18, and 19 and the thumb section 14, only a portion of the tip of these sections is covered with the polymer material 30. In a preferred embodiment, between 10% and 40% of the finger sections 16, 17, 18, and 19 and the thumb section 14, including the tips of those sections, of the knuckle side of the grove 42 are covered with the polymer material 30. In a further preferred embodiment, between 15% and 25% of these sections of the knuckle side of the grove 42 are covered with the polymer material 30. In a most preferred embodiment, 15% to 20% of these sections are covered with the polymer material 30.

[0179] FIG. 30 further illustrates the attachment of additional materials. Optionally, means for fastening the grove to the hand of the wearer are illustrated on both gloves 92 and 94. The fastening means includes a strap 96 attached to cuff 8. The strap 96 is threaded through a loop 102 and folded back on itself and secured to itself with Velcro®.

[0180] FIG. 31 illustrates both sides of an electrician's grove, including the application of the polymer coating and the materials to the cuff and knuckle side. Each of the groves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. On the palm side, components 1, 2, 3, 4, 5, 6, and 7 and of 7 are knitted in a single layer fashion with a different yarn than component 8 and the remaining portion of 7. On the knuckle side, components 1, 2, 3, 4, 5, 6 and portions of 5 and 7 are knitted in a single layer fashion with a different yarn than component 8 and the remaining portions of 5 and 7. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. The groves are coated with a polymer material 30. The polymer material improves grip and puncture resistance. The polymer material 30 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of components 1, 2, 3, 4, and 6 as well as on the back (or exterior) side, as indicated. A strap 96 and fastener 102 attached to cuff 8. Reinforcing areas 31 of plaiting yarn are provided at the tips of 1, 2, 3, 4, and 6. Plaiting is also provided in 8 and portions of 7 and 5.

Example 2

[0181] The following describes an electrician's grove in a preferred aspect. Eight components, including components 1, 2, 3, 4, 5, 6, and 7 are knitted in a single layer using a 15 gauge Dyneema® yarn having a first color and a 15 gauge Dyneema® yarn having a second color in the pattern shown in FIG. 22. Areas of reinforcement are plaited into components 1, 2, 3, 4, and 6 using a nylon plaiting yarn. The knitted grove liner having two different types of yarn is then placed on a former designed to provide a palm-dip and dipped into a coagulant that includes soft water, calcium nitrate and sodium diamyl sulfosuccinate (AY 65% 65% Surfactant). Then, after further processing, the grove liner is dipped into an aqueous latex compound coating that includes Synthomer 6322 (an aqueous dispersion of butadine acrylonitrile copolymer), Darvan WAQ 50% (sodium lauryl sulfate and water), MB-2 ES, Zinc Oxide, Akrosperse E-98 blue pigment, Acrysol RM-5000 (solvent-free hydrophobically modified polyethylene oxide urethane), and MHPC-50 (Culmin@ methylhydroxypropylcellulose). The latex compound properties include a 21-30% foam and a viscosity in the range of 3000-4000 cPs. The coating is then dried and cured. After curing, the grove is stripped from the mold and affixed with a cuff and a logo pad.

Example 3

[0182] The following describes an electrician's grove in a preferred aspect. Nine components, including components 1, 2, 3, 4, 5, 6, 7 and 8 are knitted in a single layer using a 15 gauge Dyneema® yarn having a first color and a 15 gauge Dyneema® yarn having a second color in the pattern shown in FIG. 8. Areas of reinforcement are plaited into components 1, 2, 3, 4, 6, and 8 using a nylon plaiting yarn. The knitted grove liner is then placed on a former and dipped into a coagulant that includes soft water, calcium nitrate and sodium diamyl sulfosuccinate (AY 65% 65% Surfactant). Then, after further processing, the grove liner is dipped into an aqueous latex compound coating that includes Synthomer 6322 (an aqueous dispersion of butadine acrylonitrile copolymer), Darvan WAQ 50% (sodium lauryl sulfate and water), MB-2 ES, Zinc Oxide, Akrosperse E-98 blue pigment, Acrysol RM-5000 (solvent-free hydrophobically modified polyethylene oxide urethane), and MHPC-50 (Culmin@ methylhydroxypropylcellulose). The latex compound properties include a 21-30% foam and a viscosity in the range of 3000-4000 cPs. The coating is then dried and cured. After curing, the grove is stripped from the mold and affixed with a wrist strap.

HVAC Gloves

[0183] HVAC technicians need occupational gloves to protect their hands and to operate a variety of hand tools. This requires a grove that not only provides a high degree of cut and puncture resistance but also good dexterity, wear management, and grip characteristics. Vibration, impact, abrasion, and hot and cold resistance are somewhat important. Gloves provided herein are suitable for enabling HVAC technicians to comfortably work for long periods of time performing tasks typically required of HVAC technicians, including handling tools and materials while providing the desired dex-
tered, sweat management, grip, and cut and puncture resistance. Such gloves also provide adequate abrasion, vibration, impact, and hot and cold resistance.

[0184] In one aspect, the HVAC technician’s glove is fabricated and constructed to provide a high level of sweat management, dexterity, cut resistance, puncture resistance, and grip. With regard to puncture resistance, at least one area of reinforcement comprising a plaiting yarn is provided on at least one portion of the glove fingers and thumb. The glove comprises a knitted glove liner that is fabricated as a singleply layer comprised of a yarn that is cut resistant. The singleply knitted layer may also comprise a first yarn that is cut resistant and a second yarn that is stretchable such as spandex (Lycra®), which aids in dexterity and flexibility of the glove. The second yarn may also provide other performance characteristics desirable in an occupational glove, such as moisture management. In one example, all of the finger and thumb components comprise reinforced areas formed by a yarn plaiting on top of the singleply layer. In a specific embodiment, the glove includes a knitted glove liner having a single layer with two different yarns each of which contain wire, the single layer including four finger sections, a thumb section and a palm section, each of these sections having a palm side and a knuckle side. The glove also provides reinforced areas, generally on the tips of the finger and thumb components, formed by plaiting a yarn over the singleply. The knitted glove liner having a single layer preferably includes two different wire-containing yarns.

[0185] Typically, in the HVAC technician’s glove, the coating will be placed on the finger tips and/or the palm side of the fingers, leaving the knitted liner exposed on a substantial portion of the knuckle side of the glove.

[0186] In one aspect, the first polymer coating on the knitted glove liner has a thickness in the range of 51 to 57 mils (or even 54 mils). In another aspect, two polymer coatings are provided having a thickness in the range of 54 to 60 mils (or even 57 mils).

[0187] FIG. 32 illustrates a pair of gloves, where each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16, 17, 18, 19, a knuckle side section 20 (only shown on glove 12), and a palm side section 26 (only shown on glove 10).

[0188] Gloves 10 and 12 further comprise an optional cuff 22. The cuff 22 may be part of the knitted structure of the glove or, alternatively, can be attached to gloves 10 and 12 at a point distal to knuckle side section 20 and palm side section 26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively the cuff may be made of a different material than the knitted liner and attached by means such as sewing. The cuff 22 encircles the wearer’s wrist and is provided with a tab 25 for ease of donning and doffing. Additional reinforcement elastic may be attached to the cuff prior to addition of the fastening system. Cuff designs as shown in FIGS. 17, 18, and 19 are also suitable.

[0189] Gloves 10 and 12 can be palm-dipped with a polymer coating 30. The polymer material improves grip and puncture resistance. Areas of reinforcement 31 are provided, which are formed by plaiting a yarn such as nylon over the single ply of the knitted liner in selected areas.

[0190] Formation of knitted liners for gloves 10 and 12 is illustrated in FIG. 33, which illustrates a pair of knitted glove liners that are formed from a single layer of knitted yarns and areas of plaiting. On the palm side of components 1, 2, 3, 4, 5, 6, 7, and most of 8, a first yarn of a first color is used. The remainder of 8 is formed by a second yarn of a second color. On the knuckle side of components 1, 2, 3, 4, 5, 6, parts of 5, 7, and 8, the first yarn of the first color is used. The remainder of 5, 7, and 8 are formed by the second yarn of the second color.

[0191] The plaiting yarn can be plaited into the knitted liner in selected areas 31 to provide areas of reinforcement as a second layer over the single layer. On the palm side of each finger and the thumb, the plaiting yarn can be provided in up to almost all of the courses of the component (up to 100%, or 95%, or even 50%). On the knuckle side, there is no plaiting yarn provided.

[0192] Turning to FIGS. 32 and 34, the polymer coating 30 is palm-dipped onto liner. The polymer material may also extend over the distal tips of the plurality of fingers and thumb sections 14 on the back (or exterior) side of the gloves 10 and 12, as indicated. Components 1 and 4 can be fully coated on both the palm side and the knuckle side.

[0193] The coating applied to the glove preferably has an abrasion property of up to 5,000 revolutions. This parameter is measured using the Taber method wherein the 5,000 revolutions refers to revolutions of a rotating turntable before a failure is detected. The thickness of the coating or coatings applied to the palm-dip coated glove is in the range of 51 to 60 mils and is preferably 54 or 57 mils.

[0194] FIG. 35 further illustrates the attachment of additional materials to the gloves. On the knuckle side, a patch 100 is stitched to the glove. This patch can provide further padding functions as well as serve as a location for a logo. Tab 25 is provided for donning and doffing purposes.

[0195] FIG. 36 illustrates both sides of an HVAC technician’s glove, including the application of the polymer coating and the materials to the cuff. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. On the palm side, components 1, 2, 3, 4, 5, 6, 7, and a portion of 8 are knitted in a single layer fashion with a different yarn than the remaining portion of 8. On the knuckle side, components 1, 2, 3, 4, 5, 6, and portions of 5, 7, and 8 are knitted in a single layer fashion with a different yarn than the remaining portions of 5, 7, and 8. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. In an aspect, the gloves are coated with a polymer material 30. The polymer material improves grip and puncture resistance. The polymer material 30 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of components 1, 2, 3, 4, and 6 as well as on the back (or exterior) side, as indicated. Components 1 and 4 may be fully coated. A tab 25 attached to cuff 8. Reinforcing areas 31 of plaiting yarn are provided on the palm side of components 1, 2, 3, 4, and 6. Plaiting is also provided in portions of 7 and 5 to reinforce the thumb crotch.

[0196] Turning to another HVAC handling glove as shown in FIG. 37, gloves 40 and 42 further comprise an optional cuff 22. Each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16, 17, 18, 19, a knuckle side section 20 (only shown on glove 42), and a palm side section 26 (only shown on glove 40). The cuff 22 can be part of the knitted structure of the glove or, alternatively, can be attached to gloves 40 and 42 at a point distal to knuckle side section 20 and palm side section 26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively the cuff may be made of a different material.
than the knitted liner and attached by means such as sewing. The cuff 22 encircles the wearer’s wrist and preferably further includes a strap and fastener 24. Additional reinforcement elastic may be attached to the cuff prior to addition of the fastening system. Cuff designs as shown in FIGS. 17, 18, and 19 are also suitable.

Gloves 40 and 42 can be palm-dipped coated with a first polymer material 30. A second polymer material 28 can also be coated so as to leave a portion of the first polymer material 30 exposed. The polymer material improves grip and puncture resistance. Areas of reinforcement 31 are provided, which are formed by plaiting a yarn such as nylon on the single ply of the knitted liner in selected areas.

Formation of knitted liners for gloves 40 and 42 is illustrated in FIGS. 38-39. FIG. 38 illustrates a pair of knitted glove liners 50 and 52 that are formed from a single layer of knitted yarns. The knitted liner 50 is shown palm (front) side up, so it is a left-handed glove. The knitted liner 52 is shown knuckle (back) side up, so it is a right-handed glove. The knitted liniers 50 and 52 can be made with a standard SWG garment knitting machine. A plaiting yarn can be plaited into the knitted linier in selected areas 31 to provide areas of reinforcement as a second layer over the single layer. The plaiting yarn can be provided in the first 1 to 15 courses (or 2, 4, 6, 8, 10, 12 or even 14) depending on the needs of the wearer.

Although the single layer of knitted yarns can use a single type of yarn. However, in a preferred embodiment, the knitted liniers 50 and 52 are formed from a single layer of knitted yarns that includes two different yarns. Further the knitted liniers 50 and 52 can be a single layer of knitted yarns that includes three or more different yarns. A single layer, multi-yarns glove or glove liner is described in co-pending U.S. Ser. No. 12/768,953.

As shown in FIG. 38, each of the glove liniers 50 and 52 is preferably divided into nine sections or components, labeled 1, 2, 3, 4, 5, 6, 7 and 8. In a preferred embodiment, the knitted liniers 50 and 52 are constructed as a single layer from two yarns differing only in color. The yarn may be a Kevlar®/nylon steel/spandex blended yarn having approximately 37/40/19/4% by weight respectively of each fiber. By way of example, yarns made according Intercept Technology co-developed by Ansell and DuPont can be used. The nylon and/or Kevlar® components of the blend are dyed to a first desired color, such as blue, to form a first yarn. The nylon and/or Kevlar® components of the blend is also dyed to a second desired color, such as grey, to form a second yarn. The first and second yarns are then knitted into a single layer glove liner, preferably in a seamless fashion using a single jersey stitch. An exemplary plaiting yarn is a nylon yarn.

The preferred gauge for the Kevlar®/nylon/steel/spandex blended yarn in this embodiment is in the range of 13 to 18, specifically 18. Referring to FIG. 38 and the table below, the knitting pattern of the glove liniers 50 and 52 in the illustrated zones in a preferred aspect using these two yarns is described.

<table>
<thead>
<tr>
<th>Component</th>
<th>Yarn</th>
<th>Gauge</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>2</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>3</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>4</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>5</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>6</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>7</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>8</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>1, 2, 3, 4, 6</td>
<td>Nylon plaiting yarn</td>
<td>18</td>
<td>White</td>
</tr>
</tbody>
</table>

Further as shown in FIG. 33, the forefinger 54 or component 4 is knitted in a single layer fashion with a different color than the other fingers 55, 56, and 57 and the thumb 58. FIG. 8 illustrates a knit liner in another aspect. In FIG. 39, the bottom parts of fingers 55, 56, and 57 (components 3, 2, and 1, respectively), nearest components 5 and 5, are stitched with the same yarn used in forefinger 54 (component 4). Typically, anywhere from 4 to 20 rows of yarn are stitched in this manner, while to upper portions of the fingers 55, 56 and 57 (components 3, 2, and 1, respectively) are stitched with the second yarn used in components 6, 7 and optionally in 8. Reinforced areas 31 have plaited yarn.

With regard to a starting lateral for forming the coating, the latex compound properties preferably includes a 21-30% foam. This results in the formation of a microsclor coating. Additionally, the latex compound preferably has a viscosity in the range of 3000-4000 cPS.

In addition to the combination of yarns specified in the table above, other combinations of yarns are possible. For example, two different color 18 gauge Dynema yarns can be used to knit the glove liniers 50 and 52; two different color 15 gauge Dynema yarns can be used to knit the glove liniers 50 and 52; and two different color 15 gauge Kevlar® yarns can be used to knit the glove liniers 50 and 52. However, the two different color 18 gauge Kevlar® and wire-containing yarns in a single layer liner are preferred.

Additionally, while a single layer glove liner is used as part of a preferred HVAC technician’s glove, a glove liner that has more than one layer can also be used. More generally, any knitted glove liner can be used for the glove liner of FIGS. 38 and 39.

In FIG. 40, on the palm side of the glove, the polymer coating 30 substantially covers the palm side of each of the thumb, finger, and palm components 1, 2, 3, 4, 5, 6, and 7, leaving the cuff component 8 uncleated. On the knuckle side of the glove, a different coverage compared to the palm side is provided. In one aspect, only portions of the finger sections 16, 17, 18, and 19 and the thumb section 14 are covered with the polymer material 30. In one aspect, none of
the palm sections of the knuckle side 20 and none of the cuff 22 is covered with the polymer material 30. Further, on the finger sections 16, 17, 18, and 19 and the thumb section 14, only a portion of the tip of these sections is covered with the polymer material 30. In a preferred embodiment, between 10% and 40% of the finger sections 16, 17, 18, and 19 and the thumb section 14, including the tips of these sections, of the knuckle side of the glove 42 are covered with the polymer material 30. In a further preferred embodiment, between 15% and 25% of these sections of the knuckle side of the glove 42 are covered with the polymer material 30. In a most preferred embodiment, 15% to 20% of these sections are covered with the polymer material 30. A second coating 28 is dipped such that the first coating 30 is still exposed.

[0207] As discussed with regard to FIG. 30 and the electrician’s glove, additional materials including means for fastening the glove to the hand of the wearer can be attached to the HVAC technician’s glove. The fastening means includes a strap 96 attached to cuff 8. The strap 96 is threaded through a loop 102 and folded back on itself and secured to itself with Velcro®.

[0208] FIG. 41 illustrates both sides of an HVAC technician’s glove in an aspect, including the application of the polymer coating and the materials to the cuff and knuckle side. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. Components 4, 5, and 5 are knitted in a single layer fashion with a different yarn than components 1, 2, 3, 6, and 7. Areas of reinforcement 31 are provided in the tips of the finger and thumb components. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. In an aspect, the gloves are coated with a polymer material 30. The polymer material improves grip and puncture resistance. The first polymer coating 30 may cover the palm side the finger, thumb, and palm components as indicated. It may also extend over the distal tips of components 1, 2, 3, 4, and 6, as indicated. A second polymer coating 28 is provided, leaving some of the first polymer coating 30 exposed. Reinforcing areas 31 of plating yarn are provided at the tips of 1, 2, 3, 4, and 6 on both the palm side and the knuckle side.

Example 4

[0209] The following describes an HVAC technician’s glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7, and 8 are knitted in a single layer using an 18 gauge Kevlar® and wire-containing yarn having a first color and an 18 gauge Kevlar® and wire-containing yarn having a second color in the pattern shown in FIG. 38. Areas of reinforcement are plaited into components 1, 2, 3, 4, and 6 using a nylon plating yarn. The knitted glove liner having two different types of yarn is then placed on a former designed to provide a palm-dip and dipped into a coagulant that includes soft water, calcium nitrate and ethoxylated wetting agent (Surlyn 465). Then, after further processing, to achieve the dip pattern of FIG. 54, the glove liner is dipped into an aqueous latex compound coating that includes a polyurethane latex, a pigment, and agents for dispersion, cross-linking, and thickening. The latex compound properties include a 21-30% foam and a viscosity in the range of 3000-4000 cps. The coating is then dried and cured. After curing, the glove is stripped from the mold and affixed with a strap and fastener.

Example 5

[0210] The following describes an HVAC technician’s glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7 and 8 are knitted in a single layer using an 18 gauge Kevlar® and wire-containing yarn having a first color and an 18 gauge Kevlar® and wire-containing yarn having a second color in the pattern shown in FIG. 33. Areas of reinforcement are plaited into the palm side of components 1, 2, 3, 4, 6, and 7 using a nylon plating yarn. The knitted glove liner is then placed on a former and dipped into a coagulant that includes soft water, calcium nitrate and ethoxylated wetting agent (Surlyn 465). Then, after further processing, to achieve the dip design of FIG. 3, the glove liner is dipped into an aqueous latex compound coating that includes a polyurethane latex, a pigment, and agents for dispersion, cross-linking, and thickening. The latex compound properties include a 21-30% foam and a viscosity in the range of 3000-4000 cps. The coating is then dried and cured. After curing, the glove is stripped from the mold and affixed with a tab and a logo patch.

Laborers Gloves

[0211] General laborers need occupational gloves to protect their hands but also to perform a variety of tasks. Generally, this requires a glove that not only provides a high degree of abrasion resistance but also has good impact resistance and cut resistance characteristics. These gloves should also provide good puncture resistance. The ability to grip tools and materials is also important. Further sweat management is also an important characteristic of a glove for general labors. Gloves provided herein are suitable for enabling laborer to comfortably work for long periods of time performing tasks typically required of laborers, including handling tools and materials while providing the desired abrasion resistance, impact resistance, cut resistance, puncture resistance, grip, and sweat management. Such gloves also provide adequate dexterity and vibration resistance as well as adequate heat and cold protection.

[0212] In one aspect, the glove is fabricated and constructed to provide a high level of abrasion resistance, impact resistance, cut resistance, puncture resistance, grip, and sweat management. In another aspect, the sweat management and cut resistance features of the glove are provided by a knitted glove liner that is fabricated as a single-ply layer comprised of a yarn that is cut resistant. The single-ply knitted layer may also comprise a first yarn that is cut resistant and a second yarn such as wool or cotton, which provides breathability or absorption. The second yarn may also provide other performance characteristics desirable in an occupational glove, such as flexibility or stretch. The glove includes a knitted glove liner having a single layer with two different yarns, the single layer including four finger sections, a thumb section and a palm section, each of these sections having a palm side and a knuckle side. On the palm side, padding is affixed to the fingers and thumb sections, leaving the undersides of the finger knuckle areas unpadded. The padding is also on the knuckle side of the fingers and thumb sections such that the tips of these sections are padded too. Microdotting is provided on the knuckle side, generally corresponding to the palm knuckles.
and the thumb joint for abrasion purposes. The knitted glove liner having a single layer preferably includes two different yarns that are cut resistant.

[0213] Typically, in the laborer’s glove, the coating will be placed on the palm side of the fingers, leaving the knitted liner exposed on a substantial portion of the knuckle side of the glove. The padding is ultimately covered by at least one polymer coating. A second polymer coating can be provided while leaving a portion of the first polymer coating exposed.

[0214] In one aspect, the polymer coating on the knitted glove liner has a thickness in the range of 58 to 64 mils (or even 61 mils).

[0215] FIG. 42 illustrates a pair of gloves, where each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16, 17, 18, and 19, a knuckle side section 20 (only shown on glove 12), and a palm side section 26 (only shown on glove 10).

[0216] The gloves 10 and 12 further comprise an optional cuff 22. The cuff 22 can be part of the knitted structure of the glove or, alternatively, can be attached to gloves 10 and 12 at a point distal to knuckle side section 14 and palm side section 26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively, the cuff may be made of a different material than the knitted liner and attached by means such as sewing. Cuff 22 encircles the wearer’s wrist and preferably further includes a tab 25 for easy donning and doffing the gloves 10 and 12. The gloves have padded fingers and thumb sections 27. The gloves 10 and 12 are provided with two layers of polymer material. A first polymer coating 28 is provided on the padded sections where the palm and fingers are dipped to a desired depth. A second polymer coating 30 is provided over a portion of the first polymer coating. On the knuckle side 20, microdots 32 for abrasion resistance are provided. A padded palm 26 is sewn to the polymer coated liner. This padded palm is shaped and configured to be ergonomically correct to allow the wearer’s palm to move naturally. Cuff designs as shown in FIGS. 17, 18, and 19 are also suitable.

[0217] Formation of knitted liners is shown in FIGS. 13-14. The preferred gauge for a Kevlar/nylon/steel/spandex blended yarn in this embodiment is in the range of 13 to 18, specifically 13. Referring to FIG. 13 and the table below, the knitting pattern of the glove liners 50 and 52 in the illustrated zones in a preferred aspect using these two yarns is described.

<table>
<thead>
<tr>
<th>Component</th>
<th>Yarn</th>
<th>Gauge</th>
<th>Overall Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Blue</td>
</tr>
<tr>
<td>2</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Blue</td>
</tr>
<tr>
<td>3</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Grey</td>
</tr>
<tr>
<td>5</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Grey</td>
</tr>
<tr>
<td>6</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Grey</td>
</tr>
<tr>
<td>7</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Blue</td>
</tr>
<tr>
<td>8</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>13</td>
<td>Blue</td>
</tr>
</tbody>
</table>

[0218] Further as shown in FIG. 13, the forefinger 54 or component 4 is knitted in a single layer fashion with a different color than the other fingers 55 to 57 and the thumb 58. FIG. 3 illustrates a knit liner in another aspect. In FIG. 14, the bottom parts of fingers 55, 56, and 57 (components 3, 2, and 1, respectively), nearest components 5 and 5, are stitched with the same yarn used in forefinger 54 (component 4). Typically, anywhere from 4 to 20 rows of yarn are stitched in this manner, while to upper portions of the fingers 55, 56 and 57 (components 5, 2, and 5, respectively) are stitched with the second yarn used in components 6, 7 and optionally in 8.

[0219] In addition to the combination of yarns specified in the table above, other combinations of yarns are possible. For example, two different color 13 gauge Dynema yarns can be used to knit the glove liners 50 and 52; two different color 15 gauge Dynema yarns can be used to knit the glove liners 50 and 52; and two different color 15 gauge Kevlar® yarns can be used to knit the glove liners 50 and 52. However, the two different color 13 gauge Kevlar® yarns in a single layer liner is preferred.

[0220] FIG. 43 illustrates the glove liners 60 and 62 after padded areas 64, 68, and 69 have been attached. The areas are separately numbered, but it is recognized that the padding can be provided as needed, whether as individual pieces or as one continuous piece cut to fit. Options for attaching include sewing or gluing or other known ways in the art. Areas of no padding located at the finger knuckles 66 and 67 of one or more fingers are provided to aid in flexibility when bending the fingers.

[0221] FIG. 44 illustrates the glove liners 70 and 72 after a plurality of microdots 74 has been added to the knuckle side by techniques understood in the art.

[0222] FIG. 45 illustrates the glove liners 80 and 82 after dipping. In an aspect, the glove liners 80 and 82 are coated with a first polymer material 84, which covers the padded areas shown in FIG. 43. A second polymer material 86 is provided over a portion of the first polymer material 84. The second polymer material 86 can be texturized, in U.S. Patent Publication No. 2005/0035493 (Flather). The polymer materials improve grip and/or puncture resistance.

[0223] The polymer materials 84 and 86 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of the plurality of finger components 1, 2, 3, and 4 and the thumb component on the back (or exterior) side of the glove liners 80 and 82, as indicated. In general, the first coating 84 covers more surface area of the glove than the second coating 86. The polymer materials 84 and 86 can be the same or different compositions of latex.

[0224] With regard a starting latex for forming the coating, the latex compound properties include a 10-20% foam. This results in the formation of a microporous coating. Additionally, the latex compound preferably has a viscosity in the range of 3000-4000 cPs.

[0225] The coating applied to the glove preferably has an abrasion property of 19,000-20,000 revs. This parameter is measured using the 1-ber method wherein the 19,000-20,000 revolutions refers to revolutions of a rotating tumtable before a failure is detected. The thickness of the double coating 84 and 86 applied to the glove is in the range of 58 mils to 64 mils and is preferably 61 mils.

[0226] In one aspect, the entire front section (or palm side) of the finger components 1, 2, 3, and 4 are covered with the first polymer material 84, as shown on the glove liner 80 in FIG. 45. In one aspect, 75% to 95% of the surface area of a palm section of the glove liner 80— including components 5, 5, and 7 as shown in FIGS. 13-14—is covered with the first polymer material. In a preferred aspect, between 90% and 95% of the surface area of the palm section of the glove liner 80 is covered with the first polymer material. Further,
between 75% and 95% of the surface area of the thumb component 6 on the palm side of the glove liners is covered with the first polymer material 84 and, more preferably between 90% and 95% of the surface area of the thumb component 6 on the palm side is covered. In a further aspect, the cuff section 8 is not covered. With regard to the second polymer material, it generally covers less than the entirety of the first polymer material, covering as much as 99% of the surface area of the first polymer (or even up to 95%, 90%, 85%, 80%, 75%, or even 70%).

[0227] From the component perspective in looking at FIGS. 13-14, the components 1, 2, 3, 4, 5, and 5 on the palm side of the glove liners 50 and 52 are covered with the polymer material. Component 8 on the palm side of the glove is not covered with the polymer material. Components 6 and 7 on the palm side of the gloves are partially covered with the polymer material. In one aspect, more than 50% of the surface areas of the components 6 and 7 on the palm side of the glove are covered with the polymer material. In a preferred embodiment, between 75% to 95% of component 6 is covered with the polymer material and, more preferably, between 90% and 95% of component 6 is covered with the polymer material. In a preferred embodiment, between 70% to 90% of component 7 is covered with the polymer material and, more preferably, between 85% and 90% of component 6 is covered with the polymer material.

[0228] One the knuckle side of the glove, shown on glove 82 of FIG. 45, a different coverage compared to the palm side is provided. In one aspect, a portion of the finger components 1, 2, 3, and 4, and of the thumb component 6 down to the base of these components are covered with the first polymer material 84, as shown on the glove liner 82 in FIG. 45. Edge portions of the palm components 5, 5, 7 and also the first polymer material. The second polymer material 86 covers some, but not all of the first polymer material 84. In one aspect, none of the palm components 5, 5, 7 and none of the cuff section 8 is covered with the second polymer material 84. Further, on the finger components 1, 2, 3, and 4 and the thumb component 6, only a portion of the tip of these sections is covered with the second polymer material 86. With regard to the second polymer material, it generally covers less than the entirety of the first polymer material, covering as much as 99% of the surface area of the first polymer (or even up to 95%, 90%, 85%, 80%, 75%, or even 70%).

[0229] FIG. 46 further illustrates the attachment of additional items are attached to the double-coated glove liners to form a final glove provide in an embodiment. On gloves 92 and 94, a pad 95 is stitched to the palm side. The pad 95 can be formed of any desired material to improve comfort and dexterity including but not limited to leather, synthetic/foam leather, and the like. Stitched areas 96 and 98 aid in dexterity and securing the pad 95 to the gloves 92 and 94. A pull tab 102 is provided to aid in donning and doffing. This pull tab can be added with information such as glove size. On the knuckle side, a patch 100 is stitched to the glove. This patch can provide further padding functions as well as serve as a location for a logo.

[0230] For clarification, the glove liners 50, 60 and 62 in FIGS. 43, 70 and 72 in FIGS. 44, 80 and 82 in FIGS. 45, and 92 and 94 in FIG. 46 are to be considered flat for the previous discussion of coverage of polymer materials. This way, there is no meaningful side portion of the glove and the previous discussion completely describes the coverage of the glove liners 80 and 82 with the polymer materials 84 and 86. The areas of coverage are an important trade-off because they have an impact on the breathability of the gloves as well as the cut resistance, puncture resistance and abrasion resistances of the present gloves.

[0231] FIG. 47 illustrates both sides of a labor’s glove 110 and 112, including the application of the polymer coatings and the materials. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. Components 4, 5, 5, and a portion of 8 are knitted in a single layer fashion with a different yarn than components 1, 2, 3, 6, 7, and the remaining portion of 8. Component 5 is a three-fingered palm component, which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. Padded areas 64, 68, and 69 are sewn to the knitted liner, leaving unpadded areas 66 and 67. A plurality of microdots 74 are then affixed to the liner. A first polymer material 84 is dipped onto the glove in selected areas. A second polymer material 86 that can be texturized for grip is dipped over the first polymer material in selected areas. A pad 95 is stitched to the palm side. Stitched areas 96 and 98 aid in dexterity and securing the pad 95 to the gloves 110 and 112. A pull tab 102 is provided to aid in donning and doffing. This pull tab can be affixed with information such as glove size. On the knuckle side, a patch 100 is stitched to the glove.

Example 6

[0232] The following describes a laborer’s glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7 and 8 are knitted in a single layer using a 13 gauge cut resistant composite yarn including Kevlar/nylon/steel/spandex having a first color and a 13 gauge cut resistant yarn including Kevlar/nylon/steel/spandex having a second color in the pattern shown in FIG. 2. Padding is then applied in the pattern shown in FIG. 43. A plurality of microdots is provided in the pattern shown in FIG. 44. The glove liner is then placed on a former and dipped into a couplant that includes soft water, calcium nitrate and ethoxylated wetting agent (Surfynol 465). Then, after further processing, the glove liner is double palm-dipped into an aqueous latex compound coating that includes a polyurethane latex, a pigment, and agents for dispersion, cross-linking, and thickening. The latex compound properties include a 10-20% foam and a viscosity in the range of 3000-4000 cps. The coating is then dried and cured. After curing, the glove is stripped from the mold and affixed with a pad, a logo patch, and a pull tab.

Mason’s Gloves

[0233] Masons need occupational gloves to protect their hands and also to perform a variety of tasks. Generally, this requires a glove that not only provides a high degree of abrasion resistance but also has good impact resistance and grip characteristics. These gloves should also provide good dexterity, sweat management, vibration resistance, cut resistance, and puncture resistance. Gloves provided herein are suitable for enabling mason to comfortably work for long periods of time performing tasks typically required of masons, including handling tools and materials while providing the desired abrasion resistance, impact resistance, cut resistance, puncture resistance, grip, and sweat management. Such gloves also provide adequate dexterity and vibration resistance as well as adequate hot and cold protection.
In one aspect, the glove is fabricated and constructed to provide a high level of abrasion resistance, impact resistance, grip, as well as sweat management and cut resistance. In another aspect, the sweat management and cut resistance features of the glove are provided by a knitted glove liner that is fabricated as a single-ply layer comprised of a yarn that is cut resistant. The single-ply knitted layer may also comprise a first yarn that is cut resistant and a second yarn such as wool or cotton, which provides breathability or absorbency. The second yarn may also provide other performance characteristics desirable in an occupational glove, such as flexibility or stretch. The glove includes a knitted glove liner having a single layer with two different yarns, the single layer including four finger sections, a thumb section and a palm section, each of these sections having a palm side and a knuckle side. On the palm side, padding is affixed to the fingers and thumb sections, leaving the underside of the fingers and thumb sections unpadding. The padding is also on the knuckle side of the fingers and thumb sections such that the tips of these sections are padded too. Microdotting is provided on the knuckle side, generally corresponding to the palm knuckles and the thumb joint for abrasion purposes. Microdotting is also provided on the palm side of the fingers and thumb. The knitted glove liner having a single layer preferably includes two different yarns that are cut resistant.

Typically, in the mason’s glove, the coating will be placed on the palm side of the fingers, leaving the knitted liner exposed on a substantial portion of the knuckle side of the glove. The padding is ultimately covered by at least one polymer coating. A second polymer coating can be provided while leaving a portion of the first polymer coating exposed.

In one aspect, the polymer coating on the knitted glove liner has a thickness in the range of 58 to 64 mils (even 61 mils).

FIG. 48 illustrates a pair of gloves, where each of the gloves 10 and 12 has a thumb section 14, a plurality of fingers 16, 17, 18, and 19, a knuckle side section 20 (only shown on glove 12), and a palm side section 26 (only shown on glove 10).

The gloves 10 and 12 further comprise an optional cuff 22. The cuff 22 can be part of the knitted structure of the glove or, alternatively, be attached to gloves 10 and 12 at a point distal to knuckle side section 20 and palm side section 26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively the cuff may be made of a different material than the knitted liner and attached by means such as sewing. Cuff 22 encircles the wearer’s wrist. Cuff designs as shown in FIGS. 17, 18, and 19 are also suitable.

The gloves have padded fingers, thumb, and palm sections 27. The padding for the palm section is shaped and configured to be ergonomically correct to allow the wearer’s palm to move naturally. The gloves 10 and 12 are provided with two layers of polymer material. A first polymer coating 28 is provided over the padded sections where the palm and fingers are dipped to a desired depth. The dip interface 35 between the first polymer coating 28 and the knuckle side 20 can be designed as desired, where here an undulating interface is provided. A second polymer coating 30 is provided over a portion of the first polymer coating. On the knuckle side 20, microdots 32 for abrasion resistance are provided. On the palm side 26, microdots 33 are also provided.

FIG. 49 illustrates a knuckle side of a glove 42 in an aspect. Glove 42 has a thumb section 14, a plurality of fingers 16, 17, 18, and 19, a knuckle side section 20, an optional cuff 22 is provided. The knuckle side of the glove 40 has padded fingers and thumb sections 27. A first polymer coating 28 is provided over the padded sections where the palm and fingers are dipped to a desired depth. The dip interface 35 between the first polymer coating 28 and the knuckle side 20 can be designed as desired, where here a wavy interface is provided. There is an absence of the first polymer coating on each the finger and thumb sections such that the an oval shape of the knuckle side 20 of the liner is surrounded by the first polymer coating 28. A second polymer coating 30 is provided over a portion of the first polymer coating. On the knuckle side 20, microdots 32 for abrasion resistance are provided.

Formation of knitted liners is shown in FIGS. 13-14. As shown in FIG. 13, each of the glove liners 50 and 52 are preferably divided into nine sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and 8. In a preferred embodiment, the knitted liners 50 and 52 are constructed as a single layer from two yarns differing only in color. The yarn may be a Kevlar®/nylon/Lycra® blended yarn having approximately 61/24/15% by weight respectively of each type of fiber. By way of example, a Kevlar® blended yarn available from Charles Craft can be used. Kevlar®, which is generally yellow in color, along with the nylon can be dyed to achieve a desired color. In one example, they are dyed blue, which when blended with the white Lycra® provides a blue/white heather colored first yarn. In another example, the Kevlar® and nylon are dyed green, which when blended with the white Lycra® provides a grey/white heather color second yarn. The first and second yarns are then knitted into a single layer glove liner, preferably in a seamless fashion using a single jersey stitch.

The preferred gauge for the Kevlar®/nylon/Lycra® blended yarn in this embodiment is in the range of 13 to 18, specifically 15. Referring to FIG. 13 and the table below, the knitting pattern of the glove liners 50 and 52 in the illustrated zones in a preferred aspect using these two yarns is described.

<table>
<thead>
<tr>
<th>Component</th>
<th>Yarn</th>
<th>Gauge</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>2</td>
<td>Kevlar/Nylon/Steel Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>3</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>4</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>5</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>6</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Grey/white heather</td>
</tr>
<tr>
<td>7</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>8</td>
<td>Kevlar/Nylon/Steel/Spandex Blend</td>
<td>18</td>
<td>Blue/white heather</td>
</tr>
<tr>
<td>1, 2, 3, 4, 6</td>
<td>Nylon plaiting yarn</td>
<td>18</td>
<td>White</td>
</tr>
</tbody>
</table>
Further as shown in FIG. 13, the forefinger 54 or component 4 is knitted in a single layer fashion with a different color than the other fingers 55 to 57 and the thumb 58. FIG. 14 illustrates a knit liner in another aspect. In FIG. 3, the bottom parts of fingers 55, 56, and 57 (components 3, 2, and 1, respectively), nearest components 5 and 5, are stitched with the same yarn used in forefinger 54 (component 4). Typically, anywhere from 4 to 20 rows of yarn are stitched in this manner, while to upper portions of the fingers 55, 56 and 57 (components 3, 2, and 1, respectively) are stitched with the second yarn used in components 6, 7 and optionally in 8).

In addition to the combination of yarns specified in the table above, other combinations of yarns are possible. For example, two different color 15 gauge Dynema yarns can be used to knit the glove liners 50 and 52; two different color 18 gauge Dynema yarns can be used to knit the glove liners 50 and 52; and two different color 18 gauge Kevlar yarns can be used to knit the glove liners 50 and 52. However, the two different color 15 gauge Kevlar® yarns in a single layer liner is preferred.

Additionally, while a single layer glove liner is used as part of a preferred mason glove in an aspect, a glove liner that has more than one layer can also be used. More generally, any type of glove liner can be used for the glove liner of FIGS. 13 and 14.

FIG. 49 illustrates the glove liners 60 and 62 after paddied areas 64, 65, 68, and 69 have been attached. The areas are separately numbered, but it is recognized that the padding can be provided as needed, whether as individual pieces or as one continuous piece cut to fit. Options for attaching include sewing or gluing or other known ways in the art. Areas of no padding located at the finger knuckles 66 and 67 are provided to aid in flexibility when bending the fingers.

FIG. 50 illustrates the glove liners 70 and 72 after a plurality of microdots 74 has been added to the knuckle side by techniques understood in the art. Microdots 76 are added to the palm side on the finger and thumb sections.

FIG. 51 illustrates the glove liners 80 and 82 after dipping. In an aspect, the glove liners 80 and 82 are coated with a first polymer material 84, which covers the paddied areas shown in FIG. 49. A second polymer material 86 is provided over a portion of the first polymer material 84. The second polymer material 86 can be textured in, U.S. Patent Publication No. 2005/0035493 (Flather). The polymer materials improve grip and/or puncture resistance.

The polymer materials 84 and 86 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of the plurality of finger components 1, 2, 3, and 4 and the thumb component on the back (or exterior) side of the glove liners 80 and 82, as indicated. In general, the first coating 84 covers more surface area of the glove than the second coating 86.

The polymer materials 84 and 86 are independent compositions that can be the same or different.

With regard a starting latex for forming the coating, the latex compound properties include a 10-20% foam. This results in the formation of a microporous coating. Additionally, the latex compound preferably has a viscosity in the range of 3000-4000 cps.

The coating applied to the glove preferably has an abrasion property of 19,000-20,000 revs. This parameter is measured using the Taber method wherein the 19,000-20,000 revolutions refers to revolutions of a rotating turntable before a failure is detected. The thickness of the double coating 84 and 86 applied to the glove is in the range of 58 mils to 64 mils and is preferably 61 mils.

In one aspect, the entire front section (or palm side) of the finger components 1, 2, 3, and 4 are covered with the first polymer material 84, as shown on the glove liner 80 in FIG. 51. In one aspect, 75% to 95% of the surface area of a palm section of the glove liner 80— including components 5, 5, and 7 as shown in FIGS. 13-14 — is covered with the first polymer material. In a preferred aspect between 90% and 95% of the surface area of the palm section of the glove liner 80 is covered with the first polymer material. Further, between 75% and 95% of the surface area of the thumb component 6 on the palm side of the glove liners is covered with the first polymer material 84 and, more preferably between 90% and 95% of the surface area of the thumb component 6 on the palm side is covered. In a further aspect, the cuffed section 8 is not covered. With regard to the second polymer material, it generally covers less than the entirety of the first polymer material, covering as much as 99% of the surface area of the first polymer (or even up to 95%, 90%, 85%, 80%, 75%, or even 70%).

From the component perspective in looking at FIGS. 13-14, the components 1, 2, 3, 4, 5, and 5, on the palm side of the glove liners 50 and 52 are covered with the polymer material. Component 8 on the palm side of the glove is not covered with the polymer material. Components 6 and 7 on the palm side of the gloves are partially covered with the polymer material. In one aspect, more than 50% of the surface areas of the components 6 and 7 on the palm side of the glove are covered with the polymer material. In a preferred embodiment, between 75% to 95% of component 6 is covered with the polymer material and, more preferably, between 90% and 95% of component 6 is covered with the polymer material. In a preferred embodiment, between 70% to 90% of component 7 is covered with the polymer material and, more preferably, between 85% and 90% of component 6 is covered with the polymer material.

One of the knuckle side of the glove, shown on glove 82 of FIG. 51, a different coverage compared to the palm side is provided. In one aspect, the finger components 1, 2, 3, and 4 and the thumb component 6 down to the base of these components are covered with the first polymer material 84, as shown on the glove liner 82 in FIG. 51. Edges of the glove liner 80 is covered with the palm components 5, 5, and 7 also have the first polymer material. The second polymer material 86 covers some, but not all of the first polymer material 84. In one aspect, none of the palm components 5, 5, and 7 and none of the cuffed section 8 is covered with the second polymer material 84. Further, on the finger components 1, 2, 3, and 4 and on the thumb component 6, only a portion of the tip of these sections is covered with the second polymer material 86. With regard to the second polymer material, it generally covers less than the entirety of the first polymer material, covering as much as 99% of the surface area of the first polymer (or even up to 95%, 90%, 85%, 80%, 75%, or even 70%).

FIG. 52 further illustrates the attachment of additional items are attached to the double-coated glove liners to form a final glove provide in an embodiment. On the knuckle side of glove 92, a patch 100 is stitched to the glove. This patch can provide further padding functions as well as serve as a location for a logo.

For clarification, the glove liners 60 and 62 in FIGS. 49, 70 and 72 in FIGS. 50, 80 and 82 in FIGS. 51, and 94 and
FIG. 53 illustrates both sides of a labor’s glove 110 and 112 in an aspect, including the application of the polymer coatings and the materials. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. Components 4, 5, 6, and a portion of 8 are knitted in a single layer fashion with a different yarn than components 1, 2, 3, 6, 7, and the remaining portion of 8. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. Padded areas 64, 65, 66, and 69 are sewn to the knitted liner, leaving unpadded areas 66 and 67. A plurality of microdots 74 are then affixed to the knuckle side of the liner. A plurality of microdots 76 are also affixed to the fingers and thumb sections on the palm side of the liner. A first polymer material 84 is dipped onto the glove in selected areas. A second polymer material 86 that can be texturized for grip is dipped over the first polymer material in selected areas. On the knuckle side, a patch 100 is stitched to the glove.

Example 7

The following describes a mason’s glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7, and 8 are knitted in a single layer using a 15 gauge cut resistant composite yarn including Kevlar®/nylon/Lycra® having a first color and a 15 gauge cut resistant yarn including Kevlar®/nylon/Lycra® having a second color in the pattern shown in FIG. 2. Padding is then applied in the pattern shown in FIG. 49. A plurality of microdots is provided in the pattern shown in FIG. 50. The glove liner is then placed on a former and dipped into a coating that includes soft water, calcium nitrate and ethoxylated wetting agent (Surfynol 465). Then, after further processing, the glove liner is double palm-dipped into an aqueous latex compound coating that includes a polyurethane latex, a pigment, and agents for dispersion, cross-linking, and thickening. The latex compound properties include a 10-20% foam and a viscosity in the range of 3000-4000 cPs. The coating is then dried and cured. After curing, the glove is stripped from the mold and affixed with a logo patch.

Plumber’s Gloves

Commercial plumbers need occupational gloves to protect their hands and to operate a variety of hand tools. This requires a glove that not only provides a high degree of dexterity but also has good sweat management characteristics. Protection from liquids and chemicals is also important. Grip is also of importance in protective gloves for commercial plumbers. Cut, puncture, and abrasion resistance are somewhat important. Gloves provided herein are suitable for enabling plumbers to comfortably work for long periods of time performing tasks typically required of plumbers, including handling tools and materials while providing the desired dexterity, sweat management, and grip features. Such gloves also provide adequate abrasion, cut, and puncture resistance.

In one aspect, the glove is fabricated and constructed to provide a high level of sweat management, dexterity, liquid and chemical protection, cut, puncture, and abrasion resistance, and grip. With regard to the grip, a grip configuration is provided that has at least one area of polymer coating. In one example, the grip configuration comprises areas of polymer coating dipped onto one or more of the fingertips only. In another example, the grip configuration comprises a palm-dipped polymer coating in conjunction with a covering that is made from abrasive resistant material. In a specific embodiment, the covering contains a notched area where the polymer coating is exposed. In another aspect, the glove comprises a knitted glove liner, which is fabricated as a single-ply layer comprised of a yarn that is cut resistant. The single-ply knitted layer may also comprise a first yarn that is cut resistant and a second yarn that is stretchable such as spandex (Lycra®), which aids in dexterity and flexibility of the glove. The second yarn also provides abrasion, cut, and puncture resistance. Such gloves also provide adequate abrasion, cut, and puncture resistance.
In an aspect, the gloves 10 and 12 are coated with areas of a polymer material 30 on the tips of each of the fingers and thumb. The polymer material improves grip and puncture resistance.

Formation of knitted liners is shown in FIGS. 13-14. As shown in FIG. 13, each of the glove liners 50 and 52 is preferably divided into nine sections or components, labeled 1, 2, 3, 4, 5, 6, 7 and 8. In a preferred embodiment, the knitted liners 50 and 52 are constructed as a single layer from two yarns differing only in color. The yarn may be a Kevlar®/nylon/Lycra® blended yarn having approximately 61/24/15% by weight respectively of each type of fiber. By way of example, a Kevlar® blended yarn available from Charles Craft can be used. Kevlar®, which is generally yellow in color, along with the nylon can be dyed to achieve a desired color. In one example, they are dyed blue, which when blended with the white Lycra® provides a blue/white heather colored first yarn. In another example, the Kevlar® and nylon are dyed grey, which when blended with the white Lycra® provides a grey/white heather color second yarn. The first and second yarns are then knitted into a single layer glove liner, preferably in a seamless fashion using a single jersey stitch.

The preferred gauge for the Kevlar®/nylon/Lycra® blended yarn in this embodiment is in the range of 13 to 18, specifically 15. Referring to FIG. 13 and the table below, the knitting pattern of the glove liners 50 and 52 in the illustrated zones in a preferred aspect using these two yarns is described.

<table>
<thead>
<tr>
<th>Component</th>
<th>Yarn</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Kevlar®/Nylon/Lycra® Blend 61/24/15</td>
<td>15</td>
</tr>
</tbody>
</table>

Further as shown in FIG. 13, the forefinger 54 or component 4 is knitted in a single layer fashion with a different color than the other fingers 55, 56, and 57 and the thumb 58. FIG. 3 illustrates a knit liner in another aspect. In FIG. 14, the bottom parts of fingers 55, 56, and 57 (components 3, 2, and 1, respectively), nearest components 5 and 5, are stitched with the same yarn used in forefinger 54 (component 4). Typically, anywhere from 4 to 20 rows of yarn are stitched in this manner, while to upper portions of the fingers 55, 56, and 57 (components 3, 2, and 1, respectively) are stitched with the second yarn used in components 6, 7 and optionally in 8).

In addition to the combination of yarns specified in the table above, other combinations of yarns are possible. For example, two different color 18 gauge Dynema® yarns can be used to knit the glove liners 50 and 52; two different color 18 gauge Kevlar® yarns can be used to knit the glove liners 50 and 52; and two different color 15 gauge Dynema® yarns can be used to knit the glove liners 50 and 52. However, the two different color 15 gauge Kevlar® yarns in a single layer liner are preferred.

Turning to FIGS. 55 and 56, areas of polymer material 30 are dipped onto the fingertips of the glove liner such that the finger and thumb pads are coated. The polymer material may also extend over the distal tips of the plurality of fingers and thumb sections 14 on the back (or exterior) side of the gloves 10 and 12, as indicated.

With regard a starting latex for forming the coating, the latex compound properties preferably includes a 21-30% foam. This results in the formation of a micro porous coating. Additionally, the latex compound preferably has a viscosity in the range of 3600-4000 cps.

The coating applied to the glove preferably has an abrasion property of up to 5,000 revolutions. This parameter is measured using the Taber method wherein the 5,000 revolutions refers to revolutions of a rotating turntable before a failure is detected. The thickness of the coating applied to the palm-dip coated glove is in the range of 51 to 57 mils and is preferably 54 mils. For the finger and thumb tip coated glove, the thickness of the coating is in the range of 30 to 40 mils, preferably 35 mils.

FIG. 6 further illustrates the attachment of additional materials to the gloves. Optionally, means for fastening the glove to the hand of the wearer are illustrated on both gloves 92 and 94. The fastening means 90 includes a strap 96 attached to cuff 98. The strap 96 is threaded through a loop 100 and folded back on itself and secured to itself with Velcro®.

FIG. 7 illustrates both sides of a plumber's glove, including the application of the polymer coating and the materials to the cuff. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. Components 4, 5, and 5 are knitted in a single layer fashion with a different yarn than components 1, 2, 3, 4, and 7. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. In an aspect, the gloves are coated on the finger and thumb tips with a polymer material 30. The polymer material improves grip and puncture resistance. The polymer material 30 may cover the pads of the finger and thumb tips as indicated. It may also extend over the distal tips of components 1, 2, 3, 4, and 6, as indicated. A strap 96 attached to cuff 98. The strap 96 is threaded through a loop 100 and folded back on itself and secured to itself with a Velcro® tab.

Turning to another aspect as shown in FIG. 58, gloves 40 and 42 further comprise an optional cuff 22. Each of the gloves 40 and 42 has a thumb section 14, a plurality of fingers 16, 17, 18, 19, a knuckle side section 20 (only shown on glove 42), and a palm side section 26 (only shown on glove 40). The cuff 22 can be part of the knitted structure of the glove or alternatively, can be attached to gloves 40 and 42 at a point distal to knuckle side section 20 and palm side section...
26. The cuff 22 may be made of a knitted material knitted into the knitted liner or sewn to it. Alternatively the cuff may be made of a different material than the knitted liner and attached by means such as sewing. The cuff 22 encircles the wearer's wrist and preferably further includes a tab 25 for easy donning and doffing. Additional reinforcement elastic may be attached to the cuff prior to addition of the fastening system. In addition, abrasion protection is provided by a covering or reinforcing pad 28 that is stitched 29 over the polymer material 30. The reinforcing pad 28 contains a notched area 32 where the polymer material 30 is exposed.

[0277] Turning to FIGS. 58 and 15, the polymer material 30 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of the plurality of fingers 16, 17, 18, and 19 and the thumb section 14 on the back (or exterior) side of the gloves 10 and 12, as indicated.

[0278] In one aspect, the entire front section (or palm side) of the fingers 16, 17, 18, and 19 and the thumb section 14 are covered with the polymer material 30, as shown in FIG. 58. In one aspect, 75% to 95% of the surface area of the palm sections on the palm side 26 of the glove 10—including components 1, 2, 3, 4, 5, and 7 as shown in FIGS. 13-14—is covered with the polymer material. In a preferred aspect between 90% and 95% of the surface area of the palm sections of the palm side 26 is covered with polymer material. In a further aspect, the cuff 22 is not covered.

[0279] From the component perspective in looking at FIG. 15, the components 1, 2, 3, 4, 5, and 5, on the palm side of the glove linings 50 and 52 are covered with the polymer material. Component 8 on the palm side of the glove is not covered with the polymer material. Components 6 and 7 on the palm side of the gloves are partially covered with the polymer material. In one aspect, more than 50% of the surface areas of the components 6 and 7 on the palm side of the glove are covered with the polymer material. In a preferred embodiment, between 75% to 95% of component 6 is covered with the polymer material and, more preferably, between 90% and 95% of component 6 is covered with the polymer material. In a preferred embodiment, between 70% to 90% of component 7 is covered with the polymer material and, more preferably, between 85% and 90% of component 6 is covered with the polymer material.

[0280] On the knuckle side of the glove, shown on glove 42 of FIG. 58 and in FIG. 15, a different coverage compared to the palm side is provided. In one aspect, only portions of the finger sections 16, 17, 18, and 19 and the thumb section 14 are covered with the polymer material 30. In one aspect, none of the palm sections of the knuckle side 20 and none of the cuff 22 is covered with the polymer material 30. Further, on the finger sections 16, 17, 18, and 19 and the thumb section 14, only a portion of the tip of these sections is covered with the polymer material 30. In a preferred embodiment, between 10% and 40% of the finger sections 16, 17, 18, and 19 and the thumb section 14, including the tips of those sections, of the knuckle side of the glove 42 are covered with the polymer material 30. In a further preferred embodiment, between 15% and 25% of these sections of the knuckle side of the glove 42 are covered with the polymer material 30. In a most preferred embodiment, 15% to 20% of these sections are covered with the polymer material 30.

[0281] From the component perspective as shown in FIG. 15, zones 5, 5, 7 and 8 on the knuckle side of the glove 42 are not covered with the polymer material 30. Components 1, 2, 3, 4 and 6 are covered as previously described with respect to the fingers and thumb sections on the knuckle side of the glove 42.

[0282] FIG. 59 further illustrates the attachment of additional materials. A covering or reinforcing material 28 can be sewn 29 over the polymer material to provide areas of less grip and more abrasion protection. The material can be notched 32 to provide selective areas of grip. A tab 25 can be added for donning and doffing. The reinforcing material 28 can end at the bases of the fingers and thumb or extend up these components alone or in combination as needed.

[0283] FIG. 60 illustrates both sides of a plumber's glove, including the application of the polymer coating and the materials to the cuff and palm side. Each of the gloves is preferably divided into eight or more sections or components, labeled 1, 2, 3, 4, 5, 6, 7, and an optional cuff 8. Components 4, 5, and 6, and a portion of 8 are knit in a single layer fashion with a different yarn than components 1, 2, 3, 6, 7, and the remaining portion of 8. Component 5 is a three-fingered palm component which is attached to components 4, 3, and 2. Component 5 is then attached to component 1 and the three-fingered palm component 5. In an aspect, the gloves are coated with a polymer material 30. The polymer material improves grip and puncture resistance. The polymer material 30 may cover the palm section and interior parts of the finger sections as indicated. It may also extend over the distal tips of the components 1, 2, 3, 4, and 6 as well as on the back (or exterior) side, as indicated. A tab 25 attached to cuff 8. A reinforcing material 28 having a notch 32 is stitched over the polymer material 30.

Example 8

[0284] The following describes a plumber's glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7, and 8 are knit in a single layer using a 15 gauge Kevlar® yarn having a first color and a 15 gauge Kevlar® yarn having a second color in the pattern shown in FIG. 13. The knitted, single layer glove liner having two different types of yarn is then placed on a former designed to provide a dip design that includes only finger and thumb tips and dipped into a coagulant that includes soft water, calcium nitrate and an ethoxylated wetting agent (Surfynol 465). Then, after further processing, the glove liner is dipped into an aqueous latex compound coating that includes a polyurethane latex, a pigment, and agents for dispersion, cross-linking, and thickening. The latex compound properties include a 21-30% foam and a viscosity in the range of 3000-4000 cPs. The coating is then dried and cured. After curing, the glove is stripped from the mold and affixed with a wrist strap.

Example 9

[0285] The following describes a plumber's glove in a preferred aspect. Nine components, include components 1, 2, 3, 4, 5, 6, 7, and 8 are knit in a single layer using a 15 gauge Kevlar® yarn having a first color and a 15 gauge Kevlar® yarn having a second color in the pattern shown in FIG. 13. The knitted, single layer glove liner having two different types of yarn is then placed on a former designed to provide a dip design that includes both the palm and finger and thumb tips and dipped into a coagulant that includes soft water, calcium nitrate and an ethoxylated wetting agent (Surfynol 465). Then, after further processing, the glove liner is dipped into an aqueous latex compound coating that includes a poly-
urethane latex, a pigment, and agents for dispersion, cross-linking, and thickening. The latex compound properties include a 21-30% foam and a viscosity in the range of 3000-4000 cPs. The coating is then dried and cured. After curing, the glove is stripped from the mold and affixed with a notched reinforcing pad and a pull tab.

The invention has been described with specific reference to the embodiments and modifications thereto described above. It is to be understood that the invention is not limited to the details of construction or process steps set forth in the following description. The invention is capable of other embodiments and of being practiced in various ways. Further modifications and alterations may occur to others upon reading and understanding the specification. It is intended to include all such modifications and alterations insofar as they come within the scope of the invention.

We claim:

1. A glove for a hand comprising:
a knitted glove liner having a continuous single layer with	two different yarns, the single layer comprising four finger sections, a thumb section and a palm section, each of these sections having a palm side and a knuckle side; and	
a first polymer coating.

2. The glove of claim 1, wherein the polymer coating is formed in a grip configuration.

3. The glove of claim 1 further comprising at least one reinforced section comprising a plaiting yarn located on at least one of the four finger sections or the thumb section.

4. The glove of claim 3, wherein both of the two different yarns are wire-free.

5. The glove of claim 3, wherein both of the two different yarns comprise wire.

6. The glove of claim 1 further comprising a plurality of microdots on the knuckle side, the palm side, or both.

7. The glove of claim 1 further comprising a padded area on at least one of the four finger sections or the thumb section.

8. The glove of claim 1 further comprising a second coating over the first polymer coating such that the first polymer coating is partially exposed.

9. The glove of claim 1 further comprising a plurality of microdots located on the knuckle side; a padded area located on each of the four finger sections and on the thumb section; whereas the first polymer coating is over at least the padded areas; and a second polymer coating over the first polymer coating such that the first polymer coating is partially exposed.

10. The glove of claim 1 further comprising a plurality of microdots located on both the knuckle side and the palm side; a padded area located on each of the four finger sections, on the thumb section, and on the palm section; wherein the first polymer coating is over at least the padded areas; and a second polymer coating over the first polymer coating such that the first polymer coating is partially exposed.

11. The glove of claim 1, wherein:
on the palm side, the polymer coating covers all of the four finger sections, at least 75% of the surface area of the palm section and at least 75% of the surface area of the thumb section; and
on the knuckle side, the polymer coating substantially covers the tips of the four finger sections and of the thumb section and 15% to 25% of the surface area of each of the four finger sections and of the thumb section; wherein the remaining portions of the four finger sections, the thumb section and the palm section are not coated by the polymer coating.

12. The glove of claim 1, further comprising a cuff section attached to the palm section.

13. The glove of claim 1, wherein the single layer further comprises a cuff section.

14. The glove of claim 1, wherein the two different yarns comprise a first cut resistant yarn having a first color and a second cut resistant yarn having a second color.

15. The glove of claim 14, wherein both cut resistant yarns are 13, 15, or 18 gauge.

16. The glove of claim 14, wherein both cut resistant yarns comprise an ultrahigh molecular weight polyethylene, a para-aramid, wire, or a combination thereof.

17. The glove of claim 1, wherein the palm section comprises a first palm zone, a second palm zone, a first palm zone, and a third palm zone, and the four finger sections comprise a forefinger section, a middle finger section, a ring finger section, and a pinky finger section.

18. The glove of claim 17, wherein the first palm zone is attached to the forefinger, middle finger, and ring finger sections, the second palm component is attached to the pinky finger section and the first palm component, and the third palm component is attached to the second palm component and the thumb.

19. The glove of claim 1, wherein a forefinger section of the four finger sections and a first zone of the palm section comprise a first yarn having a first color and remaining sections of the single layer comprise the second yarn having a second color.

20. The glove of claim 19, wherein the yarns are cut resistant yarns comprising an ultrahigh molecular weight polyethylene and a gauge of 15.

21. The glove of claim 19, wherein the yarns are cut resistant yarns comprising a para-aramid and a gauge of 15.

22. The glove of claim 19, wherein the yarns are cut resistant yarns comprising a para-aramid, a wire, and a gauge of 13 or 18.

23. The glove of claim 1, wherein the polymer coating comprises a cured polyurethane-based latex or a cured nitrile-based latex.

24. A method of protecting hands and handling tools and equipment comprising: wearing the glove of claim 1, and thereby providing one or more of sweat management, dexterity, cut resistance, puncture resistance, impact resistance, thermal protection, vibration resistance, and grip.

* * * * *