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(54) Title: POLYMERIC GLOVES HAVING GRIP FEATURES

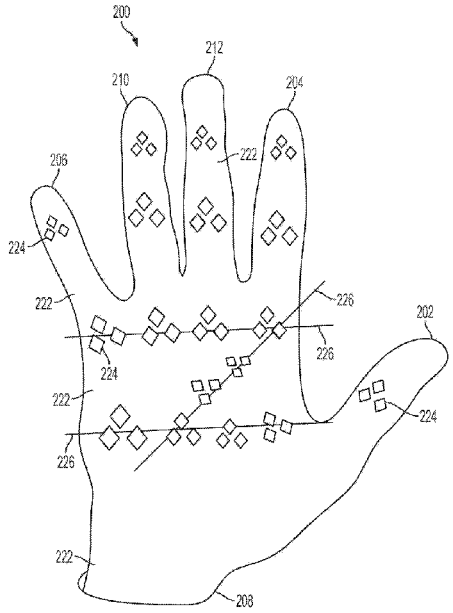

FIG. 2

(57) Abstract: A glove, including a first polymeric composition disposed as a polymeric coating or polymeric layer; and a plurality of raised features comprising a second polymeric composition disposed on a surface of the polymeric coating, wherein the polymeric coating and the plurality of raised features comprise different polymeric compositions adapted to enhance at least one of oil grip properties, dry grip properties, or wet grip properties, and methods of making the gloves, which may be unsupported gloves, are disclosed.

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POLYMERIC GLOVES HAVING GRIP FEATURES

BACKGROUND

Field of the invention

[0001] Embodiments of the present invention generally relate to gloves and, more particularly, to polymeric gloves having raised features comprised of polymeric compositions disposed on the gloves and methods of making the gloves.

Description of the Related Art

[0002] Gloves are utilized in many fields for protecting workers, such as medical, industrial, and chemical industries as well as for household uses. In service, gloves include features to impart grip-ability and flexibility properties. Moreover, gloves are subjected to extensive wear from cuts, punctures, and abrasions.

[0003] Some polymeric gloves are formed from dipping a former into a polymeric composition, e.g., natural rubber latex, synthetic rubber latex, or the like, to form a coating in the shape of the former. However, such gloves are typically smooth and, therefore, do not offer adequate grip properties. Past attempts to impart grip properties to gloves have involved the use of caustic chemicals, salts, and require additional processes.

[0004] Also, for comfort and flexibility reasons, many gloves comprise foamed coatings. However, although such gloves may protect users against germs, viruses, and microbes as well as injuries, such gloves are not particularly abrasion- or cut-resistant, especially when foamed, leading to breaches during use and particularly during extended use. Moreover, gloves having open-celled foams have networks of inter-connecting cells and, generally, have a surface texture, which can aid in grip properties. However, open-celled foams do not adequately protect users from, for instance, medical hazards, such as germs, bacteria, viruses, and the like, as well as chemicals. Accordingly, users often double-glove, reducing comfort and grip.

[0005] Therefore, polymeric gloves offering excellent grip properties, represent advances in the art.

SUMMARY

[0006] Polymeric gloves having polymeric raised features disposed thereon, and methods of making such gloves, according to embodiments of the present invention, substantially as shown in and/or described in connection with at least one of the figures, as set forth more completely in the claims, are disclosed. Various advantages, aspects, and novel features of the present disclosure, as well as details of an exemplary embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] So that the manner in which the above recited features of the present invention can be understood in detail, a more particular description of the invention, briefly summarized above, may be had by reference to embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments. It is to be understood that elements and features of one embodiment may be in other embodiments without further recitation and that, where possible, identical reference numerals have been used to indicate comparable elements that are common to the figures.

[0008] Figure 1A depicts an exemplary flow diagram of a method for making a glove according to embodiments of the present invention;

[0009] Figure 1B depicts an exemplary flow diagram of a method for making a two-layer glove according to embodiments of the present invention;

[0010] Figure 2 depicts the palmside of a glove having features disposed thereon according to embodiments of the present invention;

[0011] Figure 3 depicts the palmside of an exemplary glove having features disposed thereon according to embodiments of the present invention; and

[0012] Figures 4A-4F depict various alternative embodiments of additional raised features disposed on the gloves of FIGS. 2-3, according to embodiments of the invention.

DETAILED DESCRIPTION

[0013] Embodiments according to the present invention comprise polymeric gloves, such as examination, surgical, and the like gloves, that have a plurality of polymeric raised features disposed on the polymeric gloves, creating gloves having enhanced grip-ability, wherein the plurality of polymeric raised features are comprised of a polymeric composition that is different than the polymeric composition of which the polymeric glove is comprised. In some embodiments of the present invention, the plurality of raised features is disposed on a polymeric layer(s) before curing the polymeric layer(s). Also, in some embodiments according to the invention, the polymeric composition, whether for the polymeric layer(s) or the raised features, is foamed, as discussed more fully below.

[0014] The process according to embodiments of the invention comprise the step of applying a coagulant onto a glove-shaped former and dipping the former into a first polymeric composition to form a polymeric layer, i.e., an unsupported glove, as discussed below. Subsequently, raised features, such as dots, mounds, bullets, straight or curved rails, circles, toroids, grains, and the like, optionally disposed in patterns, comprising a second polymeric composition, are disposed on the unsupported glove.

[0015] Figure 1 depicts an exemplary flow diagram of a method 100 for making a glove according to embodiments of the present invention. The method 100 starts at step 102 and proceeds to step 104, at which point a former is heated, for example, from between 40-60°C. The former is, for example, a metallic or ceramic former in the shape of a glove and may be in an arcuate shape, such as a partially closed hand or, alternatively, a flat shape. At step 106, a decision is made whether to apply a coagulant to the former, such as an aqueous coagulant or a powdered coagulant as are known to those in the art. If the answer is yes, at step 108, a coagulant is applied to the former, which, for e.g., may be a dipping or spraying step. If the

answer is no, the method 100 proceeds directly to step 110, at which point the former is dipped into a polymeric composition, forming a polymeric coating on the former. The coating comprises one or more polymeric materials or blends thereof, including thermoplastic and thermoset materials. At least one exemplary embodiment is shown in Table 1. Thermosetting materials may include, for example, phenolics, silicones, polyesters, and sulfur-filled (or other vulcanizing agents), vulcanizable natural and synthetic rubber materials. Also, thickening agents, i.e., rheological modifiers, as known to those in the art to control the viscosity of the thermosetting and/or polymeric and/or thermoplastic materials, are contemplated herein.

[0016] At step 112, a decision is made whether to cure the coating formed at step 110. If the answer is yes, the coating is cured, for example, by allowing the coating to drip dry or by applying heat to the coating, at step 114, for example, in an infrared oven. If the answer is no, no curing occurs and the method 100 proceeds to step 116, at which point, additional raised features, such as a plurality of polymeric features (as discussed below) are applied to the coating formed on the former, which may be the same or a different thermoplastic or thermoset composition as discussed above regarding the composition of which the coating is comprised. Table 2 depicts at least one exemplary formulation for a polyurethane composition. In some embodiments, the application of the additional raised features is a screen-printing step. At least one exemplary embodiment includes wherein the silkscreen is a stainless steel screen. The temperature of the polymeric composition during the screen-printing step is between 10-30°C and, in at least one embodiment according to the invention, the temperature is approximately 23-25°C. In some embodiments according to the invention, the additional raised features are applied via an air-jetting deposition and/or 3D printing processes.

[0017] The method 100 next proceeds to step 118, at which point the coating and the features are cured, for example, in an oven. The method 100 then proceeds to step 120 at which point the method 100 ends. The curing step(s) comprise, in some embodiments, curing in an oven at, for example, 50°C to 150°C for approximately 10 to 60 minutes. In at least one exemplary embodiment of the invention, made from the foregoing method, gloves having the additional raised features disposed thereon

are placed into an oven, for example, an infrared oven and heated to approximately 105°C to 130°C for approximately 5 to 30 minutes, forming a cured glove. In at least one embodiment according to the invention, curing is for approximately 7-8 minutes at 130°C or, for example, 20 minutes at approximately 115°C. In some embodiments of the present invention, the heating or curing occurs twice, once before the additional raised features are disposed on the polymeric coating and once after the additional raised features are disposed thereon. Also, any of the additional raised features may comprise bullets, circles, toroids, dots, rings, waves, grains, or other additional raised features in varying sizes, shapes, or patterns, as discussed below.

[0018] Also, some steps of the preceding method 100 may be omitted or performed in a different sequence. Moreover, additional steps may be employed. For example, the coating on the former may be stripped, washed, and dried following step 110. Washing can be carried out at a temperature between approximately 25°C and 60°C, for approximately 15 to 90 minutes. The gloves may then be dried in a tumble dryer for approximately 20 to 60 minutes at 50°C to 70°C. These ranges allow different moisture contents, which may be important for the subsequent steps, for example, re-dressing the gloves on former and adding the additional raised features at step 110. Also, other finishing processes may be applied at this stage. For example, the coating and/or additional raised features may be cured by the application of heat.

[0019] Moreover, texturization or wrinkling processes may be added to the process, as are known to those in the art, to provide enhanced grip properties. Also, the method 100 may also comprise the application of a plurality of polymeric features comprising a third polymeric composition. In other words, for example, a base coating of a glove may comprise, a highly-carboxylated nitrile-butadiene composition, additional raised features comprising an acrylic composition, and yet other additional raised features comprising a polyurethane composition. A highly–carboxylated acrylonitrile-butadiene in this context indicates approximately 35-40% acrylonitrile, and is particularly oil-resistant. Also, embodiments according to the invention include wherein a glove is stripped from a former and re-dressed on a flat-shaped former before the additional raised features are applied thereto.

[0020] At least one exemplary embodiment according to the invention comprises a second polymeric layer. For example, the method for making a glove may further comprise a step for disposing a foamed polymeric layer on the former described above. The foamed polymeric layer may optionally have a coagulant disposed thereon and, subsequently, a second unfoamed polymeric composition disposed thereon and then a plurality of raised features may be disposed thereon, as described above. Alternatively, an unfoamed polymeric layer may be disposed on a former, a foamed layer may be disposed on the unfoamed polymeric layer (again, with or without a coagulant disposed on the foamed layer before the disposition of the unfoamed polymeric layer), the foamed layer and the unfoamed layer disposed thereon is inverted, so that the unfoamed layer is now an outer layer and the foamed layer is an inner layer, and additional raised features disposed thereon as described herein.

[0021] Figure 1B depicts an exemplary flow diagram of a method 150 for making a two-layer glove according to embodiments of the present invention. The method 150 starts at step 152 and proceeds to step 154, at which point a former is heated, for example, from between 40-60°C. The former is, for example, a metallic or ceramic former in the shape of a glove and may be in an arcuate shape, such as a partially closed hand or, alternatively, a flat shape, as discussed above. At step 156, a decision is made whether to apply a coagulant to the former, such as an aqueous coagulant or a powdered coagulant as are known to those in the art. If the answer is yes, at step 158, a coagulant is applied to the former, which, for e.g., may be a dipping or spraying step. If the answer is no, the method 150 proceeds directly to step 160, at which point the former is dipped into an unfoamed polymeric composition, forming an unfoamed polymeric coating on the former. The unfoamed polymeric coating comprises one or more polymeric materials or blends thereof, including thermoplastic and thermoset materials. At least one exemplary embodiment is shown in Table 1 as discussed above.

[0022] Thermosetting materials may include, for example, phenolics, silicones, polyesters, and sulfur-filled (or other vulcanizing agents), vulcanizable natural and synthetic rubber materials. Also, thickening agents, i.e., rheological modifiers, as

known to those in the art to control the viscosity of the thermosetting and/or polymeric and/or thermoplastic materials, are contemplated herein.

[0023] At step 162, a decision is made whether to cure the unfoamed polymeric coating formed at step 160. If the answer is yes, the unfoamed polymeric coating is cured, for example, by allowing the coating to drip dry or by applying heat to the coating, at step 164, for example, in an infrared oven. If the answer is no, no curing occurs and the method 150 proceeds to step 166, at which point, the former having the unfoamed polymeric coating is dipped into a second foamed polymer composition to form a foamed polymeric layer on the foamed polymeric layer. Optionally, the first polymeric layer is dipped into a coagulant before being dipped into the second foamed polymer composition. At step 168, the unfoamed polymeric layer and the foamed polymeric layers are inverted, so that the foamed polymeric layer is an inner layer, i.e., a skin-contacting layer.

[0024] At step 170, additional raised features, such as a plurality of polymeric features (as discussed below) are applied to the coating formed on the former, which may be the same or a different thermoplastic or thermoset composition as discussed above regarding the composition of which the coating is comprised. Table 2 depicts at least one exemplary formulation for a polyurethane composition. In some embodiments, the application of the additional raised features is a screen-printing step. The temperature of the polymeric composition during the screen-printing step is between 10-30°C and, in at least one embodiment according to the invention, the temperature is approximately 23-25°C. In some embodiments according to the invention, the additional raised features are applied via an air-jetting deposition and/or 3D printing processes.

[0025] The method 150 next proceeds to step 172, at which point the first polymeric layer and the second polymeric layers and the raised features are cured, for example, in an oven. The method 150 then proceeds to step 174 at which point the method 150 ends. The curing step(s) comprise, in some embodiments, curing in an oven at, for example, 50°C to 150°C for approximately 10 to 60 minutes. In at least one exemplary embodiment of the invention, made from the foregoing method, gloves having the additional raised features disposed thereon are placed into an

oven, for example, an infrared oven and heated to approximately 105°C to 130°C for approximately 5 to 30 minutes, forming a cured glove. In at least one embodiment according to the invention, curing is for approximately 7-8 minutes at 130°C or, for example, 20 minutes at approximately 115°C. In some embodiments of the present invention, the heating or curing occurs twice, once before the additional raised features are disposed on the polymeric coating and once after the additional raised features are disposed thereon. Also, any of the additional raised features may comprise bullets, circles, toroids, dots, rings, waves, grains, or other additional raised features in varying sizes, shapes, or patterns, as discussed below.

[0026] One exemplary formulation for a carboxylated nitrile-butadiene composition, according to embodiments, for a coating is shown in Table 1.

Table 1

Ingredient	% in formulation
Dispersion of nitrile-butadiene polymer	75-95
Surfactant	0-1
Colorant/Pigment	0.1-5
Vulcanization agent(s)	2-7
Various additives	0-7
Thickener(s)/Rheology modifier(s)	0.1-5

[0027] One exemplary formulation for a polyurethane composition, according to embodiments of the invention, of which the raised features are comprised and disposed on the coating, is shown in Table 2.

Table 2

Ingredient	% in formulation
Dispersion of polyurethane polymer	90-100
Colorant/Pigment	0-5
Various additives	0-3
Thickener(s)/Rheology modifier(s)	0-5

[0028] At least one acrylic composition, according to embodiments of the invention, for additional raised features disposed on the coating, is shown in Table 3. And, one exemplary composition comprises acrylic grade Polidisp 7730, manufactured by the Resiquimica Co. Embodiments according to the invention further comprise pressure sensitive acrylic formulations.

Table 3

Ingredient	% in formulation
Dispersion of acrylic polymer	90-100
Colorant/Pigment	0-5
Crosslinker	1-3
Various additives	0-3
Thickener(s)/Rheology modifier(s)	0-5

[0029] Figure 2 depicts the palmside of a glove 200 having raised features 224 disposed thereon according to embodiments of the present invention. A glove 200 comprises seven components, including a pinky finger 206, a ring finger 210, a middle finger 212, an index finger 204, a thumb 202, a palm component 214, and an optional cuff 208. The glove 200 is comprised of a polymeric coating 222 disposed on a former as discussed above. Disposed on the polymeric coating 222 is a plurality of polymeric features 224, which may be of any practical shape or size. Also, the glove 200 further comprises wherein the polymeric features 224 are arranged in patterns. For example, in the glove 200, the diamond-shaped features 224 are disposed on areas where grip is most important, such as where the knuckles bend on the palmside. Furthermore, the glove 200 comprises features 224 along bend lines 226, which is where a hand bends when gripping objects. Disposing polymeric features 224 along such areas concentrates the stress of the gripping action where it is needed most and provides greater grip.

[0030] The polymeric coating 222 comprises one or more polymeric material or blends, as described above in Tables 1 and 2 or in other polymeric compositions.

For example, the polymeric coating in accordance with the present invention may comprise natural or synthetic polymeric coatings or mixtures or blends thereof. For example, the polymeric composition may comprise a natural latex, such as guayule or natural polyisoprene, synthetic latexes, such as synthetic polyisoprene, carboxylated acrylonitrile butadiene, non-carboxylated acrylonitrile butadiene, acrylics, butyl latex, polychloroprene, nitriles, aqueous- and non-aqueous-polyurethanes, styrene-butadiene, acrylonitrile-butadiene, and the like, or mixtures or blends thereof. Similarly, the plurality of features 224 disposed on the polymeric coating 222 comprise polymeric compositions, which may be different than the composition comprising the polymeric coating 222. In one exemplary embodiment of the present invention, the polymeric coating 222 comprises an aqueous polyurethane material and, as discussed below, the additional raised features disposed thereon further comprise an aqueous polyurethane material or a nitrile-butadiene composition, or vice versa.

[0031] We have surprisingly found that additional raised features, disposed on an unsupported glove, comprising polyurethane have much greater grip properties than other polymeric materials. Also, the polyurethane features exhibit greater abrasion resistance. Furthermore, we have found that some polymeric compositions, when formed as either a coating or as features on the coating, are more suited for certain applications. For example, nitrile-butadiene rubbers offer good grip properties for dry in-service requirements while polyurethanes offer good grip properties for wet and oily environments. Therefore, a glove comprising a layer or coating of, for example, polyurethane and having additional raised features comprising nitrile, disposed on a surface of the unsupported glove, or vice-versa, can be used in both dry and wet/oily environments. Therefore, a user need not re-glove or have two different types of gloves because one glove, according to embodiments of the invention, will exhibit enhanced gripping properties for wet, dry, and oily environments.

[0032] The temperature of the polymeric composition may be controlled, as is known in the art, and may include additives, such as surfactants, to control or modify the physical properties of the composition and/or resulting article formed thereby. The composition may also comprise various accelerators, stabilizers, pigments, and the like. In some embodiments, the composition comprises additives, such as

bentonite and other clays, minerals, silica, and like thickeners, to control the rheological properties of the composition. The composition of one or more embodiments may also include a cure package or vulcanization agents to promote cross-linking during the curing process, such as sulfur and/or other suitable crosslinking agents known to those in the art and activators, such as zinc oxide.

[0033] Embodiments according to the invention comprise polymeric compositions generally having a viscosity in the range of 250-5000 centipoise and further comprise commonly used stabilizers including but not limited to potassium hydroxide, ammonia, sulfonates, and the like. The composition may contain other commonly used ingredients such as surfactants, anti-microbial agents, fillers/additives, and the like. In at least one exemplary embodiment, the viscosity of the formulation for the additional raised features ranges from approximately 1000 cP to 40000 cP.

[0034] A typical coagulant comprises a 2-15 wt% calcium nitrate aqueous solution. The coagulant solution dries on the former. When the coagulant coated former is dipped into a polymeric composition, the composition is destabilized and gels. Other suitable coagulants include, but are not limited to, strong coagulants, such as calcium chloride or calcium citrate, and weak acids, such as tricarboxylic acid, acetic acid, formic acid, and other weak acid salts known to those in the art.

[0035] Other embodiments according to the present invention include where the polymeric composition is foamed, which is retained in the dipped article. The air content is typically in the 5 to 50% range on a volume basis. The composition may contain additional surfactants such as TWEEN 20 to stabilize the foamed composition. Once the composition is foamed with the desired air content and the viscosity is adjusted, refinement of the foam is undertaken by stirring the emulsion with an impeller driven at a fast speed and using a different impeller run at a reduced speed to refine the bubble size as is known to those of skill in the art.

[0036] An air content in the range of 5-15 volumetric percent results in foams that have closed cells, creating a foamed coating that is liquid impervious and has a spongy, soft feel. Some air cells, whether an open-celled or close-celled foam are disposed on the external surface of the coating, providing increased roughness and

have the ability to remove boundary layer of oil and water from a gripping surface, providing increased grip properties. If the volumetric air content is in the range of 15-50% in a foamed coating, the air cells are adjacent to each other and expand during a vulcanization heating step and touch each other, merge, and burst. This process creates a foam having an open-celled structure comprising an intra-foam network of cells in fluid communication with each other. Therefore, open-celled foams absorb liquids into an internal matrix, enhancing the wet and oily grip properties of the glove. For example, if a drop of liquid is placed on a glove in the palm portion, the liquid penetrates the polymeric coating cells, as opposed to a closed-cell foam, which is impervious to liquids. Without intending to be bound by theory, it is similarly believed that a polymeric open-celled foam disposed as a coating on a liner allows the additional raised features disposed on the coating, as discussed below, to penetrate the internal cell matrix of the coating, forming a glove comprising more abrasion-resistant additional raised features that do not peel from the coating as readily. Moreover, the surface tension of the composition comprising the additional raised features can be varied to promote adherence to the foamed coating.

[0037] Figure 3 depicts the palmside of an exemplary glove 300 having features disposed thereon according to embodiments of the present invention. The glove 300 comprises a polymeric coating 222, including a pinky finger 206, a ring finger 210, a middle finger 212, an index finger 204, a thumb 202, a palm component 214. The glove 300 may be, for example, a surgical or examination glove. Disposed on the polymeric coating 222 is a plurality of polymeric features 302, 304, 306. As shown, the additional raised features comprise half-circles 302, round dots 304, and rectangular rails 306. In embodiments of the present invention, the round, raised dots have a thickness between 1.0 to 2.0 mm. The diameter of the round raised dots range from approximately 1 to 10 mm in diameter. However, any practical shape, such as hexagonal, size, and number of additional raised features may be disposed on the polymeric coating 222. Furthermore, all other polymeric features disclosed herein comprise similar practical sizes on a glove for differently sized human hands. The grip properties of the glove 300 are enhanced by a ratio of the area of raised additional raised features versus the area of the polymeric coating 222 upon which the additional raised features are disposed. Moreover, as discussed above, nitrile-

butadiene rubbers offer good grip properties for dry in-service requirements while polyurethanes offer good grip properties for wet and oily environments. Therefore, the combination of additional raised features comprising polyurethane on a nitrile-butadiene coating, and vice-versa, forms a glove having surprisingly enhanced grip properties.

[0038] Also, at least one exemplary embodiment according to the invention comprises a foamed inner layer (not shown) disposed on an inner surface of the coating. The foamed inner layer may be an open-celled foam, comprising a network of inter-connected cells as is known to those in the art. Open-celled foam, when disposed on an inner layer of a glove, for example, a skin-contacting layer, absorb moisture and/or perspiration, promoting a hygienic condition and/or comfort.

[0039] Figures 4A-4F depict various alternative embodiments of additional raised features disposed on the gloves of FIGS. 2-3, according to embodiments of the invention. Different patterns of the raised features may impart different grip properties, such as for dry, wet, or oily service requirements. For example, FIG. 4A shows two separate embodiments of patterns of additional raised features comprising a polymeric composition and disposed on, for example, a coating or layer(s) of the polymeric composition. The raised dots 402, as shown, are small but may be as large as is practical. A feature 405 is the underlying coating layer described above. In the pattern 404, the raised dots 402 are disposed in single file laterally and longitudinally. In a pattern 406, the raised dots 402 are disposed in a staggered pattern. In FIG. 4B, the additional raised features comprise a wave-like raised feature 408. The wave-like raised feature 408 may be in a staggered pattern 410 or in a single file (not shown). Also, as shown in a pattern 412, ends 414 and 416 of adjacent wave-like raised feature 408 may form an interlocked structure. In some embodiments, the wave-like feature assumes a "C" structure.

[0040] FIG. 4C shows patterns of additional raised features 420 and 422. A ring 420 is a raised circular rail that surrounds a raised dot 422. A feature 421 is the coating layer applied as above and, therefore, it is recessed from the raised ring 420 and the raised dot 422. As above, the additional raised features may be disposed in a single file pattern 424 or in a staggered pattern 426. FIG. 4D depicts the additional

raised features as rectangular raised rails 430 in a staggered pattern 432. Embodiments according to the invention also comprise where rectangular raised rails 430 are disposed in a grain pattern 434, i.e., where several straight or curved patterns of rectangular raised rails 430 intersect, like wood grain. FIG. 4E depicts small thicker rings 450 arranged in a staggered pattern 452. FIG. 4F depicts large thinner rings 460 arranged in a staggered pattern 462.

[0041] Abrasion resistance and grip properties, such as dynamic and static coefficient of friction in different environments, such as wet, dry, and oily tests of various gloves according to embodiments of the invention exhibit surprisingly increased performance over prior art gloves. This phenomenon is true irrespective of whether the additional raised features are disposed on the coating as bullets, small rings, big rings, toroids, dots, waves, or grains. Without intending to be bound by theory, it is believed that one explanation for the increased grip performance is that when pulling forces reach a certain threshold, dragging is overcome and a sample is moved easier. This causes a drop in pulling and, consequently, the sample starts a new increase of resistance to movement. In other words, there is a build-up and drop of the drag.

[0042] Reference throughout this specification to "one embodiment," "certain embodiments," "one or more embodiments" or "an embodiment" means that a particular feature, structure, material, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. Thus, the appearances of the phrases such as "in one or more embodiments," "in certain embodiments," "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily referring to the same embodiment of the invention. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in any one or more of the embodiments. Also, it is to be understood that polymeric, elastomeric, and latex are used interchangeably herein with respect to polymeric coatings and raised features made from polymeric compositions. Furthermore, it is to be understood that the terms coating and layer may be used interchangeably throughout the disclosure.

[0043] While the foregoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

CLAIMS

What is claimed is:

1. A glove, comprising:

a first polymeric composition disposed as a polymeric coating or polymeric layer; and

a plurality of raised features comprising a second polymeric composition disposed on a surface of the polymeric coating, wherein the polymeric coating and the plurality of raised features comprise different polymeric compositions adapted to enhance at least one of oil grip properties, dry grip properties, or wet grip properties.

2. The glove of claim 1, wherein the second polymeric composition of the plurality of raised features comprises polyurethane and the first polymeric composition comprising the polymeric coating includes nitrile-butadiene, and the polyurethane raised features enhance good wet and oily grip properties and the nitrile-butadiene enhance good dry grip properties.

3. The glove of claim 1, wherein the second polymeric composition of the plurality of raised features comprises nitrile-butadiene and the first polymeric composition comprising the raised features includes polyurethane, wherein the polymeric coating has enhanced good wet and oily grip properties and the plurality of raised features has enhanced good dry grip properties.

4. The glove of claim 1, wherein the plurality of raised features comprise at least one of bullets, small rings, big rings, toroids, dots, waves, or grains or patterns or combinations thereof.

5. The glove of claim 1, wherein the first polymeric composition comprises natural latex, guayule, polyisoprene, synthetic latexes, non-carboxylated acrylonitrile butadiene, carboxylated acrylonitrile butadiene, butyl latex, polychloroprene, polyurethane, acrylics, butadiene, styrene-butadiene, or blends thereof.

6. The glove of claim 1, wherein the second polymeric composition comprises natural latex, guayule, polyisoprene, synthetic latexes, non-carboxylated acrylonitrile butadiene, carboxylated acrylonitrile butadiene, butyl latex, polychloroprene, polyurethane, acrylics, butadiene, styrene-butadiene, or blends thereof.

7. The glove of claim 1, wherein at least one of the first polymeric composition or the second polymeric composition is foamed.

8. The glove of claim 1, further comprising a foamed inner polymeric layer disposed on an inner surface of the polymeric coating.

9. A method of forming a glove, comprising:

disposing a coagulant on a former;

applying at least one of a first polymeric composition on the former to form a coating;

disposing a plurality of raised features, comprising a second polymeric composition, onto the coating; and

heating the coating and the plurality of raised features disposed thereon to cure the coating and the plurality of raised features, forming a glove having enhanced grip properties,

wherein the second polymeric composition of the plurality of raised features comprises polyurethane and the first polymeric composition comprising the polymeric coating includes nitrile-butadiene, and the polyurethane raised features enhance good wet and oily grip properties and the nitrile-butadiene enhance good dry grip properties or wherein the second polymeric composition of the plurality of raised features comprises nitrile-butadiene and the first polymeric composition comprising the raised features includes polyurethane, wherein the polymeric coating has enhanced good wet and oily grip properties and the plurality of raised features has enhanced good dry grip properties.

10. The method of claim 9, wherein at least one of the first polymeric composition and second polymeric composition is foamed.

11. The method of claim 9, wherein the disposing the plurality of raised features step is a screen printing step.

12. A method of forming a multi-layer glove, comprising:

disposing a coagulant on a former;

dipping the former into a first polymeric composition to form a first coating;

disposing a coagulant on the first coating;

dipping the former having the first coating disposed thereon into a second polymeric composition to form a second coating onto the first coating;

disposing a coagulant onto the second coating;

disposing a plurality of raised features onto the second coating; and

heating the first coating, the second coating, and the plurality of raised features disposed on the second coating to cure the first coating, the second coating, and the plurality of raised features, forming a multi-layer glove having enhanced grip properties.

13. The method of claim 12, wherein the second polymeric composition of the plurality of raised features comprises nitrile-butadiene and the first polymeric composition comprising the raised features includes polyurethane, wherein the polymeric coating has enhanced good wet and oily grip properties and the plurality of raised features has enhanced good dry grip properties.

14. The method of claim 12, wherein at least one of the first polymeric composition or the second polymeric composition is foamed.

15. The method of claim 14, further comprising a step for stripping and inverting the first coating and the second coating before the disposing a plurality of raised features step, thereby forming an inner foamed, skin-contacting layer.

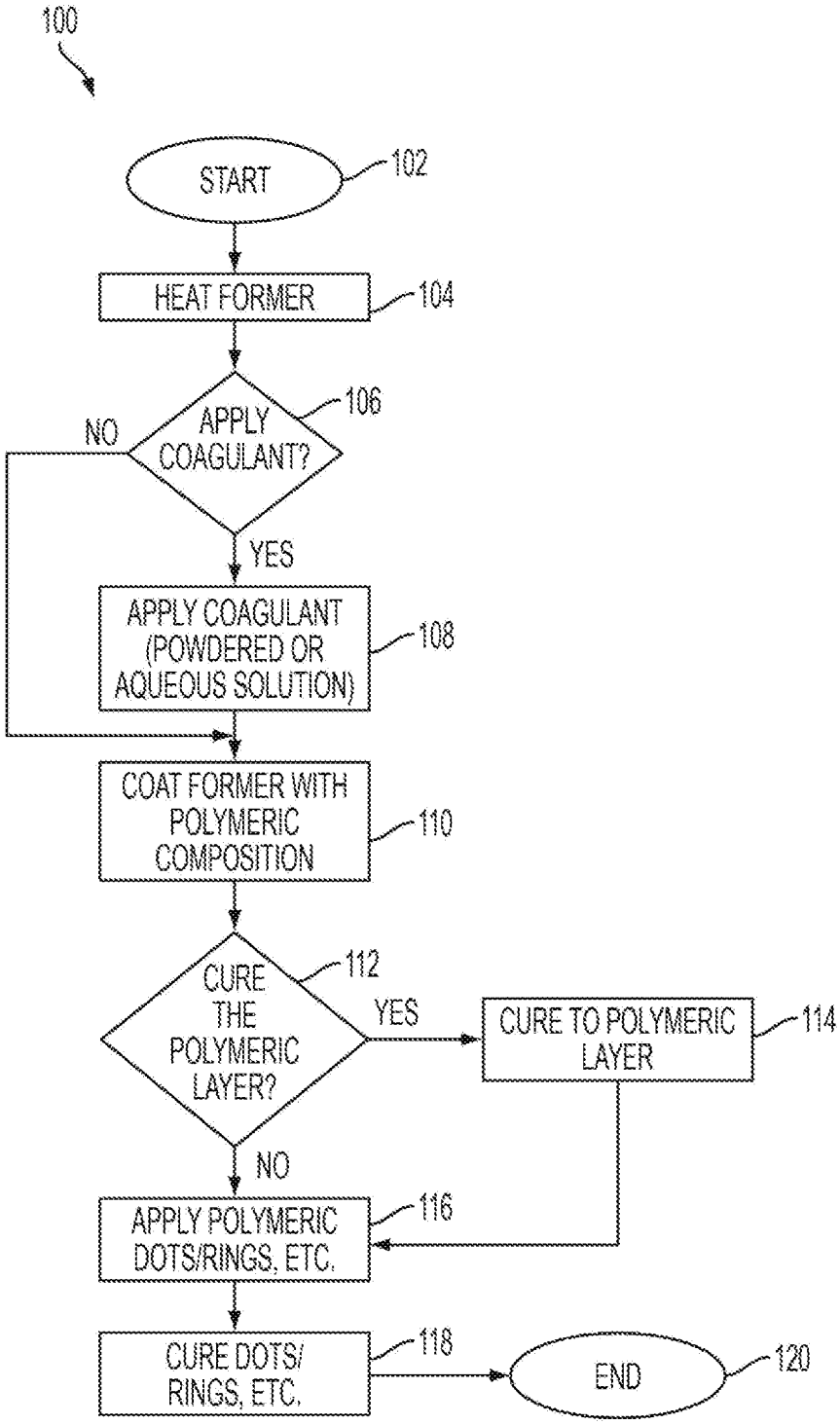
100
START
102
HEAT FORMER
104
APPLY COAGULANT?
106
NO
YES
APPLY COAGULANT (POWDERED OR AQUEOUS SOLUTION)
108
COAT FORMER WITH POLYMERIC COMPOSITION
110
CURE THE POLYMERIC LAYER?
112
YES
CURE TO POLYMERIC LAYER
114
NO
APPLY POLYMERIC DOTS/RINGS, ETC.
116
CURE DOTS/ RINGS, ETC.
118
END
120

FIG. 1A

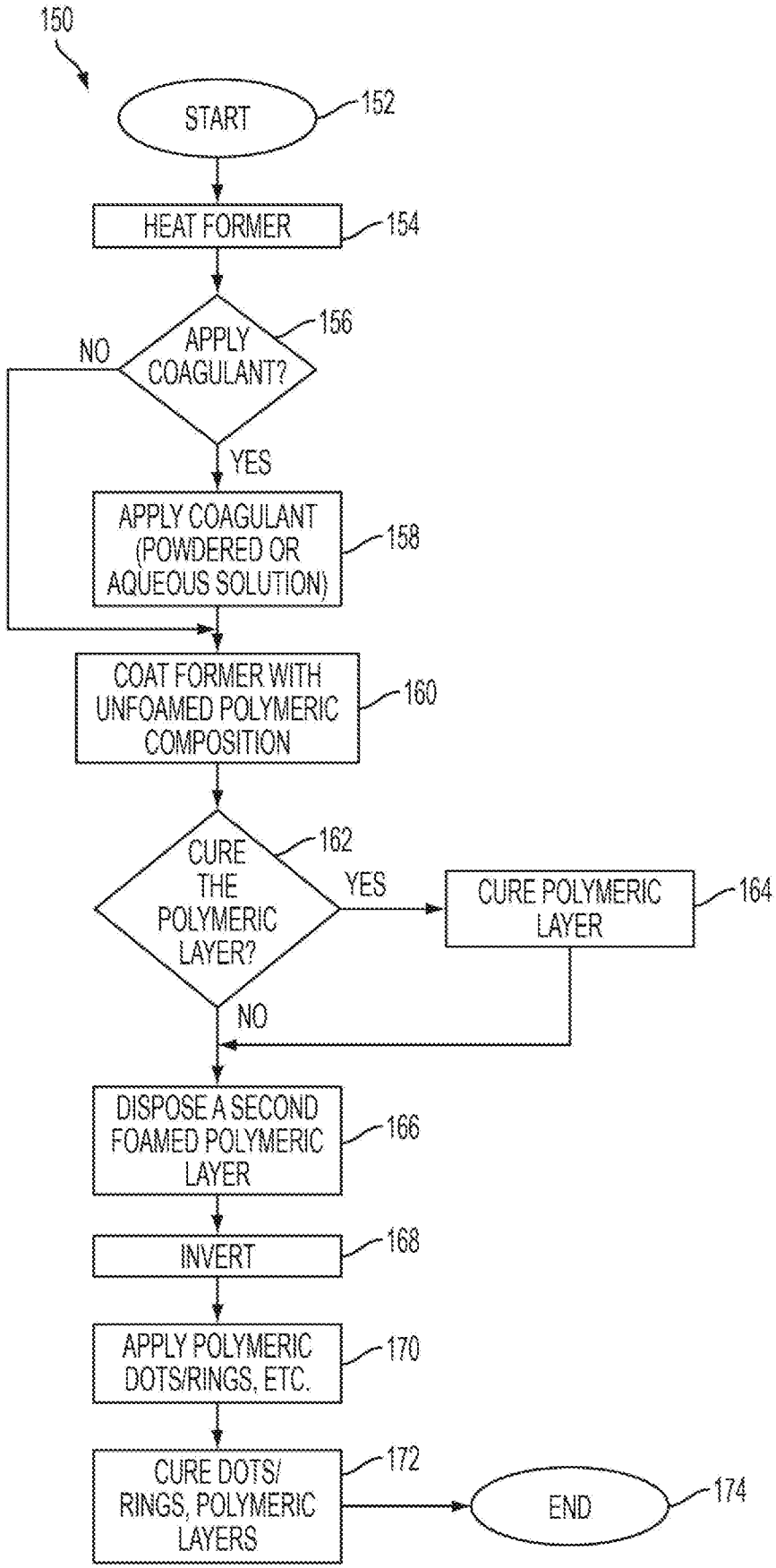
150
START
152
HEAT FORMER
154
APPLY COAGULANT?
156
NO
YES
APPLY COAGULANT (POWDERED OR AQUEOUS SOLUTION)
158
COAT FORMER WITH UNFOAMED POLYMERIC COMPOSITION
160
CURE THE POLYMERIC LAYER?
162
YES
CURE POLYMERIC LAYER
164
NO
DISPOSE A SECOND FOAMED POLYMERIC LAYER
166
INVERT
168
APPLY POLYMERIC DOTS/RINGS, ETC.
170
CURE DOTS/ RINGS, POLYMERIC LAYERS
172
END
174

FIG. 1B

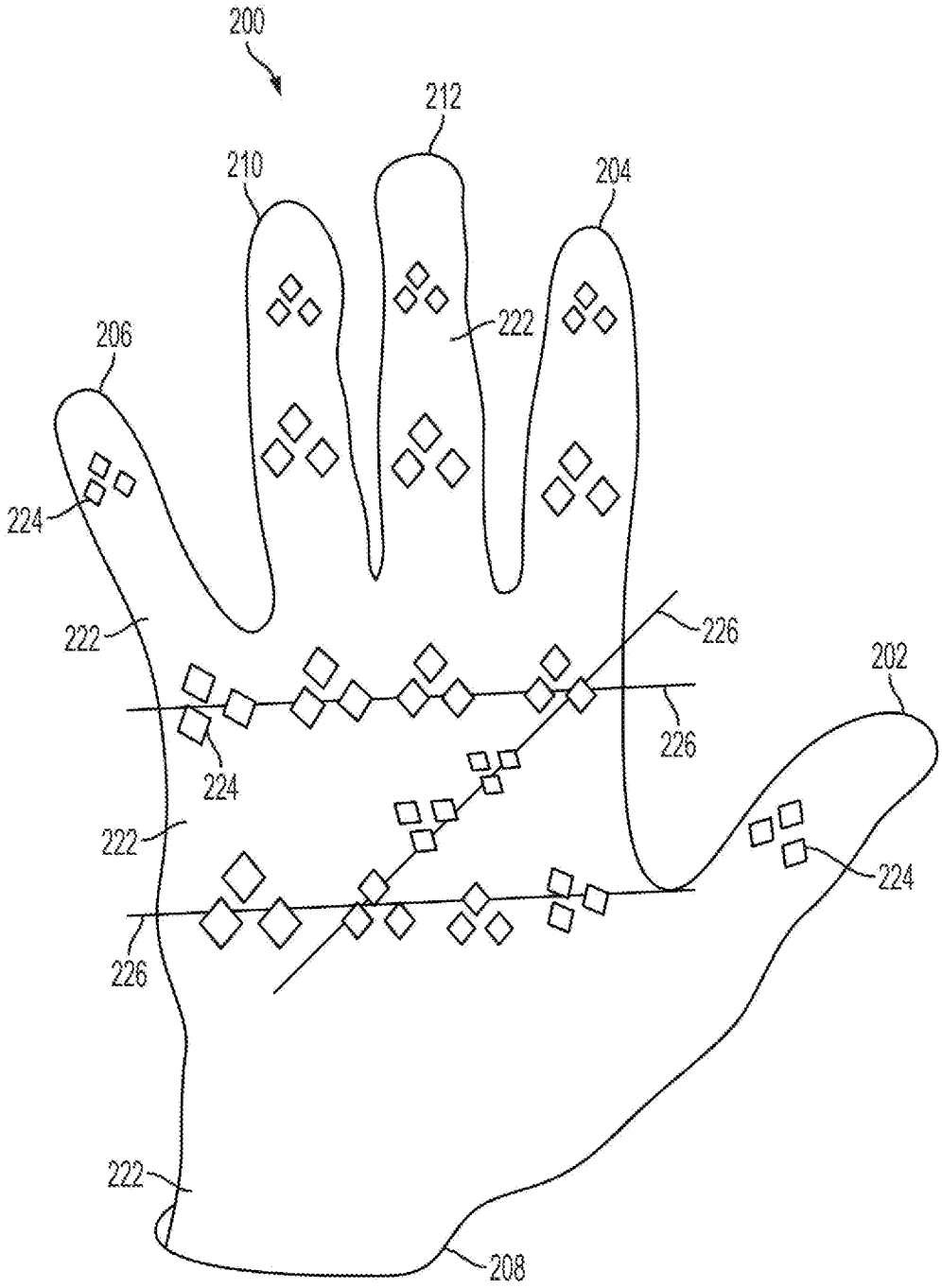
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FIG. 2

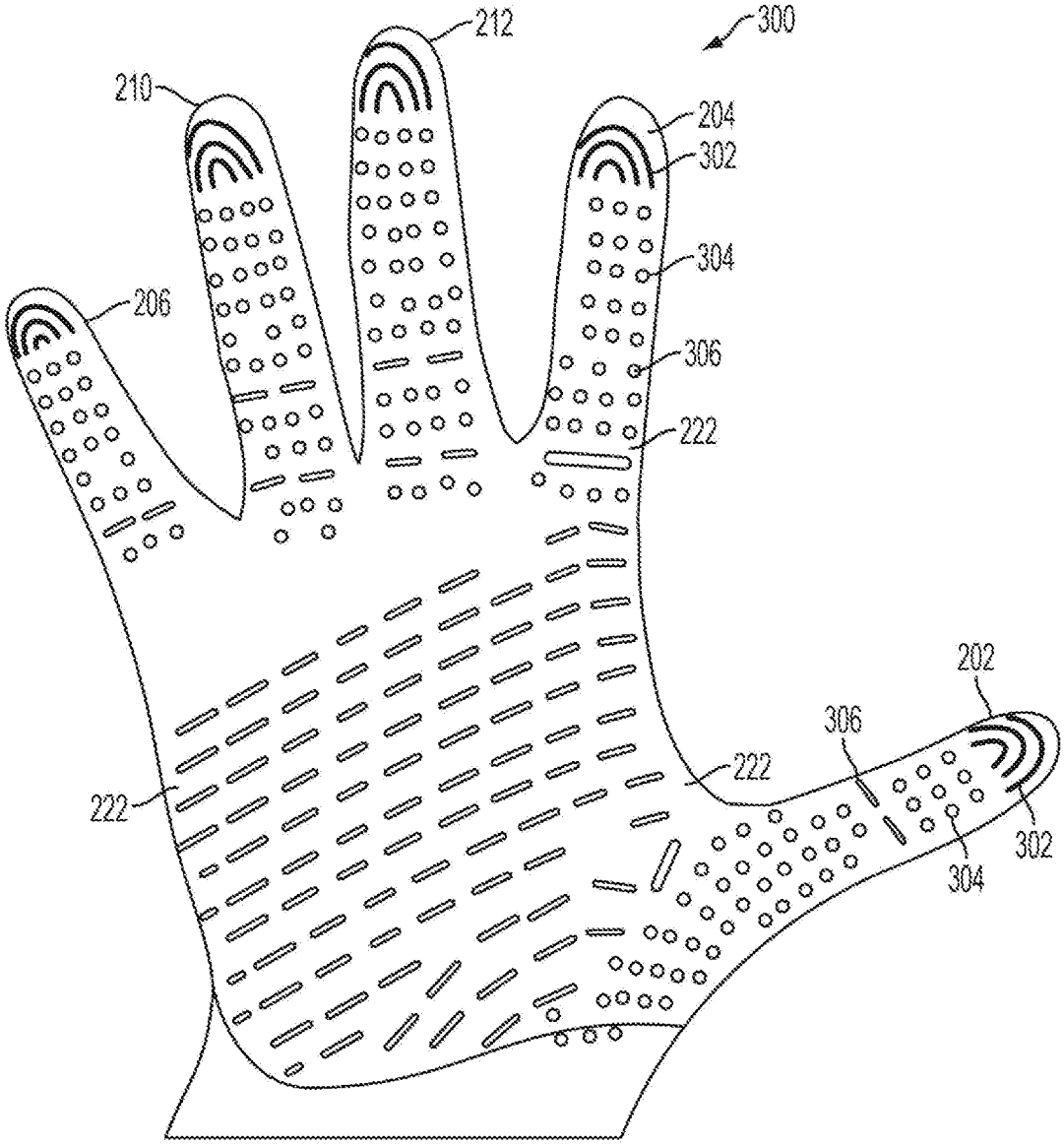

FIG. 3

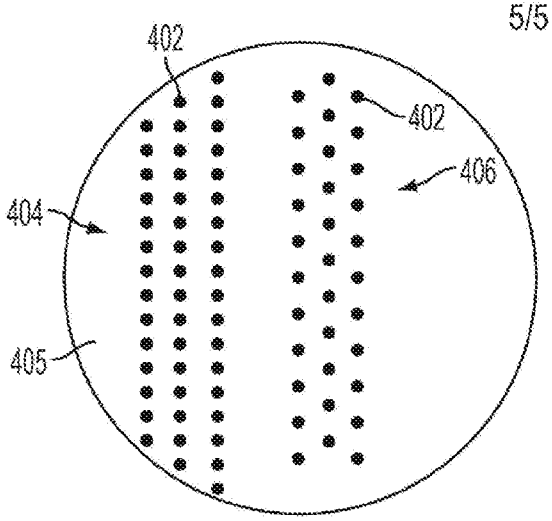

FIG. 4A

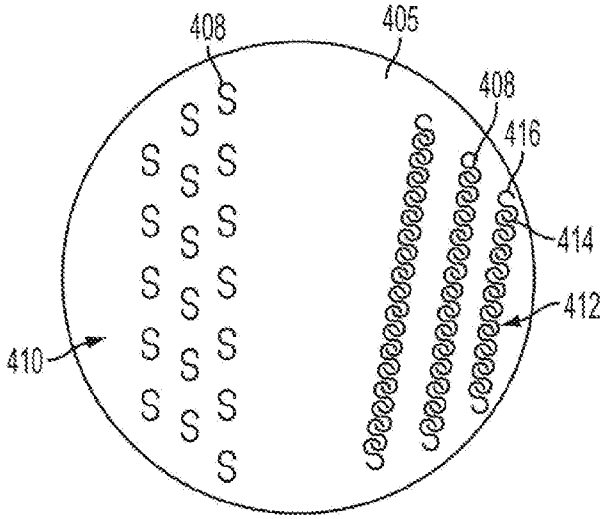

FIG. 4B

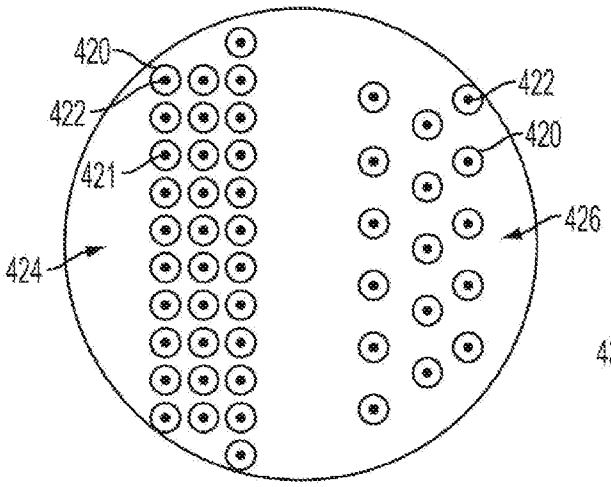

FIG. 4C

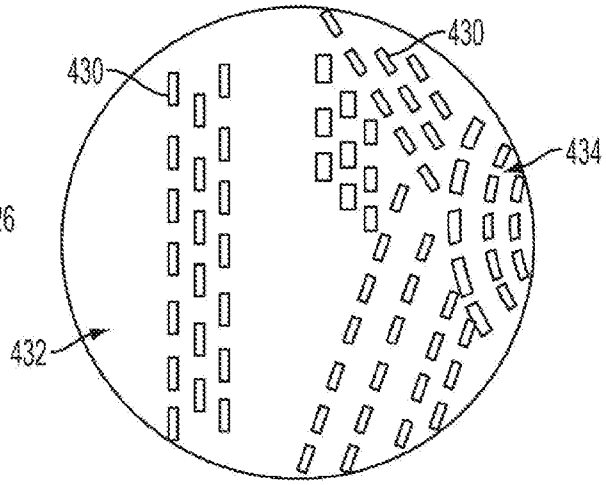

FIG. 4D

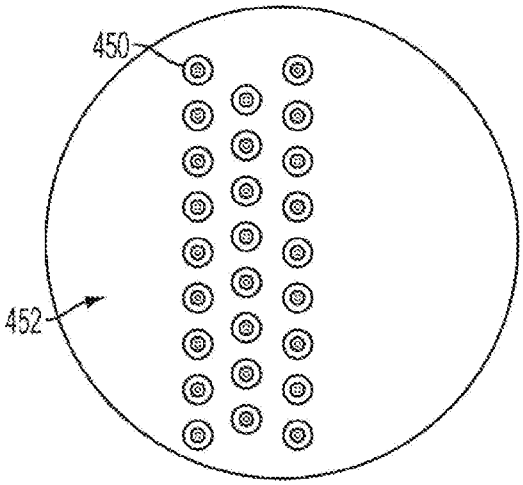

FIG. 4E

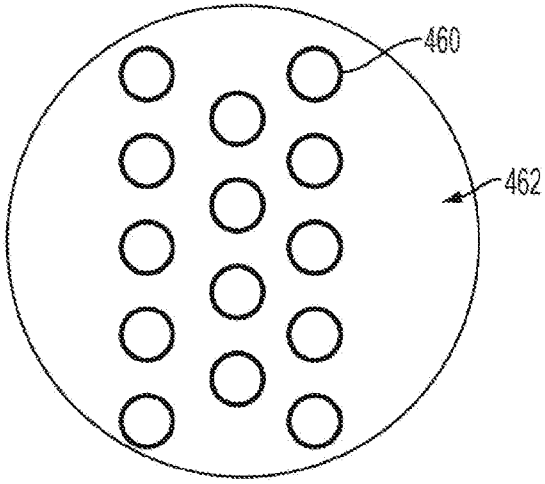

FIG. 4F