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(54) **ARTICLE OF FOOTWEAR HAVING WELDED UPPER**

SCHUHARTIKEL MIT GESCHWEISSTEM OBERMATERIAL

ARTICLE DE CHAUSSURE AYANT UNE TIGE SOUDÉE

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Description

BACKGROUND

[0001] The present invention relates generally to a material construction for an upper of an article of footwear.

[0002] Conventional articles of athletic footwear include two primary elements, an upper and a sole structure. The upper provides a covering for the foot that comfortably receives and securely positions the foot with respect to the sole structure. The sole structure is secured to a lower portion of the upper and is generally positioned between the foot and the ground. In addition to attenuating ground reaction forces (that is, providing cushioning) during walking, running, and other ambulatory activities, the sole structure may influence foot motions (for example, by resisting pronation), impart stability, and provide traction, for example. Accordingly, the upper and the sole structure operate cooperatively to provide a comfortable structure that is suited for a wide variety of athletic activities.

[0003] The upper is often formed from a plurality of material elements, which may be stitched or adhesively bonded together to define a void or cavity on the interior of the footwear for comfortably and securely receiving a foot. More particularly, the upper forms a structure that extends over instep and toe areas of the foot, along medial and lateral sides of the foot, and around a heel area of the foot. The upper may also incorporate a lacing system to open and close an opening to the void or cavity and adjust fit of the footwear, within the upper. In addition, the upper may include a tongue that extends under the lacing system to enhance adjustability and comfort of the footwear, and the upper may incorporate a heel counter or other stabilizing structure.

[0004] The upper may also include provisions to improve fit, comfort, and performance. Materials selection and placement may be utilized to achieve certain desired characteristics. The design of many types of footwear is often driven by conflicting considerations. As but one example, it is normally desirable for an athletic shoe to have a construction that supports and protects a wearer's foot during a particular athletic endeavor. However, "breathability" is also a desirable quality for many types of athletic shoes. Specifically, air flow through a shoe upper between the shoe interior and exterior can help relieve the effects of heat and perspiration that typically build up around a foot during sporting activities. However, many materials that provide support and foot protection can block air and moisture flow through the upper. Conversely, many materials that facilitate air and moisture flow provide little support or protection to the wearer's foot.

[0005] One solution is to fabricate a shoe in which some portions are formed from supportive/protective materials and some portions are formed from breathable materials. However, this can increase the complexity of the fabrication process and increase cost. In addition, material joining techniques, such as stitching and use of adhesives, can add weight to footwear. Moreover, footwear design (including athletic footwear design) is also driven by aesthetics. A complex production process developed to fabricate a complex shoe can potentially limit a manufacturer's ability to vary that shoe's design to achieve different aesthetic effects.

[0006] US 2012/227282 A1 describes a layered nonwoven textile which may be incorporated into various products, including apparel.

[0007] US 2012/297643 A1 describes a shoe with composite upper and method of making the same.

[0008] US 2006/051566 A1 describes a comfort element for an article of footwear or an article of clothing, a method of manufacturing same, and an article of footwear or clothing that includes such element.

SUMMARY

[0009] In one aspect, the present disclosure is directed to an article of footwear, as defined in claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention can be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like reference numerals designate corresponding parts throughout the different views.

FIG. 1 shows a perspective view of an embodiment of an article of footwear;
FIG. 2 shows exploded view of the article of footwear shown in FIG. 1;
FIG. 3 shows another perspective view of the article of footwear shown in FIG. 1;
FIG. 4 shows a rear perspective and interview view of the article of footwear shown in FIG. 1;
FIG. 5 shows an enlarged version of a portion of the view of the article of footwear shown in FIG. 4;
FIG. 6 shows a perspective view of an article of footwear and an enlarged portion of the upper of the article of footwear;
FIG. 7 shows a cross sectional view taken at line 4-4 of FIG. 3;
FIG. 8 shows an enlarged view of a portion of an upper of an article of footwear according to another embodiment;
FIGS. 9-11 show an exemplary process of ultrasonic welding layers of an upper;
FIG. 12 shows an exemplary tongue portion of an article of footwear;
FIG. 13 shows a cross-sectional view of the tongue taken at line 13-13 in FIG. 12; and
FIG. 14 shows a cross-sectional view of the tongue taken at line 14-14 in FIG. 12.

DETAILED DESCRIPTION

[0011] The following discussion and accompanying figures disclose a sole structure for an article of footwear. Concepts associated with the footwear disclosed herein may be applied to a variety of athletic footwear types, including running shoes, basketball shoes, soccer shoes, baseball shoes, football shoes, and golf shoes, for example. Accordingly, the concepts disclosed herein apply to a wide variety of footwear types.

[0012] To assist and clarify the subsequent description of various embodiments, various terms are defined herein. Unless otherwise indicated, the following definitions apply throughout this specification (including the claims). For consistency and convenience, directional adjectives are employed throughout this detailed description corresponding to the illustrated embodiments.

[0013] The term "longitudinal," as used throughout this detailed description and in the claims, refers to a direction extending a length of a sole structure, i.e., extending from a forefoot portion to a heel portion of the sole. The term "forward" is used to refer to the general direction in which the toes of a foot point, and the term "rearward" is used to refer to the opposite direction, i.e., the direction in which the heel of the foot is facing.

[0014] The term "lateral direction," as used throughout this detailed description and in the claims, refers to a side-to-side direction extending a width of a sole. In other words, the lateral direction may extend between a medial side and a lateral side of an article of footwear, with the lateral side of the article of footwear being the surface that faces away from the other foot, and the medial side being the surface that faces toward the other foot.

[0015] The term "lateral axis," as used throughout this detailed description and in the claims, refers to an axis oriented in a lateral direction.

[0016] The term "horizontal," as used throughout this detailed description and in the claims, refers to any direction substantially parallel with the ground, including the longitudinal direction, the lateral direction, and all directions in between. Similarly, the term "side," as used in this specification and in the claims, refers to any portion of a component facing generally in a lateral, medial, forward, or rearward direction, as opposed to an upward or downward direction.

[0017] The term "vertical," as used throughout this detailed description and in the claims, refers to a direction generally perpendicular to both the lateral and longitudinal directions. For example, in cases where a sole is planted flat on a ground surface, the vertical direction may extend from the ground surface upward. It will be understood that each of these directional adjectives may be applied to individual components of a sole. The term "upward" refers to the vertical direction heading away from a ground surface, while the term "downward" refers to the vertical direction heading towards the ground surface. Similarly, the terms "top," "upper," and other similar terms refer to the portion of an object substantially furthest from the ground in a vertical direction, and the terms "bottom," "lower," and other similar terms refer to the portion of an object substantially closest to the ground in a vertical direction.

[0018] The "interior" of a shoe refers to space that is occupied by a wearer's foot when the shoe is worn. The "inner side" of a panel or other shoe element refers to the face of that panel or element that is (or will be) oriented toward the shoe interior in a completed shoe. The "outer side" of an element refers to the face of that element that is (or will be) oriented away from the shoe interior in the completed shoe. In some cases, the inner side of an element may have other elements between that inner side and the interior in the completed shoe. Similarly, an outer side of an element may have other elements between that outer side and the space external to the completed shoe. Further, the terms "inward" and "inwardly" shall refer to the direction toward the interior of the shoe, and the terms "outward" and "outwardly" shall refer to the direction toward the exterior of the shoe.

[0019] For purposes of this disclosure, the foregoing directional terms, when used in reference to an article of footwear, shall refer to the article of footwear when sitting in an upright position, with the sole facing groundward, that is, as it would be positioned when worn by a wearer standing on a substantially level surface.

[0020] In addition, for purposes of this disclosure, the term "fixedly attached" shall refer to two components joined in a manner such that the components may not be readily separated (for example, without destroying one or both of the components). Exemplary modalities of fixed attachment may include joining with permanent adhesive, rivets, stitches, nails, staples, welding or other thermal bonding, or other joining techniques. In addition, two components may be "fixedly attached" by virtue of being integrally formed, for example, in a molding process.

[0021] FIG. 1 depicts an embodiment of an article of footwear 100. Footwear 100 includes a sole structure 105 and an upper 110 secured to sole structure 105 and configured to receive a foot. For reference purposes, footwear 100 may be divided into three general regions: a forefoot region 115, a midfoot region 120, and a heel region 125. Forefoot region 115 generally includes portions of footwear 100 corresponding with the toes and the joints connecting the metatarsals with the phalanges. Midfoot region 120 generally includes portions of footwear 100 corresponding with an arch area of the foot. Heel region 125 generally corresponds with rear portions of the foot, including the calcaneus bone. Regions 115, 120, and 125 are not intended to demarcate precise areas of footwear 10. Rather, regions 115, 120, and 125 are intended to represent general relative areas of footwear 100 to aid in the following discussion. Since various features of footwear 100 extend beyond one region of footwear 100, the terms forefoot region 115, midfoot region 120, and heel region 125 apply not only to footwear 100, but also to the various features of footwear 100.

[0022] As shown in FIG. 1, upper 110 may include one or more material elements (for example, meshes, textiles, foam, leather, and synthetic leather), which may be joined to define an interior void 130 configured to receive a foot. The material elements may be selected and arranged to selectively impart properties such as light weight, durability, air-permeability, wear-resistance, flexibility, and comfort. Upper 110 may define an opening 135 configured to receive a foot of a wearer into interior void 130. In addition, upper 110 may include a lace 140, which may be utilized to modify the dimensions of interior void 130, thereby securing the foot within interior void 130 and facilitating entry and removal of the foot from interior void 130. Lace 140 may extend through lace receiving loops 145 in upper 110. Lace receiving loops 145 may extend from a reinforcing strip 150 bordering a lace region 155 of upper 110, which may be in an instep region 157 of footwear 100. As further shown in FIG. 1, footwear 100 may also include a tongue 800.

[0023] In some embodiments, reinforcing strip 150 may include eyelets or holes configured to receive lace 40. Further, upper 110 may alternatively implement any of a variety of other configurations, materials, or closure mechanisms. For example, alternative closure mechanisms, such as hook and loop fasteners (for example, straps), buckles, clasps, cinches, or any other arrangement for securing a foot within interior void 130 defined by upper 110.

[0024] Sole structure 105 is fixedly attached to upper 110 (for example, with adhesive, stitching, welding, or other suitable techniques) and may have a configuration that extends between upper 110 and the ground. Sole structure 105 may include provisions for attenuating ground reaction forces (that is, cushioning and stabilizing the foot during vertical and horizontal loading). In addition, sole structure 105 may be configured to provide traction, impart stability, and control or limit various foot motions, such as pronation, supination, or other motions.

[0025] The configuration of sole structure 105 may vary significantly according to one or more types of ground surfaces on which sole structure 105 may be used. For example, the disclosed concepts may be applicable to footwear configured for use on any of a variety of surfaces, including indoor surfaces or outdoor surfaces. The configuration of sole structure 105 may vary based on the properties and conditions of the surfaces on which footwear 100 is anticipated to be used. For example, sole structure 105 may vary depending on whether the surface is harder or softer. In addition, sole structure 105 may be tailored for use in wet or dry conditions.

[0026] In some embodiments, sole structure 105 may be configured for a particularly specialized surface or condition. For example, in some embodiments, footwear 100 is illustrated in the accompanying figures as a running shoe and, accordingly, the illustrated sole structure 105 is configured for providing cushioning, stability, and traction on hard, smooth surfaces, such as pavement. The proposed footwear upper construction may be applicable to any kind of footwear, however, such as basketball, soccer, football, and other athletic activities. Accordingly, in some embodiments, sole structure 105 may be configured to provide traction and stability on hard indoor surfaces (such as hardwood), soft, natural turf surfaces, or on hard, artificial turf surfaces. In some embodiments, sole structure 105 may be configured for use on a multiple different surfaces.

[0027] In some embodiments, sole structure 105 may include multiple components, which may individually or collectively provide footwear 100 with a number of attributes, such as support, rigidity, flexibility, stability, cushioning, comfort, reduced weight, or other attributes. In some embodiments, sole structure 105 may include an insole/sockliner (See FIG. 4), a midsole 160, and a ground contacting sole component 165, which may have an exposed, ground contacting lower surface 170, as shown in FIG. 1. In some cases, however, one or more of these components may be omitted.

[0028] The insole may be disposed in void 130 defined by upper 110. The insole may extend through each of forefoot region 115, midfoot region 120, and heel region 125, and between a lateral side 175 and medial side 180 of footwear 100. The insole may be formed of a deformable (for example, compressible) material, such as polyurethane foams, or other polymer foam materials. Accordingly, the insole may, by virtue of its compressibility, provide cushioning, and may also conform to the foot in order to provide comfort, support, and stability.

[0029] Midsole 160 may be fixedly attached to a lower area of upper 110 (for example, through stitching, adhesive bonding, thermal bonding (such as welding), or other techniques), or may be integral with upper 110. Midsole 160 may extend through each of forefoot region 115, midfoot region 120, and heel region 125, and between a lateral side 175 and medial side 180 of footwear 100. In some embodiments, portions of midsole 160 may be exposed around the periphery of footwear 100, as shown in FIG. 1. In other embodiments, midsole 160 may be completely covered by other elements, such as material layers from upper 110. Midsole 160 may be formed from any suitable material having the properties described above, according to the activity for which footwear 100 is intended. In some embodiments, midsole 160 may include a foamed polymer material, such as polyurethane (PU), ethyl vinyl acetate (EVA), or any other suitable material that operates to attenuate ground reaction forces as sole structure 105 contacts the ground during walking, running, or other ambulatory activities.

[0030] In all embodiments, at least a portion of the upper of the article of footwear may be formed from a skin layer. In all embodiments, an inner reinforcing material is welded to the skin layer in select areas. The welded areas provide a color variation from the externally exposed skin layer. The inner reinforcing material may provide support, protection, and comfort in appropriate regions based on activities for which the footwear is intended. Further, additional layers may cover the skin layer in

one or more areas (such as the heel and toe region) to provide additional durability. In some embodiments, such additional layers may also be utilized for decorative purposes.

[0031] As utilized herein, the term "welding" (and variants thereof) is defined as a securing technique between two elements that involves a softening or melting of the material of at least one of the elements such that the materials of the elements are secured to each other when cooled. Similarly, the term "weld" or variants thereof is defined as the bond, link, or structure that joins two elements through a process that involves a softening or melting of material within at least one of the elements such that the elements are secured to each other when cooled. In some embodiments, welding may involve the melting or softening of two components such that the materials from each component intermingle with each other, that is, the materials may diffuse across a boundary layer between the materials, and are secured together when cooled. In some embodiments, welding may involve the melting or softening of a material in a first component such that the material extends into or infiltrates the structure of a second component, for example, infiltrating crevices or cavities in the second component or extending around or bonding with filaments or fibers in the second component to secure the components together when cooled. Thus, welding of two components together may occur when material from one or both of the components melts or softens. Accordingly, a weldable material, such as a polymer material, may be provided in one or both of the components. Additionally, welding does not generally involve the use of stitching or adhesives, but involves directly bonding components to each other with heat. In some situations, however, stitching or adhesives may be utilized to supplement the weld or the joining of the components through welding.

[0032] A variety of heating techniques may be utilized to weld components to each other. In some embodiments, suitable heating techniques may include conduction heating, radiant heating, high frequency heating, laser heating, or combinations of such techniques. In some embodiments, the welding method used to join portions of the upper may include a high frequency welding method, such as ultrasonic welding or radio frequency (RF) welding.

[0033] In embodiments where a high frequency welding method is used to form welds in the upper, the materials of the upper may be any materials suitable for such a method. For example, materials suitable for high frequency welding may include thermoplastic material or natural material coated with a thermoplastic material. Examples of material suitable for high frequency welding methods include an acrylic, a nylon, a polyester, a polylactic acid, a polyethylene, a polypropylene, polyvinyl chloride (PVC), a urethane, a natural fiber that is coated with one or more thermoplastic materials, and combinations of such materials. In some embodiments, a natural fiber, such as cotton or wool, may be coated with a thermoplastic material, such as an ethyl vinyl acetate or thermoplastic polyurethane.

[0034] Use of welding can provide various advantages over use of adhesives or stitching. For example, use of welding may produce a lighter weight shoe due to the absence of stitching and adhesives. By eliminating stitching and adhesives, the mass that would otherwise be imparted by stitching and adhesives may be utilized for other structural elements that enhance the performance properties of the article of footwear, such as cushioning, durability, stability, and aesthetic qualities. Another advantage relates to manufacturing efficiency and expense. Stitching and application of adhesives can be relatively time-consuming processes. By welding components, manufacturing time may be reduced. Further, costs may be reduced by eliminating the expense of adhesives or stitching materials. In addition, since adhesives and stitching can increase the rigidity of upper materials, welding (that is, joining materials without using adhesives or stitching) can preserve the flexibility of the upper of the article of footwear. Flexibility of the upper can enable the upper to conform to the foot of a wearer, thus providing improved fit. By conforming to the foot of the wearer, a flexible upper may also provide improved comfort. In some embodiments, the skin layer may be a mesh skin layer. In portions of the upper, the mesh skin layer may remain unreinforced, permitting directed ventilation through the upper. That is, in unreinforced portions, the skin layer may have an outwardly exposed outer surface and an inwardly exposed inner surface. Accordingly, in such embodiments, the openings in the mesh of the unreinforced skin layer may permit ventilation through the upper. In addition to ventilation, the openings in the mesh skin layer may also provide other advantages, such as weight reduction, flexibility, and other advantages. In some embodiments, in the unreinforced portions of the skin layer, the upper may consist essentially of the skin layer, and thus, may not include any additional layers. In some areas, the mesh may be provided in panels that extend between reinforcing panels, the mesh and reinforcing panels being joined only at abutting edges, for example with minimal overlap.

[0035] Upper 110 includes a skin layer 185 forming at least a portion of an external surface of upper 110. Upper 110 further includes a reinforcing material 190 selectively located internal and adjacent to portions of skin layer 185, thereby defining reinforced portions 195 of skin layer 185 and unreinforced portions 200 of skin layer 185. As shown in FIG. 1, reinforced portions 195 may include a plurality of striped line portions. For example, reinforced portions 195 may include a first reinforced portion 301, a second reinforced portion 302, a third reinforced portion 303, a fourth reinforced portion 304, a fifth reinforced portion 305, a sixth reinforced portion 306, and a seventh reinforced portion 307. The arrangement of reinforced portions 195 and unreinforced portions 200 is discussed in greater detail below.

[0036] In all embodiments, reinforcing material 190 is

selectively joined with skin layer 185. For example, reinforcing material 190 is selectively joined with skin layer 185 at a bonded area 205 by welding. As shown in FIG. 1, bonded area 205 has an externally exposed surface that defines a portion of the external surface of upper 110.

[0037] Reinforcing material 190 may provide advantages with respect to various characteristics, such as strength, durability, support, stability, and other attributes. In some embodiments, reinforcing material 190 may be a material having a tensile strength or puncture strength that is substantially the same or greater than skin layer 185. Thus, in some embodiments, reinforcing material 190 may provide upper 110 with increased strength in select areas. In some embodiments, reinforcing material 190 may be a material having an abrasion resistance that is greater than skin layer 185. In such embodiments, reinforcing material 190 may provide upper 110 with increased durability. In some embodiments, reinforcing material 190 may have an elasticity that is lower than the same or lower than skin layer 185. In such embodiments, reinforcing material 190 may provide additional support and stability to the wearer, for example, by limiting the amount to which skin layer 185 may stretch in reinforced portions 195.

[0038] In some embodiments, portions of upper 110 may include one or more additional layers/components for reinforcement, support, padding, and stability. For example, in some embodiments, upper 110 may include one or more panels affixed to an exterior of, or adjacent to, skin layer 185. Reinforcing strip 150 is one example of such an additional layer/component. Further, as shown in FIG. 1, upper 110 may include a heel panel 210. Additionally, or alternatively, in some embodiments, upper 110 may include a toe panel 215. In some embodiments, the additional panels of material, such as heel panel 210 and toe panel 215 may be welded to skin layer 185. Heel panel 210 and toe panel 215 may provide additional protection for the foot of a wearer. In addition, heel panel 210 and toe panel 215 may provide additional durability for upper 110. Further, in some embodiments, heel panel 210 and toe panel 215 may provide additional stability for footwear 100. In addition, heel panel 210 and toe panel 215 may be configured to provide aesthetic appeal.

[0039] In some embodiments, the mesh skin layer may be a full-length layer. That is, skin layer 185 may extend throughout all, or substantially all, of upper 110. In such embodiments, the additional layers, such as heel panel 210 and toe panel 215 may be affixed to an exterior surface of skin layer 185. In other embodiments, additional weight may be saved by utilizing skin layer 185 only in the areas of footwear 100 where skin layer 185 is exposed, for example between heel panel 210 and toe panel 215.

[0040] In some embodiments, padding can be included in one or more portions of the upper to provide comfort and a close fit against the contours of the foot. For example, in some embodiments, an ankle region 220 of upper 110 proximate to opening 135 may include compressible padding, such as foam padding, in order to provide cushioning and a close fit against the ankle of a wearer.

[0041] FIG. 2 is an exploded view of footwear 100 shown in FIG. 1. FIG. 2 shows sole structure 105 and the plurality of components from which the upper may be constructed. For example, skin layer 185 is shown. Skin layer 185 is shown as a full length skin layer in FIG. 2.

[0042] In some embodiments, heel panel 210 and toe panel 215, such as shown in FIG. 2, may be fixedly attached to an external surface of skin layer 185. Such fixed attachment may be by welding. It will be noted, however, that, as discussed above, in some embodiments, skin layer 185 may be less than a full length layer and, instead, may extend between additional panel components, such as heel panel 210 and toe panel 215. In such embodiments, heel panel 210 and toe panel 215 may overlap skin layer 185 only minimally, for example, at the peripheral, adjoining edges of each panel. The shape and size of heel panel 210 and toe panel 215 may vary according to desired performance characteristics such as weight, foot protection, durability, aesthetic design, and other such characteristics. Further, the materials from which heel panel 210 and toe panel 215 may be formed may vary according to the same or similar desired performance characteristics.

[0043] FIG. 2 shows strips of reinforcing material 190 in isolation. These strips may be disposed against the inner surface of skin layer 185. The arrangement of reinforcing material in footwear 100 is discussed in greater detail below.

[0044] Additional panels may also be provided around the throat opening of footwear 100. For example, an inner liner panel 191 and a reinforcing collar panel 192 may be provided inside skin layer 185. In some embodiments, however, reinforcing collar panel 192 may be provided external to skin layer 185. FIG. 2 also shows a foam collar piece 193, which may be disposed between inner liner panel 191 and reinforcing collar panel 192. Foam collar piece 193 may be a compressible component, which may conform to the contours of the foot proximate the ankle, thus improving fit and comfort. Such a compressible foam collar piece 193 may also provide protection for the ankle against impact and shifting of footwear 100 due to loading experienced during athletic activities.

[0045] As further illustrated in FIG. 2, tongue 800 may include multiple components. For example, as shown in FIG. 2, tongue 800 may include a grip portion 875, which may form an external surface of an upper portion of tongue 800. Grip portion 875 may provide a suitable area at which to grip tongue 800 when putting footwear 100 on the foot. Further, grip portion 875 may provide a location to display indicia, such as a logo or other graphic or text. In addition, tongue 800 may include a skin layer 885. Skin layer 885 may be formed of the same or similar material as skin layer 185, such as a mesh material. In some embodiments, skin layer 885 may form the exterior surface of a substantial majority of tongue 800. That is,

the area of skin layer 885 which is not covered by grip portion 875 may form a substantial majority of the exterior exposed surface of tongue 800. As shown in FIG. 2, skin layer 885 may extend the full length of tongue 800, and thus, grip portion 875 may overlay skin layer 885. However, in other embodiments, skin layer 885 and grip portion 875 may be joined at their peripheral edges and thus may not overlap, or may overlap minimally. This may save weight, by reducing the amount of skin layer material is used to form tongue 800.

[0046] As shown in FIG. 2, tongue 800 may also include a plurality of foam pads 880 and a liner 890. Foam pads 880 may be disposed between skin layer 885 (or grip portion 875) and liner 890. Foam pads 880 may be compressible, and thus, may provide comfort and improved fit in the instep region of footwear 100. Liner 890 may be formed of a material that is suitable for contacting the skin of a foot or a sock-covered foot of a wearer. Thus, liner 890 may be formed of a material that enables the sock-covered foot to slide into and out of footwear 100 with minimal effort. In addition, liner 890 may also have moisture wicking properties to absorb sweat from a wearer's foot.

[0047] The layers of tongue 800 may be joined using one or more joining techniques, such as welding, stitching, heat bonding, or other suitable construction methods. Additional details of the construction of tongue 800 are discussed below with regard to FIGS. 12-14.

[0048] In some embodiments, the skin layer may be exposed over a relatively large area of the upper. Accordingly, the reinforcing material and the bonded area in which the reinforcing material is bonded to the skin layer may be used to reinforce a span of skin layer between other shoe components. That is, strips of the reinforcing material may extend between components of the shoe. Similarly, the bonded area may include lines of bonded material extending between components of the article of footwear. For example, strips of reinforcing material and lines of bonded area may extend from a midsole of the article of footwear to a reinforcing strip bordering the lacing region of the article of footwear. This configuration may provide structural support in a generally vertical direction. In some embodiments, however, the strips and lines of bonded area may be angled in order to strategically reinforce the upper in certain directions and orientations.

[0049] In some embodiments, first reinforced portion 301 may extend from reinforcing strip 150 to sole structure 105, for example to midsole 160, as shown in FIG. 3. First reinforced portion 301 may extend, not only vertically, but also in a forward direction as it approaches midsole 160. The angling of first reinforced portion 301 may provide structural support in a forward-rearward direction. For example, first reinforced portion 301 may operate in tension to resist forces that tend to translate upper 110 in a rearward direction relative to sole structure 105. Such forces may occur, for example, when an athlete accelerates in a forward direction. In addition, first reinforced portion 301 may also span between reinforcing strip 150 and toe portion 215, providing further reinforcement to upper 110 by connecting skeletal structures of upper 110.

[0050] Second reinforced portion 302 may also extend from reinforcing strip 150 to midsole 160, as shown in FIG. 3. Further, second reinforced portion 302 may extend in a substantially vertical direction when viewed from the side of footwear 100. In addition, second reinforced portion 302 may be joined to reinforcing strip 150 proximate to first reinforced portion 301.

[0051] Third reinforced portion 303 may extend from reinforcing strip 150 to midsole 160, as shown in FIG. 3. Third reinforced portion 303 may extend, not only vertically, but also in a rearward direction as it approaches midsole 160. The angling of second reinforced portion 303 may provide structural support in a forward-rearward direction. For example, third reinforced portion 303 may operate in tension to resist forces that tend to translate upper 110 in a forward direction relative to sole structure 105. Such forces may occur, for example, when an athlete slows or stops their forward movement. In addition, third reinforced portion 303 may be joined to reinforcing strip 150 proximate to second reinforced portion 302.

[0052] Each of first reinforced portion 301, second reinforced portion 302, and third reinforced portion 303 may connect to reinforcing strip 150 adjacent one another and provide supportive reinforcement in different directions (fore, aft, and vertically). This may contribute the stability of footwear 100, by maintaining the relative positioning of upper 110 relative to sole structure 105. In some embodiments, first reinforced portion 301, second reinforced portion 302, and third reinforced portion 303 may connect to reinforcing strip 150 adjacent one another in a forefoot portion of footwear 100, for example in the area corresponding with the first metatarsal head and the first metatarsal-phalangeal joint. This joint is a point of flexion of the forefoot. Accordingly, it is advantageous to maintain the positioning of upper 110 relative to sole structure 105 in the region of this joint. This may promote, comfort, fit, and performance of footwear 100.

[0053] The strategic positioning of first reinforced portion 301, second reinforced portion 302, and third reinforced portion 303 in the orientations discussed above on the lateral and medial sides of footwear 100 to thereby provide fore-aft stability in the first metatarsal-phalangeal joint region, may enable a first unreinforced region 311 in the forefoot region to be a relatively wide span of skin layer that is unreinforced. This may provide additional ventilation and weight reduction.

[0054] Fourth reinforced portion 304 and fifth reinforced portion 305 may extend from reinforcing strip 150 to midsole 160, as shown in FIG. 3. In addition, fifth reinforced portion 305 may be joined to reinforcing strip 150 proximate to fourth reinforced portion 304, and may separate as fourth reinforced portion 304 and fifth reinforced portion 305 approach midsole 160. Also, sixth reinforced portion 306 and seventh reinforced portion 307

may be arranged similarly to fourth reinforced portion 304 and fifth reinforced portion 305, that is, in an inverted "V" formation. This inverted "V" formation may provide structural support in a similar manner to first reinforced portion 301, second reinforced portion 302, and third reinforced portion 303 discussed above.

[0055] It is also noted that the arrangement of reinforced portions with upper ends converging in various regions of reinforcing strip 150 and diverging proximate midsole 160 may enable structural connection between reinforcing strip 150 and diverging proximate midsole 160 despite these two components having differing lengths. That is, reinforcing strip 150 has a first length corresponding with the lacing region, whereas midsole 160 has a second length that extends the full length of footwear 100 and is, thus, longer than the first length of reinforcing strip 150.

[0056] In other embodiments, the reinforced portions of upper 110 may have other arrangements to provide strength, support, durability, and other performance characteristics. For example, in some embodiments, instead of an inverted "V" arrangement, reinforcing portions may be arranged in an "X" configuration between various components of footwear 100. Other arrangements are also possible according to the locations at which reinforcement is desired for performance benefits.

[0057] By strategically arranging the reinforced portions of upper 110, relatively large amounts of surface area of upper 110 may be formed of unreinforced skin layer. For example, in addition to first unreinforced portion 311, a second unreinforced portion 312 may be disposed between first reinforced portion 301 and second reinforced portion 302. In addition, a third unreinforced portion 313 may be disposed between second reinforced portion 302 and third reinforced portion 303. A fourth unreinforced portion 314 may be disposed between third reinforced portion 303 and fourth reinforced portion 304. Further, a fifth unreinforced portion 315 may be disposed between fourth reinforced portion 304 and fifth reinforced portion 305. Also, a sixth unreinforced portion 316 may be disposed between fifth reinforced portion 305 and sixth reinforced portion 306. A seventh unreinforced portion 317 may be disposed between sixth reinforced portion 306 and seventh reinforced portion 307. And an eighth unreinforced portion 318 may be disposed between seventh reinforced portion 307 and ankle region 220.

[0058] Additional unreinforced portions similar to second unreinforced portion 312, third unreinforced portion 313, fourth unreinforced portion 314, fifth unreinforced portion 315, sixth unreinforced portion 316, seventh unreinforced portion 317, and eight reinforced portion 318 may be provided on the opposite side of footwear 100. Thus, in some embodiments, the medial and lateral sides of upper 110 may be substantial mirror images in terms of the arrangement of reinforcing material. In some embodiments, the collective surface area of unreinforced portions may form a substantial majority of the surface area of exposed skin layer.

[0059] Further, in some embodiments, the collective surface area of unreinforced portions may constitute a substantial majority of the surface area of upper 110. By providing relatively large amounts of upper 110 as unreinforced, upper 110 may be provided with ventilation, flexibility, and reduced weight.

[0060] In some embodiments, the welding may be used to, not only join components, but also change the outward appearance of those components by changing the apparent color of the exterior portion of the footwear upper. In all embodiments, the unreinforced skin layer has a first color. As discussed in greater detail below, the skin layer is be a mesh material, and thus, portions of underlying reinforcing material show through the openings in the mesh skin layer. The reinforcing material has a second color that is different than the first color of the skin layer, and the appearance of a reinforced portion of skin layer may have a third color that is a blend of first color of the skin layer and the second color of the reinforcing material color. In addition, the bonded areas, where reinforcing material is bonded to the skin layer may have a fourth color. This fourth color may be substantially the same as the second color of the reinforcing material, as the skin layer may become embedded in the reinforcing material during the welding process. In some embodiments, however, the bonded area may have a color that is a blend of the first color of the skin layer and the second color of the reinforcing material. In addition, other portions of the footwear may have a fifth color, which may be the same or different as other components of the footwear. The color differences may be utilized for aesthetic design purposes. Further, the color differences may be utilized to show, through the color arrangement, various structural aspects of the footwear construction.

[0061] Unreinforced skin layer has a first color. For example, as shown in FIG. 3, first unreinforced portion 311, second unreinforced portion 312, third unreinforced portion 313, fourth unreinforced portion 314, fifth unreinforced portion 315, sixth unreinforced portion 316, seventh unreinforced portion 317, and eight reinforced portion 318 may have a first color represented in FIG. 3 simply as a grid. Reinforcing material, although not shown exposed in FIG. 3, may have a second color. For purposes of discussion, FIG. 3 illustrates a configuration in which the second color of the reinforcing material is substantially the same as a fifth color of other footwear components, such as heel panel 210, toe panel 215, and reinforcing strip 150, which are shown with a relatively dark stipple.

[0062] The appearance of reinforced portions of skin layer may have a third color that is a blend of the first color of the skin layer and the second color of the reinforcing material color. For example, as shown in FIG. 3, first reinforced portion 301, second reinforced portion 302, third reinforced portion 303, fourth reinforced portion 304, fifth reinforced portion 305, sixth reinforced portion 306, and seventh reinforced portion 307 may have a third

color that is an intermediate color between the first color of the skin layer and the second color of the reinforcing material. Accordingly, first reinforced portion 301, second reinforced portion 302, third reinforced portion 303, fourth reinforced portion 304, fifth reinforced portion 305, sixth reinforced portion 306, and seventh reinforced portion 307 are shown with a medium darkness stipple.

[0063] In addition, bonded areas 205, where reinforcing material is bonded to the skin layer may have a fourth color. This fourth color may be substantially the same as the second color of the reinforcing material. Accordingly, bonded areas 205 are shown in FIG. 3 as having a relatively dark stipple. By welding reinforcing material to the skin layer, the externally exposed surface of bonded area 205 may be given a fourth color that is different from the first color. It will be noted that, in some embodiments, the additional layers/components discussed above, such as reinforcing strip 150, heel panel 210, and toe panel 215, may be formed of the same or similar material as reinforcing material 190. For example, all of these components may be formed of a relatively lightweight fabric. In some embodiments, the lines of bonded area 205 may match in color with other footwear components to provide various decorative appearances. In some embodiments, one or more footwear components may have a different color than the reinforcing material and bonded area 205 to provide a different visual appearance.

[0064] The welding process changes the apparent color of the exterior surface of upper 110 by relocating portions of reinforcing material to the exterior surface of upper 110. For example, the process of welding involves the melting of reinforcing material 190 such that the reinforcing material flows from the inner side of skin layer 185 between the fibers of skin layer 185 (for example through the openings in a skin layer mesh material) to the outer, exposed side of skin layer 185. Thus, the externally exposed surface of bonded area 205 includes portions of reinforcing material, thus providing the externally exposed surface of the bonded area 205 with substantially the same color as the reinforcing material. The mechanism by which the relocation of portions of reinforcing material takes place is explained in more detail below.

[0065] Although the colors of footwear 100 are shown in FIG. 3 as being varying shades of grey, it will be understood that the components of footwear 100 may have any suitable colors. Further, the differences in color between components may be varying shades of a given color, such as dark red and light red. In addition, blends of colors may produce not only varying shades, but different colors altogether. For example, in some embodiments, a yellow skin layer may be combined with a blue reinforcing material to form reinforced portions or bonded areas that have a green appearance.

[0066] FIG. 4 illustrates a perspective view through opening 135 into void 130 within upper 110 of footwear 100. FIG. 4 shows an insole 225, and shows strips of reinforcing material 190 extending upward from beneath insole 225. As shown in FIG. 4, portions of skin layer 185 are inwardly exposed between the strips of reinforcing material 190. Thus, these unreinforced portions of skin layer 185 are exposed both externally and internally. Accordingly, as skin layer 185 may be a mesh material in some embodiments, the unreinforced portions of skin layer 185 may provide direct ventilation through skin layer 185, to internal void 130 defined by upper 110.

[0067] FIG. 5 is an enlarged illustration of a portion of FIG. 4 showing the inner surface of upper 110. As shown in FIG. 5, unreinforced portions 196, such as sixth unreinforced portion 316, seventh unreinforced portion 317, and eighth unreinforced portion 318 may be disposed between reinforced portions 190, such as sixth reinforced portion 306 and seventh reinforced portion 307. The reinforced portions may be welded to the skin layer, for example in a first bonded area 321, a second bonded area 322, a third bonded area 323, and a fourth bonded area 324. It will be noted that, first bonded area 321, second bonded area 322, third bonded area 323, and fourth bonded area 324 are shown in FIG. 5 as having the same color as the reinforcing material. Because FIG. 5 shows an inner side of upper 110, the skin layer is not shown, since the skin layer is not internally exposed proximate to the bonded areas. Thus, the bonded areas may have the same color as the reinforcing material on the inner side of upper 110.

[0068] It will also be noted that in some places, two bonded areas may join to form a more complex pattern. For example, as shown in FIG. 5, second bonded area 322 and third bonded area 323 may converge to form an inverted "V" arrangement. This joining of bonded areas may provide a structural connection between skeletal components of upper 110. Further, in some embodiments, sixth reinforced portion 306 and seventh reinforced portion 307 may be formed by separate strips of reinforcing material. In such embodiments, joining the bonded areas that secure these separate strips to the skin layer may provide a structural connection between these separate strips, thus creating a truss-like structure.

[0069] FIGS. 6 and 7 illustrate, in greater detail, the structure of the reinforced portions of upper 110. The arrangement of skin layer 185, reinforcing material 190, and bonded area 205 is illustrated in greater detail in FIG. 6, which shows an enlarged view of one of the striped regions of upper 110 created by reinforced portion 195 of skin layer 185. As shown in FIG. 6, skin layer 185 may be formed of a mesh material. As shown in the enlarged view portion of FIG. 6, skin layer 185 may include a plurality of openings 230, which may provide weight reduction and ventilation. In unreinforced portions 200, openings 230 may provide direct ventilation with an interior of footwear 100. In some embodiments, the mesh material may have more than 50% open area (e.g., more than 50% of the material surface area comprises open space through which air can freely flow from one side to the other).

[0070] In a substantial majority of reinforced portion

195, reinforcing material 190 may be visible behind skin layer 185 through openings 230. In this substantial majority of reinforced portion 195, reinforcing material 190 may remain adjacent to, but detached from, skin material 185. In select portions of reinforced portion 195, reinforcing material 190 may be affixed to skin layer 185 to form bonded areas 205. It will be noted that unreinforced portions 200 of skin layer 185 appear as generally white, while reinforced portion 195 appears generally grey due to the combination of the dark reinforcing material 190 with the white mesh of skin layer 185. Bonded areas 205 appear darker still as no white grid lines interrupt the dark color of reinforcing material 190 in bonded areas 205.

[0071] It will be noted that the skin material is illustrated, in the accompanying drawings, as a relatively simple grid representation. This grid representation is schematic only, and is provided in this manner for convenience and to avoid obscuring the drawings with excessive detail. Nevertheless, actual materials used for the mesh of the skin layer, examples of which are provided below, may have a relatively simple square or rectangular grid structure, similar to that shown in the drawings. The orientation of the grid may vary. Further, in some embodiments, other more complicated grid structures may be utilized for the mesh material of the skin layer. In addition, the size of the grid openings may also vary. The configuration of the skin layer mesh may be selected according to desired performance characteristics, including weight, strength, puncture resistance, ventilation, and other attributes.

[0072] In at least some embodiments, the mesh material of skin layer 185 may be a single layer warped knit with an open structure (or other type of woven material) and may be formed from nylon, polyester, nylon/polyester blends, recycled polyethylene terephthalate (rePET), or other material. However, the mesh material of skin layer 185 may be made of any desired materials, with any desired mesh opening size(s). Reinforcing material 190 may be any suitable material, including fabrics, textiles, weaves, knits, and other such materials. Reinforcing material 190 may be a material that is adhesively compatible with skin layer 185 and other materials of the shoe. In some embodiments, reinforcing material 190 may be a material that is adhesively compatible with skin layer 185 during welding. Suitable materials may include crystalline or semi crystalline materials. In some embodiments, such materials may include thermoplastics. For example, suitable materials may include polyalkylenes, such as polyethylene and polypropylene. Other materials may also be suitable for use as reinforcing materials, such as nylons, polyesters, and other such materials. In some embodiments, reinforcing material 190 may be configured to melt under welding, and thereby flow through openings 230 in the mesh of skin layer 185, thus resulting in skin layer 185 embedding within reinforcing material 190 in bonded regions. In other embodiments, skin layer 185 and reinforcing material 190 may be configured to slightly melt during welding and adhesively attach to one another (without skin layer 185 becoming embedded). In some embodiments, reinforcing material may be melted slightly, enabling the mesh of skin layer 185 to become partially embedded in reinforcing material 190 during welding. In such embodiments, reinforcing material 190 and skin layer 185 may rely not only on the partially embedded construction, but also on the adhesive bonding created by the partial melting of the reinforcing material. In order to achieve the welding, the reinforcing material may have the same or lower melting point as the skin layer. This may enable the reinforcing material to melt and flow through the openings in the mesh while the fibers of the mesh remain substantially intact.

[0073] As shown in FIG. 6, bonded areas 205 may span one or more of openings 230. Further, the amount of reinforced portion 195 in which reinforcing material 190 is affixed to skin layer 185 may vary. That is, the ratio of bonded area 205 to reinforced portion 195 may vary from relatively low, for example, 1:20, to relatively high, for example, 19:20. In some exemplary embodiments, stripes on the medial and lateral side of upper 110 may have a ratio of bonded area 205 to reinforced portion 195 of approximately 1:3. For example, as shown in FIG. 6, the combined widths of bonded areas 205 may be approximately one third of the total width of reinforced portion 195.

[0074] Because skin layer 185 is directly bonded to reinforcing material 190, the combined strength of the mesh skin layer 185 and reinforcing material 190 may obviate the need for another material on the outside or inside surface of upper 110 to provide tensile strength, puncture strength, durability, stability, or other performance characteristics. This permits upper 110 to be much lighter than is possible using various conventional shoe construction techniques.

[0075] Openings 230 in skin layer 185 allow air to flow through. This air flow helps to cool and dry the foot of a wearer of footwear 100. In some embodiments, skin layer 185 may be the only layer of upper 110 in certain portions of upper 110. In other embodiments, however, additional reinforcing materials may be utilized. For example, reinforcing material 190 may be selectively located at various portions of skin layer 185, and an additional inner reinforcing material may be provided for more comfort and moisture control (for example, wicking moisture away from the foot). This additional inner liner (not shown) may extend over otherwise unreinforced portions of skin layer 185. In some embodiments, this additional inner liner may be a relatively breathable material, and thus, may preserve the ventilation benefits of a mesh skin layer 185.

[0076] FIG. 7 is a cross-sectional view of upper 110 taken at line 7-7 in FIG. 6. As shown in FIG. 7, upon welding, bonded areas 205 may be created by embedding the mesh fibers of the skin layer 185 into reinforcing material 190. The fibers of skin layer 185 may melt to a greater or lesser degree during the welding process. Accordingly, in some embodiments, when forming bonded areas 205, the fibers of skin layer 185 may remain sub-

stantially intact. In other embodiments, the fibers of skin layer 185 may substantially melt and mix with the reinforcing material 190. In some cases, it may be desirable for the fibers of skin layer 185 to remain substantially intact in order to preserve the strength and durability of skin layer 185. In some embodiments, the fibers of skin layer 185 may deform slightly, as shown in FIG. 7. This slight deformation may result from slight melting, which may improve the bonding between the fibers of skin layer 185 and reinforcing material 190, while substantially preserving the tensile strength of skin layer 185 since the fibers of skin layer 185 remain substantially intact.

[0077] FIG. 7 further illustrates the deformation of reinforcing material 190 in bonding areas 205. This deformation may be created by heat and pressure applied by the welding process, which may compress the reinforcing material 190. In addition, FIG. 7 also shows reinforced portion 195 where reinforcing material 190 extends beneath skin layer 185, as well as unreinforced portions 200 where reinforcing material 190 does not extend.

[0078] FIG. 8 provides a schematic illustration of an alternative configuration of the mesh material of the skin layer. For example, FIG. 8 shows a mesh skin layer 700 backed in a reinforced portion 730 by a reinforcing material 705. Reinforced portion 730 extends to edges 710 of reinforcing material 705. Further, reinforcing material 705 is welded to skin layer 700 in a first bonded area 720 and a second bonded area 725.

[0079] As shown in FIG. 8, the mesh of skin layer 700 may have a hexagonal configuration. This hexagonal configuration may provide improved strength and inelasticity in multiple directions as compared to a square or rectangular grid configuration. Meshes having grid with other geometricallyshaped configurations may also be used. For example, the skin layer may be formed of a mesh material having a triangular or octagonal configuration. The varying shapes may be selected to provide desired performance characteristics, such as directional strength and inelasticity.

[0080] Although the mesh of the skin layer is shown as having generally two-dimensional configurations, in some embodiments, the mesh may have a three-dimensional configuration. For example, in some embodiments, the skin layer may be formed of a spacer mesh or spacer textile. Three-dimensional mesh configurations may provide more complex and tailored performance characteristics, such as directional tensile strength and inelasticity, as well as puncture strength, abrasion resistance, and ventilation.

[0081] Some embodiments may use one or more spacer meshes or spacer textile materials that are discussed in Hazenberg et al., U.S. Patent Application Publication No. 2013/0266773, published October 10, 2013, and entitled "Spacer Textile Materials And Methods For Manufacturing The Spacer Textile Materials," and Chao et al., U.S. Patent Application Publication No. 2013/0263391, published October 10, 2013, and entitled "Methods for Manufacturing Fluid-Filled Chambers Incorporating Spacer Textile Materials." In some embodiments, a double needle bar raschel knit or other three-dimensional knit may be used to form a mesh material for the skin layer. Exemplary three-dimensional knits that may be used, including the double needle bar raschel knit, are disclosed in Bruer et al., "Three-Dimensionally Knit Spacer Fabrics: A Review of Production Techniques and Applications," Journal of Textile and Apparel, Technology and Management, Vol. 4, Iss. 4, Summer 2005.

[0082] In some embodiments, a bonded mesh composite panel of an upper may be created by assembling individual panels of material for the various layers in a flat configuration. The panels and other elements are assembled so as to have an arrangement in which the relative locations of the panels and elements correspond to the locations those panels and elements will have in the completed shoe. After assembling the individual panels and other elements into the proper arrangement and tacking the assembly at several locations, the assembly undergoes a series of pressing operations to bond the assembled elements. These operations create a flat, one-piece unibody upper shell that can contain many or all elements to be included in the finished upper. Edges of the unibody upper shell can then be joined to create a three-dimensional upper body ready for further finishing and attachment to a midsole. Some embodiments may use one or more of the assembly procedures disclosed in Shaffer et al., U.S. Patent Application Publication No. 2012/0297643, published November 29, 2012, and entitled "Shoe with Composite Upper and Method of Making the Same". Additionally, some embodiments may use one or more of the footwear assembly methods disclosed in (a) Dojan et al., U.S. Patent Application No. 13/029,502, filed February 17, 2011 and entitled "Shoe with Composite Upper and Foam Element and Method of Making Same," (now abandoned), (b) Dojan et al., U.S. Patent Application Publication No. 2011/0088285, published April. 21, 2011, and entitled "Composite Shoe Upper and Method of Making Same," and (c) Dojan et al., U.S. Patent Application Publication No. 2011/0088282, published April. 21, 2011 and entitled "Composite Shoe Upper and Method of Making Same."

[0083] FIGS. 9-11 illustrate an exemplary ultrasonic welding process in greater detail. As shown in FIG. 9, skin layer 185 and reinforcing material 190 (or other components of the upper) may be ultrasonically welded on an anvil 235. Anvil 235 may be a relatively rigid body on which the components may be ultrasonically welded. In some embodiments, anvil 235 may be a relatively flat surface, such as a table. In other embodiments, anvil 235 may be a last upon which the article of footwear may be assembled. The schematic illustrations of FIGS. 9-11 are intended to encompass use of an anvil generally, and thus, are not specific to any particular anvil configuration.

[0084] As further shown in FIG. 9, an ultrasonic horn 240 may be provided to effectuate the ultrasonic welding. As shown in FIG. 10, ultrasonic horn 240 may compress skin layer 185 and reinforcing material 190 against anvil

235. Also, ultrasonic horn 240 may be vibrated at an ultrasonic frequency, as illustrated by vibration lines 245. This ultrasonic vibration may create friction, which may create heat, which, along with the pressure of ultrasonic horn 240 pressing against anvil 235, may at least partially melt a portion of reinforcing material 190. As a result of this melting, the fibers of skin layer 185 may embed within reinforcing material 190, effectively relocating portions of reinforcing material 190 to an exterior surface of the upper, thereby forming bonded area 205, as shown in FIG. 11.

[0085] Using the technique schematically illustrated in FIGS. 9-11, a method of making an article of footwear may be performed. The method is not part of the claimed invention and may include forming an upper configured to receive a foot of a wearer. Forming the upper may include selectively attaching inner reinforcing material 190 to skin layer 185 using ultrasonic welding. (In some embodiments, other welding techniques may be utilized.) The method may further include arranging skin layer 185 to form at least a portion of the external surface of the upper. Ultrasonically welding inner reinforcing material 190 to skin layer 185 may form bonded area 205 having an externally exposed surface that defines a portion of the external surface of the upper. In some embodiments, skin layer 185 may have a first color and the reinforcing material 190 may have a second color that is different from the first color.

[0086] The externally exposed surface of bonded area 205 may be formed to include portions the reinforcing material 190, thus providing the externally exposed surface of bonded area 205 with a different color than skin layer 185. For example, ultrasonically welding the inner reinforcing material 190 to skin layer 185 to form bonded area 205 may relocate portions of reinforcing material 190 to the external surface of the upper at the externally exposed surface of bonded area 205, thereby providing the externally exposed surface of bonded area 205 with substantially the same color as reinforcing material 190. In some embodiments, relocating portions of reinforcing material 190 to the external surface of the upper may include pressing the portions of reinforcing material 190 through openings in the mesh material of skin layer 185. Further, selectively attaching the inner reinforcing material 190 to certain portions of skin layer 185 may form reinforced portions of skin layer 185, leaving unreinforced portions of skin layer 185 that provide direct ventilation, through the mesh material of skin layer 185, to an internal void defined by the upper.

[0087] Ultrasonically welding reinforcing material 190 to skin layer 185 to form bonded area 205 may include forming lines of bonded material extending between components of the article of footwear. For example, forming lines of bonded material may include forming lines of bonded material extending from the sole structure of the article of footwear to the reinforcing strip proximate to the instep region of the article of footwear.

[0088] In order to form lines of bonded material, a stylus-like ultrasonic horn 240 may be moved in a desired pattern. In other embodiments, ultrasonic horn 240 may be an elongate structure formed in the desired pattern. Such an elongate ultrasonic horn may simply be pressed against the material to be welded and the ultrasonic vibrations activated. Some embodiments may use one or more ultrasonic welding techniques using an elongate horn that are discussed in Beye et al., U.S. Patent Application Publication No.___, published___, (now U.S. Patent Application No. 13/741,428, filed January 15, 2013, and entitled "Spacer Textile Material with Tensile Strand Having Multiple Entry and Exit Points" (Attorney Docket No. 51 -2687)).

[0089] In some embodiments, exemplary articles of footwear may include an additional layer of material located between a portion of the skin layer and a portion of the reinforcing material. For example, an additional layer of material may include a compressible foam material, which may provide comfort, protection, and a close fit. Such a compressible foam layer may be provided, for example, in a tongue portion of the upper of the article of footwear. Lines of bonded area may enclose a pocket between the skin layer and the reinforcing material, in which the compressible foam layer may be disposed. In some embodiments, multiple compressible foam pads may be provided proximate one another. For example, multiple compressible foam pads may be separated by lines of bonded area. Such an arrangement may produce a quilted configuration, which may provide comfort to the instep region of the footwear.

[0090] FIG. 12 illustrates a view of footwear 100 with tongue 800 substantially exposed. As shown in FIG. 12, upper 110 may include a tongue 800, which may be formed of multiple layers that may be joined using welding or stitching. For example, multiple bonded areas 805, in the form of lines, may be provided to selectively attach reinforcing material 190 to skin layer 885. In addition, stitching 840 may secure reinforcing material 190 to skin layer 885 in certain portions of tongue 800, such as a peripheral edge, as shown in FIG. 12.

[0091] As further shown in FIG. 12, in some embodiments, footwear 100 may include an additional layer of material located between a portion of skin layer 885 and a portion of reinforcing material 190. For example, the additional layer of material may include a compressible foam material. As shown in FIG. 12, a first pocket 810 between skin layer 885 and reinforcing material 190 may house a first foam pad 815. First pocket 810 may be enclosed by a plurality of bonded area lines that define a polygonal pocket. For example, as shown in FIG. 12, a first bonded area line 820, a second bonded area line 825, a third bonded area line 830, and a fourth bonded area line 835 may enclose first pocket 810.

[0092] In addition, at least one additional foam pad may be provided in tongue 800. For example, a second foam pad 845 may be provided in a second pocket 850. Second pocket 850 may be enclosed by a fifth bonded area line 855, a sixth bonded area line 860, a seventh bonded area

line 865, and fourth bonded area line 835. First foam pad 815 and second foam pad 845 may be disposed substantially proximate one another, thereby forming a substantially quilted configuration.

[0093] FIG. 13 shows a cross-sectional view taken at line 13-13 of FIG. 12. As shown in FIG. 13, first foam pad 815 may be disposed within first pocket 810 between skin layer 885 and reinforcing material 190. Similarly, foam pad 845 may be disposed within second pocket 850. As shown in FIG. 12, second bonded area line 825 and third bonded area line 830 define boundaries of first pocket 810. Similarly, sixth bonded area line 860 and seventh bonded area line 865 define boundaries of second pocket 850.

[0094] FIG. 14 shows a cross-sectional view taken at line 14-14 of FIG. 12, which is substantially perpendicular to line 13-13 at which the cross section in FIG. 13 is taken. As shown in FIG. 14, in addition to first foam pad 815, tongue 800 may also include a third foam pad 846 and a fourth foam pad 847 disposed between liner 890 and skin layer 885. In some embodiments, liner 890 may be formed of reinforcing material 190. Therefore, liner 890 may provide structural support to tongue 800.

[0095] As shown in FIG. 14, reinforcing material 190 may be joined to skin layer 885 to form a plurality of bonded areas. For example, reinforcing material 190 may be welded to skin layer 885 to form an eighth bonded area line 901 and a ninth bonded area line 902. Eighth bonded area line 901 and ninth bonded area line 902 may separate third foam pad 846 from first foam pad 815. In addition, fourth bonded area line 835 and a tenth bonded area line 904 may separate first foam pad 815 and fourth foam pad 847. Further, upper edge 905 may be formed using welding or by another bonding process. Upper edge 905 may form at least one side of the pocket within which third foam pad 846 is disposed. Similarly, a lower edge 906 may be formed using welding or by another bonding process. Lower edge 905 may form at least one side of the pocket within which fourth foam pad 847 is disposed.

[0096] While various embodiments of the invention have been described, the description is intended to be exemplary, rather than limiting and it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible. Although many possible combinations of features are shown in the accompanying figures and discussed in this detailed description, many other combinations of the disclosed features are possible. Therefore, it will be understood that any of the features shown and/or discussed in the present disclosure may be implemented together in any suitable combination. Accordingly, the invention is not to be restricted except in light of the attached claims.

Claims

1. An article of footwear (100) including a sole structure (105) fixedly attached to an upper (110) configured to receive a foot of a wearer, the upper (110) comprising:

a skin layer (185) forming at least a portion of an external surface of the upper (110);
a reinforcing material (190) selectively located internal and adjacent to portions of the skin layer (185), thereby defining reinforced portions of the skin layer (185) and unreinforced portions (311, 312, 313, 314, 315, 316, 317, 318) of the skin layer (185);
wherein the reinforcing material (190) is selectively joined with the skin layer (185) at a bonded area (205) by welding, the bonded area (205) having an externally exposed surface that defines a portion of the external surface of the upper (110) and includes compressed reinforcing material deformed by heat and pressure during the welding;
wherein the skin layer (185) has a first color and the reinforcing material (190) has a second color that is different from the first color, and wherein the skin layer (185) is formed of a mesh material having openings extending therethrough, and wherein at the bonded area (205), the mesh material is embedded in the reinforcing material (190); and
wherein the externally exposed surface of the bonded area (205) includes portions of the reinforcing material (190), thus providing the externally exposed surface of the bonded area (205) with substantially the same color as the reinforcing material (190).

2. The article of footwear (100) of claim 1, wherein the upper (110) includes an additional layer of material located between a portion of the skin layer (185) and a portion of the reinforcing material (190),

wherein the additional layer of material includes a compressible foam material, and
wherein the compressible foam material is provided in a pocket between the skin layer (185) and the reinforcing material (190) and enclosed by the bonded area (205).

3. The article of footwear (100) of claim 1, wherein portions of the reinforcing material (190) are visible through the openings in the mesh material in a substantial majority of the reinforced portions of the skin layer (185).

4. The article of footwear (100) of claim 3, wherein the mesh material of the skin layer (185) has more than 50% open area defined by the openings.

5. The article of footwear (100) of claim 1, wherein the

upper (110) includes an additional layer of material located between a portion of the skin layer (185) and a portion of the reinforcing material (190),

wherein the additional layer of material includes a compressible foam material, and
wherein the additional layer of material is provided in a tongue portion (800) of the upper (110).

6. The article of footwear (100) of claim 1, wherein the bonded area (205) includes lines of bonded material extending between components of the article of footwear (100).

7. The article of footwear (100) of claim 6, wherein the lines of bonded material extend from the sole structure (105) to a reinforcing strip proximate to an instep region of the article of footwear (100).

8. The article of footwear (100) of claim 1, wherein the article of footwear (100) includes additional panels of material that are welded to the skin layer (185).

9. The article of footwear (100) of claim 1, wherein the skin layer (185) is formed of a mesh material having openings extending therethrough, and wherein the openings provide direct ventilation to an internal void defined by the upper (110).

10. The article of footwear (100) of claim 1, wherein the reinforcing material (190) is selectively joined with the skin layer (185) at plural bonded areas by welding, each of the bonded areas having an externally exposed surface that defines a portion of the external surface of the upper (110) and includes compressed reinforcing material deformed by heat and pressure during the welding.

11. The article of footwear (100) of claim 10, wherein the skin layer (185) is formed of a mesh material having openings extending therethrough, and wherein portions of the reinforcing material (190) are visible through the openings in the mesh material in a substantial majority of the reinforced portions of the skin layer (185).

12. The article of footwear (100) of claim 11, wherein at the bonded areas, the mesh material is embedded in the reinforcing material (190).

13. The article of footwear (100) of claim 11, wherein the upper (110) includes an additional layer of material located between a portion of the skin layer (185) and a portion of the reinforcing material (190),

wherein the additional layer of material includes a compressible foam material, and
wherein the additional layer of material is provided in a tongue portion of the upper (110).

14. The article of footwear (100) according to any preceding claim, wherein in a substantial portion of the reinforced portions of the upper (110), the reinforcing material (190) is located adjacent to, but detached from, the skin layer material.

Patentansprüche

1. Ein Fußbekleidungsartikel (100), der eine Sohlenstruktur (105) enthält, die fest an einem Oberteil (110) angebracht ist, das konfiguriert ist, um einen Fuß eines Trägers aufzunehmen, wobei das Oberteil (110) Folgendes umfasst:

eine Haut- bzw. Außen-Schicht bzw. Skinlage (*skin layer*) (185), die mindestens einen Teil einer Außenfläche des Oberteils (110) bildet;
ein Verstärkungsmaterial (190), das selektiv innerhalb und angrenzend an Abschnitte der Skinlage (185) angeordnet ist und dadurch verstärkte Abschnitte der Skinlage (185) und unverstärkte Abschnitte (311, 312, 313, 314, 315, 316, 317, 318) der Skinlage (185) definiert;
wobei das Verstärkungsmaterial (190) in einem verbundenen Bereich bzw. Verbindungsbereich (*bonded area*) (205) mit der Skinlage (185) durch Schweißen selektiv verbunden ist, wobei der Verbindungsbereich (205) eine nach außen freiliegende Oberfläche aufweist, die einen Teil der Außenfläche des Oberteils (110) definiert und komprimiertes Verstärkungsmaterial beinhaltet, das während des Schweißens durch Wärme und Druck verformt wurde;
wobei die Skinlage (185) eine erste Farbe aufweist und das Verstärkungsmaterial (190) eine zweite Farbe aufweist, die sich von der ersten Farbe unterscheidet, und wobei die Skinlage (185) aus einem Netzmaterial mit sich hindurch erstreckenden Öffnungen gebildet ist, und wobei das Netzmaterial am Verbindungsbereich (205) in das Verstärkungsmaterial (190) eingebettet ist; und
wobei die nach außen freiliegende Oberfläche des Verbindungsbereichs (205) Teile des Verstärkungsmaterials (190) beinhaltet, wodurch die nach außen freiliegende Oberfläche des Verbindungsbereichs (205) im Wesentlichen die gleiche Farbe wie das Verstärkungsmaterial (190) aufweist.

2. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei das Oberteil (110) eine zusätzliche Materialschicht beinhaltet, die sich zwischen einem Teil der Skinlage (185) und einem Teil des Verstärkungsma-

terials (190) befindet,

wobei die zusätzliche Materialschicht ein komprimierbares Schaummaterial beinhaltet, und
wobei das komprimierbare Schaummaterial in einer Tasche zwischen der Skinlage (185) und dem Verstärkungsmaterial (190) bereitgestellt wird und vom Verbindungsbereich (205) umschlossen wird.

3. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei Teile des Verstärkungsmaterials (190) durch die Öffnungen im Netzmaterial in einer wesentlichen Mehrheit der verstärkten Abschnitte der Skinlage (185) sichtbar sind.

4. Der Fußbekleidungsartikel (100) nach Anspruch 3, wobei das Netzmaterial der Skinlage (185) eine durch die Öffnungen definierte offene Fläche von mehr als 50% aufweist.

5. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei das Oberteil (110) eine zusätzliche Materialschicht beinhaltet, die sich zwischen einem Teil der Skinlage (185) und einem Teil des Verstärkungsmaterials (190) befindet,

wobei die zusätzliche Materialschicht ein komprimierbares Schaummaterial beinhaltet, und
wobei die zusätzliche Materialschicht in einem Zungenabschnitt (800) des Oberteils (110) bereitgestellt wird.

6. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei der Verbindungsbereich (205) Bahnen bzw. Linien *(lines)* aus verbundenem Material beinhaltet, die sich zwischen Komponenten des Fußbekleidungsartikels (100) erstrecken.

7. Der Fußbekleidungsartikel (100) nach Anspruch 6, wobei sich die Linien aus verbundenem Material von der Sohlenstruktur (105) zu einem Verstärkungsstreifen in der Nähe eines Ristbereichs des Fußbekleidungsartikels (100) erstrecken.

8. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei der Fußbekleidungsartikel (100) zusätzliche Stoffbahnen (*panels of material*) beinhaltet, die mit der Skinlage (185) verschweißt sind.

9. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei die Skinlage (185) aus einem Netzmaterial mit sich hindurch erstreckenden Öffnungen gebildet ist, und wobei die Öffnungen eine direkte Belüftung eines durch das Oberteil (110) definierten inneren Hohlraums ermöglichen.

10. Der Fußbekleidungsartikel (100) nach Anspruch 1, wobei das Verstärkungsmaterial (190) durch Schweißen an einer Vielzahl von Verbindungsbereichen mit der Skinlage (185) selektiv verbunden ist, wobei jeder der Verbindungsbereiche eine nach außen freiliegende Oberfläche aufweist, die einen Teil der Außenfläche des Oberteils (110) definiert und komprimiertes Verstärkungsmaterial beinhaltet, das während des Schweißens durch Wärme und Druck verformt wird.

11. Der Fußbekleidungsartikel (100) nach Anspruch 10, wobei die Skinlage (185) aus einem Netzmaterial mit sich hindurch erstreckenden Öffnungen gebildet ist, und wobei Teile des Verstärkungsmaterials (190) durch die Öffnungen im Netzmaterial in einer wesentlichen Mehrheit der verstärkten Teile der Skinlage (185) sichtbar sind.

12. Der Fußbekleidungsartikel (100) nach Anspruch 11, wobei das Netzmaterial an den Verbindungsbereichen in das Verstärkungsmaterial (190) eingebettet ist.

13. Der Fußbekleidungsartikel (100) nach Anspruch 11, wobei das Oberteil (110) eine zusätzliche Materialschicht beinhaltet, die sich zwischen einem Teil der Skinlage (185) und einem Teil des Verstärkungsmaterials (190) befindet,

wobei die zusätzliche Materialschicht ein komprimierbares Schaummaterial beinhaltet, und
wobei die zusätzliche Materialschicht in einem Zungenabschnitt des Oberteils (110) bereitgestellt wird.

14. Der Fußbekleidungsartikel (100) nach irgendeinem der vorstehenden Ansprüche, wobei in einem erheblichen Teil der verstärkten Abschnitte des Oberteils (110) das Verstärkungsmaterial (190) an das Skinlagen-Material angrenzt, aber von diesem abgelöst ist.

Revendications

1. Un article chaussant (100) incluant une structure de semelle (105) attachée de manière fixe à une tige (110) qui est configurée pour recevoir un pied d'un porteur, la tige (110) comprenant :

une couche superficielle ou encore couche pelliculaire (*skin layer*) (185) formant au moins une portion d'une surface externe de la tige (110) ;
un matériau de renforcement (190) situé sélectivement à l'intérieur et adjacent à des portions de la couche pelliculaire (185), définissant ainsi des portions renforcées de la couche pelliculaire (185) et des portions non renforcées (311, 312,

313, 314, 315, 316, 317, 318) de la couche pelliculaire (185) ;
sachant que le matériau de renforcement (190) est joint sélectivement à la couche pelliculaire (185) au niveau d'une zone liée (205) par soudage, la zone liée (205) présentant une surface exposée extérieurement qui définit une portion de la surface externe de la tige (110) et inclut un matériau de renforcement comprimé déformé par la chaleur et la pression pendant le soudage ;
sachant que la couche pelliculaire (185) présente une première couleur et que le matériau de renforcement (190) présente une deuxième couleur qui est différente de la première couleur, et sachant que la couche pelliculaire (185) est formée d'un matériau maillé présentant des ouvertures qui s'étendent à travers celui-ci, et sachant qu'au niveau de la zone liée (205), le matériau maillé est incorporé dans le matériau de renforcement (190) ; et
sachant que la surface exposée extérieurement de la zone liée (205) inclut des portions du matériau de renforcement (190), conférant ainsi à la surface exposée extérieurement de la zone liée (205) essentiellement la même couleur que le matériau de renforcement (190).

2. L'article chaussant (100) d'après la revendication 1, sachant que la tige (110) inclut une couche supplémentaire de matériau située entre une portion de la couche pelliculaire (185) et une portion du matériau de renforcement (190),

sachant que la couche supplémentaire de matériau inclut un matériau en mousse compressible, et
sachant que le matériau en mousse compressible est fourni dans une poche entre la couche pelliculaire (185) et le matériau de renforcement (190) et enfermé par la zone liée (205).

3. L'article chaussant (100) d'après la revendication 1, sachant que des portions du matériau de renforcement (190) sont visibles à travers les ouvertures dans le matériau maillé dans une majorité substantielle des portions renforcées de la couche pelliculaire (185).

4. L'article chaussant (100) d'après la revendication 3, sachant que le matériau maillé de la couche pelliculaire (185) présente une surface ouverte de plus de 50% définie par les ouvertures.

5. L'article chaussant (100) d'après la revendication 1, sachant que la tige (110) inclut une couche supplémentaire de matériau située entre une portion de la couche pelliculaire (185) et une portion du matériau de renforcement (190),

sachant que la couche supplémentaire de matériau inclut un matériau en mousse compressible, et
sachant que la couche supplémentaire de matériau est fournie dans une portion de languette (800) de la tige (110).

6. L'article chaussant (100) d'après la revendication 1, sachant que la zone liée (205) inclut des lignes (*lines*) de matériau lié s'étendant entre les composants de l'article chaussant (100).

7. L'article chaussant (100) d'après la revendication 6, sachant que les lignes de matériau lié s'étendent depuis la structure de semelle (105) jusqu'à une bande de renforcement à proximité d'une région de coude-pied de l'article chaussant (100).

8. L'article chaussant (100) d'après la revendication 1, sachant que l'article chaussant (100) inclut des panneaux supplémentaires de matériau qui sont soudés à la couche pelliculaire (185).

9. L'article chaussant (100) d'après la revendication 1, sachant que la couche pelliculaire (185) est formée d'un matériau maillé présentant des ouvertures qui s'étendent à travers celui-ci, et sachant que les ouvertures fournissent une ventilation directe à un vide interne défini par la tige (110).

10. L'article chaussant (100) d'après la revendication 1, sachant que le matériau de renforcement (190) est joint sélectivement à la couche pelliculaire (185) au niveau de plusieurs zones liées par soudage, chacune des zones liées présentant une surface exposée extérieurement qui définit une portion de la surface externe de la tige (110) et inclut un matériau de renforcement comprimé déformé par la chaleur et la pression pendant le soudage.

11. L'article chaussant (100) d'après la revendication 10, sachant que la couche pelliculaire (185) est formée d'un matériau maillé présentant des ouvertures qui s'étendent à travers celui-ci, et sachant que des portions du matériau de renforcement (190) sont visibles à travers les ouvertures dans le matériau maillé dans une majorité substantielle des portions renforcées de la couche pelliculaire (185).

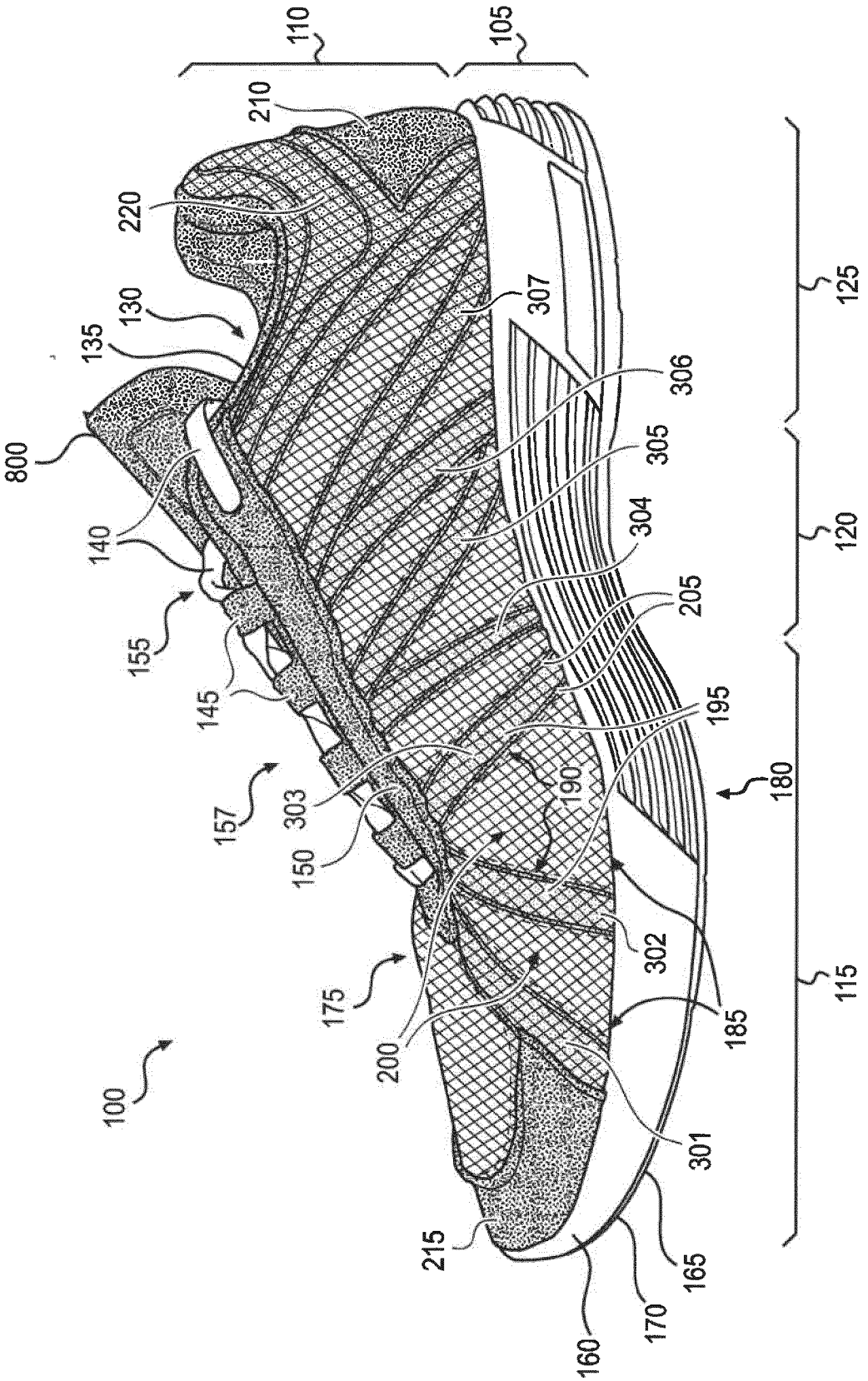
12. L'article chaussant (100) d'après la revendication 11, sachant qu'au niveau des zones liées, le matériau maillé est noyé dans le matériau de renforcement (190).

13. L'article chaussant (100) d'après la revendication 11, sachant que la tige (110) inclut une couche sup-

plémentaire de matériau située entre une portion de la couche pelliculaire (185) et une portion du matériau de renforcement (190),

sachant que la couche supplémentaire de matériau inclut un matériau en mousse compressible, et
sachant que la couche supplémentaire de matériau est fournie dans une portion de languette de la tige (110).

14. L'article chaussant (100) d'après l'une quelconque des revendications précédentes, sachant que dans une portion substantielle des portions renforcées de la tige (110), le matériau de renforcement (190) est situé de manière adjacente à, mais détachée du matériau de la couche pelliculaire.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115

FIG. 1

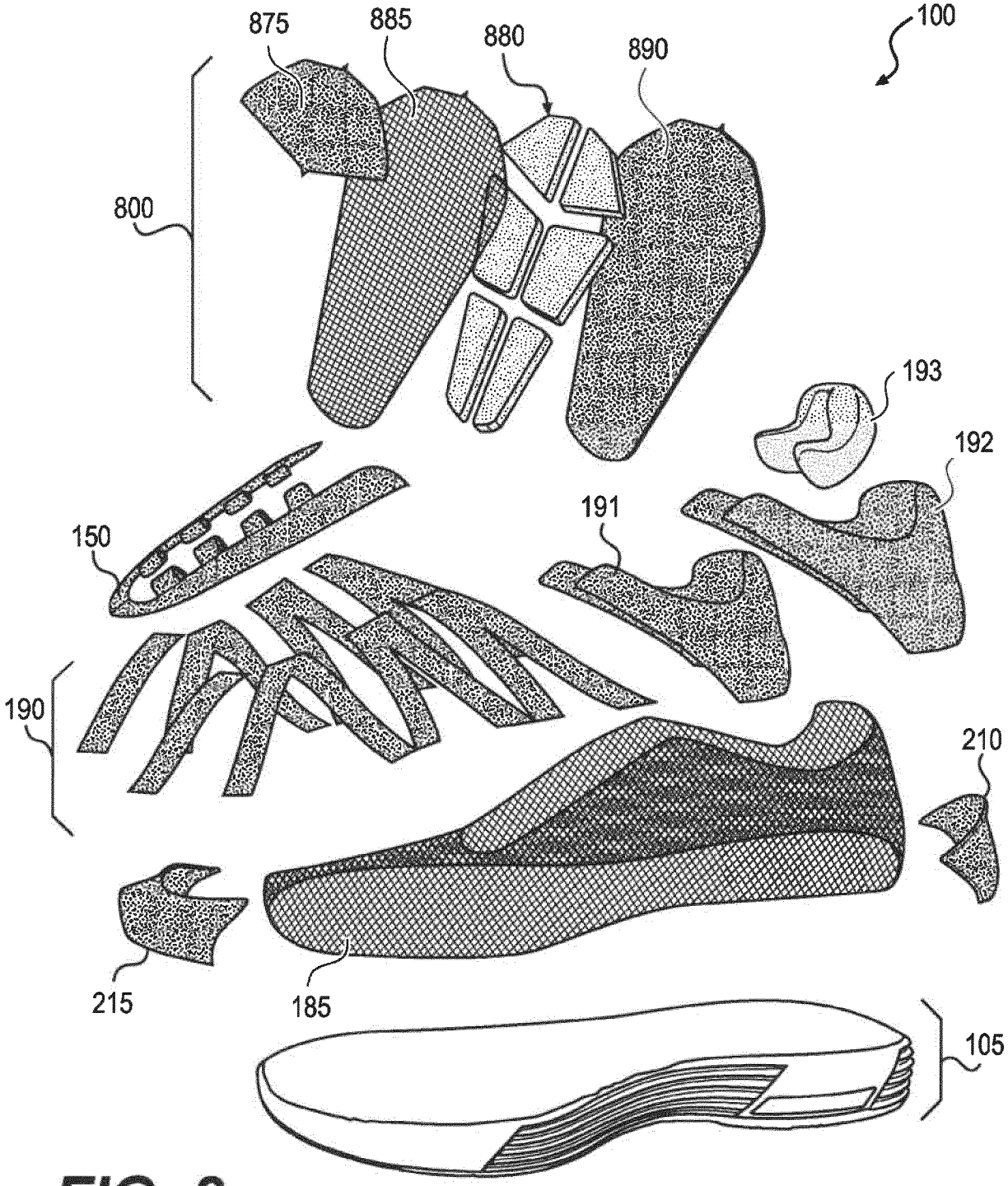
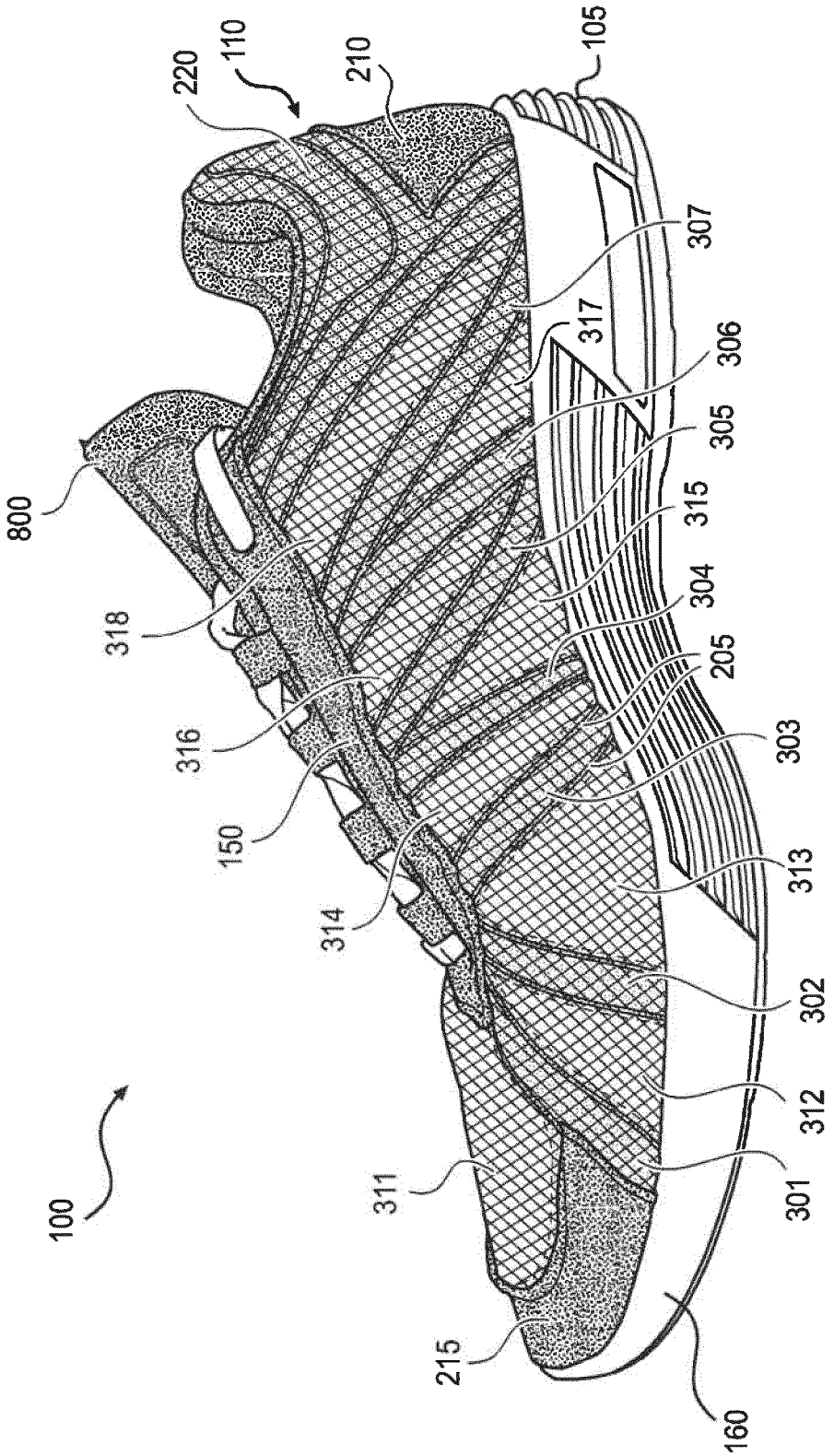


FIG. 2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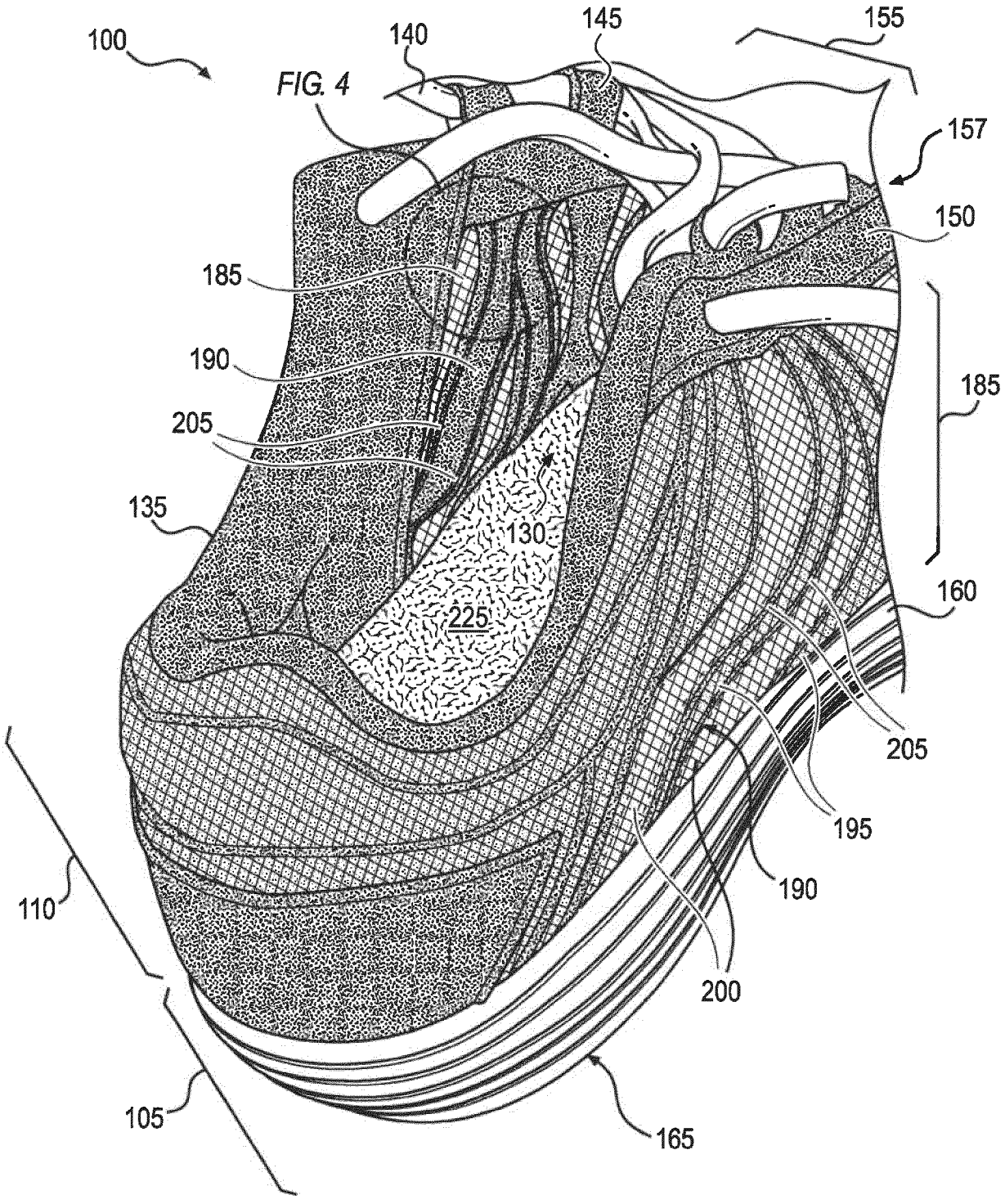
110
220

FIG. 3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140
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185
190
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130
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185
205
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190
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110
105
165

FIG. 4

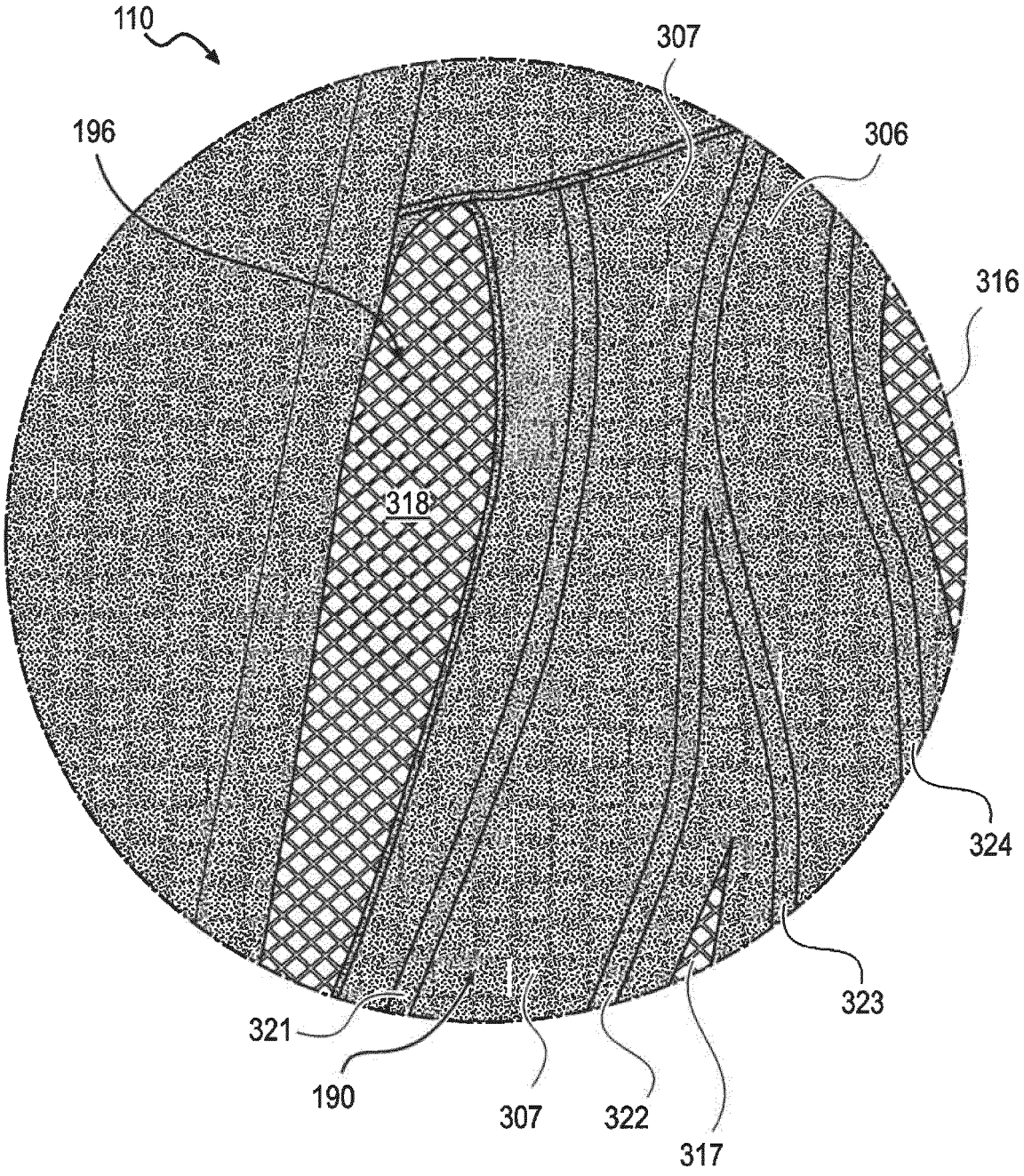
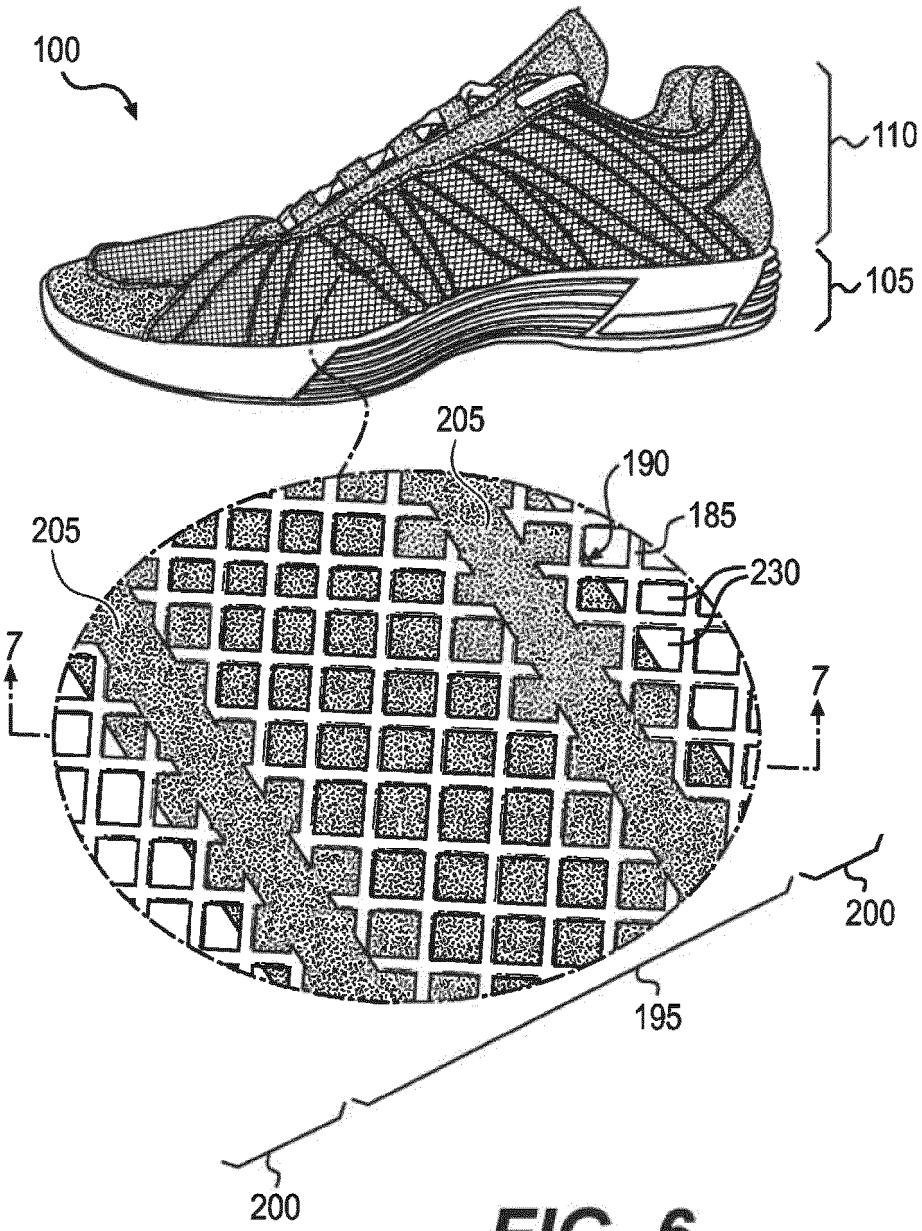


FIG. 5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105
205
190
185
205
230
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7
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195
200

FIG. 6

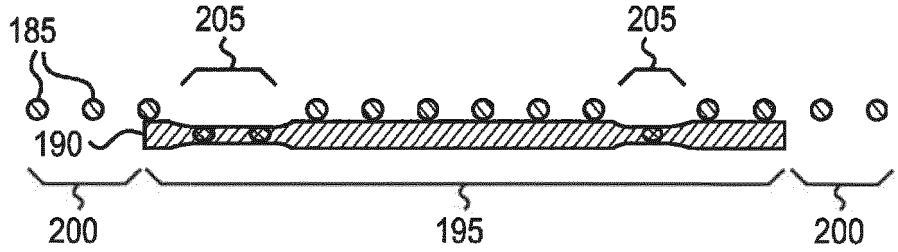

185
205
205
190
200
195
200

FIG. 7

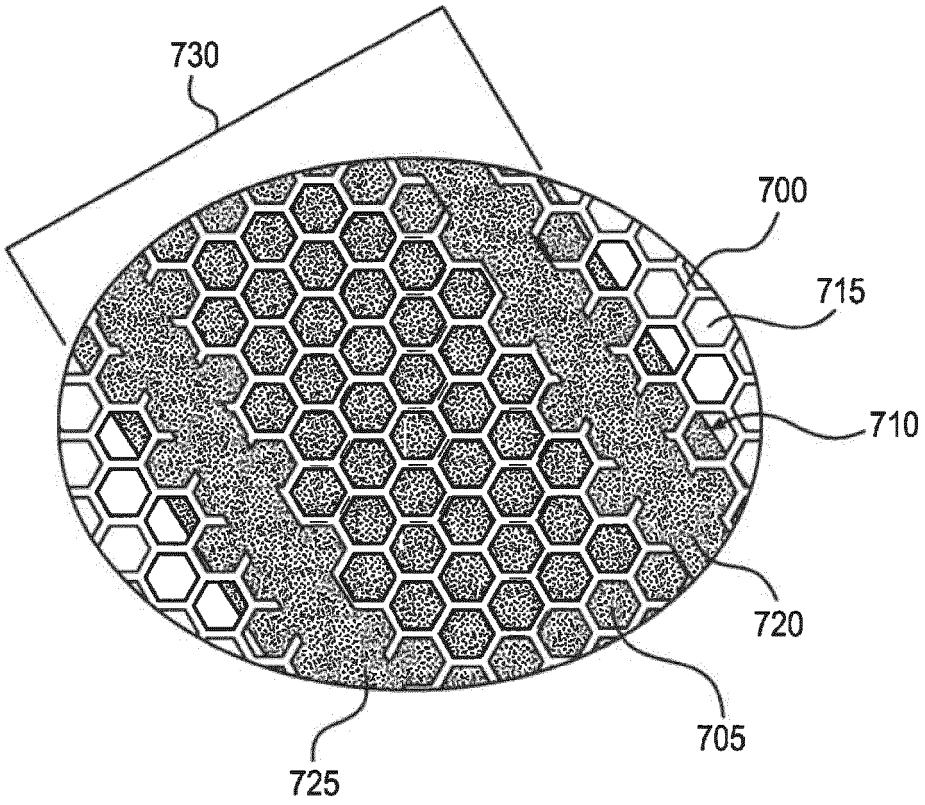


FIG. 8

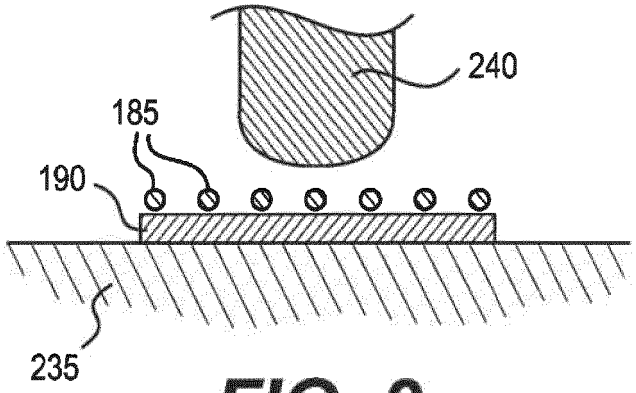


FIG. 9

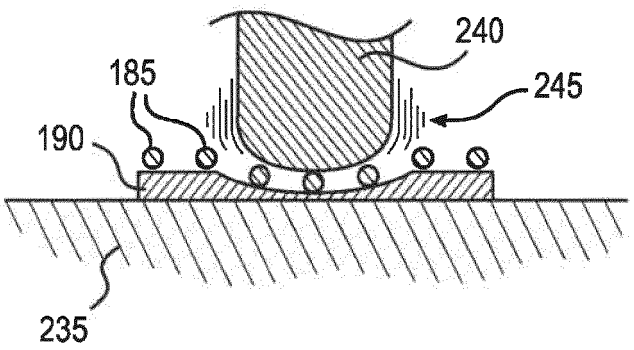


FIG. 10

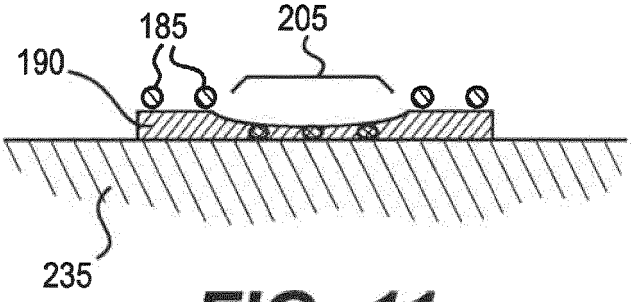
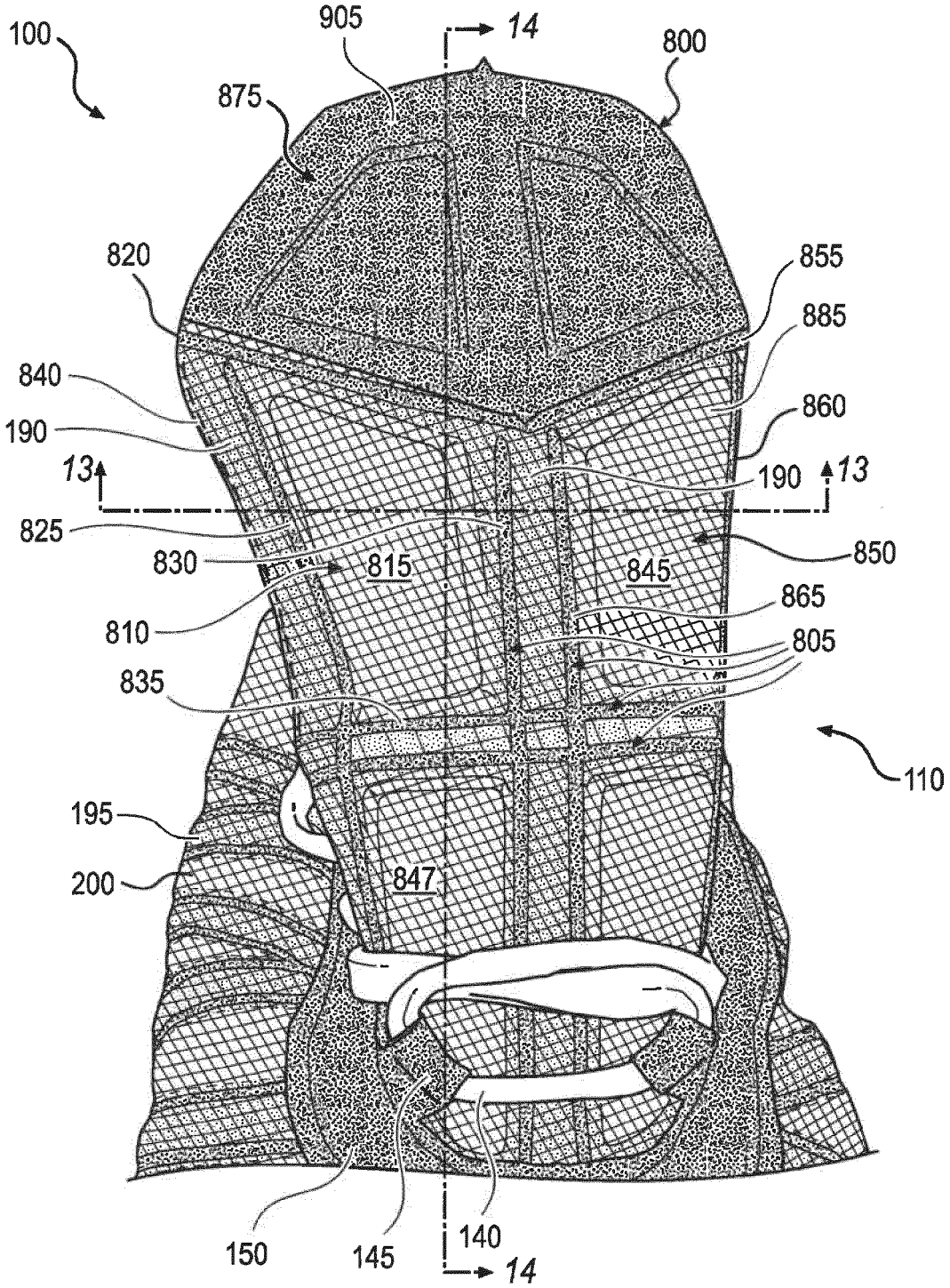


FIG. 11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14

FIG. 12

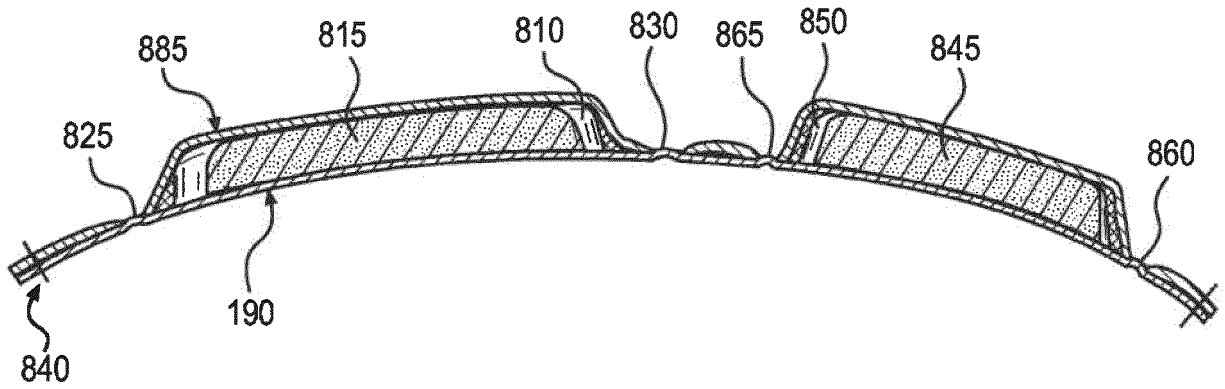

FIG. 13

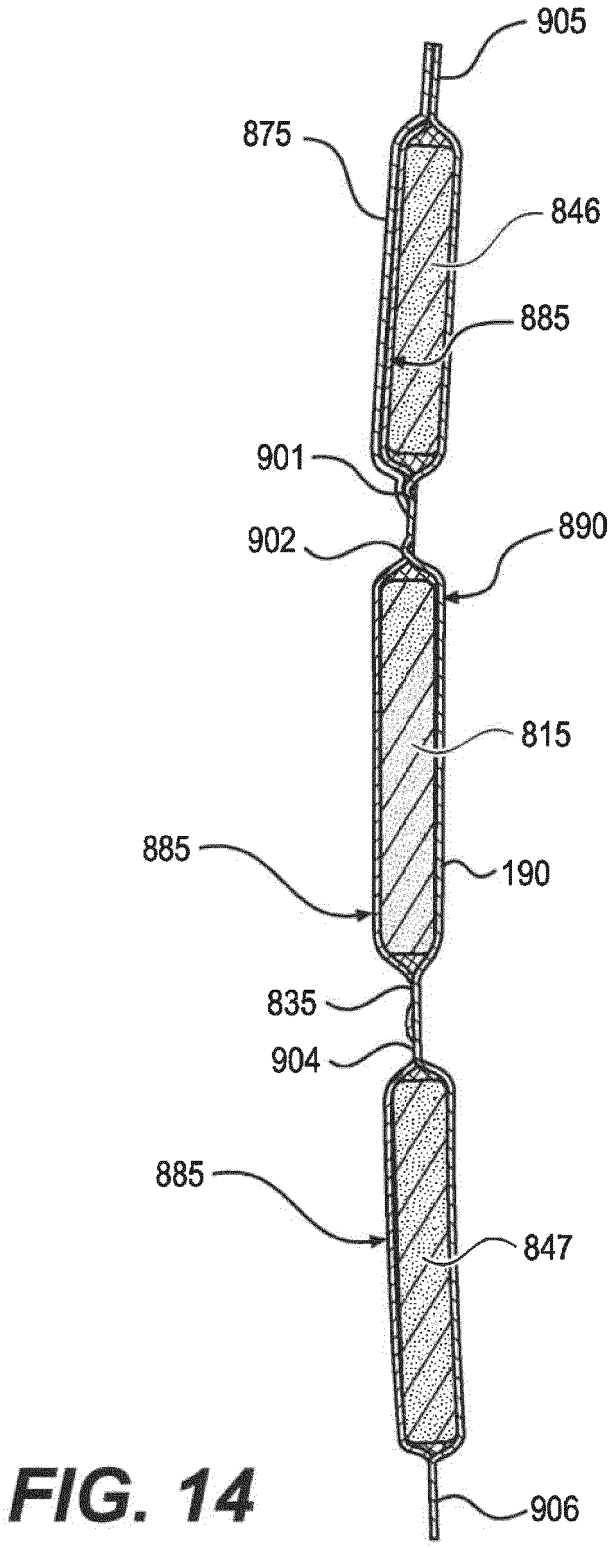

FIG. 14

REFERENCES CITED IN THE DESCRIPTION

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