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(54) BRAIDED FOOTWEAR WITH INTEGRATED LACES AND METHODS FOR THEIR MANUFACTURE

GEFLOCHTENES SCHUHWERK MIT INTEGRIERTEN SCHUHBÄNDERN UND VERFAHREN ZU SEINER HERSTELLUNG

ARTICLE CHAUSSANT TRESSÉ AYANT DES CORDES INTEGRÉES AINSI QUE LES PROCÉDÉS POUR SA RÉALISATION

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EP 3 810 839 B1

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Description

FIELD OF THE INVENTION

[0001] Aspects herein relate braided articles and in particular, braided articles of footwear.

BACKGROUND OF THE INVENTION

[0002] Traditional shoes are often made from textiles or materials that have uppers that are cut to a desired shape and stitched together. Newer methods also now include forming shoe uppers from a knitted textile. Still newer methods involve braiding a tubular textile for use as the shoe upper. Aspects herein relate to braiding tubular structures that in some aspects are used in articles of footwear. Traditional shoes often also have a separate lace closure system to tighten or secure the footwear to a user's foot. Aspects herein relate to a braided upper for footwear that has an integrally braided lace closure system. US 2014/377488 A1 describes a patterned plexus of filaments, a method of producing and articles containing patterned filaments. US 2008/110049 A1 describes an article of footwear having a flat knit upper construction or other upper construction.

BRIEF DESCRIPTION OF THE DRAWING

[0003] Aspects herein is described in detail below with reference to the attached drawing figures, wherein:

- FIG. 1 depicts a perspective view of a braiding machine in accordance with aspects herein;
 FIG. 2 depicts a schematic top-down view of the braiding machine in an initial configuration in accordance with aspects herein;
 FIG. 3 depicts a schematic top-down view of the braiding machine in an active configuration in accordance with aspects herein;
 FIG. 4 depicts a schematic top-down view of the braiding machine in a different active configuration from FIG. 3 in accordance with aspects herein;
 FIG. 5 depicts a top plan view of an aspect of a braided upper, with the braids shown schematically, in accordance with aspects herein;
 FIG. 6 depicts a side perspective view of an aspect of a braided upper, with the braids shown schematically, in accordance with aspects herein;
 FIG. 7 depicts a plan view of an aspect of a braided upper, on a last, in accordance with aspects herein;
 FIG. 8 depicts a plan view similar to FIG. 7, but with the braided laces laced through the eyelets of the braided upper in accordance with aspects herein;
 FIG. 9 depicts a method of making a braided upper in accordance with aspects herein;
 FIG. 10 depicts an enlarged portion of a braided upper in accordance with aspects herein; and
 FIG. 11 depicts a side view of an aspect of a braided

upper, with the braids not shown for clarity, but showing other aspects.

DETAILED DESCRIPTION OF THE INVENTION

[0004] Aspects described herein are directed to braided articles and methods for their manufacture. Braiding offers many advantages over knitting or weaving such as, for example, the reduction of frictional forces applied to the yarns used in the creation of the braided structure, the ability to use high dtex (denier) yarns (e.g., between 888.9 dtex to 22222.2 dtex (800D to 20000D), between 1111.1 dtex to 11111.1 dtex (1000D to 10000D), between 1111.1 dtex to 5555.6 dtex (1000D to 5000D), and the like), the ability to combine different types of yarns with non-yarn materials such as, for example, rubber strands, ropes, metals, and the like.

[0005] Braiding is a process of interlacing or interweaving three or more yarns diagonally to a product axis in order to obtain a thicker, wider or stronger product or in order to cover (overbraid) some profile. Interlacing diagonally means that the yarns make an angle with the product axis, which can be between 1° and 89° but is usually in the range of 30° - 80°. This angle is called the braiding angle. Braids can be linear products (ropes), hollow tubular shells or solid articles (one, two or three-dimensional textiles) with constant or variable cross-section, and of closed or open appearance.

[0006] As used herein, the yarns, filaments, or other materials used for braiding may be formed of different materials having different properties. The properties that a particular yarn or other will impart to an area of a braided component partially depend upon the materials that form the yarn. Cotton, for example, provides a softer product, natural aesthetics, and biodegradability. Elastane and stretch polyester each provide substantial stretchability and fast recovery, with stretch polyester also providing recyclability. Rayon provides high luster and moisture absorption. Wool provides high moisture absorption in addition to having insulating properties and biodegradability. Nylon is a durable and abrasion-resistant material with relatively high strength. Polyester is a hydrophobic material that also provides relatively high durability. In addition to materials, other aspects of the yarn selected for formation of a braided component may affect the properties of the braided component. For example, a yarn may be a monofilament or a multifilament. The yarn may also include separate filaments that are each formed of different materials. In addition, the yarn may include filaments that are each formed of two or more different materials, such as a bicomponent yarn with filaments having a sheath-core configuration or two halves formed of different materials.

[0007] As stated above, braided articles can be formed as tubular braids on a braiding machine. Different types of braiding machines such as a radial, axial or lace are available. One example of a lace braiding machine can be found in Ichikawa, EP 1 486 601, granted May 9, 2007

entitled "Torchon Lace Machine" and EP No. 2 657 384, published Oct. 30, 2013 entitled "Torchon Lace Machine,". The upper portion of an exemplary braiding machine 10 is shown in FIG. 1. Braiding machine 10 includes a plurality of spools 12. In some configurations, the spools 12 carry the yarn 14 selected for braiding. The yarns 14 from individual spools are selectively interlaced or intertwined with one another by the braiding machine 10. This interlacing or intertwining of strands forms a braided article 16, as further described below. Each of the spools 12 is supported and constrained by a track 18 about the circumference of the braiding machine 10. Each spool 12 has a tensioner 20 (shown schematically in FIG. 1) that operates, along with a roller 22, to maintain a desired tension in the yarns 14 and the braided article 16. As the yarns 14 extend upwardly, they pass through a braid ring 24 that is generally considered the braiding point. The braiding point is defined as the point or area where yarns 14 consolidate to form braided article 16. At or near braid ring 24, the distance between yarns 14 from different spools 12 diminishes. As the distance between yarns 14 is reduced, the yarns 14 intermesh (i.e. interlace) or braid with one another in a tighter fashion and are pulled linearly by roller 22.

[0008] As best seen in FIG. 2, each spool 12 is carried and supported by a carriage 26. Each spool 12 is movable about the circumference of the track 18 by rotor metals 28. As described on the Torchon Lace Machine referenced previously, and disclosed in EP 1 486 601, each of the rotor metals 28 can be moved clockwise or counterclockwise. In contrast to radial braiding machines or fully non-jacquard machines, in a lace braiding machine, each rotor metal is not intermeshed with the adjacent rotor metal. Instead, each rotor metal 28 may be selectively independently movable. As can be seen by comparing FIG. 3 to FIG. 4, as the rotor metals 28 rotate, they move the carriages 26, and thus the spools 12 supported on the carriages 26 by moving them about the circumference of the track 18. The braiding machine 10 is programmable such that the individual rotor metals 28 rotate the carriages 26, and thus the spools 12 to move them about the circumference of the track 18. As an individual spool 12 moves relative to an adjacent spool 12, the yarns 14 carried on the spools 12 interlace to create a desired braid pattern. The movement of spools 12 may be pre-programmed to form particular shapes, designs, and to specify thread densities of a braided component or portions of a braided component. By varying the rotation and location of individual spools 12 various braid configurations may be formed. Such an exemplary braiding machine may form intricate braid configurations including both jacquard and non-jacquard braid configurations or geometries. Such configurations and geometries offer design possibilities beyond those offered by other textiles, such as knitting or weaving.

[0009] In some aspects, the size of braiding machine 10 may be varied. It should be understood that the braiding machine 10 shown and described is for illustrative

purposes only. In some aspects, braiding machine 10 may be able to accept, for example, 144 carriages, although other sizes of braiding machines, carrying different numbers of carriages and spools is possible and is within the scope of this disclosure. By varying the number of carriages and spools within a braiding machine, the density of the braided articles as well as the size of the braided component may be altered.

[0010] One aspect of the technology described herein is related to a braided article of footwear comprising a sole and a unitary braided upper formed from a first yarn and coupled to the sole. The braided upper has a medial side, a lateral side opposite the medial side, where each of the lateral and medial sides has an underfoot edge proximate the sole. The medial and lateral sides have a toe portion, a heel portion, a throat portion, and a midfoot portion. The braided upper further includes at least one braided lace formed from a second yarn different from the first yarn, the second yarn being a high-performance yarn, the braided lace integrated with the braided upper, at a lace integration portion of the braided upper. In some aspects, the braided upper includes at least two braided laces integrated with the braided upper at each edge of the throat of the upper.

[0011] In one aspect, a braided article of footwear is provided comprising a sole and a braided upper. The braided article of footwear may also include at least one braided lace that is integrated with the braided upper at a lace integration portion. The throat portion is defined by at least a first edge and an opposite second edge spaced from the first edge. The braided upper comprises a first plurality of arcuate braided eyelets formed along the first edge of the throat portion and a second plurality of arcuate braided eyelets formed along the second edge of the throat portion. Each of the first plurality of arcuate braided eyelets and the second plurality of arcuate braided eyelets are contiguously braided with the upper.

[0012] In one aspect, a method is provided for forming a braided article of footwear. In one aspect, the method includes braiding a unitary braided upper with a first yarn, the braided upper having at least a main body and independently braiding at least one braided lace with a second yarn different from the first yarn, the second yarn being a high performance yarn, and braiding the at least one braided lace while braiding the unitary upper, the method further comprising forming the main body of the unitary braided upper having a toe portion, a heel portion, a medial midfoot portion and a lateral midfoot portion between the toe portion and the heel portion, a throat portion between the medial midfoot portion and the lateral midfoot portion, and an underfoot portion, affixing a sole to the underfoot portion of the braided upper. At a lace integration portion of the unitary braided upper, the method includes integrating the at least one braided lace into the unitary braided upper.

[0013] Turning now to FIG. 5 and FIG. 6, a top view and a perspective view of an exemplary braided upper 100 are shown, provided in accordance with aspects

herein. The braided upper 100 has a medial side 102 and a lateral side 104. In addition, the medial side 102 and the lateral side 104 may further be defined as having a toe portion 106, a heel portion 108 and a mid-foot portion 110. Further, the braided upper 100 includes a defined throat portion 112 having a medial edge 114 and a lateral edge 116 that project from a throat base 117. The braided upper 100 further has a collar portion 118. The medial side 102, lateral side 104, toe portion 106, heel portion 108, mid-foot portion 110, throat portion 112 and collar portion 118 may be collectively referred to as the main body 120 of braided upper 100. The braid pattern of main body 120 is shown schematically in FIG. 5, for simplicity. Any of a number of braid patterns are suitable for the main body 120.

[0014] The braided upper 100 also includes a first braided lace 122 and a second braided lace 124. First braided lace 122 and second braided lace 124 are braided independently, and contiguously, to the main body 120 of braided upper 100. If the braided upper 100 is braided in the direction from the toe portion 106 toward the heel portion 108, first braided lace 122 and second braided lace 124 are braided on the same braiding machine (such as braiding machine 10) and at the same time as main body 120. As the braiding of main body 120 advances to the throat portion 112, the first braided lace 122 and second braided lace 124 are braided into the main body 120 at the base 117 of the throat portion 112 at a lace integration portion 130. The main body 120 may also, in some aspects, include integrally braided eyelets 132 (shown schematically in FIG. 5 and FIG. 6) along the medial edge 114 and lateral edge 116 of the throat portion 112. In the worn condition, first braided lace 122 and second braided lace 124 may be laced through the eyelets 132 in any of a number of lacing patterns, as further discussed below with reference to FIG. 8. According to the claimed invention, main body 120 is braided with a base yarn, and the first and second braided laces 122, 124 are braided with a high performance yarn. The main body 120 may also have high performance yarns and base yarns braided together to form the main body 120 to add structural integrity and support to the braided upper. For example, the high performance yarns may include high tenacity yarns that have higher strength than the base yarns such as carbon fiber yarns, aramid fiber yarns, liquid crystal polymer yarns, high strength nylon yarns, and the like. Additionally or alternatively, the high performance yarns in accordance with aspects herein may, for example, be high dtex (denier) yarns ranging between, 888.9 dtex and 22222.2 dtex (800D and 20000D), 1111.1 dtex and 11111.1 dtex (1000D and 10000D), 1111.1 and 10000 dtex (1000D and 9000D), 1111.1 dtex and 5555.6 dtex (1000D and 5000D), and the like. Further, the high performance yarns in accordance with aspects herein may further include, for example, composite yarns that may include filaments that are each formed of two or more different materials, such as in a bicomponent yarn with filaments having a sheath-

core configuration or two halves formed of different material. The composite yarns may include, for example, a polyester core, a nylon core, or any of the high tenacity material yarns described above as the core and a thermoplastic material sheath, such as, for example, thermoplastic polyurethane (TPU), a silicone based thermoplastic material, and the like. The bicomponent yarns in accordance with aspects herein may be further processed, for example, to create locked down areas for the article of footwear by selectively applying heat to melt the thermoplastic material only in certain areas of the article of footwear where the composite yarn is present (e.g., using a masking technique to protect other areas). While not shown in FIG. 5 and FIG. 6, the main body 120 may include an eyelet structure incorporated as an overlay attached to the main body 120 along the medial edge 114 and lateral edge 116 of the throat portion 112.

[0015] FIG. 7 and FIG. 8 show an additional aspect with braided upper 100 shown on a last 140. In one aspect, the main body 120 of braided upper 100 is braided in a braid pattern with a base yarn 142 in addition to a high performance yarn 144. In some aspects, the high performance yarn 144 is also used to integrally braid eyelets 132 along the throat portion 112. The eyelets 132 may be contiguous with the braid pattern of the high performance yarn, such that tension on the eyelets 132 is transferred to (and through) the remainder of the braid pattern of the high performance yarn. As shown in FIG. 7 and FIG. 8, the first braided lace 122 and the second braided lace 124 are integrally braided with the main body 120 of the upper, and are incorporated into the main body 120 at the lace integration portion 130. Again, the first braided lace 122 and second braided lace 124 may be independently braided at the same time as main body 120 is being braided, and on the same braiding machine (such as braiding machine 10). The braiding of the first and second laces 122, 124 continues independently from the main body 120, until reaching the lace integration portion 130, at which point the first and second laces 122, 124 are integrated into the main body 120, as shown in FIG. 7 and FIG. 8. The term independently braided generally refers to the simultaneous braiding of two independent braid structures by one braiding machine during one braiding operation. At the lace integration portion 130, the independent braid structures (the main body 120, the first braided lace 122 and the second braided lace 124) are merged and/or inter-braided. In aspects, the braiding operation may also start at the toe portion 106 and proceed to the heel portion 108. In such a case, the braided upper 100 is braided until the lace integration portion 130 is reached, at which point the remainder of the main body 120 of braided upper 100 is independently braided from the first braided lace 122 and the second braided lace 124. In other words, the remainder of main body 120 of braided upper is braided at the same time, but independently from, the first braided lace 122 and the second braided lace 124, such that the first and second braided laces 122, 124 are integral with the main

body 120, but project separately from the main body 120. In some aspects, a high performance yarn (which may be the same as, or different from, the high performance yarn 144) is used to braid the first and second laces 122, 124. FIG. 8 shows the first and second braided laces 122, 124 in the as-worn condition in one example of a lace pattern, crisscrossing through eyelets 132.

[0016] In some aspects, the braided framework for the main body 120 of braided upper is contiguously braided with the eyelets 132 along the throat portion 112. In some aspects, the eyelets 132 are braided independently from the main body 120. In other words, the eyelets 132 may be on a separate plane or braided layer. Each braided eyelet comprises an exit location 134 (also referred to as the first location), and an entry location 136 (also referred to as the second location). An individual braided eyelet 132, for example, is contiguously braided with the main braided layer forming the main body 120 of braided upper 100 and as part of the braided framework of the main body 120, up to the edge (either medial edge 114 or lateral edge 116) of the throat portion 112 of the braided upper 100. Once the braided framework reaches the edge of the throat portion 112, the eyelet 132 continues to be braided separately/independently from the throat starting at exit location 134 for a predetermined length and then is reincorporated into the main body 120 of the braided upper 100 at an entry location 136. In other words, the eyelets 132 briefly form a second braided layer at the medial edge 114 and lateral edge 116 of the unitary braided upper 100.

[0017] In one aspect, the first and second braided laces 122, 124 cooperate with the high performance yarns 144 in the braid pattern of the main body 120 to add tension across the braided upper 100 in a controlled pattern as the high performance yarns 144 of the main body are pulled by the first and second braided laces 122, 124 through the eyelets 132.

[0018] While shown at the base of the throat portion 112, the lace integration portion 130 may, in some aspects, be located at different points along the main body 120. Further, the first braided lace 122 and the second braided lace 124 could be any of a variety of lengths based on the desired lacing pattern, the type of footwear for which braided upper 100 is used, etc.

[0019] In some aspects, the space or gap 148 between the lateral edges of throat portion 112 may be closed by providing a tongue element (not shown), or a braided elastic portion covering a top portion of a wearer's foot when the braided article of footwear is worn by a wearer. The braided elastic portion may comprise, for example, elastic yarns to aid in the donning and doffing of the article of footwear, and at the same time, to aid in securing the article of footwear on the last 140 or a wearer's foot when the article of footwear is worn. In some aspects, a sole 150 may be coupled to the braided upper 100 along a joint edge 152, as shown in FIG. 8, to complete the article of footwear.

[0020] Although the braided framework shown in FIG.

7 and FIG. 8 forms a crisscross pattern profile other pattern profiles, such as, for example, linear, curvilinear, organic, geometric, logos, and the like, are possible and are within the scope of this disclosure.

[0021] Turning now to FIG. 9, a method 900 of braiding a braided upper (such as the braided upper 1000 of Figures 5-8) through the interbraiding of at least an independently braided lace and a main body is provided in accordance with aspects herein. At block 902B, at least one lace and a portion of the main body of a footwear upper are independently braided. As described above, this independent braiding may be done on the same braiding machine (such as braiding machine 10) using a portion of the spools 12 to braid the main body (such as main body 120) and a different portion of the spools 12 to braid the at least one lace (such as either first braided lace 122 or second braided lace 124). Each of the at least one lace and the main body portion are braided with different yarns. The at least one lace is braided with a high performance yarn 144.

[0022] At block 904, at a lace integration portion (such as lace integration portion 130), the braiding machine 10 may be configured to inter-braid the independently braided at least one lace and the main body portion, joining the at least one lace to the main body portion through the braiding process. The lace integration portion may occur in any portion of the braided upper 100. In one aspect, the lace integration portion is located at, or near, the base of the throat portion (such as throat portion 112). At block 906, the method includes finishing or completing the braiding of the braided footwear upper.

[0023] FIG. 10 and FIG. 11 show an additional aspect somewhat similar to FIG. 7 and FIG. 8. FIG. 10 shows a top plan view of a portion of braided upper 100 in one aspect. Like the braided upper of FIG. 7 and FIG. 8, the main body 120 of braided upper 100 is braided in a braid pattern with a base yarn 142 in addition to a high performance yarn 144. The high performance yarn 144 may be integrally braided with the base yarn 142, or in some aspects may be woven with the base yarn 142. In some aspects the first braided lace 122 and the second braided lace 124 are each formed from six individual high performance yarns 144 that are woven into the base yarn 142 in the main body 120 of upper 100. As shown in FIG. 10, at the lace integration portion 130, the individual high performance yarns 144 are braided together to form first braided lace 122 and second braided lace 124. FIG. 10 also shows a third braided lace 160 and a fourth braided lace 162. In some aspects the third braided lace 160 and the fourth braided lace 162 are each formed from four individual high performance yarns 144 that are woven into the base yarn 142 in the main body 120 of upper 100. As shown in FIG. 10, at the lace integration portion 130 just above first braided lace 122 and second braided lace 124, the individual high performance yarns 144 are braided together to form third braided lace 160 and fourth braided lace 162. Having two braided laces on each side of throat portion 112 helps to reduce pressure points

along the throat portion to distribute the force applied to the main body 120 by first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162. The high performance yarns 144 woven into the main body 120 and braided into first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 form a containment zone that allows added lateral foot stability with a minimal upper structure. The integrally braided first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 provide support for upper 100 in the direction of shear forces generated in the worn condition, such as when a user is changing direction laterally ("cutting"). As the first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 are tightened, the performance yarns 144 woven into main body 120 tighten around the user's foot, along with the surrounding braided portion formed by base yarns 142. This is an advantage of a braided structure that allows forces delivered in one portion to be distributed across the entire braided structure, effectively allowing the main body 120 to tighten across a user's foot when worn. In some aspects, the high performance yarn 144 is also used to integrally braid eyelets 132 along the throat portion 112. Each of first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 are integrated into the main body 120 of the upper, and are incorporated into the main body 120 at the lace integration portion 130. Again, first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 may be independently braided at the same time as main body 120 is being braided, and on the same braiding machine (such as braiding machine 10). The braiding of first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 continues independently from the main body 120, until reaching the lace integration portion 130, at which point the high performance yarn strands 144 of first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 are integrated into the main body 120, as shown in FIG. 10. The term independently braided generally refers to the simultaneous braiding of two independent braid structures by one braiding machine during one braiding operation. At the lace integration portion 130, the independent braid structures (the main body 120, first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162) are merged, woven and/or inter-braided. In aspects, the braiding operation may also start at the toe portion 106 and proceed to the heel portion 108. In such a case, the braided upper 100 is braided with base yarn 142 and the high performance yarn strands 144 of first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 are merged, woven and/or inter-braided with the main body 120 until the lace integration portion 130 is reached, at which point the remainder of the main body 120 of braided upper 100 is independently braided from first braided lace 122, second

braided lace 124, third braided lace 160 and fourth braided lace 162. In other words, the remainder of main body 120 of braided upper is braided at the same time, but independently from, first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162, such that first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 are integral with the main body 120, but project separately from the main body 120.

[0024] As discussed above with respect to FIG. 7 and FIG. 8, the eyelets 132 may be contiguous with the braid pattern of the high performance yarn 144, such that tension on the eyelets 132 is transferred to (and through) the remainder of the braid pattern of the high performance yarn. FIG. 11 shows second braided lace 124 and fourth braided lace 162 in the as-worn condition in one example of a lace pattern, crisscrossing through eyelets 132. One aspect of a different pattern for the high performance yarn 144 forming eyelets 132 is shown in FIG. 11. As shown, high performance yarn 144 may extend under main body 120 of braided upper 100 and upwardly towards throat portion 112 in a vertical section 164, exiting throat portion 112 at exit location 134, and re-entering at entry location 136 to form eyelet 132. High performance yarn 144 may then continue in a generally orthogonal orientation to vertical section 164 in a horizontal section 166 that wraps around heel portion 108. As shown in FIG. 11, a series of high performance yarns 144 may be used to form the desired number of eyelets 132 (with four eyelets being shown in FIG. 11). More, or fewer, eyelets can be so formed with high performance yarn 144 in other aspects. Additionally, the yarn used for first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 may differ from the high performance yarn 144 used to form eyelets 132 in some aspects. Note that in FIG. 11, the braid pattern of braided upper 100 is not shown to clarify the location of the high performance yarn 144 in this aspect. The braided upper 100, with high performance yarns 144 forming first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162, as well as extending through upper 100 to form eyelets 132, all allow the braided upper 100 to provide containment for a user's foot in the as worn condition when the first braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 are tightened. The high performance yarns 144 together with the braided pattern of braided upper 100 form a containment net that provides containment forces to surround the foot, providing added stability. First braided lace 122, second braided lace 124, third braided lace 160 and fourth braided lace 162 provide a containment zone to support to upper 100 in the direction of shear forces exerted during lateral movement to contain the foot during lateral movement, or "cutting."

[0025] In some aspects, the braided framework for the main body 120 of braided upper is contiguously braided with the eyelets 132 along the throat portion 112. In some aspects, the eyelets 132 are braided independently from

the main body 120. In other words, the eyelets 132 may be on a separate plane or braided layer. Each braided eyelet comprises an exit location 134 (also referred to as the first location), and an entry location 136 (also referred to as the second location). An individual braided eyelet 132, for example, is contiguously braided with the main braided layer forming the main body 120 of braided upper 100 and as part of the braided framework of the main body 120, up to the edge (either medial edge 114 or lateral edge 116) of the throat portion 112 of the braided upper 100. Once the braided framework reaches the edge of the throat 112, the eyelet 132 continues to be braided separately/independently from the throat starting at exit location 134 for a predetermined length and then is reincorporated into the main body 120 of the braided upper 100 at an entry location 136. In other words, the eyelets 132 briefly form a second braided layer at the medial edge 114 and lateral edge 116 of the unitary braided upper 100.

[0026] In one aspect, the first and second braided laces 122, 124 cooperate with the high performance yarns 144 in the braid pattern of the main body 120 to add tension across the braided upper 100 in a controlled pattern as the high performance yarns 144 of the main body are pulled by the first and second braided laces 122, 124 through the eyelets 132.

[0027] While shown at the base of the throat portion 112, the lace integration portion 130 may, in some aspects, be located at different points along the main body 120. Further, the first braided lace 122 and the second braided lace 124 could be any of a variety of lengths based on the desired lacing pattern, the type of footwear for which braided upper 100 is used, etc.

[0028] In some aspects, the space or gap 148 between the lateral edges of throat portion 112 may be closed by providing a tongue element (not shown), or a braided elastic portion covering a top portion of a wearer's foot when the braided article of footwear is worn by a wearer. The braided elastic portion may comprise, for example, elastic yarns to aid in the donning and doffing of the article of footwear, and at the same time, to aid in securing the article of footwear on the last 140 or a wearer's foot when the article of footwear is worn. In some aspects, a sole 150 may be coupled to the braided upper 100 along a joint edge 152, as shown in FIG. 8, to complete the article of footwear.

[0029] Although the braided framework shown in FIG. 7 and FIG. 8 forms a crisscross pattern profile other pattern profiles, such as, for example, linear, curvilinear, organic, geometric, logos, and the like, are possible and are within the scope of this disclosure.

[0030] From the foregoing, it will be seen that this invention is one well adapted to attain all the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

[0031] It will be understood that certain features and sub-combinations are of utility and may be employed

without reference to other features and sub-combinations. This is contemplated by and is within the scope of the claims.

[0032] Since many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Claims

1. A braided article of footwear comprising: a sole (150); a unitary braided upper (100) formed from a first yarn (142) and coupled to the sole (150) and having a toe portion (106), a heel portion (108), a midfoot portion (110) extending between the toe portion (106) and the heel portion (108), and a throat portion (112); and at least one braided lace (122, 124, 160, 162) formed from a second yarn different from the first yarn (142), the braided lace (122, 124, 160, 162) integrated with the braided upper (100), at a lace integration portion (130) of the braided upper (100), **characterized in that** the second yarn is a high-performance yarn (144).
2. The braided article of footwear of claim 1, wherein the throat portion (112) includes a base (117), and the lace integration portion (130) is located at the base (117) of the throat portion (112).
3. The braided article of footwear of claim 1, wherein at least two braided laces (122, 124, 160, 162) are integrated with the braided upper (100), at the lace integration portion (130) of the braided upper (100).
4. The braided article of footwear of claim 1, wherein the high performance yarn (144) comprises one or more of a thermoplastic coated polyester yarn, an aramid material yarn, a liquid crystal material yarn, a carbon fiber yarn, or a combination thereof.
5. The braided article of footwear of claim 1, wherein the throat portion (112) includes a medial edge (114) and a lateral edge (116), further comprising a plurality of integrally braided eyelets (132) along each of the medial edge (114) and the lateral edge (116) of the throat portion (112).
6. The braided article of footwear of claim 5, wherein the plurality of integrally braided eyelets (132) are braided with a high performance yarn (144).
7. The braided article of footwear of claim 5, wherein at least two braided laces (122, 124, 160, 162) are integrated with the braided upper (100) along the medial edge (114) of the throat portion (112) and the

at least two braided laces (122, 124, 160, 162) are integrated with the braided upper (100) along the lateral edge (116) of the throat portion (112).

8. A method of forming a braided article of footwear (900), the method comprising: braiding a unitary braided upper (100) with a first yarn (142), the braided upper (100) having at least a main body (120) and independently braiding at least one braided lace (122, 124, 160, 162) with a second yarn different from the first yarn (142) (902), and braiding the at least one braided lace (122, 124, 160, 162) while braiding the unitary upper (100); at a lace integration portion (130) of the unitary braided upper (100), integrating the at least one braided lace (122, 124, 160, 162) into the unitary braided upper (100) (904),

the method further comprising forming the main body (120) of the unitary braided upper (100) having a toe portion (106), a heel portion (108), a medial midfoot portion and a lateral midfoot portion between the toe portion (106) and the heel portion (108), a throat portion (112) between the medial midfoot portion and the lateral midfoot portion, and an underfoot portion, and comprising affixing a sole (150) to the underfoot portion of the braided upper (100),

characterized in that the second yarn is a high-performance yarn (144).

9. The method of claim 8, wherein the integrating the at least one braided lace (122, 124, 160, 162) into the unitary braided upper (100) is performed by interlacing a plurality of yarns of the at least one braided lace (122, 124, 160, 162) and a plurality of yarns of the unitary braided upper (100) in at least two different directions.
10. The method of claim 8, further comprising braiding a plurality of integrally braided eyelets (132), each eyelet in the plurality of integrally braided eyelets (132) having an exit point (134) and an entry point (136) into the main body (120).
11. The method of claim 8, wherein the throat portion (112) has a medial side (114) and a lateral side (116), the method further comprising, at the lace integration portion (130) of the unitary braided upper (100), integrating at least two braided laces (122, 124, 160, 162) into the unitary braided upper (100) along each of the medial side (114) and the lateral side (116).

Patentansprüche

1. Geflochtener Schuhartikel, umfassend: eine Sohle (150); ein einheitliches geflochtenes Schuhoberteil (100), das aus einem ersten Garn (142) gebildet und

mit der Sohle (150) verbunden ist und einen Zehenbereich (106), einen Fersenbereich (108), einen Mittelfußbereich (110), der sich zwischen dem Zehenbereich (106) und dem Fersenbereich (108) erstreckt, und einen Schaftbereich (112) aufweist, und mindestens einen geflochtenen Schnürsenkel (122, 124, 160, 162), der aus einem zweiten Garn gebildet ist, das sich von dem ersten Garn (142) unterscheidet, wobei der geflochtene Schnürsenkel (122, 124, 160, 162) mit dem geflochtenen Schuhoberteil (100) an einem Schnürsenkelintegrationsbereich (130) des geflochtenen Schuhoberteils (100) integriert ist, **dadurch gekennzeichnet, dass** das zweite Garn ein hochfestes Garn (144) ist.

2. Geflochtener Schuhartikel nach Anspruch 1, wobei der Schaftbereich (112) eine Basis (117) aufweist und der Schnürsenkelintegrationsbereich (130) an der Basis (117) des Schaftbereichs (112) angeordnet ist.
3. Geflochtener Schuhartikel nach Anspruch 1, wobei mindestens zwei geflochtene Schnürsenkel (122, 124, 160, 162) mit dem geflochtenen Schuhoberteil (100) an dem Schnürsenkelintegrationsbereich (130) des geflochtenen Schuhoberteils (100) integriert sind.
4. Geflochtener Schuhartikel nach Anspruch 1, wobei das hochfeste Garn (144) eines oder mehrere aus einem thermoplastisch beschichteten Polyester-garn, einem Aramidmaterialgarn, einem Flüssigkristallmaterialgarn, einem Kohlenstofffasergarn oder einer Kombination davon umfasst.
5. Geflochtener Schuhartikel nach Anspruch 1, wobei der Schaftbereich (112) eine mediale Kante (114) und eine laterale Kante (116) aufweist und ferner eine Mehrzahl von integral geflochtenen Ösen (132) entlang jeder der medialen Kante (114) und der lateralen Kante (116) des Schaftbereichs (112) umfasst.
6. Geflochtener Schuhartikel nach Anspruch 5, wobei die Mehrzahl der integral geflochtenen Ösen (132) mit einem hochfesten Garn (144) geflochten ist.
7. Geflochtener Schuhartikel nach Anspruch 5, wobei mindestens zwei geflochtene Schnürsenkel (122, 124, 160, 162) mit dem geflochtenen Schuhoberteil (100) entlang der medialen Kante (114) des Schaftbereichs (112) integriert sind und die mindestens zwei geflochtenen Schnürsenkel (122, 124, 160, 162) mit dem geflochtenen Schuhoberteil (100) entlang der lateralen Kante (116) des Schaftbereichs (112) integriert sind.
8. Verfahren zum Herstellen eines geflochtenen

Schuhartikels (900), wobei das Verfahren umfasst: Flechten eines einheitlichen geflochtenen Schuhoberteils (100) mit einem ersten Garn (142), wobei das geflochtene Schuhoberteil (100) mindestens einen Hauptkörper (120) aufweist, und unabhängiges Flechten mindestens eines geflochtenen Schnürsenkels (122, 124, 160, 162) mit einem zweiten Garn, das sich von dem ersten Garn (142) unterscheidet (902), und Flechten des mindestens einen geflochtenen Schnürsenkels (122, 124, 160, 162) beim Flechten des einheitlichen Schuhoberteils (100); an einem Schnürsenkelintegrationsbereich (130) des einheitlichen geflochtenen Schuhoberteils (100), Integrieren des mindestens einen geflochtenen Schnürsenkels (122, 124, 160, 162) in das einheitliche geflochtene Schuhoberteil (100) (904),

wobei das Verfahren weiter das Bilden des Hauptkörpers (120) des einheitlichen geflochtenen Schuhoberteils (100) mit einem Zehenbereich (106), einem Fersenbereich (108), einem medialen Mittelfußbereich und einem lateralen Mittelfußbereich zwischen dem Zehenbereich (106) und dem Fersenbereich (108), einem Schaftbereich (112) zwischen dem medialen Mittelfußbereich und dem lateralen Mittelfußbereich, und einem Unterfußbereich umfasst, und das Befestigen einer Sohle (150) an dem Unterfußbereich des geflochtenen Schuhoberteils (100) umfasst,

dadurch gekennzeichnet, dass das zweite Garn ein hochfestes Garn (144) ist.

9. Verfahren nach Anspruch 8, wobei das Integrieren des mindestens einen geflochtenen Schnürsenkels (122, 124, 160, 162) in das einheitliche geflochtene Schuhoberteil (100) durch Verflechten einer Mehrzahl von Garnen des mindestens einen geflochtenen Schnürsenkels (122, 124, 160, 162) und einer Mehrzahl von Garnen des einheitlichen geflochtenen Schuhoberteils (100) in mindestens zwei verschiedenen Richtungen durchgeführt wird.
10. Verfahren nach Anspruch 8, weiter umfassend das Flechten einer Mehrzahl von integral geflochtenen Ösen (132), wobei jede Öse in der Mehrzahl von integral geflochtenen Ösen (132) einen Austrittspunkt (134) und einen Eintrittspunkt (136) in den Hauptkörper (120) aufweist.
11. Verfahren nach Anspruch 8, wobei der Schaftbereich (112) eine mediale Seite (114) und eine laterale Seite (116) aufweist, wobei das Verfahren weiter umfasst, dass an dem Schnürsenkelintegrationsbereich (130) des einheitlichen geflochtenen Schuhoberteils (100) mindestens zwei geflochtene Schnürsenkel (122, 124, 160, 162) in das einheitliche geflochtene Schuhoberteil (100) entlang jeder der me-

dialen Seite (114) und der lateralen Seite (116) integriert werden.

5 Revendications

1. Article tressé à porter au pied comprenant : une semelle (150) ; une tige tressée unitaire (100) formée d'un premier fil (142) et couplée à la semelle (150) et présentant une partie de pointe (106), une partie de talon (108), une partie de mi-pied (110) s'étendant entre la partie de pointe (106) et la partie de talon (108), et une partie formant garant (112) ; et au moins un lacet tressé (122, 124, 160, 162) formé d'un deuxième fil différent du premier fil (142), le lacet tressé (122, 124, 160, 162) étant intégré à la tige tressée (100), à une partie d'intégration de lacet (130) de la tige tressée (100), **caractérisé en ce que** le deuxième fil est un fil haute performance (144).
2. Article tressé à porter au pied selon la revendication 1, dans lequel la partie formant garant (112) comprend une base (117) et la partie d'intégration de lacet (130) est située à la base (117) de la partie formant garant (112).
3. Article tressé à porter au pied selon la revendication 1, dans lequel au moins deux lacets tressés (122, 124, 160, 162) sont intégrés à la tige tressée (100), à la partie d'intégration de lacet (130) de la tige tressée (100).
4. Article tressé à porter au pied selon la revendication 1, dans lequel le fil haute performance (144) comprend un ou plusieurs d'un fil de polyester revêtu de thermoplastique, d'un fil en matière d'aramide, d'un fil en matière de cristal liquide, d'un fil en fibre de carbone ou d'une combinaison de ceux-ci.
5. Article tressé à porter au pied selon la revendication 1, dans lequel la partie formant garant (112) comprend un bord médial (114) et un bord latéral (116), comprenant en outre une pluralité d'oeillets tressés d'une seule pièce (132) le long de chacun du bord médial (114) et du bord latéral (116) de la partie formant garant (112).
6. Article tressé à porter au pied selon la revendication 5, dans lequel la pluralité d'oeillets tressés d'une seule pièce (132) sont tressés avec un fil haute performance (144).
7. Article tressé à porter au pied selon la revendication 5, dans lequel au moins deux lacets tressés (122, 124, 160, 162) sont intégrés à la tige tressée (100), le long du bord médial (114) de la partie formant garant (112) et les au moins deux lacets tressés

(122, 124, 160, 162) sont intégrés à la tige tressée (100), le long du bord latéral (116) de la partie formant garant (112).

8. Procédé de formation d'un article tressé à porter au pied (900), le procédé comprenant : le tressage d'une tige tressée unitaire (100) avec un premier fil (142), la tige tressée (100) présentant au moins un corps principal (120) et le tressage indépendant du au moins un lacet tressé (122, 124, 160, 162) avec un deuxième fil différent du premier fil (142) (902) et le tressage du au moins un lacet tressé (122, 124, 160, 162) tout en tressant la tige unitaire (100) ; à une partie d'intégration de lacet (130) de la tige tressée unitaire (100), l'intégration du au moins un lacet tressé (122, 124, 160, 162) dans la tige tressée unitaire (100) (904),

le procédé comprenant en outre la formation du corps principal (120) de la tige tressée unitaire (100) présentant une partie de pointe (106), une partie de talon (108), une partie médiale de mi-pied et une partie latérale de mi-pied entre la partie de pointe (106) et la partie de talon (108), une partie formant garant (112) entre la partie médiale de mi-pied et la partie latérale de mi-pied, et une partie de dessous de pied, et comprenant la reliure d'une semelle (150) à la partie de dessous de pied de la tige tressée (100), **caractérisé en ce que** le deuxième fil est un fil haute performance (144).

9. Procédé selon la revendication 8, dans lequel l'intégration du au moins un lacet tressé (122, 124, 160, 162) dans la tige tressée unitaire (100) est réalisée par l'entrelacement d'une pluralité de fils du au moins un lacet tressé (122, 124, 160, 162) et d'une pluralité de fils de la tige tressée unitaire (100) dans au moins deux directions différentes.

10. Procédé selon la revendication 8, comprenant en outre le tressage d'une pluralité d'oeillets tressés d'une seule pièce (132), chaque oeillet parmi la pluralité d'oeillets tressés d'une seule pièce (132) ayant un point de sortie (134) et un point d'entrée (136) dans le corps principal (120).

11. Procédé selon la revendication 8, dans lequel la partie formant garant (112) présente un côté médial (114) et un côté latéral (116), le procédé comprenant en outre, à la partie d'intégration de lacet (130) de la tige tressée unitaire (100), l'intégration d'au moins deux lacets tressés (122, 124, 160, 162) dans la tige tressée unitaire (100), le long de chacun du côté médial (114) et du côté latéral (116).

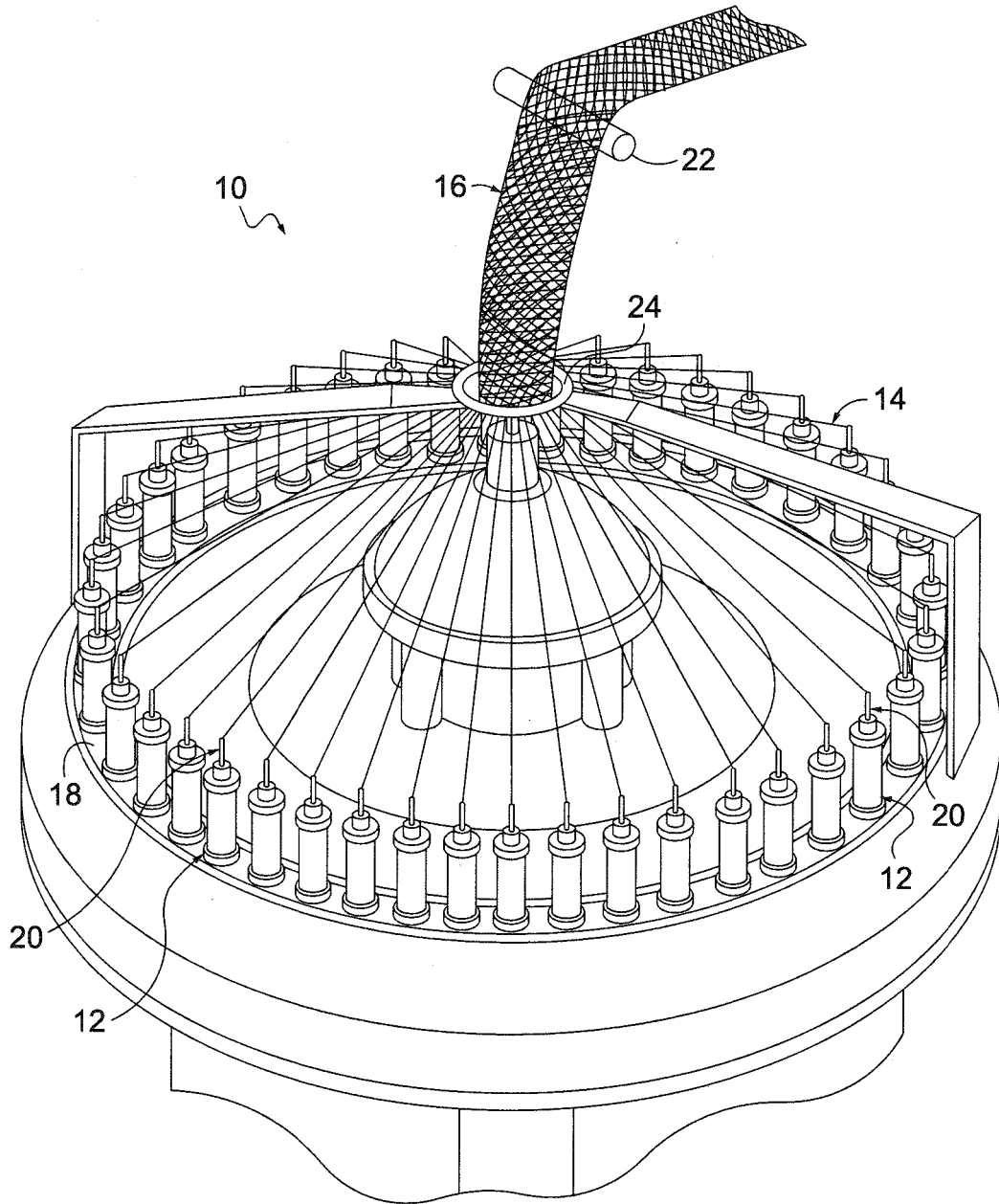


FIG. 1

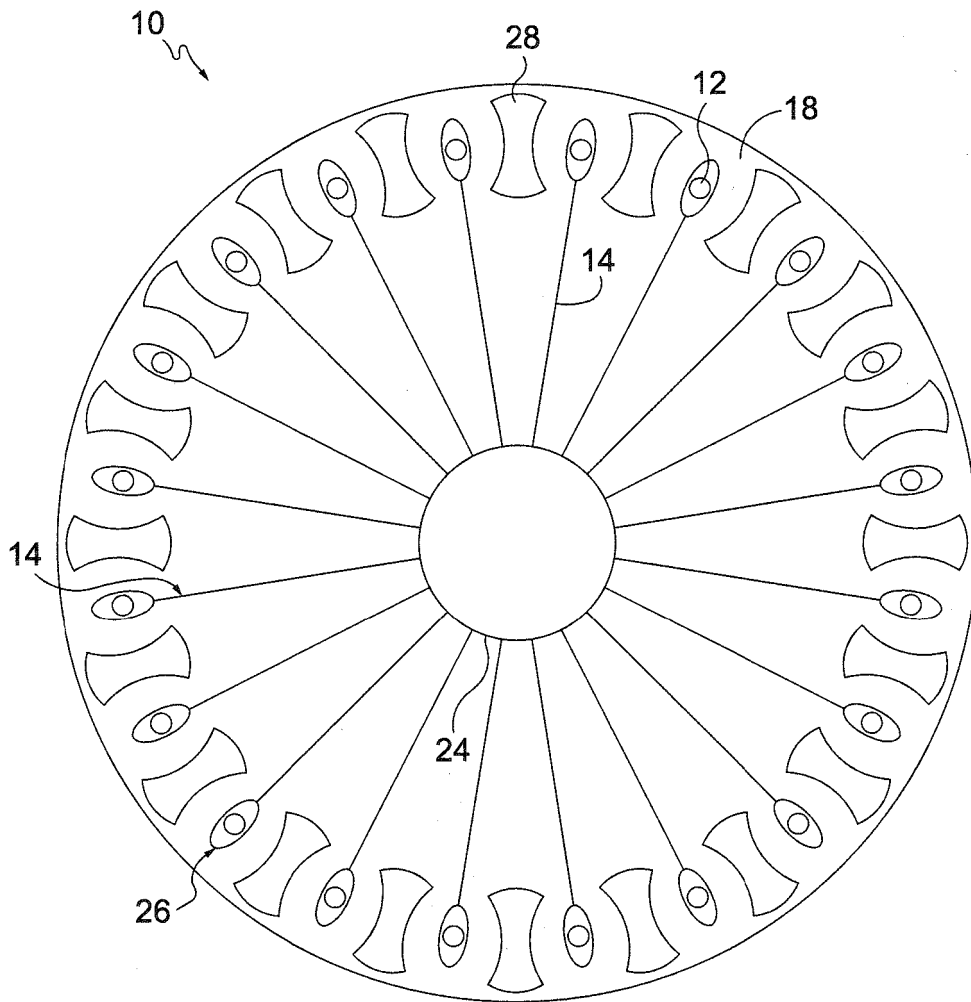


FIG. 2

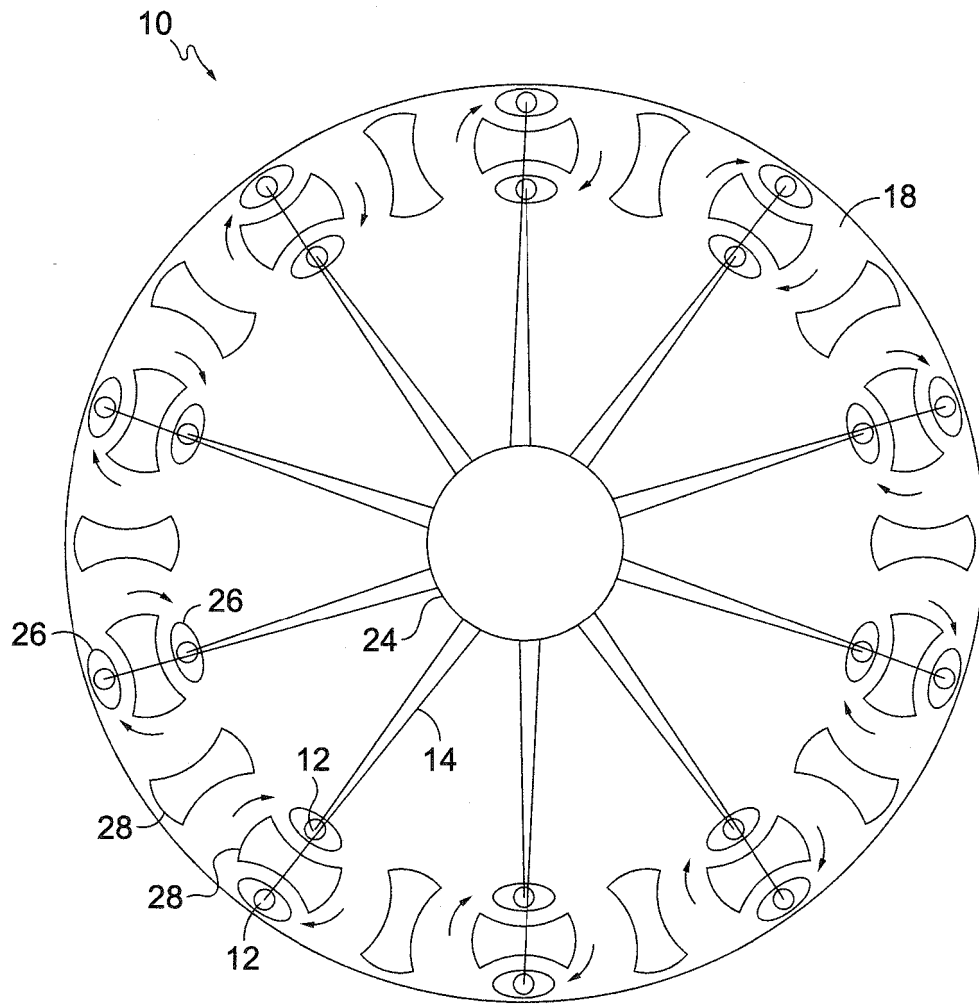


FIG. 3

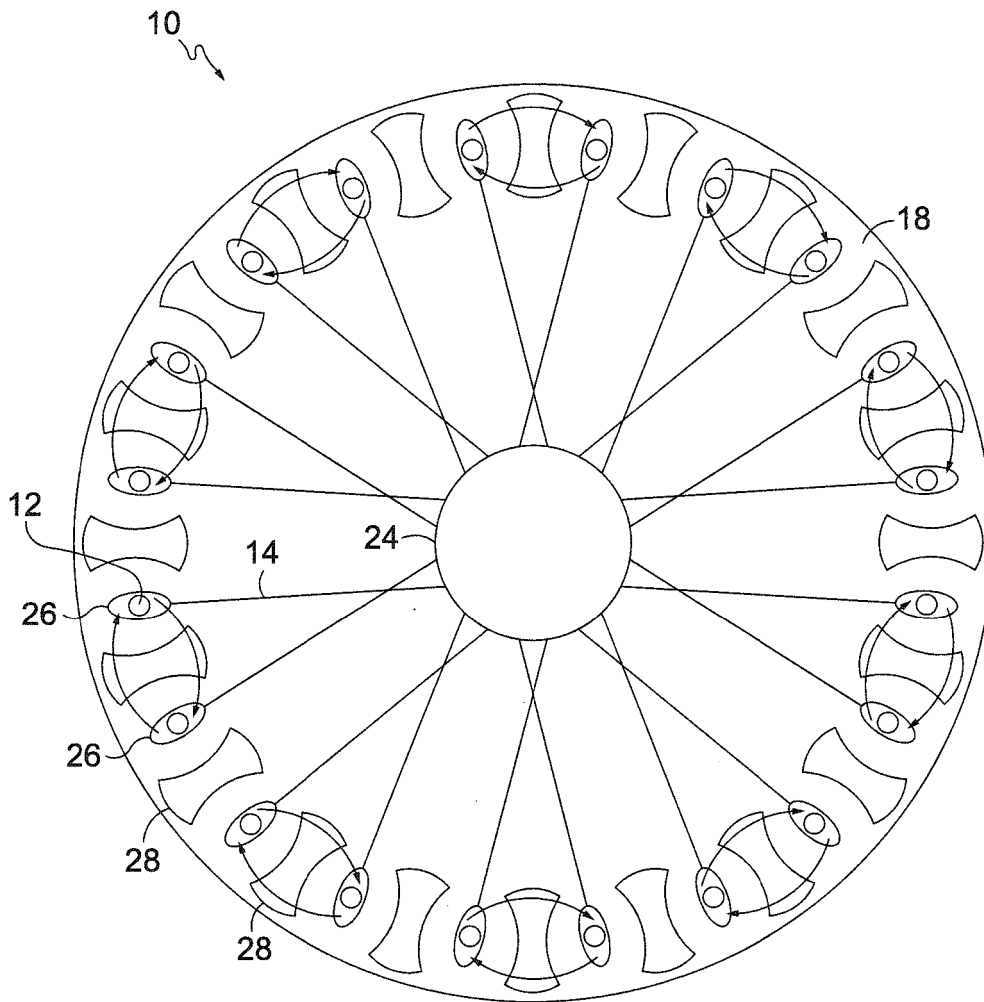


FIG. 4

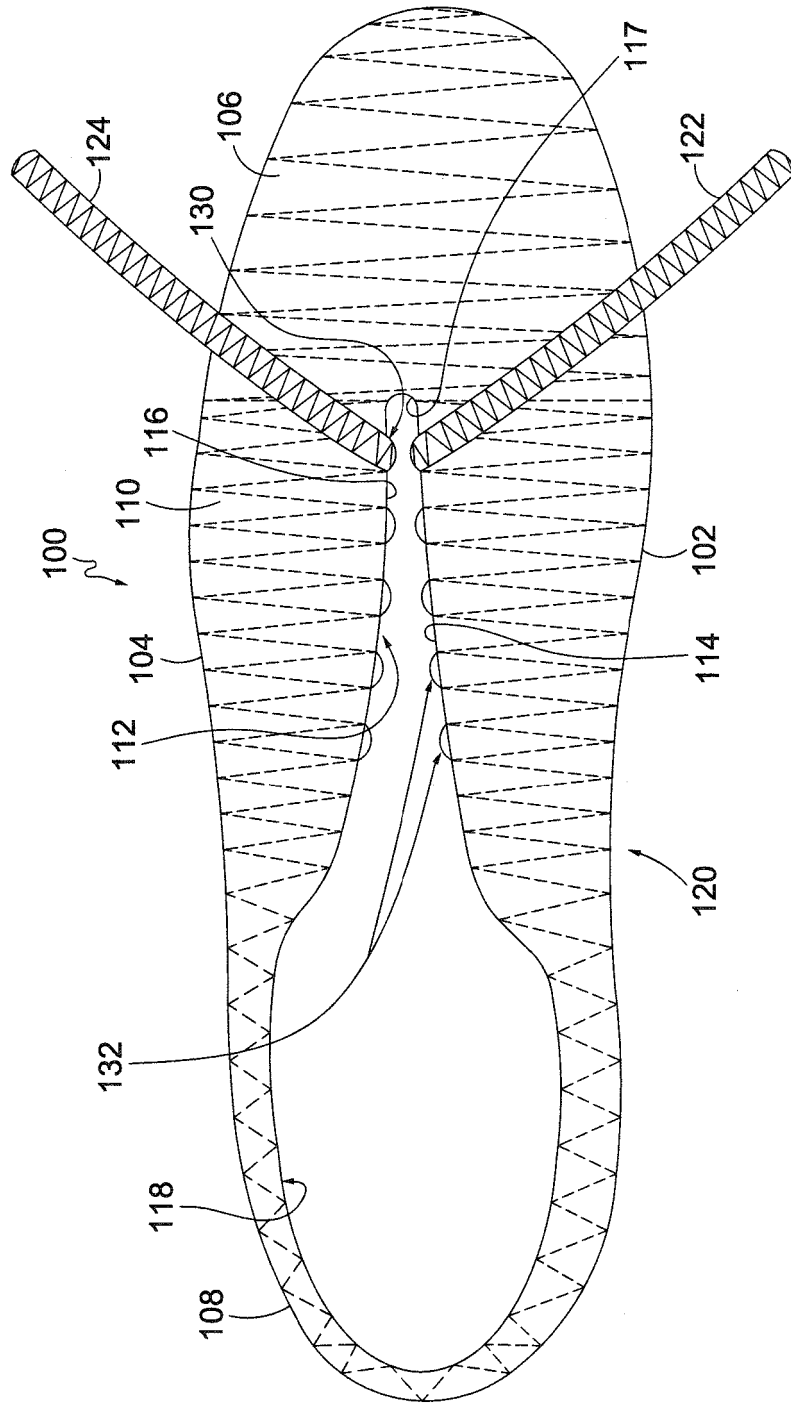


FIG. 5.

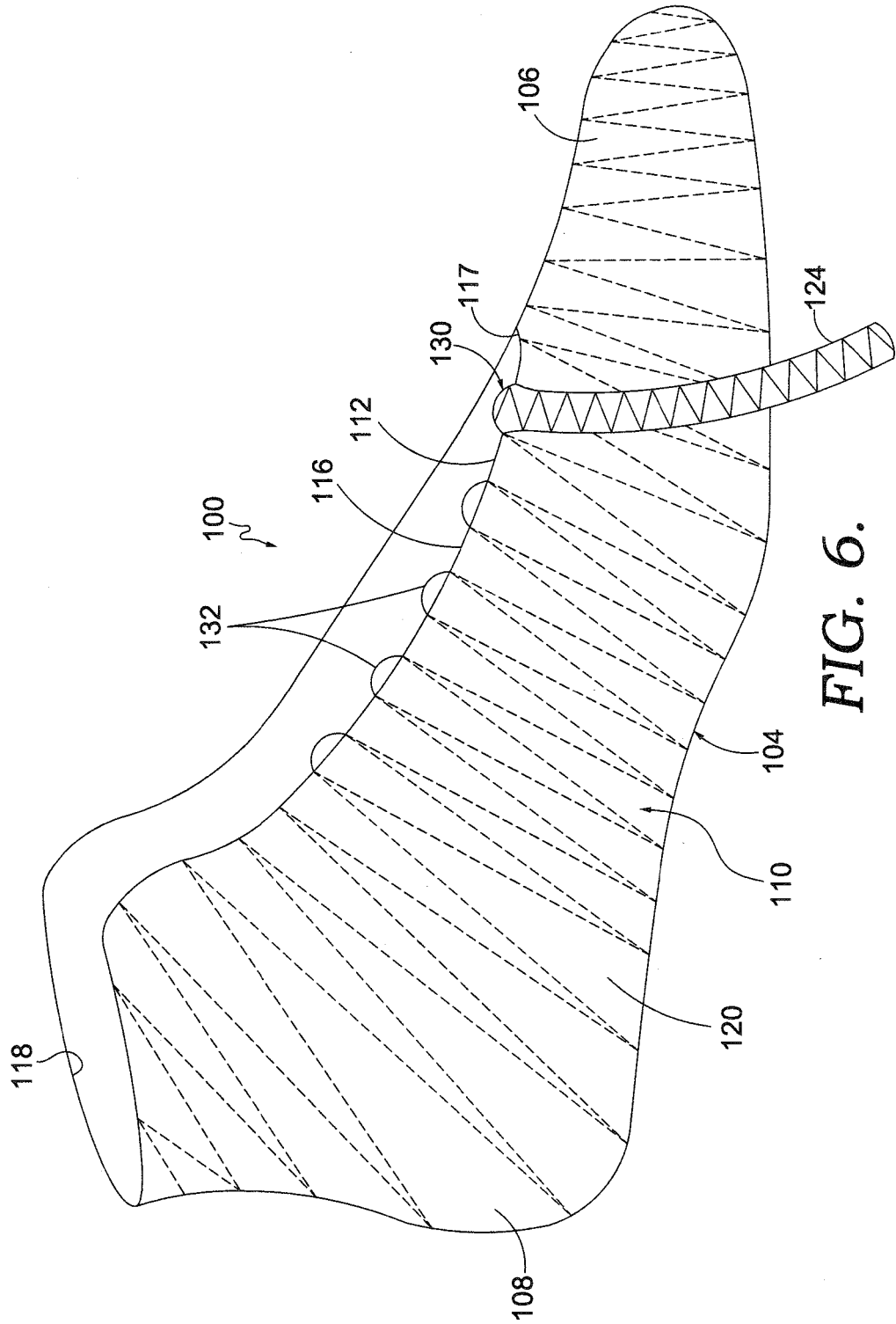


FIG. 6.

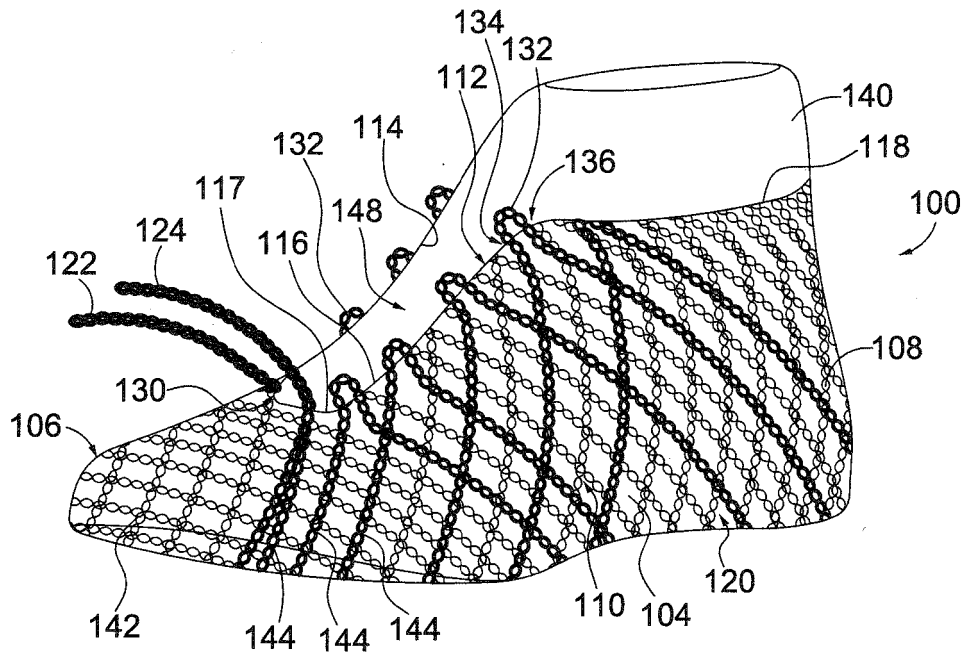


FIG. 7

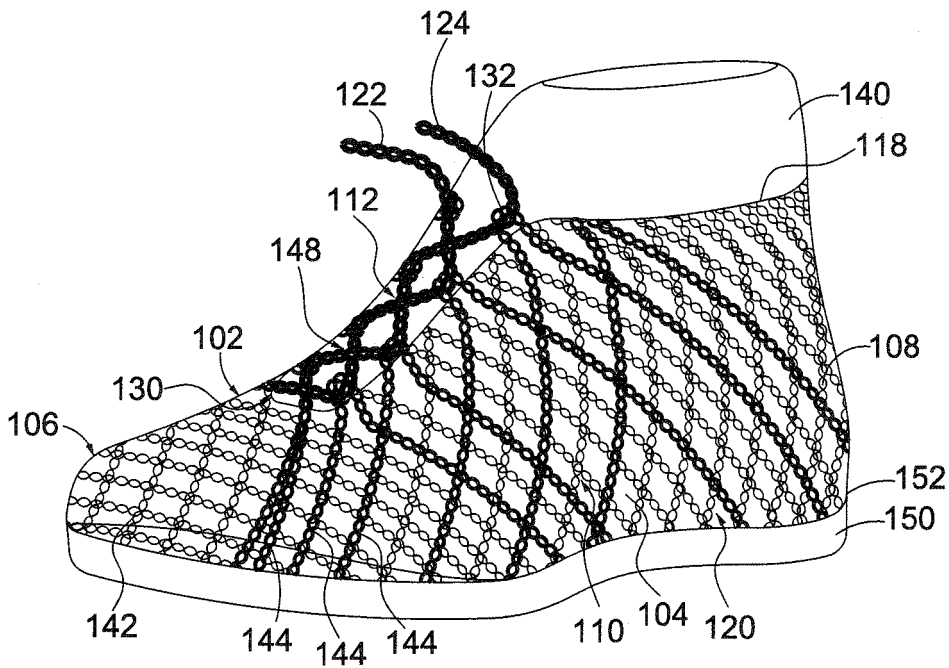


FIG. 8

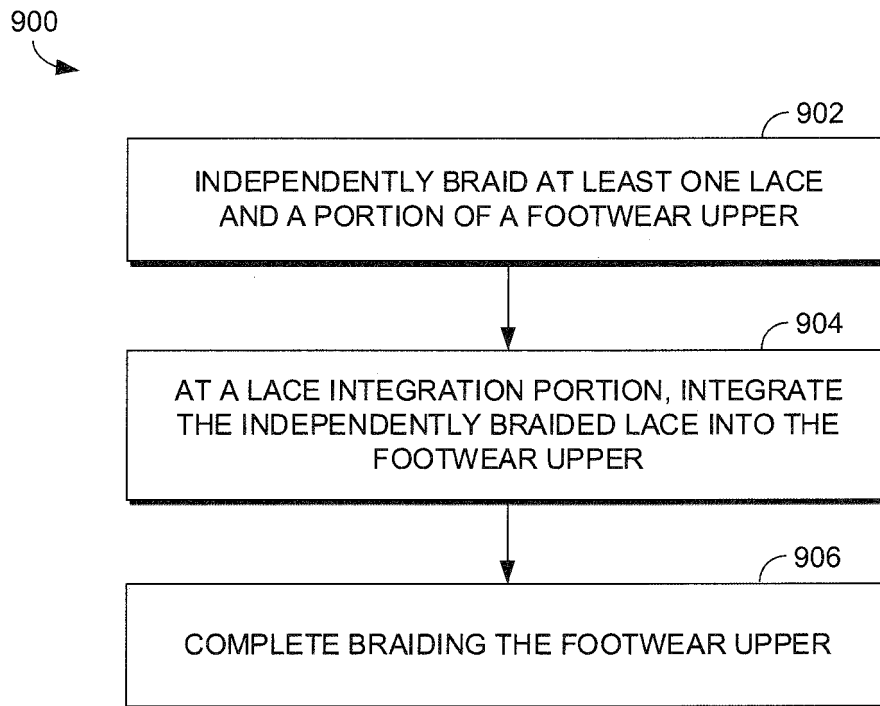


FIG. 9.

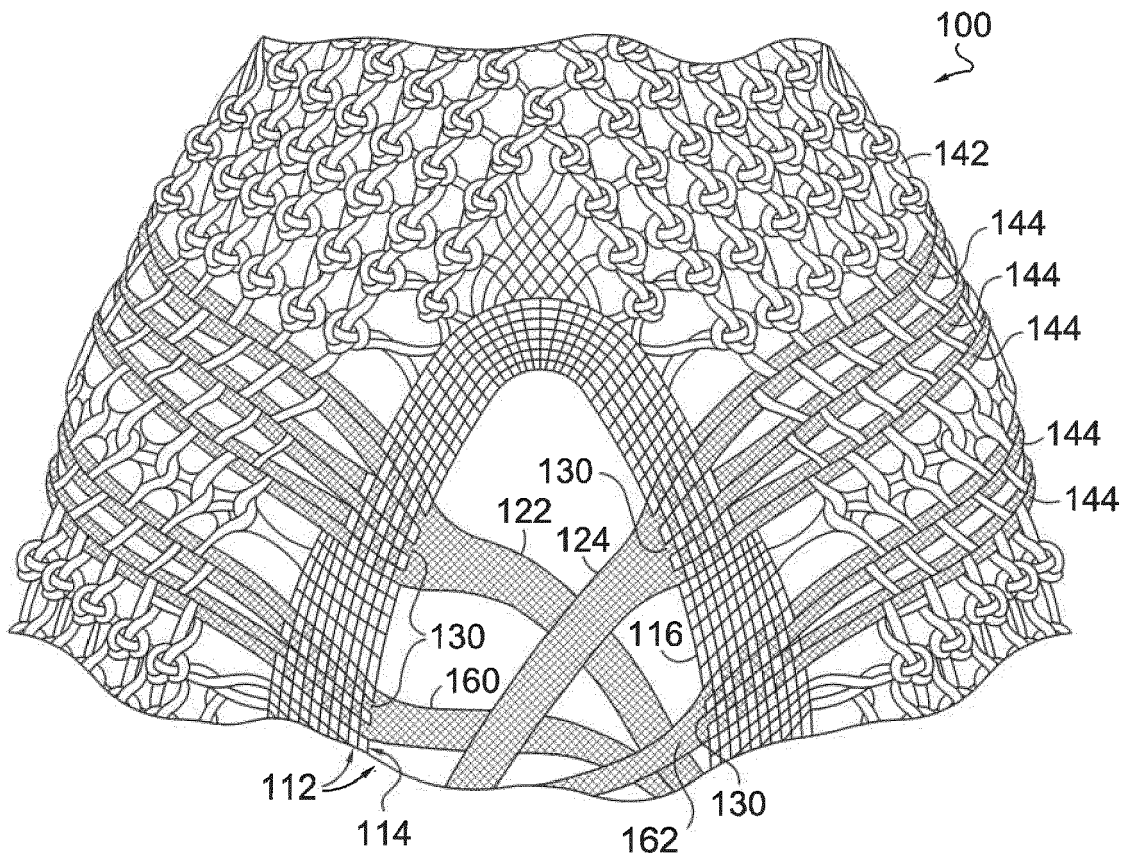


FIG. 10

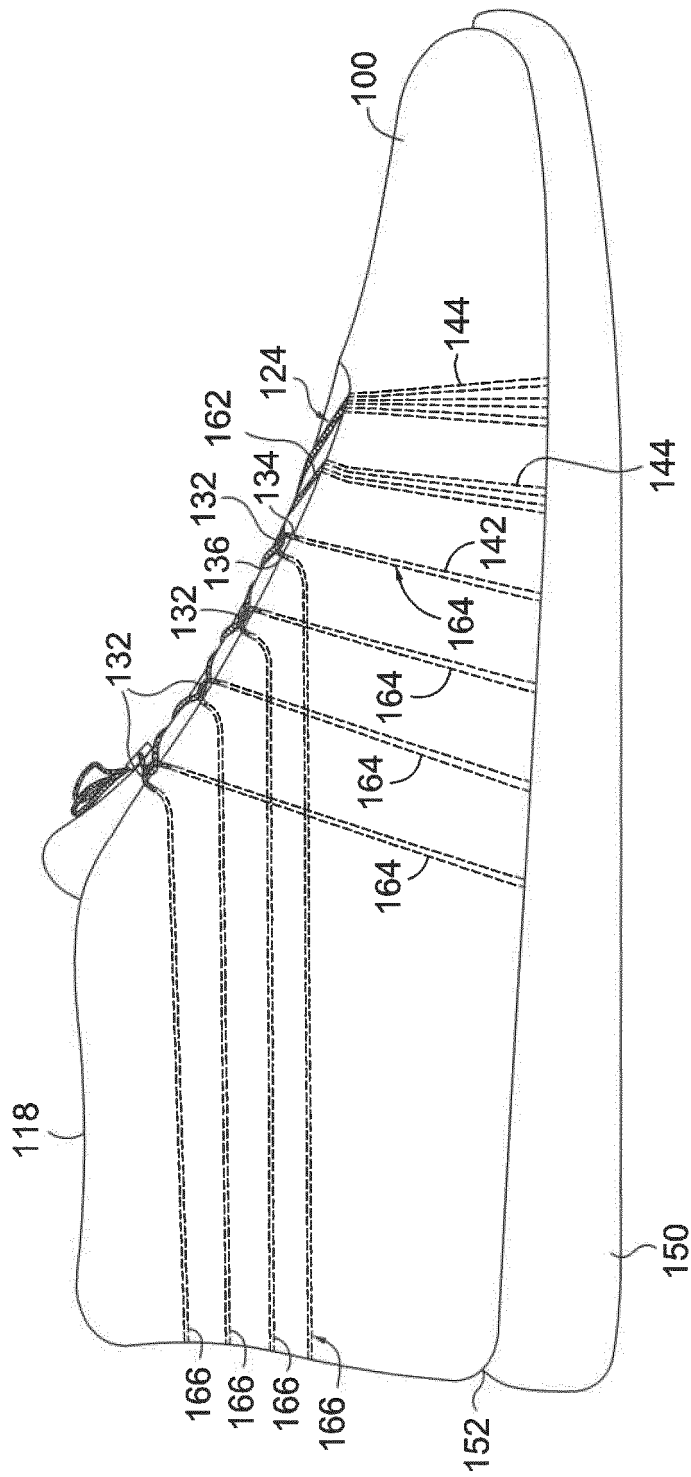


FIG. 11.

REFERENCES CITED IN THE DESCRIPTION

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