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(54) **BRAIDED UPPER FOR FOOTWEAR WITH FINISHED HEEL AXIS**

GEFLOCHTENES OBERMATERIAL FÜR SCHUHWERK MIT ENDBEARBEITETER FERSENACHSE
TIGE TRESSÉE POUR CHAUSSURE À AXE DE TALON FINI

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a heel-axis finishing system for forming a braided footwear upper, an upper for an article of footwear comprising a braided upper and a method for forming a heel axis on a braided footwear upper.

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.

[0003] US 2016/345676 A1 describes a braiding machine and method of forming an upper that includes braiding over a forming mandrel located adjacent to a ring. The braiding machine being capable of forming intricate braided structures.

[0004] US 2014/377488 A1 describes a plexus of filaments which is composed of groups of filaments, whose filament members are linked together, in a repetitious pattern, and whose filaments may be interlaced or linked to bisecting groups of filaments, creating a patterned plexus whose filament members generally follow spiraling paths, while linking with neighboring filaments, creating a group, or interlaced groups, of tension distributive filaments within a plexus of filaments; and a method of producing said filament structures for a variety of uses including composite structures with tension displacement properties, and sporting goods requiring conformal load distribution with minimal weight; such as, running shoes.

SUMMARY OF THE INVENTION

[0005] The present invention is defined by a heel-axis finishing system for forming a braided footwear upper according to the appended claim 1, an upper for an article of footwear comprising a braided upper according to the appended claim 5 and a method for forming a heel axis on a braided footwear upper according to the appended claim 10. Further embodiments are defined by the appended dependent claims.

BRIEF DESCRIPTION OF THE DRAWING

[0006] Aspects herein are described in detail below with reference to the attached drawing figures, wherein:

FIG. 1 depicts a schematic view of an exemplary braiding machine;

FIG. 2 depicts a schematic top view of an exemplary braiding machine, illustrating the carriages and rotor metals;

FIG. 3 depicts a view similar to FIG. 2, but with the rotor metals moving the carriages;

FIG. 4 depicts a view similar to FIG. 3, but showing the completion of the exemplary movement of FIG. 3;

FIG. 5 depicts an article of footwear, in accordance with aspects herein;

FIG. 6 depicts a perspective view of an exemplary braiding machine having a lead bobbin or spool in a first position, in accordance with aspects herein;

FIG. 7 depicts a perspective view of an exemplary braiding machine having a lead spool in a second position, in accordance with aspects herein;

FIG. 8 depicts a perspective view of an exemplary braided upper, shown with an unfinished heel area, in accordance with aspects herein;

FIG. 9 depicts a perspective view of the exemplary braided upper of FIG. 8, shown in a finishing jig, in accordance with aspects herein;

FIG. 9A depicts an enlarged view of a portion of FIG. 9;

FIG. 9B depicts an enlarged portion of the tail of the braided upper in the heel area;

FIG. 10 depicts a perspective view of the exemplary braided upper of FIG. 8, shown with a finished heel area, in accordance with aspects herein;

FIG. 10A depicts an enlarged view of a portion of FIG. 10;

FIG. 10B depicts a side view of the portion of FIG. 10A; and

FIG. 11 depicts a flow chart of an exemplary method of forming an article of footwear having a braided upper with a finished heel axis, in accordance with aspects herein.

DETAILED DESCRIPTION OF THE INVENTION

[0007] The present invention provides a heel-axis finishing system for forming a braided footwear upper having at least a medial side and a lateral side, and a toe end and a heel end. The braided footwear is made from a number of yarns that are braided together. The heel axis finishing system includes an alignment mechanism that orients the medial side of the upper and the lateral side of the braided upper at the heel end. The lateral side and the medial side come together at the heel and form a heel axis. A joining mechanism is associated with the alignment mechanism. The joining mechanism couples at least one braided yarn from the medial side to at least one braided yarn from the lateral side along the heel axis. In some aspects, the alignment mechanism includes a jig that aligns the medial side and the lateral side at the heel axis. According to the invention the joining mechanism is a sonic welding apparatus that severs and fuses the yarns along the heel axis to present a finished seam. By fusing the yarns as they are severed, when they are

properly aligned, the heel area transitions from the medial side to the lateral side with an appearance of seamless-ness.

[0008] According to the invention, an article of footwear is provided that has a unitary, braided upper. The upper has a medial side, a lateral side, a toe end, and a heel end opposite the toe end. The braided upper has a joined heel axis along a joinder line where the lateral side and the medial side meet at the heel end. The joinder line forms a heel axis that, in one aspect, has at least one braided yarn from the medial side coupled to at least one braided yarn from the lateral side. In some aspects, the heel axis presents a transition from the medial side to the lateral side.

[0009] 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 structures (one, two, or three-dimensional textiles) with constant or variable cross-sections, and of closed or open appearance.

[0010] As used herein, the yarns used for braiding may be formed of different materials having different properties. The properties that a particular yarn 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 stretch and recovery, with stretch polyester also providing recyclability. Rayon provides high luster and moisture absorption. Wool also provides high moisture absorption, in addition to 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.

[0011] As stated above, braided structures can be formed as tubular braids on a braiding machine, such as a radial, axial, or lace braiding machine. 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 embodiments, 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 structure 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 structure 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 braid structure 16. At or near ring 24, the distance between yarns 14 from different spools 12 diminishes. As the distance between yarns 14 is reduced, the yarns 14 intermesh or braid with one another in a tighter fashion and are pulled linearly by roller 22.

[0012] 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. 2 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 interweave to create a desired braid pattern. The movement of spools 12 may be pre-programmed to form particular shapes, designs, and 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.

[0013] 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 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 structure as well as the size of the braided component may be altered.

[0014] Turning now to FIG. 5, an exemplary article of footwear 100 is depicted as having a first end 102 and a second end 104. In accordance with aspects herein, the first end 102 may correspond to a portion of the article of footwear 100 adapted to cover the toes of a wearer, while the second end 104 may correspond to a portion of the article of footwear 100 adapted to cover a heel or ankle end of a wearer. In accordance with the aspects discussed throughout this disclosure, the article of footwear 100 is generally braided from a first end 102 to (towards) a second end 104. In other words, the article of footwear 100 is generally braided from a toe end to an ankle end. However, it is envisioned that the first end 102 of the article of footwear 100 and the second end 104 of the article of footwear 100 may be reversed, such that the article of footwear is braided from an ankle end to a toe end of the article of footwear.

[0015] With continued reference to FIG. 5, the first end 102 of the article of footwear 100 generally corresponds to a first plane of braiding 106, while the second end 104 of the article of footwear generally corresponds to a second plane of braiding 108. As depicted in FIG. 5, the first plane of braiding 106 is generally placed in an X-Y orientation, while the second plane of braiding 108 is generally placed in an X-Z orientation.

[0016] However, other orientations of the first plane of braiding 106 and second plane of braiding 108 are considered to be within the scope of this disclosure. For example, the first plane of braiding 106 may be placed in an X-Z orientation, while the second plane of braiding 108 may be placed in a Y-Z orientation or an X-Y orientation. Regardless of the exact planes of braiding selected, the important aspect of the planes of braiding is that the first plane of braiding 106 and the second plane of braiding 108 are perpendicular to each other, such that a "Mobius twist" is performed to rotate from the first plane of braiding 106 to the second plane of braiding 108. However, aspects in which the first plane of braiding 106 and the second plane of braiding 108 are not perpendicular are considered to be within the scope of this disclosure. For example, the first plane of braiding 106 and the second plane of braiding 108 may be offset 45 degrees from one another, or may be offset any other amount between 0 and 90 degrees from each other. Generally, the article of footwear will have the greatest resistance to stretch in a direction that aligns to the plane of braiding used to manufacture that portion of the article of footwear. In other words, the amount of "Mobius twist" performed changes the functional characteristics of the article of footwear created by the methods described herein.

[0017] In accordance with aspects herein, the "Mobius twist" is generally performed at a transition point 110 of the article of footwear, which generally refers to a point of the article of footwear in which the first plane of braiding 106 and second plane of braiding 108 intersect. In some

aspects, the first plane of braiding 106 may transition to the second plane of braiding 108 instantaneously at the transition point 110. The transition point 110 may be located between 5.08 and 15.24 cm (2 and 6 inches) from the first end 102 of the article of footwear. However, in some aspects, the first plane of braiding 106 may gradually morph into the second plane of braiding 108. In this aspect, the transition point 110 may be more accurately referred to as a transition section 112, wherein the transition section 112 has a beginning transition point 114a and an ending transition point 114b. Similar to the transition point 110, the beginning transition point 114a may be located between 5.08 and 15.24 cm (2 and 6 inches) from the first end 102 of the article of footwear.

[0018] Thus far in this disclosure, the discussion with respect to FIG. 5 has focused on manufacturing the exemplary article of footwear 100 that comprises a first section braided with a plurality of yarns in a first direction, which corresponds to the first plane of braiding 106. Next, the exemplary article of footwear comprises a second section braided with a plurality of yarns in a second direction, which corresponds to the second plane of braiding 108. Further, the exemplary article of footwear 100 further comprises the transition section 112 positioned between the first section end 102 and the second end 104, wherein the transition section 112 further comprises the beginning transition point 114a proximate the first section and the ending transition point 114b proximate the second section, wherein the plurality of yarns of the transition section 112 linearly transitions from the first direction, or the first plane of braiding 106, to the second direction, or second plane of braiding 108. In accordance with aspects herein, transitioning linearly refers to the angle of the yarns rotating smoothly between perpendicular directions, the first direction and the second direction, over the length of the transition section 112. Alternatively, the plurality of yarns of the transition section 112 may transition in a non-linear manner, in which the angle of the yarns rotate quickly in one part of the transition section 112, and rotate less quickly in another part of the transition section 112.

[0019] Turning now to FIG. 6, an automated braiding machine 200, similar to those shown in FIGS. 1-4, is depicted. In FIG. 6, the article of footwear 100 is shown as being braided beginning at first end 102. The automated braiding machine has a braid ring assembly 202 and a plurality of spools 204 associated with the braid ring assembly 202. The plurality of spools 204 may be integrally formed into the braid ring assembly 202, or provided separately and then coupled to the braid ring assembly 202. In accordance with aspects herein, at least some of the plurality of spools 204 may contain strands of braiding material, such as yarn, although it is generally desirable for the entirety of the plurality of spools 204 to contain strands of braiding material. One of the plurality of spools 204 has been shaded, and is referred to as the "lead spool" throughout this disclosure, for the purposes of tracking the positioning of the plurality of spools 204 on

the braid ring assembly 200. As used throughout this disclosure, the braid ring assembly 202 may have a first set of positions 210 (FIG. 6) and a second set of positions 212 (FIG. 7), where the second set of positions 212 is obtained by rotating the spools on the braid ring assembly 202 from the first set of positions 210. The amount of rotation of spools on the braid ring assembly 202 is completely variable based on the desired properties of the article of footwear. For example, the second set of positions 212 may be rotated 45 degrees from the first set of positions 210, or the second set of positions 212 may be rotated 90 degrees from the first set of positions 210. Alternatively, other intermediate amounts of rotation are considered to be within the scope of this disclosure.

[0020] For example, the lead spool can be tracked from the first set of positions 210 as shown in FIG. 6, to a second set of positions 212 as shown FIG. 7, which depicts that the braid ring assembly has rotated approximately 90 degrees. As discussed previously, the article of footwear 100 is braided, beginning with a first end 102, with the plurality of spools 204 on the braid ring assembly 202 in the first set of positions 210. In accordance with the "Mobius twist" described herein, braiding the article of footwear 100 with the braid ring assembly 202 in the first set of positions 210 results in a first end 102 of the article of footwear 100 being braided in a first braiding plane 106, and wherein braiding the article of footwear 100 with the braid ring assembly 202 in the second set of positions 212 results in the second end 104 of the article of footwear being braided in a second braiding plane 108.

[0021] Turning now to FIG. 7, the automated braiding machine 200 is depicted as manufacturing an article of footwear 100, after the "Mobius twist" has been performed. In other words, the article of footwear depicted in FIG. 7 has been fully braided in the first plane of braiding 106, has passed the transition point 110, and is now braiding in the second plane of braiding 108, meaning that the positioning of the spools on the braid ring assembly 202 are in the second set of positions 212. Accordingly, FIG. 7 depicts the automated braiding process after reaching and completely passing through the transition point 110 of the article of footwear 100, or in other words, after the "Mobius twist" has been performed.

[0022] An exemplary article of footwear 100 is shown in FIG. 8, after removal from the braiding machine. The article of footwear 100 is shown disposed on a last 300 in an expanded condition that conforms to the shape of the last 300. As shown, the article of footwear 100 has the first end 102 in the toe area and the second end 104 in the heel area. The article of footwear 100 includes a lateral side 302 and an opposite medial side 304 extending from the first end 102 to the second end 104. As shown in FIG. 8, the article of footwear 100, in an unfinished state, also includes a tail 306 adjacent the second end 104. The article of footwear 100 can be braided, for example, as described above with respect to FIGS. 5-7. For simplicity, the braiding is depicted in FIG. 8 somewhat

schematically (such that the first braid plane 106 is not depicted). However, the tail 306, in one aspect, is braided in a vertical plane as described with respect to second braid plane 108 of FIG. 5. The tail 306 is formed by braiding together the yarns forming the lateral side 302 and the medial side 304. The intersection of the lateral side 302 and the medial side 306 forms a heel axis 308. The tail 306 is removed in a finishing process, described more fully below.

[0023] The article of footwear 100 of FIG. 8 is shown placed in a jig 310 in FIG. 9. According to the invention, jig 310 has a base 312 that supports, and is coupled to, a first back plate 314 and a second back plate 316. According to the invention, first and second back plates 314, 316 are coupled to base plate 312 such that they are spaced from one another, forming a slot 318. Moreover, in one aspect, first and second back plates 314, 316 are coupled to base plate 312 such that they are allowed to move inward and outward to close or open slot 318, within a groove 317, as indicated by arrows 320. Although shown with both first back plate 314 and second back plate 316 as moveable with respect to base 312, it should be understood that only one of first back plate 314 or second back plate 316 could be moveable. Moreover, while shown as vertical, planar plates, first and second back plates 314, 316 could also be contoured to match a contour along the heel axis 308. First back plate 314, in one aspect, has a sonic welding horn 322 that extends into the slot 318. Second back plate 316 has a corresponding sonic welding anvil 324 that extends into the slot in a location to mate with the sonic welding horn 322. The sonic welding horn 322 and sonic welding anvil 324 are shown schematically, and are coupled to a sonic welding apparatus (not shown). The jig 310 serves to support the article of footwear 100 of FIG. 8 such that the tail 306 is aligned with, and extends through, the slot 318. The jig 310 operates as an alignment mechanism to consistently position the tail 306 with respect to the base 312 and the first and second back plates 314, 316.

[0024] FIG. 9B shows the tail 306 with the lateral side 302 crossing over, and braided with, the medial side 304. The seam area 308 where the lateral side 302 is braided together with the medial side 302 could extend further, as shown in FIG. 9A. As shown in the enlarged area of FIG. 9A, in one aspect, the tail 306 is placed through slot 318 to extend between sonic welding horn 322 and sonic welding anvil 324. In one aspect, tension may be applied to tail 306, as indicated by arrow 326. First back plate 314 and second back plate 316 can then be moved toward one another, until sonic welding horn 322 and sonic welding anvil 324 engage the tail 306. In one aspect, first back plate 314 and second back plate 316 remain stationary, while the sonic welding horn 322 and sonic welding anvil 324 move toward and away from one another within their respective back plates 314, 316. The sonic welding horn 322 and the sonic welding anvil 324 are thus able to selectively engage the braided yarns of tail 306. In this condition, the sonic welding apparatus can

be activated to join the yarns of the braided article of footwear 100 along heel axis 308. In one aspect, the sonic welding horn 322 and sonic welding anvil 324 operate to join and sever the yarns of the braided article of footwear 100 along the braid axis 308.

[0025] FIG. 10 illustrates the article of footwear 100 after the yarns from the lateral side 302 are joined with the yarns from the medial side 304 along the heel axis 308. As shown in the enlargement in FIG. 10A, after the yarns from the lateral side 302 are joined with the yarns from the medial side 304, and the remainder of the tail 306 is severed from the article of footwear 100, the heel axis 308 presents a seam 330 that allows the lateral side 302 and the medial side 304 to join while appearing to be a continuous braided structure. FIG. 10B shows a fused zone 332 that extends along seam 330. The fused zone 332 represents the joining of the yarns on the lateral side 302 fused to the yarns on the medial side 304 to prevent the braid from unraveling. So, the braid pattern of the lateral side 302, in one aspect, mates with the braid pattern of the medial side 304. In other words, the braided yarns from the lateral side 302 appear to be continuous with the braided yarns from the medial side 304. With this configuration, the heel axis is a strong seam that does not present a raised seam that needs further processing, such as requiring a taped seam. Further, by joining yarns from the lateral side 302 to the medial side 304, a unitary upper is formed that allows forces from the lateral side 302 to be transmitted to the medial side 304, and vice versa. Other methods of joining and severing the yarns from the lateral side 302 and the medial side 304, beyond sonic welding, could also be used.

[0026] A method 400 for manufacturing a braided upper for an article of footwear is shown in FIG. 11. The method includes positioning a braided upper having a heel axis into a finishing jig, as shown at block 402. Once in the jig, the method continues at block 404 by positioning the heel axis adjacent an alignment mechanism associated with the jig. In this position, the method continues at block 406 by activating a joining mechanism associated with the jig to join the yarns associated with a medial side of the upper to the yarns associated with a lateral side of the upper along the heel axis. As shown at block 408, the method continues by severing any yarns exterior of the joint formed by the joined yarns along the heel axis.

[0027] 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.

[0028] 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.

[0029] Since many possible embodiments may be made of the invention without departing from the scope

of the claims 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 heel-axis (308) finishing system for forming a braided footwear upper comprising:

an alignment mechanism (310) configured to orient a medial side (304) of a braided upper with a lateral side (302) of the braided upper at a heel end (104) of the braided upper; and a joining mechanism associated with the alignment mechanism, said joining mechanism configured to couple a first braided yarn of the medial side (304) to a first braided yarn of the lateral side (302) along a heel axis (308), wherein the alignment mechanism comprises a base (312) and a pair of back plates (314), (316) coupled to the base in spaced apart relation to define a slot (318) and wherein the joining mechanism is a sonic welder.

2. The heel-axis (308) finishing system of claim 1, wherein at least one of the pair of back plates (314), (316) is slidably coupled to the base (312).

3. The heel-axis (308) finishing system of claim 2, wherein both of the back plates (314), (316) are slidably coupled to the base (312).

4. The heel-axis (308) finishing system of claim 3, wherein the sonic welder comprises a sonic welding anvil (324) housed within one of the pair of back plates (314), (316), and a sonic welding horn (322) housed within the other of the pair of back plates, the sonic anvil and sonic horn extending into the defined slot.

5. An upper for an article of footwear comprising: a braided upper comprising

a unitary, braided structure (16) having a lateral side (302) opposite a medial side (304) and a heel end opposite a toe end, wherein the braided upper comprises a joined heel axis (308) between the lateral side (302) and the medial side (304) proximate the heel end of the braided upper, said joined heel axis (308) comprising at least a first braided yarn of the lateral side (302) aligned and coupled, by a joining mechanism that is a sonic welder and associated with the alignment mechanism that comprises a base (312) and a

pair of back plates (314), (316) coupled to the base in spaced apart relation to define a slot (318), to at least a first braided yarn of the medial side (304) at the joined heel axis (308).

6. The upper for an article of footwear of claim 5, wherein the joined heel axis (308) presents a vertical transition seam from the lateral side (302) to the medial side (304).

7. The upper for an article of footwear of claim 6, wherein the braided structure of the medial side (304) and the braided structure of the lateral side (302) are configured to mate with one another at the heel axis (308).

8. The upper for an article of footwear of claim 7, wherein the joined heel axis (308) comprises yarns from the medial side (304) sonically welded to yarns from the lateral side (302).

9. The upper for an article of footwear of claim 5, wherein the toe end presents a seam oriented orthogonally to the joined heel axis (308).

10. A method for forming a heel axis (308) on a braided footwear upper, comprising:

placing a braided upper on an alignment mechanism configured to orient a medial side (304) of a braided upper with a lateral side (302) of the braided upper at a heel end of the braided upper;
and joining at least a first braided yarn of the medial side (304) to a first braided yarn of the lateral side (302) along a heel axis (308), wherein the alignment mechanism comprises a base (312) and a pair of back plates (314), (316) coupled to the base in spaced apart relation to define a slot (318) and wherein the joining step comprises activating a sonic welder along the heel axis (308).

11. The method of forming a heel axis on a braided footwear upper of claim 10, further comprising removing at least a portion of the braided upper along the heel axis (308).

12. The method of forming a heel axis on a braided footwear upper of claim 11, wherein the removing step includes activating a sonic welding apparatus along the length of the heel axis (308).

Patentansprüche

1. Ein Fersenachsen (308) - Fertigstellungssystem zum Ausbilden eines geflochtenen Schuhoberteils,

umfassend:

einen Ausrichtungs-Mechanismus (310), der dazu konfiguriert ist, eine mediale Seite (304) eines geflochtenen Oberteils mit einer lateralen Seite (302) des geflochtenen Oberteils an einem Fersenende (104) des geflochtenen Oberteils auszurichten; und
einen Zusammenfügungs-Mechanismus, der dem Ausrichtungs-Mechanismus zugeordnet ist, wobei der genannte Zusammenfügungs-Mechanismus dazu konfiguriert ist, ein erstes geflochtenes Garn der medialen Seite (304) mit einem ersten geflochtenen Garn der lateralen Seite (302) entlang einer Fersenachse (308) zu koppeln, wobei der Ausrichtungs-Mechanismus eine Basis (312) und ein Paar von Rückplatten (314), (316) umfasst, die mit der Basis in beabstandeter Beziehung gekoppelt sind, um einen Schlitz (318) zu definieren, und wobei der Zusammenfügungs-Mechanismus ein Schallschweißgerät ist.

2. Das Fersenachsen (308) - Fertigstellungssystem nach Anspruch 1, wobei mindestens eine von dem Paar Rückplatten (314), (316) gleitend mit der Basis (312) verbunden ist.

3. Das Fersenachsen (308) - Fertigstellungssystem nach Anspruch 2, wobei beide Rückplatten (314, 316) gleitend mit der Basis (312) gekoppelt sind.

4. Das Fersenachsen (308) - Fertigstellungssystem nach Anspruch 3, wobei das Schallschweißgerät einen Schall-Schweißamboss (324) umfasst, der in einer der beiden Rückplatten (314), (316) untergebracht ist, und ein Schall-Schweißhorn (322), das in der anderen der beiden Rückplatten untergebracht ist, wobei sich der Schallamboss und das Schallhorn in den definierten Schlitz hinein erstrecken.

5. Ein Oberteil für einen Fußbekleidungsartikel, umfassend: ein geflochtenes Oberteil, umfassend

eine einheitliche, geflochtene Struktur (16), die Folgendes aufweist: eine laterale Seite (302) gegenüber einer medialen Seite (304) und ein Fersenende gegenüber einem Zehenende, wobei das geflochtene Oberteil zwischen der lateralen Seite (302) und der medialen Seite (304) in der Nähe des Fersenendes des geflochtenen Oberteils eine zusammengefügte Fersenachse (308) umfasst, wobei die genannte zusammengefügte Fersenachse (308) mindestens ein erstes geflochtenes Garn der lateralen Seite (302) umfasst, der

- durch einen Verbindungs-Mechanismus, der ein Schallschweißgerät ist und dem Ausrichtungs-Mechanismus zugeordnet ist, der eine Basis (312) und ein Paar Rückplatten (314), (316) umfasst, die mit der Basis in beabstandeter Beziehung gekoppelt sind, um einen Schlitz (318) zu definieren, ausgerichtet und gekoppelt ist mit mindestens einem ersten geflochtenen Garn der medialen Seite (304) an der zusammengefügte Fersenachse (308).
6. Das Oberteil für einen Fußbekleidungsartikel nach Anspruch 5, wobei die zusammengefügte Fersenachse (308) eine vertikale Übergangsnäht von der lateralen Seite (302) zur medialen Seite (304) aufweist.
7. Das Oberteil für einen Fußbekleidungsartikel nach Anspruch 6, wobei die geflochtene Struktur der medialen Seite (304) und die geflochtene Struktur der lateralen Seite (302) so konfiguriert sind, dass sie sich an der Fersenachse (308) miteinander verbinden (*to mate*).
8. Das Oberteil für einen Fußbekleidungsartikel nach Anspruch 7, wobei die zusammengefügte Fersenachse (308) Garne von der medialen Seite (304) umfasst, die mit Garnen von der lateralen Seite (302) schallverschweißt sind.
9. Das Oberteil für einen Fußbekleidungsartikel nach Anspruch 5, wobei das Zehenende eine orthogonal zur zusammengefügte Fersenachse (308) orientierte Naht aufweist.
10. Ein Verfahren zum Ausbilden einer Fersenachse (308) auf einem geflochtenen Schuhoberteil, umfassend:
- Platzieren eines geflochtenen Oberteils auf einen Ausrichtungs-Mechanismus, der dazu konfiguriert ist, eine mediale Seite (304) eines geflochtenen Oberteils mit einer lateralen Seite (302) des geflochtenen Oberteils an einem Fersenende des geflochtenen Oberteils auszurichten;
- und Zusammenfügen mindestens eines ersten geflochtenen Garns der medialen Seite (304) mit einem ersten geflochtenen Garn der lateralen Seite (302) entlang einer Fersenachse (308),
- wobei der Ausrichtungs-Mechanismus eine Basis (312) und ein Paar Rückplatten (314), (316) umfasst, die mit der Basis in beabstandeter Beziehung gekoppelt sind, um einen Schlitz (318) zu definieren, und
- wobei der Schritt des Zusammenfügens das Aktivieren eines Schallschweißgeräts entlang der

Fersenachse (308) umfasst.

11. Das Verfahren zum Ausbilden einer Fersenachse auf einem geflochtenen Schuhoberteil nach Anspruch 10, ferner umfassend das Entfernen mindestens eines Teils des geflochtenen Oberteils entlang der Fersenachse (308).
12. Das Verfahren zum Ausbilden einer Fersenachse auf einem geflochtenen Schuhoberteil nach Anspruch 11, wobei der Schritt des Entfernens das Aktivieren einer Schallschweißvorrichtung entlang der Länge der Fersenachse (308) beinhaltet.

Revendications

1. Un système de finition à l'axe de talon (308) pour former une tige de chaussure tressée comprenant :
- un mécanisme d'alignement (310) configuré pour orienter un côté médial (304) d'une tige tressée par rapport à un côté latéral (302) de la tige tressée à une extrémité du talon (104) de la tige tressée ; et
- un mécanisme d'assemblage associé au mécanisme d'alignement, ledit mécanisme d'assemblage étant configuré pour coupler un premier fil tressé du côté médial (304) à un premier fil tressé du côté latéral (302) le long d'un axe de talon (308),
- sachant que le mécanisme d'alignement comprend une base (312) et une paire de plaques arrière (314), (316) couplées à la base en relation espacée pour définir une fente (318) et sachant que le mécanisme d'assemblage est une soudeuse sonique.
2. Le système de finition à l'axe de talon (308) d'après la revendication 1, sachant qu'au moins l'une de la paire de plaques arrière (314), (316) est couplée de manière coulissante à la base (312).
3. Le système de finition à l'axe de talon (308) d'après la revendication 2, sachant que les deux plaques arrière (314), (316) sont couplées de manière coulissante à la base (312).
4. Le système de finition à l'axe de talon (308) d'après la revendication 3, sachant que la soudeuse sonique comprend une enclume (324) de soudage sonique logée dans l'une de la paire de plaques arrière (314), (316), et un émetteur de sons (322) de soudage sonique ou encore sonotrode (*sonic welding horn*) logée dans l'autre de la paire de plaques arrière, l'enclume sonique et la sonotrode s'étendant à l'intérieur de la fente définie.

5. Une tige pour un article chaussant comprenant : une tige tressée comprenant

une structure tressée unitaire (16) ayant un côté latéral (302) opposé à un côté médial (304) et une extrémité de talon opposée à une extrémité d'orteils, sachant que la tige tressée comprend un axe de talon joint (308) entre le côté latéral (302) et le côté médial (304) à proximité de l'extrémité de talon de la tige tressée, ledit axe de talon joint (308) comprenant au moins un premier fil tressé du côté latéral (302) aligné et couplé, par un mécanisme d'assemblage qui est une soudeuse sonique et est associé au mécanisme d'alignement qui comprend une base (312) et une paire de plaques arrière (314), (316) couplées à la base en relation espacée pour définir une fente (318), à au moins un premier fil tressé du côté médial (304) au niveau de l'axe de talon joint (308).

arrière (314), (316) couplées à la base dans une relation espacée pour définir une fente (318) et sachant que l'étape de jointure comprend l'activation d'une soudeuse sonique le long de l'axe de talon (308).

11. Le procédé pour former un axe de talon sur une tige de chaussure tressée d'après la revendication 10, comprenant en outre le fait d'enlever au moins une partie de la tige tressée le long de l'axe de talon (308).

12. Le procédé d'après la revendication 11, sachant que l'étape d'enlèvement inclut l'activation d'un appareil de soudage sonique le long de l'axe de talon (308).

6. La tige pour un article chaussant d'après la revendication 5, sachant que l'axe de talon joint (308) présente une jointure (seam) de transition verticale depuis le côté latéral (302) jusqu'au côté médial (304).
7. La tige pour un article chaussant d'après la revendication 6, sachant que la structure tressée du côté médial (304) et la structure tressée du côté latéral (302) sont configurées pour s'accoupler (*to mate*) l'une à l'autre au niveau de l'axe de talon (308).
8. La tige pour un article chaussant d'après la revendication 7, sachant que l'axe de talon (308) joint comprend des fils provenant du côté médial (304) soudés soniquement à des fils provenant du côté latéral (302).
9. La tige pour un article chaussant d'après la revendication 5, sachant que l'extrémité d'orteils présente une jointure orientée orthogonalement à l'axe du talon joint (308).
10. Un procédé pour former un axe de talon (308) sur une tige de chaussure tressée, comprenant le fait de :

placer une tige tressée sur un mécanisme d'alignement configuré pour orienter un côté médial (304) d'une tige tressée par rapport à un côté latéral (302) de la tige tressée à une extrémité de talon de la tige tressée ; et de joindre au moins un premier fil tressé du côté médial (304) à un premier fil tressé du côté latéral (302) le long d'un axe de talon (308), sachant que le mécanisme d'alignement comprend une base (312) et une paire de plaques

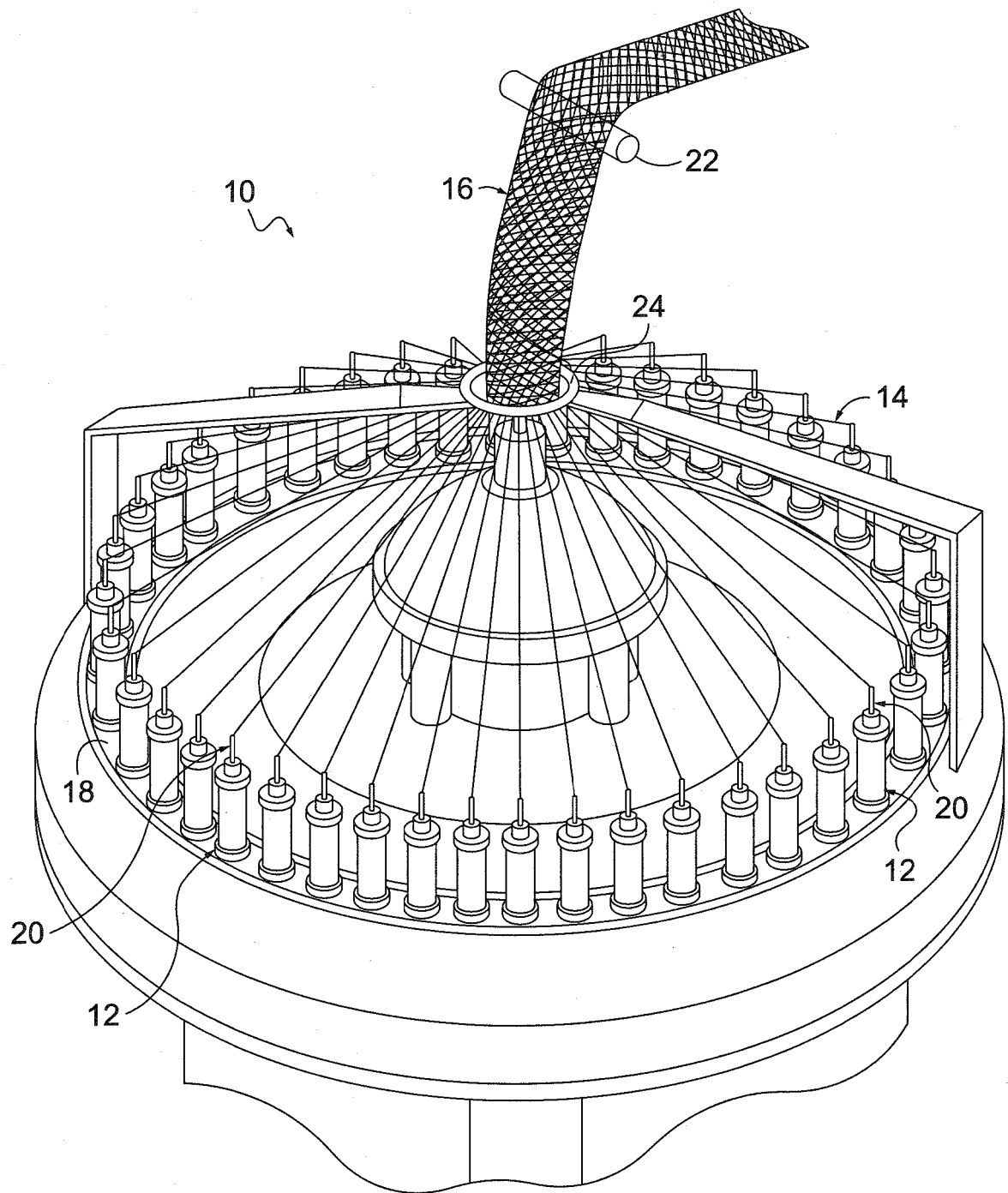


FIG. 1.

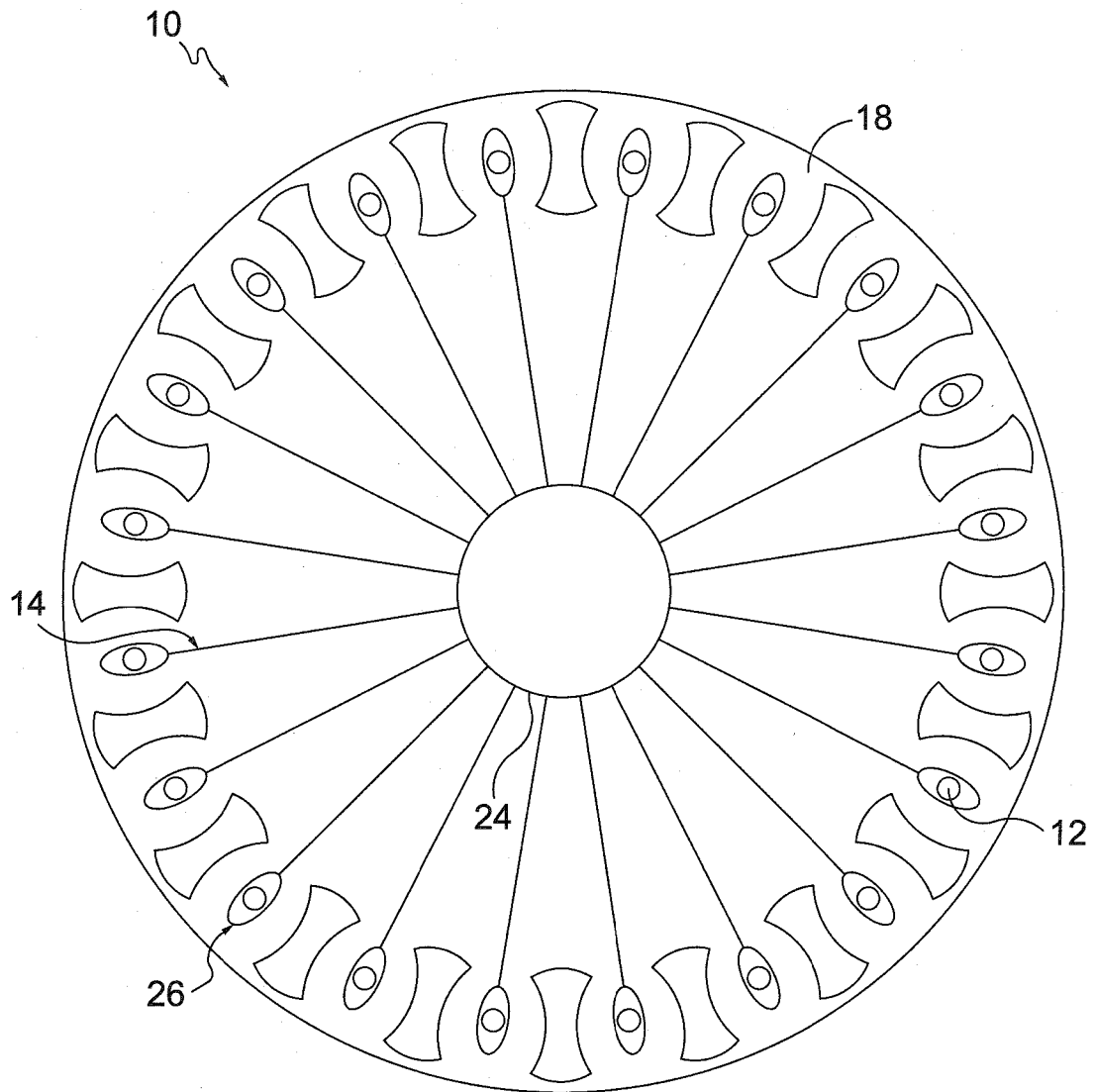


FIG. 2.

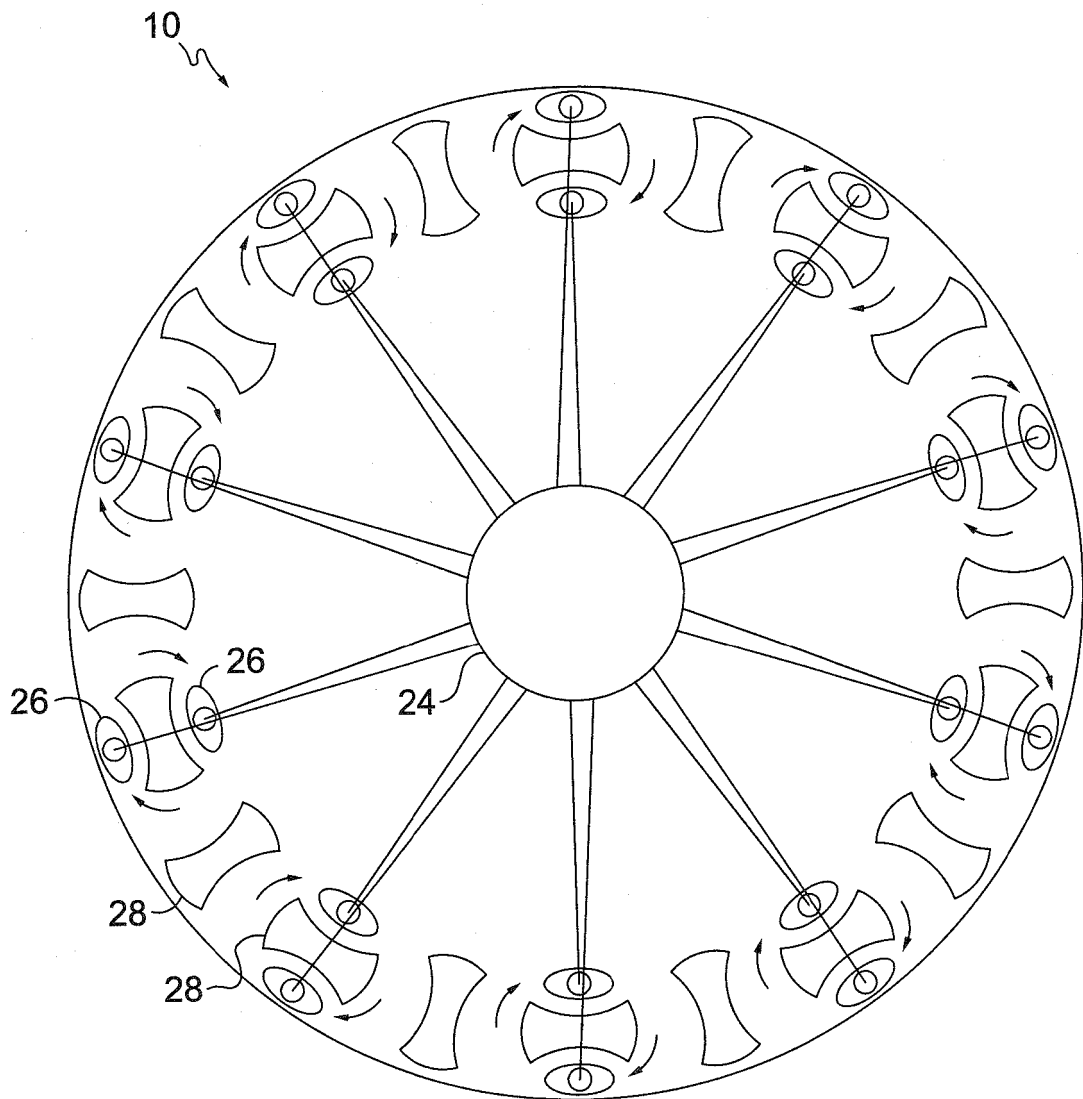


FIG. 3.

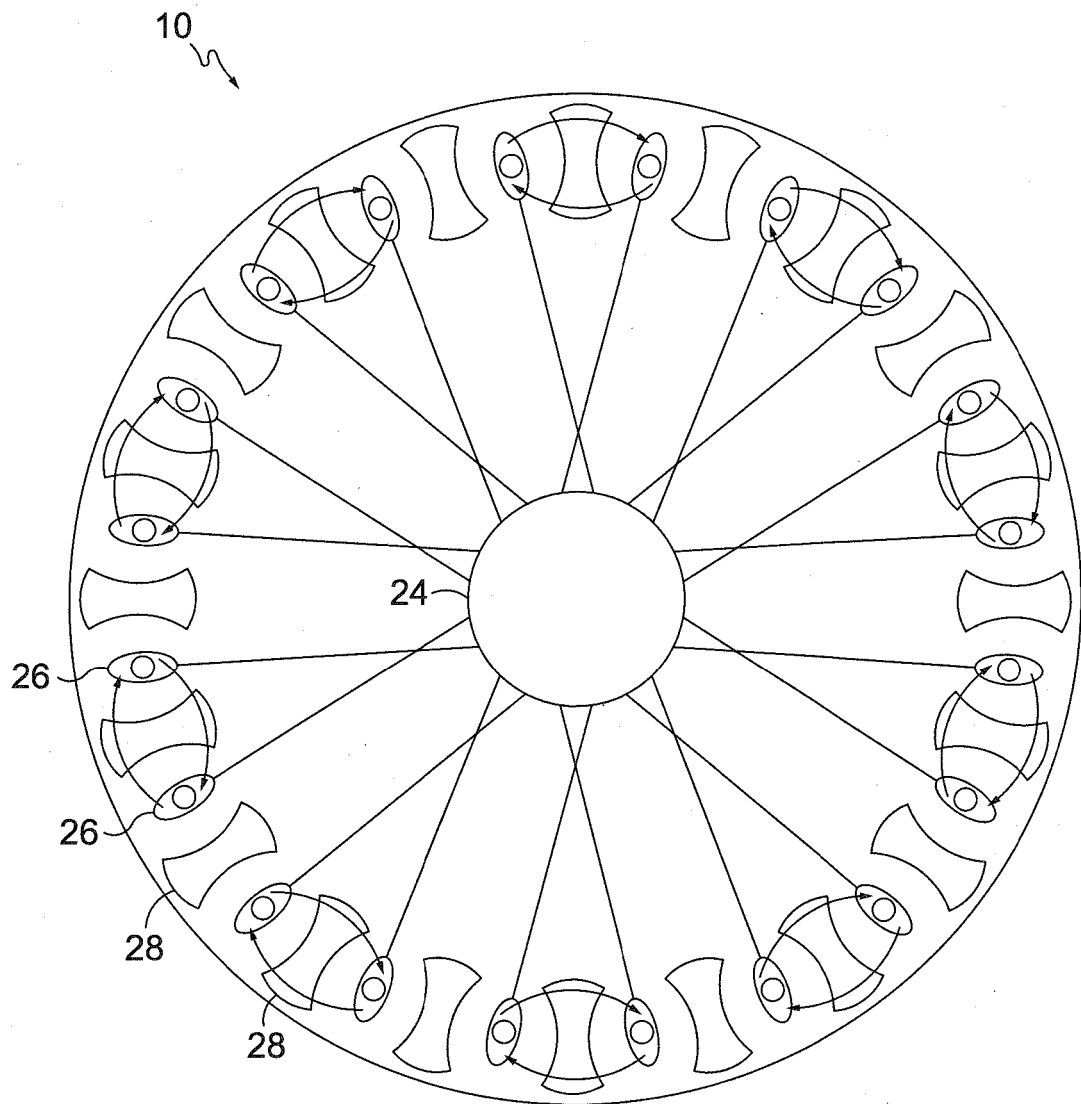
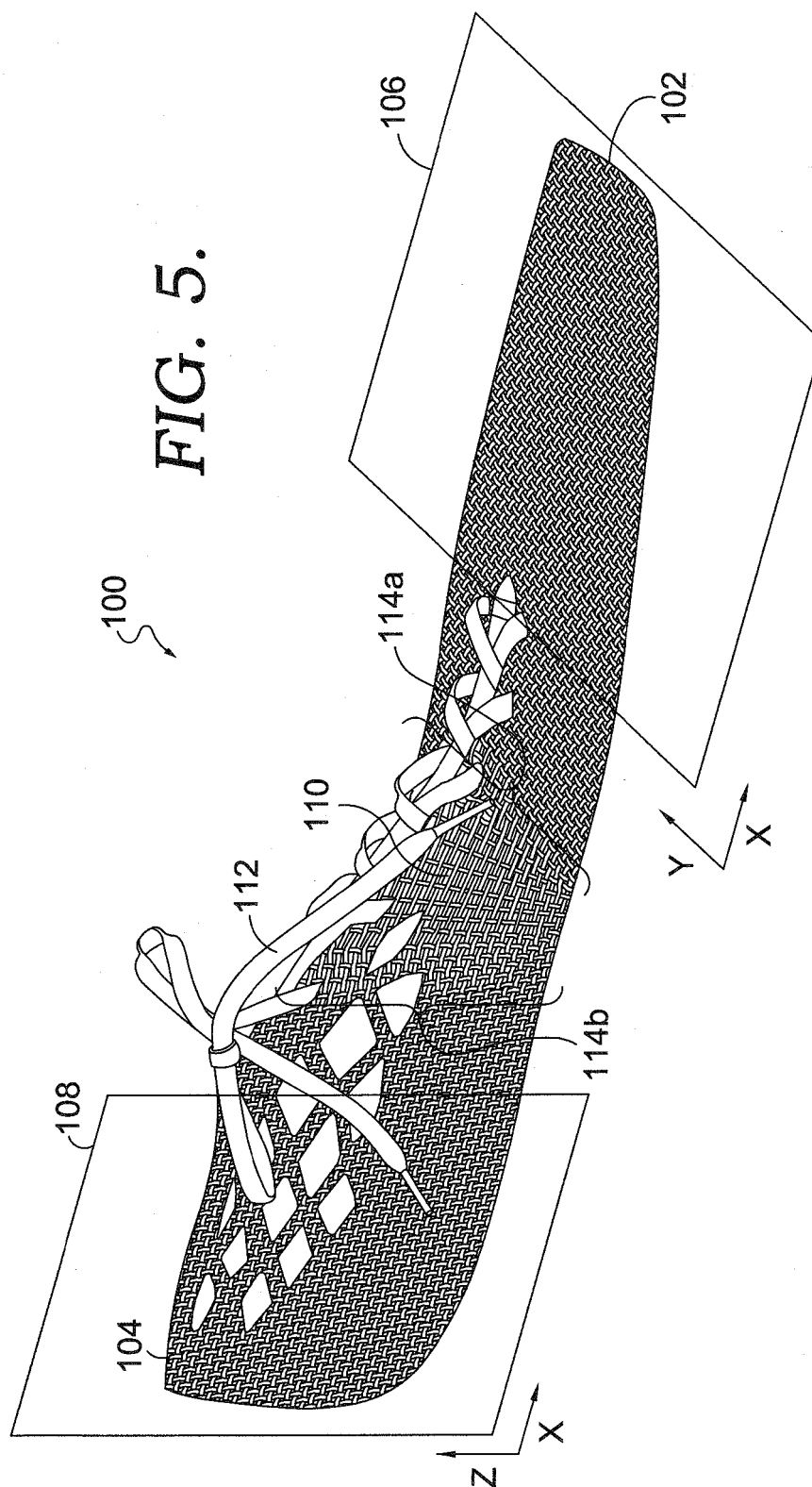


FIG. 4.



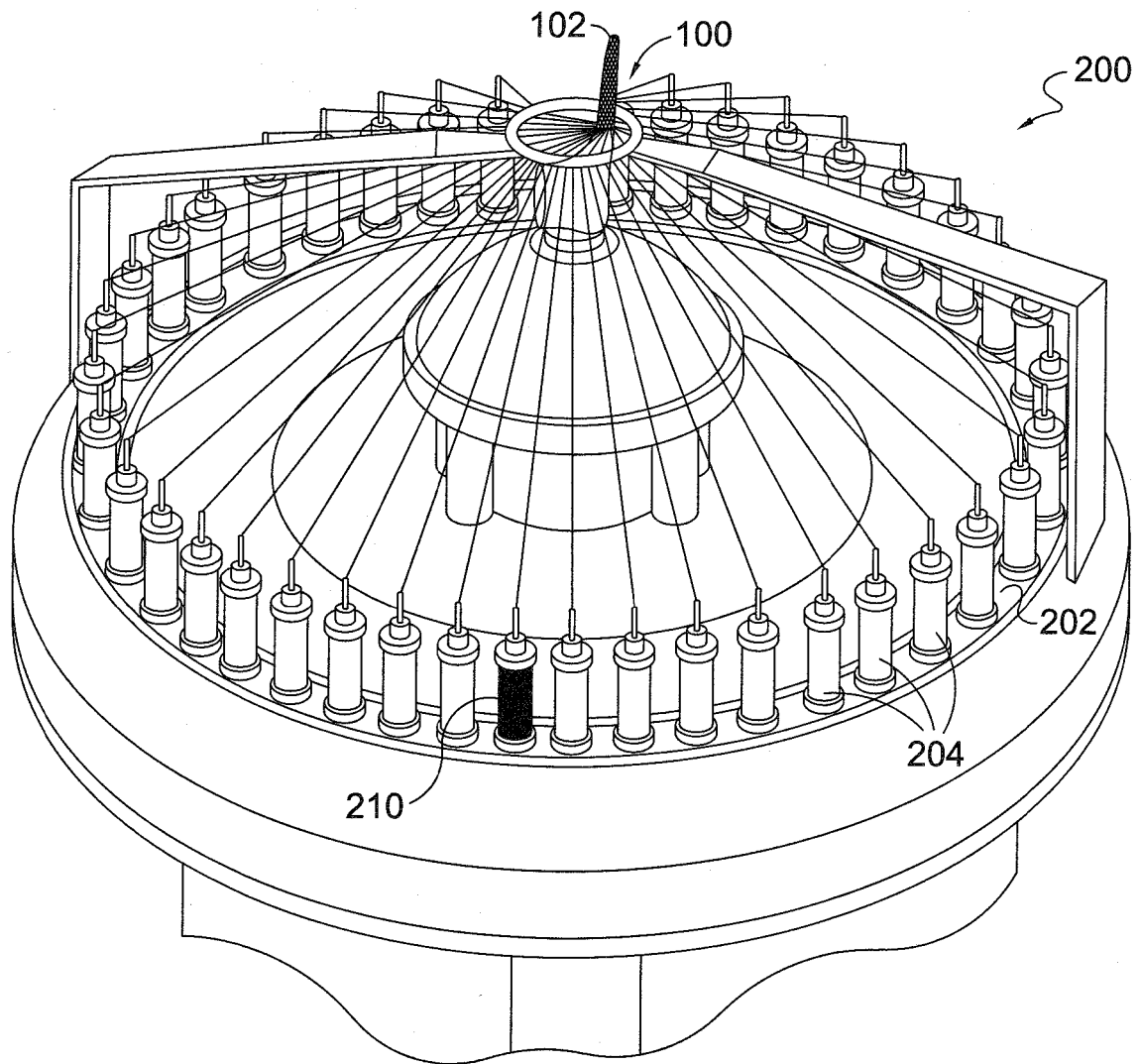


FIG. 6.

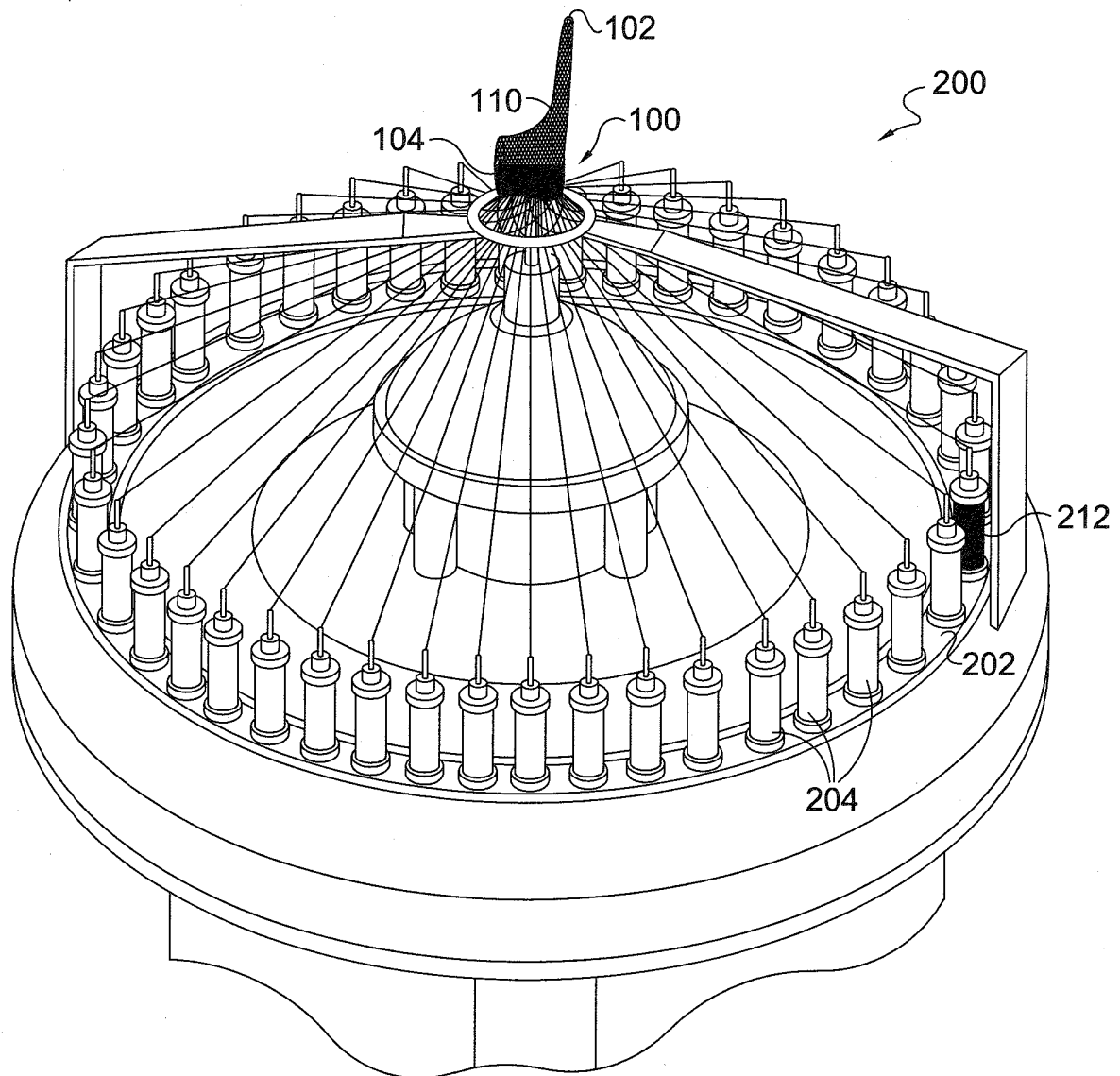


FIG. 7.

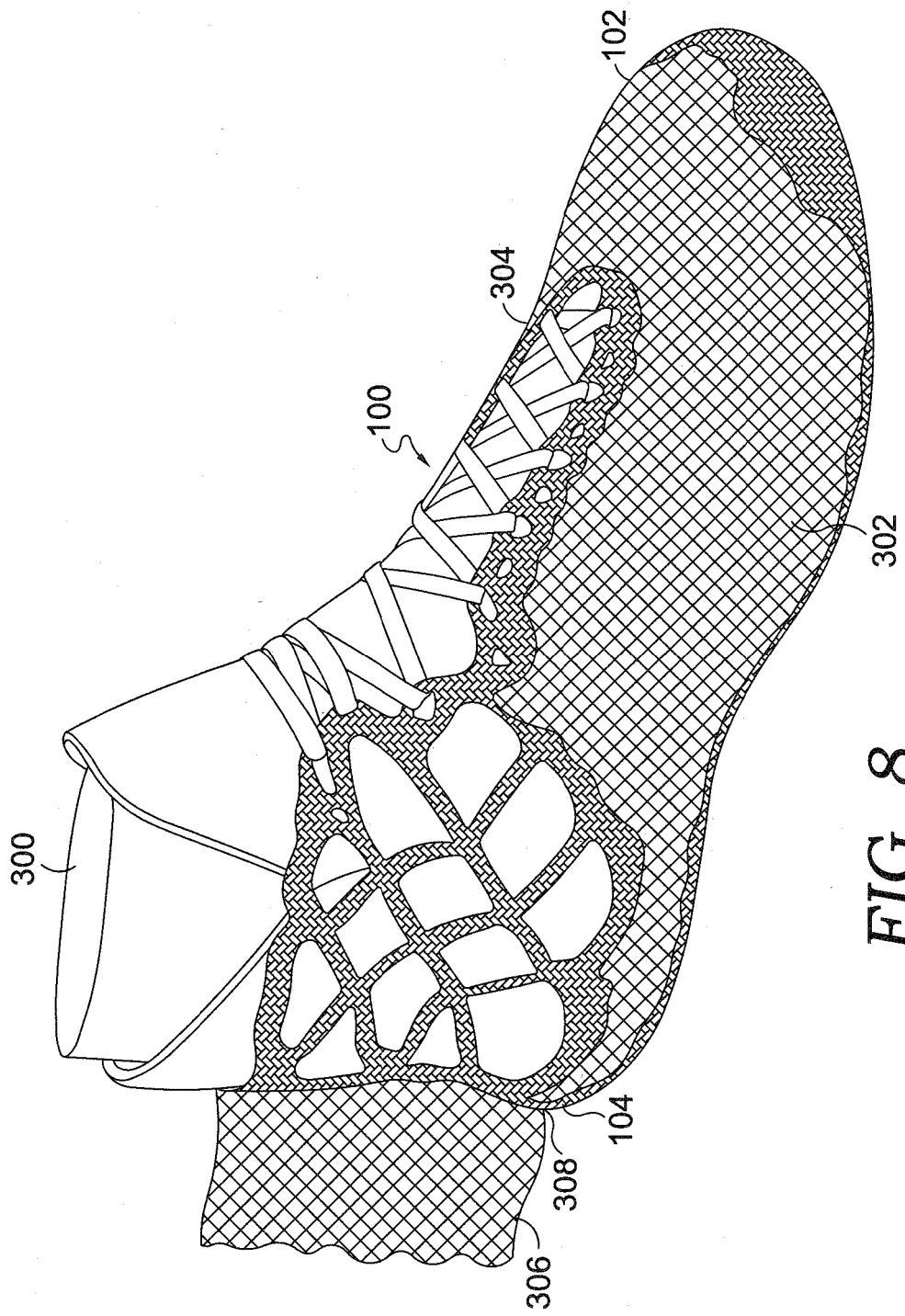


FIG. 8.

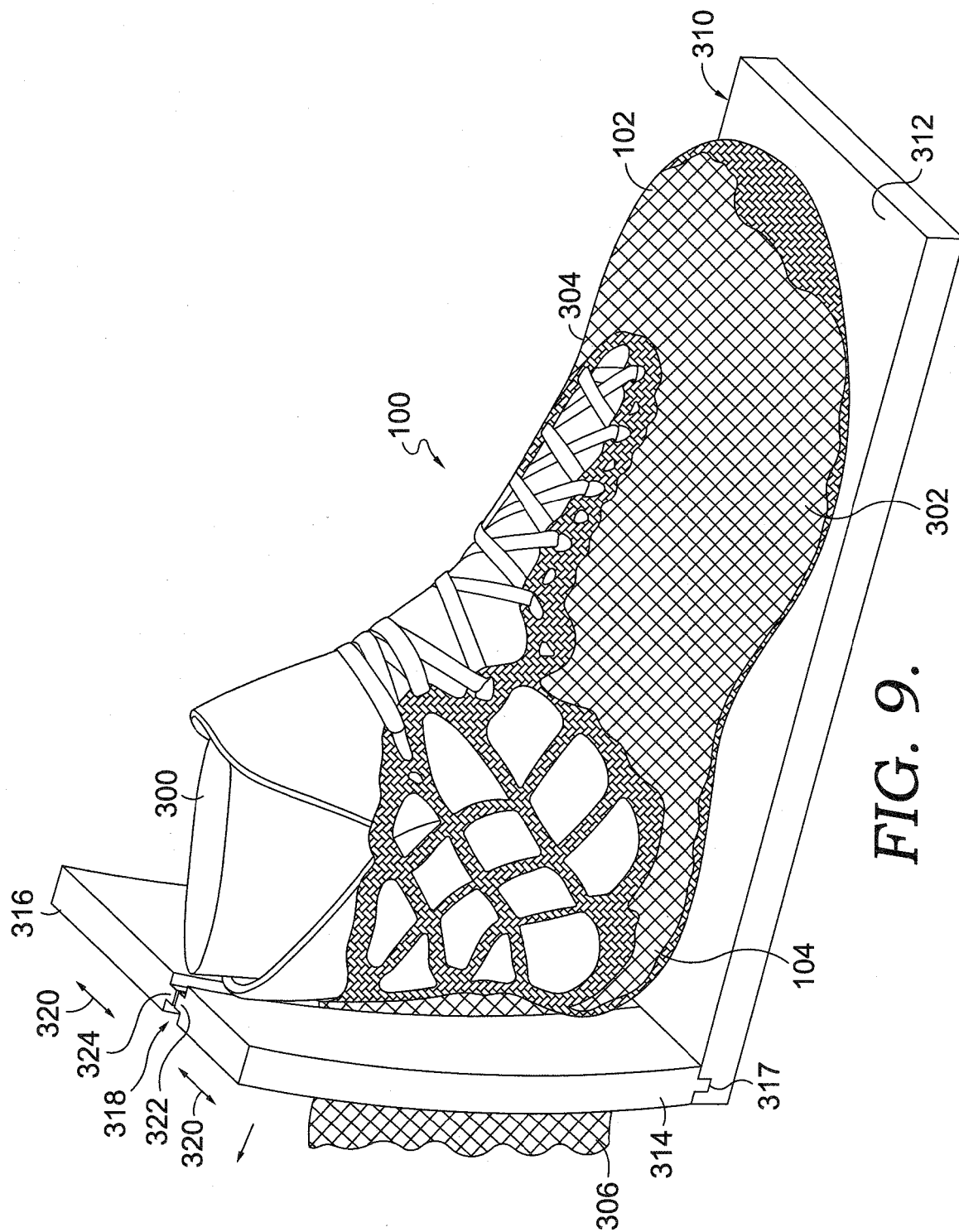


FIG. 9.

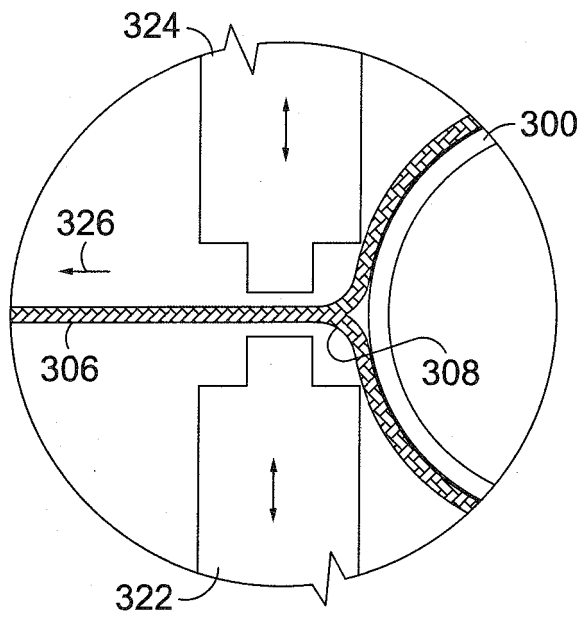


FIG. 9A.

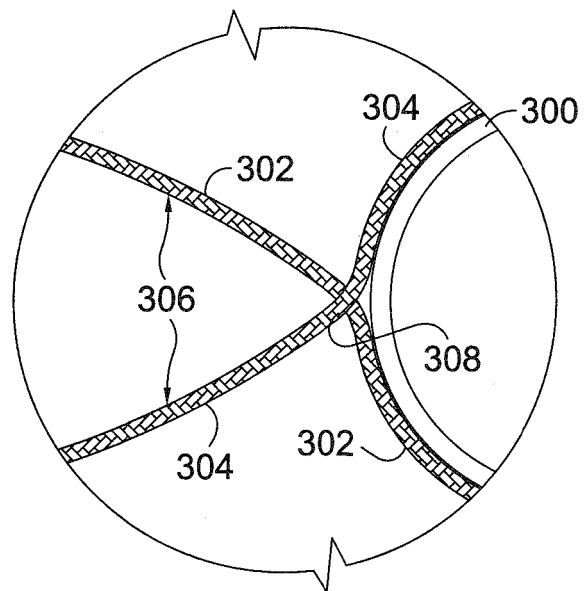
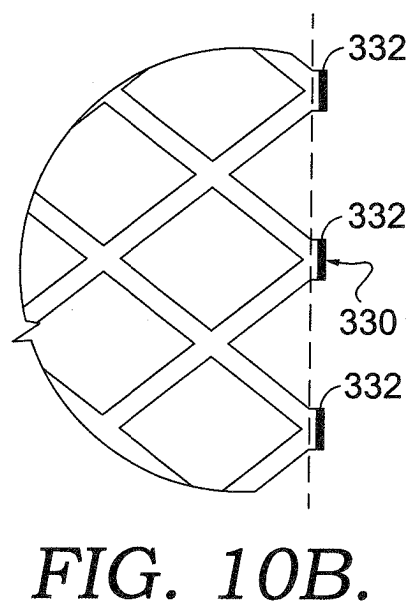
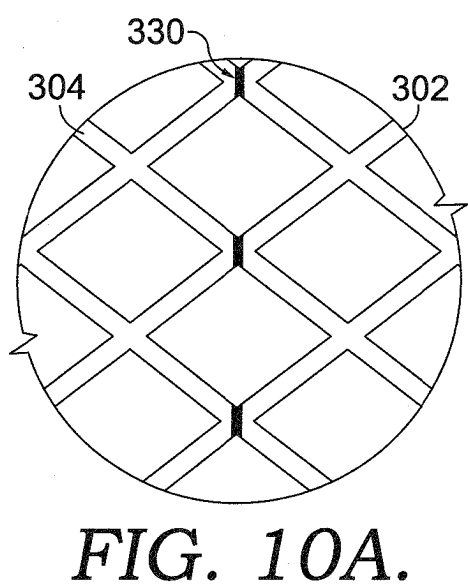
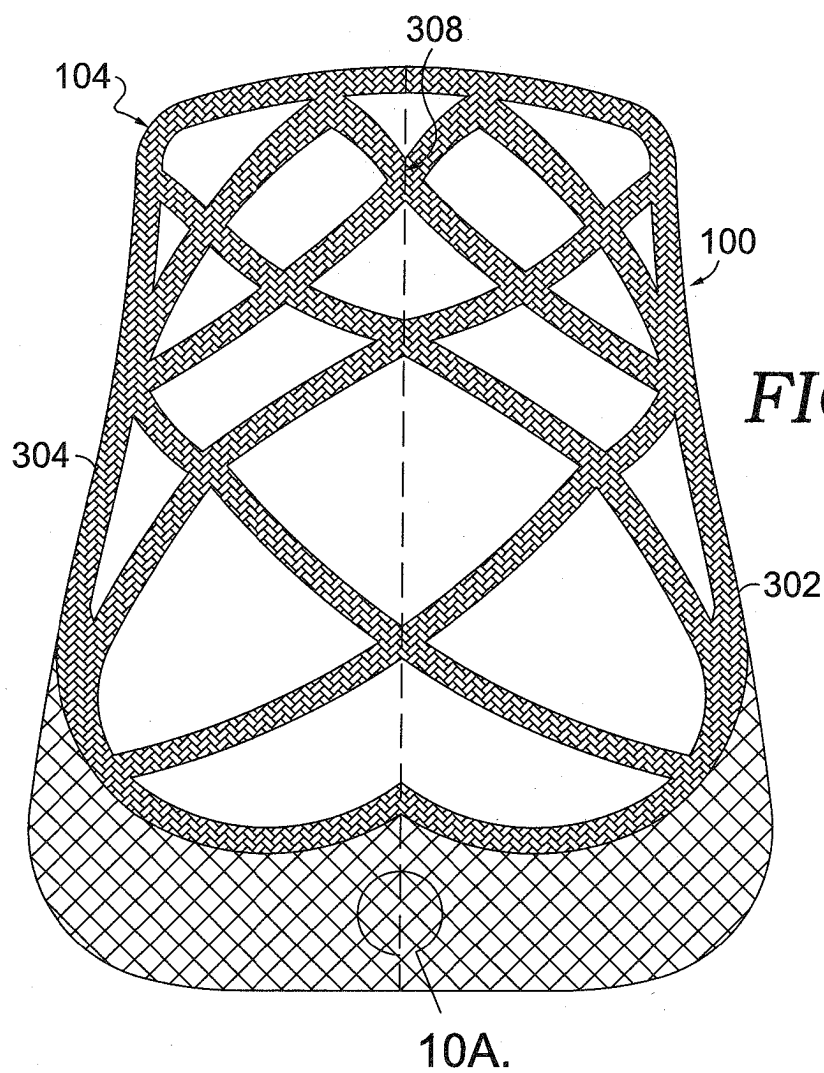


FIG. 9B.



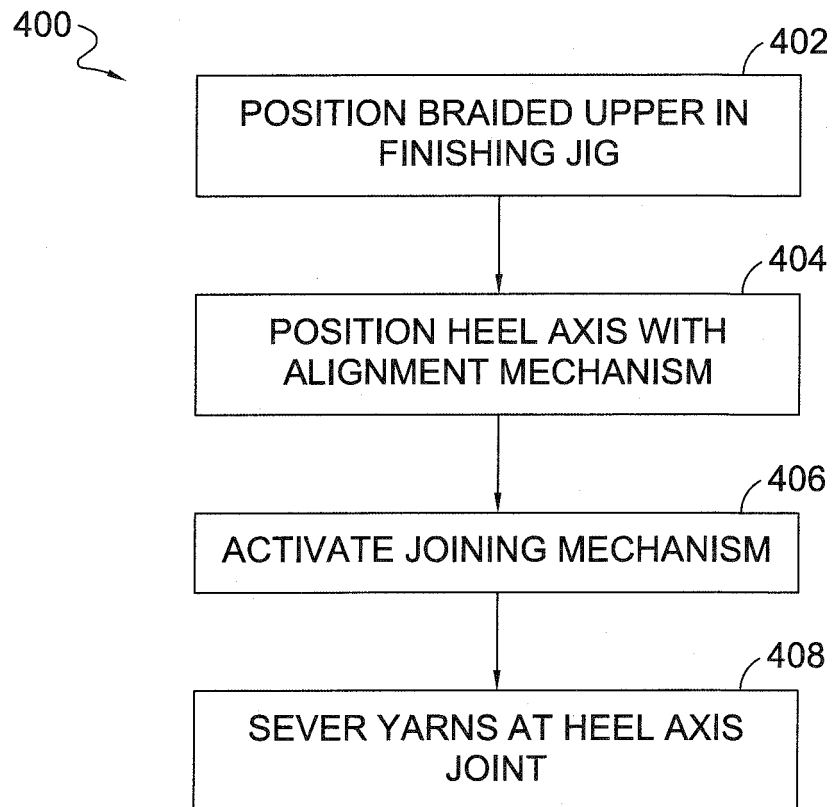


FIG. 11.

REFERENCES CITED IN THE DESCRIPTION

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