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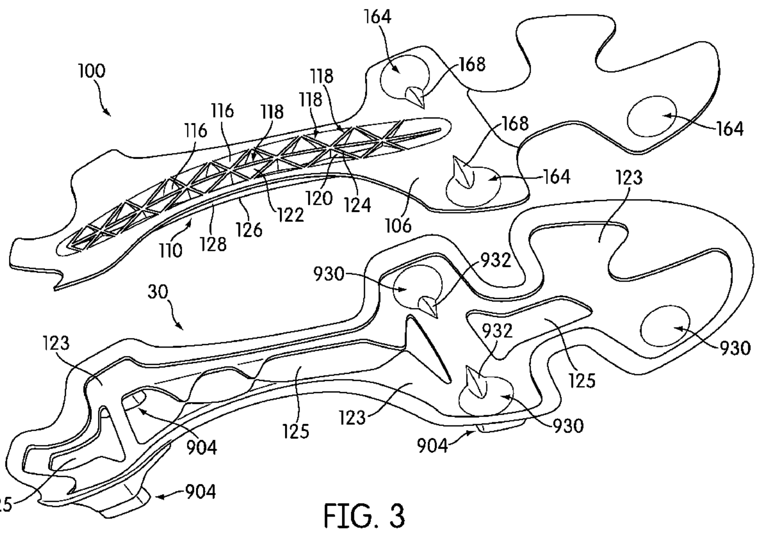

FIG. 3

(57) Abstract: An article of footwear is provided, which may include an upper and a sole structure. The sole structure may include a chassis including a forefoot region, a midfoot region, a heel region, a lateral width, a longitudinal axis, and a reinforcing rib disposed longitudinally and having a length along the longitudinal axis. The rib may include a rearward end disposed proximate the heel region of the chassis, the rib longitudinally extending substantially through the midfoot region of the chassis to a forward end of the rib. Also, the lateral width of the reinforcing rib may span a substantial majority of the lateral width of the chassis over a substantial majority of the length of the rib. Further, the lateral width of the rib at the forward end and the rearward end is less than or equal to the lateral width of the rib at any point between the rearward end and the forward end.

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ARTICLE OF FOOTWEAR

BACKGROUND

[0001] The present disclosure is directed to an article of footwear and, more particularly, to an article of footwear having a sole structure including a chassis having both rigid and flexible components.

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

[0003] The upper is often formed from a plurality of material elements (for example, textiles, polymer sheets, foam layers, leather, synthetic leather) that are stitched or adhesively bonded together to define a void on the interior of the footwear for comfortably and securely receiving a foot. More particularly, the upper forms a structure that extends over instep and toe areas of the foot, along medial and lateral sides of the foot, and around a heel area of the foot. The upper may also incorporate a lacing system to adjust fit of the footwear, as well as permit entry and removal of the foot from the void within the upper. In addition, the upper may include a tongue that extends under the lacing system to enhance adjustability and comfort of the footwear, and the upper may incorporate a heel counter.

[0004] The sole structure generally incorporates multiple layers: a sockliner, a midsole, and a ground-engaging component. The sockliner is a thin, compressible member located within the upper and adjacent to a plantar (that is, lower) surface of the foot to enhance footwear comfort. The midsole is secured to a lower surface of the upper and forms a middle layer of the sole structure. Many midsole configurations are primarily formed from a resilient polymer foam material, such as polyurethane (PU) or ethyl vinyl acetate (EVA), that extends throughout the length and width of the footwear. The midsole may also incorporate plates, moderators, fluid-filled chambers, and/or other elements that further attenuate forces, influence the motions of the foot, and/or impart stability, for example. The ground-engaging component may be fashioned from a durable and wear-resistant material (for example, rubber) that includes texturing to improve traction.

[0005] Sole structures have been developed that include reinforcing plates having a substantially narrow configuration in conjunction with outsoles also having a similarly narrow configuration. However, such reinforcing plates have front or rear sections that flare to a wider shape. These flared configurations can add weight, and restrict flexibility in the forefoot sections of the shoe.

[0006] The related art lacks provisions for accommodating flexing of various features of a foot. There is a need for articles that address the limitations of the related art.

SUMMARY

[0007] In one aspect, the present disclosure is directed to an article of footwear. The article of footwear may include an upper configured to receive a foot and a sole structure fixedly attached to the upper and including a sole component having a ground-engaging lower surface. The sole structure may further include a chassis configured to provide support to the sole component, wherein the chassis includes a forefoot region, a midfoot region, a heel region, a lateral width, a longitudinal axis, and a reinforcing rib disposed longitudinally and having a length along the longitudinal axis. In addition, the reinforcing rib may include a rearward end disposed proximate the heel region of the chassis, the reinforcing rib longitudinally extending substantially through the midfoot region of the chassis to a forward end of the reinforcing rib. Also, the reinforcing rib may have a lateral width that spans a substantial majority of the lateral width of the chassis over a substantial majority of the length of the reinforcing rib. Further, the lateral width of the reinforcing rib at the forward end and the rearward end is less than or equal to the lateral width of the reinforcing rib at any point between the rearward end and the forward end.

[0008] In another aspect, the present disclosure is directed to an article of footwear. The article of footwear may include an upper configured to receive a foot and a sole structure fixedly attached to the upper and including a sole component having a ground-engaging lower surface. The sole structure may further include a chassis configured to provide support to the sole component, wherein the chassis includes a forefoot region, a midfoot region, a heel region, a lateral width, a longitudinal axis, and a central portion extending through at least a portion of the forefoot region, the midfoot region, and the heel region. The chassis may further include a plurality of chassis projections extending laterally from the central portion of the chassis wherein at least one of the chassis projections is made from a first material and a second material having a substantially different level of flexibility than the first material.

[0009] In another aspect, the present disclosure is directed to an article of footwear. The article of footwear may include an upper configured to receive a foot; and a sole structure fixedly attached to the upper and including a sole component having a ground-engaging lower surface. The sole structure may further include a chassis configured to provide support to the sole component, wherein the chassis includes a forefoot region, a midfoot region, a heel region, a lateral width, and a central portion extending through at least a portion of the forefoot region, the midfoot region, and the heel region. The chassis may further include a plurality of chassis projections extending laterally from the central portion of the chassis; a reinforcing rib disposed longitudinally and having a longitudinal length and a lateral width; and one or more chassis projections extending from the central portion of the chassis. In addition, the reinforcing rib may include a rearward end disposed proximate the heel region of the chassis, the reinforcing rib longitudinally extending substantially through the midfoot region of the chassis to a forward end of the reinforcing rib. Further, over a substantial majority of the length of the reinforcing rib, the lateral width of the reinforcing rib may span a substantial majority of the lateral width of the chassis. Also, the lateral width of the reinforcing rib at the forward end and the rearward end may be less than or equal to the lateral width of the reinforcing rib at any point between the rearward end and the forward end. In addition, a first portion of the chassis may be formed of a first material and a second portion of the chassis is formed of a second material having a substantially different level of flexibility than the first material.

[0010] Other systems, methods, features and advantages of the current embodiments will be, or will become, apparent to one of ordinary skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description and this summary, be within the scope of the current embodiments, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The current embodiments can be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the current embodiments. Moreover, in the figures, like reference numerals designate corresponding parts throughout the different views.

[0012] FIG. 1 is a schematic side view of an embodiment of an article of footwear;

[0013] FIG. 2A is a schematic top view of an embodiment of a chassis for an article of footwear;

[0014] FIG. 2B is a schematic bottom view of an embodiment of a chassis for an article of footwear;

[0015] FIG. 3 is a exploded perspective view of an embodiment of a sole component-chassis assembly for an article of footwear;

[0016] FIG. 4 is a schematic, lateral side view of an embodiment of a chassis for an article of footwear;

[0017] FIG. 5 is a perspective cross-sectional cutaway view of the chassis shown in FIG. 4, taken at line 5-5 in FIG. 4;

[0018] FIG. 6 is a perspective cross-sectional cutaway view of the chassis shown in FIG. 4, taken at line 6-6 in FIG. 4;

[0019] FIG. 7 is a schematic, lateral side view, illustrating flexion of an embodiment of a chassis for an article of footwear;

[0020] FIG. 8 is a partial top view of an embodiment of a chassis for an article of footwear, illustrating individual flexibility of chassis projections;

[0021] FIG. 9 is a schematic bottom view of an embodiment of a sole component-chassis assembly for an article of footwear;

[0022] FIG. 10 is a schematic top view of an embodiment of a sole component-chassis assembly for an article of footwear;

[0023] FIG. 11 is schematic, lateral side view, illustrating flexion of an embodiment of a sole component-chassis assembly for an article of footwear;

[0024] FIG. 12 is a front view of an embodiment of a sole component-chassis assembly, illustrating flexion of portions of the assembly;

[0025] FIG. 13 is schematic view of an athlete wearing an embodiment of an article of footwear incorporating a sole structure with individually flexible portions; and

[0026] FIG. 14 is a schematic perspective view of an embodiment of a sole structure.

DETAILED DESCRIPTION

[0027] The following discussion and accompanying figures disclose a sole structure for an article of footwear. Concepts associated with the footwear disclosed herein may be applied to a variety of athletic footwear types, including running shoes, baseball shoes, basketball shoes, cross-training shoes, cycling shoes, football shoes, golf shoes, tennis shoes, walking shoes, and hiking shoes and boots, for example. The concepts may also be applied to footwear types that are generally considered to be non-athletic, including dress shoes, loafers, sandals, and work boots. Accordingly, the concepts disclosed herein apply to a wide variety of footwear types.

[0028] For consistency and convenience, directional adjectives are employed throughout this detailed description corresponding to the illustrated embodiments. The term "longitudinal," as used throughout this detailed description and in the claims, refers to a direction extending a length of a sole structure. In some cases, the longitudinal direction may extend from a forefoot portion to a heel portion of the sole. Also, the term "lateral," as used throughout this detailed description and in the claims, refers to a direction extending a width of a sole. In other words, the lateral direction may extend between a medial side and a lateral side of footwear 10, with the lateral side of footwear 10 being the surface that faces away from the other foot, and the medial side being the surface that faces toward the other foot.

[0029] Furthermore, the term "vertical," as used throughout this detailed description and in the claims, refers to a direction generally perpendicular to a lateral and longitudinal direction. For example, in cases where a sole is planted flat on a ground surface, the vertical direction may extend from the ground surface upward. It will be understood that each of these directional adjectives may be applied to individual components of a sole. In addition, the terms "upward" and "downward," as used throughout this detailed description and the claims, refer to modes of vertical bending and/or deflection. For example, the term "upwards" refers to the vertical direction heading away from a ground surface, while the term “downwards” refers to the vertical direction heading towards the ground surface.

[0030] For purposes of this disclosure, the term fixedly attached shall refer to two components joined in a manner such that the components may not be readily separated (for example, without destroying one or both of the components). Exemplary modalities of fixed attachment may include joining with permanent adhesive, rivets, stitches, nails, staples, welding or other thermal bonding, and/or other joining techniques.

Footwear Structure

[0031] FIG. 1 depicts an embodiment of an article of footwear 10, which may include a sole structure 12 and an upper 14. For reference purposes, footwear 10 may be divided into three general regions: a forefoot region 16, a midfoot region 18, and a heel region 20. Forefoot region 16 generally includes portions of footwear 10 corresponding with the toes and the joints connecting the metatarsals with the phalanges. Midfoot region 18 generally includes portions of footwear 10 corresponding with an arch area of the foot. Heel region 20 generally corresponds with rear portions of the foot, including the calcaneus bone. Regions 16, 18, and 20 are not intended to demarcate precise areas of footwear 10. Rather, regions 16, 18, and 20 are intended to represent general relative areas of footwear 10 to aid in the following discussion.

[0032] Since sole structure 12 and upper 14 both span substantially the entire length of footwear 10, the terms forefoot region 16, midfoot region 18, and heel region 20 apply not only to footwear 10 in general, but also to sole structure 12 and upper 14, as well as the individual elements of sole structure 12 and upper 14.

[0033] The disclosed footwear components may be formed of any suitable materials. In some embodiments, one or more materials disclosed in Lyden et al. (U.S. Patent No. 5,709,954), which is hereby incorporated by reference in its entirety, may be used.

[0034] As shown in FIG. 1, upper 14 may include one or more material elements (for example, textiles, foam, leather, and synthetic leather), which may be stitched, adhesively bonded, molded, or otherwise formed to define an interior void configured to receive a foot. The material elements may be selected and arranged to selectively impart properties such as durability, air-permeability, wear-resistance, flexibility, and comfort. An ankle opening 22 in heel region 20 provides access to the interior void. In addition, upper 14 may include a lace 24, which may be utilized to modify the dimensions of the interior void, thereby securing the foot within the interior void and facilitating entry and removal of the foot from the interior void. Lace 24 may extend through apertures in upper 20, and a tongue portion 26 of upper 14 may extend between the interior void and lace 24. Upper 14 may alternatively implement any of a variety of other configurations, materials, and/or closure mechanisms. For example, upper 14 may include sock-like liners instead of a more traditional tongue; alternative closure mechanisms, such as hook and loop fasteners (for example, straps), buckles, clasps, cinches, or any other arrangement for securing a foot within the void defined by upper 14.

[0035] Sole structure 12 may be fixedly attached to upper 14 (for example, with adhesive, stitching, welding, and/or other suitable techniques) and may have a configuration that extends between upper 14 and the ground. Sole structure 12 may include provisions for attenuating ground reaction forces (that is, cushioning the foot). In addition, sole structure 12 may be configured to provide traction, impart stability, and/or limit various foot motions, such as pronation, supination, and/or other motions. The configuration of sole structure 12 may vary significantly according to one or more types of ground surfaces on which sole structure 12 may be used, for example, natural turf, synthetic turf, dirt, pavement (for example, asphalt, concrete, and other types of pavement), as well as indoor surfaces, such as hardwood, synthetic rubber surfaces, tile, and other indoor surfaces. In addition, the configuration of sole structure 12 may vary significantly based according to the type of activity for which footwear 10 is anticipated to be used (for example, running, walking, soccer, baseball, basketball, and other activities). Footwear 10 is depicted in the accompanying figures as a cleated shoe, having a sole structure suited for natural and/or synthetic turf. Although footwear 10, as depicted, may be suited for soccer, such a cleated shoe may be applicable for use in other activities on natural and/or synthetic turf, such as baseball, football, and other such activities where traction and grip may be significantly enhanced by cleat members. However, many of the features of footwear 10 discussed herein may be applicable to other types of footwear, including non-cleated footwear.

[0036] In some embodiments, sole structure 12 may include multiple components, which may individually and/or collectively provide footwear 10 with a number of attributes, such as support, rigidity, flexibility, stability, cushioning, comfort, reduced weight, and/or other attributes. In some embodiments, sole structure 12 may include an insole 26, a midsole 28, a chassis 100, and a sole component 30, as shown in FIG. 1. In some cases, however, one or more of these components may be omitted.

[0037] Insole 26 may be disposed in the void defined by upper 14. Insole 26 may extend through each of regions 16, 18, and 20 and between the lateral and medial sides of footwear 10. Insole 26 may be formed of a deformable (for example, compressible) material, such as polyurethane foams, or other polymer foam materials. Accordingly, insole 26 may, by virtue of its compressibility, provide cushioning, and may also conform to the foot in order to provide comfort, support, and stability.

[0038] In some embodiments, insole 26 may be removable from footwear 10, for example, for replacement or washing. In other embodiments, insole 26 may be integrally formed with the footbed of upper 14. In other embodiments, insole 26 may be fixedly attached within footwear 10, for example, via permanent adhesive, welding, stitching, and/or another suitable technique.

[0039] In some embodiments of footwear 10, upper 14 may surround insole 26, including on an underside thereof. In other embodiments, upper 14 may not extend fully beneath insole 26, and thus, in such embodiments, insole 26 may rest atop midsole 28 (or atop chassis 100 in embodiments that do not include a midsole).

[0040] As noted above, footwear 10 is depicted in FIG. 1 as a soccer shoe. Although soccer shoes often do not include a midsole, since many features of footwear 10 may be applicable to shoes that do include a midsole (including soccer shoes as well as shoes for other activities), the general location of midsole 28 has been depicted in FIG. 1 as it may be incorporated into any of a variety of types of footwear (including soccer shoes if they do include midsoles). Midsole 28 may be fixedly attached to a lower area of upper 14 (for example, through stitching, adhesive bonding, thermal bonding (for example, welding), and/or other techniques), or may be integral with upper 14. Midsole 28 may extend through each of regions 16, 18, and 20 and between the lateral and medial sides of footwear 10. In some embodiments, portions of midsole 28 may be exposed around the periphery of footwear 10. In other embodiments, midsole 28 may be completely covered by other elements, such as material layers from upper 14. Midsole 28 may be formed from any suitable material having the properties described above, according to the activity for which footwear 10 is intended. In some embodiments, midsole 28 may include a foamed polymer material, such as polyurethane (PU), ethyl vinyl acetate (EVA), or any other suitable material that operates to attenuate ground reaction forces as sole structure 12 contacts the ground during walking, running, or other ambulatory activities.

[0041] In some embodiments, a footwear sole structure may include structural elements that provide stiffness, support, and/or strength. In addition, structural features may be included that distribute ground reaction forces and/or increase performance during engagement with ground surface irregularities. Structural elements that provide the foregoing properties may include one or more plate-like chassis components disposed within a sole structure. The chassis may be configured with various geometries in order to achieve certain attributes, such as those discussed above. Such attributes may also be achieved by selection of materials for the various components and regions of the sole structure that provide desired performance characteristics.

[0042] FIG. 2A is a top view and FIG. 2B is a bottom view of an exemplary embodiment of chassis 100. For purposes of illustration, chassis 100 is shown in isolation in FIGS. 2A and 2B. In some embodiments, however, chassis 100 could be associated with sole component 30 (*see, e.g.*, FIGS. 3, 9, and 10), midsole 28, and/or upper 14 of footwear 10. A left foot version of chassis 100 is shown in FIGS. 2-6, however, it should be understood that the presently disclosed features of chassis 100 may be equally applicable to a mirror image of chassis 100 that is intended for use with a right foot.

[0043] As shown in FIGS. 2A and 2B, chassis 100 may be a plate-like structure configured to provide support, strength, stiffness, stability, and other structural properties to sole component 30. Chassis 100 may include a lateral side 102 and a medial side 104. As shown in Fig. 2A, lateral side 102 and medial side 104 may be opposing sides of chassis 100. In addition, chassis 100 may include a top surface 106 and a longitudinal axis 108. As shown in Fig. 2B, chassis 100 may include a bottom surface 109. Additional details of chassis 100 and other components of footwear 10 are discussed in greater detail below.

<u>Reinforcing Rib</u>

[0044] In some embodiments, the sole structure according to the disclosed embodiments may include features configured to provide rigidity, strength, and/or support to various aspects of the sole structure without substantially adding weight. For example, some exemplary sole structure embodiments may include a plate-like chassis having features configured to provide increased stiffness. The chassis may be configured to provide support to a ground-engaging sole component fixedly attached to the chassis. The chassis may include certain features that provide resistance to vertical bending, lateral bending, and/or torsion. In some embodiments, a reinforcing rib may be provided longitudinally along the chassis. In some embodiments, the reinforcing rib may include a hollow structure, and thus, may provide rigidity without adding substantial amounts of extra material, and therefore maintains a low weight.

[0045] As shown in FIGS. 2A and 2B, chassis 100 may include a reinforcing rib 110 disposed longitudinally and having a length along longitudinal axis 108. Rib 110 may have a rearward end 112, which may be disposed proximate heel region 20 of chassis 100, a central portion 113, and a forward end 114, which may be disposed proximate midfoot region 18, forefoot region 16, or near a transition between midfoot region 18 and forefoot region 16. Thus, rib 110 may longitudinally extend substantially through midfoot region 18 of chassis 100, to a forward end 114 of rib 110 and, in some embodiments, rib 110 may extend into forefoot region 16.

[0046] In some embodiments, as shown in the accompanying figures, the lateral width of rib 110 may span a substantial majority of the lateral width of chassis 100 over a substantial majority of the length of rib 110. In addition, in some embodiments, the lateral width of rib 110 at forward end 114 and rearward end 112 is less than or equal to the lateral width of rib 110 at any point between rearward end 112 and forward end 114.

[0047] According to some embodiments, an exemplary reinforcing rib may include, not only features that provide support and stiffness (e.g., resistance to bending and torsion), but also features that provide gradual transition between stiffened portions of the chassis and portions of the chassis that are desired to remain flexible. For example, in some embodiments, certain aspects of the rib may taper in size in one or more dimensions.

[0048] In some embodiments, rib 110, may have a lateral width that tapers toward rearward end 112 and/or forward end 114, as shown in FIGS. 2A and 2B. This tapering may provide for a more gradual transition between the rigidity provided by rib 110 and the greater flexibility of the portions of chassis 100 through which rib 110 does not extend. Similarly, as discussed in greater detail below with respect to FIG. 4, the vertical height of rib 110 may taper toward rearward end 112 and forward end 114. As shown in FIGS. 2A and 2B, the lateral width of rib 110 may taper completely. For example, either or both of rearward end 112 and forward end 114 may terminate with a rounded shape, as shown in FIGS. 2A and 2B. Alternatively, rearward and/or forward ends 112, 114 may terminate with a more linear taper (e.g., coming to a point). As yet another alternative, rearward and/or forward ends 112, 114 may terminate with a partial taper.

[0049] In some embodiments, rib 110 may be a substantially hollow structure including a longitudinally elongate cavity 116 formed in chassis 100. In addition, rib 110 may include reinforcing structure within cavity 116. In some embodiments, the reinforcing structure may include a plurality of partition members 118, which may provide cross-bracing support. As shown in FIG. 2A, the reinforcing structure may include a plurality of partition members 120 arranged in a crisscross pattern. In addition, in some embodiments, the reinforcing structure may further include a central partition member 122 arranged longitudinally and bisecting partition members 120 that are arranged in a crisscross pattern. Partition members 118 may provide not only added resistance to bending forces, but also significant resistance to torsional forces.

[0050] In some embodiments, partition members 118 may be formed simultaneously with other portions of chassis 100 (for example in the same injection molding process). In other embodiments, partition members 118 may be injection molded into cavity 116 in a preformed chassis plate. In still other embodiments, partition members 118 may be formed separately and bonded into cavity 116. In such embodiments, partition members 118 may be separately injection molded. In other such embodiments, partition members 118 may be formed by other processes, such as carbon-fiber layup and curing, to form a preformed structure, which may be bonded into cavity 116 or fastened within cavity 116 using an alternative process.

[0051] FIG. 3 is an exploded view of chassis 100 and sole component 30. When sole structure 12 is assembled, chassis 100 may reside within a recess 123 in sole component 30. (*See* FIG. 10.) In some embodiments, chassis 100 may be formed from injection molding. In other embodiments, chassis 100 may be formed from other processes, such as compression molding, carbon-fiber layup and molding, and/or any other suitable processes. Sole component 30 may be formed using any suitable process, such as molding (for example injection molding) or other suitable processes.

[0052] In some embodiments, chassis 100 and sole component 30 may both be formed separately, and then joined together, for example, by welding, adhesive, and/or other techniques. In other embodiments, chassis 100 may be formed first, and then placed within a mold, and sole component 30 may be molded around chassis 100, effectively welding the two components together in the process. Alternatively, sole component 30 may be formed first and placed within a mold. Then, chassis 100 may be injection molded into the preformed sole component 30.

[0053] In some cases, one or more preformed ground engaging members (for example, cleat studs) may be inserted into a mold, and sole component 30 may be formed by, for example, injection molding of material into the mold to thus join with the preformed ground engaging members in the mold. In some embodiments, a sole component 30 formed in this manner may be subsequently bonded to a preformed version of chassis 100 in a separate process. In other embodiments, sole component 30 may be co-molded with chassis 100 as described above. In such a process, both a preformed chassis 100 and preformed ground engaging members may be inserted into a mold configured to form the assembly of sole component 30 and chassis 100. Alternatively, the assembly of sole component 30 and chassis 100 may be formed by any other suitable process.

[0054] In some embodiments, an exemplary chassis may include features that provide comfort. For example, in some embodiments, the chassis may have a substantially flat top surface. Therefore, the top portions of various elements may sit flush with the top surface of the chassis. Further, the chassis may have some degree of curvature in various areas to accommodate the natural curvatures of the foot.

[0055] As shown in FIG. 3 (and also in FIG. 12), in some embodiments, top portions 124 of the reinforcing structure (e.g., partition members 118) may be flush with top surface 106 of chassis 100. This may maintain a relatively flat, consistent surface upon which the footbed of footwear 10 (e.g., insole 26, midsole 28, and/or a bottom portion of upper 14) may rest. In other embodiments, the reinforcing structure may have an alternative configuration.

[0056] As also shown in FIG. 3, sole component 30 may include one or more through holes 125. In some embodiments, through holes 125 in sole component 30 may be filled in with portions of chassis 30 when assembled. In other embodiments, chassis 30 may reside at least partially above through holes 125 (*see, e.g.*, FIG. 9), thus leaving through holes 125 as open areas. This may provide weight reduction.

[0057] FIG. 4 is a lateral side view of chassis 100. As shown in FIG. 4, chassis 100 may be a substantially planar structure, with a slight upward curvature at its periphery in conformity with the contours of the sole of a foot. In addition, bottom surface 109 of chassis 100 may be upwardly curved in midfoot region 18 to accommodate the concavity of the arch of a foot. As shown in FIG. 4, rib 110 may project downward from a laterally central portion of chassis 100. In some embodiments, rib 110 may project through one of through holes 125 in sole component 30 (*see, e.g.*, FIG. 11). A bottom-most crest 126 of rib 110 may have a substantially flat lateral profile, as shown in FIG. 4, thereby providing for a deeper portion of rib 110 in a longitudinally central portion 111 of rib 110, e.g., at a longitudinally central portion of midfoot region 18, than at rearward end 112 or forward end 114 of rib 110. Thus, the depth of rib 110 may taper toward rearward end 112 and forward end 114, providing for a gradual transition between stiffness and flexibility of different regions of chassis 100 and, consequently, sole structure 12. Enlarged views 127 and 129 are provided in FIG. 4 to illustrate the variation in cross-sectional shape of chassis 100 at different locations along the length of rib 110. The cross-sections shown in enlarged views 127, 129 will be discussed in greater detail below in conjunction with FIGS. 5 and 6.

[0058] FIG. 5 is a schematic, perspective, cut-away, cross-sectional view of chassis 100 taken at line 5-5 in FIG. 4. For purposes of simplifying the illustration, FIG. 5 does not show partition members 118 within cavity 116. In some embodiments, at at least one location along longitudinal axis 108, rib 110 may have a cross-sectional shape that is substantially trapezoidal, as shown in FIG. 5. For example, as shown in FIG. 5, rib 110 may include an angled, medial wall 128, and an angled, lateral wall 130. In addition, rib 110 may include a substantially horizontal lower wall 132, including a flattened lower surface (that is, crest 126). The cross-sectional shape of chassis 100 in the region of rib 110 may be selected to provide the desired performance characteristics. In the present example, medial wall 128 and lateral wall 130 may be angled to provide enhanced lateral and torsional rigidity, without unduly increasing vertical bending stiffness. The precise angles and dimensions of the cross-sectional shape of chassis 100 may be selected to achieve the desired properties. Therefore, various other trapezoidal configurations may be implemented. Further, other suitable cross-sectional shapes may be utilized to achieve the desired properties.

[0059] As discussed above, the lateral width of rib 110 may span a substantial majority of the lateral width of chassis 100 over a substantial majority of length of rib 110. As shown in FIG. 5, rib 110 may have a lateral width 500, which may approximate a lateral width 502 of chassis 100. Over a substantial majority of the length of rib 110, lateral width 500 of rib 110 may differ from lateral width 502 of chassis 100 by only a few millimeters. For example, the lateral width 500 of rib 110 may be at least 60% of the width of chassis 110 over approximately 50% or more of the length of rib 110. In some embodiments, lateral width 502 of chassis 100 may be no more than approximately 15 mm larger than the lateral width 500 of rib 110 over approximately 50% of the length of rib 110. In other embodiments, these relative dimensions may vary. In some embodiments, at the portion of chassis 100 corresponding approximately with line 5-5 in FIG. 4, lateral width 500 of rib 110 may be in the range of approximately 10-20mm, for example about 15mm, and lateral width 502 of chassis 100 may be in the range of approximately 20-30mm, for example about 25mm. Accordingly, a lateral width 503 of non-ribbed chassis portion may be in the range of approximately 2-10mm, for example about 5mm. Also, at line 5-5, an inner lateral width 504 of rib 110 may be in the range of approximately 10-20mm, for example about 14mm, and a lateral width 506 of crest 126 may be in the range of approximately 5-10mm, for example about 7mm. The foregoing dimensions may vary according to the desired characteristics of chassis 100.

[0060] As also discussed above, the height of rib 110 may taper toward rearward end 112 and forward end 114 of rib 110. In some embodiments, at the portion of chassis 100 corresponding approximately with line 5-5 in FIG. 4, rib 110 may have height 508, which may be in the range of approximately 3-10mm, for example about 5mm, and chassis 100, itself, may have an overall height 510, which may be in the range of approximately 5-12mm, for example about 7mm. Also, at the portion of chassis 100 corresponding approximately with line 5-5 in FIG. 4, cavity 116 of rib 110 may have an inner depth 512, which may be in the range of approximately 2-8mm, for example about 4mm. In addition, chassis 100 may have a thickness 514. At the portion of chassis 100 corresponding approximately with line 5-5 in FIG. 4, thickness 514 of chassis may be in the range of approximately 0.75-2.5mm, for example about 1.5mm. Due to the relatively thin wall thickness 514 of chassis 100, the differences between inner lateral width 504 and lateral width 506 of crest 126 may be relatively small. For similar reasons, the difference between height 508 of rib 110 and height 510 of chassis 100 may also be relatively small. The foregoing dimensions may vary according to the desired characteristics of chassis 100.

[0061] FIG. 6 is a schematic, perspective, cut-away, cross-sectional view of chassis 100 taken at line 6-6 in FIG. 4. As shown in FIG. 6, while the cross-sectional shape of chassis 100 and rib 110 at the portion of chassis 100 corresponding approximately with line 6-6 in FIG. 4 may be substantially similar the cross-sectional shape of chassis 100 and rib 110 at the portion of chassis 100 corresponding approximately with line 5-5 in FIG. 4, the dimensions of chassis 100 and/or rib 110 may differ to a certain extent. For example, where the cross-section at line 5-5 in FIG. 4 has a shallow and wide configuration, the cross-section at line 6-6 in FIG. 4 has a deeper rib configuration.

[0062] As discussed above, the lateral width of rib 110 may span a substantial majority of the lateral width of chassis 100 over a substantial majority of the length of rib 110. Therefore, as shown in FIG. 6, at the portion of chassis 100 corresponding approximately with line 6-6 in FIG. 4, rib 110 may have a lateral width 600, which may approximate a lateral width 602 of chassis 100. In some embodiments, at the portion of chassis 100 corresponding approximately with line 6-6 in FIG. 4, lateral width 600 of rib 110 may be in the range of approximately 10-20mm, for example about 15mm, and lateral width 602 of chassis 100 may be in the range of approximately 20-30mm, for example about 26mm. Accordingly, a lateral width 603 of non-ribbed chassis portion may be in the range of approximately 2-10mm, for example about 5mm. Also, at line 6-6, an inner lateral width 604 of rib 110 may be in the range of approximately 10-20mm, for example about 14mm, and a lateral width 606 of crest 126 may be in the range of approximately 5-10mm, for example about 7mm. The foregoing dimensions may vary according to the desired characteristics of chassis 100.

[0063] As also discussed above, the height of rib 110 may taper toward rearward end 112 and forward end 114 of rib 110. At the portion of chassis 100 corresponding approximately with line 6-6 in FIG. 4, the height of rib 110 may be near its maximum. In some embodiments, at the portion of chassis 100 corresponding approximately with line 6-6 in FIG. 4, rib 110 may have height 608, which may be in the range of approximately 5-15mm, for example about 8mm, and chassis 100, itself, may have an overall height 610, which may be in the range of approximately 6-18mm, for example about 9mm. Also, at the portion of chassis 100 corresponding approximately with line 6-6 in FIG. 4, cavity 116 of rib 110 may have an inner depth 612, which may be in the range of approximately 3-10mm, for example about 6mm. In addition, chassis 100 may have a thickness 614. At the portion of chassis 100 corresponding approximately with line 5-5 in FIG. 4, thickness 614 of chassis may be in the range of approximately 0.75-2.5mm, for example about 1.5mm. Due to the relatively thin wall thickness 614 of chassis 100, the differences between inner lateral width 604 and lateral width 606 of crest 126 may be relatively small. For similar reasons, the difference between height 608 of rib 110 and height 610 of chassis 100 may also be relatively small. The foregoing dimensions may vary according to the desired characteristics of chassis 100.

Chassis Projections

[0064] According to the disclosed embodiments, an exemplary chassis may provide support to a sole structure for an article of footwear where it is most effective, and may do so using a reduced amount of material and, accordingly, a lower weight. In addition, as discussed in greater detail below, the disclosed chassis configuration may also enable different portions of the sole structure to deflect on a more independent basis, which may allow the sole structure to conform to ground surface irregularities, keeping more of the ground-engaging sole component in contact with the ground surface, thereby maintaining traction and providing stability. In some embodiments, both reduced weight, and selective flexibility may be provided with, for example, independently bendable projections extending from a central portion of the chassis. In between the projections may be gaps, where material would otherwise be disposed. Thus, removal of this material reduces weight, while allowing the remaining portions of the chassis to deflect substantially independently of one another.

[0065] Returning again to FIG. 2A, chassis 100 may include a central portion 138 extending longitudinally, in a laterally central region of chassis 100, through at least a portion of forefoot region 16, midfoot region 18, and heel region 20. In addition, chassis 100 may include a plurality of chassis projections 140 extending laterally from central portion 138 of chassis 100, leaving a plurality of chassis gaps 142 between chassis projections 140. Chassis projections 140 may be selectively disposed at strategic locations in order to provide support to sole structure 12 in select areas. As shown in FIG. 2A, chassis 100 may include a narrow portion 144 between chassis projections 140.

[0066] Referring now to FIG. 7, which shows a lateral side view of chassis 100, narrow portion 144 may be, not only narrow, but also relatively thin in a vertical direction. The thin, narrow configuration of narrow portion 144 contributes to the flexibility of forefoot region 16 of chassis 100. As shown in FIG. 7, a front portion 146 of forefoot region 16 may be readily flexed in direction 148, while the remainder of chassis 100 remains substantially rigid and unflexed. The materials chosen for each portion of chassis 100 may have a significant effect on the relative flexibilities of each portion, as will be discussed in greater detail below. However, the disclosed configuration (that is, chassis projections 140) itself promotes independent flexibility of the regions of sole structure 12 corresponding with each of chassis projections 140.

[0067] Materials selection may significantly influence the performance characteristics of a chassis for an article of footwear. For example, the relative flexibility of the material selected for various portions of a chassis may contribute to the stiffness, strength, durability, comfort, and other structural characteristics that the chassis may provide to a sole structure and, ultimately, to an article of footwear. In some embodiments, more than one material may be utilized to form an exemplary chassis. The materials may have similar or very different attributes, and may be used to form different portions of the chassis accordingly. For example, in some embodiments, it may be desirable to provide a chassis that is relatively stiff in one area, and relatively flexible in another.

[0068] Chassis 100 may be formed of one or more suitable polymer, composite, and/or metal alloy materials. Exemplary such materials may include thermoplastic and thermoset polyurethane, polyester, nylon, polyether block amide, alloys of polyurethane and acrylonitrile butadiene styrene, carbon fiber, poly-paraphenylene terephthalamide (para-aramid fibers, e.g., Kevlar®), titanium alloys, and/or aluminum alloys. In some embodiments, one or more portions of chassis 100 may be formed of a composite material. For instance, in some embodiments, at least one portion of chassis 100 may be formed of a carbon-Kevlar® composite (for example a carbon fiber/Kevlar®). Still other suitable materials will be recognized by a skilled artisan.

[0069] In some embodiments, different materials may be selected for different portions of the chassis. For example, in some embodiments, a first portion of the chassis may be formed of a first material and a second portion of the chassis may be formed of a second material having a substantially different level of flexibility than the first material. In some embodiments, heel region 20 and/or midfoot region 18 may be formed of a first material, and forefoot region 16 may be formed of a second material that is substantially more flexible than the first material. Those having ordinary skill in the art will recognize other configurations regarding the placement of the materials having differing levels of flexibility.

[0070] Further, in some embodiments, at least one of chassis projections 140 may be made from two different materials. For example, as shown, e.g., in FIGS. 2A, 2B, and Fig. 7, front portion 146 of forefoot region 16 may be formed of a first, relatively flexible material, whereas, the remainder of chassis 100 may be formed of a second, more rigid material. Transition line 150 (in FIG. 2A), and transition line 152 (in FIG. 2B) indicate the transition between the two materials. In some embodiments, the material selected for front portion 146 may overlap at the junction with the material selected for the rest of chassis 100, as shown by the difference in location of transition line 150 on a top portion of chassis 100 (*see* FIG. 2A) and the location of transition line 152 on a bottom portion of chassis 100 (*see* FIG. 2B). Further, in some embodiments, a first material and a second material having a different level of flexibility than the first material may be incorporated into the same chassis projection 140. For example, as shown in Fig. 2B, middle chassis projections 154 may be positioned at a location corresponding with the ball of the foot and a first material may be disposed at a rearward portion of middle chassis projections 154 and a second material may be disposed at a forward portion of middle chassis projections 154.

In some embodiments, the second material is substantially more flexible than the first material.

[0071] FIG. 8 illustrates the substantial flexibility of forward chassis projections 156, 158. For example, as illustrated in FIG. 8, forward chassis projection 156, which may be laterally disposed in front portion 146 of forefoot region 16 of chassis 100, may be flexible, e.g., in an upward direction 160, or in a downward direction (not shown), and/or in a torsional movement. Similarly, forward chassis projection 158, which may be medially disposed in front portion 146 (associated with the location of a big toe), may be flexible, e.g., in an upward direction 162, a downward direction (not shown), and/or in a torsional movement. Outlines of chassis projections 156 and 158 in an unflexed configuration are shown in phantom in FIG. 8.

Sole Component-Chassis Assembly

[0072] According to some embodiments, an exemplary chassis may be assembled, and work in conjunction, with other components of a sole structure. An exemplary chassis may provide strength, support, rigidity, flexibility, and other performance attributes to a ground-engaging sole component. In some embodiments, certain portions of the chassis may correspond with certain portions of the ground-engaging sole component. In some cases the certain portions of the chassis may provide certain characteristics to the corresponding portions of the sole component. Further, in some cases, the corresponding portions may work in harmony with one another to provide the sole structure and, ultimately the article of footwear with desired performance characteristics.

[0073] In addition, an exemplary disclosed ground-engaging sole component may include features to provide traction/grip in one or more directions. In some embodiments, sole component may include one or more ground-engaging members (e.g., cleats). Ground-engaging members may have any of a variety of shapes and forms. In addition, ground-engaging members may be disposed on the sole component at various locations. The shape, size, material, and placement of ground-engaging members may be selected to provide traction according to an anticipated set of conditions in which the article of footwear will be used. Factors considered when configuring ground-engaging members may include, for example, the ground surface on which the activity will take place, the nature of the activity, the size of the athlete, and/or other parameters.

[0074] FIG. 9 is a bottom view of an assembly 900 of sole component 30 and chassis 100. FIG. 10 is a top view of assembly 900. Sole component 30 may be formed of suitable materials for achieving the desired performance attributes. Sole component may be formed of any suitable polymer, composite, and/or metal alloy materials. Exemplary such materials may include thermoplastic and thermoset polyurethane, polyester, nylon, polyether block amide, alloys of polyurethane and acrylonitrile butadiene styrene, carbon fiber, poly-paraphenylene terephthalamide (para-aramid fibers, e.g., Kevlar®), titanium alloys, and/or aluminum alloys. Other suitable materials will be recognized by those having skill in the art.

[0075] As shown in FIGS. 1, 3, and 9, sole component 30 may include a ground-engaging lower surface 902. For example, lower surface 902 of sole component 30 may include a plurality of ground-engaging members 904. One or more of ground-engaging members 904 may be respectively associated with one or more of chassis projections 140. For example, comparison of FIG. 9 with FIG. 2B will illustrate that the location of each of ground-engaging members 904 shown in FIG. 9, approximately coincides with one of chassis projections 140 shown in FIG. 2B.

[0076] It will be understood that any type of ground-engaging members could be used with sole structure 12. In some cases, ground-engaging members 904 could be configured to engage a soft ground surface. For example, in one embodiment, ground-engaging members 904 be configured to engage a soft grass surface. In other cases, ground-engaging members 904 could be configured to engage a hard surface. For example, in one embodiment ground-engaging members 904 could be configured to engage a hard grass surface or artificial turf.

In still other embodiments, any other types of ground-engaging members could be used.

[0077] Although the current embodiment includes ground-engaging members that are mounted to portions of an outer member, in other embodiments ground-engaging members could be mounted directly to a reinforcing plate. For example, in some embodiments, one or more ground-engaging members could be mounted directly to a chassis projection of a chassis. In some such embodiments, the sole structure may not include a separate outer member (sole component).

[0078] In addition to ground-engaging members 904, sole component 30 may include one or more secondary traction elements. For example, sole component 30 may include a central cleat member 906. Central cleat member 906 may be disposed in a central region of sole component 30 corresponding with the ball of the foot. In some embodiments, central cleat member 906 may be of a shorter vertical height than ground-engaging members 904. Also, in some embodiments, sole component 30 may include one or more textured surfaces 908. In some embodiments, textured surfaces 908 may include, for example, a plurality of short, peaked ground-engaging members, as shown in the accompanying figures (see, e.g., FIG. 12). Other textures may also be used.

[0079] Sole component 30 may also include other types of secondary traction elements. For example, in some embodiments, sole component 30 may include one or more support members 170 configured to provide support to ground-engaging members 904. While support members 170 may provide support to ground-engaging members 904, support members 170 may also provide additional traction/grip. Support members 170 may have any shape and/or configuration, including any of the various embodiments disclosed in co-pending U.S. Application Serial No. 13/234,180, filed on September 16, 2011, entitled “Shaped Support Features for Footwear Ground-Engaging Members,” U.S. Application Serial No. 13/234,182, filed on September 16, 2011, entitled “Orientations for Footwear Ground-Engaging Member Support Features,” U.S. Application Serial No. 13/234,183, filed on September 16, 2011, entitled “Spacing for Footwear Ground-Engaging Member Support Features," and U.S. Application Serial No. 13/234,185, filed on September 16, 2011, entitled "Sole Arrangement with Ground-Engaging Member Support Features," each of which is hereby incorporated by reference in its entirety.

[0080] According to some embodiments, portions of assembly 900 may be configured to deflect to allow movement of individual ground-engaging members 904. For example, in some embodiments, an exemplary sole structure may be configured to allow each of the ground-engaging members and the chassis projection with which it is associated to deflect substantially independently from the other ground-engaging members and other chassis projections respectively associated therewith.

[0081] While the rigidity of assembly 900 may be greater than that of either sole component 30 or chassis 100 as separate units, sole component 30 may include features that, even when the components are assembled together, allow assembly 900 to retain flexibility in certain areas. For example, like chassis 100, as shown in Fig. 9, sole component 30 may include gaps 912, and a laterally narrow midfoot region 914, leaving sole component projections 116, the location of which corresponds approximately with middle chassis projections 154. In addition, through hole 125 at a forefoot region of sole component 30 also reduces the amount of material between gaps 912.

[0082] Due at least in part to the reduced amount of material between gaps 912 in assembly 900, a forward portion 918 of the forefoot region of assembly 900 may be configured to readily deflect under loads. For example, as shown in FIG. 11, forward portion 918 may deflect upward in a direction 1100. Alternatively or additionally, forward portion 918 may be configured to deflect downward in an opposite direction, and/or undergo a torsional movement.

[0083] In addition to allowing the entirety of forward portion 918 to deflect, assembly 900 may also include provisions to enable a medial section 919 and a lateral section 920 sections of forward portion 918 including a forward medial ground-engaging member 921 and a forward lateral ground-engaging member 922 to deflect individually. For example, sole component 30 may include a hinge element 924, disposed separating medial section 919 and lateral section 920. Hinge element 924 may function similar to a “living hinge,” by having a reduced thickness, thus allowing medial section 919 and lateral section 920 to bend with respect to one another at the joint formed by hinge element 924. The material of assembly 900 in the area between ground-engaging members 921 and 922 is further reduced by through hole 125 in sole component 30. These features of sole component 30, in conjunction with the separate forward chassis projections 156 and 158 of chassis 100, enable medial section 919 and a lateral section 920 of forward portion 918 on which ground-engaging members 921 and 922 are disposed to deflect individually. For example, as shown in FIG. 12, upon loading, medial section 919 may undergo a deflection in an upward direction 926. Similarly, lateral section 920 may undergo a deflection in an upward direction 928. Alternatively, or additionally, sections 919 and 920 may undergo an opposite, that is, downward deflection.

[0084] By providing chassis projections portions associated with ground-engaging members that can bend and/or twist, a sole structure can be configured to provide increased ground contact on irregular ground surfaces. In particular, chassis projections associated with the ball of the foot and forward chassis projections, associated with a front portion of the forefoot region can deflect in a manner that accommodates the natural motion of the foot while providing substantially consistent ground contact. Thus, sections of assembly 900 may deflect individually according to ground surface irregularities. For example sections of assembly 900 may deflect upwardly (e.g., when stepping on a rock), downwardly (when stepping in a hole in ground surface 1302), and/or may twist to accommodate ground surface irregularities that are not engaged squarely with a ground-engaging member. This adaptive attribute may facilitate athlete 904 maintaining good balance and consistent traction.

[0085] FIG. 13 illustrates an embodiment of chassis 100 incorporated into footwear 10 having a plurality of ground-engaging members 904 worn on the foot of an athlete 1300. As illustrated, chassis 100 may be configured to adapt to an uneven ground surface 1302 as athlete 1300 steps down with his foot. As shown in FIG. 11, a rock 1304 may be disposed beneath a portion of the athlete's foot. Footwear 10 may be configured to deflect independently at one or more regions in order to accommodate rock 1304, while allowing the remaining ground-engaging members to maintain consistent ground contact. For example, as shown in FIG. 13, medial section of forward portion 918 of assembly 900 may deflect upon engaging rock 1304, while the remainder of ground engaging members 904 remain engaged with ground surface 1302.

[0086] According to some embodiments, a sole structure may include provisions for strengthening ground-engaging members. In some embodiments, a chassis may include features that enhance the strength of ground-engaging members, without adding a significant amount of weight. For example, in some embodiments, a chassis may include recesses on a top side and corresponding protrusions on the bottom side. A mating sole component may include corresponding recesses above ground-engaging members. This assembly may enable ground-engaging members with a shorter root structure (that is, the non-exposed portion of the ground-engaging member) to be formed, without sacrificing strength. This type of feature may be employed with any of a variety of ground-engaging elements that protrude from a sole.

[0087] Referring again to FIG. 3, chassis 100 may include one or more recesses 164 on top surface 106. Recesses 164 may be positioned at locations that, when assembled with sole component 30, will reside above one or more of ground-engaging members 904. In some embodiments, one or more of recesses 164 may be substantially round. In other embodiments, recesses 164 may have other shapes that generally correspond with the size and/or shape of the ground-engaging members with which they are associated. The inner surface of recesses 164 may have a spherical (e.g., bowl-shaped) contour. In some embodiments, the thickness of chassis 100 in recesses 164 may remain consistent with the areas of chassis 100 surrounding the recesses. For example, in some embodiments, chassis 100 may project downward from bottom surface 109 of chassis 100, creating bulges 166 opposite recesses 164. (*See* FIG. 2B.) Sole component 30 may include corresponding recesses 930, which may accommodate bulges 166 when sole component 30 and chassis 100 are assembled to form assembly 900.

[0088] In addition, in some embodiments, one or more of recesses 164 may include a tapering channel 168. Channels 168 may be positioned at locations that, when chassis 100 is assembled with sole component 30, will reside above one or more of support members 910. In some embodiments, tapering channels 168 may have a triangular cross-sectional shape, as shown in FIG. 3. This shape corresponds with the elongated and sloped structure of support members 910. In other embodiments, channels 168 may have any suitable shape that generally correspond with the size and/or shape of the support members with which they are associated. In some embodiments channels 168 may not be tapered. As with recesses 164, chassis 100 may include protrusions 170 on bottom side 109 of chassis 100 opposite channels 168, in order to maintain the thickness of chassis 100. Further, sole component 30 may include tapering channels 932

[0089] FIG. 14 illustrates an alternative embodiment of certain sole structure components, including an assembly 1400. As shown in FIG. 14, assembly 1400 may include a chassis 1402 having a reinforcing rib 1404 and a plurality of chassis projections 1405. Assembly 1400 may further include a plurality of sole components 1406, which may include a plurality of ground-engaging members 1408 extending therefrom. Sole components 1406 may include one or more support members 1410. The features of assembly 1400 may function substantially similarly to corresponding features of assembly 900.

[0090] While various embodiments have been described, the description is intended to be exemplary, rather than limiting and it will be apparent to those in the art that many more embodiments and implementations are possible that are within the scope of the current embodiments. Accordingly, the current embodiments are not to be restricted except in light of the attached claims and their equivalents. Features described in one embodiment may or may not be included in other embodiments described herein. Also, various modifications and changes may be made within the scope of the attached claims.

WHAT IS CLAIMED IS:

1. An article of footwear, comprising:

an upper configured to receive a foot; and

a sole structure fixedly attached to the upper and including a sole component having a ground-engaging lower surface, the sole structure further including a chassis configured to provide support to the sole component, wherein the chassis includes a forefoot region, a midfoot region, a heel region, a lateral width, and a reinforcing rib disposed longitudinally and having a longitudinal length and a lateral width;

wherein the reinforcing rib includes a rearward end disposed proximate the heel region of the chassis, the reinforcing rib longitudinally extending substantially through the midfoot region of the chassis to a forward end of the reinforcing rib;

wherein, over a substantial majority of the length of the reinforcing rib, the lateral width of the reinforcing rib spans a substantial majority of the lateral width of the chassis; and

wherein the lateral width of the reinforcing rib at the forward end and the rearward end is less than or equal to the lateral width of the reinforcing rib at any point between the rearward end and the forward end.

2. The article of footwear according to claim 1, wherein the reinforcing rib is a substantially hollow structure including a longitudinally elongate cavity formed in the chassis.

3. The article of footwear according to claim 2, wherein at at least one location along the longitudinal axis, the reinforcing rib has a cross-sectional shape that is substantially trapezoidal.

4. The article of footwear according to claim 2, wherein the reinforcing rib includes reinforcing structure within the cavity.

5. The article of footwear according to claim 4, wherein the reinforcing structure includes a plurality of partition members arranged in a crisscross pattern.

6. The article of footwear according to claim 5, wherein the reinforcing structure further includes a longitudinally-disposed central partition member bisecting the partition members arranged in a crisscross pattern.

7. The article of footwear according to claim 4, wherein top portions of the reinforcing structure are flush with top portions of the chassis.

8. The article of footwear according to claim 1, wherein the sole component includes a plurality of ground-engaging members, wherein one or more of the ground-engaging members are respectively associated with one or more chassis projections extending laterally from a central portion of the chassis.

9. The article of footwear according to claim 8, wherein the sole structure is configured to allow each of the ground-engaging members and the chassis projection with which it is associated to deflect substantially independently from the other ground-engaging members and associated chassis projections.

10. The article of footwear according to claim 8, wherein the chassis includes at least one recess on a top surface thereof at a location above one of the plurality of ground-engaging members.

11. The article of footwear according to claim 10, wherein the at least one recess is substantially round.

12. The article of footwear according to claim 10, wherein the at least one recess includes a tapering channel with a triangular cross-sectional shape disposed above a support member adjacent one of the plurality of ground-engaging members.

13. An article of footwear, comprising:

an upper configured to receive a foot; and

a sole structure fixedly attached to the upper and including a sole component having a ground-engaging lower surface, the sole structure further including a chassis configured to provide support to the sole component, wherein the chassis includes a forefoot region, a midfoot region, a heel region, a lateral width, and a central portion extending through at least a portion of the forefoot region, the midfoot region, and the heel region, the chassis further including a plurality of chassis projections extending laterally from the central portion of the chassis;

wherein at least one of the chassis projections is made from a first material and a second material having a substantially different level of flexibility than the first material.

14. The article of footwear according to claim 13, wherein the at least one chassis projection is disposed in the forefoot region at a location corresponding with the ball of the foot.

15. The article of footwear according to claim 14, wherein the first material is disposed at a rearward portion of the at least one chassis projection and the second material is disposed at a forward portion of the at least one chassis projection and is substantially more flexible than the first material.

16. The article of footwear according to claim 13, wherein the sole component includes a plurality of ground-engaging members, wherein one or more of the ground-engaging members are respectively associated with one or more of the chassis projections.

17. The article of footwear according to claim 16, wherein the sole structure is configured to allow each of the ground-engaging members and the chassis projection with which it is associated to deflect substantially independently from the other ground-engaging members and chassis projections respectively associated therewith.

18. The article of footwear according to claim 16, wherein the chassis includes at least one recess on a top surface thereof at a location above one of the plurality of ground-engaging members.

19. The article of footwear according to claim 18, wherein the at least one recess is substantially round.

20. The article of footwear according to claim 18, wherein the at least one recess includes a tapering channel with a triangular cross-sectional shape disposed above a support member adjacent one of the plurality of ground-engaging members.

21. An article of footwear, comprising:

an upper configured to receive a foot; and

a sole structure fixedly attached to the upper and including a sole component having a ground-engaging lower surface, the sole structure further including a chassis configured to provide support to the sole component, wherein the chassis includes a forefoot region, a midfoot region, a heel region, a lateral width, and a central portion extending through at least a portion of the forefoot region, the midfoot region, and the heel region; the chassis further including a plurality of chassis projections extending laterally from the central portion of the chassis; a reinforcing rib disposed longitudinally and having a longitudinal length and a lateral width; and one or more chassis projections extending from the central portion of the chassis;

wherein the reinforcing rib includes a rearward end disposed proximate the heel region of the chassis, the reinforcing rib longitudinally extending substantially through the midfoot region of the chassis to a forward end of the reinforcing rib;

wherein, over a substantial majority of the length of the reinforcing rib, the lateral width of the reinforcing rib spans a substantial majority of the lateral width of the chassis;

wherein the lateral width of the reinforcing rib at the forward end and the rearward end is less than or equal to the lateral width of the reinforcing rib at any point between the rearward end and the forward end; and

wherein a first portion of the chassis is formed of a first material and a second portion of the chassis is formed of a second material having a substantially different level of flexibility than the first material.

22. The article of footwear according to claim 21, wherein the first portion of the chassis includes the heel region or the midfoot region and the second portion includes the forefoot region, and wherein the second material in the second portion is substantially more flexible than the first material in the first portion.

23. The article of footwear according to claim 21, wherein the sole component includes a plurality of ground-engaging members, wherein one or more of the ground-engaging members are respectively associated with one or more of the one or more chassis projections.

24. The article of footwear according to claim 23, wherein the sole structure is configured to allow each of the ground-engaging members and the chassis projection with which it is associated to deflect substantially independently from the other ground-engaging members and associated chassis projections.

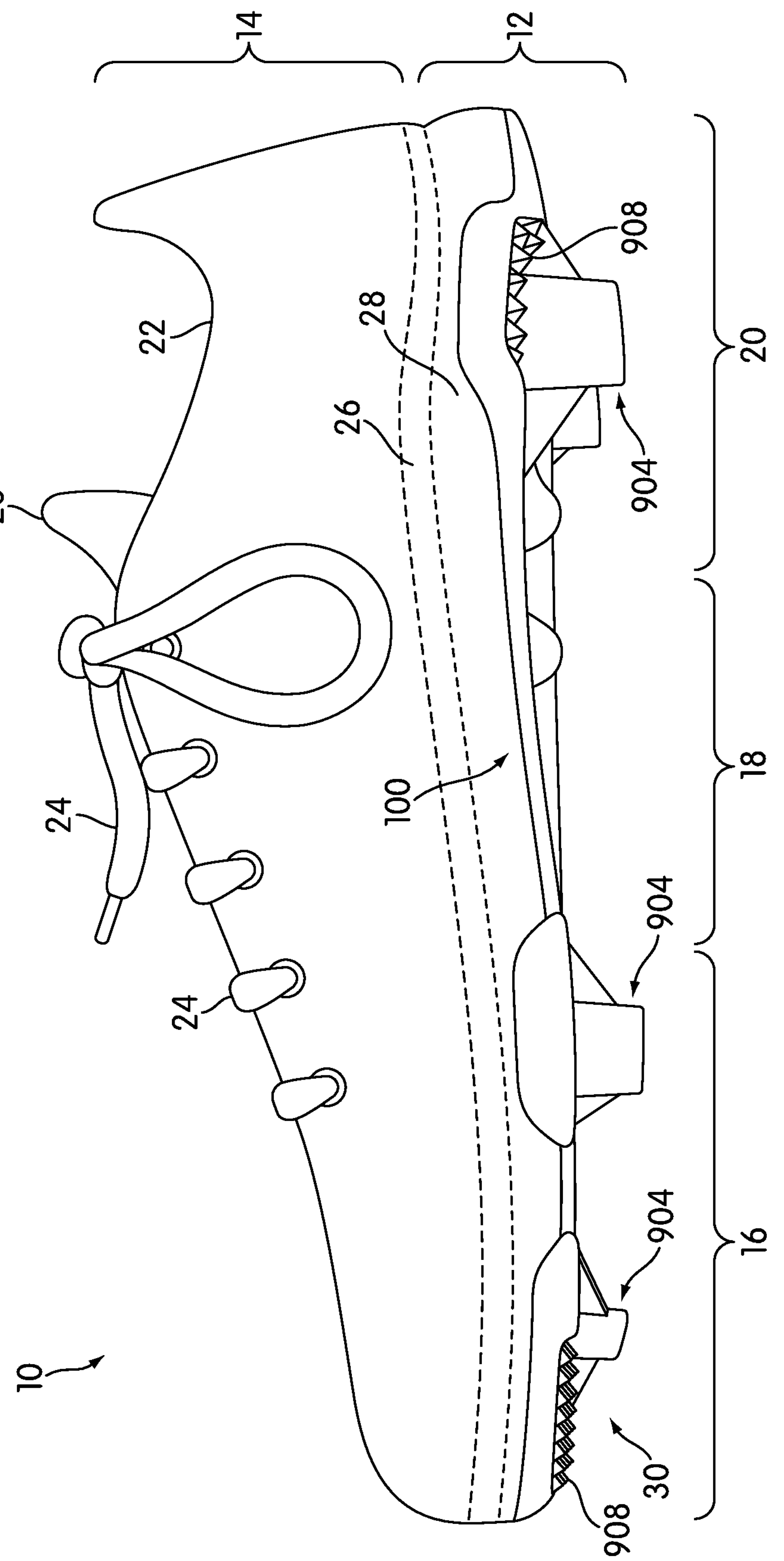

FIG. 1

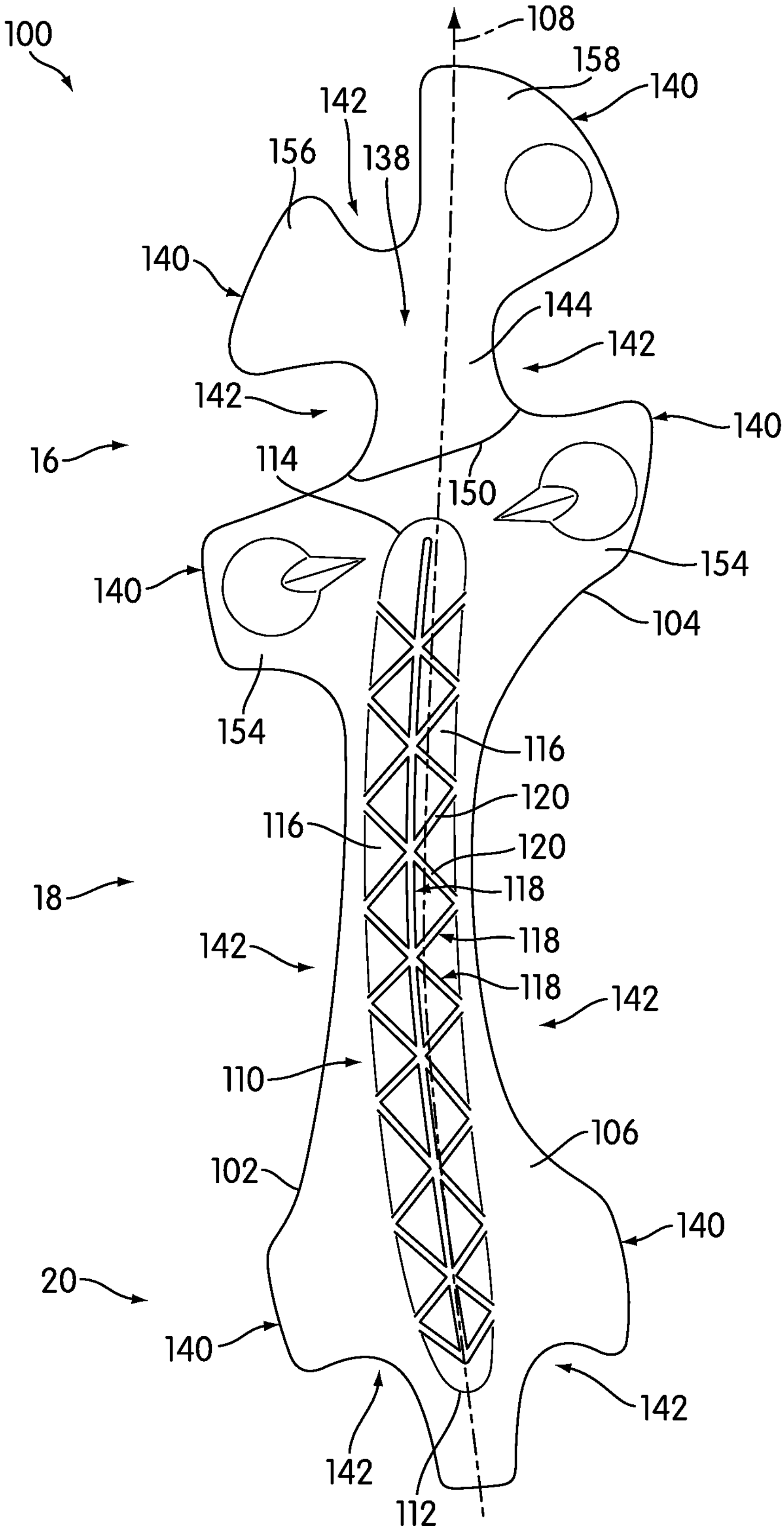
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FIG. 2A

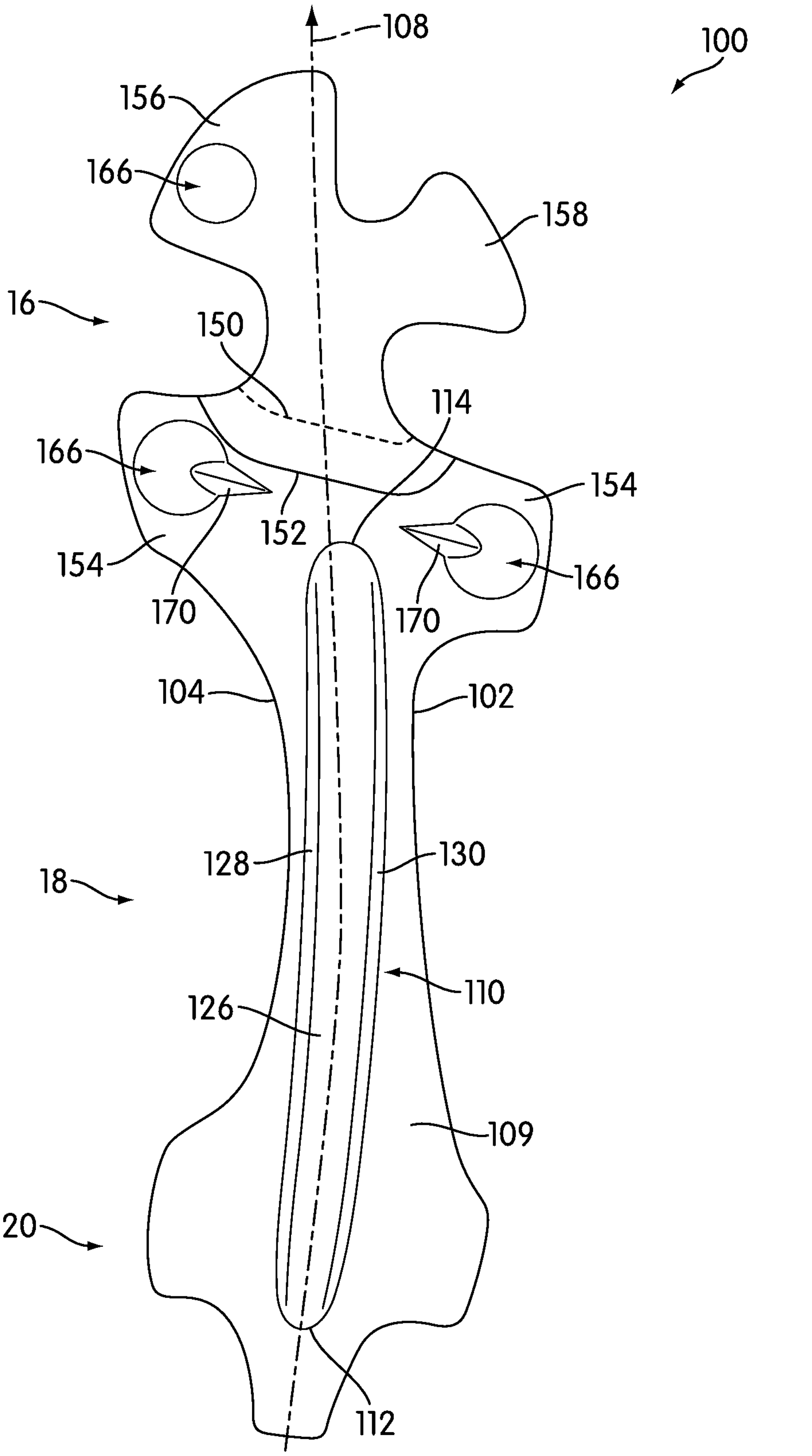
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FIG. 2B

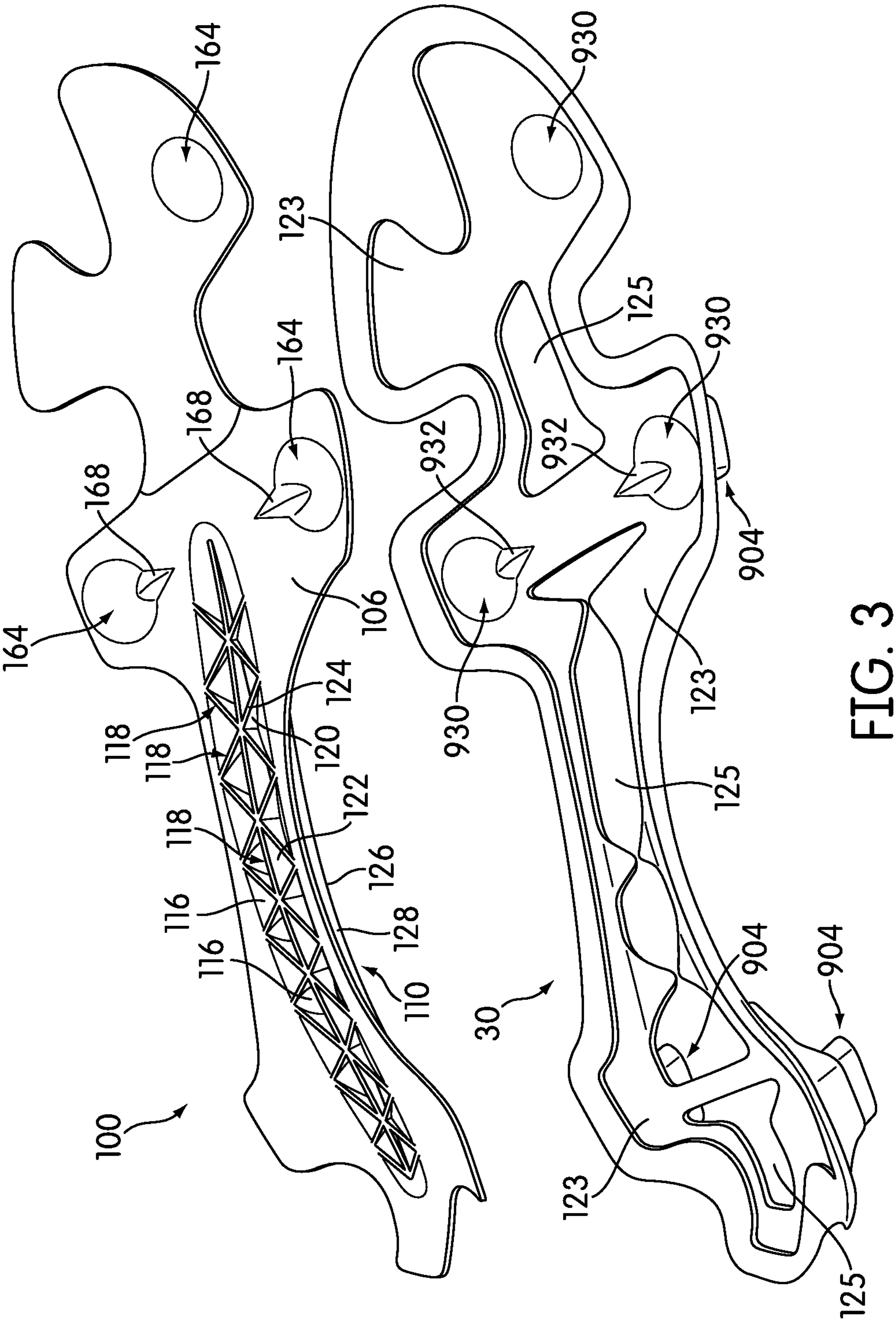
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FIG. 3

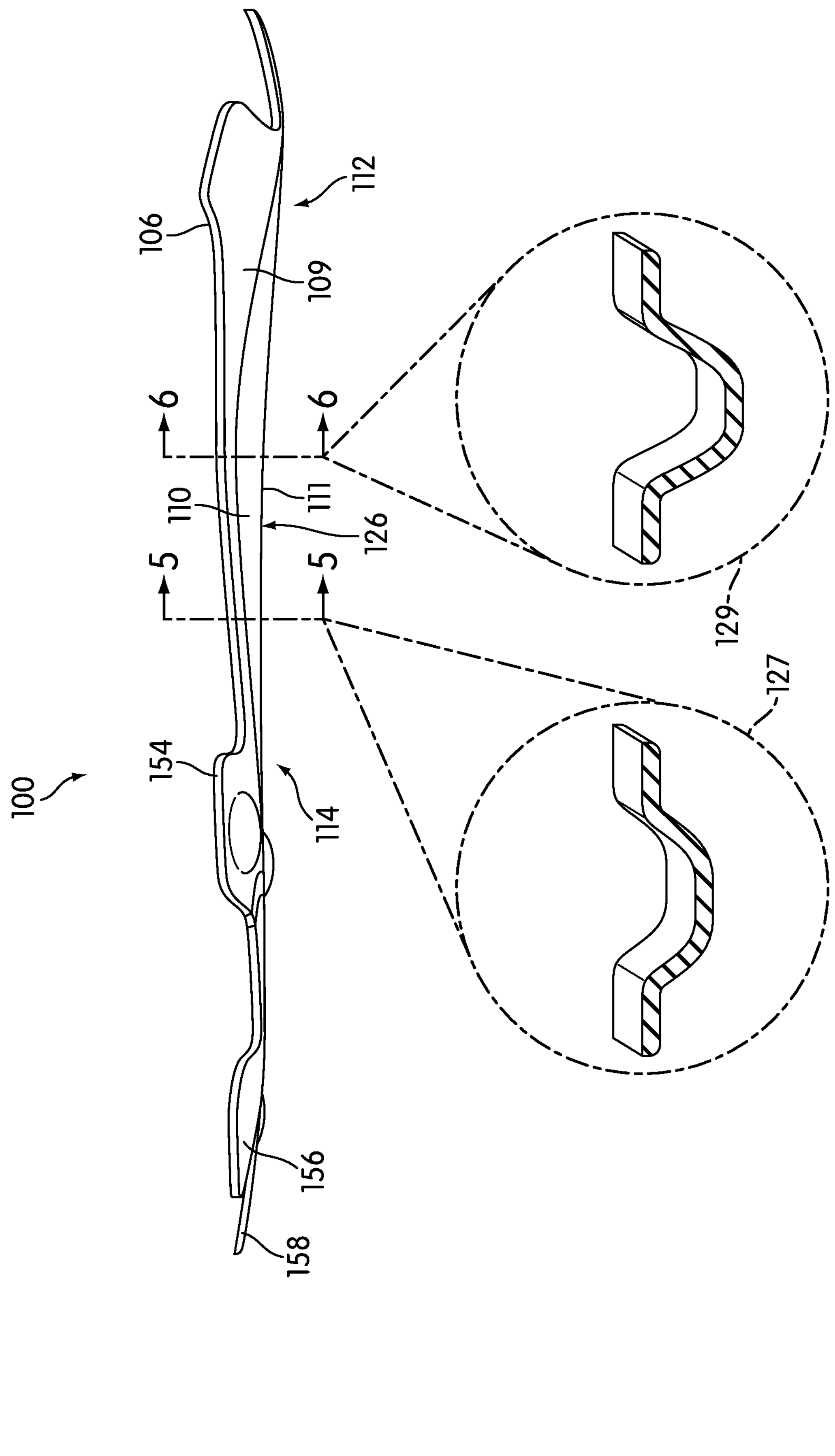

FIG. 4

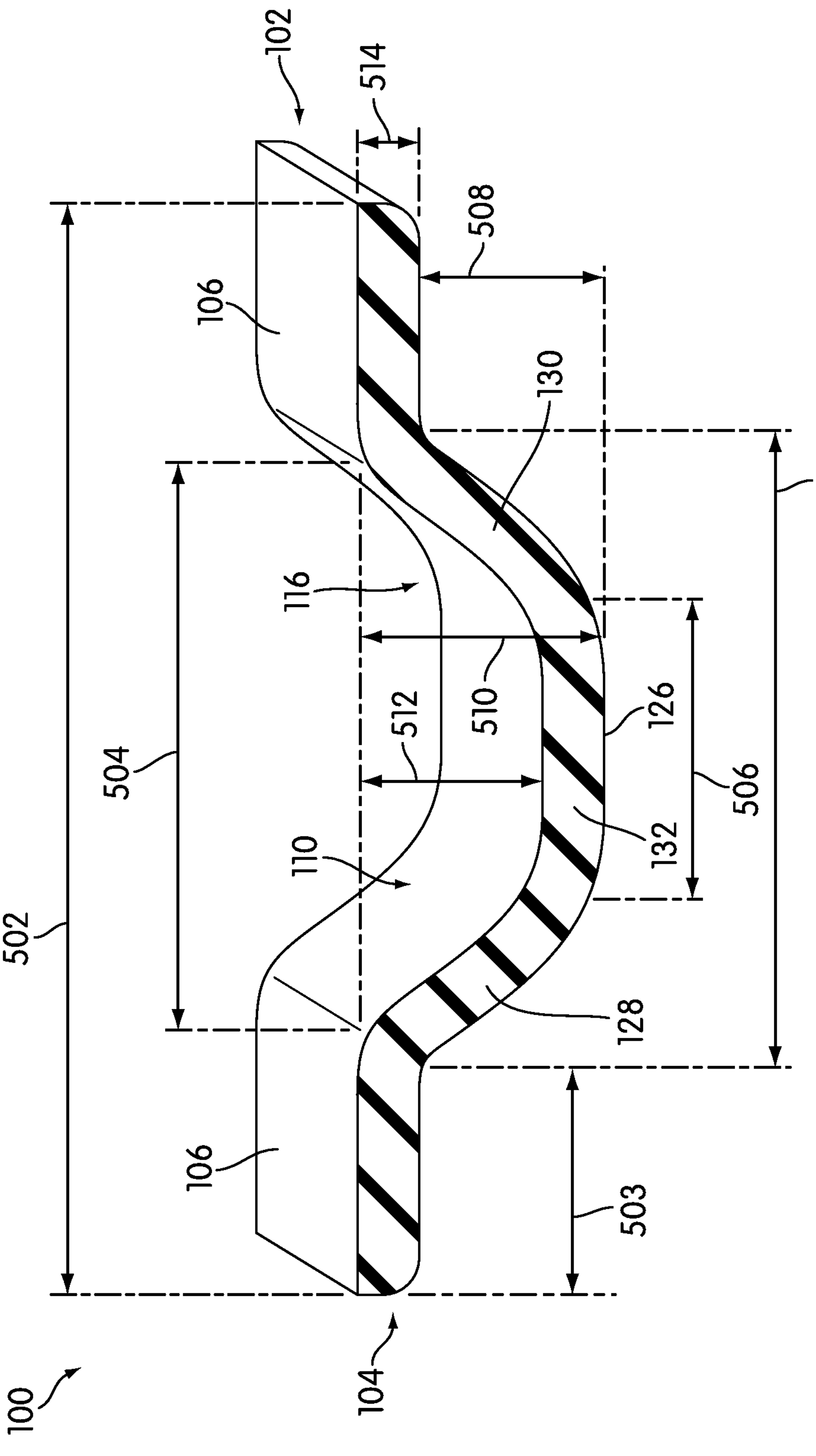
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FIG. 5

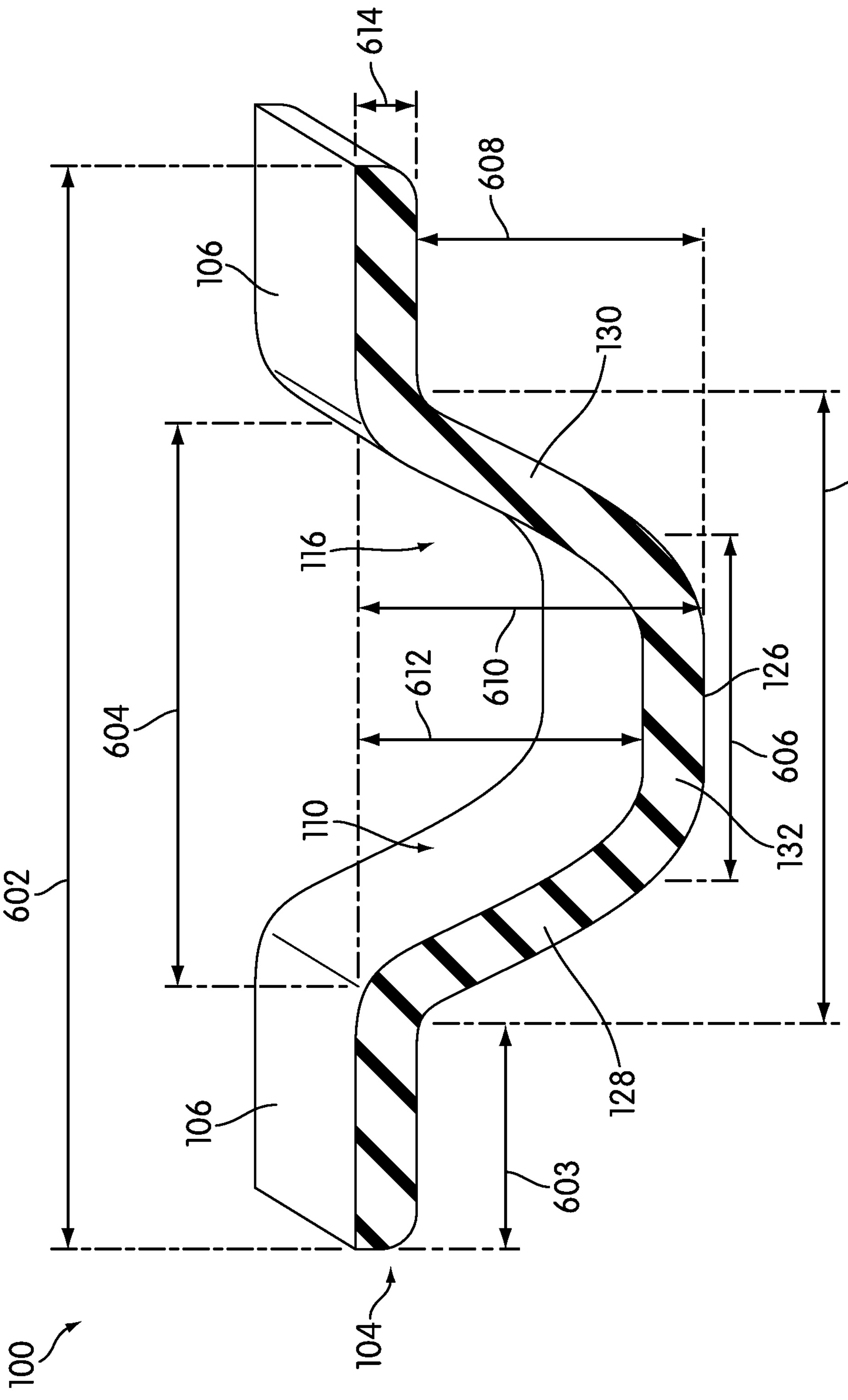
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FIG. 6

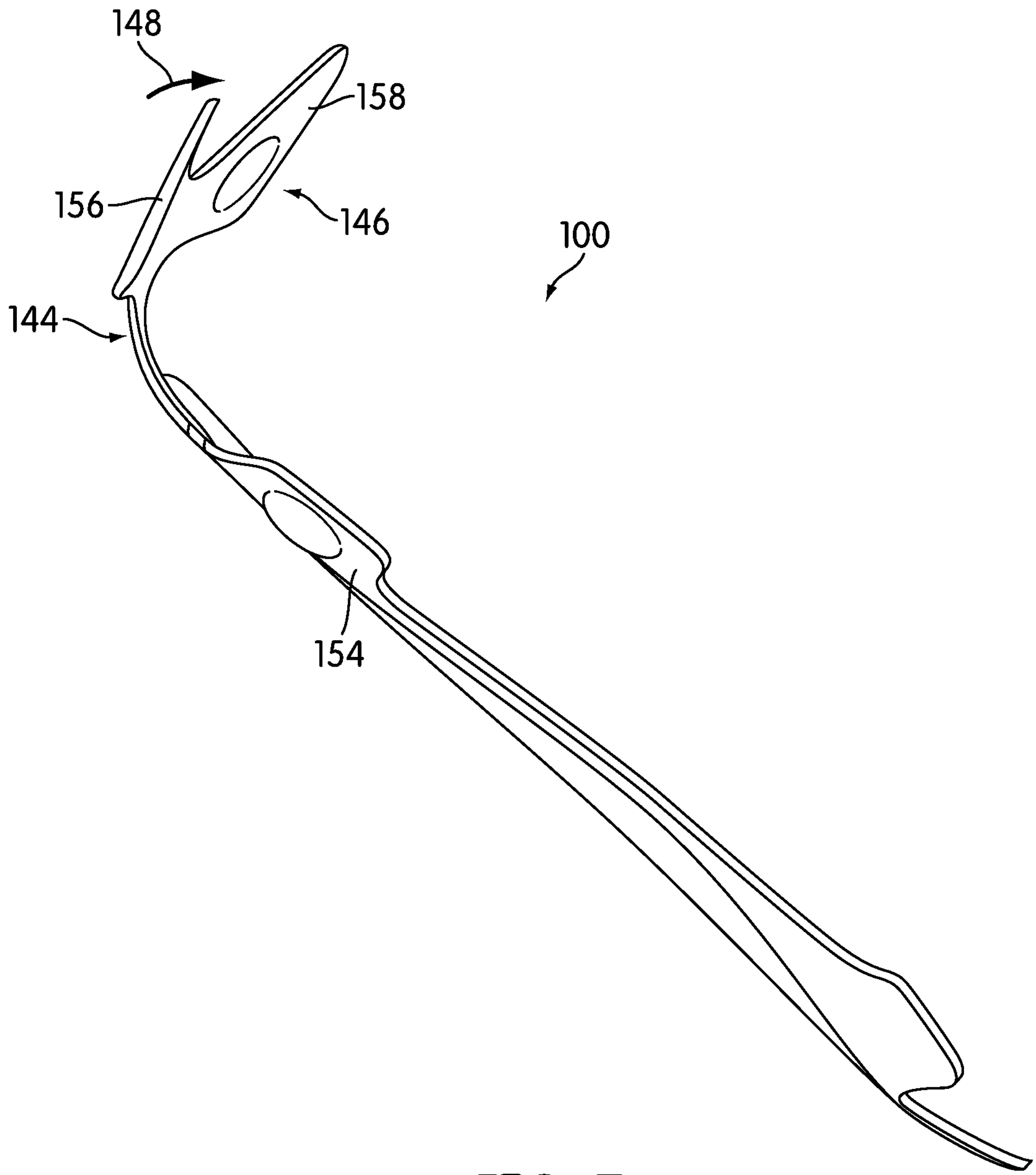

FIG. 7

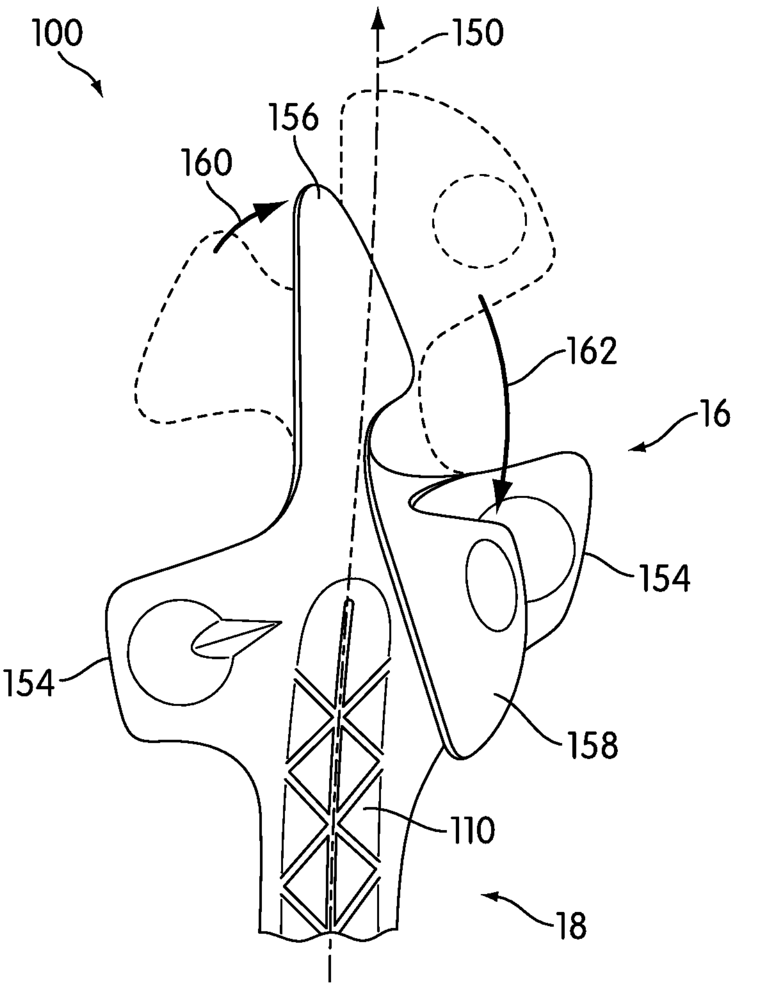

FIG. 8

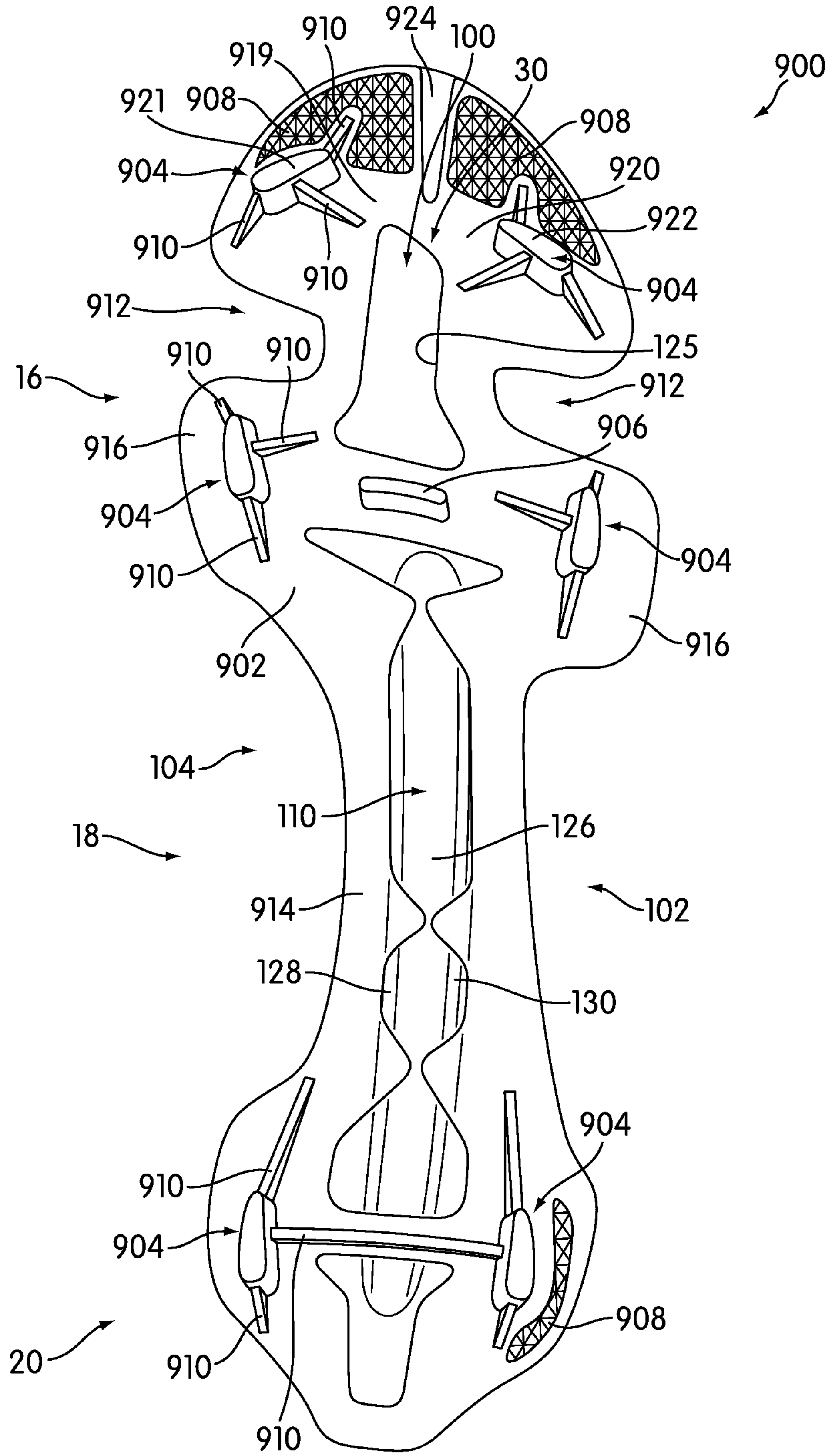
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FIG. 9

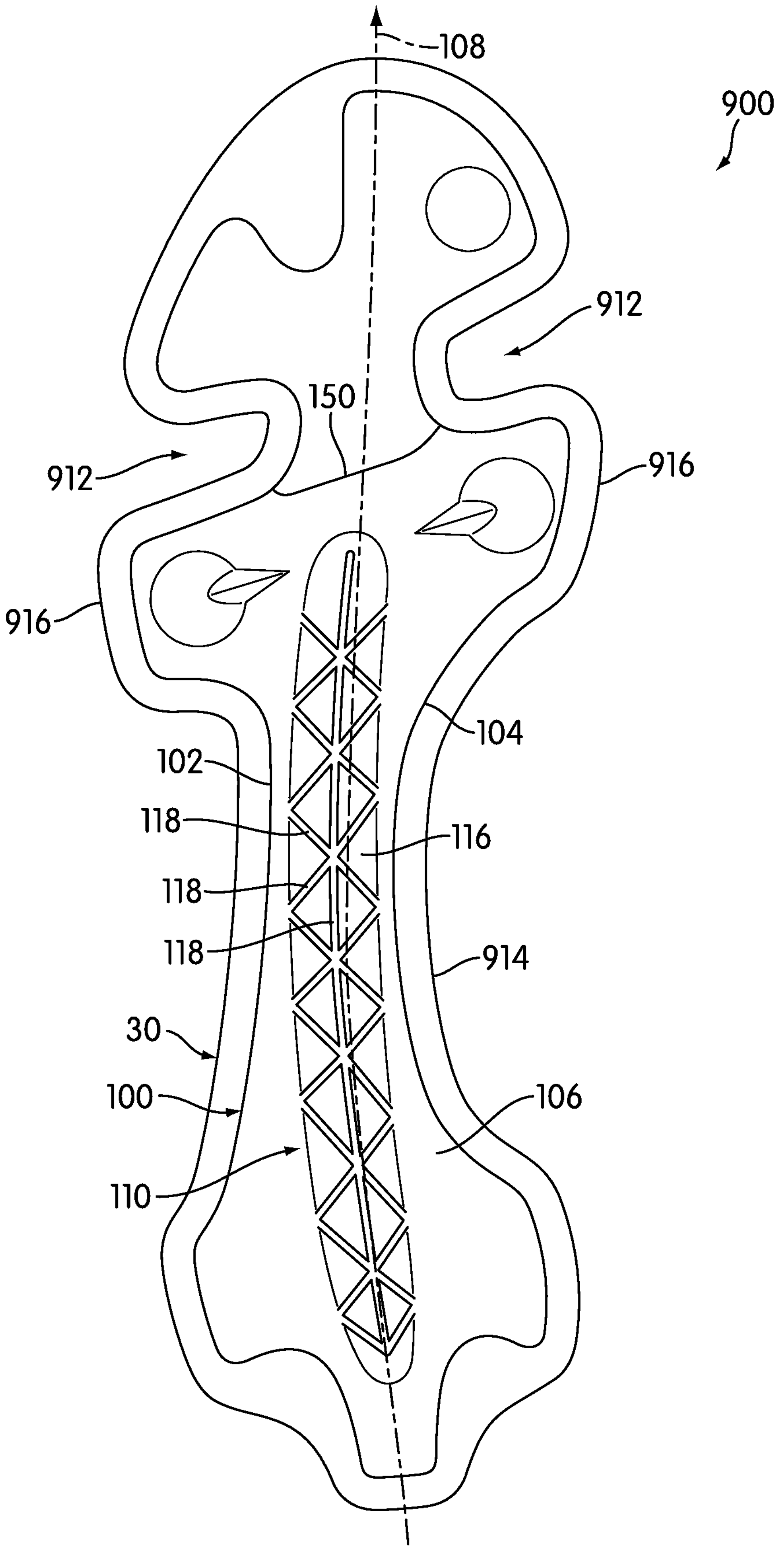
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FIG. 10

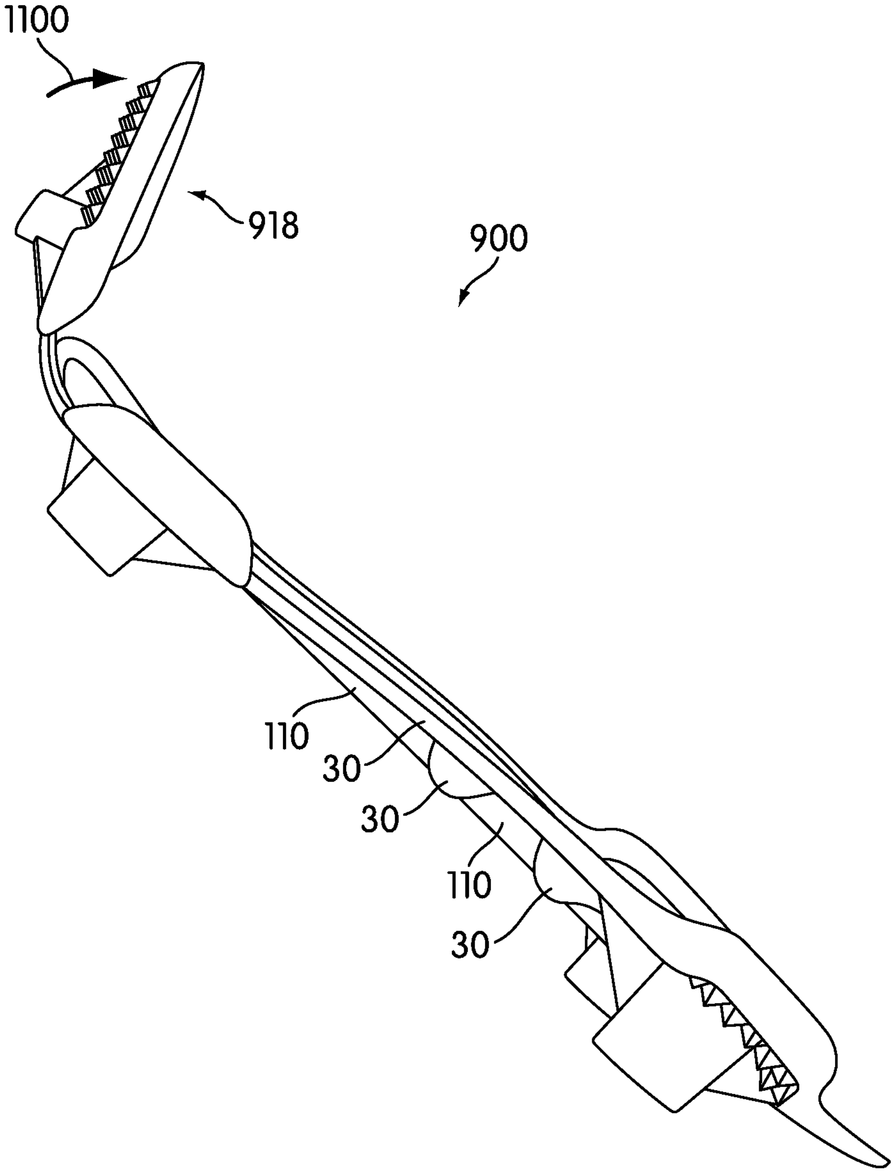

FIG. 11

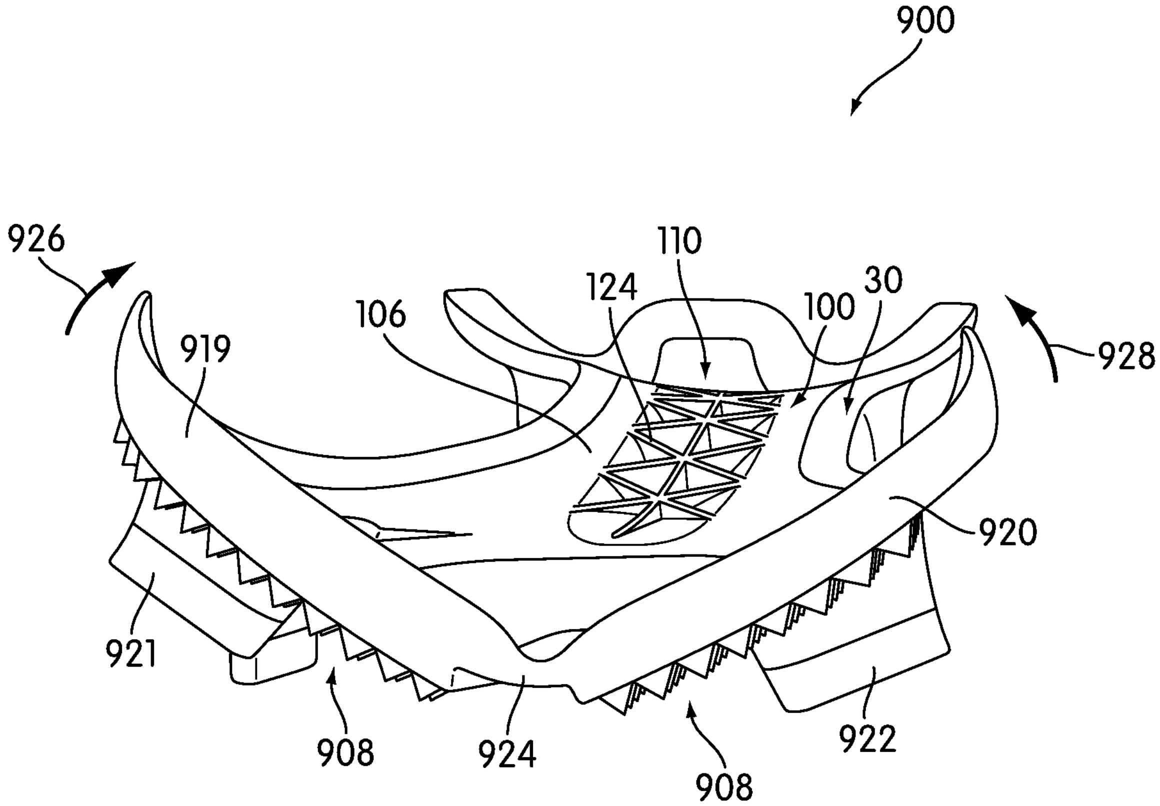

FIG. 12

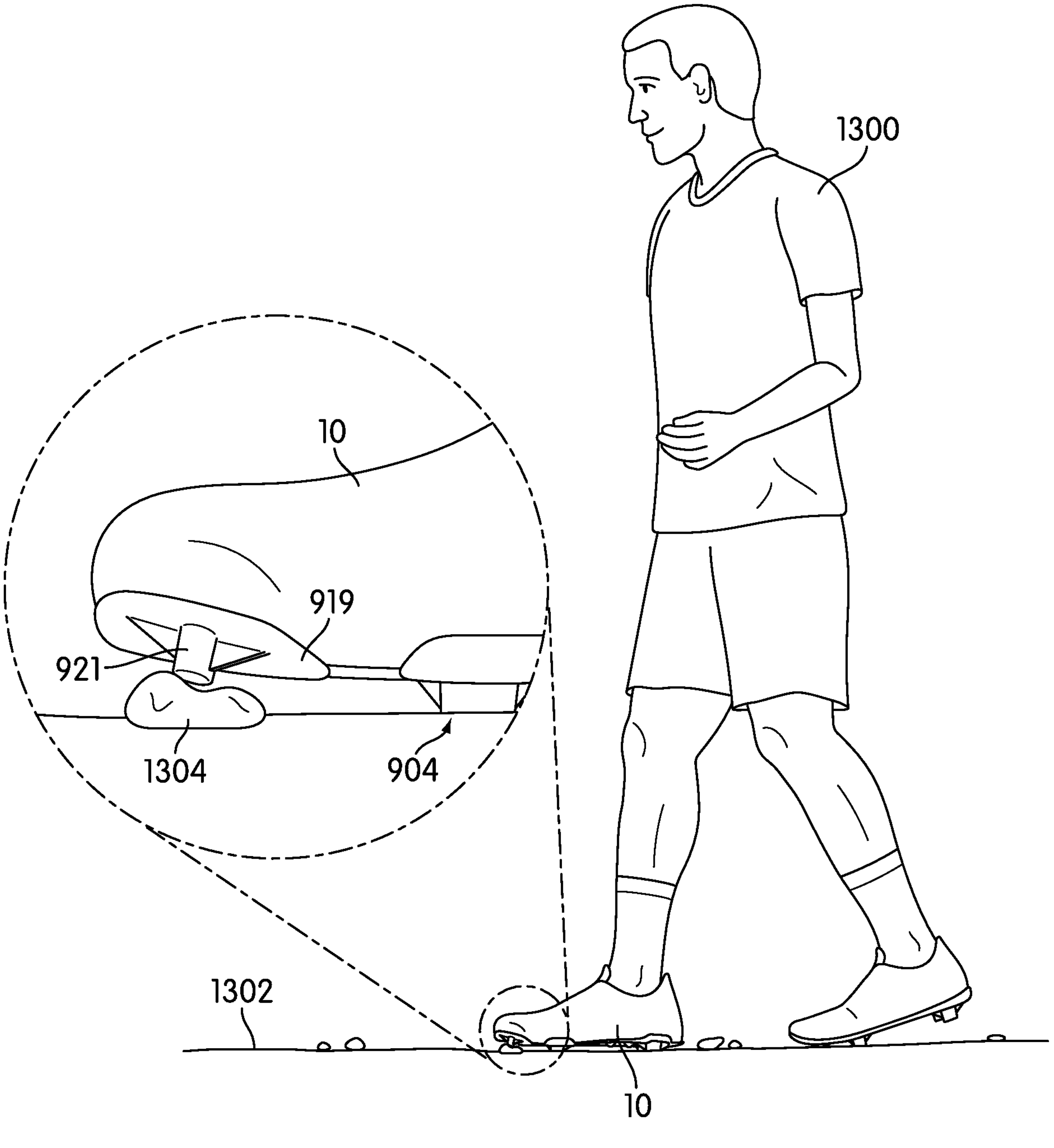

FIG. 13

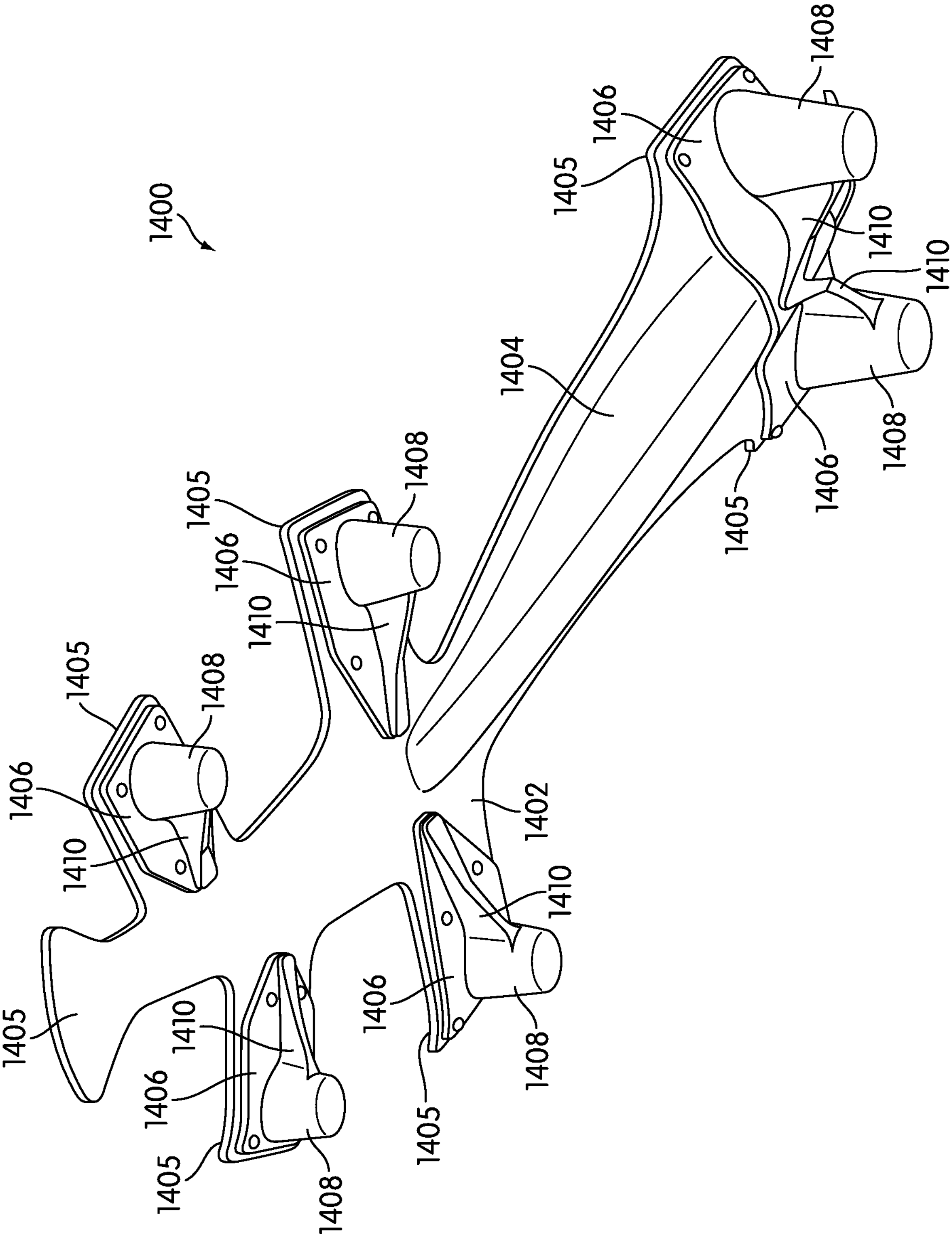

FIG. 14