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(54) **WRAP-AROUND WIRE SUPPORT FOR SHOE**

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## Description

### Field Of The Invention

**[0001]** The invention is generally related to shoes used during sporting activities and, more particularly, to a pair of shoes having increased support and/or torsional control properties and features to optimize performance and other characteristics of the shoes during a particular sporting activity (e.g., golf).

### Background Of The Invention

**[0002]** Many sporting activities today require shoes that provide enhanced stability, traction and performance to the athletes that wear them. For example, in golf, the golfer's footwork during the swing is complex and generates many different forces on the golfer's feet that must be absorbed, withstood and/or compensated for by the golfer's shoes. In general, for most golf shots the golfer's weight is initially loaded 50/50 on each foot and the golfer's weight is typically distributed evenly across the bottom surface area of each foot. During the backswing, a majority of the golfer's weight typically shifts to the outside (lateral side) of the golfer's back foot while the front foot maintains some weight for balance. The backswing applies forces tending to spin or pivot the back forefoot outwardly and the back heel inwardly, which must be resisted by the back foot's contact with the ground to keep the golfer's back foot stable.

**[0003]** During the downswing of the club, the golfer's weight begins to shift and by the time the golf ball is struck, the golfer's weight is again evenly distributed between the rear and front feet, or has started to shift more to the front foot. At the finish position of the swing, most of the golfer's weight is on the front foot with more weight on the outside (lateral side) of the front foot than the inside (medial side), and the heel of the golfer's back foot is elevated above the ground and faces rearwardly. In a proper swing, only the toe portion of the golfer's rear foot remains in contact with the ground at the finish. Thus, finish position, the heel and most of the outsole of the golfer's rear shoe are off of the ground, with only the toe portion contacting the ground for balance.

**[0004]** As discussed above, the golfer's feet make complex movements during a golf swing to keep the golfer balanced while generating torque and club head speed to strike the golf ball. During various stages of the golf swing, significant forces in various directions are exerted on the left and right shoes. Thus, it is desirable that the shoes provide enhanced stability, traction and torsional control in order to withstand and react appropriately to these forces and maximize the performance of the golfer's footwork during the golf swing. Similar circumstances exist during other sports such as baseball (e.g., during a batter's swing) and track & field (e.g., during start and running on a track), for example.

**[0005]** US 2014/0223779 A1 discloses an article of

footwear which includes an upper with a heel region that extends posteriorly about the heel, a medial side, and a lateral side. The article of footwear also includes a sole structure. Moreover, the article includes a longitudinal strand that extends along at least one of the medial side and the lateral side. Also, the article includes an underfoot strand that is coupled to the longitudinal strand and that extends across the sole structure to extend between the lateral side and the medial side of the upper. Furthermore, the article includes a closure strand that is coupled to the longitudinal strand. The closure strand is configured to couple to the closure element such that tensioning of the closure element tensions the longitudinal strand, the underfoot strand, and the closure strand to selectively secure the article of footwear to the foot.

**[0006]** In order to address the above exemplary needs, it is desirable to optimize various characteristics of shoes (e.g., arch support, torsion, flexibility, stiffness, weight, etc.) to provide the best comfort, fit, stability and performance to a wearer of the shoes, generally, and more particularly, to an athlete wearing the shoes during a sporting activity.

### Summary of the Invention

**[0007]** The invention addresses the above and other needs by providing shoes with improved comfort, fit, stability and performance to a wearer of the shoes.

**[0008]** This objective is achieved by a shoe according to claim 1.

**[0009]** There is also disclosed a golf shoe that includes: an upper configured to receive therein a foot of a wearer of the golf shoe, the upper comprising a closure and a tongue configured to cover a top portion of the foot; a reel assembly and at least one wire lace coupled to the reel assembly; a wrap-around saddle assembly comprising a saddle and at least one saddle wire coupled to the saddle, wherein the saddle wraps around a lateral, bottom and medial side of the upper and the at least one saddle wire is coupled to the at least one wire lace such that when the reel assembly is turned in a first direction, the saddle tightens around the lateral, bottom and medial sides of the upper; a sole comprising a front sole portion and a heel sole portion, wherein the saddle wraps around a middle portion of the bottom surface of the upper located between the front and heel sole portions; and a plurality of traction elements disposed on bottom surfaces of the front and heel sole portions.

**[0010]** Further, there is disclosed a method of manufacturing a shoe, the method including: providing an upper configured to receive therein a foot of a wearer of the golf shoe, the upper comprising a closure and a tongue configured to cover a top portion of the foot; coupling a reel assembly to the tongue; coupling at least one wire lace to the reel assembly; wrapping a saddle around a lateral, bottom and medial side of the upper, wherein the saddle comprises at least one saddle wire coupled to the saddle; coupling the at least one saddle wire to the at

least one wire lace such that when the reel assembly is turned in a first direction, the saddle tightens around the lateral, bottom and medial sides of the upper; coupling a front sole portion to a front portion of the bottom surface of the upper; and coupling a heel sole portion to a heel portion of the bottom surface of the upper, wherein the saddle wraps around a middle portion of the bottom surface of the upper located between the front and heel portions.

### Brief Description Of The Drawings

**[0011]** In the following description of exemplary embodiments, reference is made to the following Figures which form a part hereof, and in which it is shown by way of illustration specific embodiments in which the invention may be made and practiced. It is to be understood that other embodiments may be utilized, and design and/or structural changes may be made, without departing from the scope of the invention. The Figures are provided for purposes of illustration only and merely depict exemplary embodiments of the invention to facilitate the reader's understanding of the invention and should not be considered limiting of the breadth, scope, or applicability of the invention. It should be noted that for clarity and ease of illustration these drawings are not necessarily drawn to scale.

Figure 1 is a perspective view of a left shoe, in accordance with one embodiment of the invention.

Figure 2 is a top view of a right shoe corresponding to the left shoe of Figure 1, in accordance with one embodiment of the invention.

Figure 3 is a side view of the shoe of Figure 1, in accordance with one embodiment of the invention.

Figure 4 is a bottom view of the shoe of Figure 1, in accordance with one embodiment of the invention.

Figure 5 is a perspective view of a wrap-around wire saddle, in accordance with one embodiment of the invention.

Figure 6 is a cross-sectional side view of a coupling member having two wire loops contained therein, in accordance with one embodiment of the invention.

Figure 7 illustrates a close-up view of a plurality of coupling members that couple a BOA reel-based lace system with the wrap-around wire saddle of Figure 5, in accordance with one embodiment of the invention.

Figure 8 is a side view of a golf shoe, in accordance with one embodiment of the invention.

Figure 9 is a bottom view of the golf shoe of Figure 8, in accordance with one embodiment of the invention.

### Detailed Description Of Exemplary Embodiments of the Invention

**[0012]** In the following description of exemplary em-

bodiments, reference is made to the accompanying drawings which form a part hereof, and in which it is shown by way of illustration of specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the invention. Although various embodiments and features of the invention are described below in the context of golf shoes, it will be apparent to those of ordinary skill in the art that various features and advantages of the invention can be applied to shoes used during other types of sporting activities.

**[0013]** Figure 1 illustrates a perspective view of a left shoe 100, in accordance with one embodiment of the invention. The shoe 100 includes an upper 102 for covering a top surface of a wearer's foot and front sole portion 104 and a heel sole portion 106 each attached to respective bottom surfaces of the upper 102. As described in further detail below with reference to Figure 4, in one embodiment, the front sole portion 104 and the heel sole portion 106 are two separate sole portions that leave exposed a mid-portion of the upper 102. In an alternative embodiment, an arch midsole reinforcement structure 221 (Fig. 8) is affixed to an arch portion of the bottom surface of the upper 102 to provide further support and stability to this region of the shoe, as shown in Figure 8 and described in further detail below.

**[0014]** The upper 102 includes an opening 108 through which a wearer's foot (not shown) may be inserted, and a closure 110 that allows a top portion of the upper 102 to be expanded or widened for easier insertion of the wearer's foot and thereafter closed or tightened around the wearer's foot. A flexible tongue 112 forms part of the closure 110 and is fixed to an underside of the upper 102 near the bottom of the closure 110 and extends upwardly past a top portion of the closure 110 so as to cover a top surface of the wearer's foot that would otherwise be exposed. As is known in the art, the tongue 112 provides a cushioning cover above a top surface of the wearer's foot around which the closure 110 may be tightened via a lacing system to snugly secure the shoe 100 around the wearer's foot after it has been inserted through opening 108.

**[0015]** As shown in Figure 1, the shoe 100 includes a reel-based lacing system 114 to tighten and secure the closure 110 and tongue 112 around the wearer's foot, in accordance with one embodiment of the invention. The reel-based lacing system 114 includes a reel assembly 116, a wire lace 118, and lace guides 120 and 121. The reel assembly 116 is attached to a top portion of the tongue 112 and contains a spool member (not shown) for holding the wire lace 118. The wire lace 118 is threaded through the plurality of lace guides 120, which also function as coupling mechanisms 120 to couple the reel-based lacing system to a wrap-around saddle assembly 122, as described in further detail below. When the reel assembly is turned in a predetermined direction (e.g., clockwise), the wire lace 118 is wound around the spool

member and becomes shorter, thereby pulling the lace guides 120 and 121 on opposite sides of the closure 110 closer together to tighten the closure 110 around the wearer's foot. Reel-based lacing systems are known in the art and described, for example, in U.S. Patent Publications Nos. 2014/0123449 and 2013/0092780, and U.S. Patent Nos. 8,516,662 and 8,468,657. As disclosed in U.S. Patent Publication No. 2014/0123449, for example, in some embodiments, the reel assembly 116 includes a knob (e.g., knob 218 in U.S. Patent Publication No. 2014/0123449) that may be raised axially to disengage the knob from the spool member (e.g., spool member 216 in U.S. Patent Publication No. 2014/0123449) in order to allow the spool member to freewheel in a loosening direction to release the lace. In other embodiments, the knob may be manually and incrementally turned in the loosening direction to gradually loosen the lacing system.

**[0016]** The shoe 100 further includes the wrap-around saddle assembly 122 that forms a portion of the closure 110, and includes one or more wire loops 124 threaded through respective channels (not shown) of a saddle 126 that wraps around an underside of the upper 102, as discussed in further detail below. Each wire loop 124 is received within respective lace guide/coupling mechanisms 120 on opposite side edges of the saddle assembly 122 or closure 110. As shown in Figures 1-4, in one embodiment, three wire loops 124 extend from a respective coupling mechanism 120 affixed to one side edge of the saddle 126 and wraps around the side and bottom surfaces of the upper 102 to be coupled to a corresponding coupling mechanism 120 affixed to the opposite side edge of the saddle 126. The wire lace 118 is also threaded through lace guides 121 affixed to opposite side edges of the closure near a top portion of the closure 110 to further tighten and secure the closure 110 around the wearer's foot. When the reel assembly 116 is turned to tighten the wire lace 118 and the coupling mechanisms 120 and lace guides 121 on opposite sides of the saddle 126 and closure 110, respectively, are brought closer together, the wire loops 124 are pulled taut to tighten around a corresponding mid-portion of the wearer's foot that includes the arch of the foot. Thus, the wrap-around saddle assembly 122, in addition to forming a part of the closure 110, provides increased arch support, lateral stability, and a tighter fit around the middle portion of the wearer's foot, which decreases foot fatigue and thereby increases comfort and performance of the wearer's foot during a sporting activity.

**[0017]** Figure 2 illustrates a top view of a right shoe 100' corresponding to the left shoe 100 of Figure 1, in accordance with one embodiment of the invention. The right shoe 100' has the same features discussed above with respect to the left shoe 100 of Figure 1. These common features are designated with the same reference numerals as in Figure 1. As shown in Figure 2, the wire lace 118 is laced in a traditional criss-cross pattern over the top of the tongue 112. It is understood, however, that

any desired lacing pattern may be implemented in accordance with various embodiments of the invention. The wire lace 118 is secured to each side edge of the saddle 126 by a plurality (e.g., three) of coupling mechanisms 120 fixed to each side edge of the saddle 126 of the wrap-around saddle assembly 122. The wire lace 118 is further secured to lace guides 121 affixed to each side edge of the closure 110 near the top portion of the closure 110. When the reel assembly 116 is turned to tighten the wire lace 118, opposite side edges of the saddle 126 and the top portion of the closure 110 are brought closer together to tighten the upper 102 around the wearer's foot. Additionally, the wire loops 124 that wrap around the bottom of the mid-portion of the upper 102 tighten around the mid-portion and bottom arch of the foot to provide increased support and a more snug, custom fit around the wearer's foot.

**[0018]** Figures 3 and 4 illustrates side and bottom views, respectively, of the shoe 100 of Figure 1, in accordance with one embodiment of the invention. As shown in Figures 3 and 4, the wire loops 124 and saddle 126 of saddle assembly 122 wrap around a bottom portion of the upper 102 that is located between the front sole portion 104 and the heel sole portion 106, where no sole is present. Thus, as the wire loops 124 are tightened around the mid-portion of the shoe, as described above, increased arch support and a tighter, custom fit of the shoe is provided. Increased arch support and a custom fit increases the comfort and responsiveness of the shoe and decreases foot fatigue that may be experienced by a wearer during a sporting activity.

**[0019]** As further shown in Figure 4, the front and heel soles 104 and 106 may include various grooves or indentations 140 in various patterns to provide enhanced flexibility, grip or traction to the bottom of the shoe 100. It is understood that any desired sole patterns may be implemented on the front and heel sole portions 104 and 106, respectively, in accordance with various embodiments of the invention. Additionally, cleats (not shown) may be fixed to the sole portions 104 and 106 in any desired configuration, number and size to provide increased gripping action on various surfaces such as natural or artificial turf, for example.

**[0020]** Figure 5 illustrates a perspective view of a wrap-around saddle assembly 122 when detached from the shoe 100, in accordance with one embodiment of the invention. The saddle assembly 122 includes the saddle 126 and a plurality (e.g., three) wire loops 124 that are threaded through respective channels 128 (indicated by dashed lines) in the saddle 126 such that each wire loop 124 traverses the entire length of the saddle 126 to extend outwardly from each corresponding end of the saddle 126 where they can be coupled to corresponding, opposing coupling members 120, as discussed above. In an alternative embodiment, each wire loop 124 need not extend across the entire underside of the shoe but, instead, may be fixed (e.g., stitched, glued, etc.) to respective edge portions of the saddle 126 such that when

the wire loop 124 is pulled taut, as described above, the saddle 126 is also pulled taut around the foot of the wearer. In one embodiment, at least a portion of the bottom portion 150 of the saddle 126 is fixed (e.g., stitched, glued, bonded, etc.) to a corresponding arch region of a bottom surface of the upper 102 (Fig. 3), or to the arch midsole reinforcement structure 221 (Fig. 8) so as to prevent undesired sliding or movement of the saddle 126 with respect to the upper 102 or arch midsole reinforcement structure 221.

**[0021]** The saddle 126 may be made from various known materials or combination of materials and implemented in various configurations (e.g., size, shape, thickness, etc.). The saddle 126 reinforces the middle portion of the upper 102 and provides enhanced support and stability to this area of the shoe 100. In various embodiments, the saddle 126 may be made from various materials known in the art, such as thermoplastic polyurethane or polyurea (TPU), rubber, leather, synthetic leather, textiles, and polyurethane or polyurea (PU), or carbon fiber, for example, or any combination of these materials to achieve desired strength, reinforcement and/or flexibility properties.

**[0022]** Figure 6 illustrates a cross-sectional side view of a coupling member 120, in accordance with one embodiment of the invention. As shown in Figure 6, the coupling member 120 includes a first channel 160 through which wire lace 118 of reel-based lacing system 114 (Fig. 1) may be threaded in accordance with known reel-based lacing techniques. The coupling member 120 further includes a second channel 162 into which a wire loop 124 may be inserted via slot 164. The slot 164 has a smaller height than a diameter of the second channel 162 such that once the wire loop 124 is inserted into the second channel 162, the smaller height of the slot 164 will prevent or resist movement of the wire loop 124 out of the second channel 162.

**[0023]** Figure 7 illustrates a perspective close-up view of the reel-based lacing system 114 coupled to the wrap-around saddle assembly 122 via coupling members 120, as described above. As shown in Figure 7, the reel-based lacing system 114 includes a reel assembly 116 for reeling in or out a wire lace 118, which is received within respective first channels 160 of a plurality of coupling members 120. Each wire loop 124 of the saddle assembly 122 is also received within respective second channels 162 of the coupling member 120. Thus, the coupling members 120 couple the reel-based lacing system 114 to the wrap-around saddle assembly. In Figure 7, each coupling member 120 is shown as partially transparent to reveal the wires contained within each coupling member 120.

**[0024]** In one embodiment, the saddle 126 is affixed onto the upper 102 by sewing the saddle 126 onto the upper 102 as shown by stitching 170. It is understood however, that the saddle 126 may be fixed or loosely coupled to one or more portions of the upper 102 in any desired fashion (e.g., stitching, gluing, bonding, etc.). As

also shown in Figure 7, longitudinal grooves formed in the saddle 126 form respective channels 172 between the saddle 126 and the underlying upper 102 through which respective portions of wire loops 124 may travel and wrap around the side and bottom portions of the upper 102. In one embodiment, the stitching 170 forms an exterior boundary for containing respective wire loops 124 within their respective channels 172. As discussed above, as the reel assembly 116 is turned to reel in the wire lace 118, the wire loops 124 are tightened around the side and bottom portions of the upper 102 via the coupling members 120, thereby providing a tight fit around the arch and mid-foot area of the wearer.

**[0025]** Figure 8 illustrates a side view of a golf shoe 200 in accordance with one embodiment of the invention. The golf shoe 200 has many similar features as the shoe 100 described above such as an upper 102, a reel assembly 116, wire laces 118, slightly modified coupling members 120' and lace guides 121', a wrap-around saddle assembly 122 having a plurality of wire loops 124 and a wrap-around saddle 126. For the sake of brevity, these common elements and features will not be described again here.

**[0026]** As shown in Figure 8, the golf shoe 200 further includes a sole 202 having a front sole portion 204, a heel sole portion 206 and an arch sole portion 208 that couples the front and heel sole portions 204 and 206 together, as described in further detail below. The front sole portion 204 includes a front midsole 210 that is sandwiched between a bottom surface of a front portion of the upper 102 and a front outsole 212 attached to a bottom surface of the front midsole 210. A front midsole reinforcement structure 214 is attached to a top portion of the front midsole 210 and surrounds an upper portion of the front midsole 210 where the front midsole 210 contacts the bottom surface of the upper 102. Portions of the front midsole reinforcement structure 214 are fixed to portions of the front outsole 212 to provide a reinforcement frame that surrounds the front midsole 210. The front midsole reinforcement structure 214 may be fixed to the front outsole 212 using any known technique (e.g., bonding, gluing, fastening with screws, etc.) or, alternatively, may be integrally formed together using known injection molding techniques. In one embodiment, the front midsole reinforcement structure 214 and the front outsole can be made from a relatively dense ethyl vinyl acetate (EVA) or thermoplastic polyurethane (TPU) material that substantially prevents the respective portions of the front midsole 210 covered by the front midsole reinforcement structure 214 and the front outsole 212 from collapsing or substantially stretching in an outwardly direction, thereby providing increased strength and stability to the front midsole 210.

**[0027]** Similarly, the heel sole portion 206 includes a heel midsole 216 that is sandwiched between a bottom surface of a heel portion of the upper 102 and a heel outsole 218 attached to a bottom surface of the heel midsole 216. A heel midsole reinforcement structure 220 is

attached to a top portion of the heel midsole 216 and surrounds an upper portion of the heel midsole 216 where the heel midsole 216 contacts the bottom surface of the heel portion of the upper 102. Portions of the heel midsole reinforcement structure 220 are fixed to portions of the heel outsole 218 to provide a reinforcement frame that surrounds the heel midsole 216. The heel midsole reinforcement structure 220 may be fixed to the heel outsole 218 using any known technique (e.g., bonding, gluing, fastening with screws, etc.) or, alternatively, may be integrally formed together using known injection molding techniques. In one embodiment, the heel midsole reinforcement structure 220 and the heel outsole 218 can be made from a relatively dense ethyl vinyl acetate (EVA) or thermoplastic polyurethane (TPU) material that substantially prevents the respective portions of the heel midsole 216 covered by the heel midsole reinforcement structure 220 and the heel outsole 218 from collapsing or substantially stretching in an outwardly direction, thereby providing increased strength and stability to the heel midsole 216.

**[0028]** As further shown in Figure 8, the golf shoe 200 further includes an arch sole portion 208 comprising an arch outsole portion 219 that spans across and connects the front outsole portion 212 with the heel outsole portion 218, in accordance with one embodiment of the invention. The arch sole portion 208 further includes an arch midsole surrounded by an arch midsole reinforcement structure 221 and a window 222 between the arch midsole reinforcement structure and arch outsole portion 219, in accordance with one embodiment of the invention. In one embodiment, the saddle 126 wraps around the arch midsole and reinforcement structure 221 such that the window 222 (i.e., a space of air) is formed between the bottom surface of the saddle 126 and the arch outsole portion 219, as shown in Figure 8. The window 222 allows for the saddle 126 to completely wrap around the side and bottom surfaces of the upper 102, and further allows for the expansion and contraction of the saddle 126 as the wire laces 118 and wire loops 124 are loosened or tightened, as described above. The window 222 further allows for increased flexion to the arch region of the shoe 200, and torsion between the front and heel portions of the shoe 200. In other words, the front and heel portions can more readily twist with respect to one another. To offset and/or control the amount of torsion between the front and heel portions of the shoe 200, the arch outsole portion 219 (a.k.a., torsion control bridge) is provided, as described in further detail below.

**[0029]** The arch outsole portion 219 provides further stability and torsion control to the middle section of the shoe 200 because it resists twisting of the front and heel portions of the upper 102 with respect to one another. A desired amount of torsion control can be achieved by adjusting the thickness, rigidity and/or physical material properties of the arch outsole portion 219. Further, the arch outsole portion 219 allows for the full-length of the outsole to touch the ground and thus provides for traction

along the full length of the shoe 200. It further provides an increased outsole surface area that contacts the ground, thereby providing increased traction while still allowing for a desired level of torsion/twisting of the shoe.

Thus, the arch outsole portion 219 provides a torsion control bridge between the front and heel outsole portions 212 and 218, that allows the front and heel portions of the shoe 200 to move independently of one another to a desired degree, but not substantially beyond the desired amount. The arch outsole portion 219 further increases the length and surface area of the outsole that contacts the ground to provide increased traction during a sporting activity.

**[0030]** In Figure 8, both the arch midsole and its surround arch midsole reinforcement structure are collectively illustrated as the structure 221 since the arch midsole is contained within or surrounding by the arch midsole reinforcement structure. In one embodiment, the arch midsole and surrounding arch midsole reinforcement structure 221 extends across a middle portion of the bottom surface of the upper 102 to provide further support and stability in the arch region of the shoe 200, in accordance with one embodiment of the invention. The arch midsole reinforcement structure 221 provides a relatively rigid frame or housing that surrounds and contains an arch midsole made from a relatively less rigid material (e.g., eTPU) located under the arch region of the upper 102. The wrap-around saddle 126 wraps around the arch midsole and arch midsole reinforcement structure 221 and, in one embodiment, is secured or affixed thereto. In one embodiment, the front, heel and arch midsole reinforcement structures 214, 220 and 221, respectively, are integrally formed with one another and extend across substantially all of the bottom surface of upper 102, as shown in Figure 8.

**[0031]** In one embodiment, the front and heel midsoles 210 and 216, as well as the arch midsole, discussed above can be made from an expanded TPU (eTPU) material (aka, Boost™ foam). Such eTPU and other foams based on thermoplastic polyurethanes (TPU) suitable for use to form the midsole and/or outsole layers, in accordance with various embodiments, are described in further detail in U.S. Pat. App. Pub. No. 2010/0222442 A1. Additionally, exemplary methods for production of eTPU using water as a blowing agent or propellant are described in U.S. Pat. App. Pub. No. 2012/0065285 A1. In some embodiments, the midsole layer can comprise a hybrid material comprising a matrix of PU and foamed particles of TPU or other thermoplastic elastomers, as described in U.S. Pat. App. Pub. No. 2010/0047550 A1.

**[0032]** Some exemplary advantages of using Boost™ foam as a midsole material is that it is light weight and possesses superior energy-return or rebound properties that promote smooth energy transfer during the swing. The Boost™ foam also results in a lighter weight shoe, which further reduces fatigue to the wearer, especially if he or she is walking a golf course. The Boost™ foam also provides consistent and responsive cushioning

across dynamic temperature ranges from subzero cold to punishing heat, thereby retaining its advantageous properties in any weather.

**[0033]** In an alternative embodiment, the wrap-around saddle assembly 122 may be omitted and a shoe may utilize a traditional lacing system or reel-based lacing system. In this embodiment, the arch outsole portion 219 can still function to provide enhanced traction, stability and torsion control to the shoe, as described above.

**[0034]** In one embodiment the arch outsole portion 219 is integrally formed with the front and heel outsole portions 212 and 218, and made from the same outsole materials described above. In alternative embodiments, the arch outsole portion 219 may be made from the same or a different material and mechanically attached to the front and heel outsole portions 212 and 216 such that it may be detached and interchanged with various different arch outsole portions (not shown) having different physical characteristics to achieve different desired performance characteristics of the shoe 200.

**[0035]** Figure 9 illustrates a bottom surface of an outsole 250 that can be utilized in connection with the golf shoe 200 of Figure 8, in accordance with one embodiment of the invention. As shown in Figure 9, the outsole 250 has a peripheral region 252 (shown as a darker region) that surrounds an interior region 254 (shown as a lighter region). In one embodiment, the dimensions (e.g., thickness) and/or material(s) used to form the peripheral region 252 provide greater rigidity and durability when compared to the interior region 254. The greater rigidity and durability of the peripheral region 252 provides increased support and strength to the peripheral frame of the shoe 200 and allows for relatively larger traction elements 256 and 258 to be formed on or affixed to the peripheral region 252 of the outsole 250 to provide increased traction.

**[0036]** A plurality of relatively smaller traction elements 260 extend outwardly from a bottom surface of the interior region 254 to provide further traction to supplement the traction provided by the larger traction elements 256 and 258 on the peripheral region 252. The interior region 254 further includes a plurality of holes 262 that allows the midsole material (e.g., Boost™) to expand through the holes 262, which allows for greater deformation of the midsole material and, hence, an enhanced "shock absorbing" property of the midsoles 210 and 216. The holes 262 also significantly decrease the weight of the interior region 254 of outsole 250, which reduces fatigue to a wearer, especially if they are walking long distances.

**[0037]** As also shown in Figure 9, the wrap around saddle assembly 122, comprising the saddle 126 and wire loops 124, is located directly above the arch outsole portion 219 with no midsole material sandwiched therebetween. As discussed above, a window of open space 222 (Fig. 8) between the arch outsole portion 219 and the wrap-around saddle assembly 122 allows the saddle 126 and wire loops 124 to be completely wrapped around the side and bottom surfaces of the upper 102, and to be

tightened or loosened using the reel-based lacing system 114 (Fig. 1), as described above.

**[0038]** In various embodiments the traction elements 256, 258 and 260 may be formed in various ways and made from various materials known in the art. In one embodiment, for example, the traction elements 256, 258 and 260 may be formed using Grip-More™ technology, in which a plurality of cleat and/or traction elements may be attached to a bottom surface of a flexible fiber cloth or mesh textile lining that is cut and shaped to match the size and shape of each corresponding traction zone on a bottom surface of the outsole(s) 208, 212 and/or 218. The Gripmore™ technology is described in further detail in Taiwan Publication No. TW M412636U1.

**[0039]** In one embodiment, the fiber cloth or mesh lining is fixedly adhered to a correspondingly sized and shaped indented bottom surface of the outsole corresponding to each respective traction zone. Multiple durometer plastic cleats are then injected into the fiber cloth so as to be permanently held in place by means of known techniques. For example, the cleats which can be made of a highly durable TPR (thermoplastic rubber) are injected onto a lightweight but strong mesh textile lining and affixed with commercial grade adhesives for a secure bond. The mesh backing with injected cleats is then set into a pre-defined area in the outsole (commonly made from TPU) and glued in place to form the traction elements needed as per the sporting activity requirements.

**[0040]** In various embodiments, the flexible fiber cloth or mesh lining can be made from known plastics, rubber or other flexible, durable materials, or any combination of such materials. In various embodiments, the cleats or traction elements can be made from suitable polyurethane (PU) materials. The flexible fiber cloth can be cut and shaped to be attached to premade indentations in the bottom surface of the outsole. The flexible fiber cloth can be permanently attached to the bottom surface of the outsole by any suitable means, such as gluing, bonding, etc.

**[0041]** The Gripmore™ cleat technology provides many advantages for shoes requiring cleats. The fiber cloth can be ideally shaped, preformed and placed as desired without restriction to provide any cleat or traction element configuration. Additionally, since conventional cleat receptacle structures for receiving and securing a cleat therein are no longer required, the manufacturing cost and weight of the golf shoes are significantly decreased. Further, since cleat receptacle structures are no longer required, the size and placement of cleats on the bottom surface of the outsole are no longer limited by available space for the receptacle structures in the midsole layer.

**[0042]** The various elements of the shoes described herein can be made from known suitable materials to achieve desired performance, durability and comfort characteristics, in accordance with various embodiments of the invention. For example, in one embodiment, the upper 102 may be made from a breathable microfiber

leather, or similar material, with varying thicknesses in various portions of the upper to achieve desired characteristics and properties. As another example, the outsoles discussed above may be made from an EVA or TPU material, and can be injection molded with one or more types of thermoplastic polyurethane (TPU). The midsoles discussed above can be formed by pouring PU or Boost™ foam material into respective TPU molds of the front and heel outsole portions. Thus, the soles described herein, comprising midsole and outsole layers, can provide increased comfort and performance compared to conventional golf shoe soles having a single rigid platform that spans the sole and supports the traction elements in a dependent manner.

**[0043]** The poured midsole can provide a durable yet soft and comfortable region below the golfer's foot and can bond directly to the injection molded outsole without cement or other rigid adhesion materials. The lower outsole can comprise a durable yet flexible material and can include various traction elements supported independently from one another such that they can flex and move separately throughout the golf swing, which results in more of the traction elements being in contact with the ground at any given time and allows the golfer's foot to have more freedom of motion and more comfort. Additionally, the soles described herein can be lighter than conventional soles due to the use of lightweight polymeric materials, direct bonding of the constituent materials without cement, lack of other conventional platform components, and other properties.

**[0044]** In one embodiment, the midsole can be bonded directly to the outsole without an intermediate adhesive material. The midsole can comprise various foams and hybrid materials, such as a matrix of PU and foamed particles of TPU or eTPU. Various soles and methods of making soles may be utilized in accordance with the present invention, such as those described in U.S. Patent Application Serial No. 14/513,582, filed on October 14, 2014, claiming priority to U.S. Provisional Application Serial No. 61/896,442, filed on October 28, 2013. It should be noted that in these previous applications, what is referred to as the "midsole" herein is referred to as the "upper outsole." In further embodiments, the sole of a golf shoe may be made from various material layers as described in U.S. Publication No. 2013/0291409 A1.

**[0045]** Although various embodiments described above focus on the use of Boost™ foam material for the midsole, other embodiments of the invention are not limited to using a particular type of material for the midsole, which can be made from any other suitable material such as TPU, Rubber, EVA, etc., or combination of such materials.

**[0046]** Additionally, other components or elements of the shoes described herein can be made from any suitable material or combination of materials using any technique known to those skilled in the art. For example, the wire laces 118 and wire loops 124 may be made from any suitable material or combination of materials (e.g.,

steel, plastics, etc.) that have the desired strength and durability properties for a given activity. In one embodiment, the wire laces 118 and 124 are made from nylon-coated stainless steel.

**[0047]** Various exemplary embodiments of the invention have been described above to provide shoes having enhanced mid-foot and arch support and customizable fit and/or increased torsional control and traction under a mid-foot region of the shoe. It should be understood that the various embodiments described herein have been presented by way of example only, and not by way of limitation. Likewise, the various figures or diagrams presented depict an example design, structure or configuration, which is done to aid in understanding the concepts, features and functionality that can be included in various shoe pairs in accordance with one or more embodiments of the invention. The invention is not restricted to the illustrated exemplary designs, structures or configurations, but can be implemented using a variety of alternative designs, structures and configurations depending on the particular sporting activity (e.g., golf, baseball, track and field, etc.) or performance characteristics desired for a particular application.

## Claims

### 1. A shoe (100), comprising:

an upper (102) configured to receive therein a foot of a wearer of the shoe (100), the upper (102) comprising a closure (110) and a tongue (112) configured to cover a top portion of the foot;

at least one wire lace (118) coupled to opposing edges of the closure (110) and configured to pull the opposing edges of the closure (110) closer together to tighten the closure (110) around the foot;

at least one support wire (124) coupled to the at least one wire lace (118), wherein the at least one support wire wraps (124) around a lateral, bottom and medial side of the upper (102) such that when the at least one wire lace tightens the closure (110) around the foot, the at least one support wire (124) tightens around the lateral, bottom and medial sides of the upper (102),

**characterized by** a first coupling mechanism (120) coupled to a first opposing edge of the closure (110) and to the at least one wire lace (118) and disposed on the first opposing edge of the closure (110); and

a second coupling mechanism (120) coupled to a second opposing edge of the closure (110) and to the at least one wire lace (118) and disposed on the second opposing edge of the closure (110), wherein the first and second coupling mechanisms (120) couple the at least one wire



- lace (118) to the at least one support wire (124), wherein the at least one support wire (124) comprises a first support wire (124), the first support wire (124) having a first end coupled to the first coupling mechanism (120) and a second end coupled to the second coupling mechanism (120). 5
2. The shoe of claim 1 further comprising a reel assembly coupled to the tongue, wherein the at least one wire lace is further coupled to the reel assembly such that when the reel assembly is turned in a first direction, the at least one wire lace pulls the opposing edges of the closure closer together, thereby tightening the at least one support wire around the lateral, bottom and medial sides of the upper. 10 15
3. The shoe of claim 2 wherein when the reel assembly is turned in a second direction opposite the first direction, the at least one wire lace incrementally loosens, thereby incrementally loosening the at least one support wire around the lateral, bottom and medial sides of the upper. 20
4. The shoe of claim 2 or 3 wherein the reel assembly comprises a spool member and a knob axially coupled to the spool member, wherein the knob is configured to be raised axially to be disengaged from the spool member in order to release the at least one wire lace, thereby releasing the at least one support wire around the lateral, bottom and medial sides of the upper. 25 30
5. The shoe of any preceding claim further comprising a saddle that wraps around the lateral, bottom and medial sides of the upper, wherein the saddle comprises at least one channel for receiving therein the at least one support wire such that when the at least one support wire tightens around the lateral, bottom and medial sides of the upper, the saddle also tightens around the lateral, bottom and medial sides of the upper. 35 40
6. The shoe of any preceding claim further comprising a sole, comprising: 45
- a front sole portion attached to a front portion of the bottom surface of the upper; and
- a heel sole portion attached to a heel portion of the bottom surface of the upper, wherein the at least one support wire wraps around a middle portion of the bottom surface of the upper, wherein the middle portion is located between the front and heel portions. 50
7. The shoe of claim 6 wherein:
- the front sole portion comprises a front midsole
- comprising a first material, a front outsole comprising a second material that is more rigid than the first material, and a front midsole reinforcement structure comprising a third material that is more rigid than the first material, the front midsole being at least partially contained by the front midsole reinforcement structure and the front outsole; and
- the heel sole portion comprises a heel midsole comprising the first material, a heel outsole comprising the second material, and a heel midsole reinforcement structure comprising the third material, the heel midsole being at least partially contained by the heel midsole reinforcement structure and the heel outsole.
8. The shoe of claim 7 wherein the second and third materials have different compositions from one another, and/or wherein the first material comprises an expanded thermoplastic polyurethane (eTPU).
9. The shoe of claim 7 or 8 further comprising an arch outsole portion disposed between and coupled to the front and heel outsole portions so as to form a window between the arch outsole portion and a portion of the bottom surface of the upper located between the front and heel sole portions.
10. The shoe of claim 9 further comprising a plurality of traction elements located on bottom surfaces of the front, mid and heel outsole portions.
11. The shoe of any of claims 7 to 10 further comprising:
- an arch midsole comprising the first material and disposed between the front and heel midsoles; and
- an arch midsole reinforcement structure comprising the third material and disposed between the front and heel midsole reinforcement structures, wherein the arch midsole reinforcement structure reinforces at least a portion of the arch midsole.
12. The shoe of claim 11 wherein the at least one support wire travels from the medial side of the upper, under the arch midsole and arch midsole reinforcement structure and to the lateral side of the upper.
13. The shoe of any preceding claim wherein the at least one support wire comprises at least one wire loop. 55

#### Patentansprüche

1. Schuh (100), aufweisend:

ein Oberteil (102), das ausgebildet ist, um darin

- einen Fuß eines Trägers des Schuhs (100) aufzunehmen, wobei das Oberteil (102) eine Umschließung (110) und eine Zunge (112) aufweist, die ausgebildet ist, um einen oberen Teil des Fußes abzudecken;  
 mindestens eine Drahtschnur (118), die mit gegenüberliegenden Kanten der Umschließung (110) gekoppelt ist und so ausgebildet ist, dass sie die gegenüberliegenden Kanten der Umschließung (110) näher zusammenzieht, um die Umschließung (110) um den Fuß herum festzuziehen;  
 mindestens einen Stützdraht (124), der mit der mindestens einen Drahtschnur (118) gekoppelt ist, wobei der mindestens eine Stützdraht (124) um eine laterale, untere und mediale Seite des Oberteils (102) derart gewickelt ist, dass, wenn die mindestens eine Drahtschnur die Umschließung (110) um den Fuß spannt, sich der mindestens eine Stützdraht (124) um die laterale, untere und mediale Seite des Oberteils (102) spannt,  
**gekennzeichnet durch** einen ersten Kopplungsmechanismus (120), der mit einer ersten gegenüberliegenden Kante der Umschließung (110) und mit der mindestens einen Drahtschnur (118) gekoppelt und an der ersten gegenüberliegenden Kante der Umschließung (110) angeordnet ist; und  
 einen zweiten Kopplungsmechanismus (120), der mit einer zweiten gegenüberliegenden Kante der Umschließung (110) und mit der mindestens einen Drahtschnur (118) gekoppelt ist und an der zweiten gegenüberliegenden Kante der Umschließung (110) angeordnet ist, wobei der erste und der zweite Kopplungsmechanismus (120) die mindestens eine Drahtschnur (118) mit dem mindestens einen Stützdraht (124) verbinden,  
 wobei der mindestens eine Stützdraht (124) einen ersten Stützdraht (124) aufweist, wobei der erste Stützdraht (124) ein erstes Ende aufweist, das mit dem ersten Kopplungsmechanismus (120) gekoppelt ist, und ein zweites Ende, das mit dem zweiten Kopplungsmechanismus (120) gekoppelt ist.
2. Schuh nach Anspruch 1, ferner aufweisend eine mit der Zunge gekoppelte Spulenkörperanordnung aufweist, wobei die mindestens eine Drahtschnur ferner mit der Spulenkörperanordnung derart gekoppelt ist, dass, wenn die Spulenkörperanordnung in eine erste Richtung gedreht wird, die mindestens eine Drahtschnur die gegenüberliegenden Kanten der Umschließung enger zusammenzieht, wodurch der mindestens eine Stützdraht um die Seiten-, Boden- und Medialseite des Oberteils gespannt wird.
3. Schuh nach Anspruch 2, bei dem sich die mindestens eine Drahtschnur, wenn die Spulenkörperanordnung in eine zweite Richtung entgegengesetzt zur ersten Richtung gedreht wird, inkrementell lockert, wodurch der mindestens eine Stützdraht um die Seiten-, Boden- und Medialseite des Oberteils inkrementell gelöst wird.
4. Schuh nach Anspruch 2 oder 3, wobei die Spulenkörperanordnung ein Spulenelement und einen mit dem Spulenelement axial gekoppelten Griff aufweist, wobei der Griff so ausgebildet ist, dass er axial angehoben wird, um von dem Spulenelement gelöst zu werden, um die mindestens eine Drahtschnur freizugeben, wodurch der mindestens eine Stützdraht um die Seiten-, Boden- und Medialseite des Oberteils herum freigegeben wird.
5. Schuh nach einem der vorhergehenden Ansprüche ferner aufweisend einen Sattel, der sich um die laterale, die untere und die mediale Seite des Oberteils wickelt, wobei der Sattel mindestens einen Kanal zur Aufnahme des mindestens einen Stützdrahts darin aufweist, so dass, wenn sich der mindestens eine Stützdraht um die laterale, die untere und die mediale Seite des Oberteils zieht, der Sattel sich auch um die laterale, die untere und die mediale Seite des Oberteils zieht.
6. Schuh nach einem der vorhergehenden Ansprüche, der ferner eine Sohle aufweist, aufweisend:  
 einen vorderen Sohlenabschnitt, der an einem vorderen Abschnitt der Unterseite des Oberteils befestigt ist; und  
 einen Fersensohlenabschnitt, der an einem Fersenabschnitt der Unterseite des Oberteils befestigt ist, wobei der mindestens eine Stützdraht sich um einen mittleren Abschnitt der Unterseite des Oberteils wickelt, wobei sich der mittlere Abschnitt zwischen dem vorderen Abschnitt und dem Fersenabschnitt befindet.
7. Schuh nach Anspruch 6, wobei:  
 der vordere Sohlenabschnitt eine vordere Mittelsohle aufweist, die ein erstes Material aufweist, eine vordere Laufsohle, die ein zweites Material aufweist, das steifer ist als das erste Material, und eine vordere Mittelsohlenverstärkungsstruktur, die ein drittes Material aufweist, das steifer ist als das erste Material, wobei die vordere Mittelsohle zumindest teilweise von der vorderen Mittelsohlenverstärkungsstruktur und der vorderen Laufsohle aufgenommen ist; und  
 der Fersensohlenabschnitt eine Fersenmittelsohle aufweist, die das erste Material aufweist, eine Fersenaußensohle, die das zweite Material

- aufweist, und eine Fersenmittelsohlenverstärkungsstruktur, die das dritte Material aufweist, wobei die Fersenmittelsohle zumindest teilweise durch die Fersenmittelsohlenverstärkungsstruktur und die Fersenaußensohle aufgenommen ist. 5
8. Schuh nach Anspruch 7, wobei das zweite und das dritte Material unterschiedliche Zusammensetzungen voneinander aufweisen und/oder wobei das erste Material ein expandiertes thermoplastisches Polyurethan (eTPU) aufweist. 10
9. Schuh nach Anspruch 7 oder 8, der ferner einen Bogen-Außensohlenabschnitt aufweist, der zwischen den vorderen Abschnitt und den Fersen-Außensohlenabschnitt angeordnet und mit diesen gekoppelt ist, um ein Fenster zwischen dem Bogen-Außensohlenabschnitt und einem Abschnitt der Unterseite des Oberteils, angeordnet zwischen dem vorderen Abschnitt und dem Fersensohlenabschnitt, zu bilden. 15
10. Der Schuh nach Anspruch 9 ferner aufweisend eine Vielzahl von Zuelementen auf, die sich auf den Bodenflächen der vorderen, mittleren und Fersen-Außensohlenabschnitte befinden 25
11. Schuh nach einem der Ansprüche 7 bis 10, ferner aufweisend: 30
- eine Bogenmittelsohle, die das erste Material aufweist und zwischen der vorderen Mittelsohle und der Fersenmittelsohle angeordnet ist; und eine Bogenmittelsohlenverstärkungsstruktur, die das dritte Material aufweist und zwischen der vorderen Mittelsohlenverstärkungsstruktur und der Fersenmittelsohlenverstärkungsstruktur angeordnet ist, wobei die Bogenmittelsohlenverstärkungsstruktur mindestens einen Teil der Bogenmittelsohle verstärkt. 35
12. Schuh nach Anspruch 11, wobei der mindestens eine Stützdraht von der medialen Seite des Oberteils, unter der Bogenmittelsohle und der Bogenmittelsohlenverstärkungsstruktur und zur lateralen Seite des Oberteils verläuft. 45
13. Schuh eines beliebigen vorhergehenden Anspruchs, wobei der mindestens eine Stützdraht mindestens eine Drahtschleife aufweist. 50

## Revendications

1. Chaussure (100) comprenant : 55
- une tige (102) conçue pour recevoir, en son sein, un pied d'un porteur de la chaussure (100), la

tige (102) comprenant une fermeture (110) et une languette (112) conçue pour recouvrir une partie supérieure du pied ;  
 au moins un lacet à fil (118) accouplé aux bords opposés de la fermeture (110) et conçu pour rapprocher les bords opposés de la fermeture (110) afin de serrer la fermeture (110) autour du pied ;  
 au moins un fil support (124) accouplé à l'au moins un lacet à fil (118), l'au moins un fil support s'enroulant (124) autour d'un côté latéral, inférieur et médian de la tige (102) de sorte que lorsque l'au moins un lacet à fil serre la fermeture (110) autour du pied, l'au moins un fil support (124) se serre autour des côtés latéral, inférieur et médian de la partie supérieure (102),  
**caractérisée par** un premier mécanisme d'accouplement (120) accouplé à un premier bord opposé de la fermeture (110) et à l'au moins un lacet à fil (118) et disposé sur le premier bord opposé de la fermeture (110) ; et  
 un second mécanisme d'accouplement (120) accouplé à un second bord opposé de la fermeture (110) et à l'au moins un lacet à fil (118) et disposé sur le second bord opposé de la fermeture (110), les premier et second mécanismes d'accouplement (120) accouplant l'au moins un lacet à fil (118) à l'au moins un fil support (124), l'au moins un fil support (124) comprenant un premier fil support (124), le premier fil support (124) ayant une première extrémité accouplée au premier mécanisme d'accouplement (120) et une seconde extrémité accouplée au second mécanisme d'accouplement (120).

2. Chaussure selon la revendication 1 comprenant en outre un ensemble enrouleur accouplé à la languette, l'au moins un lacet à fil étant en outre accouplé à l'ensemble enrouleur de sorte que, lorsque l'ensemble enrouleur est tourné dans une première direction, l'au moins un lacet à fil rapproche les bords opposés de la fermeture, serrant ainsi l'au moins un fil support autour des côtés latéral, inférieur et médian de la tige.
3. Chaussure selon la revendication 2, lorsque l'ensemble enrouleur est tourné dans une seconde direction opposée à la première direction, l'au moins un lacet à fil se desserrant progressivement, desserrant ainsi progressivement l'au moins un fil support autour des côtés latéral, inférieur et médian de la tige.
4. Chaussure selon la revendication 2 ou 3, l'ensemble enrouleur comprenant un élément bobine et un bouton accouplé axialement à l'élément bobine, le bouton étant conçu pour être levé axialement pour être séparé de l'élément bobine pour relâcher l'au moins

un lacet à fil, relâchant ainsi l'au moins un fil support autour des côtés latéral, inférieur et médian de la tige.

5. Chaussure selon l'une quelconque des revendications précédentes, comprenant en outre un plastron qui s'enroule autour des côtés latéral, inférieur et médian de la tige, le plastron comprenant au moins un canal pour recevoir, en son sein, l'au moins un fil support de sorte que lorsque l'au moins un fil support se serre autour des côtés latéral, inférieur et médian de la tige, le plastron se serre également autour des côtés latéral, inférieur et médian de la tige. 5
6. Chaussure selon l'une quelconque des revendications précédentes, comprenant en outre une semelle, comprenant : 10
  - une partie de semelle avant fixée à une partie avant de la surface inférieure de la tige ; et 20
  - une partie de semelle de talon fixée à une partie de talon de la surface inférieure de la tige, l'au moins un fil support s'enroulant autour d'une partie centrale de la surface inférieure de la tige, la partie centrale étant située entre les parties avant et de talon. 25
7. Chaussure selon la revendication 6, la partie de semelle avant comprenant une semelle intermédiaire avant comprenant un premier matériau, une semelle extérieure avant comprenant un deuxième matériau qui est plus rigide que le premier matériau, et une structure de renforcement de semelle intermédiaire avant comprenant un troisième matériau qui est plus rigide que le premier matériau, la semelle intermédiaire avant étant au moins partiellement contenue par la structure de renforcement de semelle intermédiaire avant et la semelle extérieure avant ; et 30
  - la partie semelle de talon comprenant une semelle intermédiaire de talon comprenant le premier matériau, une semelle extérieure de talon comprenant le deuxième matériau, et une structure de renforcement de semelle intermédiaire de talon comprenant le troisième matériau, la semelle intermédiaire de talon étant au moins partiellement contenue par la structure de renforcement de semelle intermédiaire de talon et la semelle extérieure de talon. 40
8. Chaussure selon la revendication 7, les deuxième et troisième matériaux ayant des compositions différentes l'un de l'autre, et/ou le premier matériau comprenant un polyuréthane thermoplastique expansé (eTPU). 45
9. Chaussure selon la revendication 7 ou 8 comprenant en outre une partie de semelle extérieure de cambrure disposée entre les parties de semelle extérieu- 50

re avant et de talon et accouplée à celles-ci de sorte à former une fenêtre entre la partie de semelle extérieure de cambrure et une partie de la surface inférieure de la tige située entre les parties de semelle avant et de talon.

10. Chaussure selon la revendication 9 comprenant en outre une pluralité d'éléments de traction situés sur les surfaces inférieures des parties de semelle extérieure avant, centrale et de talon. 55
11. Chaussure selon l'une quelconque des revendications 7 à 10, comprenant en outre :
  - une semelle intermédiaire de cambrure comprenant le premier matériau et disposée entre les semelles intermédiaires avant et de talon ; et 60
  - une structure de renforcement de semelle intermédiaire de cambrure comprenant le troisième matériau et disposée entre les structures de renforcement de semelle intermédiaire avant et de talon, la structure de renforcement de semelle intermédiaire de cambrure renforçant au moins une partie de la semelle intermédiaire de cambrure. 65
12. Chaussure selon la revendication 11, l'au moins un fil support se déplaçant du côté médian de la tige, sous la semelle intermédiaire de cambrure et la structure de renforcement de semelle intermédiaire de cambrure et jusqu'au côté latéral de la tige. 70
13. Chaussure selon l'une quelconque des revendications précédentes, l'au moins un fil support comprenant au moins une boucle de fil. 75

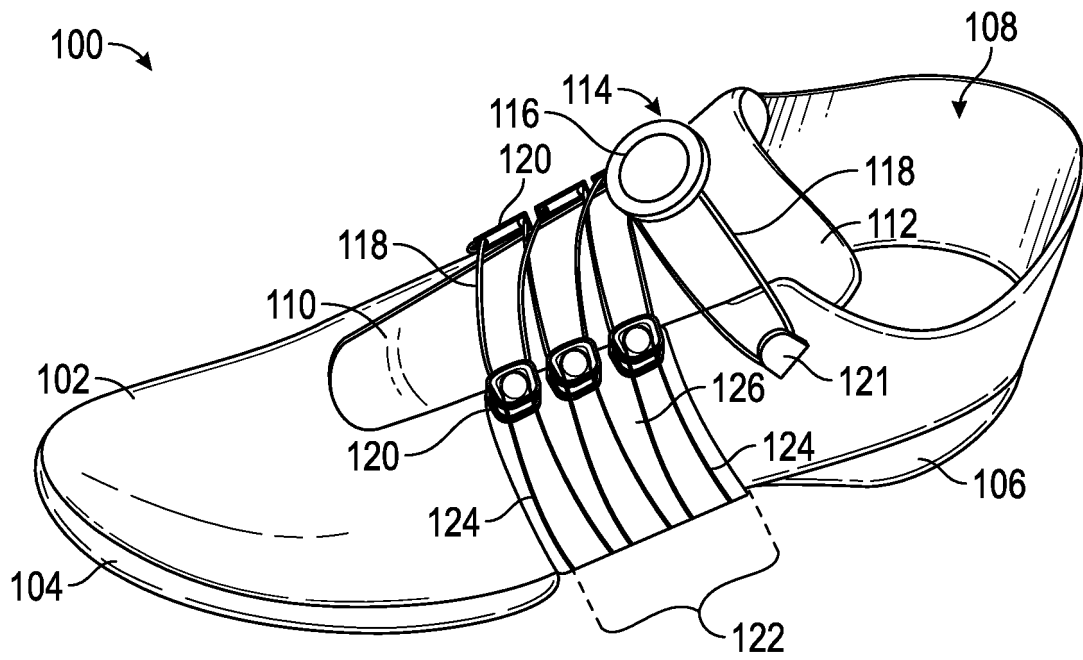


FIG. 1

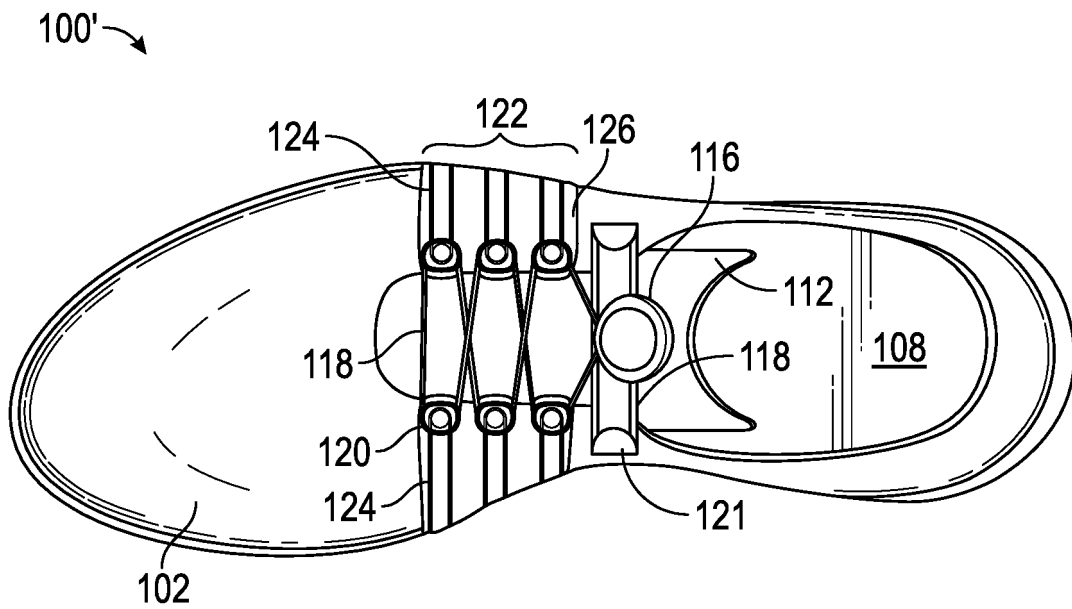


FIG. 2

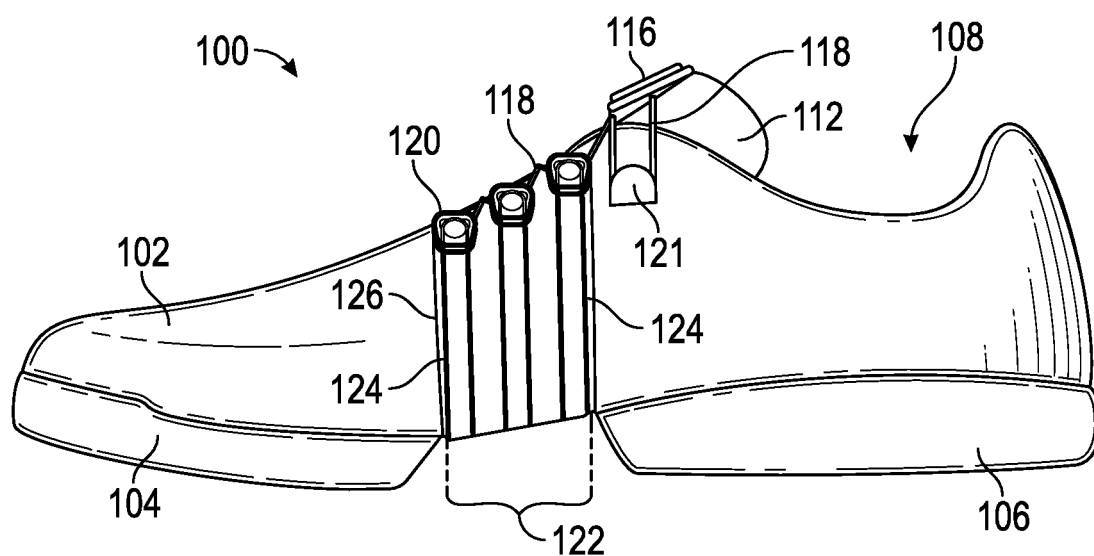


FIG. 3

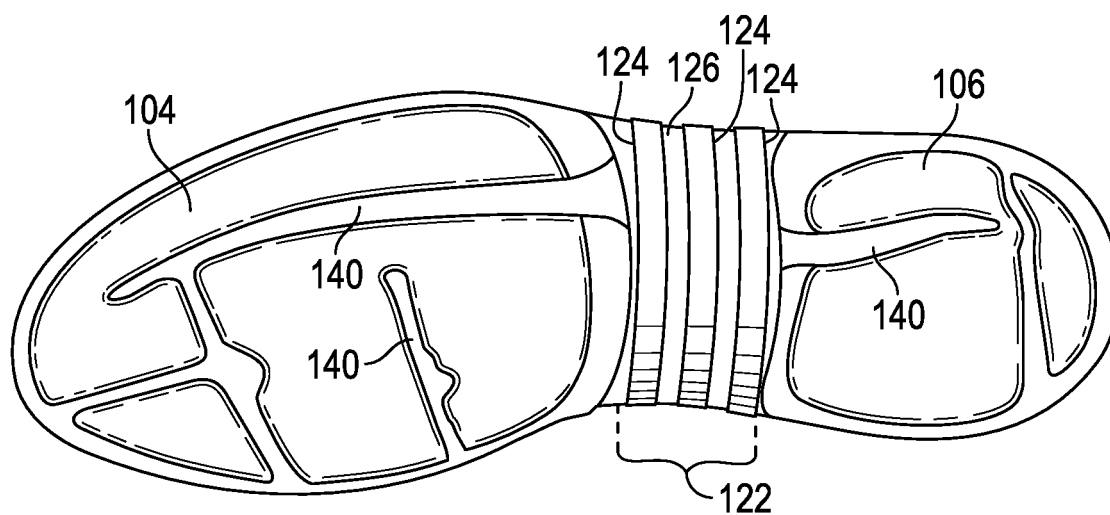
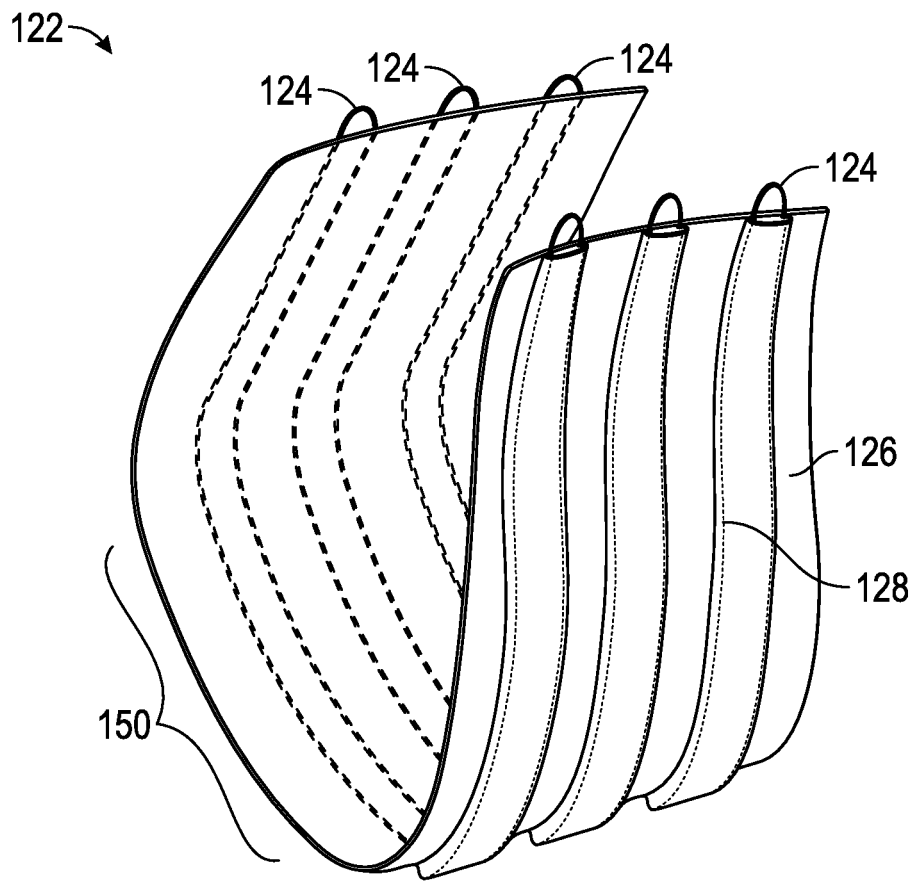
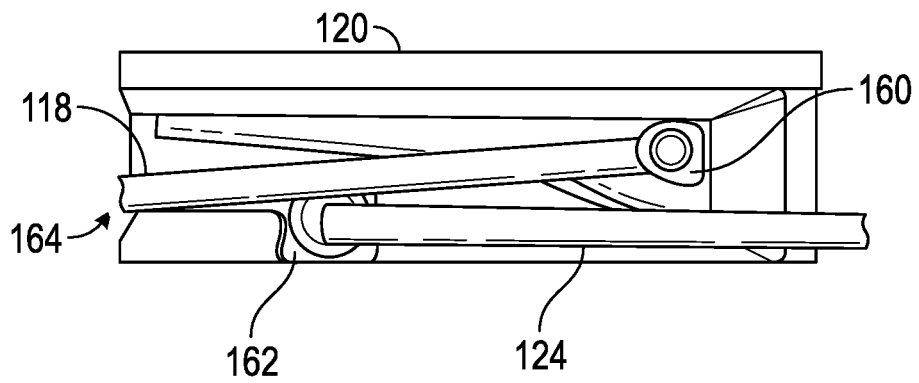


FIG. 4



**FIG. 5**



**FIG. 6**

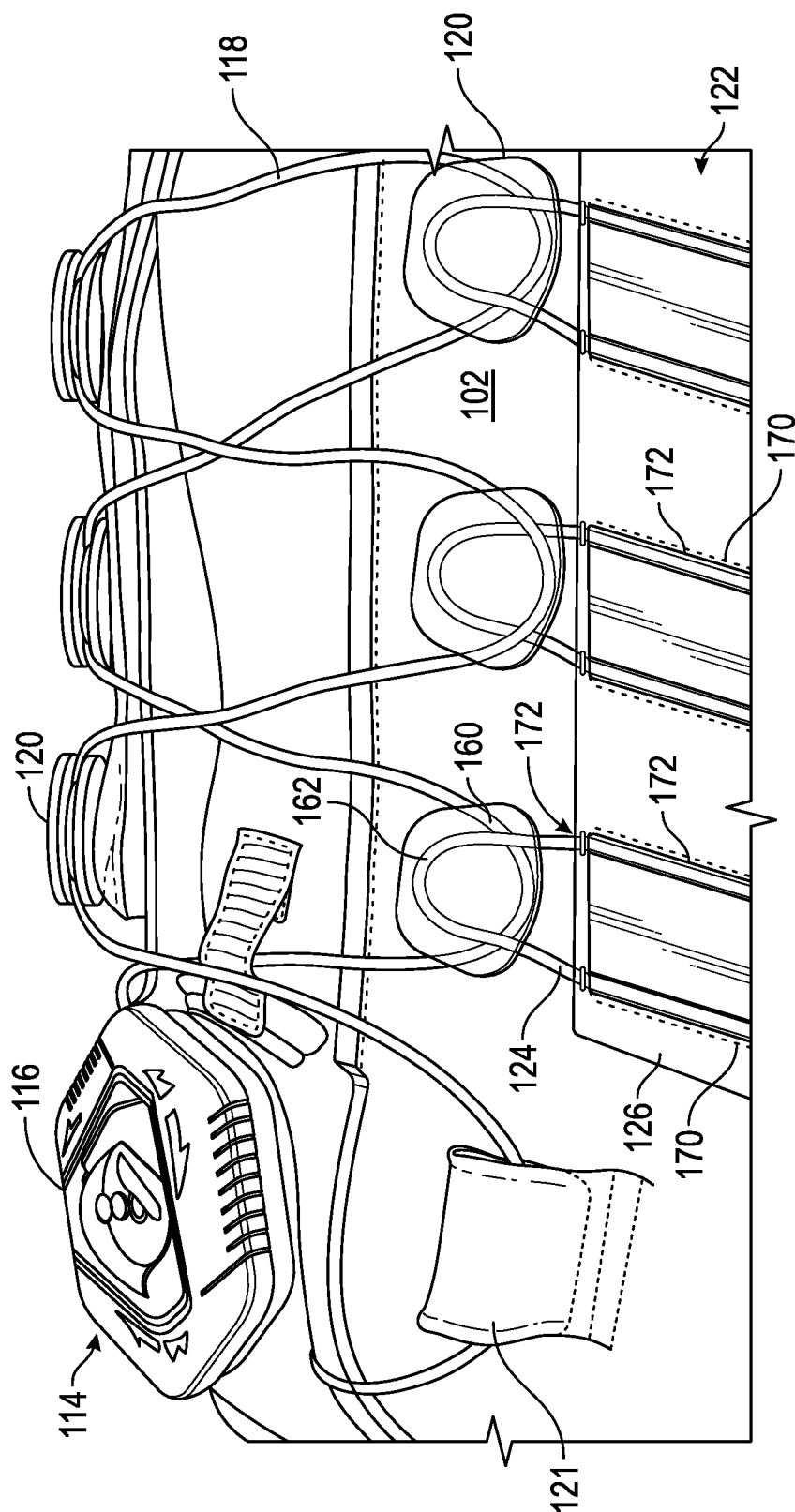


FIG. 7



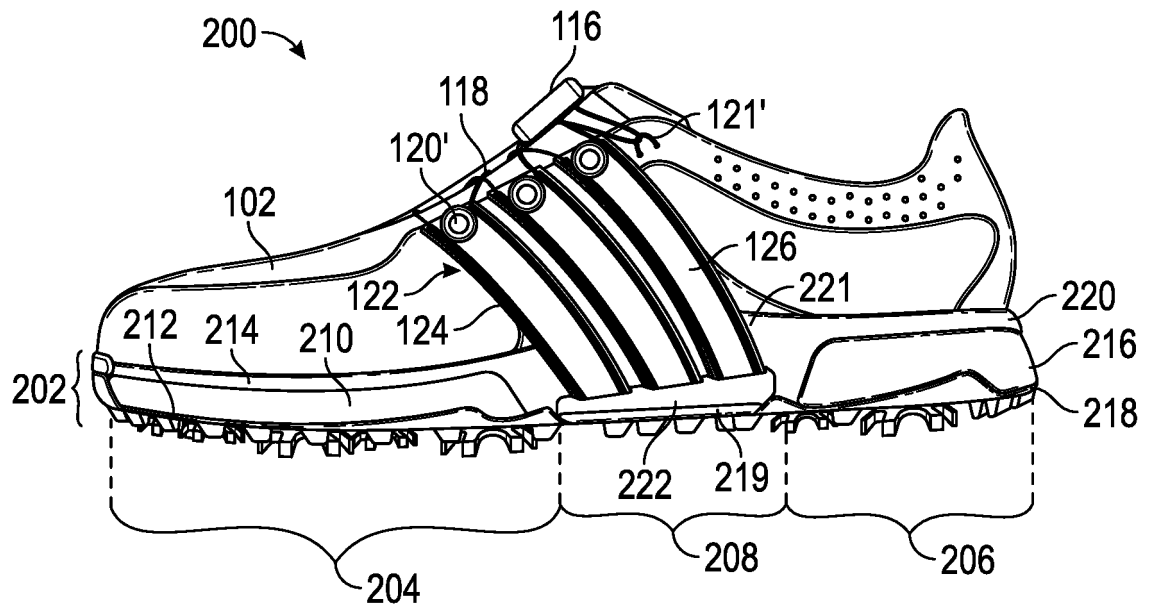


FIG. 8

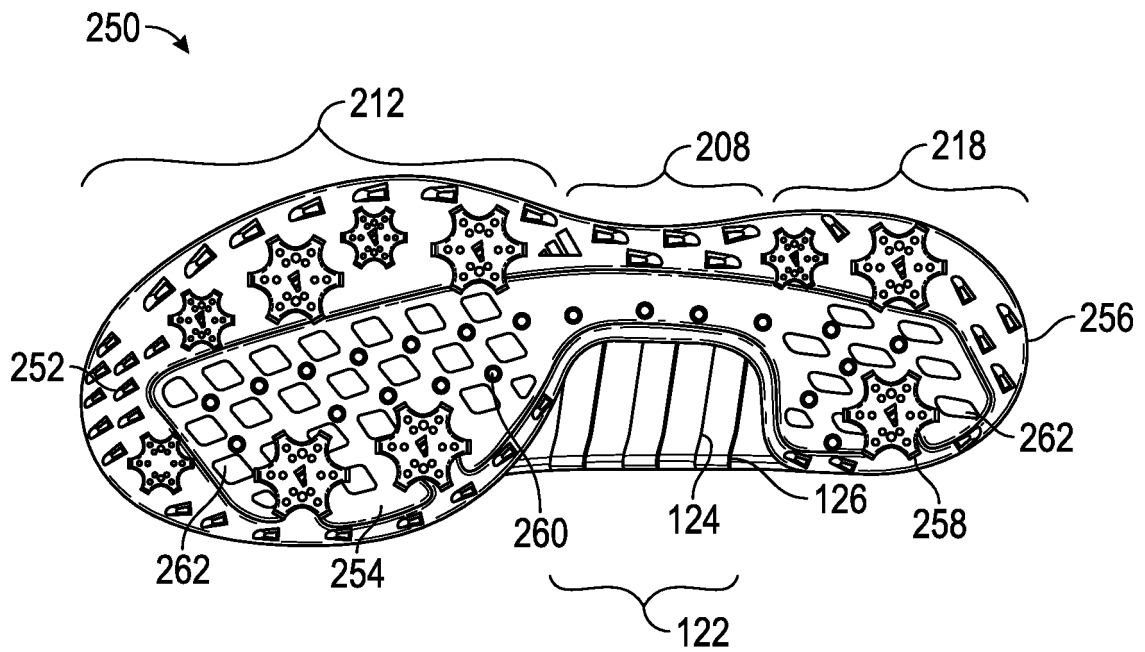


FIG. 9

**REFERENCES CITED IN THE DESCRIPTION**

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