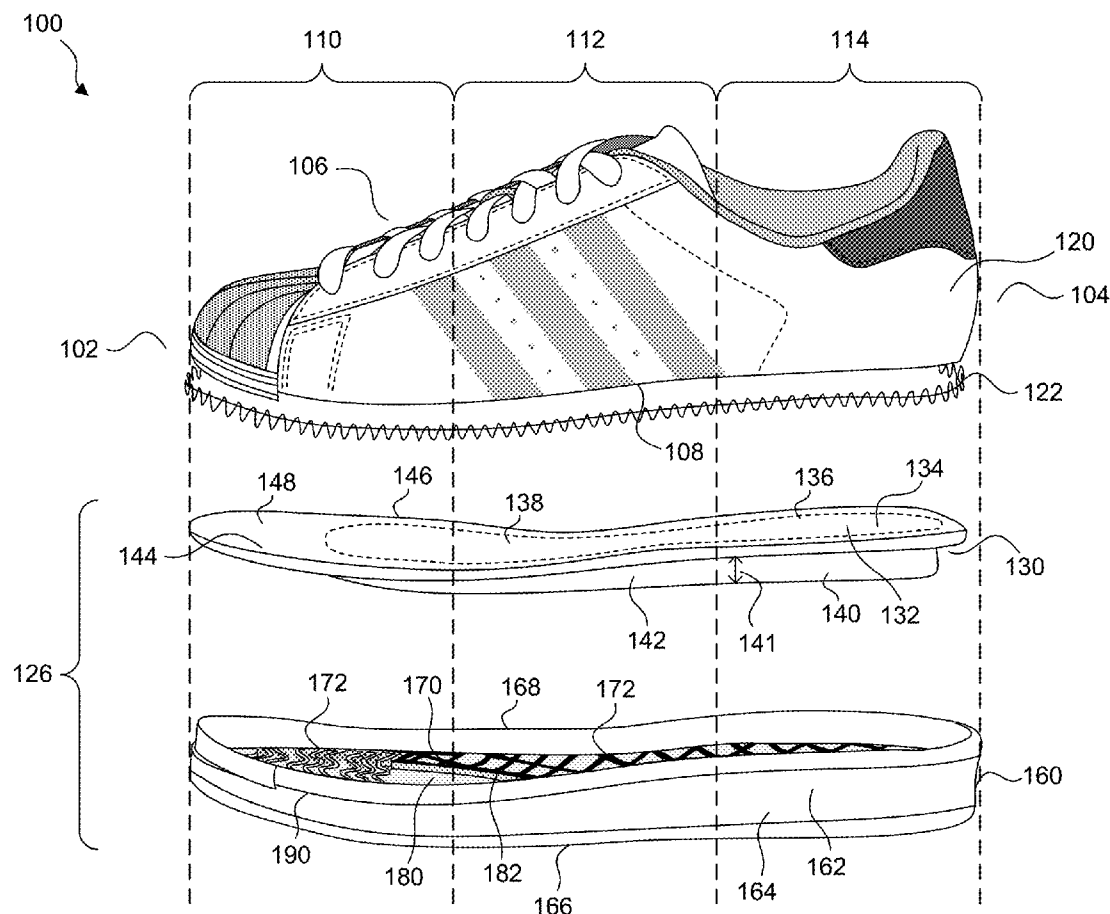


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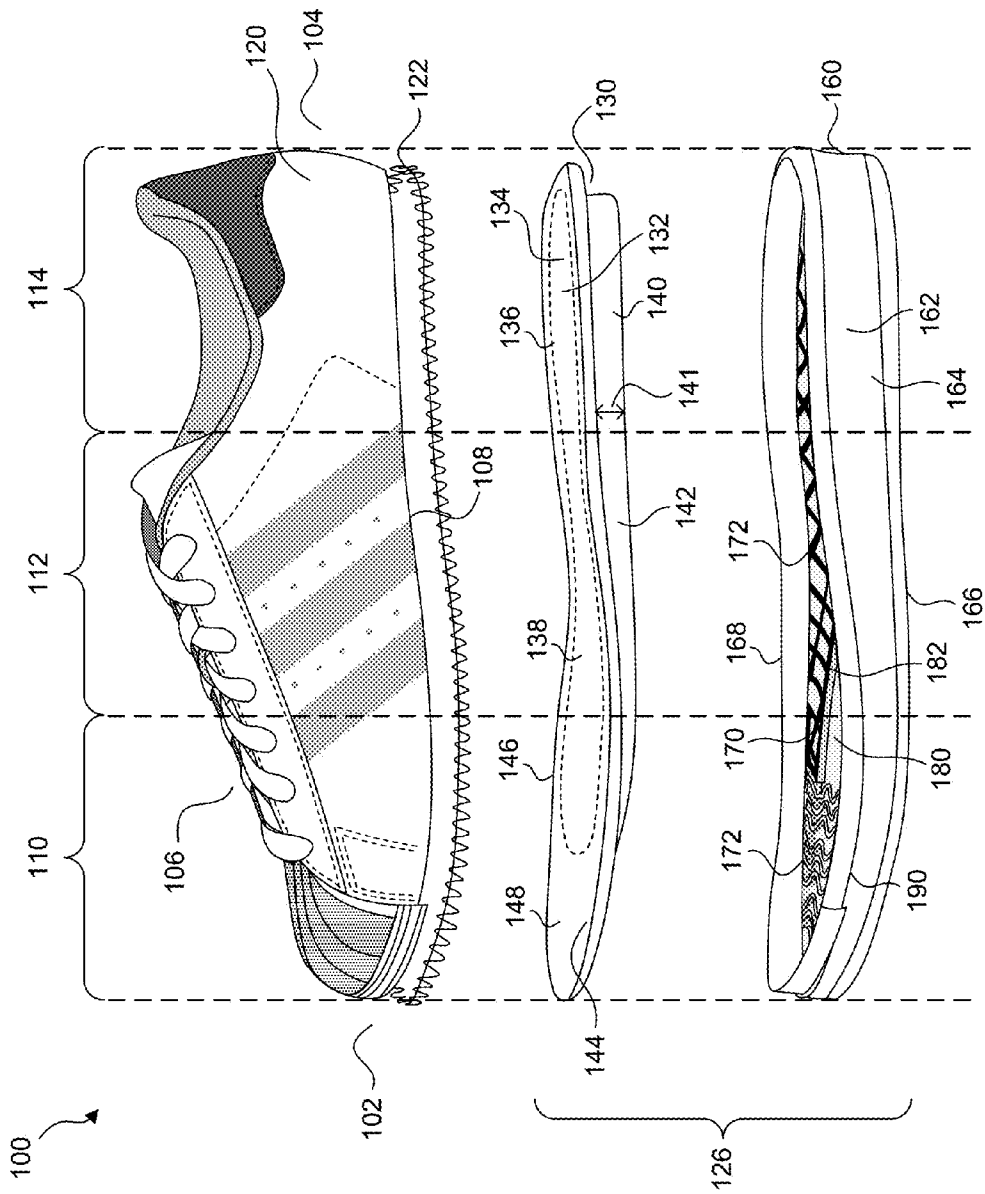


FIG. 1

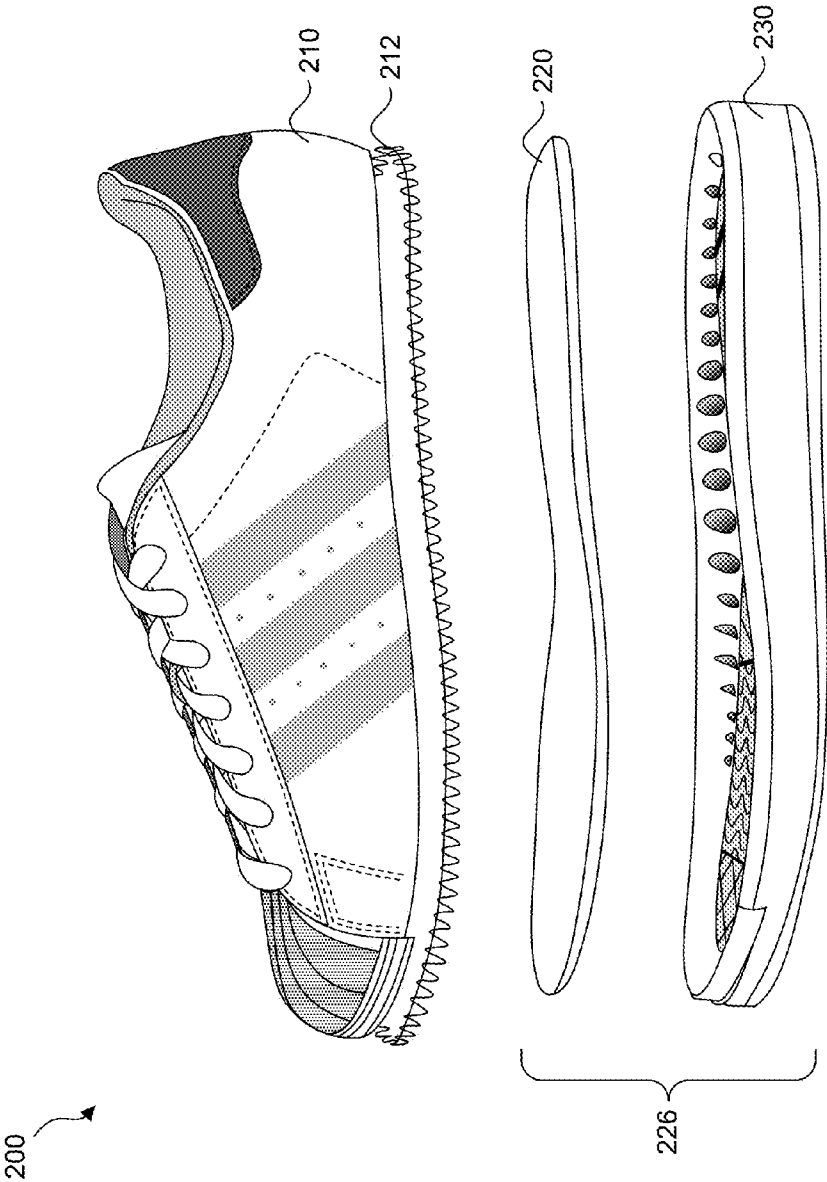


FIG. 2

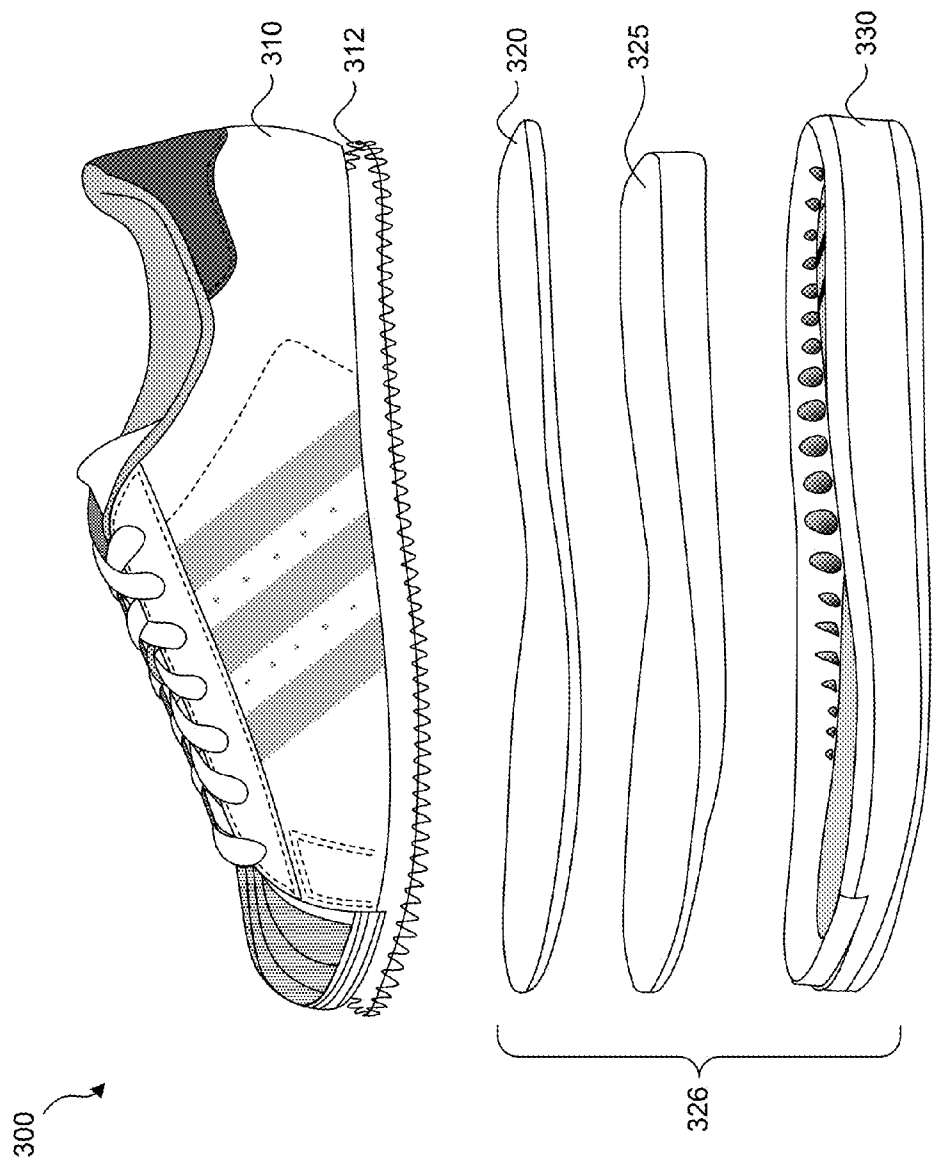


FIG. 3

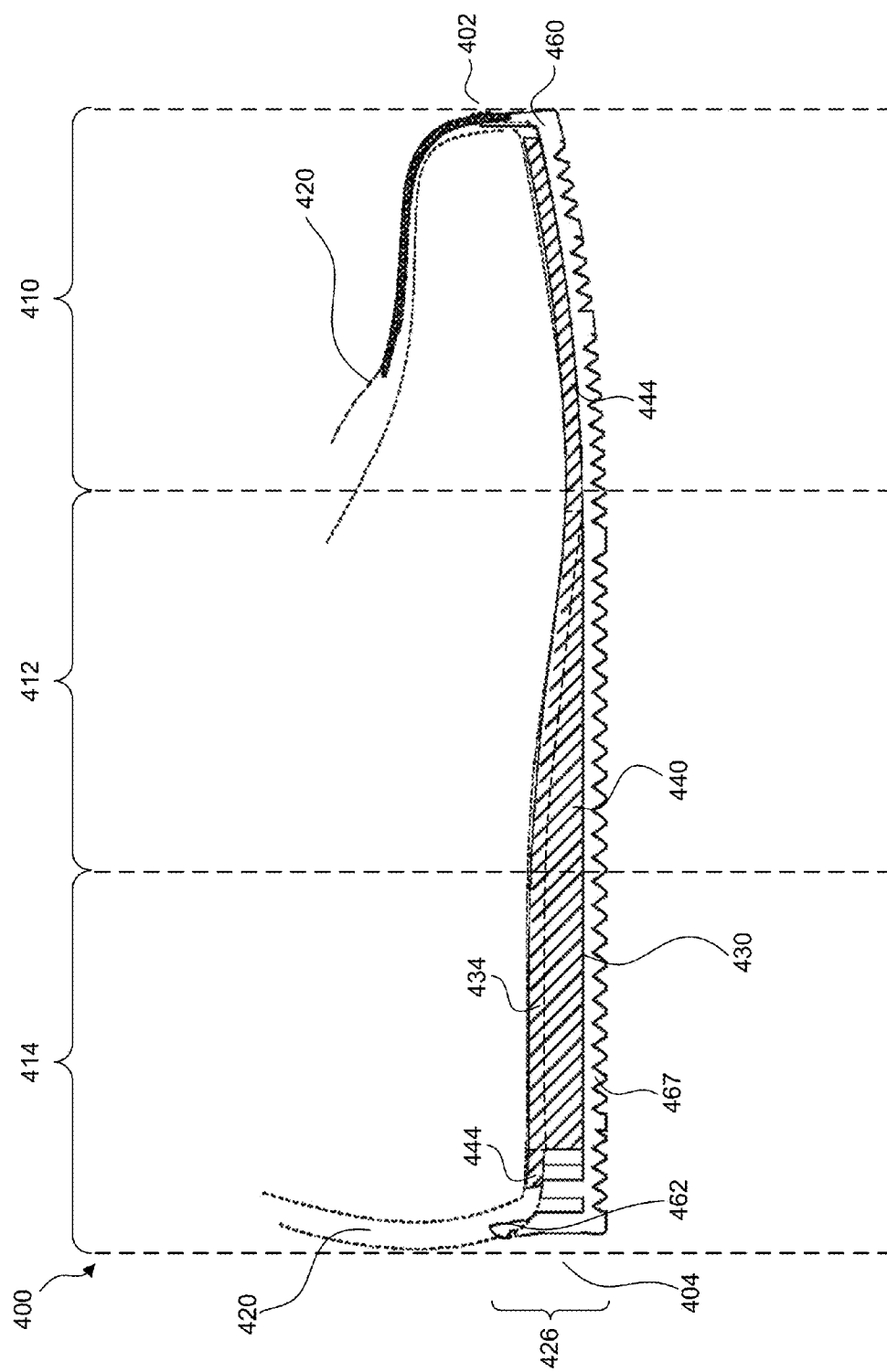


FIG. 4

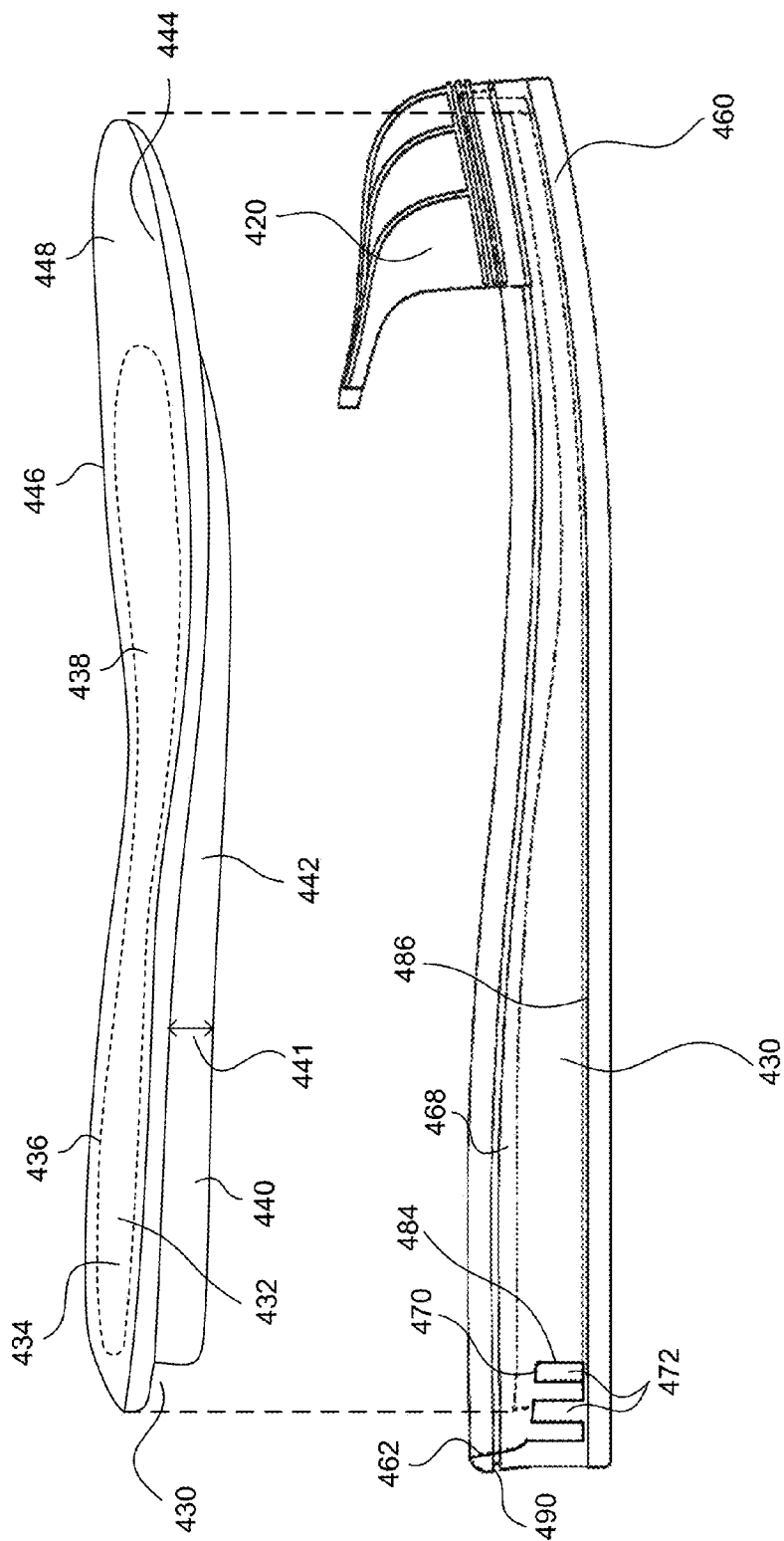


FIG. 5

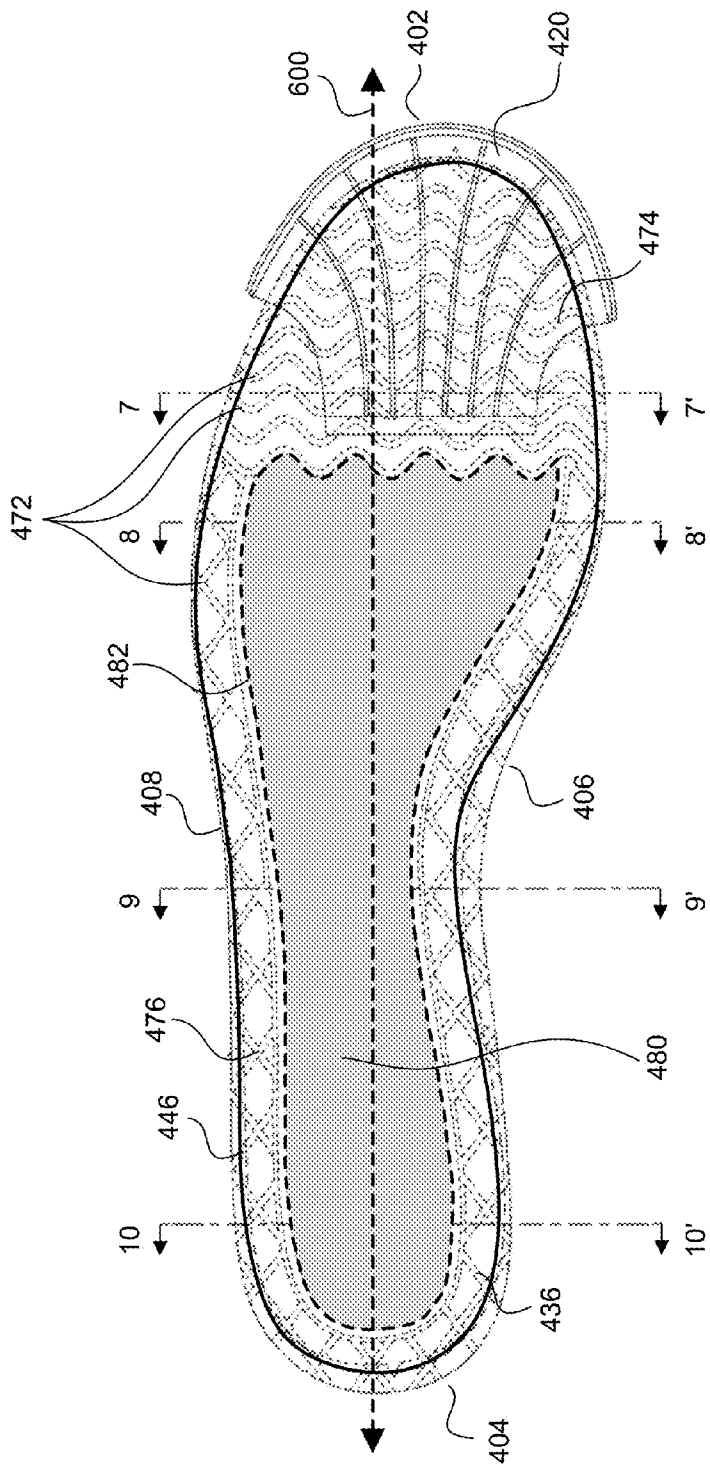


FIG. 6

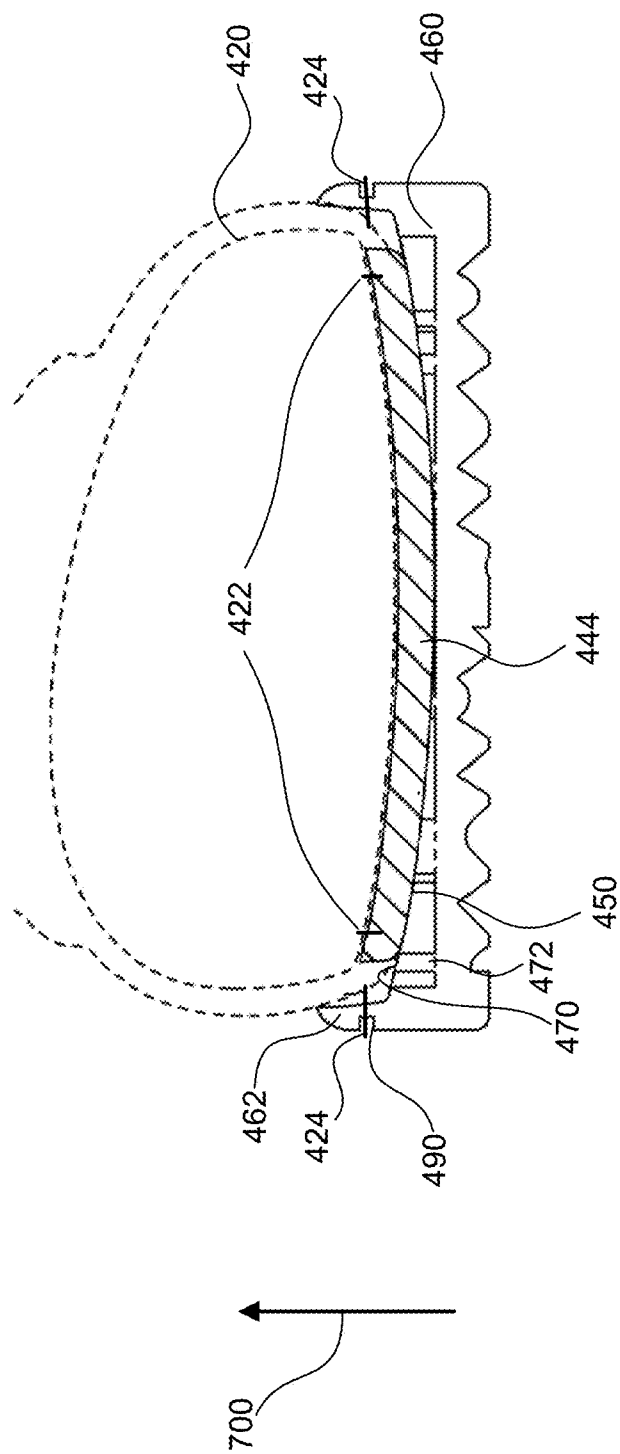


FIG. 7

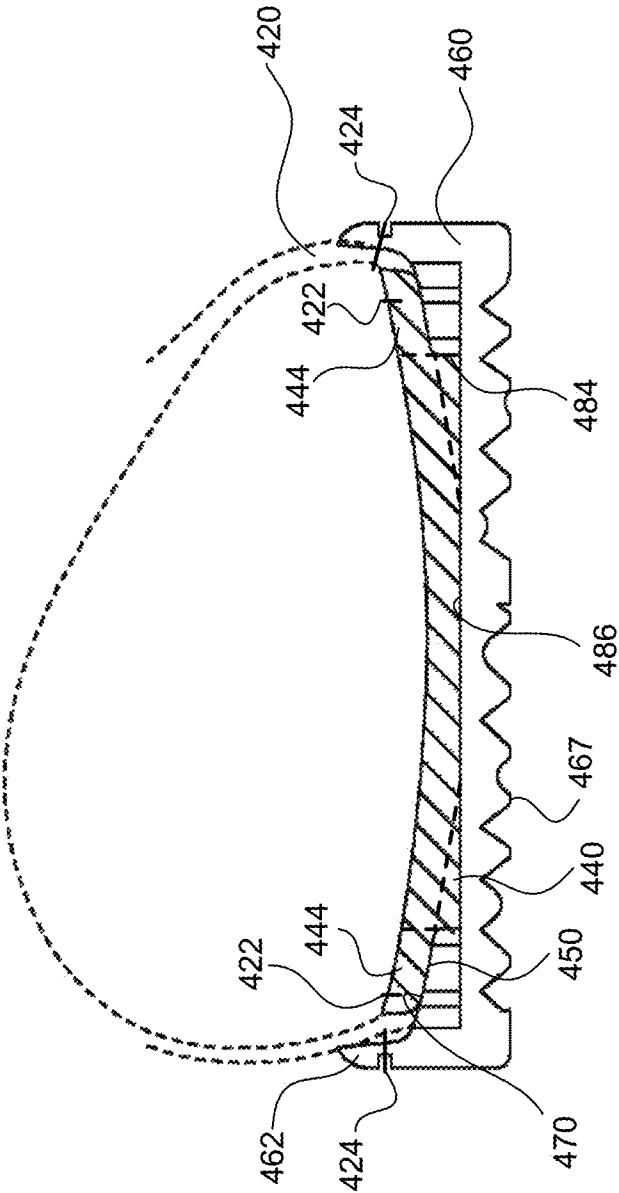


FIG. 8

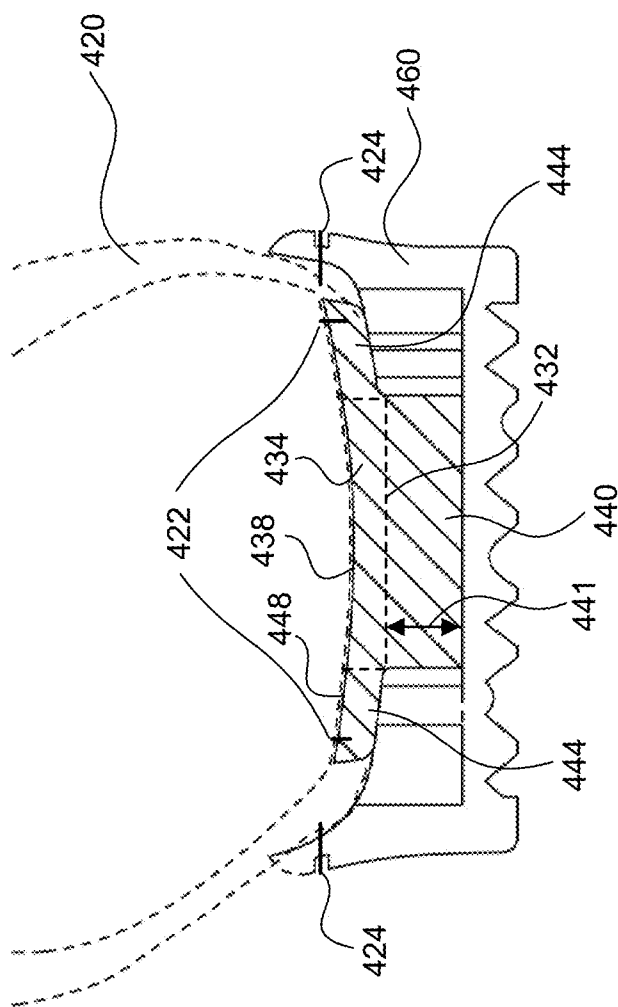


FIG. 9

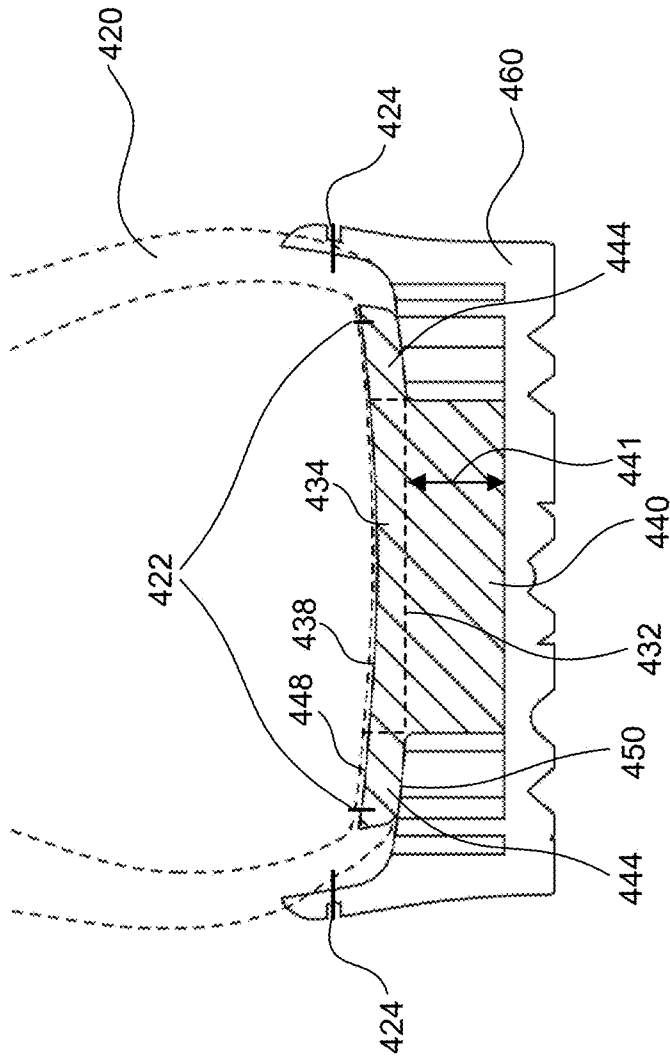


FIG. 10

ARTICLE OF FOOTWEAR HAVING A MIDSOLE AND METHODS OF MAKING THE SAME

FIELD

[0001] The described embodiments generally relate to an article of footwear having a midsole and methods of making the same. In particular, embodiments of the present invention relate to an article of footwear having a unitary midsole.

BACKGROUND

[0002] Individuals are often concerned with the amount of cushioning an article of footwear provides. This is true for articles of footwear worn for non-performance activities, such as a leisurely stroll, and for performance activities, such as running, because throughout the course of an average day, the feet and legs of an individual are subjected to substantial impact forces. When an article of footwear contacts a surface, considerable forces may act on the article of footwear and, correspondingly, the wearer's foot. The sole of an article of footwear functions, in part, to provide cushioning to the wearer's foot and to protect it from these forces.

[0003] The human foot is a complex and remarkable piece of machinery, capable of withstanding and dissipating many impact forces. The natural padding of fat at the heel and forefoot, as well as the flexibility of the arch, help to cushion the foot. Although the human foot possesses natural cushioning and rebounding characteristics, the foot alone is incapable of effectively overcoming many of the forces encountered during every day activity. Unless an individual is wearing shoes that provide proper cushioning and support, the soreness and fatigue associated with every day activity is more acute, and its onset may be accelerated. This discomfort for the wearer may diminish the incentive for further activity. Equally important, inadequately cushioned footwear can lead to injuries such as blisters; muscle, tendon and ligament damage; and bone stress fractures. Improper footwear can also lead to other ailments, including back pain.

[0004] Proper footwear should complement the natural functionality of the foot, in part, by incorporating a sole which absorbs shocks. Therefore, a continuing need exists for innovations in providing cushioning and support to articles of footwear.

BRIEF SUMMARY OF THE INVENTION

[0005] Some embodiments are directed towards an article of footwear including an upper, a midsole including a body and a flange integrally formed with the body, the flange extending outwardly from an outer perimeter of the body and coupled to the upper, and an outsole including a sidewall coupled to the upper and a base having a ground contacting surface and an open cavity disposed opposite the ground contacting surface, the open cavity having an upper surface defining a recess configured to receive a portion of the body of the midsole.

[0006] In some embodiments, the midsole consists of a single integrally formed piece.

[0007] In some embodiments, the flange of the midsole is stitched to the upper and the sidewall of the outsole is stitched to the upper. In some embodiments, the stitching between the midsole and the upper is a substantially vertical

stitch running along an outer perimeter of the flange. In some embodiments, the stitching between the upper and the outsole is oriented substantially perpendicular to the stitching between the midsole and the upper. In some embodiments, the stitching between the upper and the outsole is located above the stitching between the midsole and the upper. In some embodiments, the stitching between the upper and the outsole is horizontally offset from the stitching between the midsole and the upper.

[0008] In some embodiments, the body of the midsole includes a core from which the flange extends and a platform extending from a bottom of the core. In some embodiments, the recess in the open cavity is configured to receive the entire platform of the midsole. In some embodiments, a majority of the recess conforms to the exterior shape of the platform. In some embodiments, the recess extends from a heel portion of the outsole into a midfoot portion of the outsole.

[0009] In some embodiments, the cavity of the outsole receives the entire midsole. In some embodiments, an underside of the flange is disposed on the upper surface of the cavity disposed around the recess. In some embodiments, the upper surface has substantially the same footprint as the underside of the flange.

[0010] In some embodiments, the upper surface of the cavity comprises a plurality of projections. In some embodiments, the projections define a perimeter of the recess in the cavity. In some embodiments, the plurality of projections comprise a lattice structure. In some embodiments, the plurality of projections comprise a first set of projections and a second set of projections. In some embodiments, the first set of projections are disposed in a forefoot portion of the outsole and are oriented in a direction substantially perpendicular to a longitudinal axis of the outsole, and the second set of projections are disposed in the midfoot and heel portions of the outsole and are oriented in a direction substantially parallel to the longitudinal axis of the outsole.

[0011] In some embodiments, the midsole comprises a polymeric material. In some embodiments, the midsole comprises ethylene-vinyl acetate (EVA). In some embodiments, the midsole is composed of ethylene-vinyl acetate (EVA).

[0012] In some embodiments, the platform of the midsole tapers in thickness from a heel portion of the article of footwear towards a forefoot portion of the article of footwear. In some embodiments, the midsole has a T-shaped cross-sectional shape at the heel portion of the article of footwear.

[0013] In some embodiments, the article of footwear does not include a strobel board. In some embodiments, the outsole is adhesively bonded to the midsole.

[0014] In some embodiments, the flange extends outwardly from the body in a forefoot portion, a midfoot portion, and a heel portion of the midsole. In some embodiments, the flange has an outer perimeter that is larger than and disposed around the outer perimeter of the body. In some embodiments, a top surface of the flange is flush with a proximal surface of the midsole.

[0015] Some embodiments are directed towards an article of footwear including an upper, a midsole including a proximal surface, a platform, and a flange extending laterally from the proximal surface and coupled to the upper, and a cupsole including a sidewall coupled to the upper and a base having a ground contacting surface and an open cavity

disposed opposite the ground contacting surface, the open cavity including a plurality of projections defining an outer perimeter of a recess configured to receive the platform of the midsole.

[0016] In some embodiments, the flange of the midsole is stitched to the upper and the sidewall of the cupsole is stitched to the upper. In some embodiments, the stitching between the flange and the upper is oriented in a direction substantially perpendicular to the orientation of the stitching between the cupsole and the upper. In some embodiments, the stitching between the flange and the upper is horizontally and vertically offset from the stitching between cupsole and the upper.

[0017] In some embodiments, a top surface of the flange and the upper surface of the midsole form a contiguous surface. In some embodiments, a top surface of the flange is flush with the proximal surface of the midsole.

[0018] Some embodiments are directed towards a method of manufacturing an article of footwear including stitching a midsole to an upper by vertically stitching along a perimeter of a flange connected to a body of the midsole, coupling an outsole to the midsole such that the body of the midsole is received within a cavity formed in the outsole, and stitching the outsole to the upper, where the stitching between the upper and the outsole is oriented substantially perpendicular to the stitching between the midsole and the upper.

BRIEF DESCRIPTION OF THE DRAWINGS/FIGURES

[0019] FIG. 1 is an exploded view of an article of footwear having a unitary midsole according to an embodiment.

[0020] FIG. 2 is an exploded view of an article of footwear including a strobil board.

[0021] FIG. 3 is an exploded view of an article of footwear including a strobil board and an EVA insert.

[0022] FIG. 4 is a cross-sectional side view of an article of footwear according to an embodiment.

[0023] FIG. 5 is a partial cross-sectional exploded side view of an article of footwear with a midsole according to an embodiment.

[0024] FIG. 6 is top plan view of an article of footwear according to an embodiment.

[0025] FIG. 7 is a cross-sectional view of the article of footwear in FIG. 6 along the line 7-7'.

[0026] FIG. 8 is a cross-sectional view of the article of footwear in FIG. 6 along the line 8-8'.

[0027] FIG. 9 is a cross-sectional view of the article of footwear in FIG. 6 along the line 9-9'.

[0028] FIG. 10 is a cross-sectional view of the article of footwear in FIG. 6 along the line 10-10'.

[0029] FIG. 11 is a cross-sectional view of an article of footwear according to an embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0030] The present invention will now be described in detail with reference to embodiments thereof as illustrated in the accompanying drawings. References to “one embodiment”, “an embodiment”, “an exemplary embodiment”, etc., indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular

feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to affect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described

[0031] When an article of footwear contacts a surface, considerable forces may act on the article of footwear and, correspondingly, a wearer's foot. The natural padding of fat at the heel and forefoot, as well as the flexibility of the arch, help to cushion the foot. Although the human foot possesses natural cushioning and rebounding characteristics, the foot alone is incapable of effectively overcoming many of the forces encountered during every day activity. Unless an individual is wearing footwear (e.g., shoes) that provides proper cushioning and support, the soreness and fatigue associated with every day activity is more acute, and its onset may be accelerated. The added cushioning provided by an article of footwear, and particularly the sole of the article of footwear, reduces potential discomfort for an individual. Discomfort experienced during an activity, for example, exercise, may diminish the incentive for further activity, which can be detrimental to an individual's wellbeing.

[0032] An article of footwear, and particularly the sole of an article of footwear, can be configured to provide various amounts cushioning and/or stability to a wearer's foot. But the cost of manufacturing the article of footwear is a consideration. A sole configured to provide desired cushioning and that may be manufactured at a relatively low cost may be desirable for manufactures and consumers. A sole that can be manufactured using a relatively small amount of resources (e.g., energy and man power), materials, and time reduces manufacturing costs and may also reduce the environmental impact of manufacturing the sole.

[0033] In some embodiments, the article of footwear discussed herein may include a midsole that functions to provide desired cushioning and/or stability for an individual's foot. In some embodiments, the midsole may be a single integrally molded piece molded via, for example, compression molding. In some embodiments, the midsole may eliminate the need to include a strobil board as part of the article of footwear. The construction of the midsoles discussed herein may simplify manufacturing and thus reduce manufacturing costs and environmental impact.

[0034] In some embodiments, the article of footwear discussed herein may be assembled using a specific stitching pattern configured to optimize the strength of connections between different components of the article of footwear. Such a stitching pattern may eliminate the need to provide reinforcement for the article of footwear. Removing the need for reinforcing components may also simplify manufacturing, thus reducing manufacturing costs and environmental impact.

[0035] FIG. 1 shows an article of footwear 100 according to an embodiment. Article of footwear may include an upper 120, a midsole 130, and an outsole 160. When assembled, upper 120 may be coupled to midsole 130 and outsole 160. And midsole 130 and outsole 160 collectively form a sole 126 of article of footwear 100. As shown in FIG. 1, article of footwear 100 includes a forefoot end 102, a heel end 104, a medial side 106 and a lateral side 108 opposite medial side 106. Also as shown in FIG. 1, article of footwear 100 includes a forefoot portion 110, a midfoot portion 112, and

a heel portion 114. Portions 110, 112, and 114 are not intended to demarcate precise areas of article of footwear 100. Rather, portions 110, 112, and 114 are intended to represent general areas of article of footwear 100 that provide a frame of reference. Although portions 110, 112, and 114 apply generally to article of footwear 100, references to portions 110, 112, and 114 also may apply specifically to upper 120, midsole 130, outsole 160, or individual components of upper 120, midsole 130, or outsole 160.

[0036] FIG. 2 shows a conventional article of footwear 200 including an upper 210, a strobrel board 220, and an outsole 230. Collectively, strobrel board 220 and outsole 230 form a sole 226 of article of footwear 200. Strobrel board 220 may be coupled to upper 210 via, for example, stitching 212. And outsole 230 may be coupled to upper 210 via, for example, stitching (not shown) and an adhesive. Article of footwear 200 relies solely on strobrel board 220 and outsole 230 for providing cushioning for an individual's foot. While the construction of footwear 200 may be suitable in some circumstances, the cushioning provided by outsole 230 and strobrel board 220 may be limited.

[0037] FIG. 3 shows a conventional article of footwear 300 including an upper 310, a strobrel board 320, a midsole 325, and an outsole 330. Collectively, strobrel board 320, midsole 325, and outsole 330 form a sole 326 of article of footwear 300. Strobrel board 320 may be coupled to upper 310 via, for example, stitching 312. Midsole 325 may be coupled to outsole 330 via, for example, an adhesive. And outsole 330 may be coupled to upper 310 via, for example stitching (not shown) and an adhesive. The construction of article of footwear 300 may provide additional cushioning for an individual's foot, but the cost of manufacturing footwear 300 may be higher than article of footwear 200 because there are more components to be made and assembled. Also, as shown in FIGS. 2 and 3, both articles of footwear 200/300 include a strobrel board for providing structural support.

[0038] Returning to FIG. 1, article of footwear 100 may include a midsole 130 coupled to outsole 160, which collectively form sole 126 of article of footwear 100. As discussed herein, the construction of midsole 130 and/or outsole 160 (and other embodiments of midsoles and/or outsoles discussed herein) may eliminate the need to include a strobrel board when constructing an article of footwear. Upper 120, midsole 130, and outsole 160 may be configured for a specific type of footwear, including, but not limited to, a running shoe, a hiking shoe, a dancing shoe, a biking shoe, a tennis shoe, a cleat (e.g., a baseball cleat or a football cleat), a basketball shoe, a boot, a walking shoe, a casual shoe, or a dress shoe. Moreover, midsole 130 and outsole 160 may be sized and shaped to provide a desired combination of cushioning, stability, and ride characteristics to article of footwear 100. The term "ride" may be used herein in describing some embodiments as an indication of the sense of smoothness or flow occurring during a gait cycle including heel strike, midfoot stance, toe off, and the transitions between these stages. In some embodiments, midsole 130 and/or outsole 160 may provide particular ride features including, but not limited to, appropriate control of pronation and supination, support of natural movement, support of unconstrained or less constrained movement, appropriate management of rates of change and transition, and combinations thereof. Upper 120 may be manufactured from leather, canvas, nylon, combinations of these materials, or

other suitable materials. In some embodiments, upper 120 may include a liner, waterproofing, or other accessories. In some embodiments, article of footwear 100 may not include a strobrel board.

[0039] Midsole 130 and outsole 160 may comprise material(s) for providing desired cushioning, ride, and stability. Suitable materials for midsole 130 and outsole 160 include, but are not limited to, a foam, a rubber, ethyl vinyl acetate (EVA), expanded Thermoplastic polyurethane (eTPU), Thermoplastic rubber (TPR) and a thermoplastic polyurethane (PU). In some embodiments, the foam may comprise, for example, an EVA based foam or a PU based foam and the foam may be an open-cell foam or a closed-cell foam. In some embodiments, midsole 130 and/or outsole 160 may comprise elastomers, thermoplastic elastomers (TPE), foam-like plastics, and gel-like plastics.

[0040] In some embodiments, midsole 130 may be a unitary midsole. In some embodiments, midsole 130 may be a single integrally formed piece. For example, in one embodiment midsole 130 may comprise a—single integrally molded piece. In some embodiments, midsole 130 may be a single integrally formed piece comprising a polymeric material. In some embodiments, midsole 130 may be a single integrally formed piece comprising EVA, eTUP, TPR, or PU. In some embodiments, midsole 130 may be a single integrally formed piece composed solely of EVA, eTUP, TPR, or PU.

[0041] In some embodiments, midsole 130 and outsole 160 may comprise different materials to provide different characteristics to different portions of sole 126. In some embodiments, midsole 130 and outsole 160 may have different hardness characteristics. For example, in some embodiments, it may be desirable for sole 126 to be stiffer near the periphery of sole 126 to provide required lateral and/or medial stability. In this manner, all or a portion of a sidewall 162 of outsole 160 may comprise a harder material than other portions of outsole 160. In some embodiments, the material hardness of outsole 160 (e.g., the hardness of base 164 and/or sidewall 162 of outsole 160) may range from about 50 Asker C to about 70 Shore D, for example, about 60 C to about 75 C or about 65 C to about 70 C. In some embodiments, the material hardness of midsole 130 may range from about 20 C to about 70 C, for example, about 40 C to about 60 C or about 50 C to about 55 C.

[0042] In some embodiments, the material density of outsole 160 may be about 0.3 to about 0.5 grams/cubic centimeter (g/cm^3), for example, such as about 0.35 to about 0.4 g/cm^3 . In some embodiments, the material density of midsole 130 may be about 0.25 to about 0.5 g/cm^3 , for example, such as about 0.25 to about 0.3 g/cm^3 . In some embodiments, the material density of outsole 160 is higher than the material density of midsole 130. For example, in some embodiments, the material density of the outsole 160 may be about 0.35 to about 0.4 g/cm^3 and the material density of midsole 130 may be about 0.25 to about 0.3 g/cm^3 . In some embodiments, the material density of outsole 160 may be lower than, or even equal to, the material density of midsole 130.

[0043] In some embodiments, the material of outsole 160 may have a higher modulus than the material of midsole 130. In some embodiments, the material of outsole 160 may have a modulus that is lower, or even equal to, than the material of midsole 130.

[0044] Midsole 130 and outsole 160 may be formed using suitable techniques, including, but not limited to, injection molding, blow molding, compression molding, and rotational molding. Midsole 130 and outsole 160 may be discrete components that are formed separately and attached. In some embodiments, midsole 130 may be attached to outsole 160 via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, midsole 130 may be attached to outsole 160 via an adhesive disposed between midsole 130 and outsole 160.

[0045] As shown in FIG. 1, outsole 160 may include a sidewall 162 coupled to a base 164. Base 164 may include a ground contacting surface 166. In some embodiments, ground contacting surface 166 may include tread (e.g., tread 467). Outsole 160 may include an open cavity 168 disposed opposite ground contacting surface 166. Open cavity 168 may be defined, at least in part, by sidewall 162 and an upper surface 170 of outsole 160. Open cavity 168 may be sized and shaped (dimensioned) to receive at least a portion of midsole 130. In some embodiments, open cavity 168 may be configured to receive the entire midsole 130. An outsole 160 including open cavity 168 and sidewall 162 may be called a cupsole.

[0046] In some embodiments, upper surface 170 may include a plurality of projections 172 extending from upper surface 170. In some embodiments, projections 172 may be arranged, in whole or in part, in a lattice structure. In one embodiment, projections 172 define all or a portion of cavity 168. Projections 172 may provide cushioning and/or stability and also may help secure midsole 130 in place when midsole 130 is assembled with outsole 160 (e.g., by providing a textured surface for contacting a portion of midsole 130 and preventing undesired detachment of midsole 130 with open cavity 168).

[0047] A recess 180 may be formed in upper surface 170 for receiving at least a portion of midsole 130. In some embodiments, recess 180 may be configured to receive at least a portion of a platform 140 of midsole 130. In some embodiments, recess 180 may be configured to receive the entire platform 140. In some embodiments projections 172 may define a perimeter 182 of recess 180. Recess 180 may include a recess sidewall and a lower surface defining the size and shape of recess 180. In some embodiments, recess 180 may extend from heel portion 114 of outsole 160 into midfoot portion 112 of outsole 160. In some embodiments, recess 180 may occupy at least a portion of heel portion 114, midfoot portion 112, and forefoot portion 110 of outsole 160. In some embodiments, a majority of the shape of recess 180 conforms to an exterior surface 142 of platform 140.

[0048] Sidewall 162 of outsole 160 may be coupled to upper 120 via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, sidewall 162 may include a stitching groove 190 for facilitating stitching of outsole 160 to upper 120.

[0049] With reference to FIG. 1, midsole 130 may include a body 132 having a core 134 with platform 140 extending from a bottom of core 134 towards outsole 160 (e.g., into recess 180 when midsole 130 and outsole 160 are assembled). In some embodiments, body 132 (i.e., core 134 and platform 140) may be a single integrally formed piece. Platform 140 may have a thickness 141 that tapers from heel portion 114 of article of footwear 100 towards forefoot

portion 110 of article of footwear 100 (e.g., tapers along longitudinal axis 600). In some embodiments, platform 140 may have a cross-sectional shape along a longitudinal axis of article of footwear 100 (e.g., longitudinal axis 600) that is substantially the same as a cross-sectional shape of recess 180 along the same axis. The width of platform 140 may also vary along the longitudinal axis of article of footwear 100.

[0050] Midsole 130 also includes a flange 144 that provides structure for coupling midsole 130 to upper 120. Flange 144 extends outwardly from core 134 towards sidewall 162 of outsole 160. In other words, flange 144 extends laterally from core 134. In some embodiments, flange 144 may be integrally formed with body 132. In some embodiments, flange 144 may extend outwardly from a perimeter 136 of core 134 towards sidewall 162 of outsole 160. In some embodiments, a top surface 148 of flange 144 may coincide with and extend laterally from a proximal surface 138 of body 132. Flange 144 may extend outwardly from perimeter 136 of core 134 in one or more of forefoot portion 110, midfoot portion 112, and heel portion 114. In some embodiments, flange 144 may extend outwardly from core 134 in forefoot portion 110, midfoot portion 112, and heel portion 114. In some embodiments, flange 144 may have a perimeter 146 that is larger than and is disposed around perimeter 136 of core 134. The structure of midsole 130, and in particular the structure of flange 144, provides cushioning for a wearer's foot while at the same time providing structure for coupling midsole 130 to upper 120. In some embodiments, the construction of midsole 130 may simplify manufacturing, reduce cost of manufacturing by decreasing the time required to manufacture, and/or decrease the number of parts needed to construct an article of footwear with appropriate comfort and performance.

[0051] Flange 144 may be coupled to upper 120 by suitable attachments, including, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, flange 144 may provide structure for stitching midsole 130 to upper 120 via, for example, stitch 122. In some embodiments, midsole 130 also may be stitched to upper 120 via stitching around a portion of perimeter 146 of flange 144. In some embodiments, midsole 130 may be stitched to upper 120 via stitching around the entire perimeter 146 of flange 144.

[0052] FIG. 4 shows a cross-sectional view of an article of footwear 400 according to an embodiment. Similar to article of footwear 100, article of footwear 400 may include an upper 420 coupled to a midsole 430 and an outsole 460. And midsole 430 and outsole 460 collectively form a sole 426 of article of footwear 400. Article of footwear 400 also includes a forefoot end 402, a heel end 404, a medial side 406 and a lateral side 408 opposite medial side 406 (see FIG. 6). Additionally, as shown in FIG. 4, article of footwear 400 includes a forefoot portion 410, a midfoot portion 412, and a heel portion 414. Similar to portions 110, 112, and 114, portions 410, 412, and 414 are not intended to demarcate precise areas of article of footwear 400, but rather are intended to represent general areas of article of footwear 400 that provide a frame of reference. Although portions 410, 412, and 414 apply generally to article of footwear 400, they may also apply specifically to upper 420, midsole 430, outsole 460, or individual components of upper 420, midsole 430, or outsole 460.

[0053] Upper 420, midsole 430, and outsole 460 may be configured for a specific type of footwear, including, but not

limited to, a running shoe, a hiking shoe, a dancing shoe, a biking shoe, a tennis shoe, a cleat (e.g., a baseball cleat or a football cleat), a basketball shoe, a boot, a walking shoe, or a dress shoe. Moreover, midsole 430 and the outsole 460 may be sized and shaped to provide a desired combination of cushioning, stability, and ride characteristics to the article of footwear. Upper 420 may be manufactured from leather, canvas, nylon, combinations of these materials, or other suitable materials. In some embodiments, upper 420 may include a liner, waterproofing, or other accessories. In some embodiments, article of footwear 400 may not include a strobil board.

[0054] Outsole 460 may be the same as or similar to outsole 160. Outsole 460 may include a side wall 462 coupled to a base 464 including a ground contacting surface 466. In some embodiments, ground contacting surface 466 may include tread 467. Outsole 460 may include an open cavity 468 disposed opposite ground contacting surface 466. As shown, for example, in FIG. 5, open cavity 468 may be defined, at least in part, by sidewall 462 and an upper surface 470. Open cavity 468 may be sized and shaped (dimensioned) to receive at least a portion of midsole 430 (midsole 430 is shown in dotted lines within open cavity 468 in FIG. 5 for illustration purposes). In some embodiments, open cavity 468 may be configured to receive the entire midsole 430. An outsole 460 including open cavity 468 and sidewall 462 may be called a cupsole. In some embodiments, upper surface 470 may include a plurality of projections 472 extending from upper surface 470 (see discussion of FIG. 6 below). Projections 472 may provide cushion and also may help secure midsole 430 in place when midsole 430 is assembled with outsole 460 (e.g., by providing a textured surface for contacting a portion of midsole 430 and preventing undesired detachment of midsole 430 with open cavity 468).

[0055] A recess 480 may be formed in upper surface 470 for receiving at least a portion of midsole 130. Recess 480 may include a recess sidewall 484 and a lower surface 486 defining the size and shape of recess 480. In some embodiments, recess 480 may be configured to receive at least a portion of a platform 440 of midsole 430. In some embodiments, recess 480 may be configured to receive the entire platform 440. In some embodiments, the majority of the shape of recess 480 (e.g., the shape of sidewall 484 and lower surface 486) conforms to an exterior surface 442 of platform 440. In some embodiments, recess 480 may extend from heel portion 414 of outsole 460 into midfoot portion 412 of outsole 460. In some embodiments, recess 480 may occupy at least a portion of heel portion 414, midfoot portion 412, and forefoot portion 410 of outsole 460. In some embodiments, a majority of the shape of recess 480 conforms to an exterior surface 442 of platform 440. In some embodiments, exterior surface 442 of platform 440 may be adhesively bonded to all or a portion of sidewall 484 and lower surface 486.

[0056] FIG. 6 shows an aerial view of article of footwear 400 showing open cavity 468 and recess 480 of outsole 460. As shown in FIG. 6 upper surface 470 of open cavity 468 may include a plurality of projections 472. In some embodiments, projections 472 may define a perimeter 482 of recess 480 in open cavity 468. In some embodiments, projections 472 may be arranged, in whole or in part, in a lattice structure. For example, as shown in FIG. 6, the portions of upper surface 470 surrounding the back (i.e., heel) and side

portions of recess 480 may include a lattice structure. In some embodiments, projections 472 may include a first set of projections 474 and a second set of projections 476. In some embodiments, first set of projections 474 may be disposed in forefoot portion 410 of outsole 460 and may be oriented in a direction substantially perpendicular to longitudinal axis 600. In some embodiments, second set of projections 476 may be disposed in midfoot and heel portions 412/414 of outsole 460 and may be oriented in a direction substantially parallel to longitudinal axis 600.

[0057] The orientation of first and second set of projections 474/476 may serve to provide a textured surface for securing midsole 430 in place within open cavity 468. For example, first set of projections 474 may be oriented in a direction substantially perpendicular to longitudinal axis 600 to help prevent undesired longitudinal detachment of midsole 430 from outsole 160 when an individual pushes off his/her toes to propel himself/herself forward during, for example, walking or running. As another example, second set of projections 476 may be oriented in a direction substantially parallel to longitudinal axis 600 to help prevent undesired transverse detachment of midsole 430 from outsole 160 when an individual cuts right or left during, for example, running or jogging. Moreover, the structure, location and/or orientation of first and/or second set of projections may ensure that article of footwear 400 will flex at the right place on a wearer's foot when worn. For example, projections having a lattice structure in the midfoot portion of the sole may allow for sufficient bending of the midsole 430 during a toe-off event in the gait of the wearer.

[0058] As shown, for example, in FIGS. 7-10, sidewall 462 of outsole 460 may be coupled to upper 420 by an attachment, including, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, sidewall 462 may include a stitching groove 490 for facilitating stitching of outsole 460 to upper 420. In some embodiments, stitching groove 490 may be disposed all the way around sidewall 462. In some embodiments, stitching groove 490 may extend into sidewall 462 in a substantially horizontal direction (i.e., in a direction substantially perpendicular to the outer surface of sidewall 462). Stitching groove 490 may serve to facilitate a horizontal stitch 424 between sidewall 462 and upper 420. Horizontal stitch 424 may be called a "welt stitch" or an "outsole stitch."

[0059] Midsole 430 may be the same as or similar to midsole 130. Midsole 430 may include a body 432 having a core 434 with platform 440 extending from a bottom of core 434 towards outsole 460 (e.g., into recess 480 when midsole 430 and outsole 460 are assembled). In some embodiments, body 432 (i.e., core 434 and platform 440) may be a single integrally formed piece. Similar to platform 140, platform 440 may have a thickness 441 that tapers from heel portion 414 of article of footwear 400 towards forefoot portion 410 of article of footwear 400. In some embodiments, platform 440 may have a cross-sectional shape along a longitudinal axis of article of footwear 400 (e.g., longitudinal axis 600) that is substantially the same as a cross-sectional shape of recess 480 along the same axis.

[0060] Midsole 430 also includes a flange 444 that provides structure for coupling midsole 430 to upper 420. Flange 444 extends outwardly from core 434 towards sidewall 462 of outsole 460. In other words, flange 444 may extend laterally from core 434. In some embodiments, flange

444 may be integrally formed with body 432. In some embodiments, flange 444 may extend outwardly from a perimeter 436 of core 434 towards sidewall 462 of outsole 460. Flange 444 may extend outwardly from perimeter 436 of core 434 in one or more of forefoot portion 410, midfoot portion 412, and heel portion 414. In some embodiments, flange 444 may extend outwardly from core 434 in forefoot portion 410, midfoot portion 412, and heel portion 414. In some embodiments, flange 444 may have a perimeter 446 that is larger than and disposed around perimeter 436 of core 434. Similar to midsole 130, the structure of midsole 430, and in particular the structure of flange 444, provides cushioning for a wearer's foot while at the same time providing structure for coupling midsole 430 to upper 420.

[0061] Flange 444 may be coupled to upper 420 via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, flange 444 may provide structure for stitching midsole 430 to upper 420 via, for example, vertical stitch 422. In some embodiments, vertical stitch 422 may be, but is not limited to, a zigzag stitch. In some embodiments, midsole 430 may be stitched to upper 420 via stitching around a portion of perimeter 446 of flange 444. In some embodiments, midsole 430 may be stitched to upper 420 via stitching around the entire perimeter 446 of flange 444.

[0062] FIGS. 7-10 show cross-sectional views of article of footwear 400 along the lines 7-7', 8-8', 9-9', and 10-10' shown in FIG. 6, respectively. FIGS. 7-10 illustrate horizontal stitch 424 running along sidewall 462 of outsole 460 and vertical stitch 422 running along perimeter 446 of flange. As shown in FIGS. 7-10, horizontal stitch 424 between upper 420 and outsole 460 may be oriented substantially perpendicular to vertical stitch 422 between midsole 430 and upper 420. In some embodiments, horizontal stitch 424 may be vertically offset from (i.e., located above or below) vertical stitch 422 in at least one of forefoot portion 410, midfoot portion 412, and heel portion 414. In some embodiments, horizontal stitch 424 may be vertically offset from vertical stitch 422 in forefoot portion 410, midfoot portion 412, and heel portion 414. In some embodiments, horizontal stitch 424 may be located above vertical stitch 422 in one or more of forefoot portion 410, midfoot portion 412, and heel portion 414.

[0063] In some embodiments, horizontal stitch 424 may be horizontally offset from vertical stitch 422 in at least one of forefoot portion 410, midfoot portion 412, and heel portion 414. In some embodiments, horizontal stitch 424 may be horizontally offset from vertical stitch 422 in forefoot portion 410, midfoot portion 412, and heel portion 414. As used herein the term "horizontally offset" means that stitching does not overlap in a horizontal direction (i.e., does not overlap in a transverse cross-sectional plane that interests medial side 406 and lateral side 408 in a direction perpendicular to a longitudinal axis 600 of article of footwear 400 (e.g., the cross-sectional views shown in FIGS. 7-10)). In other words, stitching that is horizontally offset means that the orthographic projections of vertical stitch 422 and horizontal stitch 424 in a vertical direction 700 perpendicular to ground contacting surface 466 of outsole 460 do not overlap. A vertical stitch 422 and horizontal stitch 424 that are vertically and horizontally offset helps reduce structural weakness created by stitching (e.g., the puncture holes created by stitching and any stress concentrations located at the puncture holes) from interacting with each other, and

thus increasing the likelihood of one or both of stitches failing. In other words, a vertical stitch 422 and horizontal stitch 424 that are vertically and horizontally offset may be isolated from each other, thereby reducing the possibility of a weakness associated with one of the stitches from influencing the other. This may limit the need to provide reinforcement for the article of footwear.

[0064] FIGS. 7-10 also show the cross-sectional profile of midsole 430 along the length of article of footwear 400 (i.e., along longitudinal axis 600). As shown in FIG. 7, midsole 430 may have a generally uniform shape in forefoot portion 410 of article of footwear 400. In some embodiments, flange 444 may define the generally uniform shape of midsole 430 in forefoot portion 410. As shown in FIG. 7, an underside 450 of flange 444 may be disposed on (e.g., contact) upper surface 470 of open cavity 468 in forefoot portion 410. In embodiments including projections 472, underside 450 of flange 444 may be disposed on one or more projections 472 located in forefoot portion 410.

[0065] As shown in FIG. 8, when moving towards midfoot portion 412 and into a portion of outsole 460 having recess 480, body 432 (i.e., core 434 and platform 440) of midsole 430 may begin to influence the cross-sectional shape of midsole 430. Underside 450 of flange 444 may continue to be disposed on upper surface 470 of open cavity 468 and may contact one or more projections 472. As shown in FIG. 8, exterior surface 442 of platform 440 may contact lower surface 486 of recess 480. In some embodiments, exterior surface 442 of platform 440 may contact sidewall 484 of recess 480.

[0066] FIGS. 9 and 10 show how thickness 441 of platform 440 may increase when moving through midfoot portion 412 and into heel portion 414 of article of footwear 400 according to some embodiments. In other words, platform 440 of midsole 430 may taper in thickness from heel portion 414 towards forefoot portion 410. As shown in FIGS. 9 and 10, underside 450 of flange 444 may continue to be disposed on upper surface 470 of open cavity 468 and may contact one or more projections 472. In some embodiments, midsole 430 may have a T-shaped cross-sectional shape in heel portion 414 of article of footwear 400.

[0067] In some embodiments, underside 450 of flange 444 may be disposed on a majority of upper surface 470 around recess 480 (see e.g., perimeter 146 of flange 144 in FIG. 6). In some embodiments, underside 450 of flange 444 may be disposed on the entirety of upper surface 470 around recess 480. In some embodiments, underside 450 of flange 144 may have substantially the same footprint (i.e., substantially the same orthographic projection in vertical direction 700) as upper surface 470. In some embodiments, underside 450 of flange 144 may have substantially the same footprint as the area occupied by projections 472 on upper surface 470. In some embodiments, underside 450 of flange 444 may be adhesively bonded to all or a portion of upper surface 470.

[0068] As shown, for example, in FIGS. 8-10, a top surface 448 of flange 444 may coincide with and extend laterally from a proximal surface 438 of body 432. Top surface 448 and proximal surface 438 may define the portion of midsole 430 that contacts the foot when article of footwear 400 is worn. In some embodiments, top surface 448 and proximal surface 438 may form a contiguous surface that contacts the foot when worn. In some embodiments, top surface 448 may be flush with proximal surface 438. As used herein, "flush" refers to a top surface of the flange and a

proximal surface of the midsole that share the same geometric plane, at least at their edges. In some embodiments, two surfaces that are “flush” may be flush within a deviation of $\pm 1/16$ of an inch, which is generally imperceptible to a casual observer, and will provide a smooth, uninterrupted surface for the portion of the midsole configured to contact a wearer's foot when the article of footwear is worn.

[0069] FIG. 11 shows a cross-sectional view of an article of footwear 1100 according to an embodiment. Similar to article of footwear 100, article of footwear 1100 may include an upper 1120 coupled to a midsole 1130 and an outsole 1160. And midsole 1130 and outsole 1160 collectively form a sole 1126 of article of footwear 1100. Outsole 1160 may be the same as or similar to outsole 160. Outsole 1160 may include a sidewall 1162 coupled to a base 1164 having a ground contacting surface 1166. In some embodiments, ground contacting surface 1166 may include tread 1167. Outsole 1160 may include an open cavity 1168 disposed opposite ground contacting surface 1166. As shown in FIG. 11, open cavity 1168 may be defined by sidewall 1162 and base 1164. Open cavity 1168 may be the same as or similar to open cavity 468 discussed above in regards to article of footwear 400. An outsole 1160 including open cavity 1168 and sidewall 1162 may be called a cupsole. In some embodiments, article of footwear 1100 may not include a strobil board.

[0070] Sidewall 1162 of outsole 1160 may be coupled to upper 1120 via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, sidewall 1162 may include a stitching groove 1190 for facilitating stitching of outsole 1160 to upper 1120. In some embodiments, stitching groove 1190 may be disposed all the way around sidewall 1162. In some embodiments, stitching groove 1190 may extend into sidewall 1162 in a substantially horizontal direction (i.e. in a direction substantially perpendicular to the outer surface of sidewall 1162). Stitching groove 1190 may serve to facilitate a horizontal stitch 1124 between sidewall 1162 and upper 1120.

[0071] Midsole 1130 may be composed of one or more of the materials discussed above in regards to midsole 130. In some embodiments, midsole 1130 may be a unitary midsole. In some embodiments, midsole 1130 may be a single integrally molded piece. Moreover, midsole 1130 may be manufactured using one or more of the techniques discussed above in regards to midsole 130 and may be attached to outsole 1160 using one or more of the techniques discussed above in regards to midsole 130. Midsole 1130 may include a body 1132 and a flange 1144 extending upwardly from body 1132 along sidewall 1162 of outsole 1160. In some embodiments, flange 1144 may be integrally formed with body 1132. Flange 1144 may extend upwardly from body 1132 in one or more of a forefoot portion, a midfoot portion, and a heel portion of article of footwear 1100. In some embodiments, flange 1144 extends upwardly from body 1132 in the forefoot portion, midfoot portion, and heel portion of article of footwear 1100. Similar to midsoles 130 and 430, the structure of midsole 1130, and in particular the structure of flange 1144, provides cushioning for a wearer's foot while at the same time providing structure for coupling midsole 1130 to upper 1120.

[0072] Flange 1144 may be coupled to upper 1120 via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments,

flange 1144 may provide structure for stitching midsole 1130 to upper 1120 via, for example, vertical stitch 1122. In some embodiments, midsole 1130 may be stitched to upper 1120 via stitching along a portion of a top surface 1145 of flange 1144. In some embodiments, midsole 1130 may be stitched to upper 1120 via stitching along the entire top surface 1145 of flange 1144.

[0073] As shown in FIG. 11, in some embodiments, the configuration of midsole 1130 may result in horizontal stitch 1124 and vertical stitch 1122 overlapping in a vertical direction, a horizontal direction, or both. But, in some embodiments, horizontal stitch 1124 may be vertically and/or horizontally offset from vertical stitch 1122.

[0074] The articles of footwear discussed herein (e.g., 100, 400, and 1100) may be manufactured using the following exemplary method. The order of the processes discussed below is exemplary and may be rearranged depending on a number of factors, for example, but not limited to, optimization of the manufacturing process and the layout (e.g., location and process flow) of manufacturing equipment. First, a midsole (e.g., midsole 430) may be coupled to an upper (e.g., 420). The midsole may be coupled to the upper via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. In some embodiments, a flange (e.g., flange 444) of the midsole may be coupled to the upper using one or more of these processes. In some embodiments, the flange of the midsole may be stitched to the upper by vertically stitching along a perimeter of the flange as discussed above in regards to flange 444.

[0075] After coupling the midsole to the upper, an outsole (e.g., outsole 460) may be coupled to the midsole such that a body (e.g., body 432) of the midsole is received within a cavity (e.g., open cavity 468) of the outsole. The outsole may be coupled to the midsole via, for example, but not limited to, adhesive bonding, stitching, welding, or a combination thereof. Once the midsole is coupled to the outsole, a sidewall (e.g., sidewall 462) of the outsole may be stitched to the upper to ensure a secure attachment between the upper and the outsole. In some embodiments, as discussed above, the stitching between the upper and the outsole may be oriented in a direction substantially perpendicular to the stitching between the midsole and the upper. In some embodiments, as discussed above, the stitching between the midsole and the upper may be horizontally and vertically offset from the stitching between outsole and the upper.

[0076] It is to be appreciated that the Detailed Description section, and not the Summary and Abstract sections, is intended to be used to interpret the claims. The Summary and Abstract sections may set forth one or more but not all exemplary embodiments of the present invention(s) as contemplated by the inventor(s), and thus, are not intended to limit the present invention(s) and the appended claims in any way.

[0077] Embodiments of the present invention have been described above with the aid of functional building blocks illustrating the implementation of specified functions and relationships thereof. The boundaries of these functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternate boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed.

[0078] The foregoing description of the specific embodiments will so fully reveal the general nature of the invention

(s) that others can, by applying knowledge within the skill of the art, readily modify and/or adapt for various applications such specific embodiments, without undue experimentation, without departing from the general concept of the present invention(s). Therefore, such adaptations and modifications are intended to be within the meaning and range of equivalents of the disclosed embodiments, based on the teaching and guidance presented herein. It is to be understood that the phraseology or terminology herein is for the purpose of description and not of limitation, such that the terminology or phraseology of the present specification is to be interpreted by the skilled artisan in light of the teachings and guidance.

[0079] The breadth and scope of the present invention(s) should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. An article of footwear, comprising:
an upper,
a midsole comprising a body and a flange integrally formed with the body, the flange extending outwardly from an outer perimeter of the body and coupled to the upper, and
an outsole comprising a sidewall coupled to the upper and a base having a ground contacting surface and an open cavity disposed opposite the ground contacting surface, the open cavity having an upper surface defining a recess configured to receive a portion of the body of the midsole.
2. The article of footwear of claim 1, wherein the flange of the midsole is stitched to the upper and wherein the sidewall of the outsole is stitched to the upper.
3. The article of footwear of claim 2, wherein the stitching between the midsole and the upper is a substantially vertical stitch running along an outer perimeter of the flange, and wherein the stitching between the upper and the outsole is oriented substantially perpendicular to the stitching between the midsole and the upper.
4. The article of footwear of claim 3, wherein the stitching between the upper and the outsole is located above the stitching between the midsole and the upper.
5. The article of footwear of claim 1, wherein the body of the midsole comprises a core from which the flange extends and a platform extending from a bottom of the core, and wherein the recess is configured to receive the entire platform of the midsole.
6. The article of footwear of claim 1, wherein the cavity of the outsole receives the entire midsole.
7. The article of footwear of claim 1, wherein an underside of the flange is disposed on the upper surface of the cavity disposed around the recess.
8. The article of footwear of claim 1, wherein the upper surface of the cavity comprises a plurality of projections that define a perimeter of the recess in the cavity.
9. The article of footwear of claim 8, wherein the plurality of projections comprise a lattice structure.
10. The article of footwear of claim 8, wherein the plurality of projections comprise a first set of projections and a second set of projections.
11. The article of footwear of claim 10, wherein the first set of projections are disposed in a forefoot portion of the outsole and are oriented in a direction substantially perpen-

dicular to a longitudinal axis of the outsole, and wherein the second set of projections are disposed in the midfoot and heel portions of the outsole and are oriented in a direction substantially parallel to the longitudinal axis of the outsole.

12. The article of footwear of claim 5, wherein the platform of the midsole tapers in thickness from a heel portion of the article of footwear towards a forefoot portion of the article of footwear.

13. The article of footwear of claim 12, wherein the midsole has a T-shaped cross-sectional shape at the heel portion of the article of footwear.

14. The article of footwear of claim 1, wherein the article of footwear does not include a strobil board.

15. The article of footwear of claim 1, wherein the flange extends outwardly from the body in a forefoot portion, a midfoot portion, and a heel portion of the midsole.

16. The article of footwear of claim 1, wherein the flange has an outer perimeter that is larger than and disposed around the outer perimeter of the body.

17. The article of footwear of claim 1, wherein a top surface of the flange is flush with a proximal surface of the midsole.

18. An article of footwear, comprising:
an upper,

an integrally molded midsole comprising a proximal surface, a platform, and a flange extending laterally from the proximal surface and coupled to the upper, and
a cupsole comprising a sidewall coupled to the upper and a base having a ground contacting surface and an open cavity disposed opposite the ground contacting surface, the open cavity comprising a plurality of projections defining an outer perimeter of a recess, the recess configured to receive the platform of the midsole.

19. The article of footwear of claim 18, wherein the flange of the midsole is stitched to the upper and wherein the sidewall of the cupsole is stitched to the upper.

20. The article of footwear of claim 19, wherein the stitching between the flange and the upper is oriented in a direction substantially perpendicular to the orientation of the stitching between the cupsole and the upper.

21. The article of footwear of claim 19, wherein the stitching between the flange and the upper is horizontally and vertically offset from the stitching between the cupsole and the upper.

22. The article of footwear of claim 18, wherein a top surface of the flange is flush with the proximal surface of the midsole.

23. A method of manufacturing an article of footwear having an upper and a midsole having a body and a flange extending from an upper perimeter of the body, the method comprising:

stitching the midsole to the upper by vertically stitching along the flange;
coupling an outsole to the midsole such that the body of the midsole is received within a cavity formed in the outsole; and
stitching the outsole to the upper,
wherein the stitching between the upper and the outsole is oriented substantially perpendicular to the stitching between the midsole and the upper.

24. The method of claim 23, wherein the midsole is a single integrally molded piece.