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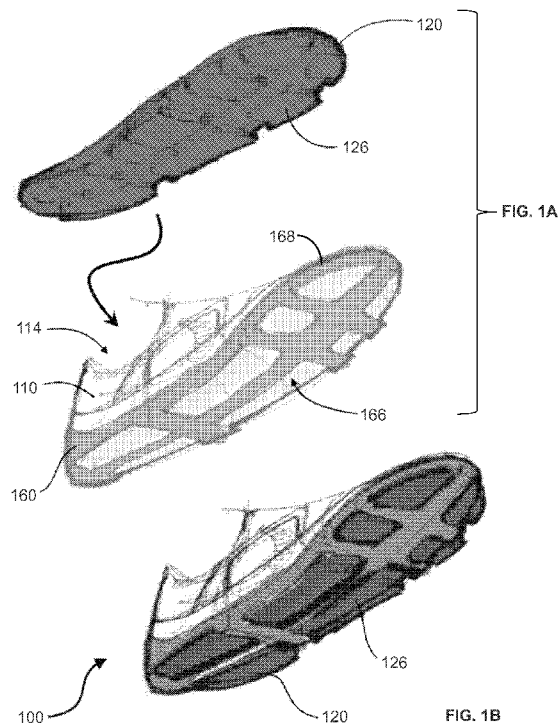
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(54) Title: MODULAR SHOE SYSTEMS AND METHODS OF USING SAME



(57) Abstract: Modular shoe systems include an upper, an outsole attached to the upper, and several midsole inserts. Each midsole insert is positionable in overlying relationship with the outsole and can operatively engage the outsole to form an assembled shoe. The outsole can include a receptacle, such as a depression or opening, configured to receive a protrusion in the midsole insert. Multiple midsole pieces can be cooperatively engaged to form the midsole insert. The midsole pieces are selected based on their properties and the needs of the user. Methods for customizing a shoe include selecting a midsole insert based on a property and positioning the midsole insert in overlying relationship with the outsole to operatively engage the midsole insert and outsole. The midsole insert can be removed and a different midsole insert can be selected and positioned based on another property. The midsole insert(s) can be assembled using several midsole pieces.



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## MODULAR SHOE SYSTEMS AND METHODS OF USING SAME

### Cross-Reference to Related Applications

[0001] This application claims priority to U.S. Provisional Application No. 61/788,269, filed on March 15, 2013, which application is hereby incorporated by reference in its entirety.

### Field

[0002] Provided are modular shoe systems and methods of using the same. More specifically, modular shoe systems are provided with interchangeable midsole inserts, in order to allow a user to customize the shoe-wearing experience.

### Background

[0003] Recently, much attention has been focused on the properties of footwear, thereby allowing a user to select footwear based on his foot type or shape, foot pathology, and/or desired use for the footwear. For example, convenience stores offer users the ability to have a computer analyze their foot type or shape (such as the user's arch height) and select aftermarket insoles to accommodate varying foot pathologies. Similarly, athletic shoes are sold in a variety of styles, depending on the desired use for such shoes. A user can thus select between a running shoe, a cross-training shoe, a walking shoe, a hiking shoe, etc. Barefoot or minimalist shoes have also been available to give a user a minimalist running or walking experience.

[0004] However, with any of these options, a user is forced to purchase a variety of different products (insoles or shoes, for example), depending on the user's needs. In order to minimize the excessive cost of investing in so many different products, users often rely on a single product for all uses. A user might, for example, purchase a walking shoe, and use the shoe while walking, running and trail hiking, in order to avoid purchasing three separate shoes. The single shoe may not offer the right type of support, or may not have the right properties, for each of these activities. This can result in significant injury to the user if the shoe being used does not accommodate the user's foot shape, foot pathologies, or the activity in which the user is engaged. Similarly, in the abstract, an aftermarket insole may be desirable to accommodate a user's foot shape or foot pathology. However, when placed into different shoes, the insole may not provide the desired comfort or support to the user, or may not fit into existing shoes.

[0005] Thus, there is a need in the art for systems and methods allowing footwear users to better customize their footwear depending on their needs.

### SUMMARY

[0006] In accordance with the purpose(s) of this invention, as embodied and broadly described herein, this invention, in one aspect, relates to modular shoe systems. In one embodiment, an exemplary modular shoe system includes an upper, an outsole attached to the upper, and at least one midsole insert. The outsole can have an outwardly facing surface and an opposed inner surface. The at least one midsole insert can be positionable in overlying relationship with the inner surface of the outsole and can be configured to operatively engage at least a portion of the outsole.

[0007] In one embodiment, the outsole can define at least one receptacle therein. The at least one midsole insert can have a first face, a second opposing face and a side surface extending between the first face and second face, and can comprise at least one protrusion extending from the second face and/or the side surface. The at least one protrusion can extend into the at least one receptacle, to form an assembled shoe. In one embodiment, the at least one receptacle can be a depression. In another embodiment, the at least one receptacle in the outsole can be an opening.

[0008] According to other embodiments, a modular shoe system is provided that comprises an upper and an outsole attached to the upper. The outsole can have an outwardly facing surface and an opposed inner surface. The shoe system can include at least two separable midsole pieces configured for selective engagement with each other to form a midsole insert. The midsole insert is positionable in overlying relationship with the inner surface of the outsole to form an assembled shoe. The assembled midsole insert can also be configured for operative engagement with at least a portion of the outsole. In some embodiments, each midsole piece can be configured to support a region of the foot of a wearer of the assembled shoe.

[0009] According to other embodiments, methods are provided for customizing a shoe. The method includes providing a modular shoe system having an upper, an outsole attached to the upper, and a plurality of midsole inserts. Each midsole insert can have at least one property. The method further includes selecting a first midsole insert based on at least one property, and positioning the first midsole insert in overlying relationship with the outsole such that the first midsole is operatively engaged with at least a portion of the outsole. The method can further include selecting a second midsole insert based on a property that differs

from the property of the first midsole insert, disengaging the first midsole insert, removing the first midsole insert, and positioning the second midsole insert in overlying relationship with the outsole such that the second midsole insert is operatively engaged with at least a portion of the outsole. The method can include selecting at least two separable midsole pieces, and selectively engaging them to form one of the plurality of midsole inserts (such as the first or second midsole insert).

**[0010]** Additional advantages will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0011]** The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several aspects of the invention and together with the description, serve to explain the principles of the invention.

**[0012]** FIG. 1A is an exploded view of a modular shoe system, showing a midsole insert, and an outsole attached to an upper, according to one embodiment.

**[0013]** FIG. 1B is an assembled view of the modular shoe system of FIG. 1A, showing the midsole insert positioned in mating relationship with the outsole.

**[0014]** FIG. 2A is a top plan view of an upper and outsole of a modular shoe system, according to one embodiment.

**[0015]** FIG. 2B is an elevational view of the medial side of the upper and outsole of FIG. 2A.

**[0016]** FIG. 2C is an elevational view of the rear of the upper and outsole of FIG. 2A.

**[0017]** FIG. 2D is an elevational view of the lateral side of the upper and outsole of FIG. 2A.

**[0018]** FIG. 2E is a bottom plan view of the outsole of FIG. 2A.

**[0019]** FIG. 3A is an elevational view of the lateral side of a midsole insert, according to one embodiment.

**[0020]** FIG. 3B is a bottom plan view of the midsole insert of FIG. 3A.

**[0021]** FIG. 4A is an elevational view of the lateral side of a modular shoe system, according to one embodiment.

- [0022] FIG. 4B is a bottom plan view of the modular shoe system of FIG. 4A.
- [0023] FIG. 5A is a top plan view of an assembled shoe of a modular shoe system, according to one embodiment.
- [0024] FIG. 5B is an elevational view of the medial side of the assembled shoe of FIG. 5A.
- [0025] FIG. 5C is an elevational view of the rear of the assembled shoe of FIG. 5A.
- [0026] FIG. 5D is an elevational view of the lateral side of the assembled shoe of FIG. 5A.
- [0027] FIG. 5E is a bottom plan view of the assembled shoe of FIG. 5A.
- [0028] FIG. 6A is a bottom plan view of an outsole and midsole insert of a modular shoe system, according to one embodiment.
- [0029] FIG. 6B is a cross-sectional view taken along line B-B' of FIG. 6A.
- [0030] FIG. 6C is a cross-sectional view taken along line C-C' of FIG. 6A.
- [0031] FIG. 6D is a cross-sectional view taken along line D-D' of FIG. 6A.
- [0032] FIG. 6E is a cross-sectional view taken along line E-E' of FIG. 6A.
- [0033] FIG. 7A is an elevational view of the lateral side of an assembled shoe of a modular shoe system, according to yet another embodiment.
- [0034] FIG. 7B is a bottom plan view of the assembled shoe of FIG. 7A.
- [0035] FIG. 8A is an elevational view of the lateral side of a midsole insert of a modular shoe system, according to another embodiment.
- [0036] FIG. 8B is a bottom plan view of the midsole insert of FIG. 8A.
- [0037] FIG. 9A is a bottom plan view of an outsole and midsole insert of a modular shoe system, according to one embodiment.
- [0038] FIG. 9B is a cross-sectional view taken along line B-B' of FIG. 9A.
- [0039] FIG. 9C is a cross-sectional view taken along line C-C' of FIG. 9A.
- [0040] FIG. 9D is a cross-sectional view taken along line D-D' of FIG. 9A.
- [0041] FIG. 9E is a cross-sectional view taken along line E-E' of FIG. 9A.
- [0042] FIG. 10 illustrates exemplary side profiles of a midsole insert for use in a modular shoe system, according to another embodiment.
- [0043] FIG. 11A is an exploded view showing a plurality of midsole pieces used to form a midsole insert and an outsole, according to one embodiment.
- [0044] FIG. 11B is a partial assembled view of a partially-assembled midsole insert in overlying relationship with the outsole of FIG. 11A.

[0045] FIG. 11C is an assembled view of an assembled midsole insert in overlying relationship with the outsole of FIG. 11A.

[0046] FIG. 12 is a flow chart of exemplary methods for customizing a shoe, according to various embodiments.

## DESCRIPTION

[0047] The present invention may be understood more readily by reference to the following detailed description, examples, drawings, and claims, and their previous and following description. However, before the present devices, systems, and/or methods are disclosed and described, it is to be understood that this invention is not limited to the specific devices, systems, and/or methods disclosed unless otherwise specified, as such can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting.

[0048] As used in the specification and the appended claims, the singular forms “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to a “midsole insert” can include two or more such midsole inserts unless the context indicates otherwise.

[0049] While described herein as a “midsole insert”, the term “midsole” is not intended to be limited to an insert that lies between an outsole and an insole of a shoe. As described herein, the midsole insert can also act as the insole of the shoe (the layer that immediately contacts the foot of the wearer of the shoe), or can be placed on top of an existing midsole. In addition, other layers can be present between the midsole insert and the outsole in some embodiments, and/or between the midsole insert and the foot of the wearer in some embodiments.

[0050] Ranges may be expressed herein as from “about” one particular value, and/or to “about” another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms another embodiment. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint.

[0051] As used herein, the terms “optional” or “optionally” mean that the subsequently described event or circumstance may or may not occur, and that the description includes instances where said event or circumstance occurs and instances where it does not.

[0052] Reference will now be made in detail to the aspects of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used throughout the drawings to refer to the same or like parts.

[0053] According to various embodiments, a modular shoe system is provided. The modular shoe system can include an upper, an outsole connected to the upper, and at least one midsole insert. The midsole insert can be configured to operatively engage at least a portion of the outsole. Referring to FIGS. 1A-1B and 2A-2E, exemplary modular shoe systems 100 can include an upper 110 with a tongue 112 and a shoe opening 114, such as found in traditional shoes. The modular shoe system 100 also includes an outsole 160 attached to the upper. As can be appreciated, the outsole is attached to the upper along a peripheral region 168 of the outsole. As can be seen in FIG. 2B, the outsole can have an outwardly facing surface 162 and an opposed inner surface 164. The outsole can also define at least one receptacle 166 therein.

[0054] The modular shoe system 100 can also include at least one midsole insert 120, such as shown in FIGS. 1A and 3A-3B. The midsole can be configured to operatively engage at least a portion of the outsole. For example, the midsole insert can have a first face 122, an opposing second face 124, and a side surface 123 extending between the first face and the second face. The midsole insert 120 can include at least one protrusion 126 extending from the second face. In other embodiments, the protrusion 126 can extend from the side surface 123. Optionally, the midsole insert can include protrusions that extend from both the second face and the side surface. The midsole insert is configured to be positionable in overlying relationship with the inner surface 164 of the outsole, such that the at least one protrusion 126 extends into a corresponding receptacle 166 in the outsole, as will be described in further detail below. With the midsole insert inserted in overlying relationship with the outsole, an assembled shoe is created. It can be appreciated that the overlying relationship of the midsole insert with the outsole can, in some instances, include abutting relationship between the midsole insert and the outsole. However, the term “overlying relationship” is not meant to be limited to an abutting relationship; rather, in some embodiments described herein, the overlying relationship can be a spaced relationship, an abutting relationship, or a partially spaced and partially abutting relationship.

[0055] According to various embodiments, such as shown in FIGS. 2B-2E, the at least one receptacle 166 of the outsole can be an opening extending from the inner surface 164 of the outsole to the outwardly facing surface 162. The outsole can include a plurality of such openings positioned within the outsole, each opening configured to receive a respective

protrusion 126 of a midsole insert, such as shown in FIG. 1B. The outsole can also include at least one receptacle in a side portion of the inner surface.

**[0056]** With reference to FIG. 6A, as in any standard shoe, the outsole includes an anterior portion, which can include the toe portion, and a posterior or heel portion, as well as a medial side, and a lateral side. In one embodiment, the outsole can include a central member 182 that extends from the toe portion to the heel portion, in between the medial side and the lateral side. The plurality of openings can include at least one opening between the central member 182 and the medial side of the outsole, as well as at least one opening between the central member and the lateral side. In yet a further embodiment, and with reference to FIG. 2E, the outsole can include a number of openings between the central member and the medial side, and a number of openings between the central member and the lateral side. As can be appreciated, a number of additional members can extend from the central member to the medial and lateral sides, in between the openings. Though shown in the figures as being generally rectangular or polygonal in shape, the openings are not intended to be limited to any particular shape or size. Thus, the openings in the outsole could be mesh-like in nature, with similarly shaped protrusions in the midsole insert. Optionally, the openings could have a variety of shapes, including round (circular, oval, elliptical), or random shapes, such as puzzle pieces.

**[0057]** According to further embodiments, the modular shoe system also includes at least one midsole insert, as described briefly above. With reference to FIGS. 3A-3B, the midsole insert 120 can include at least one protrusion 126, which has a third face 128 that is distal of the second face 124. In the embodiment of the modular shoe system 100 shown in FIGS. 1A-6E, the outsole includes a number of openings; the midsole insert can include a corresponding number of protrusions 126, each configured to extend into a corresponding opening when the midsole insert is positioned in overlying relationship with the inner surface 164 of the outsole.

**[0058]** As shown in FIG. 4B, the outsole comprises treads 170 on portions of the outwardly facing surface 162. The midsole insert can comprise treads 130 on at least portions of the third face of at least one protrusion. As can be appreciated, when the midsole insert is positioned in overlying relationship with the outsole, with the protrusions extending through the outsole openings, the midsole insert and outsole can both include treads on portions thereof to give the assembled shoe a treaded lower surface. The assembled shoe 150 can also be seen in FIGS. 5A-5E.

**[0059]** With reference to FIGS. 6A-6E, the outsole can, according to various embodiments, include at least one projection that is configured to extend into at least one receiving groove in the midsole insert. As can be appreciated, such a projection and receiving groove can also provide for the operative engagement of the midsole to the outsole. In one example, the projection 172b can be T-shaped, and the receiving groove 132b can have a complementary T-shape, thereby providing operative engagement between the midsole insert and the outsole. In this aspect, the projection can extend along portions of the length of the central member of the outsole, as well as along corresponding central portions of the midsole insert. Additional projections 172a, 172c can be provided along sides of the outsole, which can be configured to extend into corresponding receiving grooves 132a, 132c in the midsole insert. Any of the exemplary projections and grooves described above can extend substantially along the length of the outsole and midsole, respectively, or can along only portions of the outsole and midsole.

**[0060]** In various embodiments, the modular shoe system 100 includes a plurality of midsole inserts that are interchangeable depending on the needs of a user. The user can be the person who will ultimately wear the shoe. Optionally, as used herein, “user” can include a doctor, therapist, clinician, and/or manufacturer, and is not limited to the ultimate wearer of the shoe. The plurality of midsole inserts can include a first midsole insert having a first tread type on a third face of at least one protrusion. A second midsole insert can be provided having a second tread type on a third face of at least one protrusion. The tread type is intended to mean not only the size and shape of each tread, but also the spacing and pattern of treads. For example, the tread depth, height, width, and orientation can all be included as part of the tread type of a midsole insert or an outsole described herein. Tread type can also include the outsole-to-ground friction properties of the tread (i.e., the slip properties or roughness of the outsole). In one embodiment, the first tread type is different from the second tread type. Additional midsole inserts can be provided with different tread types. This can allow a user to select a specific midsole insert depending on the desired tread type of the assembled shoe. For example, aggressive tread may be desired for trail running or hiking on dirt, rocks, or other non-uniform surfaces; whereas, more streamlined or subdued tread may be desired for running or walking on streets or other hard and uniform surfaces.

**[0061]** With reference to FIGS. 7A-9B, according to other embodiments, a modular shoe system 200 is provided having an upper 110, a shoe opening 114, and an outsole 260. As described above, the midsole insert is configured to operatively engage at least a portion of the outsole. In this embodiment, the receptacle(s) 266 in the outsole 260 can include at least

one depression that extends from the inner surface 264 of the outsole toward the outwardly facing surface 262. In contrast to the openings described above, the depressions do not extend all the way through the outsole, but instead extend only partially through the outsole, as can be seen in the cross-sectional views of FIGS. 9B-9E. The outsole can also include a receptacle in a side portion of the inner surface, and the midsole insert can include at least one protrusion in a side surface 223 that is configured to extend into a corresponding receptacle in the side portion of the outsole's inner surface.

**[0062]** As shown in FIGS. 9B-9E, the protrusions 226 of the midsole insert are configured to extend into corresponding depressions in the outsole. As described above with reference to FIGS. 6B-6E, the outsole can also include at least one projection that is configured to extend into at least one receiving groove in the midsole insert to provide operative engagement between the midsole insert and the outsole. Similarly, and referring to FIGS. 9B-9E, the outsole 260 can include at least one projection 272b that is configured to extend into a corresponding receiving groove 232b in the midsole insert. Additional projections 272a, 272c can be provided along sides of the outsole, which can be configured to extend into corresponding receiving grooves 232a, 232c in the midsole insert. Any of the exemplary projections and grooves described above can extend substantially along the length of the outsole and midsole, respectively, or can along only portions of the outsole and midsole. In yet other embodiments, the outsole can include either a groove or projection that runs along an inner side wall of the outsole, which is configured to engage a corresponding projection or groove that runs along the side surface of the midsole insert.

**[0063]** In contrast to the embodiments described above with respect to FIGS. 1A-6E, the exemplary modular shoe systems shown in FIGS. 7A-9E include a midsole insert 220 which remains entirely in the interior of the shoe when it is placed therein to form an assembled shoe. Thus, no portions of the midsole insert 220 are exposed to the exterior of the shoe. The midsole insert, therefore, does not include any treads (as can be seen in FIGS. 7A-7B).

**[0064]** Although described above (referring to FIGS. 7A-9E) as an outsole having depressions configured to receive protrusions of midsole inserts, it is also contemplated that a midsole insert can have depressions extending from a second face thereof, and the outsole can include protrusions extending from the inner surface. The protrusions of the outsole could then extend into the depressions of the midsole insert to provide for operative engagement between the midsole insert and the outsole. Attachment means such as those described above can be provided to provide operative engagement between the outsole and the midsole insert.

**[0065]** In yet other embodiments, the at least one outsole receptacle can include at least one opening and at least one depression. Thus, a modular shoe system is not limited to having all openings or all depressions, as described with respect to the embodiments above.

**[0066]** With respect to any of the above-described embodiments, the plurality of midsole inserts in exemplary modular shoe systems can each have respective properties, thereby allowing a user to select a particular midsole insert depending on the desired properties of the assembled shoe. In addition to the tread type properties described above, the properties can include stiffness, cushioning, shock absorption, heel-to-toe drop height, density, heel support, arch support, shape, and toe box support/stiffness. It is contemplated that some of the midsole inserts can have certain properties in common, with at least one property being different from the other midsole inserts. For example, two midsole inserts can have the same stiffness, but can have different heel-to-toe drop heights. As another, non-limiting example, two midsole inserts can have the same stiffness, but can have different shapes or levels of heel support and/or arch support. Thus, as explained in further detail below, a user can vary the midsole insert depending on the desired properties for a specific use.

**[0067]** As shown in FIG. 10, various exemplary midsole inserts 320 are shown having different profiles, including different heel-to-toe drop heights, and different levels of heel and arch support. The uppermost midsole insert in FIG. 10 (when viewing the page) has a high heel-to-toe drop height, in that the difference in height between the ground to the heel and ground to the toe is greater than in the other midsole inserts shown. In contrast, the lowermost midsole insert in FIG. 10 has the lowest heel-to-toe drop height shown.

**[0068]** According to other embodiments, and with reference to FIGS. 11A-11C, a modular shoe system is provided that includes an upper 110 and an outsole attached to the upper (such as shown in FIG. 7A). At least two separable midsole pieces 440 are provided that are configured for selective engagement with each other to form a midsole insert 420. As shown in FIG. 11C, the midsole insert is positionable in overlying relationship with the inner surface 464 of the outsole 460 to form an assembled shoe (the upper is not shown, but could be any upper, such as the uppers 110 described herein).

**[0069]** As can be appreciated, the assembled shoe can be worn on the foot of a wearer. Thus, each midsole piece 440 can be configured to support a corresponding region of the foot. In one particular embodiment, the midsole pieces can include at least one toe and ball support piece, at least one arch support piece, and at least one heel support piece. The pieces can be selectively engaged to form a midsole insert that would support substantially the entire foot. In other embodiments, it is contemplated that certain midsole pieces can be selectively

engaged to support specific regions of the foot, without supporting the entire foot. For example, a midsole insert can be formed of one or more heel support pieces and one or more arch support pieces, but may not include a toe/ball support piece.

**[0070]** In other embodiments, such as shown in FIG. 11A, the midsole pieces can include a toe and ball piece 440a, a lateral arch piece 440b, a medial arch piece 440c, a lateral heel piece 440d, and a medial heel piece 440e. In yet other embodiments, the midsole pieces can include a medial piece (that runs from toe to heel) and a lateral piece (that also runs from toe to heel). Optionally, the midsole pieces can include a toe and ball piece and a separate arch/heel piece. Thus, the midsole pieces can include any number of different pieces that would support various regions of the foot, either partially or wholly.

**[0071]** The midsole pieces can be selected based on their unique properties, thereby allowing a user (whether a doctor, therapist, clinician, manufacturer, patient, shoe wearer, etc.) to completely customize the midsole of the shoe. For example, and not meant to be limiting, each midsole piece can be selected based on its stiffness, cushioning, shock absorption, shape and/or density. The midsole pieces can also have varying tread types or configurations, depending on the ultimate use of the assembled midsole. The midsole pieces can also be selected based on specific support properties depending on the pathology of the foot. For example, the medial arch piece 440c can be selected with a specific arch height, depending on the medial arch height or desired arch support of the user. Similarly, the lateral heel piece 440d and/or medial heel piece 440e can be selected with certain properties (stiffness, density, cushioning, cupping, etc.) depending on the needs of the user or the needs and foot pathology of the ultimate wearer of the assembled shoe.

**[0072]** As can be seen in FIGS. 11A-11C, each midsole piece 440 can include at least one male member 442 and a corresponding female receiver 444 to allow for the midsole pieces to selectively engage each other to form a midsole insert. Although shown in FIG. 11A as hook-shaped male members 442, it is contemplated that the male and female portions of the midsole pieces can be of any shape that allow for selective engagement. For example, the male and female portions can be shaped such as in traditional jigsaw puzzles. In yet other embodiments, the midsole pieces can be selectively engaged with peg and hole means (or other male/female attachment means), magnets, electrostatic, hook-and-loop, adhesives, or other engagement means known in the art.

**[0073]** The assembled midsole insert 420 can be positioned in overlying and/or engaging relationship with the outsole 460. For example, as shown in FIG. 11C, the midsole insert 420 can be positioned in an overlying, but non-engaging relationship with the outsole 460.

Optionally, the midsole piece(s) and thus the assembled midsole insert can include protrusions, such as those described above with reference to FIGS. 6A-6B, 8A-8B and 9B-9E, which are configured to extend into at least one receptacle of the outsole when the midsole insert is positioned in overlying relationship with the inner surface of the outsole. As described above, the protrusions can be positioned on the second face of the midsole insert, and/or on the side surface of the midsole insert, depending on the positions of the receptacles on the outsole. Optionally, or in addition, the midsole piece(s) (and thus the assembled midsole insert) can include receptacles to receive protrusions of the outsole, in order to result in operative engagement of the midsole insert with the outsole.

**[0074]** It is contemplated that the outsoles and midsole inserts described herein can be machined or molded to very tight tolerances, thereby providing a tight fit and secure operative engagement between the outsole and midsole insert. The use of protrusions and receptacles, and/or projections and receiving grooves, such as described herein, can be used to operatively engage the midsole insert with the outsole and provide positive mechanical engagement. In yet other embodiments, additional means can be provided for operatively engaging the midsole insert and the outsole, in addition to or in place of the protrusions and receptacles or projections and receiving grooves discussed above with respect to various modular shoe systems. Such engagement means can include hook-and-loop fasteners positioned on the inner surface (164, 264, 464) of the outsole and the second face (124, 224, 424) of the midsole insert. Optionally, such engagement means can include releasable adhesive applied to at least a portion of the inner surface of the outsole and/or the second face of the midsole insert. The use of a releasable adhesive can also aid in sealing the midsole insert/outsole combination (once operatively engaged), to allow the assembled shoe to be used in wet environments, for example. In yet other aspects, attachment can be achieved with magnets, electrostatic, or other means. Other attachment means can be provided, as are known in the art, such as any male/female attachment mechanism (for example, the protrusion/receptacle and projection/groove described herein, or peg/hole, male hook and female receiver, etc.), and are not intended to be limited to the examples described herein.

**[0075]** According to various embodiments, exemplary midsole inserts (whether they are unitary inserts or inserts comprised of multiple separable midsole pieces) can comprise at least an upper layer and a lower layer, with the upper layer comprising the first face, and the lower layer comprising the second face. Thus, the layers can be made of different materials, which can be integrally formed or bonded together. The materials can also have different properties. Optionally, a material having a first property can be used for the upper layer and

a material having a second property can be used for the lower layer. The materials may be the same, but the properties may differ. Optionally, the materials may be different and the properties may also differ. For example, the material for the upper layer can provide for additional cushioning, which may be desirable to a user since the upper layer would be in contact with a wearer's foot during wear. The lower layer could have a lower degree of cushioning, but with a higher degree of stiffness, to give the midsole insert desired stiffness properties. Any number of layers can, of course, be provided, and the embodiments described herein are not intended to be limited to any specific number of layers.

Additionally, the layers could be present laterally (lateral to medial, and/or anterior to posterior), and are not intended to be limited to upper and lower layers (relative to the foot of the wearer).

**[0076]** Any or all of the midsole layers can be made of a number of different materials, including thermoplastic polyurethane (TPU), thermoplastic elastomer (TPE), polyurethane-based materials, open-cell polyurethane, ethylene vinyl acetate co-polymer (EVA), leather, monofilament TPU-coated mesh, nylon mesh, rubber, canvas, fabric, other plastics, other polymers, natural materials or fibers (such as hemp or cotton) or combinations thereof. The midsole layers can also include other materials, and is not intended to be limited to the list above.

**[0077]** In a further embodiment, the upper layer of the midsole insert (regardless of the number of additional layers) can form an insole layer for the shoe. The insole layer can be made of specific materials that are commonly used for insoles of shoes. These materials can include certain properties, such as antimicrobial, antifungal, anti-odor, wicking, water-resistant, and/or ventilated properties. In other embodiments, the midsole insert can be machine-washable. In other optional embodiments, a user could insert a separate insole insert into the assembled shoe in overlying relationship to the first face of the midsole insert.

**[0078]** In yet other embodiments, exemplary midsole inserts can include embedded tracking devices that store and transmit data pertaining to acceleration and direction, such that a user can track his physical activities. Optionally, exemplary midsole inserts can include a receptacle configured to receive and hold a tracking device when the midsole insert is used to form an assembled shoe.

**[0079]** In accordance with other embodiments, a modular shoe system can include an upper, an outsole having at least one opening extending from the inner surface to the outwardly facing surface, and a plurality of midsole inserts configured to be used in combination with each other. A first midsole insert has a first face, a second opposing face,

and at least one protrusion extending from the second face, configured to extend into a corresponding opening of the outsole. The first midsole can optionally have other attachment means for operative engagement with the outsole. Thus, the first midsole can be positioned in overlying relationship with the inner surface of the outsole, as described above. The first midsole can, however, also include receptacles defined in the first face. A second midsole insert can be provided that is positionable in overlying relationship with the first face of the first midsole insert. The second midsole insert can include a respective first face, a second opposing face, and at least one protrusion (or other means for operative engagement) extending from the second face, configured to extend into a corresponding receptacle in the first midsole insert. In a further embodiment, the at least one receptacle of the first midsole can be a depression.

**[0080]** In this embodiment and in use, the first midsole insert can be interchangeable based on certain properties, with a focus on its tread type (as well as the properties listed below). In contrast, the second midsole insert can be interchangeable based on other properties, such as stiffness, cushioning, shock absorption, density, heel support, arch support, shape, and toe box support/stiffness. The combination of the first and second midsole inserts can affect the overall heel-to-toe drop height of the shoe.

**[0081]** According to various other embodiments, methods are provided for customizing a shoe. With reference to FIG. 12, the method can include providing a modular shoe system, such as those described above. The modular shoe system can include an upper with an outsole attached to the upper, and a plurality of midsole inserts. A user can select a first midsole insert from the plurality of midsole inserts based on at least one property of the midsole insert. The user can then position the selected first midsole insert on the outsole such that the first midsole insert is in overlying relationship with the outsole, and such that the first midsole insert is operatively engaged with at least a portion of the outsole. For example, the outsole can include at least one receptacle and each midsole insert can include at least one protrusion, and the outsole and midsole insert can be operatively engaged with the at least one protrusion extending into a corresponding receptacle in the outsole. Optionally, the outsole can include at least one protrusion and each midsole insert can include at least one receptacle for operative engagement. Other attachment means to achieve operative engagement are contemplated, as described above.

**[0082]** The method can further include selecting a second midsole insert from the plurality of midsole inserts based on at least one property of the second midsole insert that differs from the at least one property of the first midsole insert. The user can disengage the

first midsole from the outsole and can remove the first midsole insert. The user can then position the selected second midsole insert on the outsole such that the second midsole insert is in overlying relationship with the outsole such that the second midsole insert is operatively engaged with at least a portion of the outsole. For example, as described above, the at least one protrusion can extend into a corresponding receptacle in the outsole.

**[0083]** According to various embodiments, the method can include cooperatively engaging a plurality of midsole pieces to form the first midsole insert and/or the second midsole insert. Thus, selecting the first midsole insert can include selecting at least two separable midsole pieces depending on the desired properties, and selectively engaging them to form the first midsole insert. Optionally or additionally, selecting the second midsole insert can include selecting at least two separable midsole pieces depending on the desired properties, and selectively engaging them to form the second midsole insert. Thus, it is contemplated that the methods described herein can include use of unitary midsole inserts only, use of midsole inserts comprised of separable (and selectively engaged) midsole pieces only, or use of a combination of unitary midsole inserts and midsole inserts comprised of separable midsole pieces.

**[0084]** As described above, the properties of the plurality of midsole pieces and midsole inserts can include stiffness, cushioning, shock absorption, heel-to-toe drop height, density, heel support, arch support, shape, and toe box support/stiffness, as well as tread type, in some embodiments. If midsole pieces are used to form a midsole insert for use with the shoe system of FIGS. 1A-6B, the midsole pieces can also include different tread types and configurations. The user can then interchange the midsole inserts (or interchange midsole pieces) depending on the desired use for the assembled shoe. If the user is planning to walk in the assembled shoe, he can select a first midsole insert with a higher degree of cushioning, higher heel-to-toe drop height, and less shock absorption. However, if the user wants to go running in the assembled shoe, he can exchange the first midsole for a second midsole insert that has higher shock absorption, to accommodate the increased shock of running. If the user wants to engage in minimalist or 'barefoot' running, he can select a third midsole with a very low heel-to-toe drop height. In any of these examples, a user can select a modular shoe system described according to any of the embodiments above.

**[0085]** However, in certain instances, a user can use a modular shoe system such as described with reference to FIGS. 1A-6E, with an outsole having at least one opening extending through it, which is configured to receive a protrusion from a midsole insert. With such systems, the user can select and interchange midsole inserts to vary the properties listed

above, as well as to vary the tread type of the assembled shoe. For example, if a user plans to engage in off-road hiking or trail running, he can select a midsole insert with aggressive tread that is intended for use on non-uniform and/or slippery surfaces. Instead, if the user wishes to engage in walking or running on a street or other uniform surface, he can select a midsole insert with treads intended for use on such surfaces. In yet a further example, different midsole inserts could be selected for running or walking on dry surfaces or for running or walking on wet surfaces.

**[0086]** The modular shoe systems described with reference to FIGS. 7A-9E can allow a user to customize the shoe-wearing experience by selecting midsole inserts with various properties; however, in these embodiments, the user cannot modify the tread of the shoe by virtue of the unitary nature of the outsole (i.e., the fact that the outsole does not have openings in it). In these embodiments, the user can still select midsole inserts that vary to accommodate the user's foot pathology and comfort needs, even though the treads cannot be modified. Similarly, the modular shoe systems described with reference to FIGS. 11A-11C can allow a user to customize the shoe-wearing experience by selecting midsole pieces with various properties and selectively engaging them to form a midsole insert having desired properties.

**[0087]** It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope or spirit of the invention. Other aspects of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

What is claimed is:

1. A modular shoe system, comprising:

an upper;

an outsole attached to said upper, said outsole having an outwardly facing surface and an opposed inner surface; and

at least one midsole insert,

wherein said at least one midsole insert is positionable in overlying relationship with said inner surface of said outsole, and wherein said at least one midsole insert is configured to operatively engage at least a portion of said outsole.

2. The modular shoe system of Claim 1, wherein said at least one midsole insert has a first face, a second opposing face, and a side surface extending between said first face and said second face, wherein said at least one midsole insert comprises at least one protrusion extending from at least one of said second face and said side surface; and

wherein said outsole defines at least one receptacle configured to receive said at least one protrusion.

3. The modular shoe system of Claim 2, wherein said at least one receptacle comprises at least one depression extending from said inner surface toward said outwardly facing surface.

4. The modular shoe system of Claim 2, wherein said at least one receptacle comprises at least one opening extending from said inner surface to said outwardly facing surface, wherein said protrusion defines a third face distal of said second face, and wherein said midsole insert comprises treads on at least a portion of said third face of said at least one protrusion.

5. The modular shoe system of Claim 1, wherein said at least one midsole insert comprises a plurality of midsole inserts, wherein each midsole insert has at least one property selected from the group consisting of stiffness, cushioning, shock absorption, heel-to-toe drop height, density, heel support, arch support, and shape, and wherein at least one property of one midsole insert differs from at least one property of at least one other midsole insert.

6. The modular shoe system of Claim 1, wherein said at least one midsole insert comprises at least an upper layer comprising said first face and a lower layer comprising said second face, wherein said upper layer comprises a material having a first property, wherein said lower layer comprises a material having second property, and wherein said first property is different from said second property.

7. The modular shoe system of Claim 1, wherein said at least one midsole insert comprises at least two separable midsole pieces that are configured for selective engagement with each other to form said at least one midsole insert.

8. The modular shoe system of Claim 1, wherein said at least one midsole insert is made of at least one material selected from the group consisting of selected from the group consisting of thermoplastic polyurethane (TPU), thermoplastic elastomer (TPE), polyurethane-based materials, open-cell polyurethane, ethylene vinyl acetate co-polymer (EVA), leather, monofilament TPU-coated mesh, nylon mesh, rubber, plastic, polymers, canvas, fabric, and natural materials.

9. A modular shoe system, comprising:

an upper;

an outsole attached to said upper, said outsole having an outwardly facing surface and an opposed inner surface; and

at least two separable midsole pieces that are configured for selective engagement with each other to form a midsole insert,

wherein said midsole insert is positionable in overlying relationship with said inner surface of said outsole to form an assembled shoe.

10. The modular shoe system of Claim 9, wherein the assembled shoe is configured to be worn on a foot of a wearer, and wherein each respective midsole piece is configured to support a corresponding region of the foot.

11. The modular shoe system of Claim 10, wherein said at least two separable midsole pieces comprise at least one toe and ball support piece, at least one arch support piece, and at least one heel support piece.

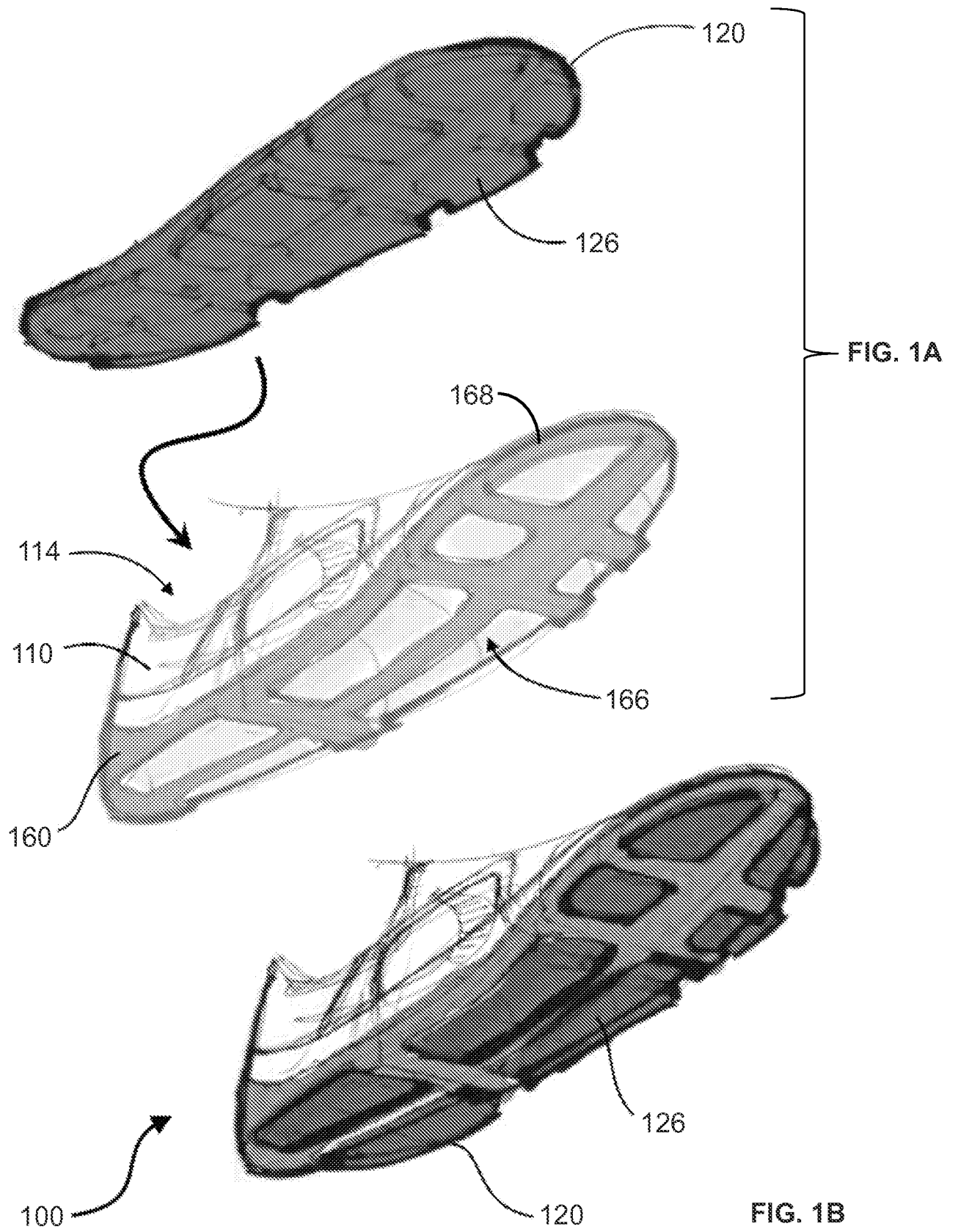
12. The modular shoe system of Claim 9, wherein each of said plurality of midsole pieces has at least one property selected from the group consisting of stiffness, cushioning, shock absorption, shape, and density.
13. The modular shoe system of Claim 9, wherein said midsole insert is configured to operatively engage at least a portion of said outsole.
14. The modular shoe system of Claim 13, wherein said outsole defines at least one receptacle, and wherein at least one of said midsole pieces comprises a protrusion configured to extend into said at least one receptacle when said midsole insert is positioned in overlying relationship with said inner surface of said outsole.
15. The modular shoe system of Claim 13, wherein said outsole defines at least one protrusion, and wherein at least one of said midsole pieces comprises a receptacle configured to receive said at least one protrusion of said outsole when said midsole insert is positioned in overlying relationship with said inner surface of said outsole.
16. A method of customizing a shoe, comprising:  
providing a modular shoe system, comprising:  
    an upper,  
    an outsole attached to said upper, and  
    a plurality of midsole inserts, each midsole insert having at least one property,  
selecting a first midsole insert from said plurality of midsole inserts based on at least one said property of said first midsole insert; and  
    positioning said selected first midsole insert in overlying relationship with said outsole such that said first midsole insert is operatively engaged with at least a portion of said outsole.
17. The method of Claim 16, further comprising:  
    selecting a second midsole insert from said plurality of midsole inserts based on at least one said property of said second midsole insert that differs from said at least one property of said first midsole insert;

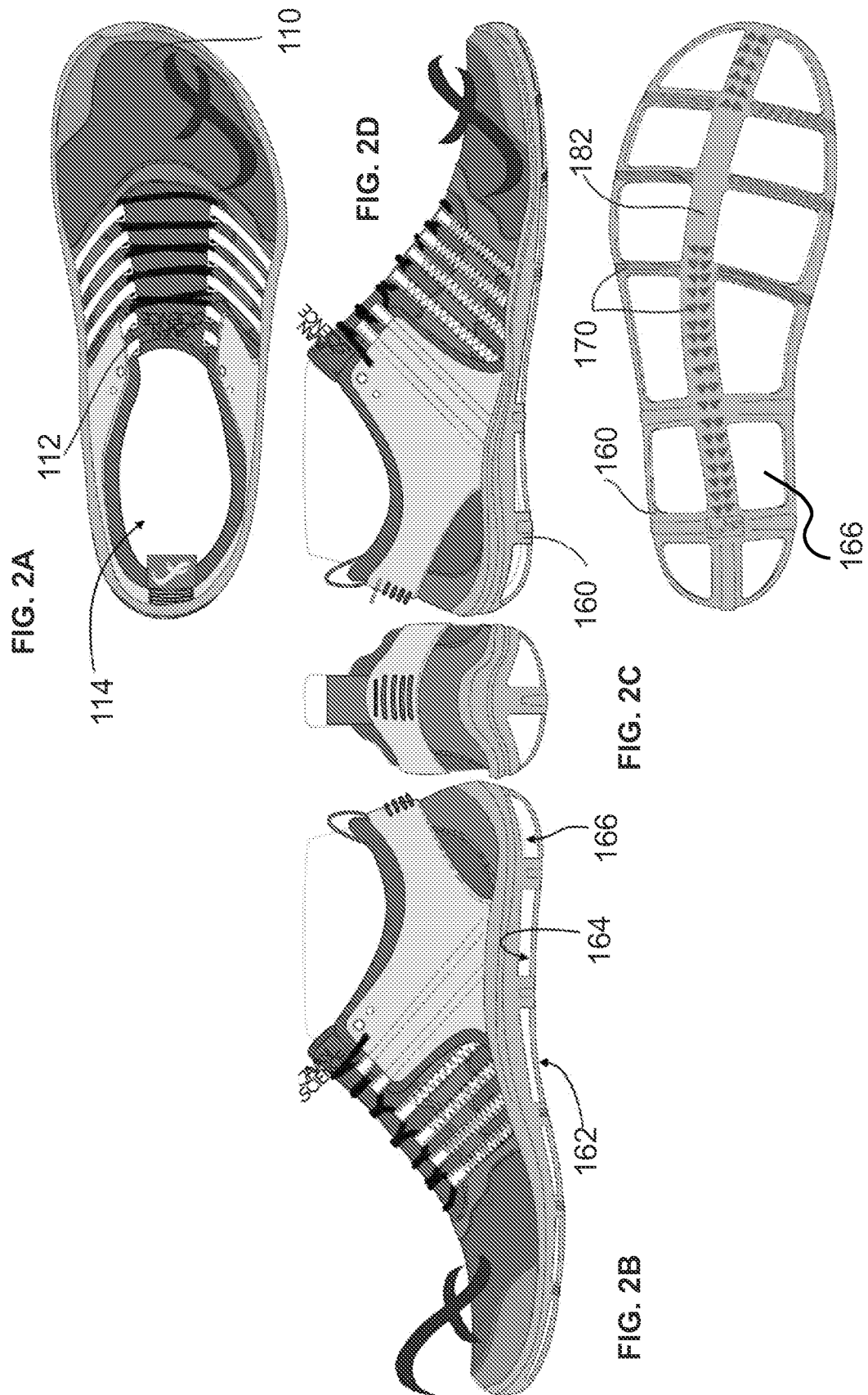
disengaging said first midsole insert from said outsole;  
removing said first midsole insert; and  
positioning said selected second midsole insert in overlying relationship with said outsole such that said second midsole insert is operatively engaged with at least a portion of said outsole.

18. The method of Claim 16, wherein said at least one property of each said midsole insert is selected from the group consisting of stiffness, cushioning, shock absorption, heel-to-toe drop height, density, heel support, arch support, and shape.

19. The method of Claim 16, wherein the modular shoe system comprises at least two separable midsole pieces, and wherein the step of selecting a first midsole insert comprises selectively engaging said at least two separable midsole pieces to form said first midsole insert.

20. The method of Claim 17, wherein the modular shoe system comprises at least two separable midsole pieces, and wherein the step of selecting a second midsole insert comprises selectively engaging said at least two separable midsole pieces to form said second midsole insert.





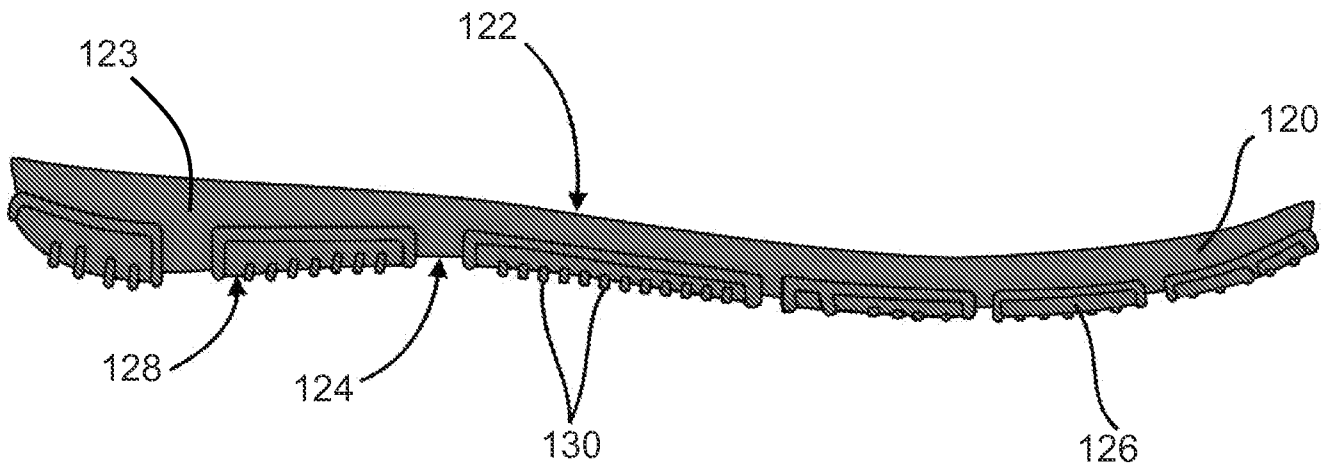


FIG. 3A

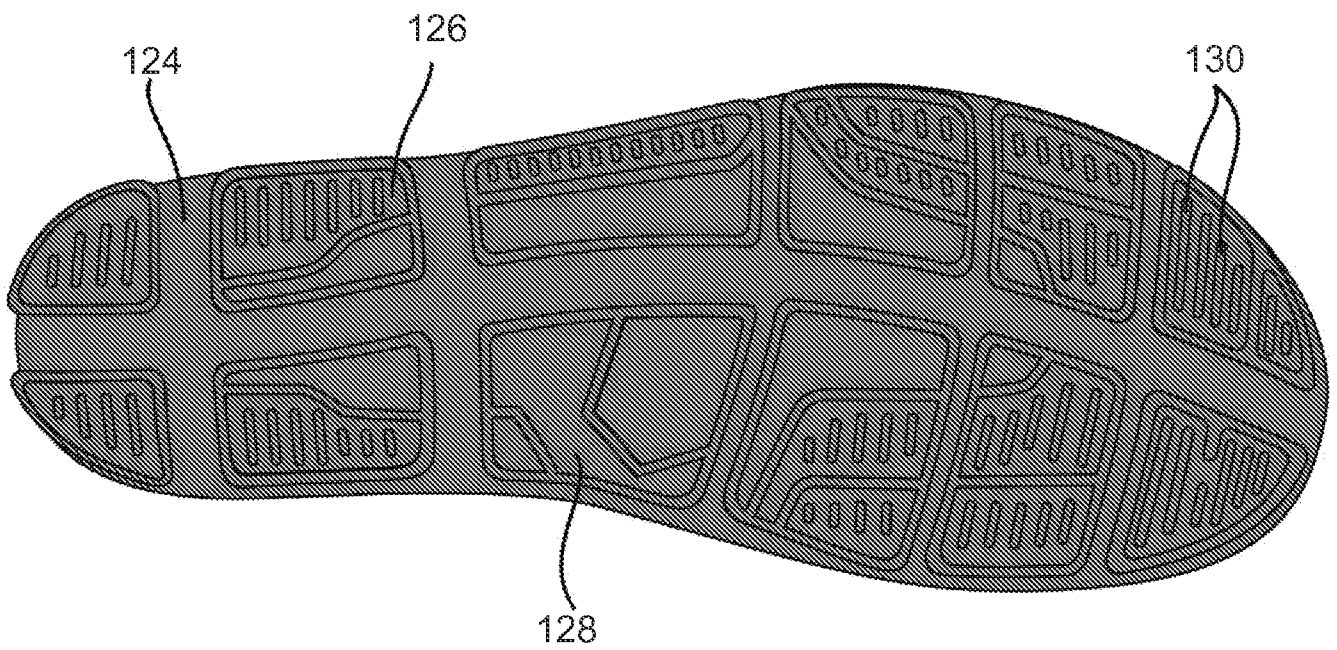


FIG. 3B

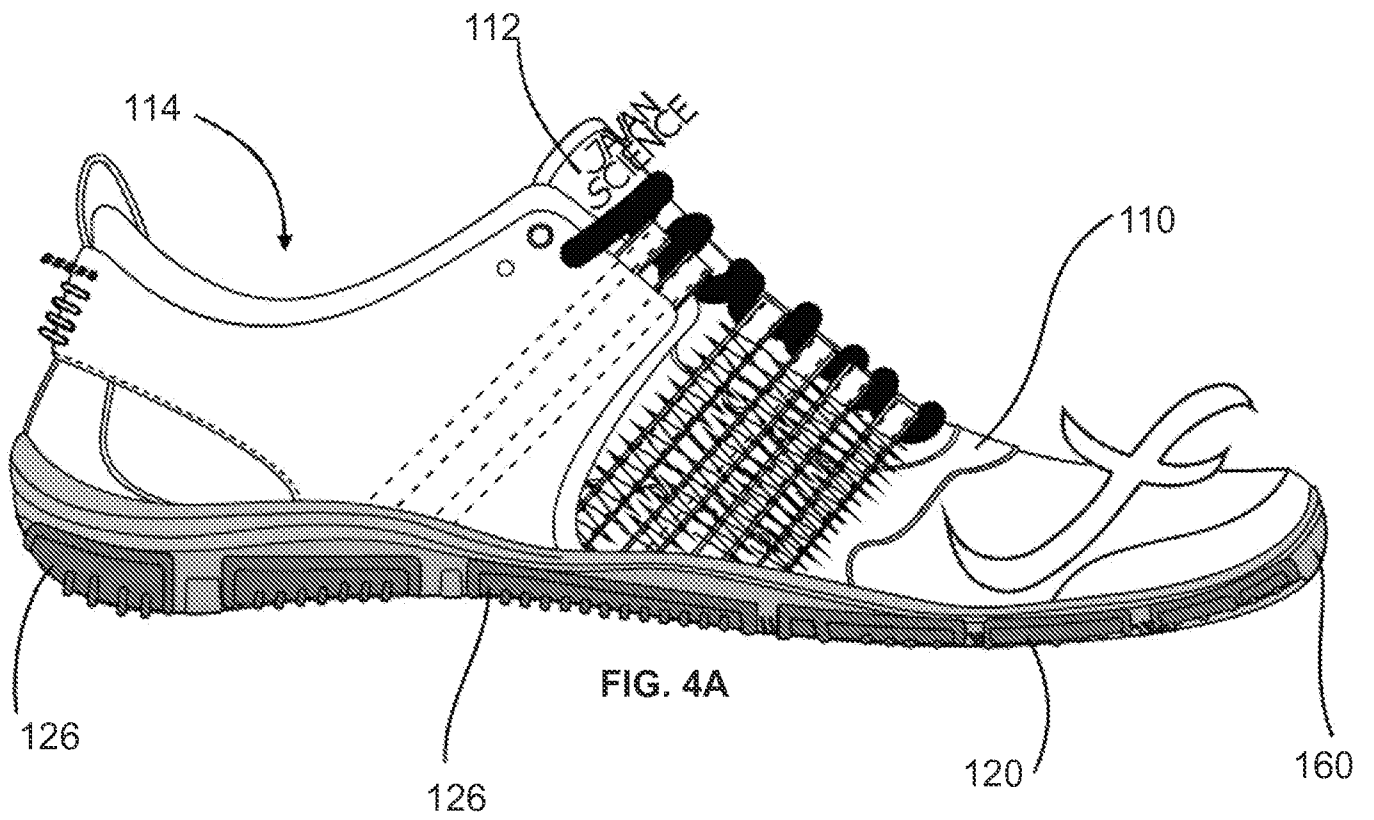


FIG. 4A

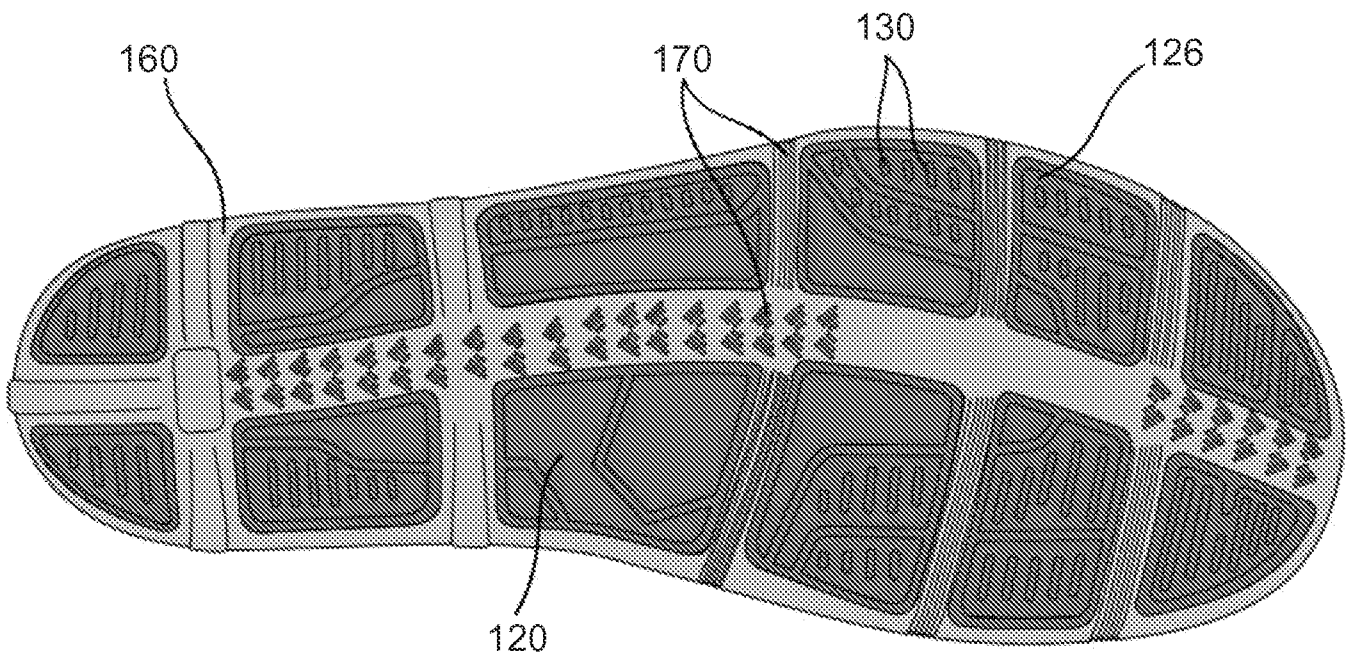


FIG. 4B

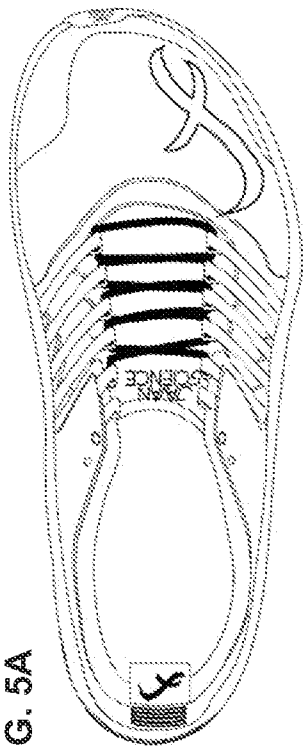


FIG. 5A

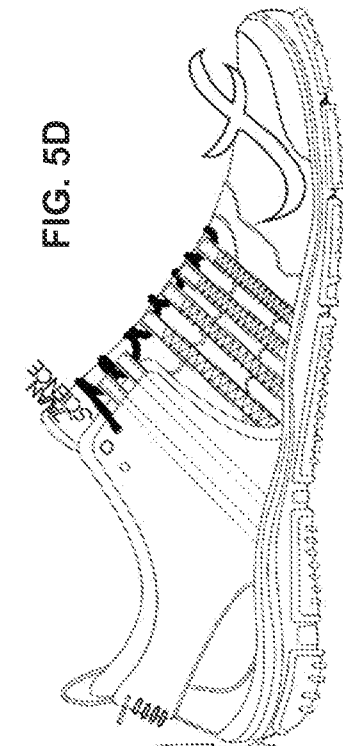
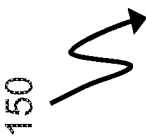


FIG. 5D

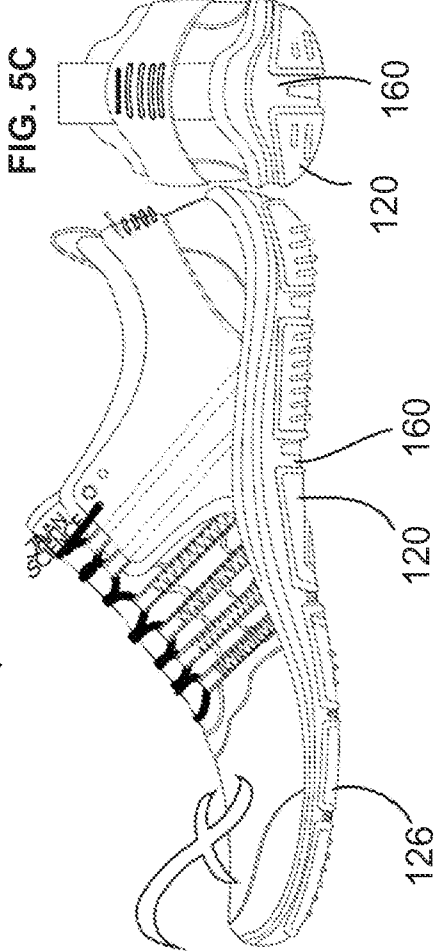


FIG. 5C

FIG. 5B

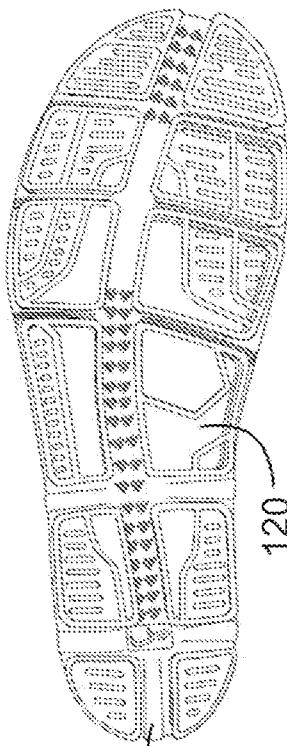


FIG. 5E

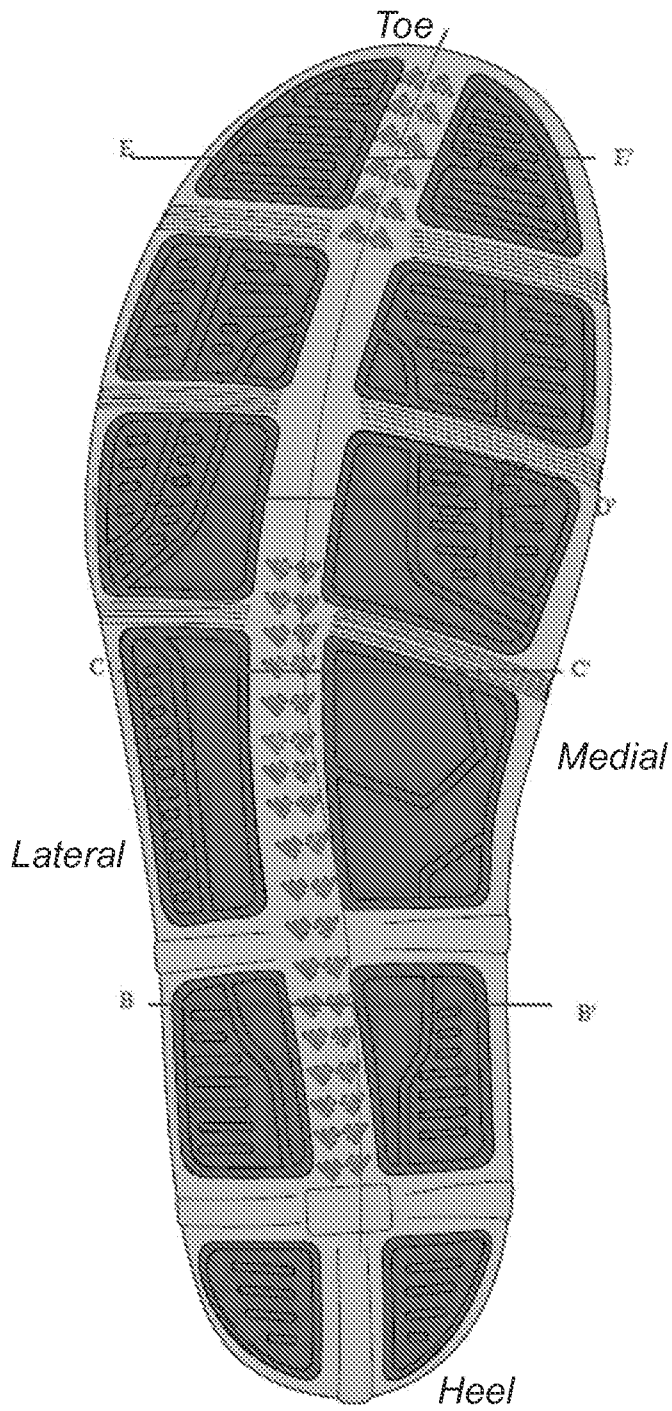


FIG. 6A

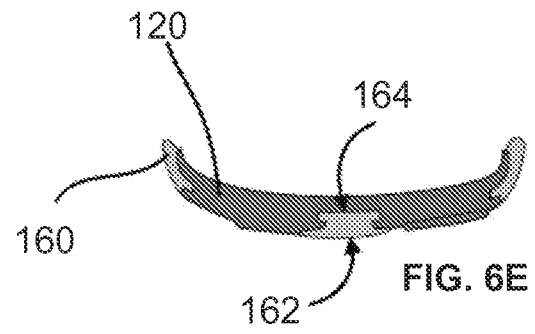


FIG. 6E

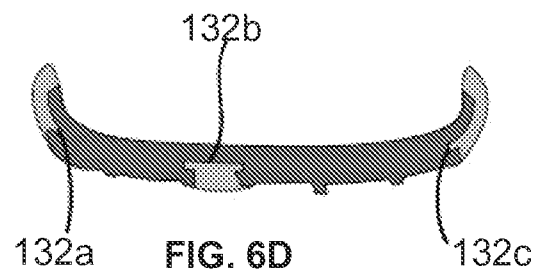


FIG. 6D

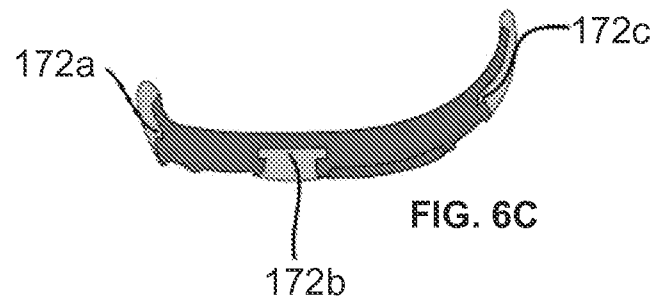


FIG. 6C

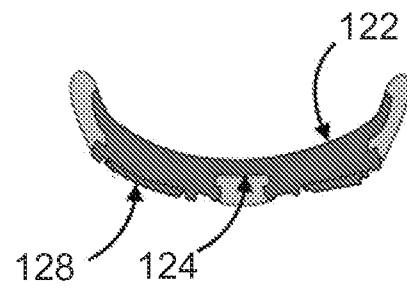
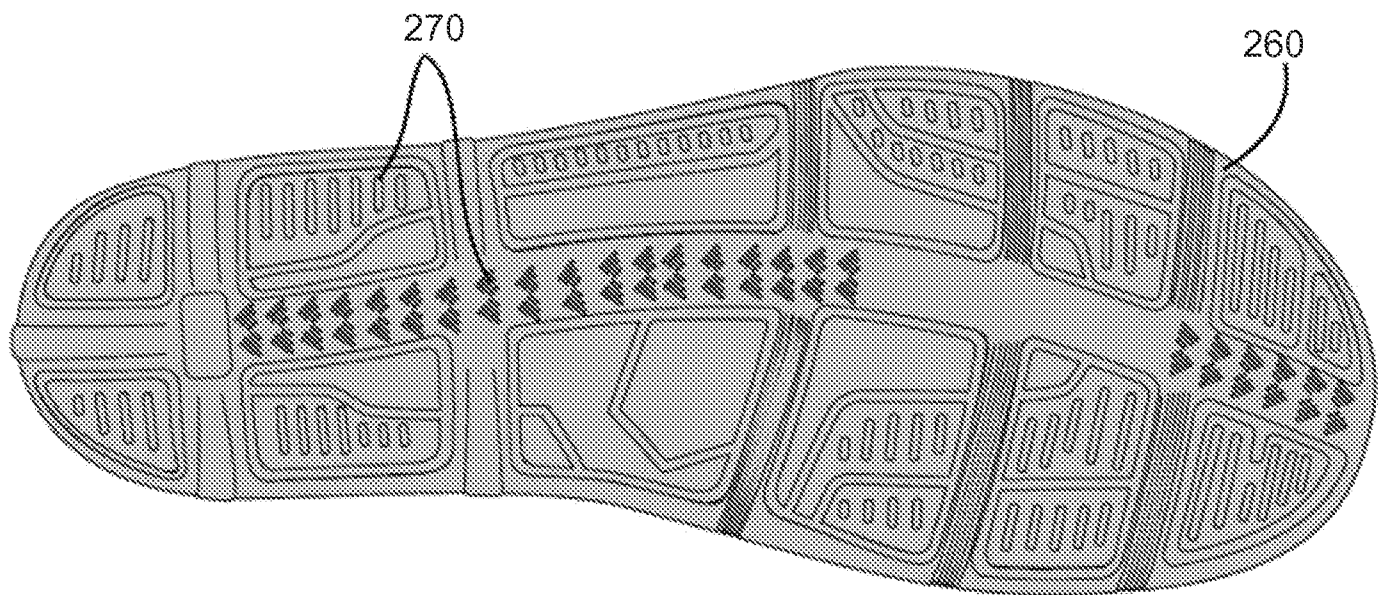
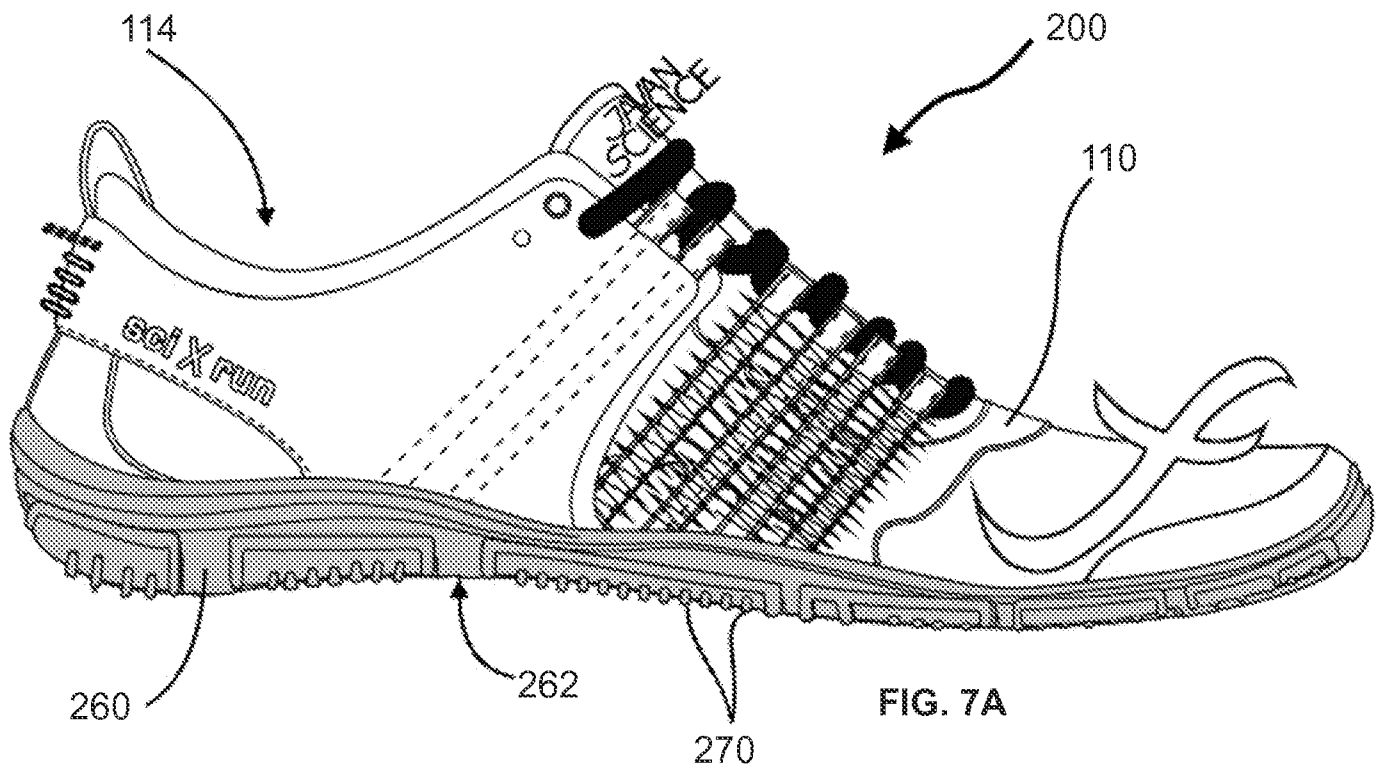


FIG. 6B



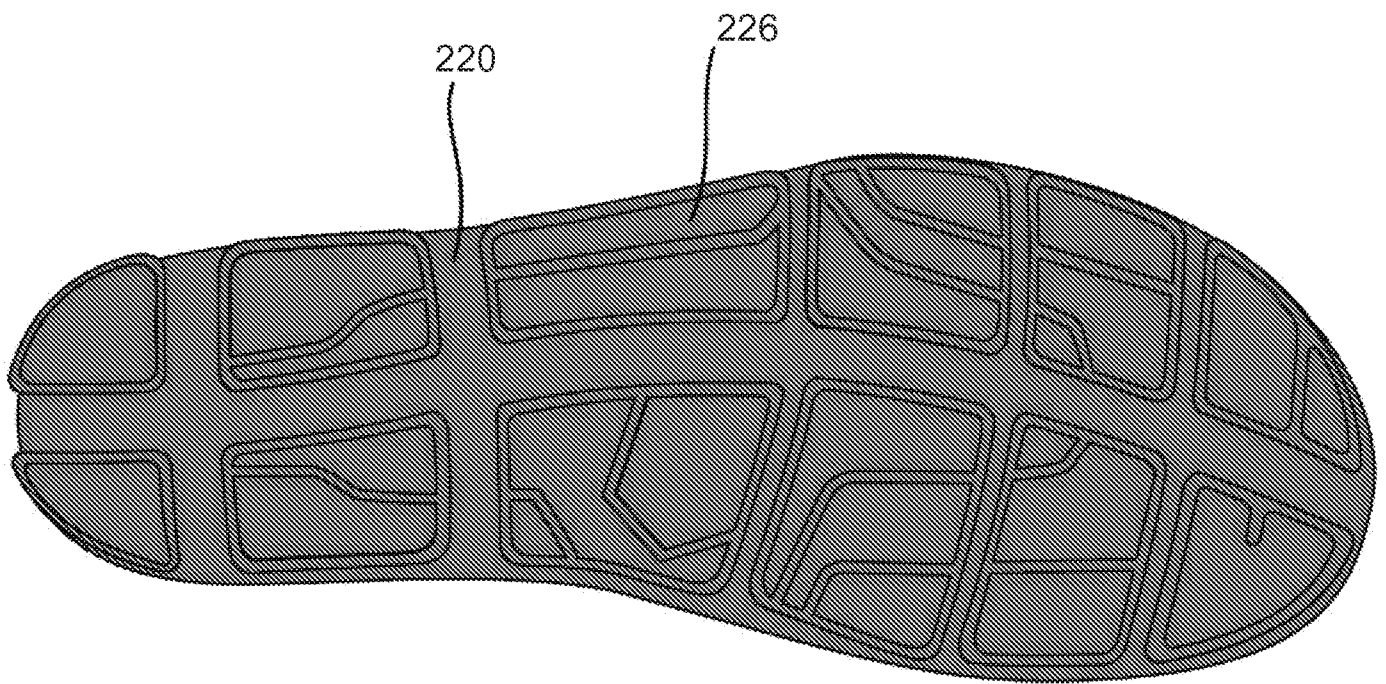
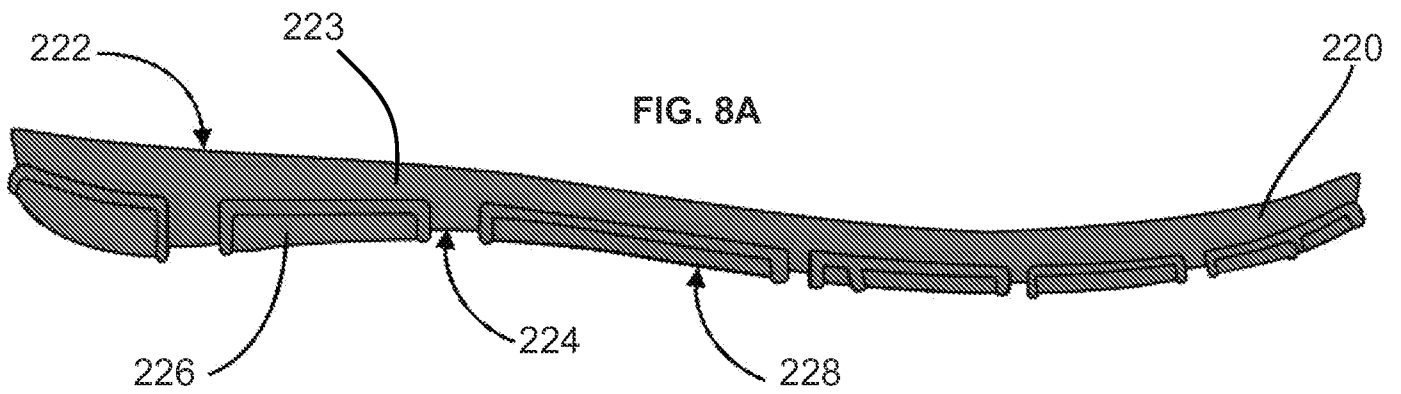


FIG. 8B

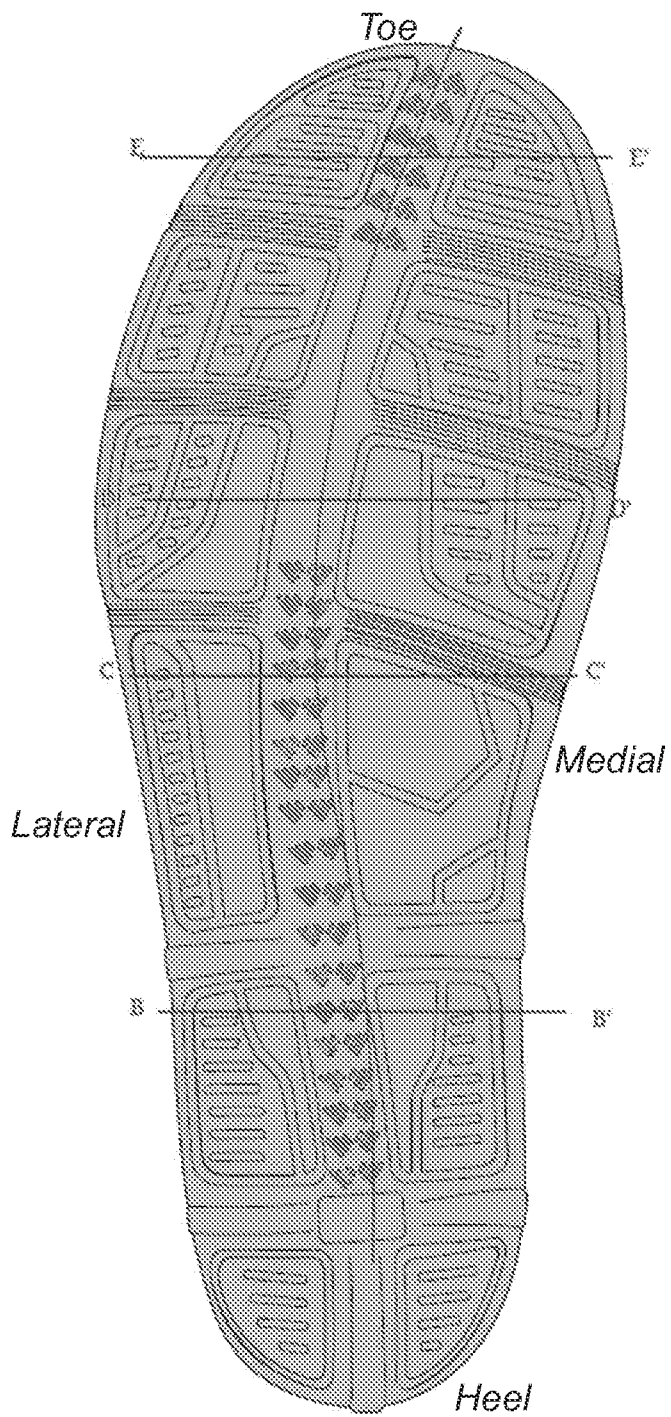


FIG. 9A

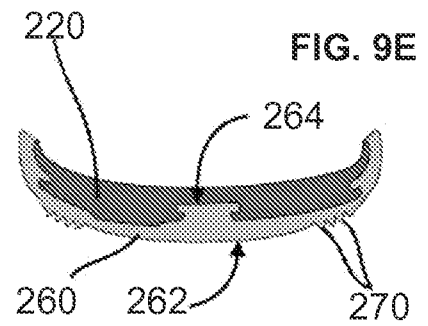


FIG. 9E

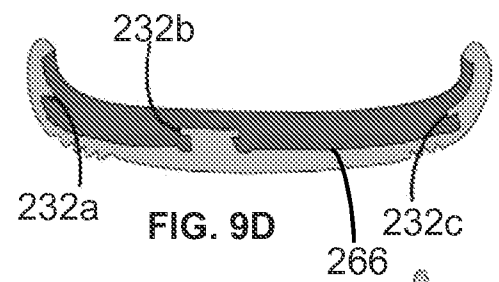


FIG. 9D

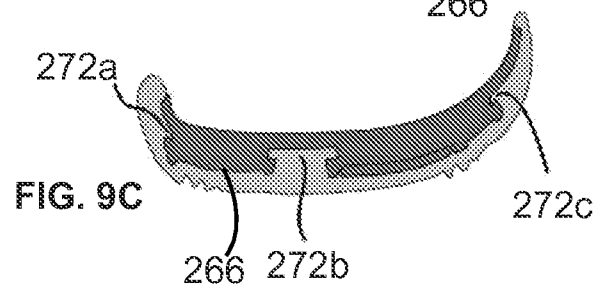


FIG. 9C

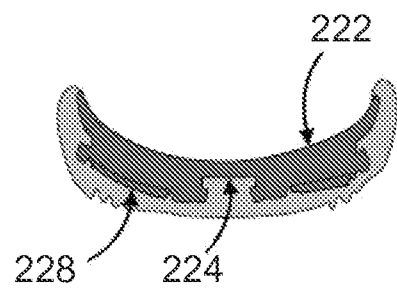


FIG. 9B

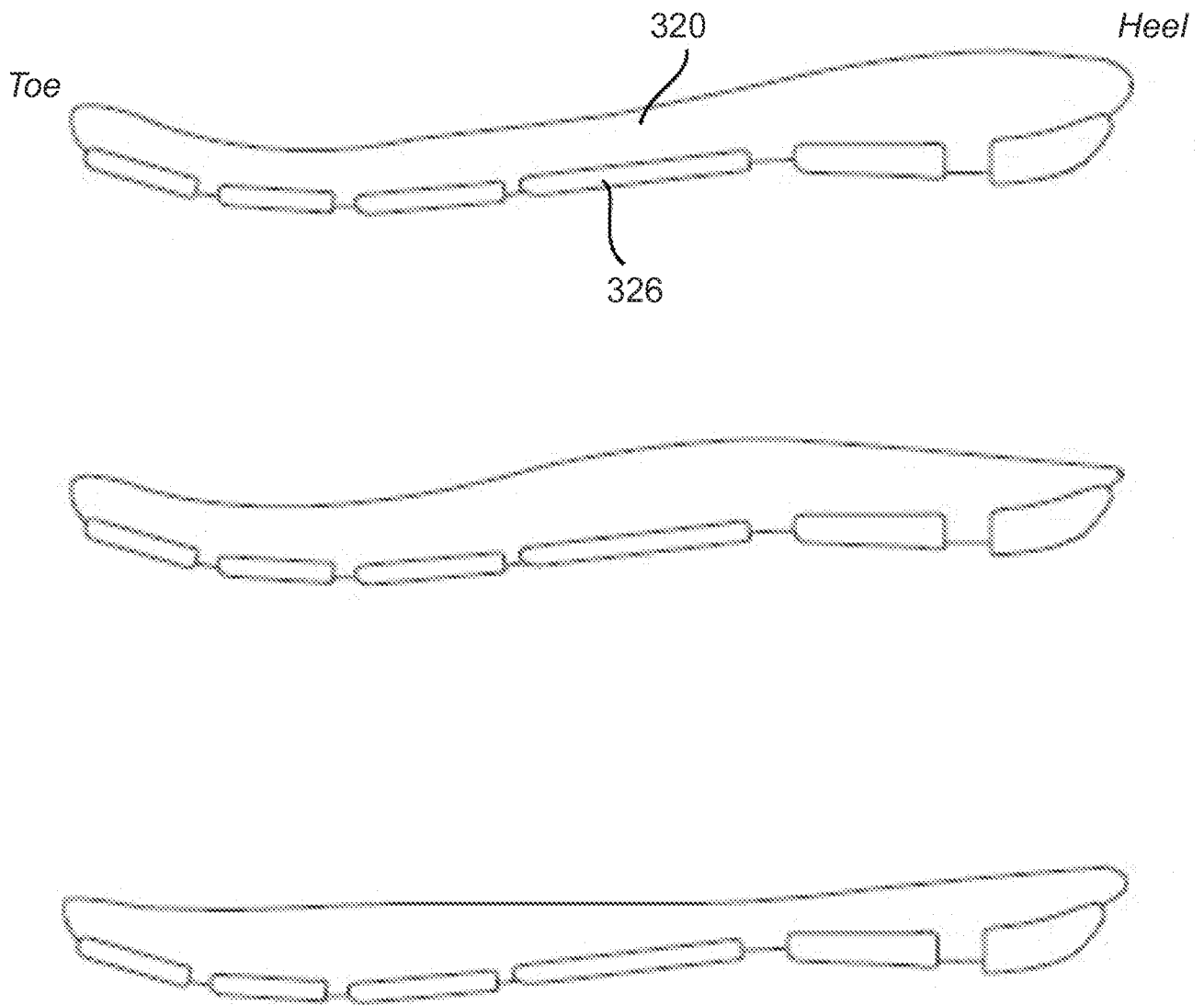


FIG. 10

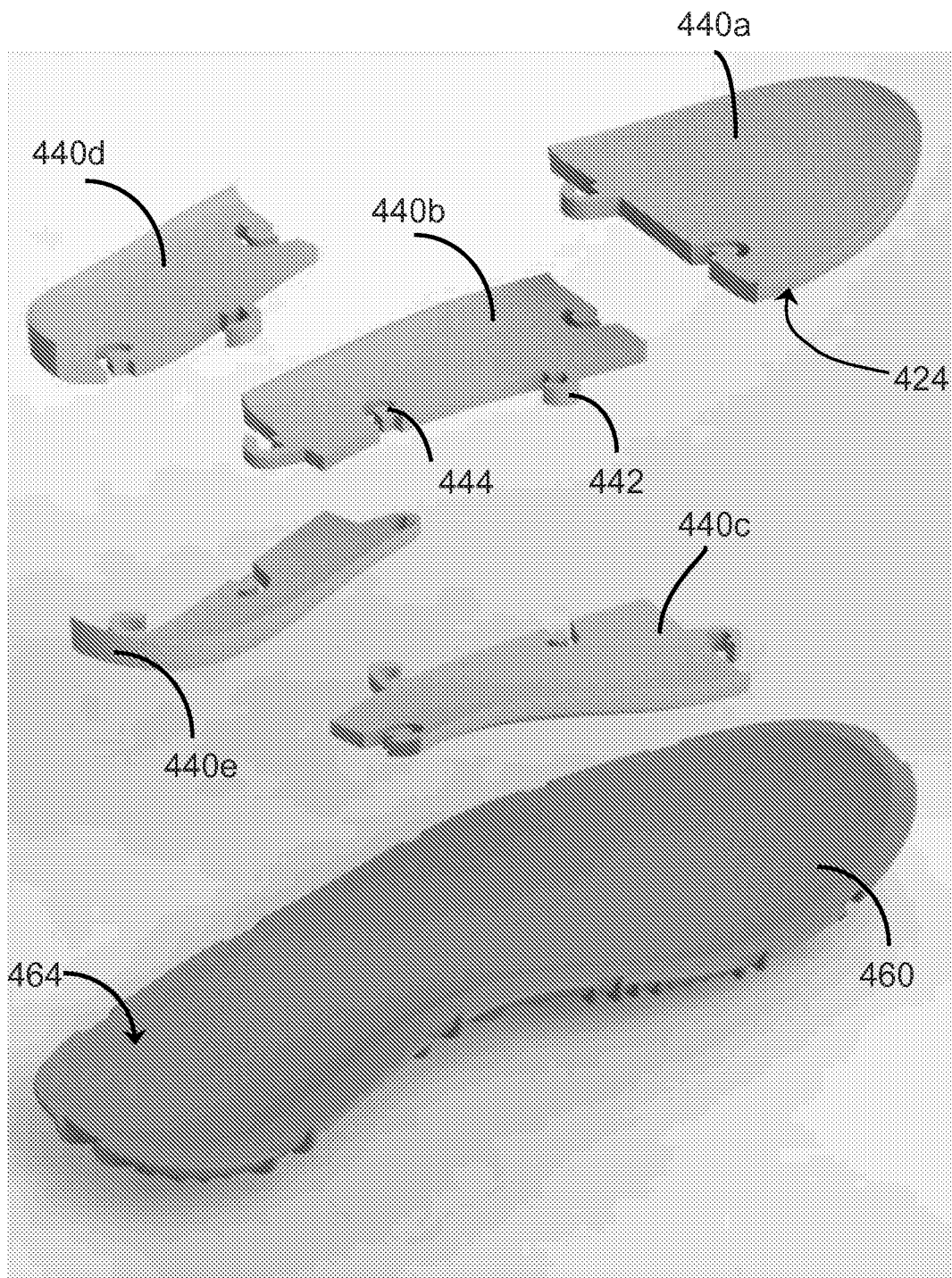


FIG. 11A

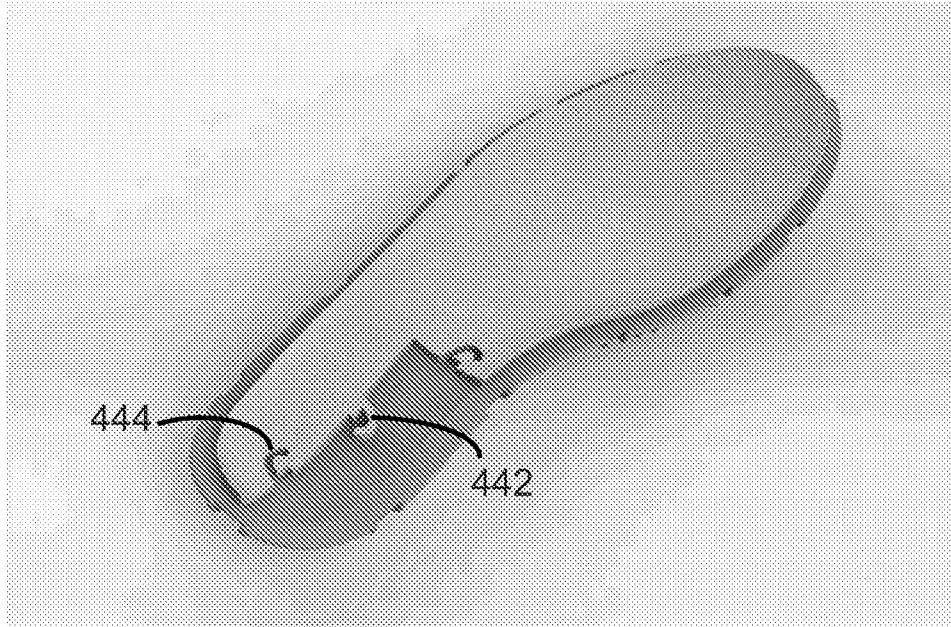


FIG. 11B

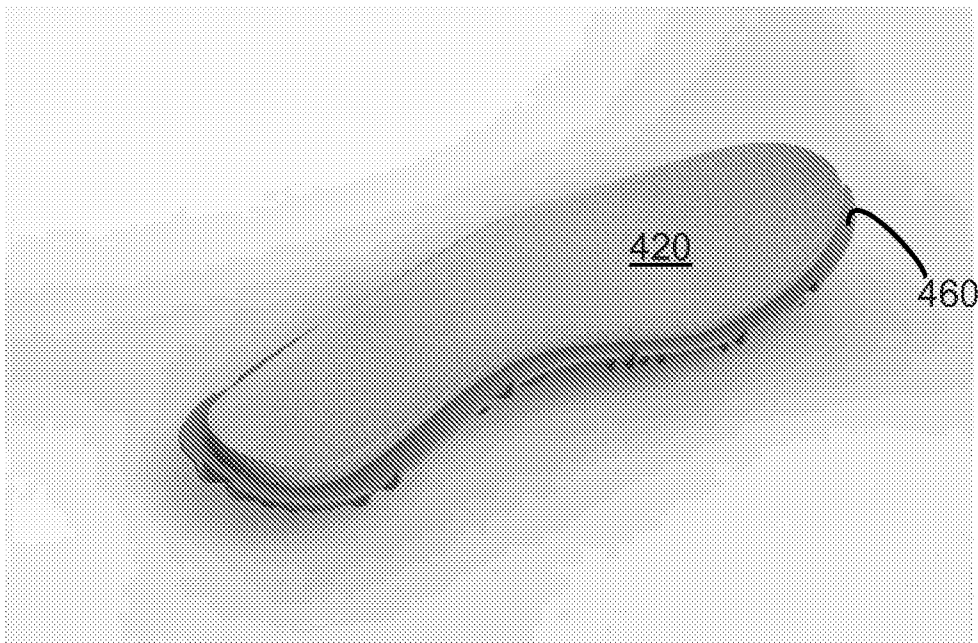


FIG. 11C

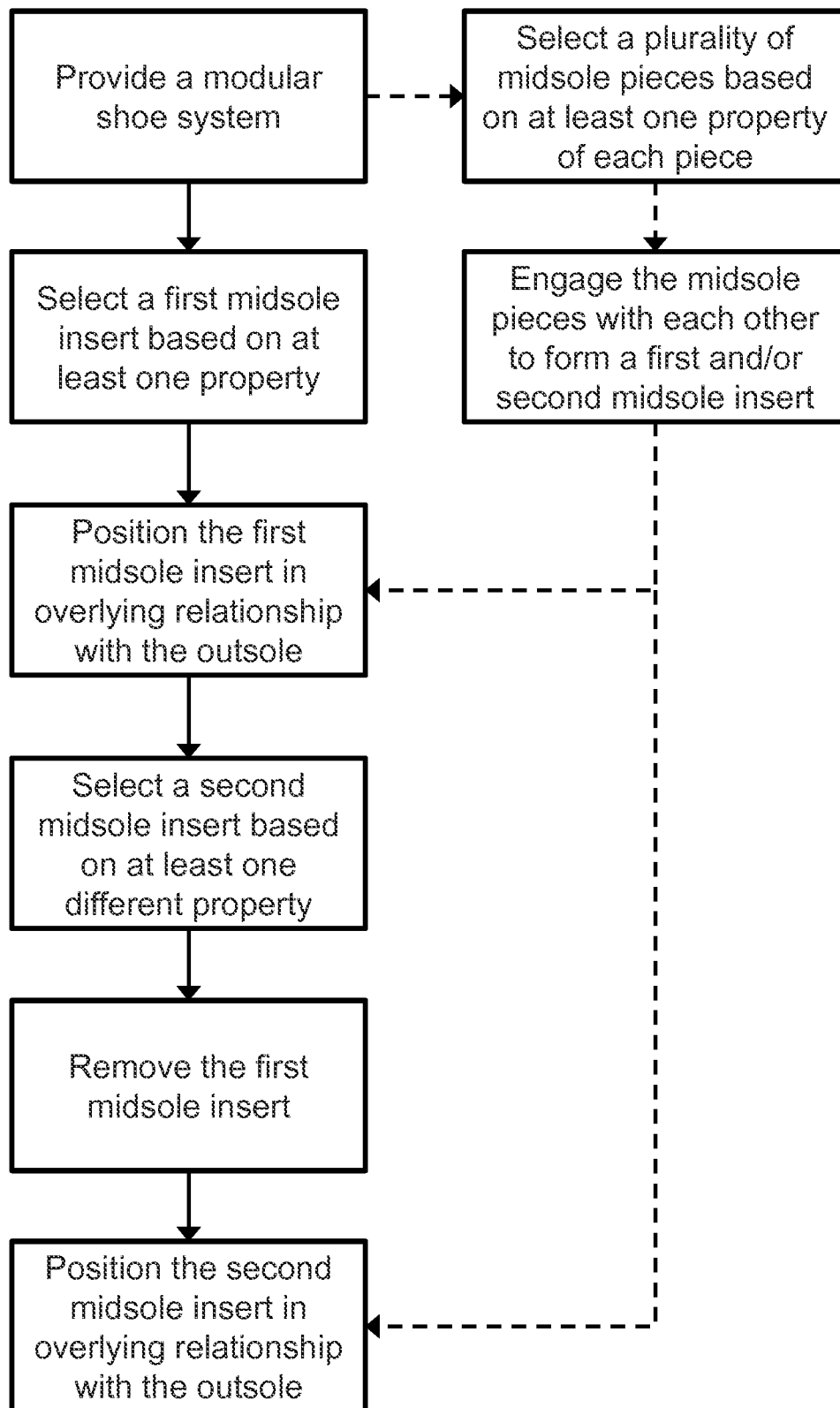


FIG. 12

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/27759

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A43B 13/12, A43B 13/16 (2014.01)

USPC - 36/30R

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8): A43B 13/00, 12, 14, 16, 28, 36 (2014.01)

USPC: 36/30R, 25R, 28, 31, 43, 44

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8): A43B 13/\*, 19/\*, 21/\* (2014.01), CPC: A43B\*

USPC: 36/\*

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patents, Google Web

Keywords: midsole, middle, sole, outsole, upper, insert, tread, modular, merrell, nike, lunar

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	WO 1997046127 A1 (GAUDIO et al.) 11 December 1997 (11.12.1997), entire document	1-3, 6, 8 ----- 5, 7, 9-15
X	US 6,023,859 A (BURKE et al.) 15 February 2000 (15.02.2000), entire document	1-2, 5, 16-18
X -- Y	US 7,076,890 B2 (GROVE et al.) 18 July 2006 (18.07.2006), entire document	1-2, 4, 8, 16-18 ----- 19-20
Y	US 7,762,012 B2 (FUERST) 27 July 2010 (27.07.2010), entire document	5, 7, 9-15, 19-20
A	US 4,606,139 A (SILVER) 19 August 1986 (19.08.1986), entire document	1-20
A	US 3,538,628 A (EINSTEIN) 10 November 1970 (10.11.1970), entire document	1-20
A	US 4,420,894 A (GLASSMAN) 20 December 1983 (20.12.1983), entire document	1-20
A	US 6,880,266 B2 (SCHOENBORN et al.) 19 April 2005 (19.04.2005), entire document	1-20

☐ Further documents are listed in the continuation of Box C.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

01 August 2014 (01.08.2014)

Date of mailing of the international search report

21 AUG 2014

Name and mailing address of the ISA/US

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Lee W. Young

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