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(54) **SYSTEMS, METHODS, AND DEVICES FOR MODULAR SHOES**

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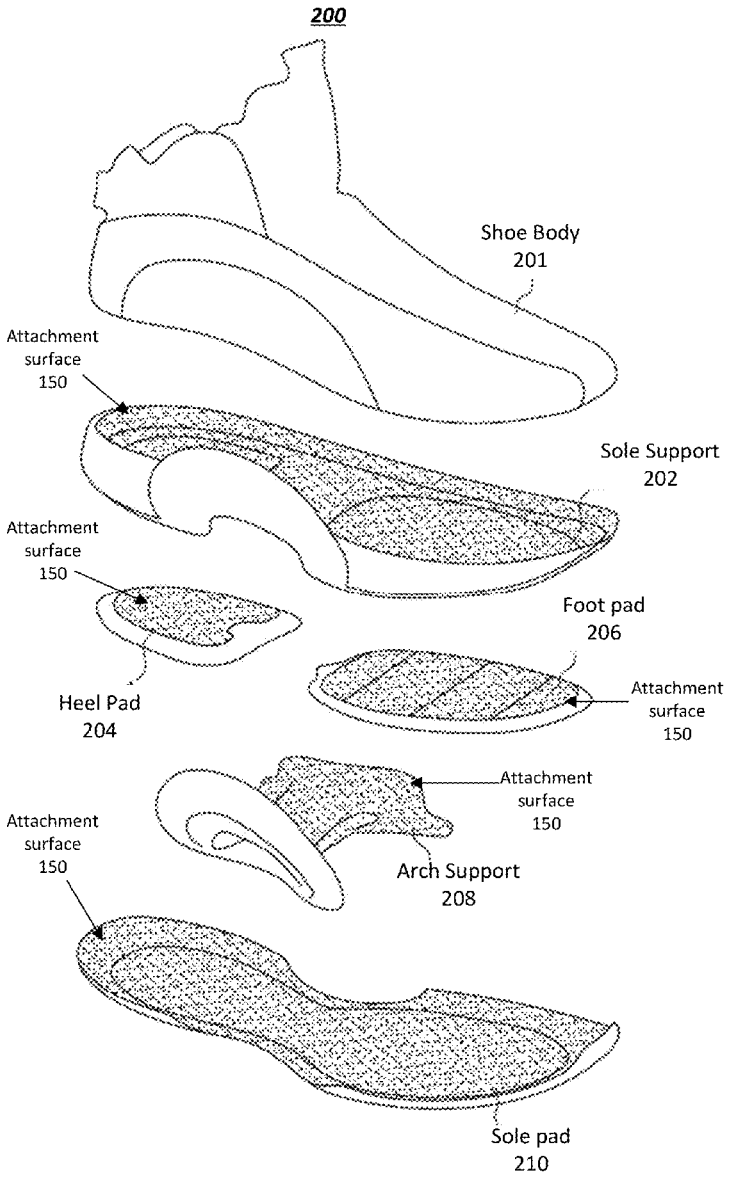
(57) **ABSTRACT**

Exemplary devices and methods are disclosed that facilitate a modular shoe system, the system. The modular shoe system can include a sole having a ground contact side and an attachment side, a shoe body having an outer surface, where an attachment surface is formed on at least a portion of the outer surface of the shoe body, and where the attachment surface of the shoe body is configured to attachably and releasably connect to the attachment side of the sole. The modular shoe system may further include a shoe component including a shoe component attachment side, where the shoe body further includes a second attachment surface formed on a second portion of the outer surface of the shoe body, and wherein the shoe component attachment side is configured to attachably and releasably connect to the second attachment surface.



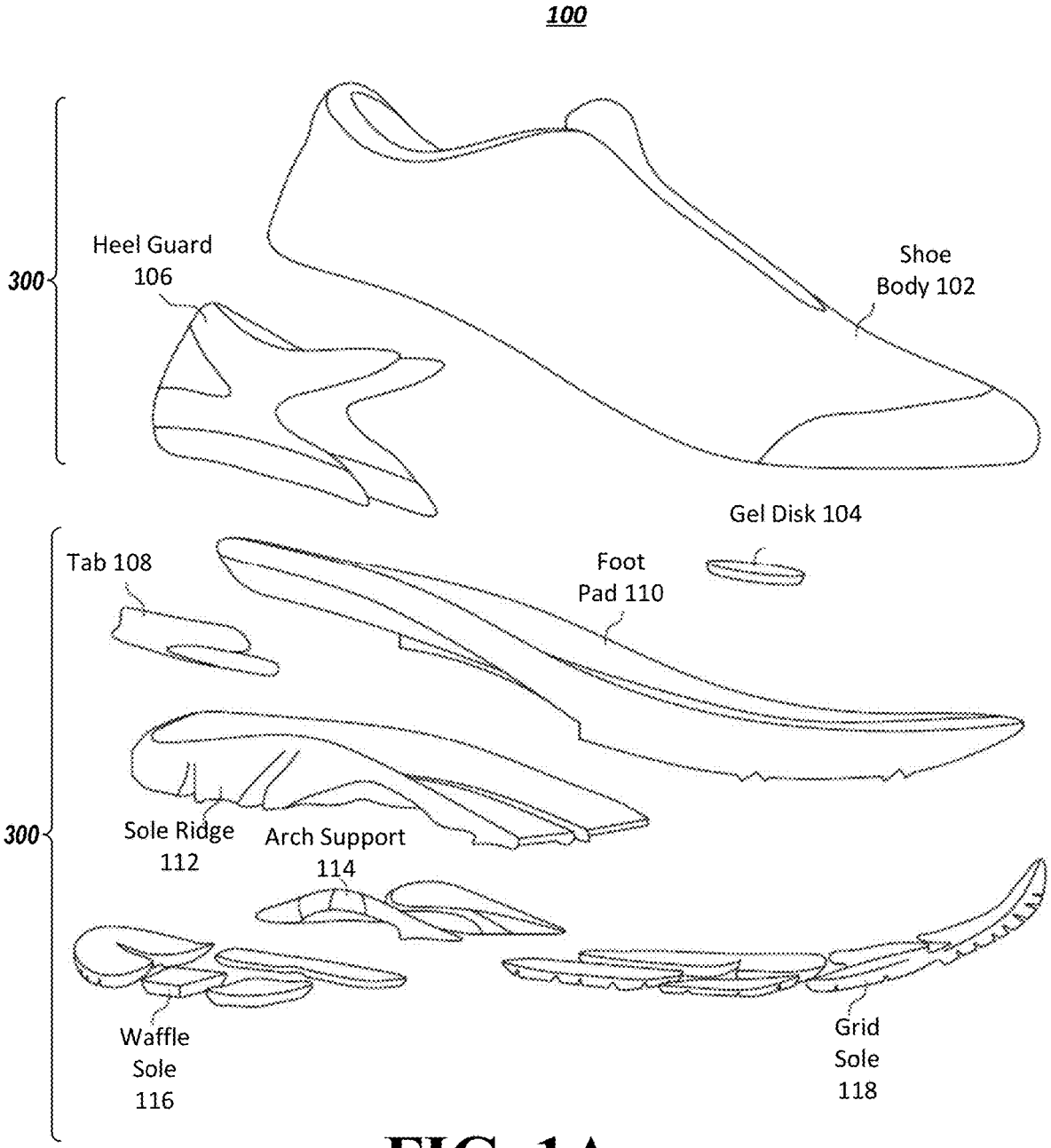

100
300
Heel Guard
106
Shoe
Body 102
Gel Disk 104
Tab 108
Foot
Pad 110
300
Sole Ridge
112
Arch Support
114
Waffle
Sole
116
Grid
Sole
118

FIG. 1A

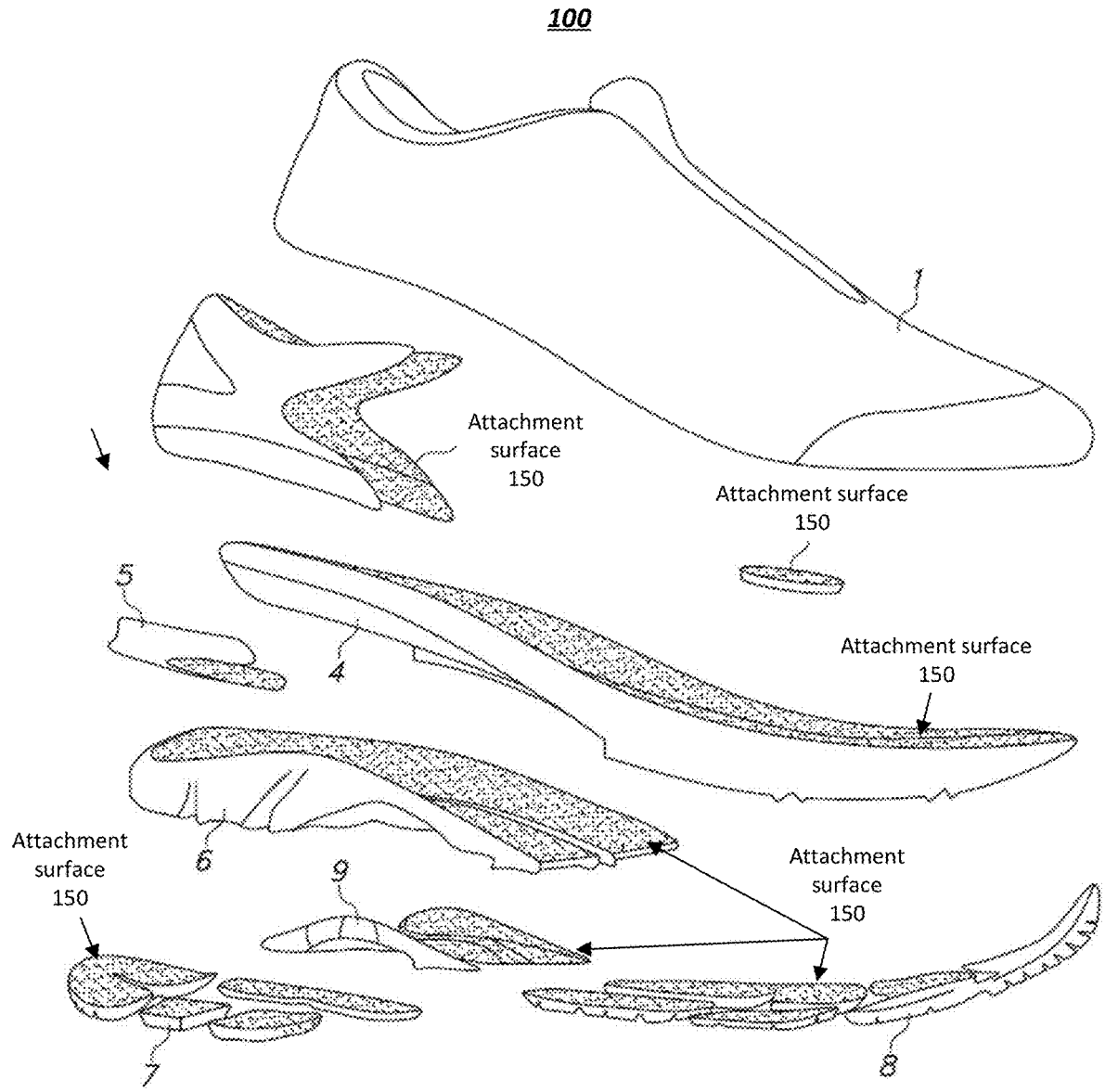

100
Attachment surface 150
Attachment surface 150
Attachment surface 150
Attachment surface 150
Attachment surface 150
1
4
5
6
7
8
9

FIG. 1B

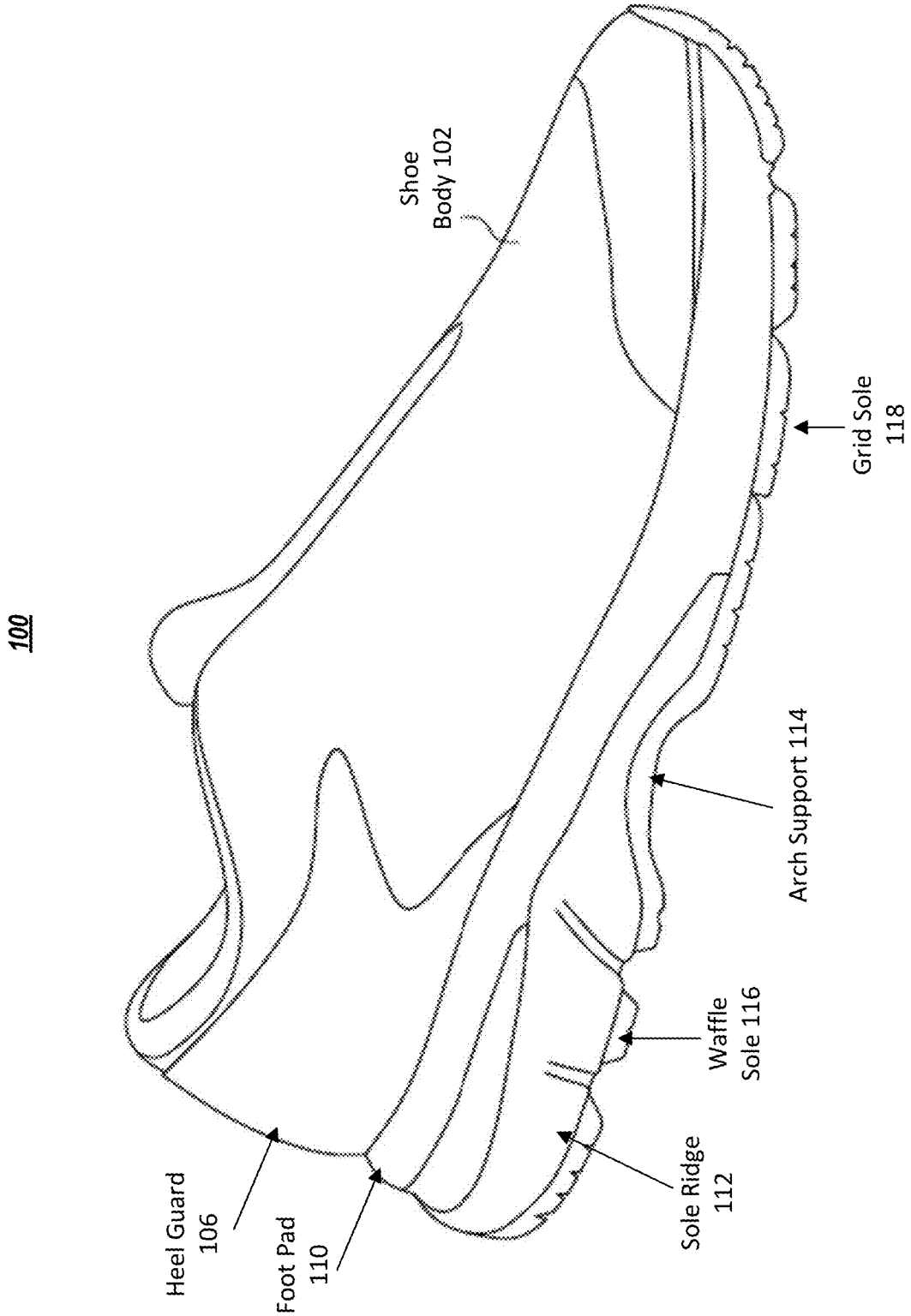

100
Shoe Body 102
Grid Sole 118
Arch Support 114
Waffle Sole 116
Sole Ridge 112
Heel Guard 106
Foot Pad 110

FIG. 1C

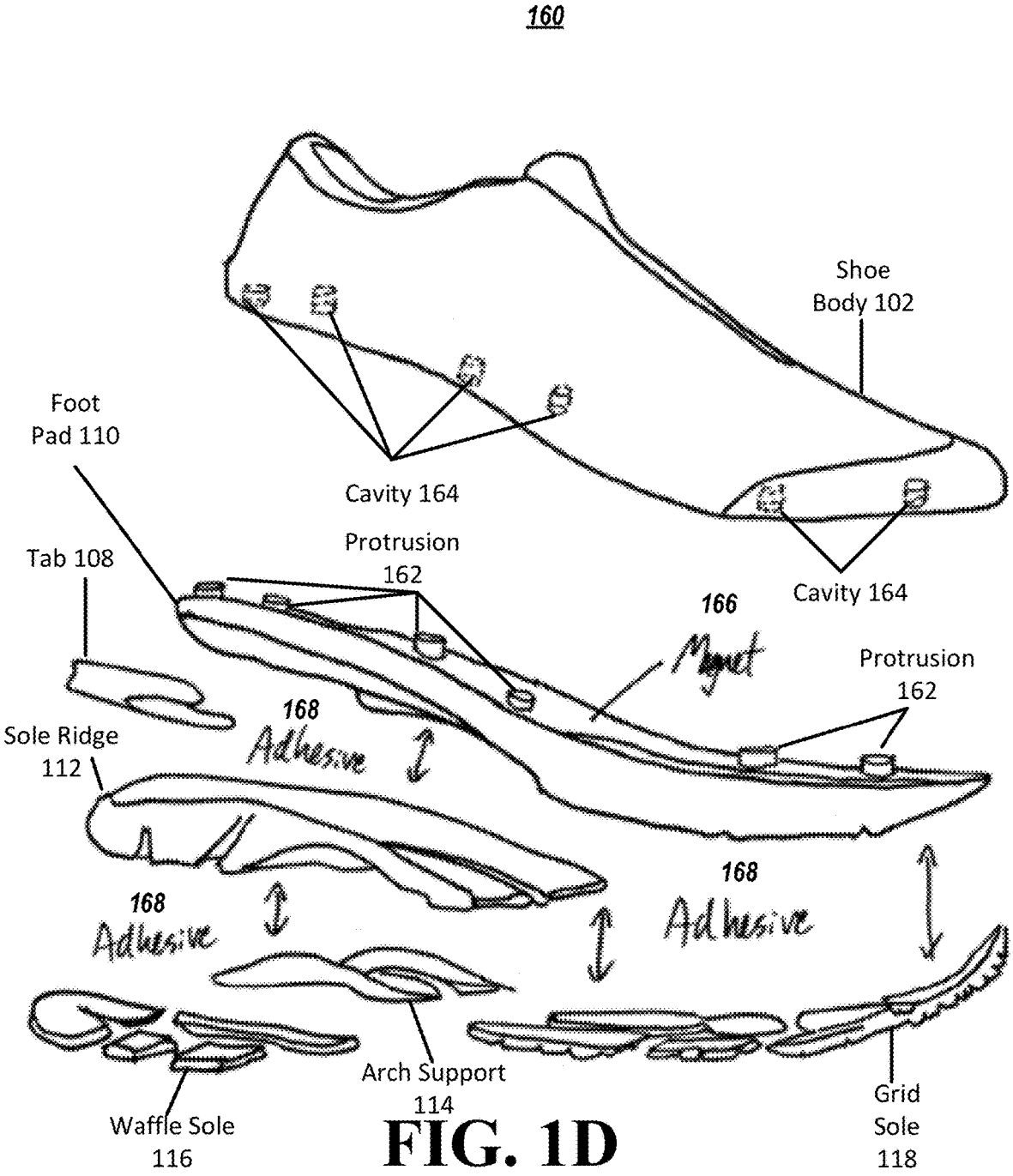

160
Shoe Body 102
Foot Pad 110
Cavity 164
Protrusion 162
Tab 108
Cavity 164
166
Magnet
Protrusion 162
168
Adhesive
Sole Ridge 112
168
Adhesive
168
Adhesive
Arch Support 114
Waffle Sole 116
Grid Sole 118

FIG. 1D

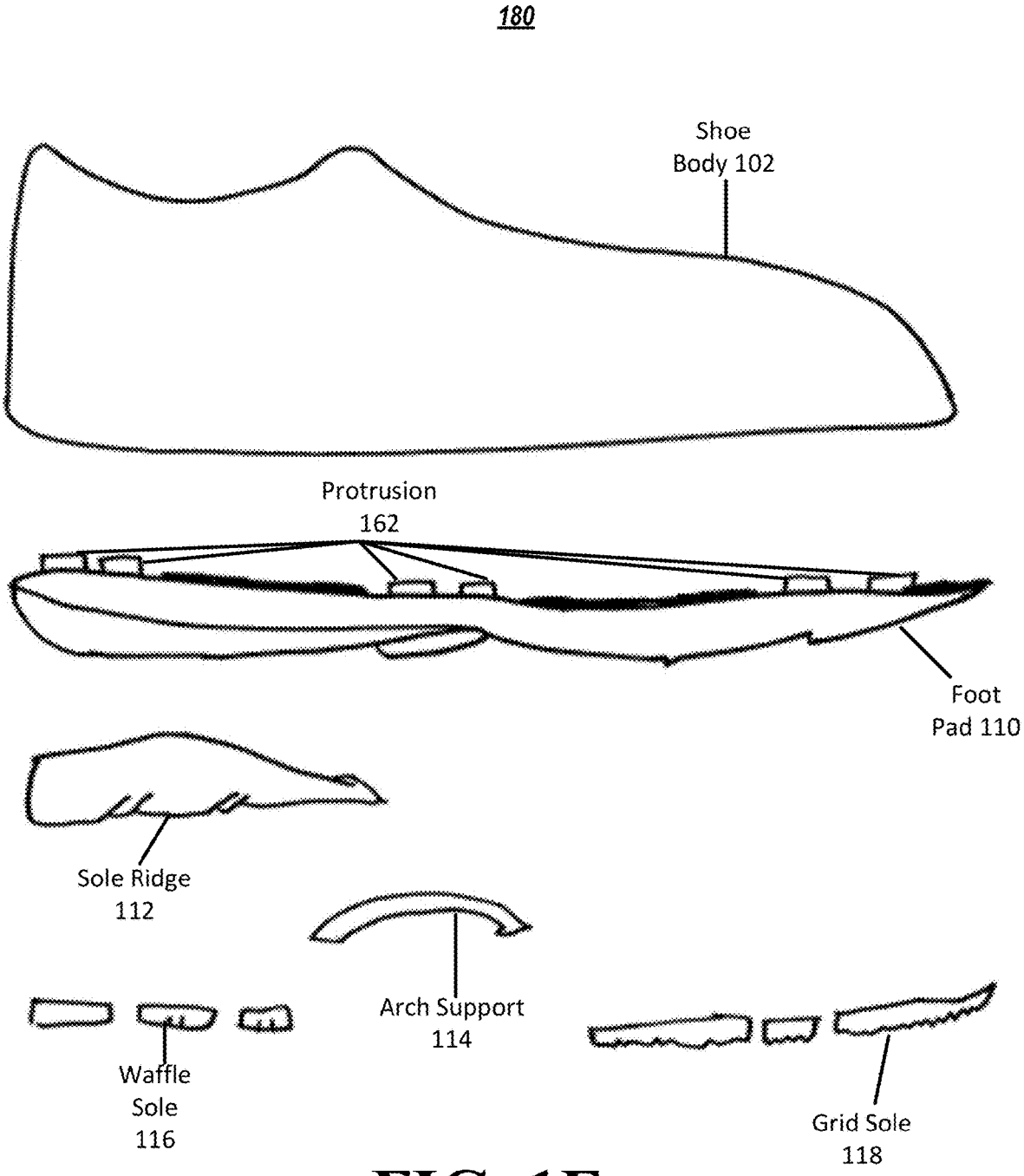

180
Shoe
Body 102
Protrusion
162
Foot
Pad 110
Sole Ridge
112
Arch Support
114
Waffle
Sole
116
Grid Sole
118

FIG. 1E

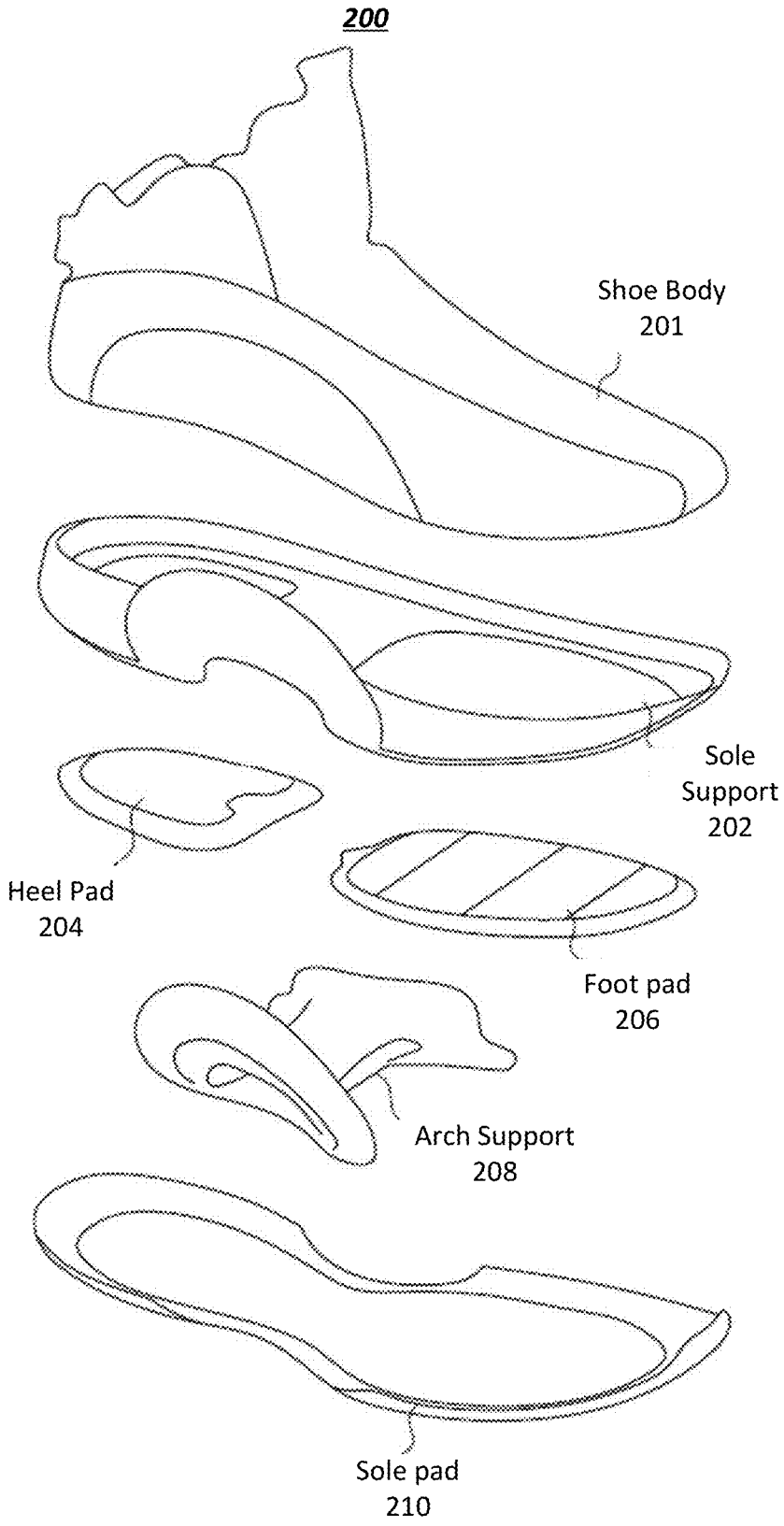

200
Shoe Body
201
Sole
Support
202
Heel Pad
204
Foot pad
206
Arch Support
208
Sole pad
210

FIG. 2A

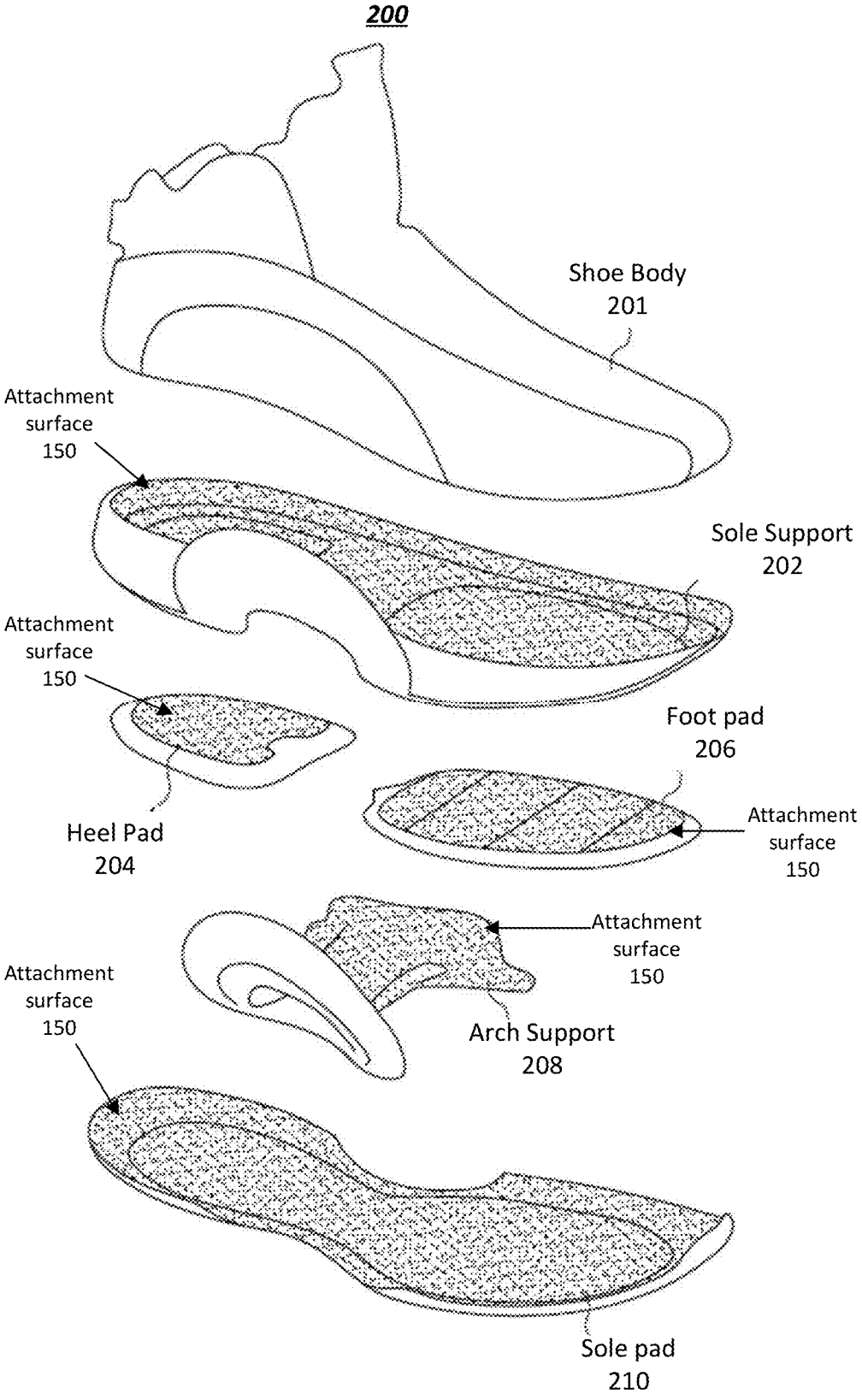

200
Shoe Body
201
Attachment surface 150
Sole Support
202
Attachment surface 150
Foot pad
206
Heel Pad
204
Attachment surface 150
Attachment surface 150
Attachment surface 150
Arch Support
208
Sole pad
210

FIG. 2B

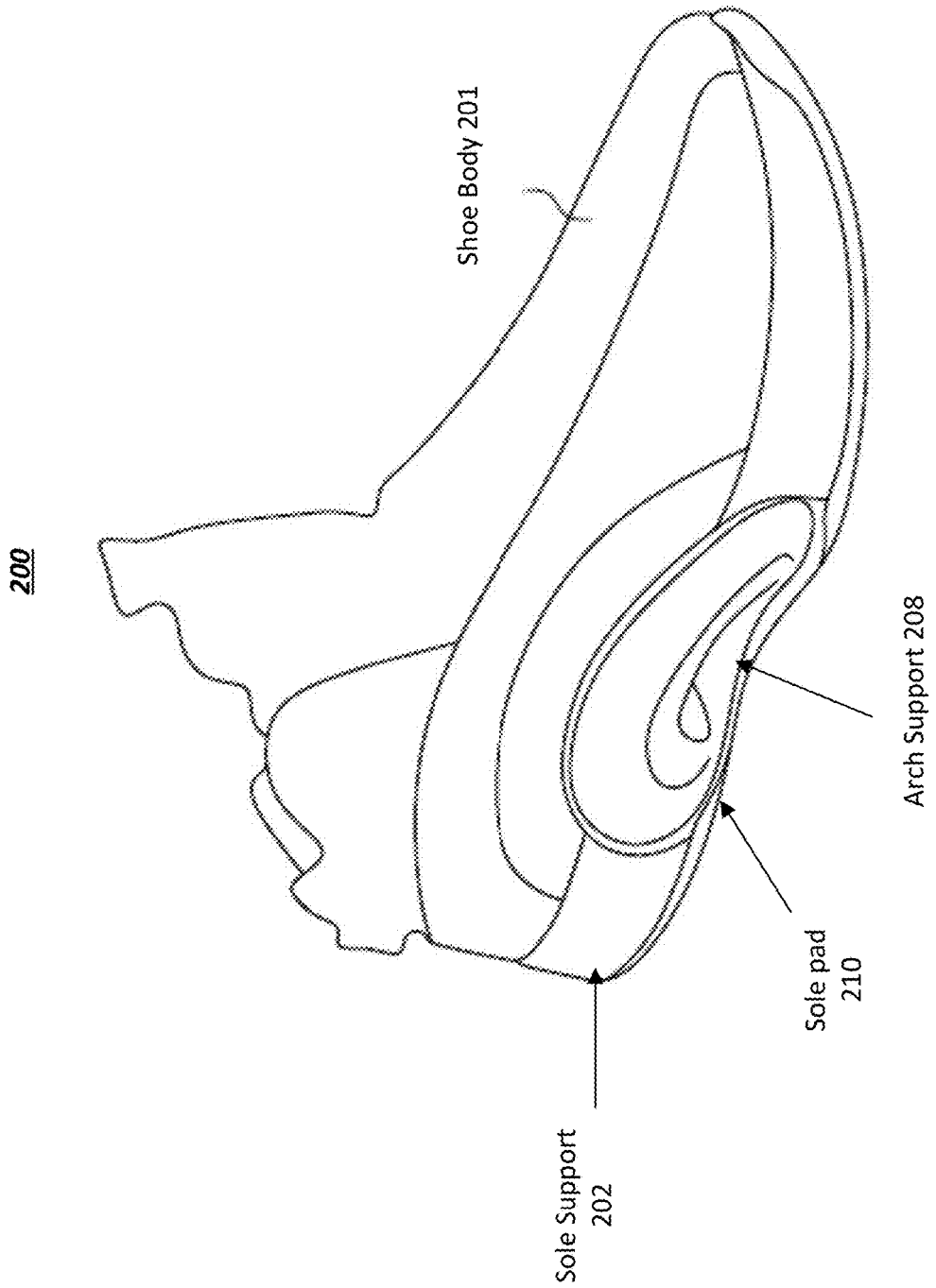

200
Shoe Body 201
Arch Support 208
Sole pad 210
Sole Support 202

FIG. 2C

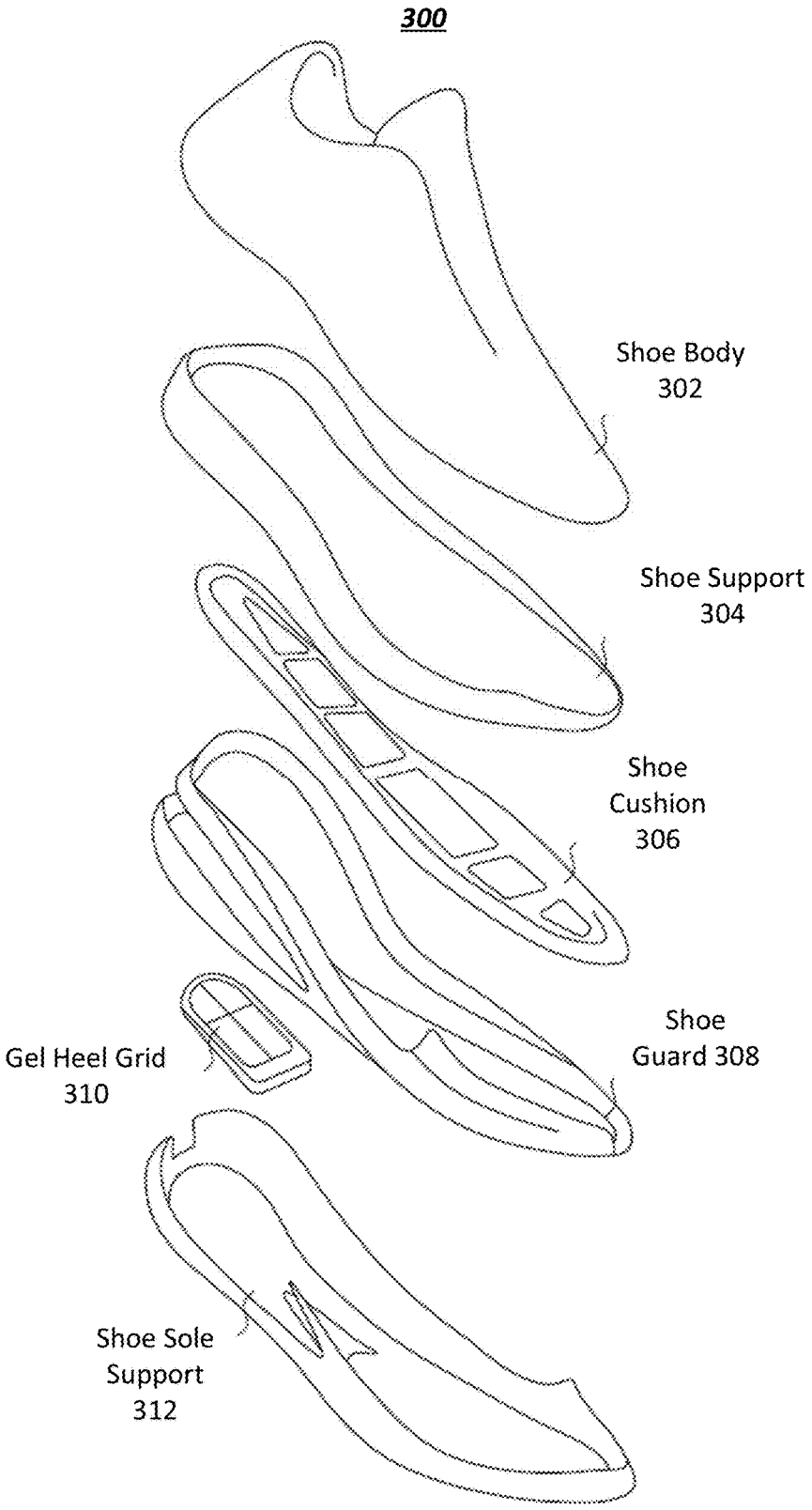

300
Shoe Body
302
Shoe Support
304
Shoe
Cushion
306
Shoe
Guard 308
Gel Heel Grid
310
Shoe Sole
Support
312

FIG. 3A

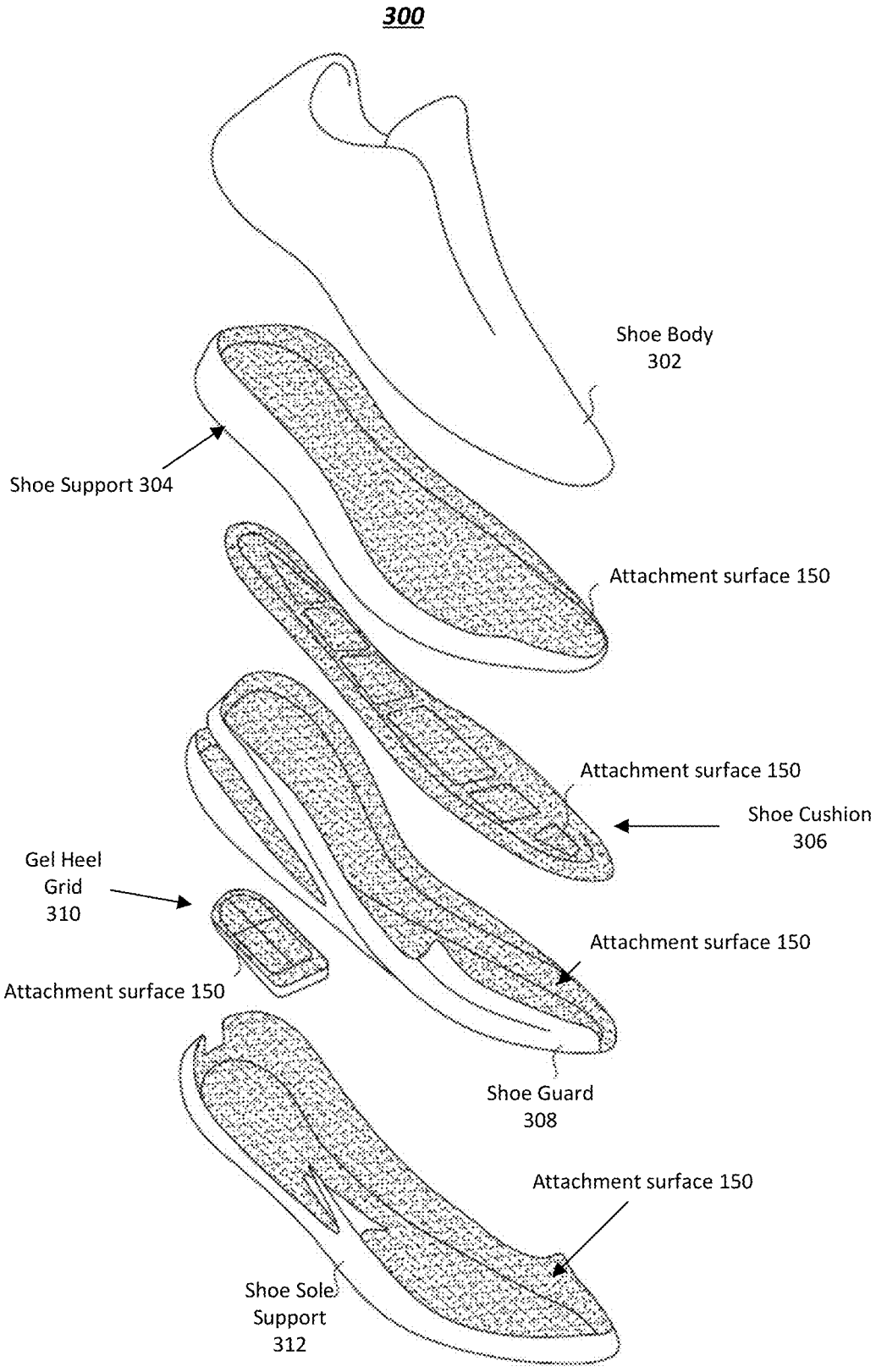

300
Shoe Body
302
Shoe Support 304
Attachment surface 150
Attachment surface 150
Shoe Cushion
306
Gel Heel
Grid
310
Attachment surface 150
Attachment surface 150
Shoe Guard
308
Attachment surface 150
Shoe Sole
Support
312

FIG. 3B

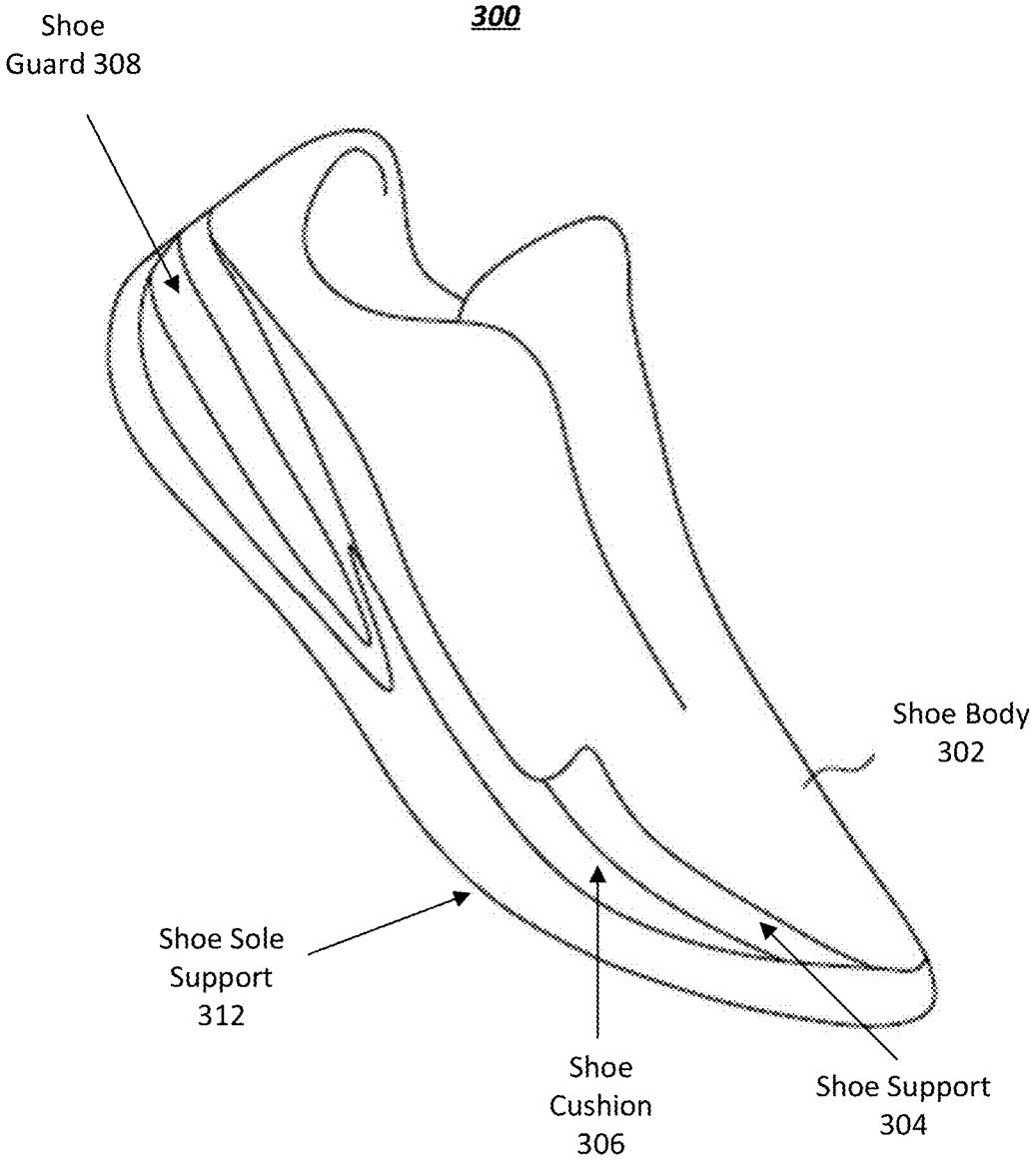

300
Shoe Guard 308
Shoe Body 302
Shoe Sole Support 312
Shoe Cushion 306
Shoe Support 304

FIG. 3C

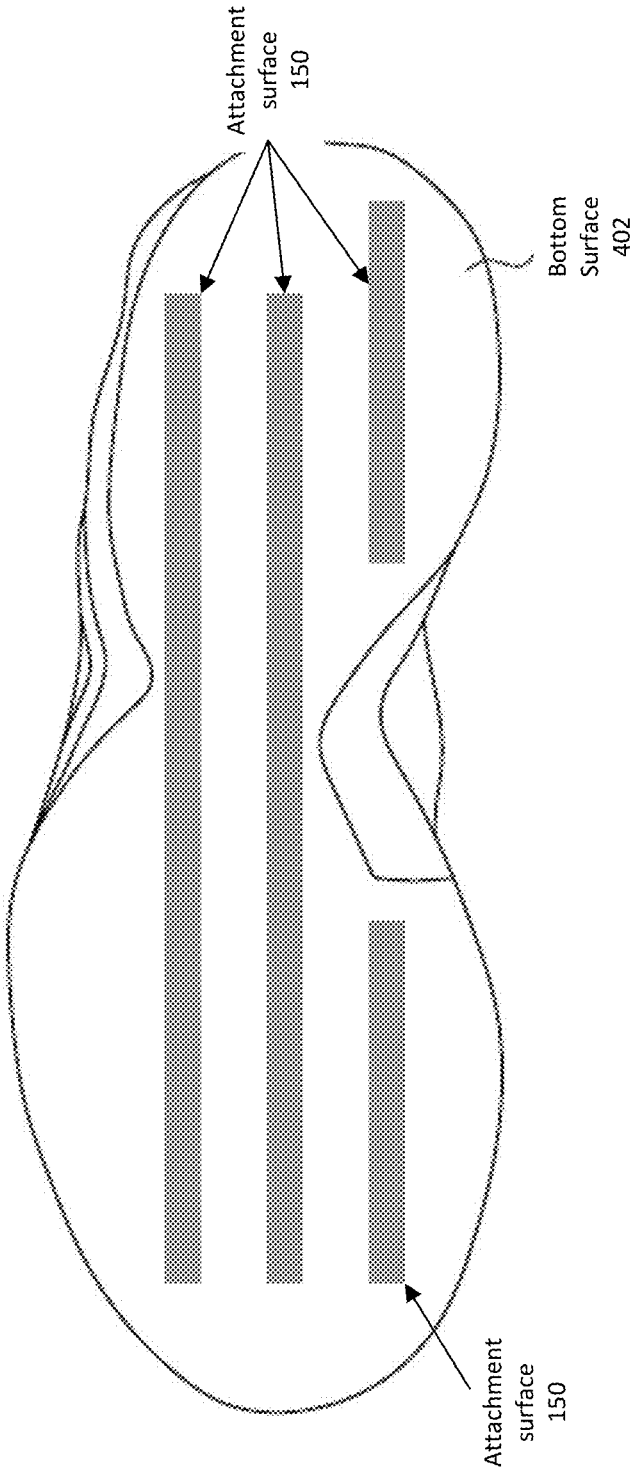

Attachment surface 150
Bottom Surface 402
Attachment surface 150

FIG. 4

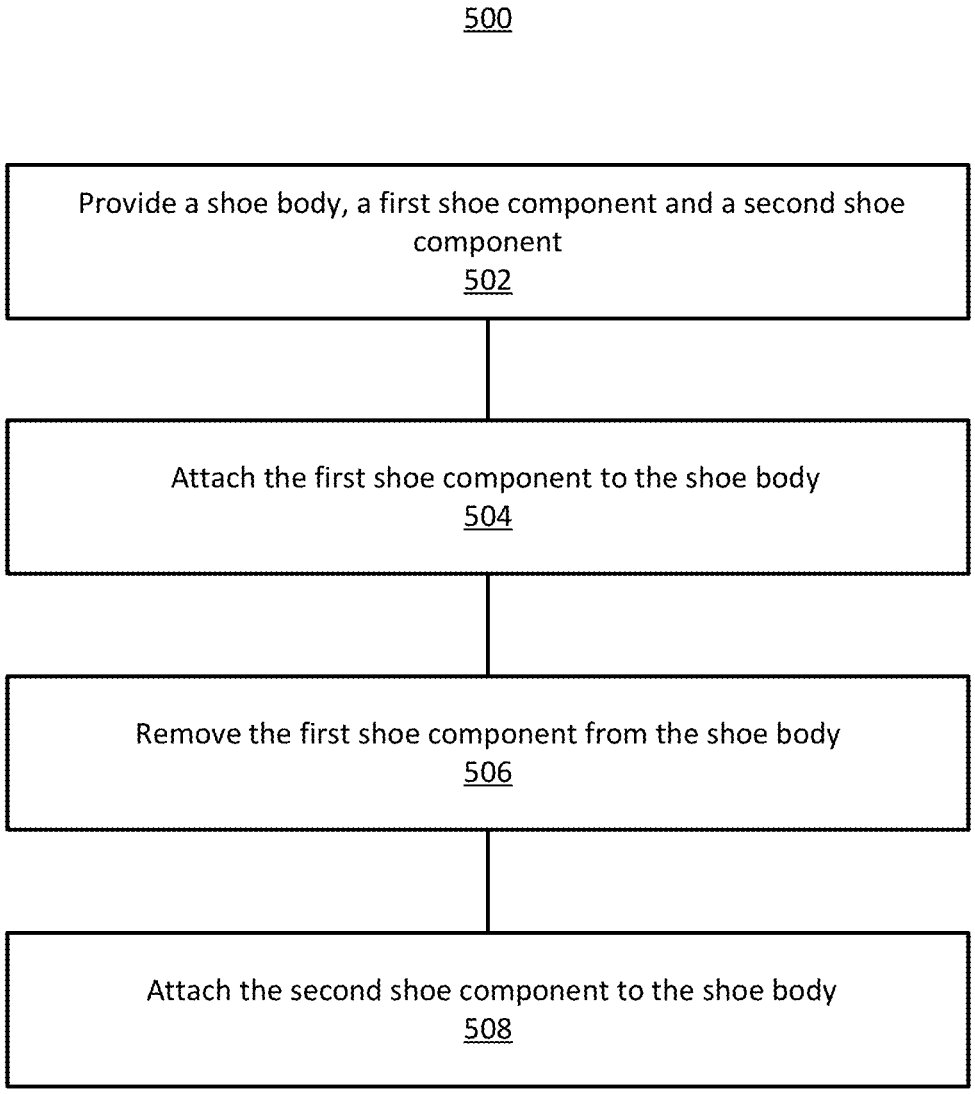

500
Provide a shoe body, a first shoe component and a second shoe component
502
Attach the first shoe component to the shoe body
504
Remove the first shoe component from the shoe body
506
Attach the second shoe component to the shoe body
508

FIG. 5

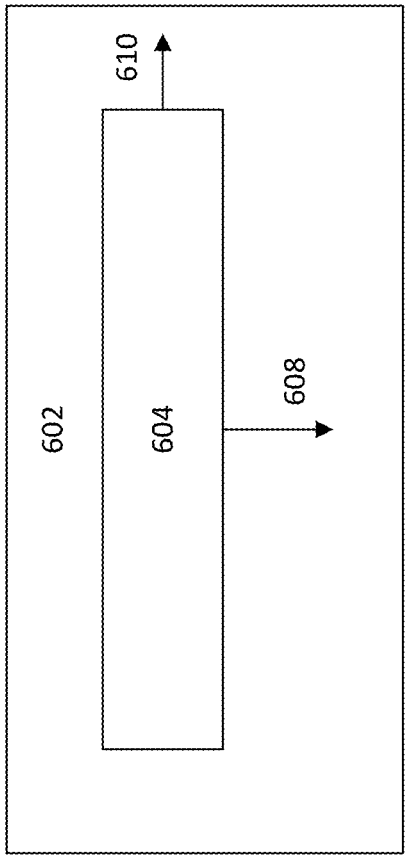


FIG. 6B

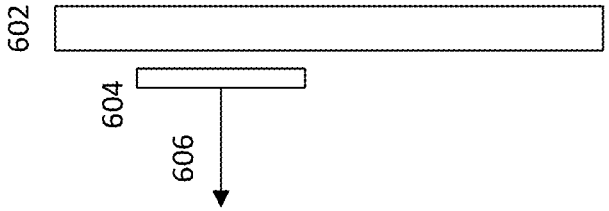


FIG. 6A

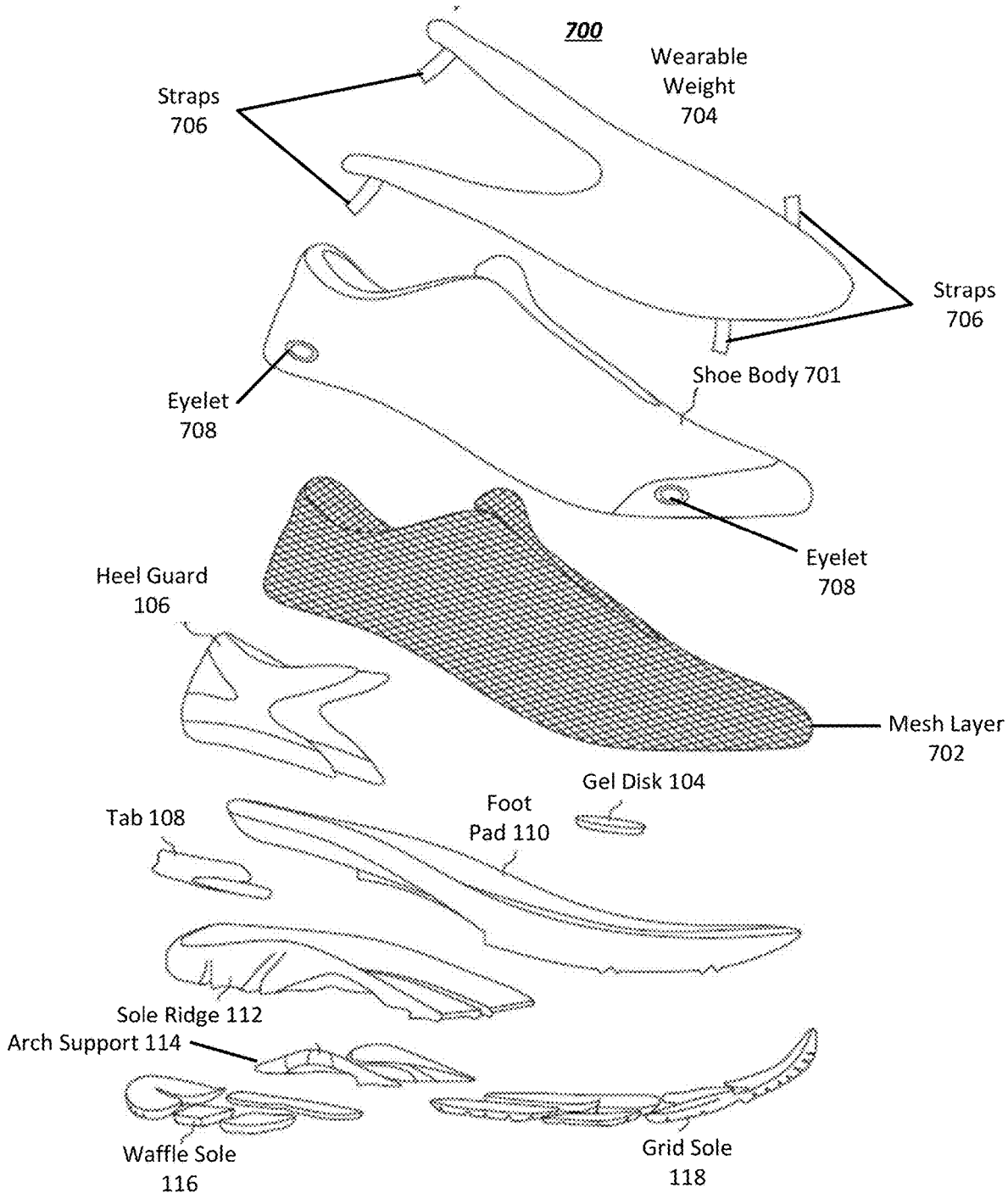

700
Wearable Weight 704
Straps 706
Straps 706
Shoe Body 701
Eyelet 708
Eyelet 708
Heel Guard 106
Mesh Layer 702
Gel Disk 104
Foot Pad 110
Tab 108
Sole Ridge 112
Arch Support 114
Waffle Sole 116
Grid Sole 118

FIG. 7

SYSTEMS, METHODS, AND DEVICES FOR MODULAR SHOES

BACKGROUND

[0001] A shoe is an item of footwear intended to protect and comfort the human foot. Shoes can be worn for a variety of different activities including sports, fitness, work, and/or simply walking around. Different activities can require shoes with different attributes. Additionally, different individuals may desire shoes with different sizes, shapes, weights, colors and other characteristics. Shows can be statements of fashion.

[0002] As footwear, shoes are subjected to a high degree of mechanical forces and stresses. Careful attention is applied in the design and manufacturing of shoes for performance, aesthetics, and life. The earliest known shoes have been dated as far as back as the beginning of human civilization. Sneakers are shoes primarily designed for sports or other forms of physical exercise but are now also widely used for everyday casual wear. Sneakers were introduced in the mid-20th century. Contemporary sneakers are largely made from synthetic materials, and the materials and manufacturing artifacts often end up in landfills at the end of the shoe's life.

[0003] There is a benefit to having additional designs for shoes that can meet different needs and extend their life.

SUMMARY

[0004] An exemplary system, method, and device are disclosed that facilitate a modular shoe having magnetic attaching components, e.g., heel, shoe body, and accessories that can be interchanged. The magnetic attaching components may include planar magnets, disc or shaped magnets, or magnetic woven into mesh fabrics that can attract to corresponding magnetic attaching components of the modular shoe.

[0005] The modular shoe can be configured to include a shoe body and attachment surfaces on the shoe body for different shoe components. Different shoe components can be attached to and removed from the attachment surfaces to configure the shoe to have different attributes, visual appeal, or aesthetics, thereby extending its usable life. Indeed, the modular shoes disclosed herein can include interchangeable foot pads, soles, and heel guards. This can allow a wearer of the shoes to quickly reconfigure the shoes for different purposes, repair damage to the shoes, and/or customize the appearance of the shoes.

[0006] In an aspect, the present disclosure relates to a modular shoe system, which, in one embodiment, includes: a sole having a ground contact side and an attachment side; a shoe body having an outer surface, where an attachment surface is formed on at least a portion of the outer surface of the shoe body, and where the attachment surface of the shoe body is configured to attachably and releasably connect to the attachment side of the sole.

[0007] In one embodiment, the attachment side of the sole includes a sole magnet (e.g., flexible and planar magnet or button magnet) in which the attachment surface of the shoe body includes a shoe body magnet (e.g., flexible and planar magnet or button magnet), where the sole magnet and shoe body magnet are configured to (i) attract each other when the attachment side of the sole is adjacent to the attachment surface of the shoe body or (ii) attract to an intermediate body having a first side and a second side, where the first side and the second side each has magnets.

[0008] In one embodiment, the attachment side of the sole includes a first button-shaped magnet, and the attachment surface of the shoe body includes a second button-shaped magnet in which the first button-shaped magnet is configured to attachably and releasably connect to the second button-shaped magnet.

[0009] In one embodiment, the system includes a shoe component, the shoe component including a shoe component attachment side, where the shoe body further includes a second attachment surface formed on a second portion of the outer surface of the shoe body, and where the shoe component attachment side is configured to attachably and releasably connect to the second attachment surface.

[0010] In one embodiment, the shoe body includes a magnetic mesh and a hook and a plurality of eyelets, where the shoe component includes a bean bag, the bean bag including a plurality of hook and loop straps configured to attach to the plurality of eyelets and a plurality of magnetic pellets configured to attract the magnetic mesh when the shoe body is adjacent to the bean bag.

[0011] In one embodiment, the shoe component attachment side and the second attachment surface each include magnets configured to attachably and releasably connect the shoe component to the shoe body.

[0012] In one embodiment, the shoe component is a heel guard.

[0013] In one embodiment, the system further includes a foot pad, the foot pad including a shoe side including a first attachment surface, and a sole side including a second attachment surface, where the first attachment surface of the foot pad is configured to attach to at least a portion of the shoe body and where the second attachment surface of the foot pad is configured to attach to at least a portion of the sole.

[0014] In one embodiment, the first attachment surface and the second attachment surface of the foot pad include magnets configured to attachably and releasably connect the shoe body, foot pad, and sole together.

[0015] In one embodiment, at least a portion of the ground contact side of the sole includes a ground contact attachment surface.

[0016] In one embodiment, the system further includes a tread, where the ground contact attachment surface is configured to attachably and releasably connect to a tread attachment surface formed on at least a portion of the tread.

[0017] In one embodiment, the tread includes at least one of a waffle pattern or a grid pattern.

[0018] In another aspect, the present disclosure relates to a modular shoe including: a shoe body including an outer surface; an attachment surface formed on at least a portion of the outer surface of the shoe body, where the attachment surface of the shoe body is configured to attachably and releasably connect to an attachment surface of a shoe sole.

[0019] In one embodiment, the shoe body further includes a second attachment surface formed on a second portion of the outer surface of the shoe body, where the second attachment surface is configured to attachably and releasably connect to a foot pad. In one embodiment, the shoe body further includes a plurality of attachment surfaces formed on the outer surface of the shoe body, where the plurality of attachment surfaces are configured to attachably and releasably connect to a plurality of shoe components.

[0020] In one embodiment, the plurality of attachment surfaces and a plurality of shoe components each include magnets.

[0021] In another aspect, the present disclosure relates to a method of operating a modular shoe, which, in some embodiments, includes: providing a shoe body, a first shoe component, and a second shoe components in which the shoe body includes a shoe body attachment surface, the first shoe component includes a first shoe component attachment surface, and the second shoe component includes a second shoe component attachment surface; attaching the first shoe component to the shoe body using the first shoe component attachment surface and the shoe body attachment surface; removing the first shoe component from the shoe body; and attaching the second shoe component to the shoe body using the second shoe component attachment surface and the shoe body attachment surface.

[0022] In one embodiment, attaching the first shoe component to the shoe body includes aligning a magnet in the first shoe component attachment surface with the shoe body attachment surface.

[0023] In one embodiment, attaching the first shoe component to the shoe body includes attaching the first shoe component attachment surface to a second button magnet of the shoe body attachment surface.

[0024] In one embodiment, the method further includes providing a third shoe component including a third shoe component attachment surface and attaching the third shoe component to the shoe body using the shoe body attachment surface.

[0025] In one embodiment, the second shoe component is a sole, and the third shoe component is a foot pad.

[0026] In another aspect, the present disclosure relates to a modular shoe, which, in some embodiments, includes: a shoe body including an outer surface; an eyelet formed on the outer surface of the shoe body; and a wearable weight including a weight component and a strap, where the strap is configured to attach to the eyelet formed on the outer surface of the shoe body.

[0027] In another aspect, the present disclosure relates to a modular shoe, which, in some embodiments, includes: a shoe body including an inner surface; and a mesh sleeve configured to be attached to the inner surface of the shoe body, where the mesh sleeve includes magnetic materials.

[0028] Other aspects and features, according to the example embodiments of the disclosed technology, will become apparent to those of ordinary skill in the art, upon reviewing the following detailed description in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments and together with the description, serve to explain the principles of the devices and methods.

[0030] FIG. **1**A is a diagram showing an exploded view of an example modular shoe in accordance with an illustrative embodiment.

[0031] FIG. **1**B is a diagram showing attachment surfaces for the modular shoe illustrated in FIG. **1**A in accordance with an illustrative embodiment.

[0032] FIG. **1**C is a diagram showing the example modular shoe illustrated in FIG. **1**A in an assembled view in accordance with an illustrative embodiment.

[0033] FIG. **1**D illustrates an example modular shoe that includes protrusions, cavities, and adhesive layers, in accordance with an illustrative embodiment.

[0034] FIG. **1**E illustrates an example modular shoe that includes protrusions, in accordance with an illustrative embodiment.

[0035] FIG. **2**A is a diagram showing an exploded view of another example modular shoe in accordance with another illustrative embodiment.

[0036] FIG. **2**B is a diagram showing additional examples of attachment surfaces for the modular shoe illustrated in FIG. **2**A in accordance with another illustrative embodiment.

[0037] FIG. **2**C is a diagram showing the example modular shoe illustrated in FIG. **2**A in an assembled view in accordance with an illustrative embodiment.

[0038] FIG. **3**A is a diagram showing an exploded view of yet another modular shoe in accordance with another illustrative embodiment.

[0039] FIG. **3**B is a diagram showing additional examples of attachment surfaces for the modular shoe illustrated in FIG. **2**A in accordance with another illustrative embodiment.

[0040] FIG. **3**C is a diagram showing the example modular shoe illustrated in FIG. **3**A in an assembled view in accordance with an illustrative embodiment.

[0041] FIG. **4** shows a bottom view of a modular shoe in accordance with an illustrative embodiment.

[0042] FIG. **5** shows a method of operating a modular shoe, in accordance with an illustrative embodiment.

[0043] FIG. **6**A illustrates a side view of an example magnetic strip attached to a surface.

[0044] FIG. **6**B illustrates a front view of an example magnetic strip attached to a surface.

[0045] FIG. **7** illustrates an exploded view of a modular shoe in accordance with an illustrative embodiment.

DETAILED DESCRIPTION

[0046] Although example embodiments of the disclosed technology are explained in detail herein, it is to be understood that other embodiments are contemplated. Accordingly, it is not intended that the disclosed technology be limited in its scope to the details of construction and arrangement of components set forth in the following description or illustrated in the drawings. The disclosed technology is capable of other embodiments and of being practiced or carried out in various ways.

[0047] As discussed above, an exemplary system, method, and device are disclosed that facilitate a modular shoe having modular components, e.g., heel, shoe body, and accessories that can be interchanged. The modular shoe can be configured to include a shoe body and attachment surfaces on the shoe body for different shoe components. Different shoe components can be attached to and removed from the attachment surfaces to configure the shoe to have different attributes, visual appeal or aesthetic. The modularity employed large surface magnetics on both sides of the attachment surfaces for light weight fabrication that allows different attachments to be releasably attached to one another in a modular manner that can provide additional use and aesthetic appeal for the shoe, e.g., for different occasions or use.

[0048] The modular shoes disclosed herein can include, for example, interchangeable foot pads, soles, and heel guards. This can allow a wearer of the shoes to (i) quickly

reconfigure the shoes for different uses, and purposes, (ii) repair damage to the shoes, and/or (iii) customize the appearance of the shoes.

[0049] In the following description, references are made to the accompanying drawings that form a part hereof and that show, by way of illustration, specific embodiments or examples. In referring to the drawings, like numerals represent like elements throughout the several figures.

Example System #1

[0050] FIGS. **1**A, **1**B, and **1**C show various views and configurations of an exemplary modular shoe **100**, in accordance with an illustrative embodiment. FIG. **1**A is a diagram showing an exploded view of the example modular shoe **100**. FIG. **1**B is a diagram showing attachment surfaces for the modular shoe illustrated in FIG. **1**A. FIG. **1**C is a diagram showing the example modular shoe illustrated in FIG. **1**A in an assembled view.

[0051] In the example shown in FIGS. **1**A-**1**C, the modular shoe **100** includes a shoe body **102** is configured to releasably connect to any number of different components to form a modular shoe with different characteristics or configurations. The shoe body **102** is preferably formed of one or more resilient layers of materials (e.g., mesh, fabrics) that can encapsulate the foot of a person. The bottom of the shoe body **102** are stitched, or attached, e.g., via adhesives, a planar magnet that forms a unitary structure with the shoe body **102**. This planar magnet can couple, during assembled configuration, with another plan

[0052] As used herein, the term "shoe component" or "component" refers to a shoe body and any components that are directly or indirectly attached to the shoe body, including a shoe sole, sole guard or support, heel guard, heel pad, or shoe guard. The "shoe component" or "component" includes planar magnets that are stitched or attached, e.g., adhesives to a substrate that can be connected to another "shoe component" or "component."

[0053] In the example shown in FIGS. **1**A-**1**C, an example component that can be connected to the shoe body is a gel disk **104**. The gel disk **104** can be configured to dampen impacts to the shoe body **102**, or to provide support to a user's foot, for example, by changing the spacing between the shoe body **102** and another component of the modular shoe **100**.

[0054] In the example shown in FIGS. **1**A-**1**C, the modular shoe **100** can include a heel guard **106**. The heel guard **106** can be configured to protect the heel of a user or to protect the shoe from damage.

[0055] Still with reference to FIG. **1**A, the modular shoe **100** can include a tab **108** and a foot pad **110**. Tab **108** can be used to join the foot pad **110** to a sole ridge **112**. In turn, the sole ridge **112** can be connected to arch support **114**. A waffle sole **116** and a grid sole **118** can be connected to any or all of the foot pad **110**, arch support **114**, and sole ridge **112**. The foot pad **110** can be connected to the shoe body **102**.

[0056] The components illustrated in FIG. **1**A can be joined together using any type of attachment mechanism or device. With reference to FIG. **1**B, an example embodiment includes attachment surfaces **150** formed on the gel disk **104**, heel guard **106**, tab **108**, foot pad **110**, sole ridge **112**, arch support **114**, waffle sole **116**, and grid sole **118**. In the example embodiment shown in FIG. **1**B, the attachment surfaces **150** can be formed using planar magnets attached to the surfaces of the gel disk **104**, heel guard **106**, tab **108**, foot pad **110**, sole ridge **112**, arch support **114**, waffle sole **116**, grid sole **118**.

[0057] FIG. **1**C illustrates the modular shoe **100** when the shoe body **102**, gel disk **104**, heel guard **106**, tab **108**, foot pad **110**, sole ridge **112**, arch support **114**, waffle sole **116**, and grid sole **118** are joined together.

Example System #2

[0058] To improve the diagonal and parallel holding strengths of a magnetic connection, embodiments of the present disclosure can include features formed on one or both attachment surfaces to provide a retaining structure or increase the friction between the attachment surfaces, or otherwise prevent the attachment surfaces from sliding relative to one another. Non-limiting examples of features formed on one or both attachment surfaces to prevent sliding can include ridges, grooves, bumps, patterns, and any other shape.

[0059] In some embodiments, two adjacent attachment surfaces can include features that are matched or mirror images of one another such that when the attachment surfaces are attached together by the magnetic adhesive force, the features formed on the attachment surfaces connect together, e.g., to allow the attachment surfaces to pull apart in only one direction, to prevent the adjacent attachment surfaces from sliding side-to-side relative to one another to prevent the attachment surfaces from pulling away from each other in other directions. FIGS. **1**D and **1**E illustrate systems for keeping different components of a modular shoe from moving relative to one another.

[0060] FIG. **1**D shows an example embodiment of a modular shoe **160** configured with retaining structures **162**, **164** (shown as "protrusions" **162** and cavities "164"). The modular shoe **160** includes a shoe body **102**, a foot pad **110**, a tab **108**, a sole ridge **112**, a waffle sole **116**, an arch support **114**, and a grid sole **118**, which can be assembled as described with reference to FIG. **1**A-**1**C. Similar features can be implemented in the shoe configurations of FIGS. **2**A-**2**C, **3**A-**3**C, and **4**.

[0061] In the modular shoe **160** shown in FIG. **1**D, the foot pad **110** includes protrusions **162** formed on the foot pad **110**. The protrusions **162** can be sized so that they fit within cavities **164** formed in the shoe body **102**. In the embodiment shown in FIG. **1**D, the shoe body **102** and the foot pad **110** are attracted together by a magnet **166** in or on the foot pad **110**. The shoe body can include another magnet or a ferrous material (not shown) configured to attract the magnet **166**.

[0062] Still with reference to FIG. **1**D, embodiments of the present disclosure can also include adhesive layers as an alternative to, or in addition to, the protrusions **162** and magnets **166** shown in FIG. **1**D. As shown in FIG. **1**D, adhesive layers **168** can be used to join the foot pad **110** to the sole ridge **112** and to join the sole ridge **112** to the arch support **114**. Likewise, the sole ridge **112** and grid sole **118** can be joined by an adhesive layer **168**, and grid sole **118** can be joined to the foot pad **110** with an adhesive layer **168**.

[0063] Referring to FIG. **1**E, a side view of an example modular shoe **180** is shown. The modular shoe **180** can include the shoe body **102**, foot pad **110**, sole ridge **112**, arch support **114**, waffle sole **116**, and grid sole **118**, described with reference to FIGS. **1**A-**1**D. The protrusions **162** formed on the foot pad **110** are also shown. In the example embodi-

ment of the modular shoe **180** shown in FIG. **1**E, the shoe body **102**, foot pad **110**, sole ridge **112**, arch support **114**, waffle sole **116**, and grid sole **118** can be joined by any combination of magnets, adhesives, and protrusions **162**.

[0064] In the examples shown in FIGS. **1**D and **1**E, the arrangements of protrusions **162**, cavities **164**, adhesive layers **168**, and magnets **166** are only non-limiting examples. For example, in other embodiments, the shoe body **102** and foot pad **110** can be held together by any combination of protrusions **162**, cavities **164**, adhesive layers **168**, and magnets **166**, or by only one of the protrusions **162**, cavities **164**, adhesive layers **168**, or magnets **166**. As yet another example, any of the adhesive layers **168** in FIG. **1**D can be replaced by magnets **166** and/or cavities **164** and protrusions **162**.

[0065] Again, as described in the present disclosure, the magnets used in different embodiments of the present disclosure can include any type of magnets, and non-limiting examples of magnets that can be used include planar magnets, shaped magnets, magnetic meshes, magnets embedded in meshes, and various combinations of magnets and magnetic materials.

Example System #3

[0066] With reference to FIG. **2**A, embodiments of the present disclosure can include additional types and combinations of components to form different types of modular shoes. An example embodiment of a modular shoe **200** is shown. The modular shoe **200** includes a shoe body **201**, and a sole support **202** configured to connect to the shoe body. The modular shoe **200** further includes a heel pad **204**, a foot pad **206**, and an arch support **208** that can be configured to connect to the sole support **202**. A sole pad **210** can be configured to connect to any or all of the heel pad **204**, foot pad **206**, and/or arch support **208**.

[0067] With reference to FIG. **2**B, the components illustrated in FIG. **2**A can include attachment surfaces **150** on some or all of the components. So, as shown in FIG. **2**B, the sole support **202**, heel pad **204**, foot pad **206**, arch support **208**, and sole pad **210** can each include attachment surfaces. Optionally, the shoe body **102** can also include an attachment surface (not shown).

[0068] With reference to FIG. **2**C, a perspective view of the shoe illustrated in FIGS. **2**A and **2**B is shown when the shoe body **201**, sole support **202**, heel pad **204**, foot pad **206**, arch support **208**, and sole pad **210** are attached together.

[0069] FIG. **3**A illustrates another modular shoe **300** according to another embodiment of the present disclosure. The modular shoe **300** includes a shoe body **302**, a shoe support **304**, a shoe cushion **306**, a shoe guard **308**, a gel heel grid **310**, and a shoe sole support **312**.

[0070] As shown in FIG. **3**B, the components illustrated in FIG. **3**A can include attachment surfaces **150** on some or all o the components. As shown in FIG. **3**B, the shoe support **304**, shoe cushion **306**, shoe guard **308**, gel heel grid **310**, and shoe sole support **312** can include attachment surfaces **150**.

[0071] FIG. **3**C illustrates a perspective view of modular shoe **300** illustrated in FIGS. **3**A and **3**B when the shoe body **302**, shoe support **304**, shoe cushion **306**, shoe guard **308**, gel heel grid **310**, and shoe sole support **312** are connected together.

[0072] It should be understood that the components illustrated in FIG. **1**A-**3**C can be interchangeable, so that any shoe component shown with respect to any one of the embodiments can be interchangeable with any component from another embodiment.

[0073] FIG. **4** illustrates the bottom surface **402** of a modular shoe **400**. Optionally, the modular shoe can be any of the modular shoes **100**, **200**, **300**, illustrated and described with reference to FIGS. **1**A-**3**C. The bottom surface **402** can include one or more attachment surfaces **150** that can be configured to attach to any of the components illustrated in FIGS. **1**A-**3**C.

Example Attachment Surfaces

[0074] As described with reference to FIGS. **1**A-**4**, the attachment surfaces of the modular shoes can include magnets. In some embodiments, some of the attachment surfaces include magnets and other attachment surfaces include ferromagnetic materials that can be attracted by magnets in the other attachment surfaces. Additionally, in some embodiments, a component of the modular shoe can include two attachment surfaces, where a magnet is on one attachment surface, and a ferromagnetic material is on the other attachment surface. Additionally, in some embodiments, the attachment surfaces can include mechanical fasteners, including straps, buckles, buttons, clips, hook-and-loop, and bolts or screws. The mechanical fasteners can be used as an alternative to magnets and ferromagnetic materials, or the mechanical fasteners can be in addition to the magnets and ferromagnetic materials.

[0075] Magnets can be characterized as having a "pull strength" where the pull strength of the magnet is the highest possible holding power of the magnet. The pull strength can be measured in kilograms or any other units of mass. Another property of magnets is the magnetic pull force, where the pull force can be represented as F=m*a. Pull force can be tested by testing the holding force of a magnet that is in contact with a flat steel plate.

[0076] The strength of a magnet can be affected by the size and shape of the magnet, as well as temperature, environmental conditions, the material being attracted. Non-limiting examples of material properties that can affect the magnet's strength include size, quality, shape, and permeability.

[0077] Another property of the magnets that can be used in embodiments of the present disclosure is the maximum energy product of the magnets. A higher maximum energy product value can correspond to a greater magnetic field in a particular application.

[0078] Another property that can be used to characterize the magnets described herein is the pull-gap curve. The pull-gap curve represents the pull force or pull strength at different air gap distances, where the air gap distance represents the space between two surfaces that are magnetically attracted to one another.

[0079] As a non-limiting example, a pair of S-15-08-N disc magnets with a 15 mm diameter, 8 mm height was considered. The magnetization for each magnet was N42, and the magnets were considered to be 0 mm apart (i.e., in contact with one another). The adhesive force of the two magnets was approximately 6.2 kilograms.

[0080] In embodiments including a magnetic tape or magnetic sheets, the adhesive force and holding strength of the magnetic tape or sheet can be measured. The adhesive force and holding strength can be given in grams per square centimeter (g/cm^2). As used herein, magnetic adhesive force of a magnetic tape or magnetic sheet can represent the

needed strength for separating the magnetic tape from a steel plate. FIG. **6**A illustrates a steel plate **602** and magnetic tape **604**, where the direction of the separation during the measurement of the magnetic adhesive force is shown with an arrow **606**.

[0081] Holding strength diagonal can be measured as the strain that happens when the magnetic tape is used to hang an object from the vertical surface of a steel plate **602**. As shown in FIG. **6**B, the holding strength diagonal is represented by the force **608** pulling the magnetic tape **604** down. Holding strength parallel can be measured as the force required to slide the piece of magnetic tape **604** is slid along the metal plate **602**. The force of holding strength parallel is represented by arrow **610** in FIG. **6**B.

[0082] As some non-limiting examples, a pair of neodymium magnetic adhesive tapes joined together can have a magnetic adhesive force of 675 g/cm^2, a holding strength diagonal of 360 g/cm^2, and a holding strength parallel of 180 g/cm^2. A neodymium magnetic adhesive tape on an iron surface can have a magnetic adhesive force of 450 g/cm^2, a holding strength diagonal of 112 g/cm^2, and a holding strength parallel of 112 g/cm^2.

[0083] It should be understood that the magnets described herein can be any magnet and are not limited to the sizes and types of magnets described herein.

Example Method

[0084] In another aspect, the present disclosure relates to methods of operating a modular shoe (e.g., the modular shoes **100**, **200**, **300** shown in FIGS. **1**A-**3**C). FIG. **5** illustrates an example method **500** of operating a modular shoe. At step **502**, a modular shoe is provided with one or more shoe components (e.g., one, two, or three). The shoe components each include a shoe component attachment surface. In some embodiments, the shoe component attachment surface includes one or more magnets (e.g., one or more-button-shaped magnets, one or more planar magnets, magnetic mesh, magnets formed in a fabric mesh, etc.). The magnets on the shoe component and/or the shoe body can be attached and released by aligning the magnets in the shoe component attachment surface with the shoe body attachment surface, and positioning the shoe component attachment surface and shoe body attachment surface close enough to each other so that the shoe body and shoe component are attracted to each other.

[0085] At step **504**, the first shoe component can be attached at to the shoe body using the shoe component attachment surface of the first shoe component.

[0086] At step **506**, the method can further include removing the first shoe component from the shoe body.

[0087] At step **508**, the second shoe component can be attached to the shoe body using the shoe component attachment surface of the second shoe component.

[0088] In some embodiments, the shoe component attachment surfaces are configured to allow attaching and releasing the shoe components any number of times. So, the method of FIG. **11** can be repeated with any number of shoe components and in any order. For example, a third shoe component can be attached after the second shoe component, and then removed and replaced with the first shoe component and/or second shoe component. Likewise, a fourth shoe component can be attached, and removed, and replaced with any of the first, second, and third shoe components. The processes of attaching, removing, and replacing shoe components can be completed with any number of shoe components.

Example Embodiment: Mesh Layers

[0089] FIG. **7** illustrates a modular shoe **700** according to another example embodiment of the present disclosure. The modular shoe **700** can include a mesh layer **702** that can be attached to one or more components of the modular shoe **700**. As a non-limiting example, the mesh layer **702** can be stitched into the shoe body **701**. For example, as shown in FIG. **7**, the mesh layer **702** can be stitched into a shoe body **701**. The shoe body **701** can optionally be a shoe body with eyelets **708**, or, alternatively, the shoe body **102** illustrated in FIGS. **1**A-**3**C.

[0090] The mesh layer **702** can be woven from magnetic fibers (e.g., fibers containing magnetized iron). Alternatively or additionally, the mesh layer **702** can include one or more magnets (e.g., bar or disk-shaped magnets) woven into the fabric that can be part of the mesh layer **702**. The magnets or magnetic fibers can be arranged around the mesh layer **702** so that fields of the mesh layer deliver a therapeutic magnetic field to the user wearing the modular shoe.

Example Embodiment: Weight Attachments

[0091] Still with reference to FIG. **7**, the modular shoe **700** can include a wearable weight **704** that can be attached to the shoe body **701**. The wearable weight **704** can be configured to be reversibly attached/released from the shoe body **701**. In the example embodiment shown in FIG. **7**, the wearable weight **704** includes straps **706** configured to attach to eyelets **708** formed on the shoe body **701**. The straps **706** can optionally include hook and loop fasteners. Additionally, the eyelets **708** can, in some embodiments, include hook and loop fasteners.

[0092] In some embodiments, the wearable weight **704** is structured as a "bean bag," including a hollow pocket (not shown) that can be filled with different materials to add weight to the wearable weight **704**. In some embodiments, the bean bag is filled with magnetic pellets that can be configured to attract magnets in the shoe body or any other component of a modular shoe.

[0093] It should be understood that the modular shoe **700** shown in FIG. **7** can include the mesh layer **702**, and/or the wearable weight **704**, and not all of the embodiments shown in FIG. **700** include both the mesh layer **702** and wearable weight **704**. In embodiments of the present disclosure, including both a wearable weight **704** and a mesh layer **702**, the wearable weight **704** can be filled with magnetic pellets configured to attract the mesh layer **702**.

[0094] While the present invention has been described with respect to specific embodiments, many modifications, variations, alterations, substitutions, and equivalents will be apparent to those skilled in the art. The present invention is not to be limited in scope by the specific embodiment described herein. Indeed, various modifications of the present invention, in addition to those described herein, will be apparent to those of skill in the art from the foregoing description and accompanying drawings. Accordingly, the invention is to be considered limited only by the spirit and scope of the disclosure (and claims), including all modifications and equivalents.

[0095] Still other embodiments will become readily apparent to those skilled in this art from reading the above-recited detailed description and drawings of certain exemplary embodiments. It should be understood that numerous variations, modifications, and additional embodiments are possible, and accordingly, all such variations, modifications, and embodiments are to be regarded as being within the spirit and scope of this application. For example, regardless of the content of any portion (e.g., title, field, background, summary, abstract, drawing figure, etc.) of this application, unless clearly specified to the contrary, there is no requirement for the inclusion in any claim herein or of any application claiming priority hereto of any particular described or illustrated activity or element, any particular sequence of such activities, or any particular interrelationship of such elements. Moreover, any activity can be repeated, any activity can be performed by multiple entities, and/or any element can be duplicated. Further, any activity or element can be excluded, the sequence of activities can vary, and/or the interrelationship of elements can vary. Unless clearly specified to the contrary, there is no requirement for any particular described or illustrated activity or element, any particular sequence or such activities, any particular size, speed, material, dimension or frequency, or any particularly interrelationship of such elements. Accordingly, the descriptions and drawings are to be regarded as illustrative in nature, and not as restrictive.

[0096] It should be appreciated that various sizes, dimensions, contours, rigidity, shapes, flexibility and materials of any of the components or portions of components in the various embodiments discussed throughout may be varied and utilized as desired or required.

[0097] It should be appreciated that while some dimensions are provided on the aforementioned figures, the device may constitute various sizes, dimensions, contours, rigidity, shapes, flexibility and materials as it pertains to the components or portions of components of the device, and therefore may be varied and utilized as desired or required.

[0098] Although example embodiments of the present disclosure are explained in detail herein, it is to be understood that other embodiments are contemplated. Accordingly, it is not intended that the present disclosure be limited in its scope to the details of construction and arrangement of components set forth in the following description or illustrated in the drawings. The present disclosure is capable of other embodiments and of being practiced or carried out in various ways.

[0099] In summary, while the present invention has been described with respect to specific embodiments, many modifications, variations, alterations, substitutions, and equivalents will be apparent to those skilled in the art. The present invention is not to be limited in scope by the specific embodiment described herein. Indeed, various modifications of the present invention, in addition to those described herein, will be apparent to those of skill in the art from the foregoing description and accompanying drawings. Accordingly, the invention is to be considered as limited only by the spirit and scope of the disclosure, including all modifications and equivalents.

[0100] Still other embodiments will become readily apparent to those skilled in this art from reading the above-recited detailed description and drawings of certain exemplary embodiments. It should be understood that numerous variations, modifications, and additional embodiments are possible, and accordingly, all such variations, modifications, and embodiments are to be regarded as being within the spirit and scope of this application. For example, regardless of the content of any portion (e.g., title, field, background, summary, abstract, drawing figure, etc.) of this application, unless clearly specified to the contrary, there is no requirement for the inclusion in any claim herein or of any application claiming priority hereto of any particular described or illustrated activity or element, any particular sequence of such activities, or any particular interrelationship of such elements. Moreover, any activity can be repeated, any activity can be performed by multiple entities, and/or any element can be duplicated. Further, any activity or element can be excluded, the sequence of activities can vary, and/or the interrelationship of elements can vary. Unless clearly specified to the contrary, there is no requirement for any particular described or illustrated activity or element, any particular sequence or such activities, any particular size, speed, material, dimension or frequency, or any particularly interrelationship of such elements. Accordingly, the descriptions and drawings are to be regarded as illustrative in nature, and not as restrictive. Moreover, when any number or range is described herein, unless clearly stated otherwise, that number or range is approximate. When any range is described herein, unless clearly stated otherwise, that range includes all values therein and all sub ranges therein. Any information in any material (e.g., a United States/foreign patent, United States/foreign patent application, book, article, etc.) that has been incorporated by reference herein, is only incorporated by reference to the extent that no conflict exists between such information and the other statements and drawings set forth herein. In the event of such conflict, including a conflict that would render invalid any claim herein or seeking priority hereto, then any such conflicting information in such incorporated by reference material is specifically not incorporated by reference herein.

[0101] It must also be noted that, 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. Ranges may be expressed herein as from "about" or "approximately" one particular value and/or to "about" or "approximately" another particular value. When such a range is expressed, other exemplary embodiments include from the one particular value and/or to the other particular value.

[0102] By "comprising" or "containing" or "including" is meant that at least the named compound, element, particle, or method step is present in the composition or article or method, but does not exclude the presence of other compounds, materials, particles, method steps, even if the other such compounds, material, particles, method steps have the same function as what is named.

[0103] In describing example embodiments, terminology will be resorted to for the sake of clarity. It is intended that each term contemplates its broadest meaning as understood by those skilled in the art and includes all technical equivalents that operate in a similar manner to accomplish a similar purpose. It is also to be understood that the mention of one or more steps of a method does not preclude the presence of additional method steps or intervening method steps between those steps expressly identified. Steps of a method may be performed in a different order than those described herein without departing from the scope of the disclosed

technology. Similarly, it is also to be understood that the mention of one or more components in a device or system does not preclude the presence of additional components or intervening components between those components expressly identified.

1-21. (canceled)

22. A modular shoe comprising:

a shoe body comprising an outer surface;

an eyelet formed on the outer surface of the shoe body; and

a wearable weight comprising a weight and a strap, wherein the strap is configured to attach to the eyelet formed on the outer surface of the shoe body.

23. A modular shoe comprising:

a shoe body comprising an inner surface; and

a mesh sleeve configured to be attached to the inner surface of the shoe body, wherein the mesh sleeve comprises magnetic materials.

* * * * *