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(71) Applicant: **Skechers U.S.A., Inc. II**
Manhattan Beach, CA 90266 (US)

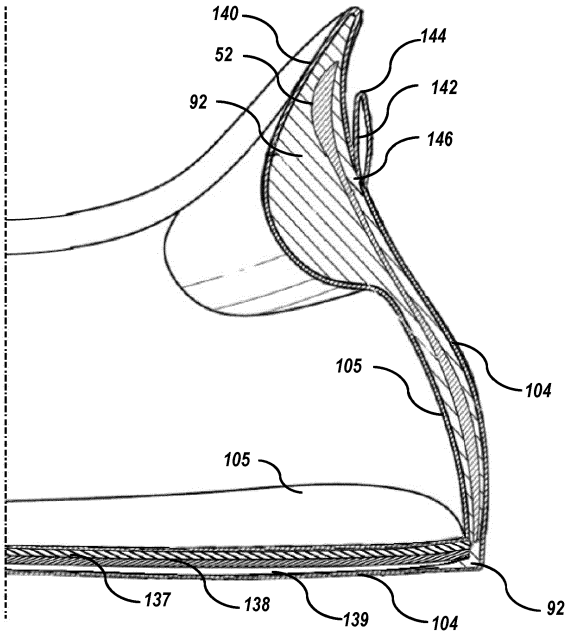
(72) Inventors:
- **SONG, Elaine Minjung**
  Manhattan Beach, 90266 (US)
- **SOEWITO, Peny Pramono**
  Manhattan Beach, 90266 (US)
- **TJA, Johnson**
  Manhattan Beach, 90266 (US)
- **CHENG, WanLing**
  Manhattan Beach, 90266 (US)
- **XIE, Hui**
  Manhattan Beach, 90266 (US)

(74) Representative: **D Young & Co LLP**
3 Noble Street
London EC2V 7BQ (GB)

(54) **SHOE UPPER WITH INTEGRATED CONSTRUCTION**

(57) A shoe has an outer sock layer structure and an inner sock layer structure. An ankle cuff is formed at the interconnection between the outer sock layer structure and the inner sock layer structure and completely surrounds the shoe opening. The inner sock layer structure has a pocket in the heel region and a heel cup or heel counter insert in the heel region is partially located between the first interior surface and the second interior surface and an upper portion of the heel cup or heel counter insert is situated within the pocket. The ankle cuff contacts a rearward facing surface of the pocket. The heel counter insert may also be attached to multilayer insole which are then collectively inserted into the upper.

FIG. 15



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Description

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This patent application incorporates by reference the following applications in their entirety: International Patent Application No. PCT/US2022/046726, filed on October 14, 2022, United States Patent Application No. 18/199,262, filed on May 18, 2023, United States Patent Application No. 18/199,250, filed on May 18, 2023, and United States Patent Application No. 18/199,274, filed on May 18, 2023.

TECHNICAL FIELD

[0002] The invention relates to the technical field of footwear, in particular, to a shoe upper and a shoe having the same.

BACKGROUND

[0003] Existing sock upper designs, uppers formed by unitarily knit or woven sock, in footwear are known for their comfort and close fit. Yet, these designs often pose a challenge in slipping on the shoes effortlessly, as they tend to lack the necessary structure or resilience to stay upright during the process. This lack of support, especially around the heel area, frequently necessitates the use of hands to keep the shoe properly open while the foot is being inserted. Furthermore, prior art sock upper designs are not configured to receive added heel components, nor are they designed to provide dual layers and/or support for such heel components around the opening of the upper.

SUMMARY

[0004] Aspects of this invention relate to a novel sock-like construction for a shoe upper comprising a singular, elongated, circular knit tube which is subsequently folded inward upon itself to form at least a double-layered sock. This folding process creates two congruent sock layers which allows for a seamless ankle collar that forms a shoe opening.

[0005] Additionally, aspects of this invention relate to a shoe that has a structure capable to support easier foot insertion.

[0006] In one aspect of the invention, an upper material is made of a knit structure. A process of forming the knit structure includes forming an outer sock layer structure and an inner sock layer structure. Each of the outer sock layer structure and inner sock layer structure resembles the general dimensions of a sock. Each of the outer sock layer structure and inner sock layer structure may have a toe region, a midfoot region, a heel region, a footbed portion, and an upper portion.

[0007] In another aspect of the invention, a heel counter may include a heel cup. The heel cup may be uniformly molded with an upper portion, midportion, and lower portion, and the upper portion has a smaller mediolateral length than the midportion. The midportion and lower portion may form a concave structure configured to receive the heel. The upper portion of the heel cup has an overall downward incline with a first angle relative to a vertical line that is normal to a horizontal surface of the floor with the highest portion extending rearward. The upper portion has an upper surface that may have a convex curved portion along the rearmost vertical cross-section of the heel cup such that a heel bottom is directed to slide upon insertion of the foot. The convex curved portion may further curve downward and inflect to form the concave structure at the midportion and lower portion.

[0008] The upper portion of the heel cup rises may extend above the medial and the lateral collar portions of the upper. The upper portion may have a horizontal curvature that is relatively coextensive to the mediolateral curvature of the heel portion of the upper. The length of the horizontal curvature may be configured to receive and at least partially cup at least a portion of the bottom of the heel as the foot is inserted into the shoe.

[0009] The heel cup may be formed of a rigid structure capable of not being substantially compressed upon insertion of the foot. In such configurations, the upper may have elastic portions that allow the upper to stretch as the foot is inserted into the shoe. As the foot is inserted, a pressure is applied to the upper portion of the heel cup. If the heel cup is substantially rigid, the pressure may push the heel cup rearward. The heel cup may be used in combination with elastic portions in the upper to allow the heel cup to move rearward during foot insertion. Following foot insertion, the rigid heel cup may return to its original position to secure the foot within the shoe and support of the foot during use.

[0010] The upper portion of the heel cup may also be compressed during foot insertion wherein the upper portion may have a first configuration in its native state and is capable of distorting into a second configuration under a load of a user's foot when the user is donning the footwear. The heel cup is capable of returning to the first configuration after the load of the user's foot is removed. In the second configuration, at least part of the upper portion is lowered relative to the first configuration and the upper portion is capable of returning to the first configuration after the load of the user's foot is removed. The midportion may include a peripheral portion having a first thickness and a central portion having a second thickness, and the second thickness is less than the first thickness.

[0011] Further to this embodiment, in the first configuration, the upper portion has a downward incline with a first angle relative to a vertical line that is normal to a horizontal surface of the floor, and the upper portion in the second configuration has an incline with a second angle greater than the first angle. Additionally, in the second

configuration, a lower region of a central portion of the heel cup extends outward in a direction away from the shoe opening that causes the shoe opening to widen along the mediolateral direction.

[0012] An interior foam layer may be a flat material lining covering at least a portion of an inner surface of the heel cup; or the foam layer may include regions with additional padding; foam layer functions to provide cushion and comfort to the foot and may assist in securing the foot within the upper after foot insertion. In one embodiment, the foam layer may be protruding and elongated with a rounded front facing surface. The foam layer may form a U-shaped padding around the region of the heel cup such that the padding contacts the foot above the calcaneus region of the foot and around the rear portion of the subtalar joint or at least a portion of the topmost region of the foot receiving shoe opening. The foam layer may extend at least partially around and over the foot receiving shoe opening. The foam layer may be compressed by the user's heel during foot insertion in an unexpanded or first partially compressed state. After the foot is inserted into the shoe, the foam layer may be expanded to its uncompressed state or a second partially compressed state wherein the second partially compressed state is less compressed than the first partially compressed state. Such a configuration enables the interior foam layer to exert sufficient pressure on or around the user's ankle in order to secure the foot into the shoe. For example, the calcaneus portion of foot may not be easily removed from the shoe during such activities as walking or running. The foam layer may have a tapered, or flattened dimension in regions where less padding is needed such as regions extending where the foam layer exerts pressure around the ankle of the foot.

[0013] The foam layer and heel cup may be constructed as a separately formed heel counter insert which is then positioned within the upper. The heel counter insert may be covered with a foam covering material. The heel counter insert may have a securing flap constructed of the foam layer and/or foam covering material which extends downward at the bottom the heel counter insert. The heel cup may terminate above the heel flap, or a portion of the heel cup may extend downward within or alongside the flap. The securing flap may be folded to be approximately perpendicular to the heel counter's vertical dimension and inserted along the footbed of the upper, sockliner, or insole. The securing flap may be affixed to the footbed of the upper, sockliner, insole or top surface of the sole.

[0014] A cover layer may cover a heel counter insert having a heel cup and foam layer. The cover layer is part of a portion of the inner sock layer structure which extends above an ankle collar of the shoe and thus is exposed and forms part of the outer sock layer structure. The cover layer may have a front cover portion and a rear cover portion. The front cover portion may cover the inner facing surface of the heel counter. The rear cover portion may cover at least a portion of the outer facing surface of the heel counter. The cover layer may be formed integrally with the sock as being integrally knit or woven with the sock. The unitary construction eliminates the need for constructing a separate cover layer of the heel cup thereby allowing for more efficient production. With the cover layer being part of the outer sock layer structure and inner sock layer structure, the cover layer forms an integrated pocket which receives the heel cup insert or heel counter insert.

[0015] Furthermore, the integrated pocket snugly accommodates at least the contours of the upper and/or mid portion of the heel cup or heel counter insert. The integrated pocket may be seamless and thus provide more comfort to the foot. It should be noted that tubular sock with the integrated pocket may also be constructed using woven material or engineered mesh or textile commonly known in the art by an ordinary person skilled in the art.

[0016] As the integrated pocket wraps around a rear facing surface of the heel cup or heel counter insert, the pocket may extend downward below the level of the ankle collar and behind the ankle collar and the upper down to the inner sock layer of the upper. The inner sock layer of the upper may then extend upward to the top of the ankle collar and then wrap over the ankle collar to meet the junction of the outer surface of the sock layer.

[0017] The shoe upper may also have an integrated ankle cuff (or may be referred to as an integrated ankle band, strap, region, flap, extension, or any other term that may be used to commonly define the integrated component). The integrated ankle cuff is a further extension of the sock and extends away from the sock portion that covers the outer heel counter. The ankle cuff wraps around the outer cover portion of the cover layer. The ankle cuff may comprise two layers, each layer forming a portion the inner sock layer structure and the outer sock layer structure, respectively. The rear cover portion of the cover layer and the ankle cuff may be integrally connected or separately formed. When integrally connected, the rear cover portion and the ankle cuff may be a knit, woven material, engineered mesh or textile commonly known in the art by an ordinary person skilled in the art.

[0018] A portion of the outer sock layer structure and a portion of the inner sock layer structure may comprise an integrated ankle cuff that may extend around the rearward facing surface of the integrated pocket and below the level of the upper portion of the heel cup.

[0019] The integration of the pocket and ankle cuff into the inner and outer sock layer structures enables ease of assembly of the upper. The outer sock layer structure and ankle cuff may serve to provide outer protection of the upper. Further, the ankle cuff may be a tension band with elastic properties such that the heel cup may move rearward during a foot insertion into the shoe, and the heel cup may return to its original state once after foot insertion.

[0020] In another aspect of the invention, an insole may be placed through an aperture in the outer sock layer structure or the inner sock layer structure and situated

primarily between the interfacing surfaces of the outer sock layer structure and the inner sock layer structure in the area corresponding to the footbed portion. The outer sock layer structure may thereafter be attached to the midsole or outsole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] By way of example only, selected embodiments and aspects of the present invention are described below. Each description refers to a figure ("FIG. ") which shows the described matter. Some figures shown in drawings or photographs that accompany this specification may be for footwear that is for either the left or right foot. Each figure includes one or more identifiers for one or more part(s) or elements(s) of the invention.

[0022] Various embodiments are described with reference to the drawings, in which:

FIG. 1 is a front view of a heel cup.
FIG. 2 is a perspective view of the heel cup of FIG. 1.
FIG. 3 is a side view of the heel cup of FIG. 1.
FIGS. 4A and 4B are a side-by-side front perspective view of the heel cup of FIG. 1 in a compressed configuration (4A) and in an uncompressed configuration (4B).
FIGS. 4C and 4D are a side-by-side top view of the compressible heel cup of FIG. 1 placed within a shoe in its compressed configuration (4C) and its uncompressed configuration (4D).
FIG. 5 is a front view of a heel cup configured to have a series of crisscross beams.
FIG. 6A is a schematic illustration of a cross-section of arc lengths of the rearmost portion of the heel cup of FIG. 1.
FIG. 6B is cross-sectional view of the heel cup of FIG. 1 taken at lines 6-6 in FIG. 1 .
FIG. 7 is a side view of a heel counter with a heel cup located in the interior of the heel counter.
FIG. 8 is a top view of the heel counter of FIG. 7.
FIG. 9 is a perspective view of the heel counter of FIG. 7.
FIG. 10 is a perspective view of a shoe upper with a heel counter incorporating a heel cup
FIG. 11 is a side view of the shoe with the upper of FIG. 10.
FIG. 12 is a rear view of the shoe with the upper of FIG. 10.
FIG. 13 is a rear view of the shoe with the upper of FIG. 10 and with the ankle cuff pulled down.
FIG. 14 is a top view of the shoe with the upper of FIG. 10.
FIG. 15 is a cross-sectional view of the heel region of the upper of the shoe of FIG. 14 and taken at line 15-15 in FIG. 14.
FIG. 16 is a perspective view of the elongated interfacing surfaces of the knit structure before the inversion process that forms the double-layer sock upper.
FIG. 17 is a perspective view of the elongated counterfacing surfaces of the knit structure before the inversion process that forms the double-layer sock upper.
FIG. 18 is a cross-sectional view of FIG 17 taken at a longitudinal midline of the elongated knit structure.
FIG. 19 is a cross-sectional view of FIG 17 taken at a longitudinal midline of the knit structure after the inversion process that forms the double-layer sock upper.
FIG. 20 is a top view of a multilayer insole.
FIG. 21 is a cross-sectional view of the insole of FIG. 20 and taken at line 21-21 in FIG. 20.
FIG. 22 is an exploded view of the insole of FIG. 20.
FIG. 23 is a bottom view of a multilayer insole.
FIG. 24 is a cross-sectional view of the shoe with a multilayered insole.
FIG. 25 is a cross-sectional view of a heel counter insert.

List of reference numerals:

[0023]

14: sole;
16: shoe upper;
32: heel counter;
34: heel counter insert
46: inner lining;
48: shoe opening;
50: central portion;
52: heel cup;
54: lower portion of the heel cup;
58: mid-portion of the heel cup;
64: upper portion of the heel cup;
66: inner wall;
68: top edge line of the heel cup;
70: peripheral portion of the heel cup;
84: heel cup collar;
86: vertical line (normal to the horizontal surface);
88: horizontal surface of the floor;
90: midline of the heel cup;
92: foam layer;
94: protruding portion
102: knit structure
104: outer sock layer structure
105: inner sock layer structure
110: first toe region
111: second toe region
112: first midfoot region
113: second midfoot region
114: first heel region
115: second heel region
116: first footbed portion
117: second footbed portion
118: aperture
122: interior side
123: exterior side

124: first interfacing surface
125: second interfacing surface
126: first opposing surface
127: second opposing surface
134: tongue region
135: perforations
136: insole
137: top insole layer
138: intermediate insole layer
139: bottom insole layer
140: pocket
142: ankle cuff
144: upper boundary
146: lower boundary
152: front cover portion
154: rear cover portion
162: Securing flap
164: notch
166: insole support pad
168: exposed region
A1: downward incline
A_L: amplitude of the arc of the lower portion
A_U: amplitude of the arc of the upper portion
W_U: width of the arc of the upper portion
W_L: width of the arc of the lower portion
T1: thickness of the heel cup

DETAILED DESCRIPTION

[0024] A shoe may comprise a sole and an upper. The sole may comprise an outsole, a midsole, and/or an integrally formed outsole and midsole. The upper may comprise a toe box, a vamp, a tongue, a medial quarter, a lateral quarter, and a heel counter. The shoe has a forefoot portion, a rear portion, a medial side and a lateral side. The upper may comprise an exterior layer, interior layers or interior structure, and/or an inner lining. The upper may form a shoe opening that can receive a user's foot when the user is donning the shoe. These regions are defined conceptually rather than as discrete, physically demarcated sections. As such, the figures of the present application depict approximate locations of these regions and portions.

[0025] The heel counter or rear portion of the upper may comprise a heel cup that enables easier insertion of the foot into the shoe opening. The upper portion of the heel cup has an overall downward incline with a first angle relative to a vertical line that is normal to a horizontal surface of the floor with the highest portion extending rearward. The upper portion has an upper surface that may have a convex curved portion along the rearmost vertical cross-section of the heel cup such that a heel bottom is directed to slide upon insertion of the foot. The convex curved portion may further curve downward and inflect to form the concave structure at a midportion and at a lower portion of the heel cup.

[0026] The upper portion of the heel cup rises and may extend above the medial and the lateral collar portions of the upper. The upper portion may have a horizontal curvature that is relatively coextensive to the mediolateral curvature of the heel portion of the upper. The length of the horizontal curvature may be configured to receive and at least partially cup at least a portion of the bottom of the heel as the foot is inserted into the shoe.

[0027] The heel cup may be formed of a rigid structure not substantially compressed upon foot insertion. In such configurations, the upper may have elastic portions that allow the upper to stretch as the foot is inserted into the shoe. As the foot is inserted, a pressure is applied to the upper portion of the heel cup. If the heel cup is substantially rigid, the pressure may push the heel cup rearward. The heel cup may be used in combination with elastic portions in the upper to allow the heel cup to move rearward during foot insertion. Following foot insertion, the rigid heel cup may return to its original position to secure the foot within the shoe and support the foot during use.

[0028] The heel cup may support both the easier insertion and easier removal of the foot. The heel counter or rear portion of the upper may allow for a transient widening of the opening of the shoe configured to receive the foot when the user is donning or removing the shoe. The widening of the shoe opening may be initiated by the user placing a load on the heel counter or rear portion of the upper that may be exerted by the user's foot with minimal to no assistance by the user's hands. In one exemplary embodiment of the invention, the heel counter may be compressible when placed under sufficient load and return to its uncompressed stated. The heel counter may have a heel cup that lowers or has compressible layers that compress under load, widening the shoe opening and allowing easier insertion of the user's foot. Once a foot is inserted into the shoe, the heel counter may have a compressible layer, such as a foam layer or component, that may further secure or enhance securement of the foot during user's normal wear of the shoe.

[0029] **Heel Cup.** Referring to the embodiments of FIGS. 1-10 a heel counter 32 may comprise a compressible heel cup 52 which may be an interior component of the upper 16, a portion of the inner lining 46 or an attachment adjacent to the inner lining 46 of the upper 16 such that the heel cup 52 makes contact with the foot, or a portion of the exterior layer 42 of the upper 16 or an attachment of an outer surface of the exterior layer 42 of the upper 16.

[0030] Referring to the exemplary embodiment of FIGS. 1-4, the heel cup 52 has a shape substantially corresponding to a heel covering and has a profile resembling a pear-like shape. The heel cup has a mediolateral width near the heel cup collar 84 that is less than the mediolateral width of the lower portion 54 as shown in FIGS. 1-2

[0031] As shown in FIG. 2, the inner wall 66 of the upper portion 64 of the heel cup at the rearmost portion of the heel cup may have a downward incline of between 0 to 90 degrees relative to a vertical line 86 that is normal to the horizontal surface 88 of the floor. In this exemplary em-

bodiment, the inner wall 66 of the upper portion 64 may have a downward incline of 30 degrees. The inner wall 66 of the upper portion 64 of the heel cup 52 may also have a convex curvature facing toward the shoe opening 48. The top portion of the convex curvature has the downward incline A1 of 30 degrees. The lower portion of the convex curvature extends just above the portion of the heel cup 52 that receives the heel. The lower portion of the convex curvature may have a downward incline less than the downward incline of A1 and gradually decreases as it approaches an incline equal to the vertical line 86. The heel cup 52 has a concave curvature that surrounds the rear portion of the heel. The medial and lateral sides of the heel cup 52 may also extend and form support of part of the quarter and even as far as the vamp.

[0032] The thickness of the heel cup 52 may be reduced at various locations. The top edge line 68 may have a tapering of the inner surface of the heel cup 52 and outer surface of the heel cup 52. The heel cup 52 may have increased thickness T1 along the other perimeter edges, such as 2 to 3 mm. In another exemplary embodiment, the thickness T1 may be reduced in certain areas to provide greater flexibility to the heel cup 52 when donning or removing the shoe 12. In one embodiment, the thickness T1 of the heel cup 52 may decrease gradually from a peripheral portion 70 forming an area at the periphery of the heel cup 52 toward the central portion or region 50 of the mid-portion 58. The minimum thickness T1 in the central region 50 of the mid-portion 58 may be approximately, but not limited to 1/4 to 1/6 the thickness relative to the thickest portions at the periphery of heel cup 52, such as 0.5 to 1 mm. The thickest region of the top portion may be greater than the thickest region of the bottom portion. The reduced thickness T1 of the central region of the mid-portion 58 may allow for the heel cup 52 to compress under sufficient load. In an alternate embodiment, the thickness T1 may be reduced across the entire mediolateral portion or in multiple regions such as regions in the mid-portion 58 and/or regions of the upper portion 64. The thinner regions may provide increased flexibility and bending of the heel cup 52 which provides the necessary compressibility under the load of a user's foot such as during the donning of a shoe 12. Such compression may allow the upper portion 64 and/or the mid-portion 58 of the heel cup 52 to move rearward and widen the shoe opening 48 to allow easier entry of the foot. The heel cup 52 can distort a first configuration in its native state, to a second under a load of a user's foot when the user is donning the footwear. For example, the heel cup 52 may be partially compressed such that the upper portion 64 and/or mid-portion 58 of the heel cup 52 is lowered sufficiently to allow the insertion of the user's foot. See for example FIGS. 4A and 4C. Once the user's foot is inserted into the shoe 12, the heel cup 52 may return to its uncompressed configuration.

[0033] Further to this embodiment, when a user dons the shoe 12, the top portion of the convex curvature of the heel cup 52 or the uppermost segment of the heel counter 32 of the shoe 12 may be lowered and extend backward away from the foot as the heel counter 32 is compressed as shown in FIG. 4A. This action allows the user's foot to be inserted into the shoe opening 48 with a reduced degree of plantar flexion. During compression of the heel cup 52, portions of the heel cup 52 may move forward toward the direction of the forefoot portion. The distortion of the heel cup 52 may include the attached heel counter 32 widening with the medial and lateral sides of the heel cup moving outward thereby widening the opening of the shoe. The mediolateral widening of the shoe opening 48 allows easier entry such as easier insertion of the forefoot portion of the user's foot. In one exemplary embodiment, the shoe opening of 7.5 cm may widen up to 4 cm or about 50%. See FIGS. 4C and 4D. The widening may be less or more depending on the size of the shoe and the flexibility of the heel cup. In some shoes, the desired widening may be less or greater depending on the needs of securement and use.

[0034] In an exemplary embodiment of the heel cup 52 as shown in FIGS. 1-4, the thickness T1 of a heel cup 52 made of a polymer material, such as Dupont Hytrel, may range from 0.4 mm to 4 mm. The range of thickness T1 of the heel cup may be thinner or thicker at various regions depending on the desired elastic and durable properties of the material. For example, the midpoint region may be thinner than the surrounding regions, and in particular, a central portion may be thinner than the peripheral portion as shown in FIG 6B. The central portion may be spaced away from the medial and lateral edges wherein the peripheral edges may have a greater thickness. Other suitable materials may include other thermoplastic elastomers or other polymers capable of providing the compressible characteristics of the heel cup.

[0035] In another exemplary embodiment, the heel cup may be configured to have a series of crisscross beams that form an egg crate like configuration. FIG. 5 shows an exemplary embodiment with beams that are in a diagonal configuration. In an alternate embodiment, the beams may also be in a vertical and lateral configuration. The apertures between the beams may be approximately uniformly sized. The beams may be uniform in dimensions or vary in thickness and width. Beams that are thinner or less wide may be used to enhance flexibility and compressibility in designated locations while thicker or wider beams provide varying degrees of rigid support. For example, the beams may be thinner in the mid-portion, and in particular, the central portion of the mid-portion that is spaced away from the edges. The surrounding beams may be thicker than the central portion. The central portion may allow for greater flexibility in order to distort under a load.

[0036] In an exemplary embodiment, the rearmost portion of the heel cup 52 may have an overall vertical cross-sectional shape that resembles approximately an S wave as shown on a cross-sectional diagram of FIG. 6A. The upper and lower portions of the S wave may be differentiated at the point P1 through a horizontal plane, i.e. the

midline 90, which is drawn between the upper arc and lower arc ends of the S wave and intersects the heel counter 52 and the inflection point of the S wave. The amplitude (Au) and width (Wu) of arc of the upper portion of the S wave may be different than the amplitude (A_L) and width (W_L) of the lower arc of the lower portion of the S wave. In the exemplary embodiment, the Wu is approximately 0.44 times that of the W_L. The Au is approximately 1/3 that of the A_L wherein the upper curvature has less depth than the lower curvature. In one possible embodiment, the Wu is approximately 2 cm and the W_L is approximately 4.5 cm. The A_U is roughly 3 mm and the A_L is roughly 9 mm. The S configuration decreases both in A_U/A_L and W_U/W_L in the cross-sections in the areas extending from the rearmost portion's cross-section of the heel cup 52 and may only consist of the lower portion arc along the medial and lateral sides of the heel cup 52. The measurements at the rearmost portion of the heel cup 52 of the exemplary embodiment are intended to be exemplary.

[0037] The central region of the mid-portion of the heel cup may have a single aperture or a plurality of apertures. Just as the central region of the mid-portion may be constructed with less material than the maximum thickness of the collar and/or the maximum thickness of the base, the central region of the mid-portion of the heel cup may be constructed with a material of greater flexibility than the material forming its periphery. The resulting effects of the central region comprising a single aperture, a plurality of apertures, a lesser thickness, and/or a material of greater flexibility, may serve to facilitate entry and removal of the user's foot from the shoe.

[0038] Further to the exemplary embodiment, the heel cup 52 may be attached at least to an foam layer 92, as shown in FIG. 10. The heel cup 52 may be located in the interior of the heel counter 32 of the upper 16 as shown in FIGS. 7-10. The foam layer 92 may line both the inner wall 66 of the heel cup 52 and outer wall of the heel cup 52. Around the upper portion and mid-portion, the foam layer 92 may protrude and extend further into the shoe opening 48. The foam layer 92 may be thicker at or adjacent to the upper portion 64 and mid-portion 58 of the heel cup 52 thereby forming part of the cuff of the shoe opening 48. The thicker foam layer 92 may provide securement of the user's foot once inserted within the shoe 12 as the foam would be located above the calcaneus bone region of the user's foot and extend around at least portions of the ankle region of the foot. Since the foam is compressible, the foam may be compressed by the heel during foot insertion or removal and hold the ankle of the user's foot once the foot is inserted.

[0039] In another aspect of the invention, a heel cup 52 may be uniformly molded with an upper portion 64, midportion 58, and lower portion 54, and the upper portion 64 has a smaller mediolateral length than the midportion 58. The midportion 58 and lower portion 54 may form a concave structure configured to receive the heel. The upper portion 64 of the heel cup 52 has an overall downward incline with a first angle relative to a vertical line 86 that is normal to a horizontal surface 88 of the floor with the highest portion extending rearward. The upper portion 64 has an upper surface that may have a convex curved portion rearmost vertical cross-section of the heel cup such that a heel bottom is directed to slide upon insertion of the foot. The convex curve may further curve downward and inflect to form the concave structure at the midportion 58 and lower portion 54.

[0040] The upper portion 64 of the heel cup 52 rises and may extend above the medial and the lateral collar portions of the upper. The upper portion may have a horizontal curvature that is relatively coextensive to the mediolateral curvature of the heel portion of the upper. The length of the horizontal curvature may be configured to receive the bottom of the heel and at least partially cup at least a portion of the bottom of the heel as the foot is inserted into the shoe.

[0041] In another exemplary embodiment of the heel counter, the heel cup 52, having the similar S wave dimensions as presented above, may be formed of a rigid structure capable of not being substantially compressed upon insertion of the foot. In such configurations, the upper 16 may have elastic portions on the medial and/or lateral sides of the upper that allow the upper 16 to stretch as the foot is inserted into the shoe. As the foot is inserted, a pressure is applied to the upper portion 64 of the heel cup 52. If the heel cup is substantially rigid, the pressure may push the heel cup 52 rearward as the foot slides down the upper portion into the shoe. Following foot insertion, the rigid heel cup 52 may return to its original position to secure the foot within the shoe and support the foot during use.

[0042] Further to this embodiment, the rigid heel cup 52 may have a uniform thickness or have varying thicknesses or lack of material in the midportion or lower portion of the heel cup.

[0043] Further to this embodiment, in the first configuration, the upper portion 64 has a downward incline A1 with a first angle relative to a vertical line 86 that is normal to a horizontal surface 88 of the floor, and the upper portion 64 in the second configuration has a downward incline A1 with a second angle greater than the first angle. Additionally, in the second configuration, a lower region of a central portion 50 of the heel cup extends outward in a direction away from the shoe opening that causes the shoe opening to widen along the mediolateral direction.

[0044] The heel cup may be used in combination with a foam layer 92 which may be a flat material lining covering at least a portion of an inner surface of the heel cup 52 or the foam layer 92 may include regions with additional padding such as the embodiment shown in FIG. 15. In one embodiment, the foam layer 92 may be protruding and rounded or substantially tubular near the upper and midportion of the heel cup, and the foam layer 92 may form a U-shaped padding around the region of the heel cup 52 wherein the foam layer contacts the foot above the calcaneus region of the foot and around the rear portion

of the subtalar joint or at least a portion of the topmost region of the foot receiving shoe opening 48. The foam layer 92 may extend at least partially around and over the foot receiving shoe opening 48. The foam layer 92 may be compressed by the user's heel during foot insertion such that the foam is in an unexpanded or in a first compressed state. After the foot is inserted into the shoe, the foam layer 92 may be expanded to its fully uncompressed state or a second compressed state wherein the second compressed state is less compressed than the first compressed state. Such a configuration enables the interior foam layer 92 to exert a sufficient pressure on or around the user's ankle in order to secure the foot into the shoe. For example, the calcaneus portion of foot may not be easily removed from the shoe during such activities as walking or running. The foam layer 92 may have a tapered, or flattened dimension in regions where less padding is needed such as regions extending where the foam layer 92 exerts pressure around the ankle of the foot. The protruding foam layer also increases the curvature of the lower portion of the upper to better secure the heel portion of the foot.

[0045] The heel cup 52 and foam layer 92 may form a heel counter insert 34 that may be separately constructed and inserted in between the layers of an upper. An exemplary embodiment of a heel counter insert 34 is shown in FIGS. 24-25. The heel counter insert 34 may have the foam layer 92 fully surrounding the heel cup 52 and have a protruding portion 94 on the interior surface of the heel cup and located at the upper portion and midportion of the heel cup. The protruding portion 94 extends from the rear most portion of the heel cup and extends along the interior surface of the heel cup thereby forming a U-shaped dimension. The ends of the protruding portion 94 may taper to the medial and lateral sides of the heel counter insert 34 and may taper vertically above and below the protruding portion 94. The heel counter insert 34 may also have a securing flap 162 which may be constructed of the foam layer or a foam covering material which may be mesh, textile, polymer film, or any other material known to an ordinary person skilled in the art. The heel cup and/or foam layer may terminate above the securing flap 162. Alternatively, a portion of the heel cup and/or foam layer may extend downward within or alongside the flap. The securing flap 162 and all components of the securing flap 162 are able to be folded or bent at an angle that is or approximate to a perpendicular angle with respect to the walls of the heel cup. The securing flap 162 may also have at least one cut or notch 164 to allow the securing flap 162 to fold or bend without buckling as it extends around the curvature of the heel counter around the rear portion of the heel. The securing flap 162 may then be affixed, stitched or bonded to footbed of the upper, sockliner, insole, one of the layers of a multilayer insole, or the top surface of the sole.

[0046] The heel counter insert 34 may be located and bonded within outer and inners layers of the upper. The upper portion of the heel counter insert 34 may be further located within a pocket 140 of the upper that extends above the ankle cuff 142 of the shoe opening. Further to embodiments involving bonding the heel counter insert into a sockliner, insole, or sole component, the combined structure may be inserted between a double layer upper with the upper portion of the heel counter inserted into a pocket of the upper.

[0047] **Double Sock Layer:** Referring to the embodiments of FIGS. 11-19 and 24, a shoe upper 16 comprising a knit structure 102 defining an elongated, circular knit tube that is subsequently folded inward (i.e., inverted) upon itself to form a double-layered sock with two congruent sock layers and a seamless ankle cuff 142 that forms the foot receiving shoe opening 48.

[0048] **Regions and Alignment.** A process of forming the knit structure 102 includes forming an outer sock layer structure 104 and an inner sock layer structure 105. Each of the outer sock layer structure 104 and inner sock layer structure 105 resembles the general dimensions of a sock. Each of the outer sock layer structure 104 and inner sock layer structure 105 may have a toe region, a midfoot region, a heel region, and a footbed portion. These corresponding segments of the outer sock layer structure 104 and inner sock layer structure 105 are aligned when the knit structure is folded inward (i.e., inverted) upon itself. These regions are defined conceptually rather than as discrete, physically demarcated sections. As such, the figures of the present application depict approximate locations of these regions and portions.

[0049] In one embodiment, the outer sock layer structure 104 has a first toe region 110 corresponding to the location of the user's toes after the shoe donned, a first heel region 114 corresponding to the location of the user's heel after the shoe is donned; a first midfoot region 112 between the first toe region 110 and the first heel region 114, and a first footbed portion 116 corresponding to the underside of the users foot. Similarly, the inner sock layer structure 105 has a second toe region 111 corresponding to the location of the user's toes after the shoe donned; a second heel region 115 corresponding to the location of the user's heel after the shoe donned; a second midfoot region 113 between the second toe region 111 and second heel region 115; and a second footbed portion 117 corresponding to the underside of the user's foot.

[0050] The shoe upper 16 provided by this embodiment further includes a heel counter 32 or a heel counter insert 34 disposed between the first heel region 114 and the second heel region 115 when the knit structure 102 is inverted.

[0051] In the exemplary embodiment, the first toe region 110 and the second toe region 111 are configured with the potential for relative movement between the corresponding regions, as are the first heel region 114 with the second heel region 115, and the first midfoot region 112 with the second midfoot region 113. In other embodiments, some or all areas of the corresponding

regions may be affixed to one another after the regions of the layers are aligned in a particular configuration.

[0052] Referring to FIG. 19, the outer sock layer structure 104 may be substantially aligned with the inner sock layer structure 105 such that the respective corresponding toe regions 110 111, midfoot regions 112 113, and heel regions 114 115 are substantially aligned. The phrase "substantially aligned" should be interpreted to mean that the inner sock layer structure 105 is predominantly contained within the outer sock layer structure 104. This, however, does not preclude the possibility of a portion of the inner sock layer structure 105 extending beyond the confines of the outer sock layer structure 104. While the inner sock layer structure 105 is largely enveloped by the outer sock layer structure 104, there may be embodiments where a segment of the inner sock layer structure 105 protrudes from or does not align with the outer sock layer structure 104, such as through the opening of the outer sock layer structure 104. The inner sock layer structure 105 can partially emerge from the outer sock layer structure 104 if necessary, without departing from the scope of their intended positional relationship.

[0053] **Knit Construction and Inversion.** In the exemplary embodiment, the outer sock layer structure 104 and inner sock layer structure 105 may be knit as a single cylindrically knit tube that does not overlap during the knitting process. Alternatively, the process of manufacturing the double layer sock may include joining a separately cylindrically-knit or flat-knit outer sock layer structure 104 and inner sock layer structure 105.

[0054] One or both of the outer sock layer structure 104 and inner sock layer structure 105 may include an aperture 118 as represented in FIGS. 16-18 (FIG. 18 shows the aperture as a dashed line). In the exemplary embodiment, an outer sock layer structure 104 may include an aperture 118 at a location at least partially along the first footbed portion 116. Once the knit structure 102 is formed, the aperture 118 allows the outer sock layer structure 104 to be inverted over the inner sock layer structure 105 to form a double layer sock. The aperture 118 may be any dimension and location on the footbed portion 116. It may be at least a partial slit along a portion of the foot bed 116 or extend along the length of the footbed. The opening may also be wider depending on structure inserts placed into the upper or how the upper will be lasted or bonded to the sole.

[0055] Once the outer sock layer structure 104 is inverted over the inner sock layer structure 105, the outer and inner sock layer structure 105 are interconnected at the top of the seamless ankle cuff 142 forming the opening of a foot-receiving cavity. Once the double layer sock is inverted and the structural supports are inserted, the aperture 118 may be optionally closed, for example, by stitching or bonding. Structural supports includes a heel counter, heel counter inserts, insoles, sockliners, shanks, plates, toe guards, toe box supports, tensile components, straps, instep/eyerow/tongue supports, foam, cushioning, insulating lining, lighting components, electronic devices, ornamental material, portions of the sole or any other components inserted in between layers of the upper. Once the upper is formed, the outer sock layer structure 104 may then be affixed to a sockliner, protective layer or the upper surface of a least a portion of the sole or simply closed if a sole has already been inserted into the upper.

[0056] In the alternative process of manufacturing the double layer sock which includes joining a separately cylindrically-knit or flat-knit outer sock layer structure 104 and inner sock layer structure 105, the ankle cuff 142 forming the shoe opening 48 may require the addition of seam which may be stitched around the edges of the ankle cuff in order to provide stability and definition of the ankle cuff. The stitching may include elastic strands that provide elasticity to the ankle cuff in order to allow a tighter fit of the heel counter/heel cup. The heel cup may in fact have a looser fit around the foot but for the elastic properties afforded by the ankle collar. To further enhance the fit, the interior foam layer of the heel cup may expand after foot insertion to further cup the foot and improve the foot's fit into the upper.

[0057] As best viewed before inverting the outer sock layer structure 104 over the inner sock layer structure 105, the single cylindrically knit tube has an interior side 122 as shown in FIG. 16 and an exterior side 123 as shown in FIG. 17. The interior side 122 of the outer sock layer structure 104 and the interior side 122 of the inner sock layer structure 105 will interface (i.e., will face or contact) one another once the outer sock layer structure 104 is inverted over the inner sock layer structure 105. The interior side 122 is therefore comprised of a first interfacing surface 124 found on the outer sock layer structure 104 and a second interfacing surface 125 found on the inner sock layer structure 105. Additionally, the exterior side 123 corresponding to the outer sock layer structure 104 and the exterior side 123 corresponding to the inner sock layer structure 105 will oppose (i.e., will not contact and will face away from) one another once the outer sock layer structure 104 is inverted over the inner sock layer structure 105. The exterior side 123, as shown in FIG. 17, is therefore comprised of a first opposing surface 126 found on the outer sock layer structure 104 and a second opposing surface 127 found on the inner sock layer structure 105. In some embodiments, the first interfacing surface 124 and the second interfacing surface 125 may freely move with respect to each other at some areas of the upper but may be anchored or fixed to each other at other areas, e.g., using stitches or bonding, or entirely affixed to each other with the exception of insertable components located between the two upper layers 104 105.

[0058] Stretchability of the shoe upper 16 may also be controlled through hot melt yarn content or the number of elastic yarns integrated into the knit structure 102. Stretchability may also be designed through the type of knitting or knit design. Stretchability may include a two-way or four-way stretch. The knitting pattern and stitching

may vary to create regions of differing stretchability such as in the toe regions 110 111, midfoot region 112 113, heel regions 114 115, and ankle cuff 142. Either or both of the outer sock layer structure 104 and the inner sock layer structure 105 may be constructed using a combination of hot melt yarns and elastic yarn. The degree of elasticity of both of the outer sock layer structure 104 and the inner sock layer structure 105 may be determined by the proportion of hot-melt and elastic yarns used to enhance the fit and adaptability of the shoe.

[0059] The exemplary embodiment exhibits increased stretchability of the outer sock layer structure 104 in the first toe region 110 and the first heel region 114. The regions where the inner sock layer structure 105 exhibits stretchability may be in the second toe region 111, the second heel region 115, and the second midfoot region 113. The ankle cuff 142 may also have stretchability such as to provide elasticity and tension around the ankle.

[0060] In the exemplary embodiment, the outer sock layer structure 104 can have a thickness ranging from 0.9 mm to 1.9 mm (inclusive); the inner sock layer structure 105 can have a thickness ranging from 0.9 mm to 1.9 mm (inclusive); the outer sock layer structure 104 and inner sock layer structure 105 can have a total thickness ranging from 1.9 mm to 2.9 mm (inclusive). With this arrangement, the thickness of the shoe upper 16 has increased structural strength and longevity. At the same time, the shoe upper 16 exhibits cushioning and vibration reduction effects.

[0061] **Knit Eyelets or Other Apertures.** Additionally, the knitting pattern may include knit eyelets, apertures. In the case of eyelets, a lace may be threaded through without any additional eyelet components or eyelet supports may line the openings of the eyelets. The eyelets may be integrally embroidered on the first opposing surface 126 found of the outer sock layer structure 104. A portion of the lace near the shoe opening 48 may be fashioned into a bow and securely attached to the outer sock layer structure 104.

[0062] Other integrally knitted apertures may be located at any region of the upper. This may include an aperture in the integrated pocket which may allow the heel counter to be inserted into such an opening and/or visualized or exposed. The apertures may have a functional role which may allow materials of the heel counter to protrude through such as a pull tab or the upper portion of the heel counter. The opening may also allow portions of the heel counter to make direct contact with the foot, such as the smooth surface a heel cup. The opening may allow for portions of cushioning material or foam layer or materials covering such components which may have direct contact with the user's foot or sock if worn. Other added elements may be added to the heel counter through the aperture in the integrated pocket such as an extension of the heel cup.

[0063] **Instep or Tongue additions.** A pull tab may be found on part of a tongue region 134 and securely attached to the outer sock layer structure 104. A pull tab may also be found on the rear portion of the ankle collar or integrated pocket. The pull tab may be integral with the sock or separately added. The pull tab may be part of an inserted between the layers and located at the instep, and the pull tab may extend through aperture at or near the front portion of the ankle cuff of the upper.

[0064] **Inserts.** At certain locations, inserts may be positioned between the outer sock layer structure 104 and the inner sock layer structure 105. The first interfacing surface 124 and the second interfacing surface 125 may be separated by such inserts, including a heel counter 32, heel cup 52 and/or insole. Once inserted, the sock may then be affixed to the sole.

[0065] **Heel counter and pocket.** In the exemplary embodiment, a heel counter insert 34 with a heel cup 52 is situated primarily between the first interfacing surface 124 at the first heel region 114 and the second interfacing surface 125 at the second heel region 115. The heel counter insert 34 with a heel cup 52 is situated through an aperture 118 in the outer sock layer structure 104. The inner sock layer structure 105 includes a specific knitting pattern which forms a cover layer, here an integrated pocket 140, that securely accommodates the contours of the upper portion of the heel counter insert 34 or the upper and mid portion of the heel counter insert 34. See e.g. FIGS. 16-19, 24, and 25.

[0066] The heel counter insert 34 may by bonded to the knit material of the upper using hot melt thermoplastic material or adhesives. Alternatively, inserts may be stitched on to the knit material or affixed by any other ordinary means known in the art. The heel counter insert 34 can be affixed to the outer sock layer structure 104 and/or the inner sock layer structure 105 by a hot-melt thermoplastic material or an adhesive, or it can be sewn to the outer sock layer structure 104 and/or the inner sock layer structure 105.

[0067] The integrated pocket 140 has a front cover portion 152 and a rear cover portion 153. The front cover portion 152 may cover the inner facing surface of the heel counter. The rear cover portion 153 may cover at least a portion of the outer facing surface of the heel counter. The heel counter insert 34 may comprise a heel cup 52 and a foam layer 92, and the integral pocket 140 may cover these components without the presence of seams or additional stitching.

[0068] The integrated pocket 140 has an interior surface that is in contact with and encloses the upper portion of the heel counter insert 34.

[0069] The integrated pocket 140 has an exterior surface with a forward-facing portion and a rearward-facing portion.

[0070] The heel counter insert 34 and integrated pocket 140 extends vertically beyond the upper boundary 144 of an ankle cuff 142, protruding above the highest point of the ankle cuff 142.

[0071] As the integrated pocket wraps around a rear facing surface of the heel cup, the pocket may extend downward below the level of the ankle collar and behind

the ankle collar. The pocket may extend to the junction of where the pocket to the inner sock layer of the upper and the inner sock layer extends upward to the top of the ankle collar and wraps over the ankle collar to meet the junction of the outer surface of the sock layer. The inner sock layer may also be the inner surface of the ankle collar. In some cases, the integral pocket may extend further down to as far as the footbed or insole which forms a defined unconnected space between the inner sock layer (or inner surface of the ankle collar) of the upper and rear facing surface of the integrated pocket. The unconnected space may provide for greater movement between the heel cup and the upper such as during foot insertion or remove where the heel cup may move rearward to widen the shoe opening so that the foot may have greater ease to move the foot in or out of the shoe.

[0072] The integrated pocket material may be fixed to the heel counter insert, i.e. the heel cup, along with additional layers such as foam layers, so as to avoid the material from blocking ease of the foot being slipped on and off the shoe. The surrounding sock upper may have stretching properties that allows the heel counter to be transiently displaced rearward as foot slides along the inner face of the heel counter. The ankle cuff or collar that wraps around the integrated pocket may provide sufficient tension to prevent the heel cup from moving excessively rearward and thus providing a secure fit around the user's heel.

[0073] **Ankle Cuff.** In the exemplary embodiment, an ankle cuff 142 forms a band-like structure that encircles the ankle and provides a secure fit. The ankle cuff 142 may extend around the shoe opening 48 partly or entirely. The ankle cuff 142 has an upper boundary 144, which is the topmost edge of the cuff, and a lower boundary 146, which is the bottom edge. The upper boundary 146 marks the distinction between the outer sock layer structure 104 and the inner sock layer structure 105. However, the distinction does not necessarily imply a physical separation as the outer sock layer structure 104 and the inner sock layer structure 105 may be integrally formed. In the exemplary embodiments, the seamless ankle cuff 142 is visually distinct from other portions of the upper. The ankle cuff 142 may incorporate elastic and tensive properties which aids in gripping the ankle comfortably. The lower boundary 146 may serve as a transition point where the integrated ankle cuff or tension band connects to the body of the sock. The first interfacing surface 124 and second interfacing surface 125 may be in contact with each other along at least a portion of the entire circumference of the ankle cuff 142 thereby forming at least a double layer that is looped along a cross-sectional axis as shown in Fig. 18. The lower boundary 146 of the ankle cuff 142, i.e. where the two layers of the of the ankle cuff 142 may be stitched or bonded throughout some or all of its length between the layers of the loop forming the ankle cuff 142. The loop of the ankle cuff 142 may have a hollow void, or the overlapping layers are entirely knitted together, or the void is filled with material that may provide a variety of functions including tension, padding, firmness, or aesthetics. The construction, fibers, or materials of the ankle cuff 142 may differ from the other regions of the upper. For example the tension may be greater or lesser than the other regions upper. Varying construction may involve high density of fibers or stitches or the types of stitches used in the various regions of the upper that may increase or decrease the tension. The different fibers or materials may differ in elasticity or stretchability.

[0074] The rear cover portion 154 of the integrated pocket 140 and the ankle cuff 142 may be integrally connected, spaced away but with a unitary construction, or separately formed.

[0075] The portion of ankle cuff 142 extending rearward of and around the heel counter 32 insert may resemble an ankle strap. The portion of the ankle cuff 142 formed by the inner sock layer's opposing surface contacts the rearward-facing surface of the integrated pocket.

[0076] The mid and lower portions of the heel cup 52 insert extend vertically below the lower boundary 146 of the ankle cuff 142 and are located between the interfacing surfaces of the outer sock layer structure 104 and the inner sock layer structure 105.

[0077] In the exemplary embodiment, the top of the upper boundary 144 of the ankle cuff 142 is lower than the top of the heel counter 32 insert and pocket 140. Therefore, the heel cup 32 insert aids in avoiding the collapse of the ankle cuff 142 under the heel pressure, thus making the process of donning the shoe easier for the user. In the alternate, the ankle cuff may have sufficient tension to prevent the heel cup from moving excessively rearward and the ankle cuff may aid in returning the heel cup to its original position after the foot is inserted. Such tension may aid in a more secure fit of the heel cup which may have a looser fit around foot without the ankle cuff. The foam layer around the user's heel and portions of the ankle may further enhance the secure fit of the foot as it expands around the foot. The foam layer may even be compressed against the foot provided by the ankle cuff.

[0078] Further to this alternate function, the integration of the integrated pocket and ankle cuff 142 into the outer sock layer structure 104 and the inner sock layer structure 105 benefits ease of assembly of the upper 16. The outer sock layer structure 104 and the ankle cuff 142 may also serve to provide outer protection of the upper 16. Either or both of the outer sock layer structure 104 and the ankle cuff may be elastic such that the heel cup 52 may move rearward during a foot insertion into the shoe such that the ankle cuff acts as a tension band or strap. In such instances, the heel cup 52 may return to its original state once after the foot is inserted into the shoe. After the foot is inserted, the ankle cuff may also reduce the heel cup from inadvertently moving rearward while the shoe is being used. The tension provided by the ankle cuff may prevent or reduce the possibility of the foot slipping out of the shoe unintentionally. The tension may be of a sufficient force that doffing of the shoe may require the

shoe to be held in place when the foot is being removed from the shoe, such as by the user's hand or the user's other foot/shoe.

[0079] The ankle cuff's tension may be adjustable. The ankle cuff may be attached to a securing device such as a strap, laces, tensioning wire system with tension dial, or any known securing device in the art. At least a portion of the securing device may also be inserted in between the layers during formation of the upper. The securing device may extend through apertures of the outer layer to allow the user access to increase the tension. In the case of straps, the tension may be provided by a buckle or velcro attachments. In the case of laces or wires, such may extend though the instep to both tighten the ankle collar as well as provide support in the instep region. The securing device may extend coextensively with the ankle collar or configured to pull ankle collar tighter.

[0080] **Insole.** In the exemplary embodiment, an insole 136 may be disposed between the first interfacing surface 124 at the first midfoot region 112 and the second interfacing surface 125 at the second midfoot region 113. See for example FIGS. 20-24.

[0081] The insole 136 may be inserted between the interfacing surfaces 124 125 through an aperture 118 in the outer sock layer structure 104 and situated primarily between the first interfacing surface 124 at the first footbed portion 116 and the second interfacing surface 125 at the second footbed portion 117.

[0082] The insole 136 may be attached to the knit structure 102, e.g., by stitching or bonding, on one or both of the first interfacing surface 124 and the second interfacing surface 125. Once the insole 136 is inserted, the aperture 118 along the first footbed portion 116 may be closed, e.g., by stitching. Once the outer sock layer structure 104's aperture 118 is closed, the shoe upper 16 may then be attached to a sole 14. A midsole may be attached to the first opposing surface 126 at the first footbed portion 116, covering the seam of the outer sock layer structure 104's aperture 118. The insole, prior to its insertion into the upper, may also be attached to other structures, such as sockliners, shanks, or components associated with the upper, such as a heel cup, heel counter insert, toe bumper, straps, or side supports. In one example, a heel counter insert 34 may be affixed to the insole 136, and the combined structure may then be inserted between the first interfacing surface 124 and the second interfacing surface 125. The methods of attachment may include any of those known in the art, including stitching and/or bonding.

[0083] As shown in FIG. 15 and 20-24 one exemplary embodiment of an insole 136 comprises a multi-layered construction to enhance comfort and in some embodiments, the airflow. Specifically, the insole 136 includes three distinct layers.

[0084] A top insole layer 137, in direct contact with the second interfacing surface 125, may be fabricated from a viscoelastic material, for example a polyurethane foam. The exemplary foam may be characterized by a density range of 130-150 kilograms per cubic meter and a hardness rating of 9-15, as measured by the Asker F scale. The top insole layer 137 may be approximately 3 mm in thickness.

[0085] Further to this embodiment, beneath the top insole layer 137 lies an intermediate insole layer 138, constructed from example materials such as a Thermoplastic Elastomer (TPE) base material. The material may be a foam polymer or a material that provides additional cushioning. The intermediate layer may have a varying rigidity or elasticity than the top insole layer. In one embodiment, the rigidity may be greater, or the elasticity may be lesser. The intermediate insole layer 138 may have any thickness such as a thickness of approximately 4 mm.

[0086] Further to this embodiment, exposed regions 168 of the TPE intermediate insole layer 138 are deliberately exposed along the medial and lateral sides of the insole when viewed from the bottom. These exposed regions may be designed with a curved or beveled profile. An exposed region 168 facilitates integration of the insole with the upper surface of the midsole, which typically exhibits curved sidewalls along its periphery. Additionally, the exposure of the TPE layer in these regions contributes to enhanced airflow and moisture reduction within the shoe. In some embodiments, perforations 135 may be located in the beveled regions of the TPE intermediate insole layer 138 which allows for enhanced airflow and heat dissipation.

[0087] A bottom insole layer 139 of the insole 136 is comprised of a hotmelt sheet, which is approximately 1 mm thick. This layer is designed to secure the insole within the upper and is in contact with the first interfacing surface 124. The bottom insole layer 139 may be fully coextensive with the intermediate insole layer or may cover portions of the intermediate layer. In one exemplary embodiment, the bottom insole layer 139 may be fully coextensive with the heel portion and partially coextensive with the midfoot or forefoot region. The exposed regions 168 of the intermediate layer may be at any location or in areas which may allow more breathability of the intermediate layer. The exposed regions 168 may also be created after the layers are combined producing a beveled angle which may be used to allow the insole to be better fit within the top surface of sole where contours are configured to receive the beveled edges of the insole.

[0088] Both the TPE intermediate insole layer 138 and/or hotmelt bottom insole layer 139 may be constructed with perforations 135 which may extend through both the intermediate layer and the bottom layer. The perforations of one layer may or may not be aligned, either partially or entirely, with the other layer. The perforations may be configured to facilitate airflow through intermediate and bottom insole layers. The exposed regions 168 may also enhance airflow. The improved airflow improves breathability and reduces moisture buildup within the shoe. In other exemplary embodiments, perforations may be present on the intermediate

insole layer but not the bottom layer or vice versa.

[0089] Additionally, an insole support pad 166 may be positioned beneath the heel region of the bottom layer of the insole. The insole support pad 166 may be composed of ethylene-vinyl acetate (EVA), with options for both foamed and non-foamed EVA configurations. Structurally, the insole support pad 166 is characterized by a thicker composition at the rear and progressively tapers towards the front.

[0090] The insole either alone or attached or combined the heel counter insert may be bonded to upper by adhesive, stitching, hotmelt film, or by any other means known in the art.

[0091] **Support plate.** In one embodiment, a support plate may be disposed between the interfacing surfaces 124 and 125 alone or in combination with other components such as an insole. The support plate may be further located on the lower surface of an insole 136 facing the first interfacing surface 124 at the midfoot region 112 and may be partially or fully coextensive with the insole. The support plate may be a minimum distance between the support plate 138 and the first heel region 114 is smaller than the minimum distance between the support plate 138 and the first toe region 110. That is, the support plate 138 may be disposed near the first heel region 114. The support plate 138 can be affixed to the lower surface of the insole 136 with an adhesive. The shape of the end of the support plate 138 near the first heel region 114 can be adapted to the shape of the insole 136. The support plate 138 can be constructed from any material that further increases the rigidity or hardness of the footbed and may be constructed of any material that may include cardboard, plastics, nylon, metals, but it is not limited thereto.

[0092] The support plate 138 may improve the structural strength of the insole 136. When the shoe upper 16 includes the heel counter 32 insert, the support plate 138 may effectively position the heel counter 32 insert and improve the stability of the heel counter 32 insert.

[0093] **Logo.** The exterior surface of the outer sock layer structure 104 can be provided with a logo strip. The angle α between the logo strip 150 and the vertical direction satisfies: $0° < \alpha < 90°$, that is, the logo strip 150 is obliquely disposed. The logo strip 150 can be provided with characters, patterns, and the like. A logo strip may be further located on the exterior surface of the pocket cover of the heel cup just above the ankle cuff 142.

[0094] Clause 1: The upper of an article of footwear comprising: a first knit layer and a second knit layer; the first knit layer and second knit layer having corresponding toe, midfoot, and heel regions; the first knit layer having a first interior surface and a first exterior surface; the second knit layer having a second interior surface and a second exterior surface; the first interior surface and the second interior surface generally facing toward each other; the first exterior surface and the second exterior surface generally opposing each other; an ankle cuff formed at the interconnection between the first knit layer and the second knit layer and at least partially surrounding the opening of the foot receiving cavity of the upper; the second knit layer defining an integrated pocket in the heel region; a heel cup in the heel region partially located between the first interior surface and the second interior surface; an upper portion of the heel cup situated within the integrated pocket; the integrated pocket defining a forward facing surface on a front cover portion and a rearward facing surface or a rear cover portion; and the ankle cuff having a portion of the second exterior surface contacting the rearward facing surface.

[0095] Clause 2: The upper of clause 1 wherein the upper portion of the heel cup and portions of the integrated pocket extend above the ankle cuff.

[0096] Clause 3: The upper of clause 1 further comprising an insole situated between the first interior surface and the second interior surface.

[0097] Clause 4: The upper of clause 1 wherein the heel cup is a structural element comprising an upper rear portion extending rearward and inclined downward in a direction from the heel toward the direction of the toe, the downward incline having a convex curvature; and the convex curvature having an upper surface facing upward and lower surface facing an opening of the article of footwear.

[0098] Clause 5: The upper of clause 4 wherein the heel cup is rigid and does not bend downward and away from the shoe opening under the load.

[0099] Clause 6: The upper of clause 4 wherein the heel cup bends downward and away from the shoe opening under load and returns to its original position once the load is removed.

[0100] Clause 7: The upper of clause 5 wherein the heel cup is pushed temporarily rearward during foot insertion or removal.

[0101] Clause 8: The upper of clause 1 wherein the heel cup is part of a heel counter insert comprising the heel cup and a foam layer wherein at least an upper portion of the heel counter insert which includes the upper portion of the heel cup is located within the integral pocket.

[0102] Clause 9: The upper of clause 6 wherein the foam layer has a protruding portion that is located on the heel cup such that the padding contacts the foot above the calcaneus region of the foot.

[0103] Clause 10: The upper of clause 9 wherein the foam layer is in a first compressed state during foot insertion and removal, and in a fully uncompressed state after foot removal and in fully uncompressed or a second compressed state after foot insertion wherein the second compressed state is less than the first compressed state.

[0104] Clause 11: The upper of clause 3 wherein the insole is multilayered with a first layer having viscoelastic properties and a second layer having perforations.

[0105] Clause 12: The upper of clause 8 wherein the heel counter insert having a securing flap that may be connected perpendicular to the heel cup and is attached to a footbed of the upper.

[0106] Clause 13: The upper of clause 12 wherein the

footbed may be either a portion of the first knit layer or second knit layer, an insole, or a sockliner.

Claims

1. The upper of an article of footwear comprising:

   a first knit layer and a second knit layer;

   the first knit layer and second knit layer having corresponding toe, midfoot, and heel regions;
   the first knit layer having a first interior surface and a first exterior surface;
   the second knit layer having a second interior surface and a second exterior surface;

   the first interior surface and the second interior surface generally facing toward each other;
   the first exterior surface and the second exterior surface generally opposing each other;

   an ankle cuff formed at the interconnection between the first knit layer and the second knit layer and at least partially surrounding the opening of the foot receiving cavity of the upper;
   the second knit layer defining an integrated pocket in the heel region; a heel cup in the heel region partially located between the first interior surface and the second interior surface;
   an upper portion of the heel cup situated within the integrated pocket;
   the integrated pocket defining a forward facing surface on a front cover portion and a rearward facing surface or a rear cover portion; and
   the ankle cuff having a portion of the second exterior surface contacting the rearward facing surface.

2. The upper of claim 1 wherein the upper portion of the heel cup and portions of the integrated pocket extend above the ankle cuff.

3. The upper of claim 1 further comprising an insole situated between the first interior surface and the second interior surface.

4. The upper of claim 1 wherein the heel cup is a structural element comprising an upper rear portion extending rearward and inclined downward in a direction from the heel toward the direction of the toe, the downward incline having a convex curvature; and the convex curvature having an upper surface facing upward and lower surface facing an opening of the article of footwear.

5. The upper of claim 4 wherein the heel cup is rigid.

6. The upper of claim 4 wherein the heel cup bends downward and away from the shoe opening under load and returns to its original position once the load is removed.

7. The upper of claim 5 wherein the heel cup is pushed temporarily rearward during foot insertion or removal.

8. The upper of claim 1 wherein the heel cup is part of a heel counter insert comprising the heel cup and a foam layer wherein at least an upper portion of the heel counter insert which includes the upper portion of the heel cup is located within the integral pocket.

9. The upper of claim 6 wherein the foam layer has a protruding portion that is located on the heel cup such that the padding contacts the foot above the calcaneus region of the foot.

10. The upper of claim 9 wherein the foam layer is in a first compressed state during foot insertion and removal, and in a fully uncompressed state after foot removal and in fully uncompressed or a second compressed state after foot insertion wherein the second compressed state is less than the first compressed state.

11. The upper of claim 3 wherein the insole is multilayered with a first layer having viscoelastic properties and a second layer having perforations.

12. The upper of claim 8 wherein the heel counter insert having a securing flap that may be connected perpendicular to the heel cup and is attached to a footbed of the upper.

13. The upper of claim 12 wherein the footbed may be either a portion of the first knit layer or second knit layer, an insole, or a sockliner.

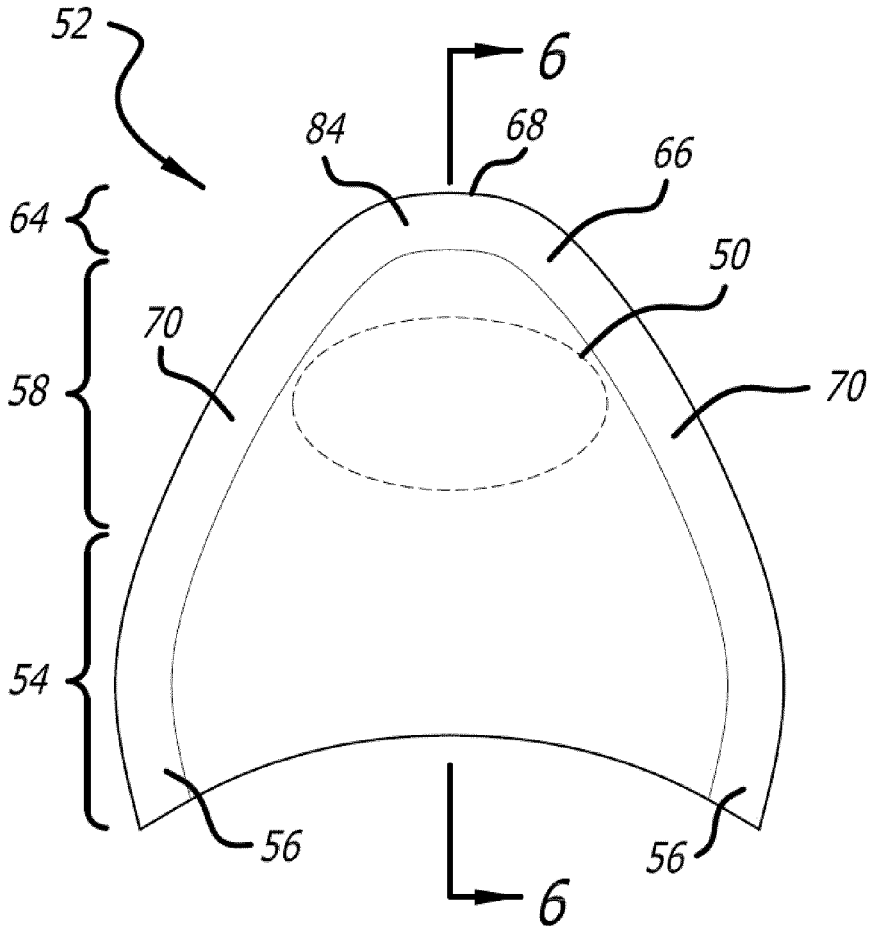


FIG. 1

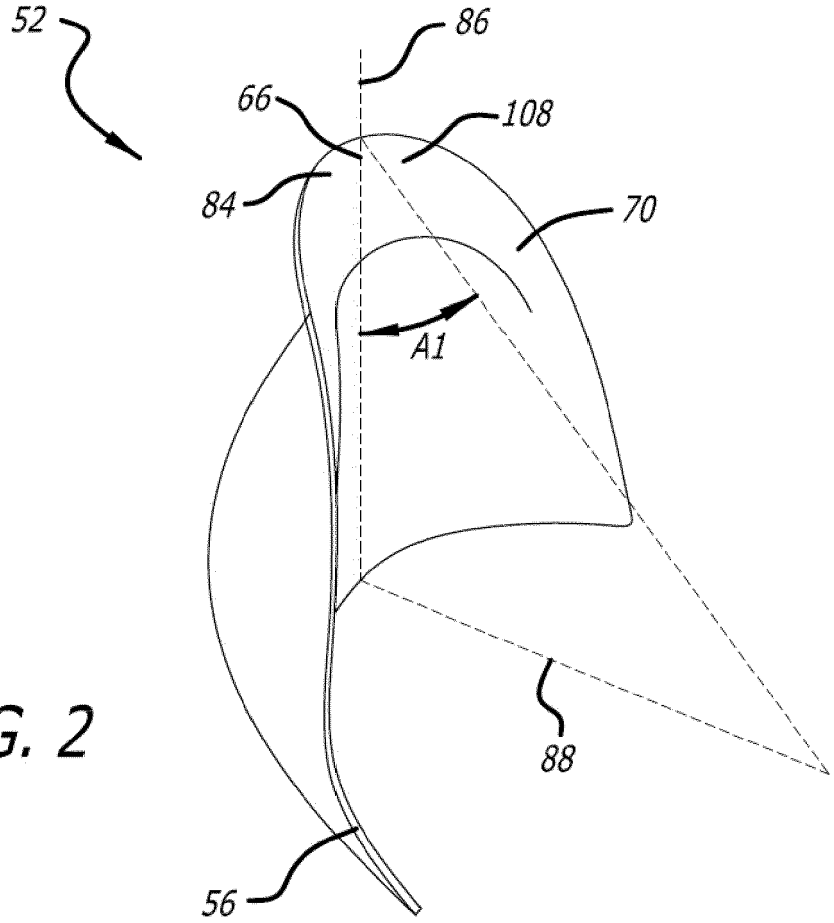
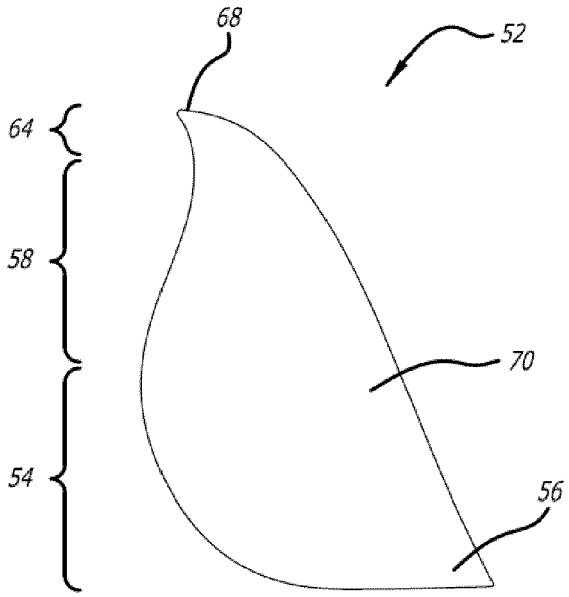


FIG. 2



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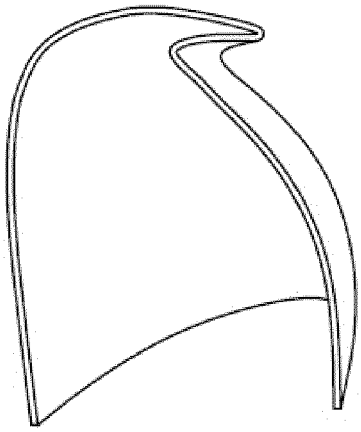


FIG. 4A

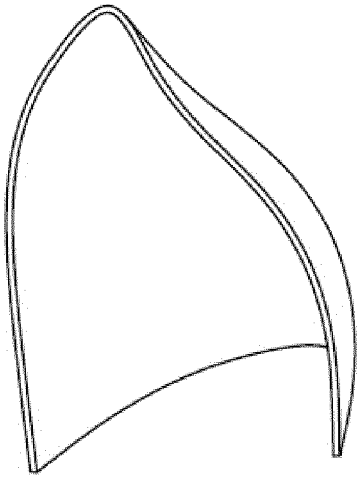


FIG. 4B

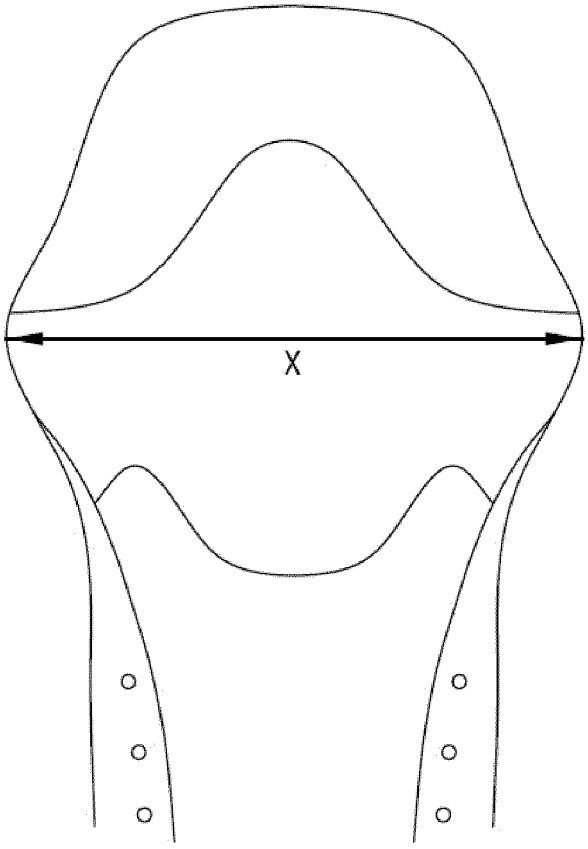


FIG. 4C

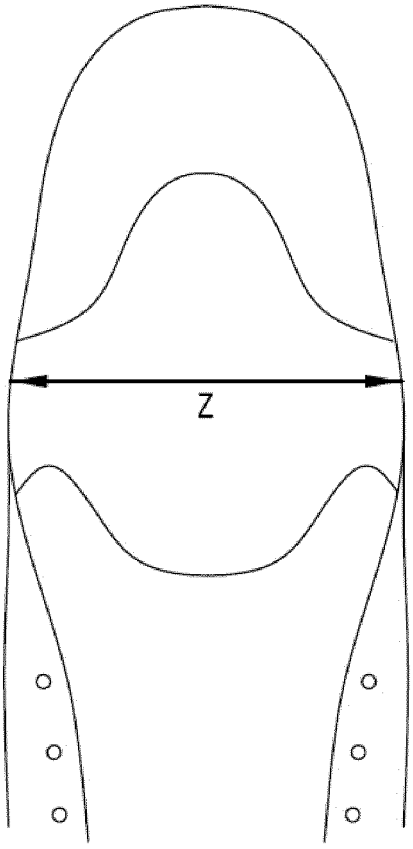
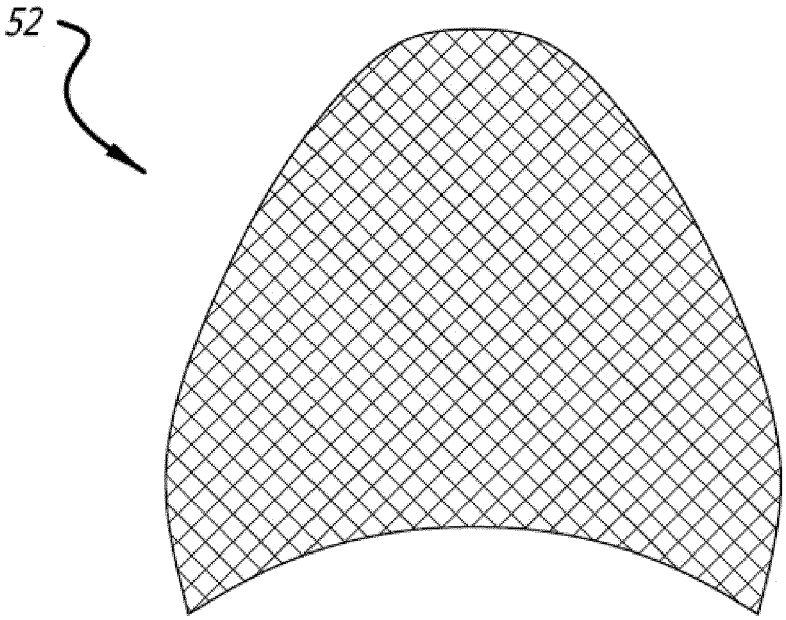


FIG. 4D



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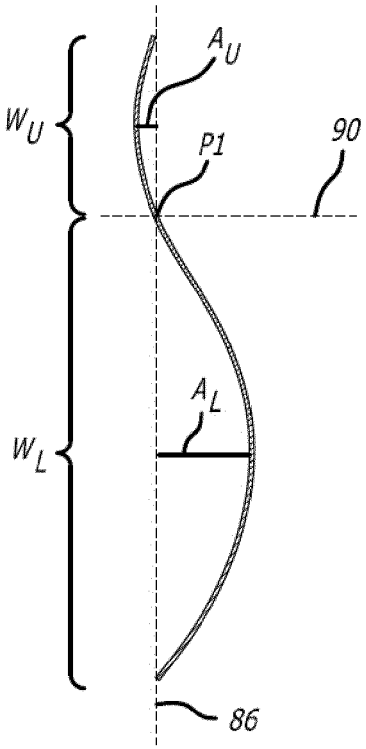

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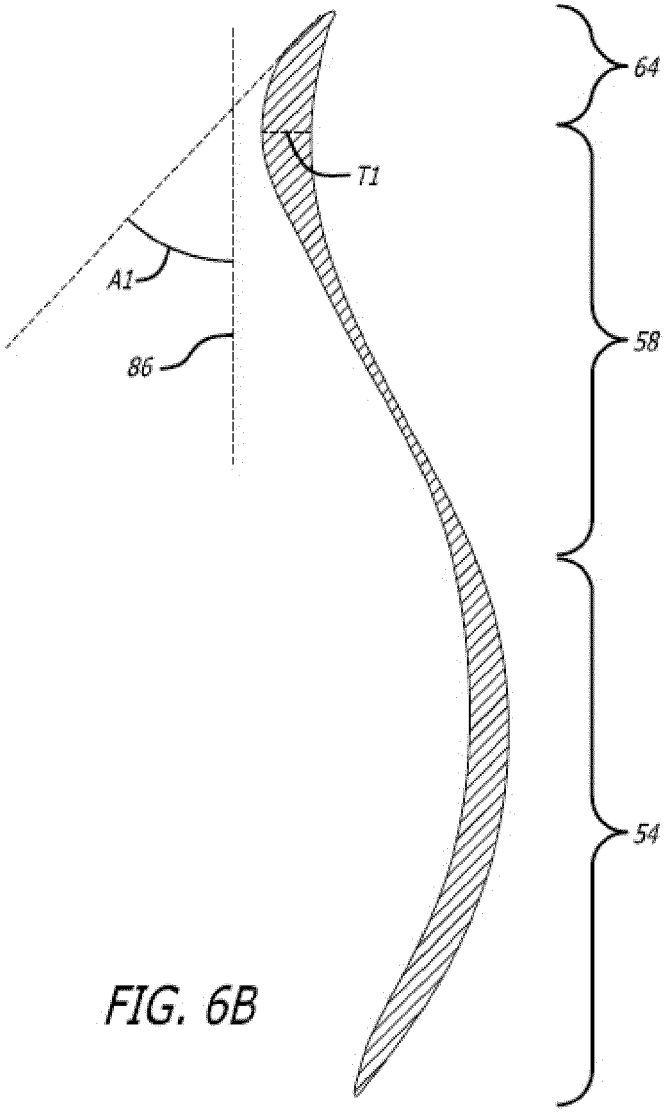
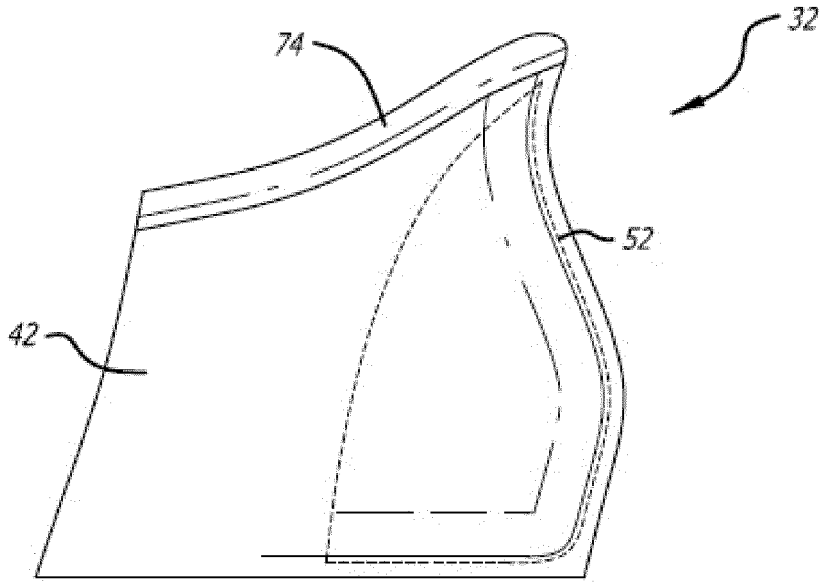


FIG. 6B



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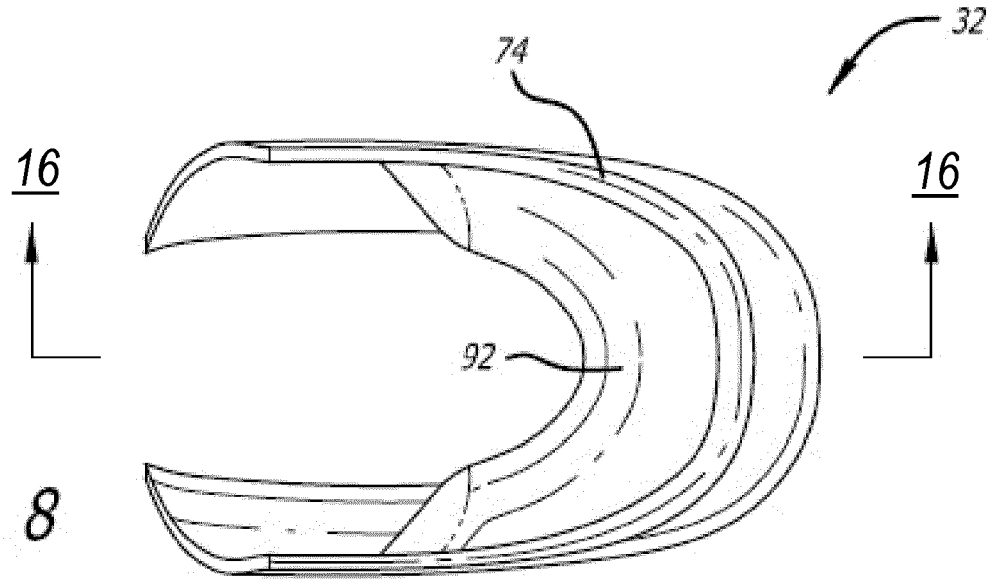

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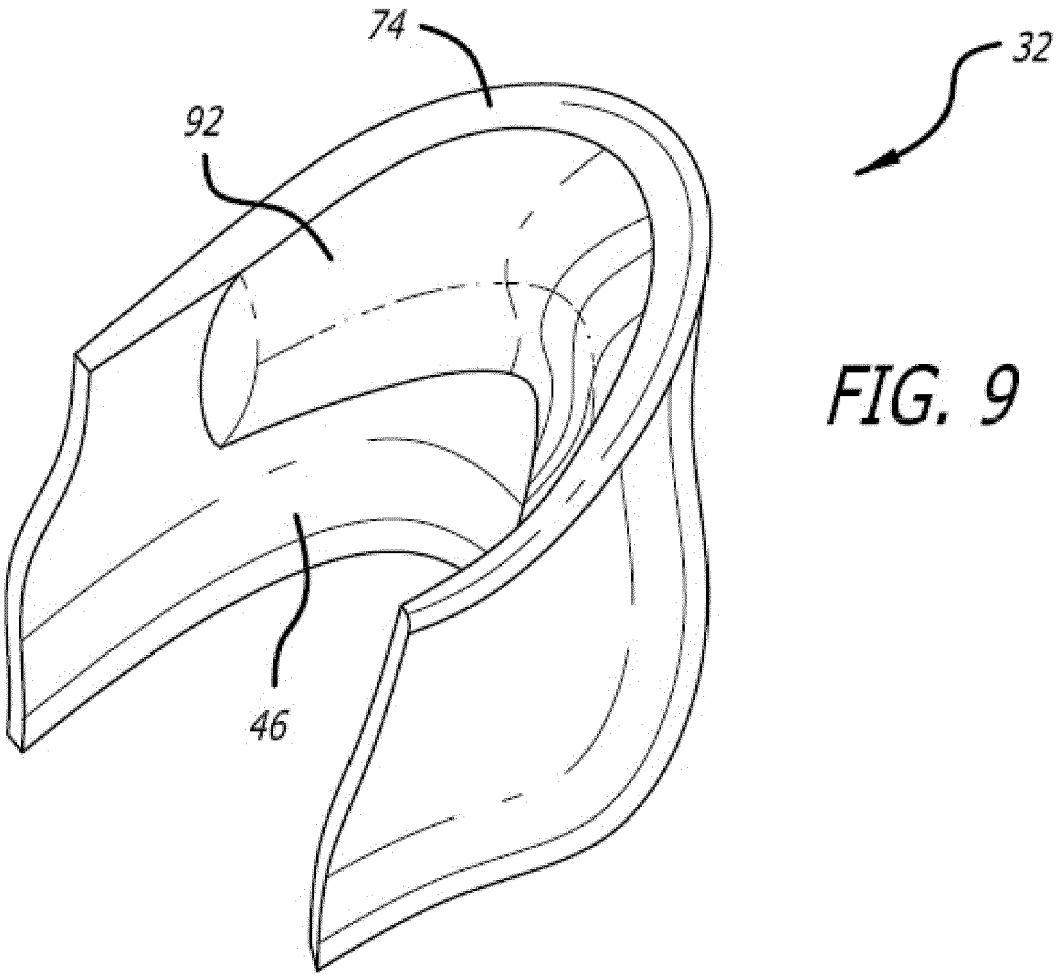
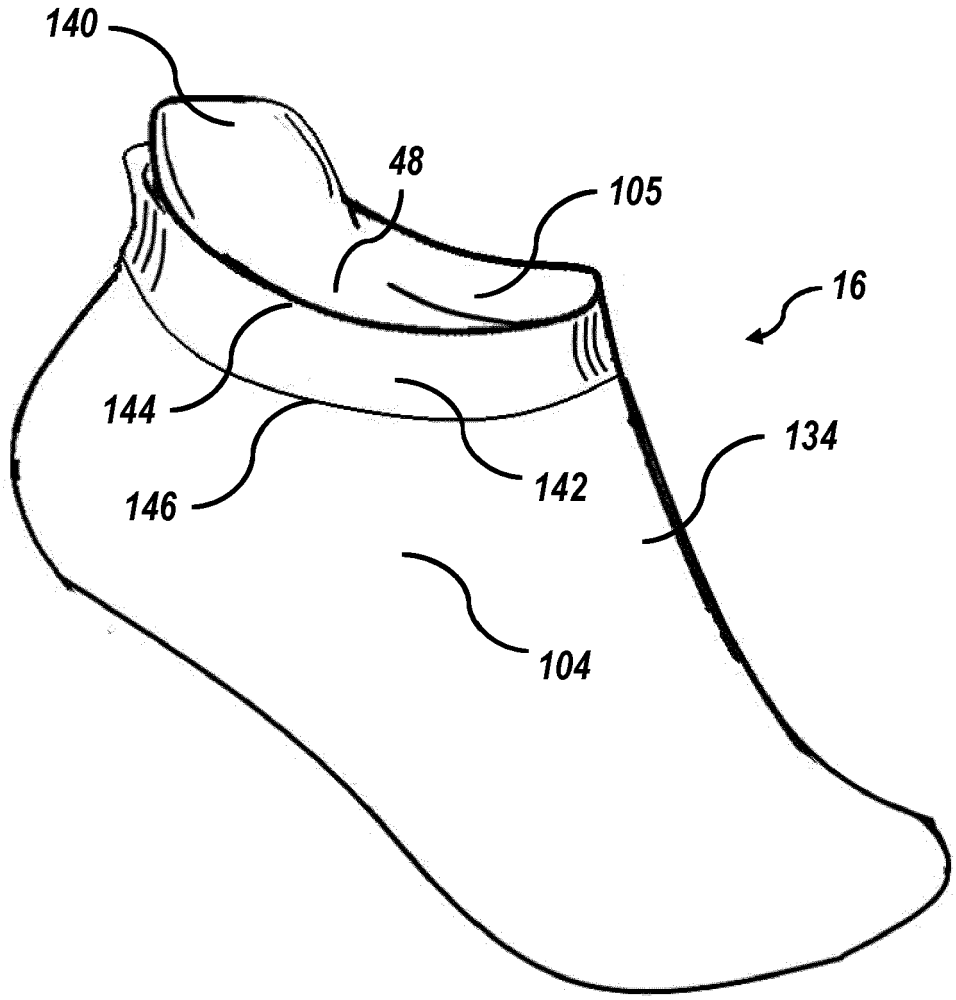


FIG. 9

FIG. 10



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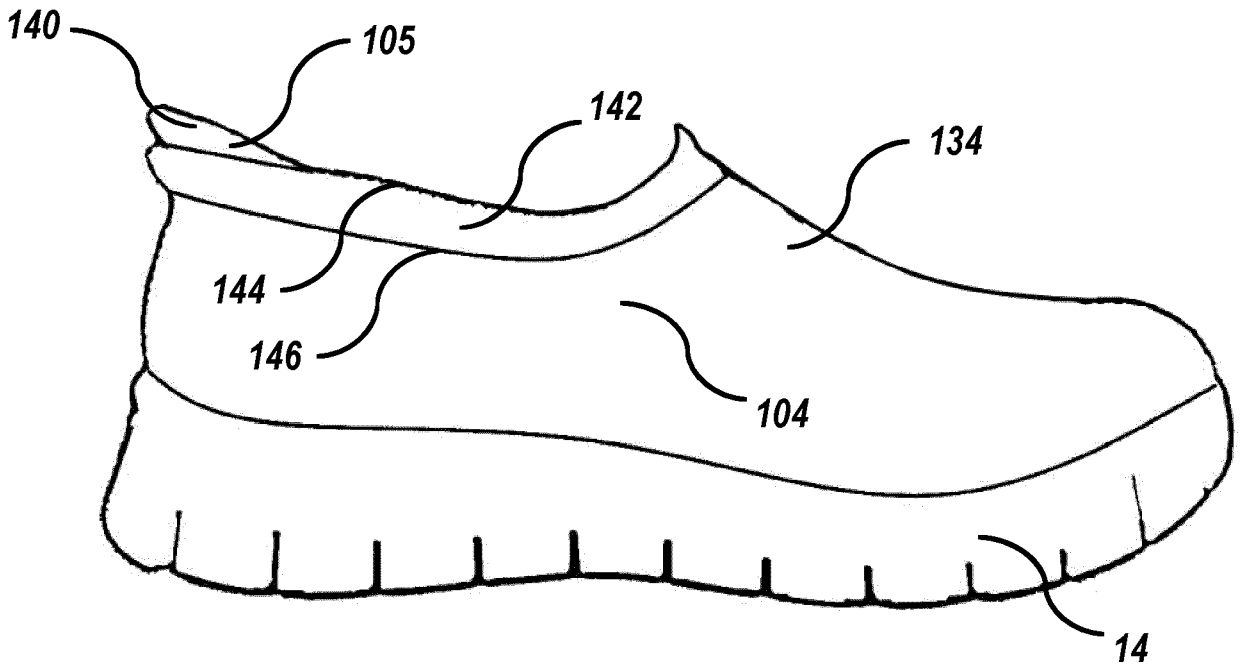


FIG. 12

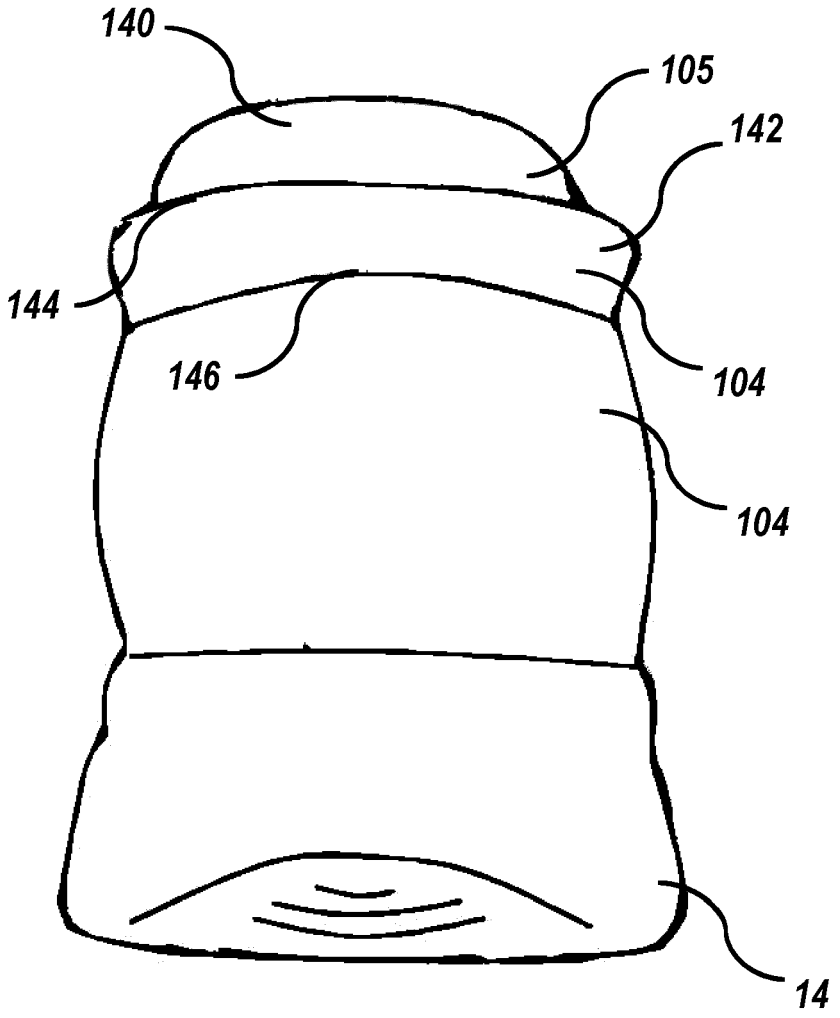
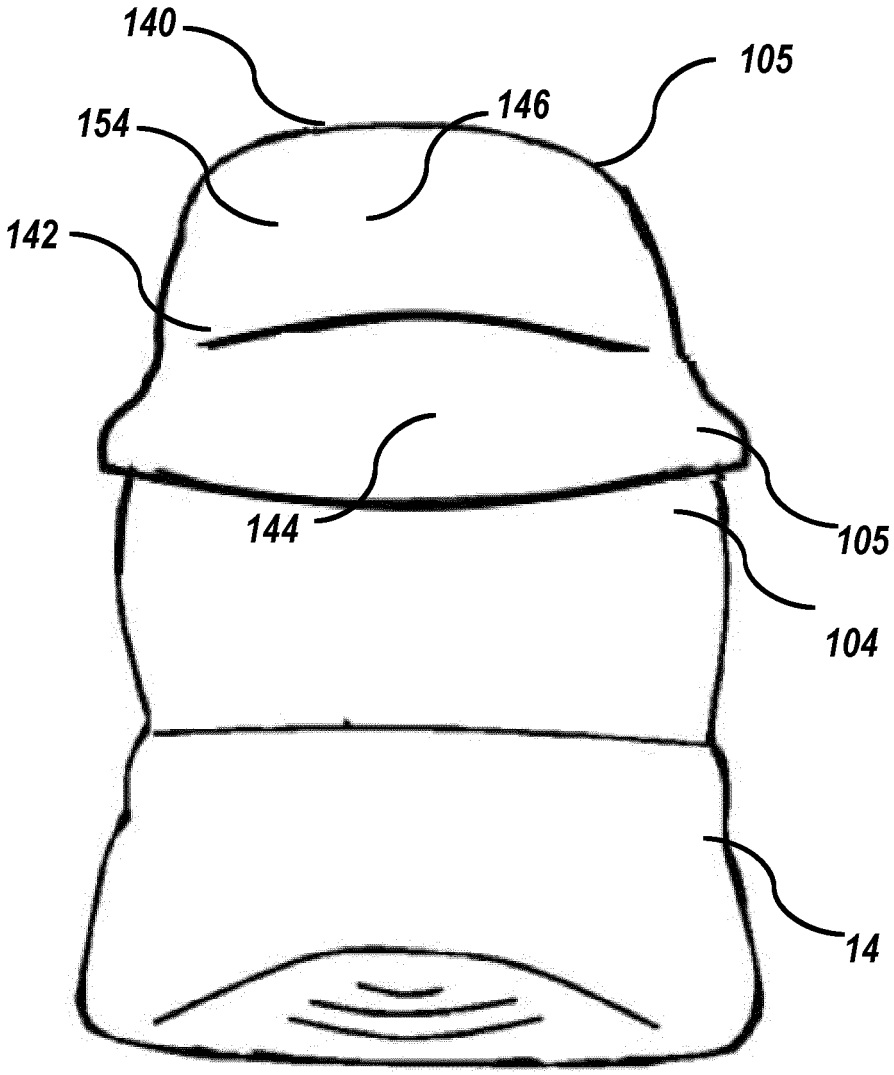


FIG. 13



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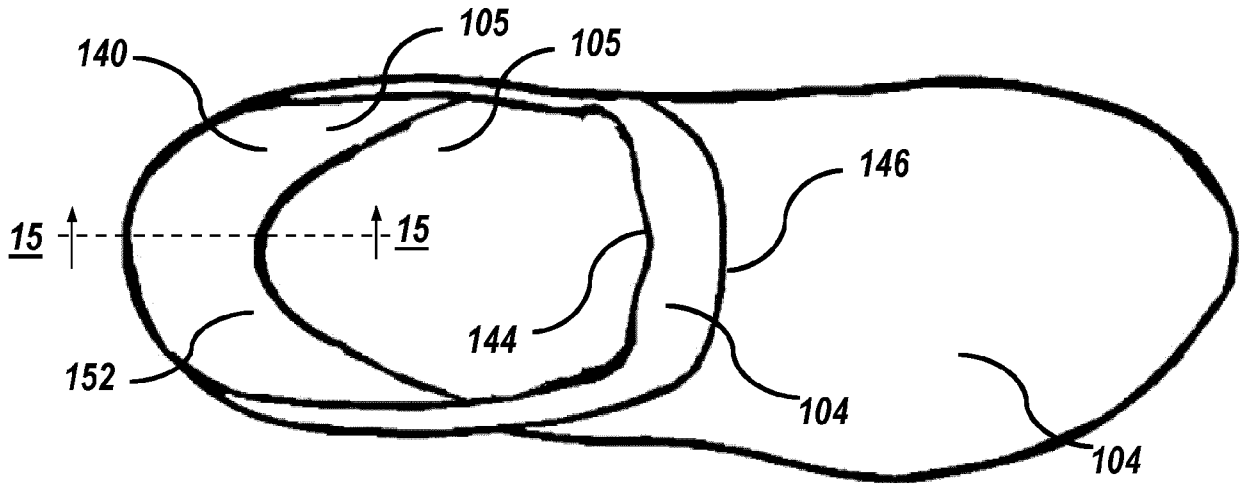
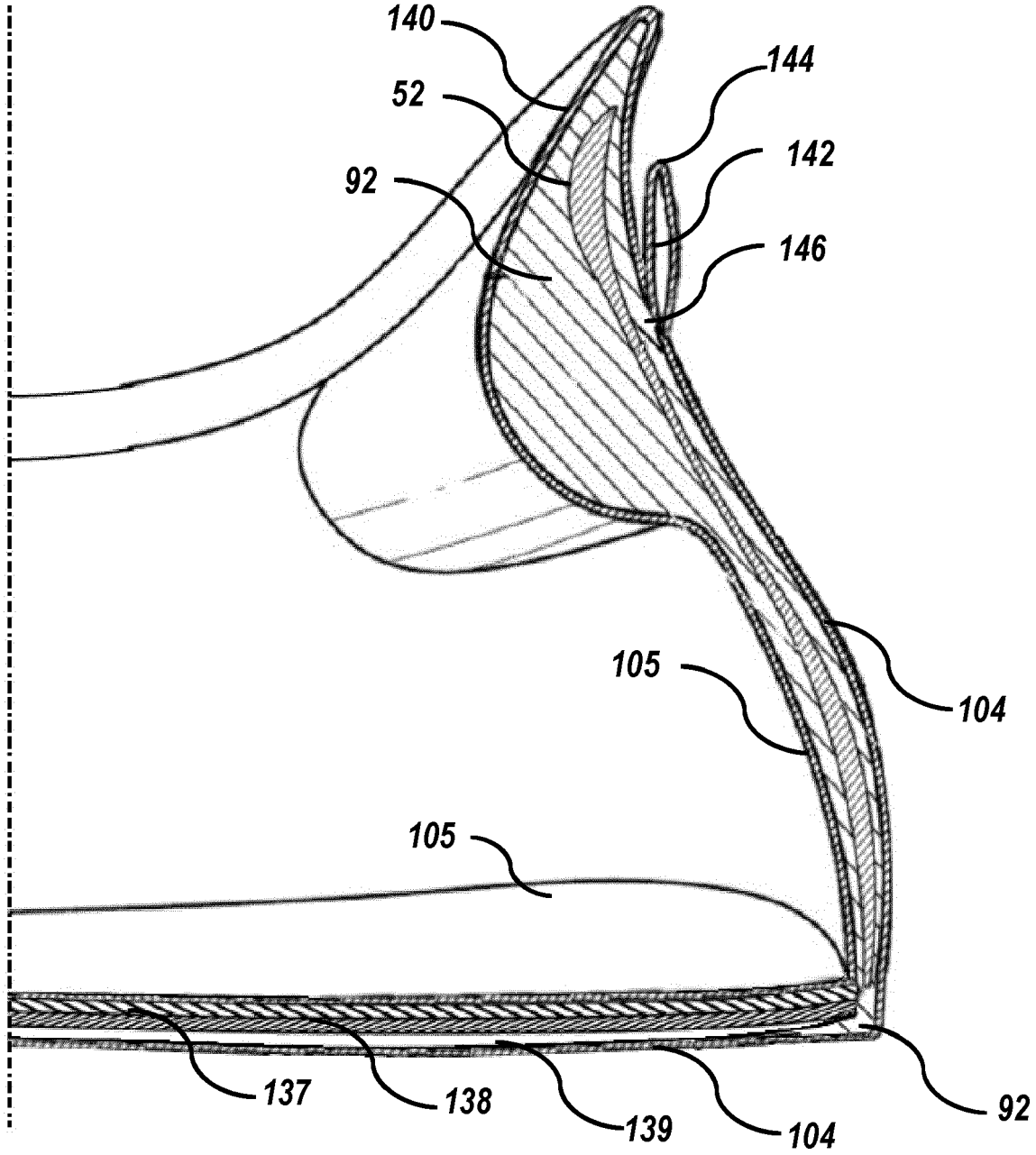


FIG. 15



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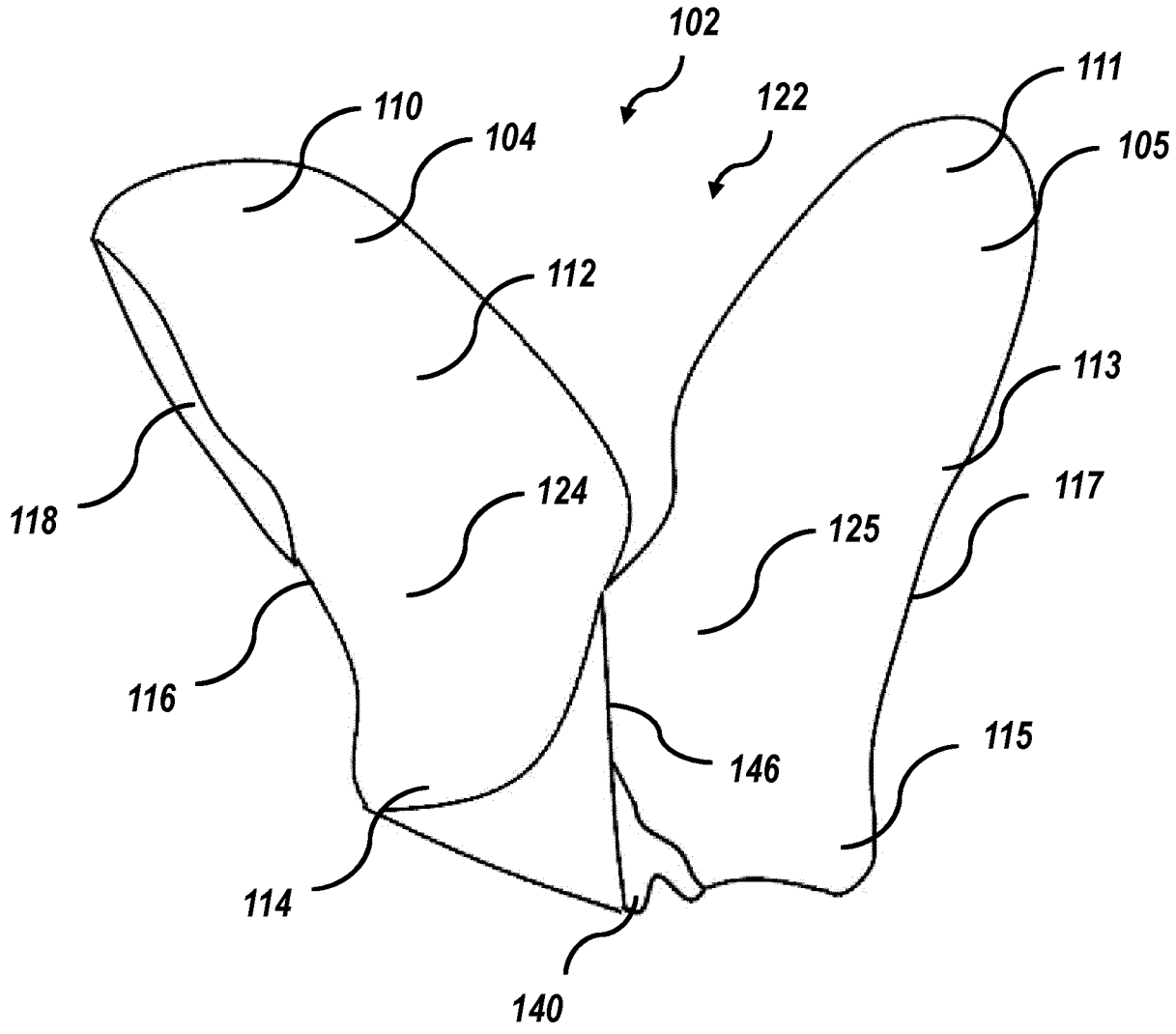
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FIG. 17

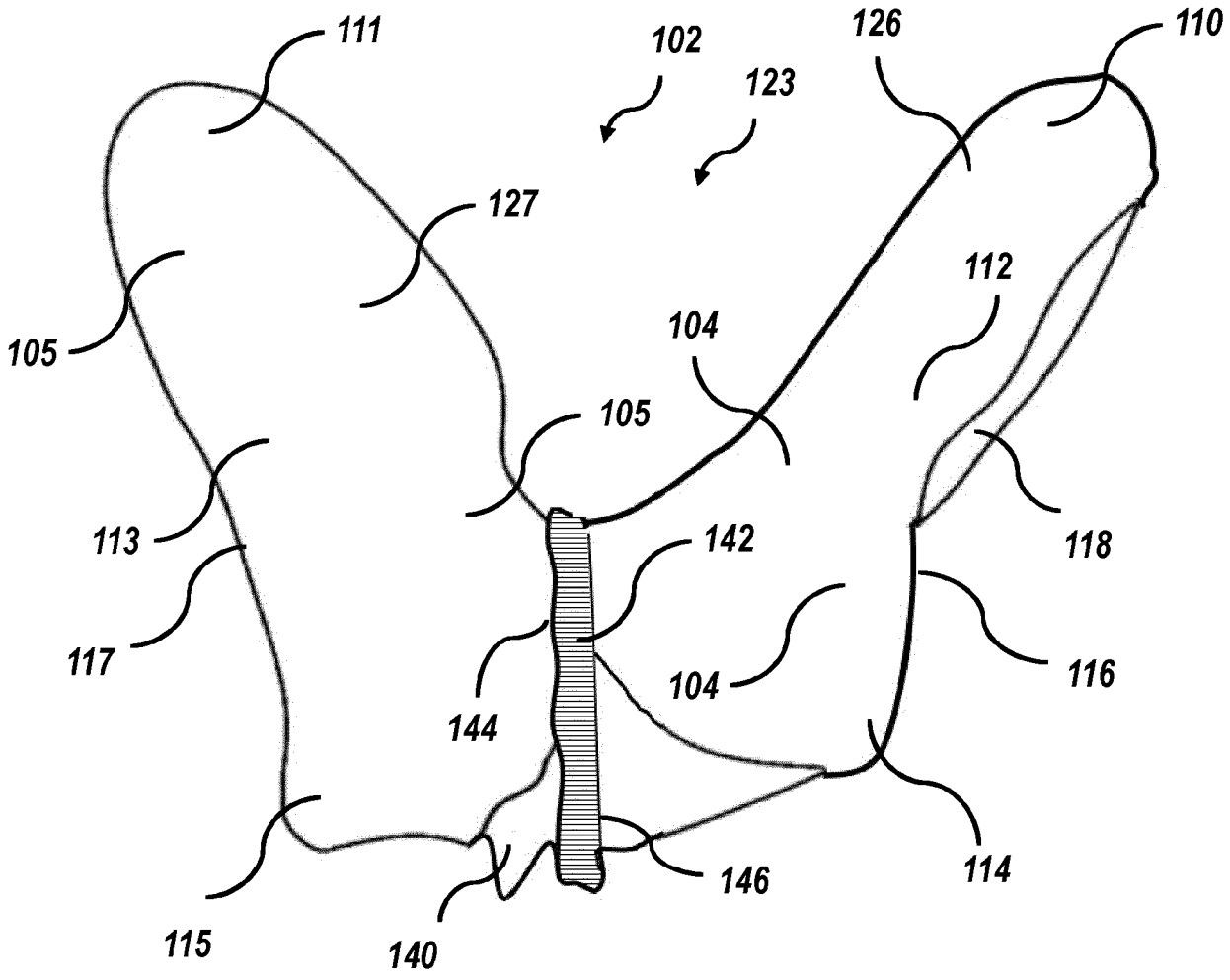
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FIG. 18

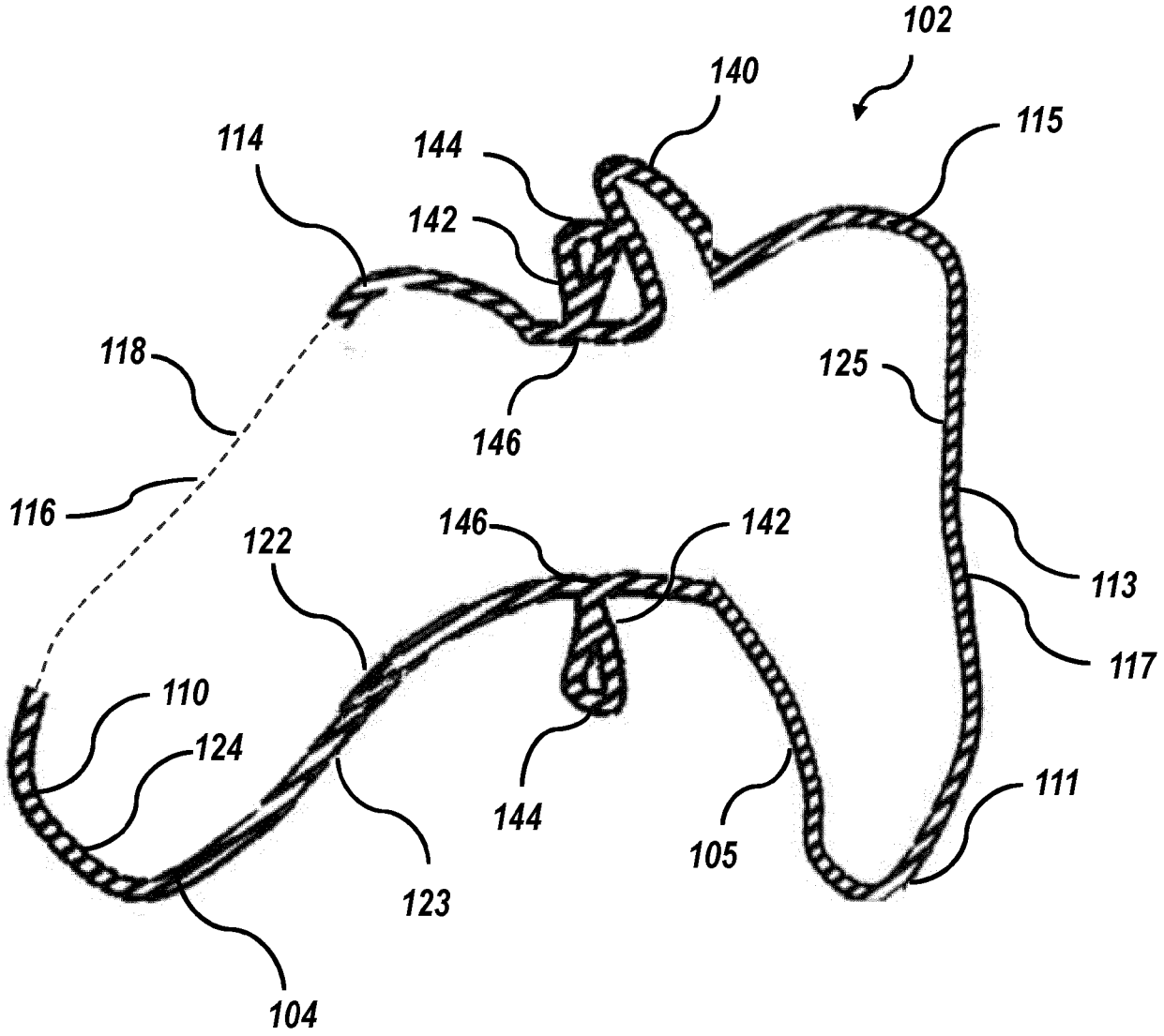
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FIG. 19

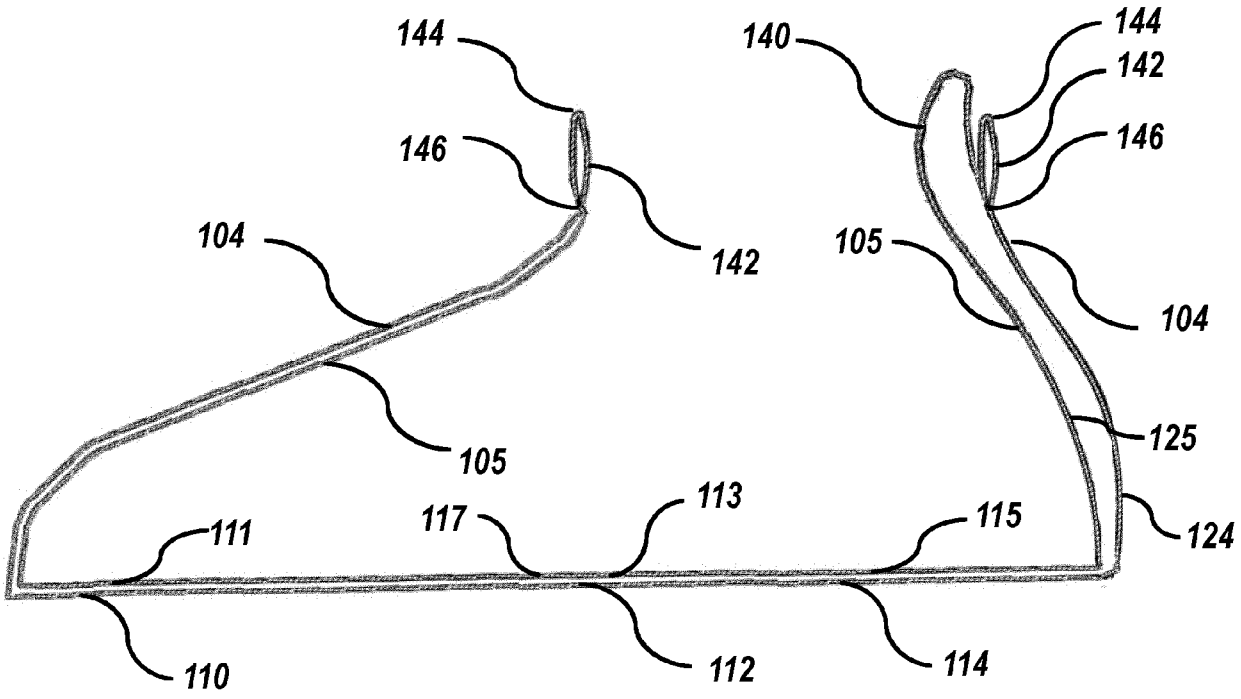
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FIG. 20

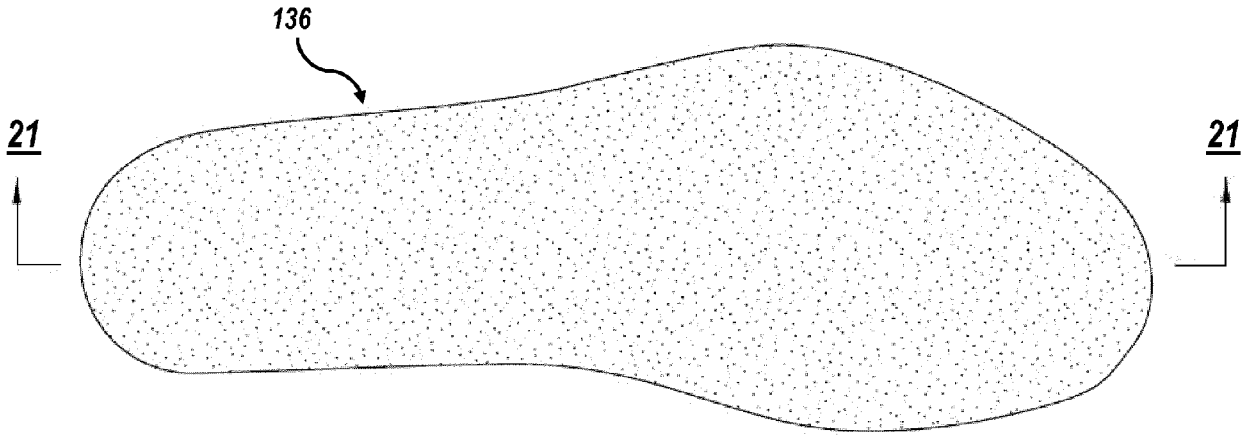


FIG. 21

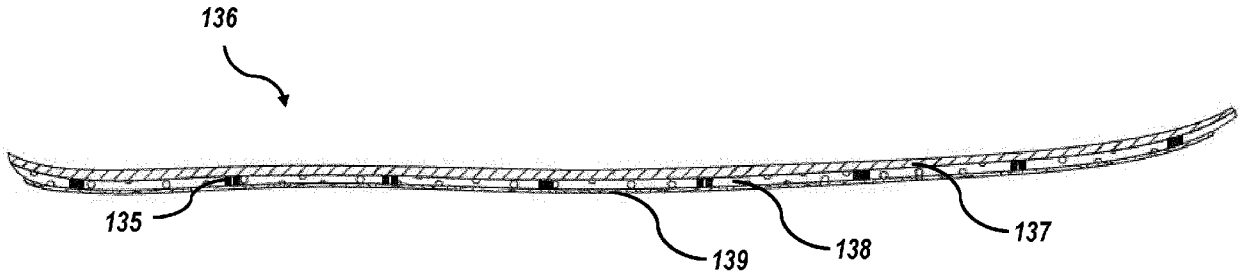


FIG. 22

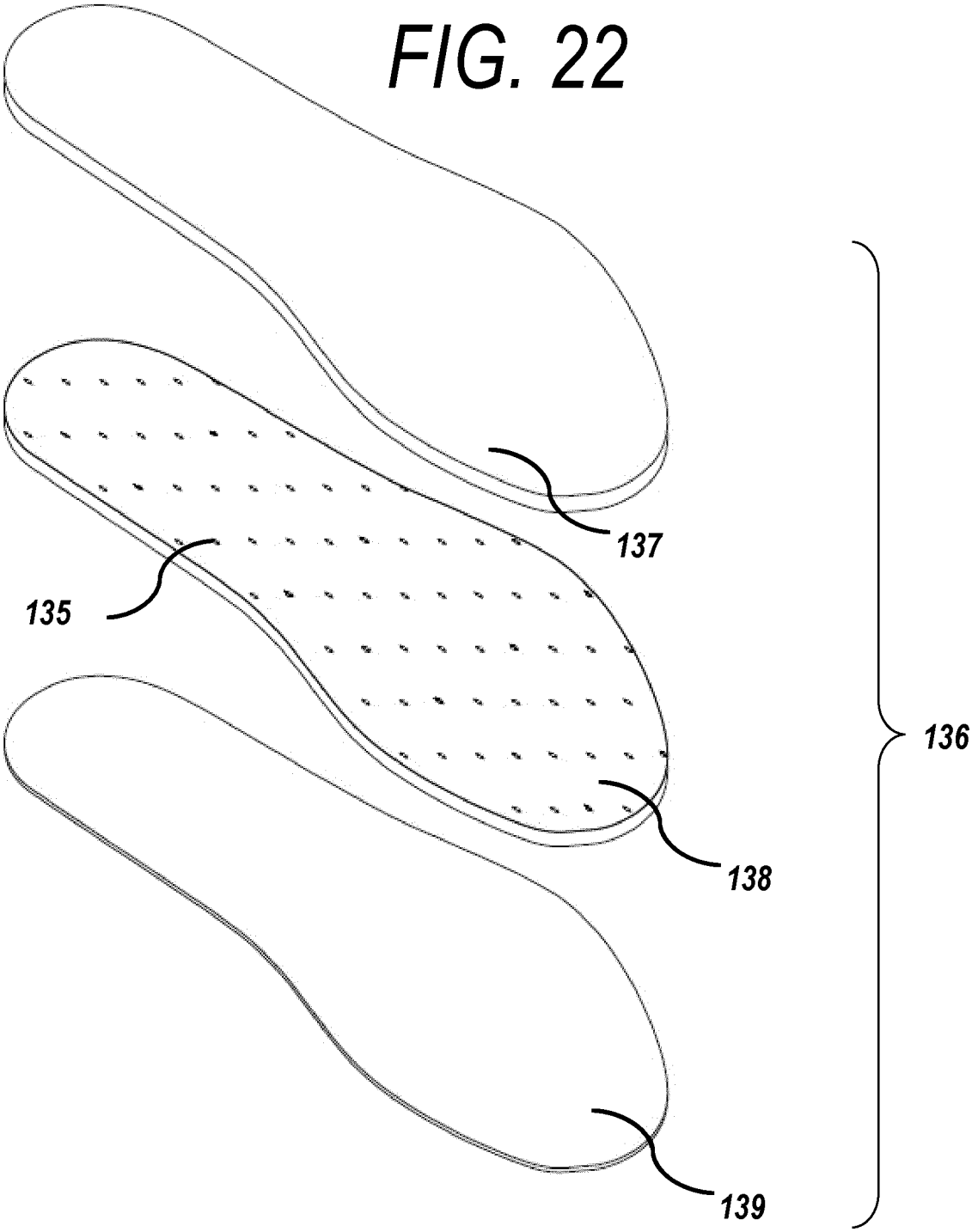


FIG. 23

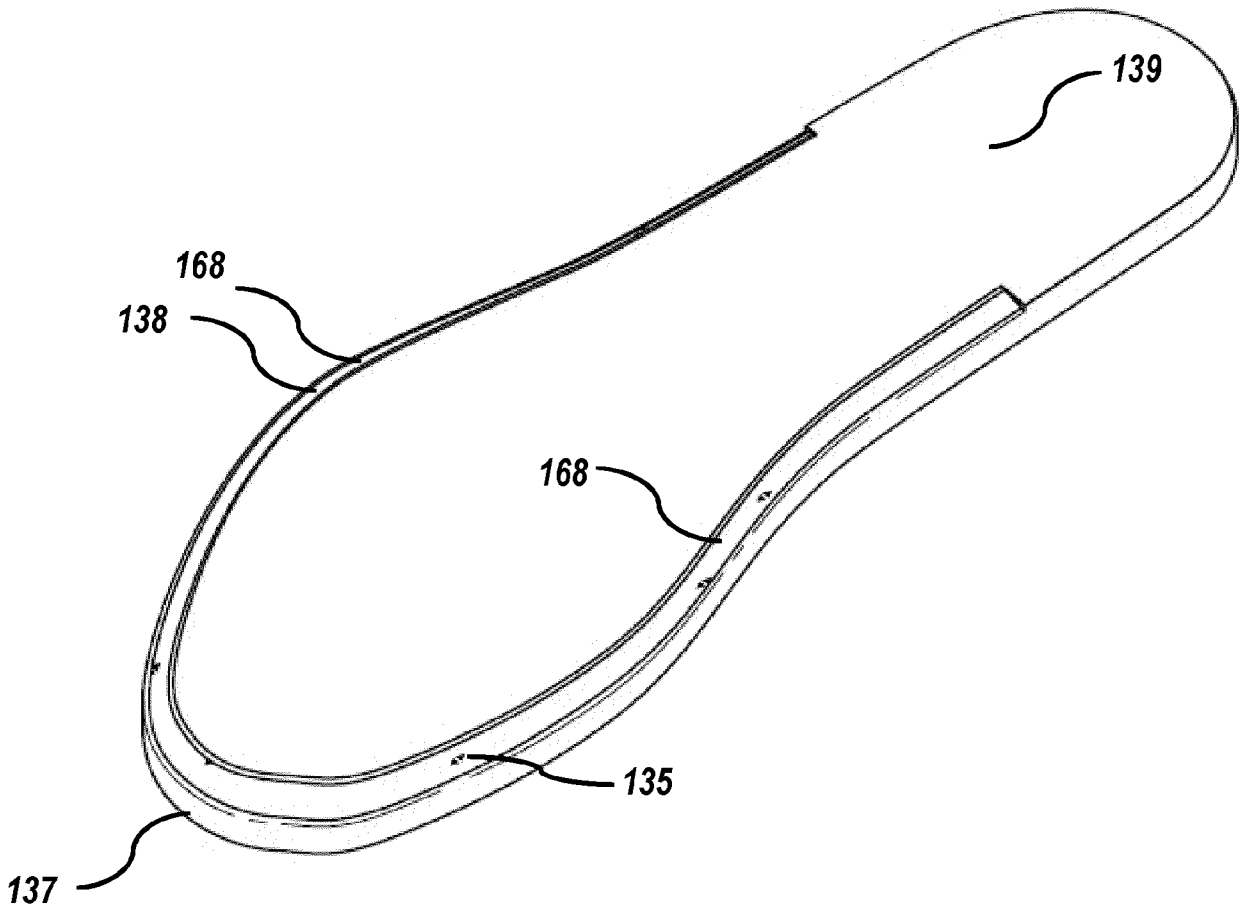


FIG. 24

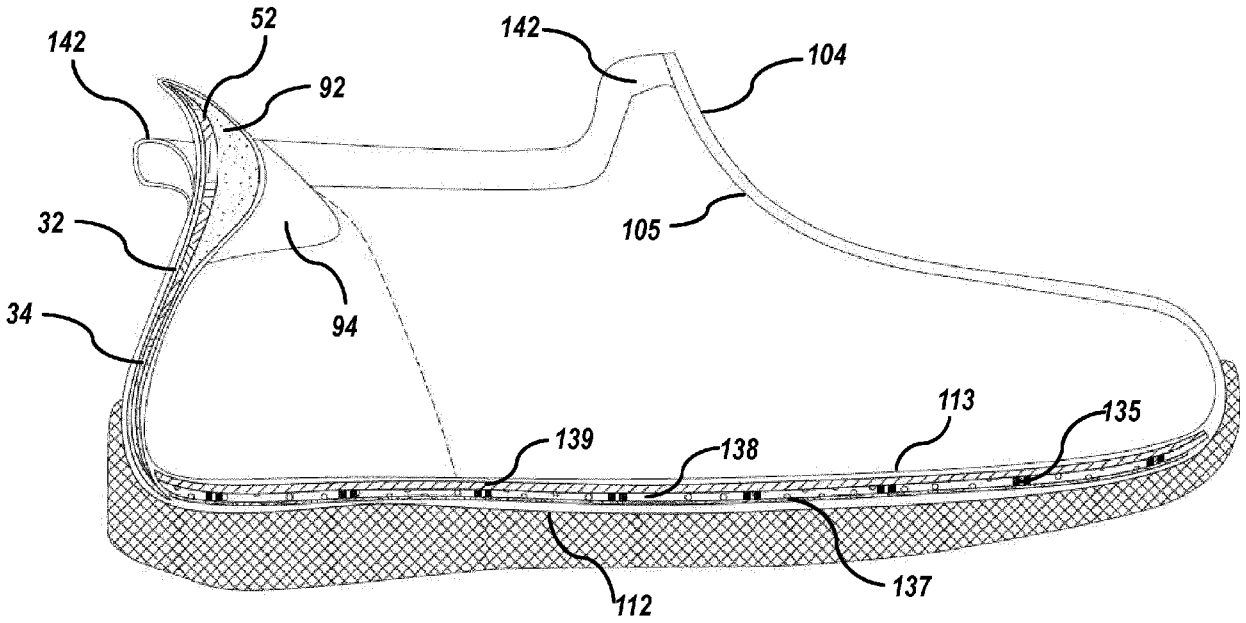
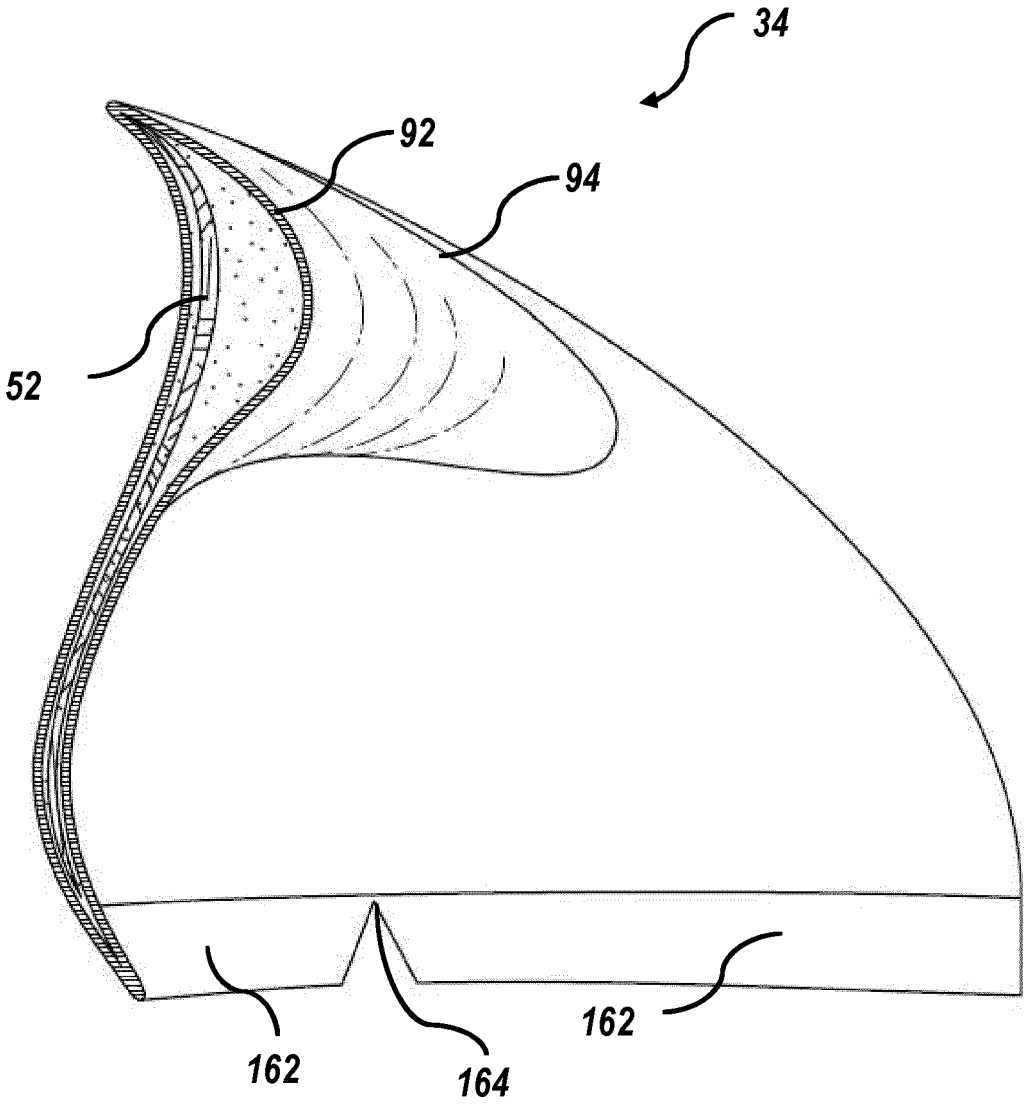


FIG. 25



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EUROPEAN SEARCH REPORT

Application Number
EP 24 18 6464

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2018/332920 A1 (BURCH JOHN H [US]) 22 November 2018 (2018-11-22) * abstract * * paragraphs [0001], [0006] - [0064] * * figures 1-9 *	1-13	INV. A43B1/04 A43B11/00 A43B11/02 A43B23/02 A43B23/08
A	CN 108 968 234 A (HAO ZHI) 11 December 2018 (2018-12-11) * the whole document *	1-13	A43B23/04

TECHNICAL FIELDS SEARCHED (IPC)

A43B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 November 2024	Espeel, Els

CATEGORY OF CITED DOCUMENTS

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21-11-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2018332920 A1	22-11-2018	NONE	
CN 108968234 A	11-12-2018	CN 108968234 A	11-12-2018
		CN 109393642 A	01-03-2019

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- US 2022046726 W **[0001]**
- US 19926223 **[0001]**
- US 19925023 **[0001]**
- US 19927423 **[0001]**