

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(10) International Publication Number

WO 2018/026957 A1

(43) International Publication Date
08 February 2018 (08.02.2018)(51) International Patent Classification:
A43C 1/04 (2006.01) A43C 5/00 (2006.01)
A43C 3/00 (2006.01) A43C 11/00 (2006.01)

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(21) International Application Number:
PCT/US2017/045165(22) International Filing Date:
02 August 2017 (02.08.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/370,032 02 August 2016 (02.08.2016) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

(54) Title: TENSION MEMBER GUIDES OF A LACING SYSTEM

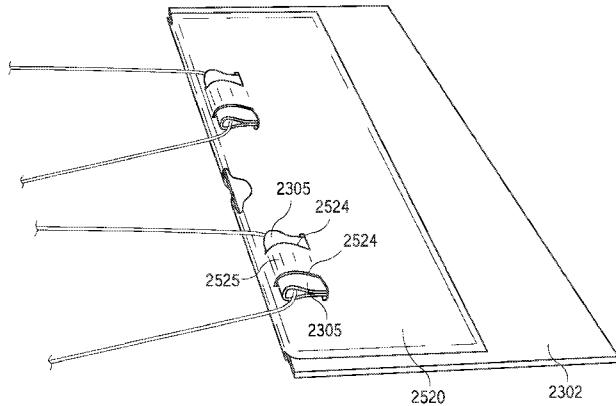


FIG. 27C

(57) **Abstract:** A tension member guide (2750) that is configured to direct or route a tension member (2770, 3010, 3102, 3104, 3202, 3204, 3303) about a path of an article (1300, 1410) includes a cover member (2500, 2520, 2540, 2752) and a guide member (1210, 1402, 1510, 1512, 1802, 2006, 2300, 2400, 2760) that is partially covered by the cover member (2500, 2520, 2540, 2752). The cover member (2500, 2520, 2540, 2752) is attachable to the article (1300, 1410) and includes a pair of slits or incisions (2754). The guide member (1210, 1402, 1510, 1512, 1802, 2006, 2300, 2400, 2760) is folded (2010) along a longitudinal length to form a loop (1212, 410) or channel (1102, 2408, 2762, 3210) within which the tension member (2770, 3010, 3102, 3104, 3202, 3204, 3303) may be inserted. The guide member (1210, 1402, 1510, 1512, 1802, 2006, 2300, 2400, 2760) is positioned in relation to the cover member (2500, 2520, 2540, 2752) so that opposing end portions (2763) of the loop (1212, 410) or channel (1102, 2408, 2762, 3210) are inserted through



HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

Published:

— *with international search report (Art. 21(3))*

TENSION MEMBER GUIDES OF A LACING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Provisional U.S. Patent Application Number 62/370,032 filed August 2, 2016, entitled “Tension Member Guides of a Lacing System;” 5 the entire disclosure of which is hereby incorporated by reference, for all purposes, as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] The embodiments described herein are generally related to closure or tightening systems, devices, and methods for closing and/or tightening an article. The embodiments 10 are specifically related to guide or components that are used to route a tension member or lace about a path of the article.

[0003] Closure or tightening systems are commonly used to tighten and close an article. For example, a reel based mechanism may be used to close or tighten footwear. A knob of the reel based mechanism is typically coupled with a spool that includes a 15 channel around which a lace is wound as the knob is rotated by the user. The reel based mechanism may include teeth that engage, or another ratchet type mechanism, that prevent counter-rotation of the spool and/or knob. A tension member is typically attached to the reel based mechanism so that rotation of the knob by the user causes tensioning of the tension member. The tension member is typically routed along a path 20 of the article via one or more guide members, such as eyelets in conventional footwear.

BRIEF DESCRIPTION OF THE INVENTION

[0004] The embodiments described herein provide various tension member guides that may be employed to direct or route a tension member or lace about a path of an article and to or from a tightening mechanism. According to one aspect, the tension member 25 guide may include a main body and a guide member. The main body may be coupleable to the article, such as footwear, and may include a pair of slits or incisions. The guide member may be folded along a longitudinal length to form a loop or channel within which the tension member may be inserted. The looped guide member may have a center

portion and two end portions that are disposed on opposite sides of the center portion. The guide member may be positioned on the main body so that each end portion of the two end portions is inserted through one slit or incision of the pair of slits or incisions such that the two end portions are positioned on an opposite side of the main body from 5 the center portion. The main body may be folded over the guide member so that the guide member, other than the two end portions, is positioned between opposing sides of the main body. A reinforcement member may be attached to the main body and to a proximal end of the guide member.

[0005] When the tension member guide is coupled with footwear, the two end portions 10 of the guide member may be positioned on an interior side of an upper of the footwear. A surface or face of the main body may include a material that is heat weldable to the footwear in order to enable easy coupling of the tension member guide to the footwear. In some embodiments, the main body may include an additional pair of slits or incisions and an additional guide member may be positioned on the main body so that opposing 15 end portions of the additional guide member are inserted through the additional pair of slits or incisions. In such embodiments, the opposing end portions of the additional guide member may be positioned on an exterior surface of the main body and the two end portions of the guide member may be positioned on an interior surface of the main body.

[0006] A method of coupling a tension member guide with a shoe or footwear includes 20 providing the tension member guide and coupling the tension member guide with the footwear. The tension member guide includes a main body that includes a pair of slits or incisions and a guide member that is folded along a longitudinal length to form a loop or channel within which a tension member may be inserted. The guide member has a center portion and two end portions that are disposed on opposite sides of the center portion and 25 the guide member is positioned on the main body so that each end portion of the two end portions is inserted through one slit or incision of the pair of slits or incisions such that the two end portions are positioned on an opposite side of the main body from the center portion. The tension member guide may be coupled with the footwear so that the two end portions are positioned near an eyestay edge of the footwear.

[0007] The method may also include inserting the tension member through the loop or channel of the guide member and/or folding the main body over the guide member so that the guide member, other than the two end portions, is positioned between opposing sides of the main body. The method may further include heat welding a surface or face of the
5 main body to the footwear. The tension member guide may also include a reinforcement member that is attached to the main body and to a proximal end of the guide member.

The tension member guide may be coupled with the footwear so that the two end portions of the guide member are positioned on an interior side of an upper of the footwear. The main body may also include an additional pair of slits or incisions and an additional guide
10 member may be positioned on the main body so that opposing end portions of the additional guide member are inserted through the additional pair of slits or incisions.

[0008] According to another aspect, a tension member guide includes a first member and a second member. The first member has a longitudinal length and a lateral width and the second member is folded along a longitudinal length to form a loop or channel within
15 which a tension member may be inserted. The looped second member has a center portion and two end portions disposed on opposite sides of the center portion. The second member is formed of a lower friction material than the first member and the second member is coupled with the first member so that the second member is positioned atop one side of the first member.

20 **[0009]** The folded second member may be shorter longitudinally than the first member so that a proximal end of the tension member guide is thinner than a distal end of the tension member guide. The first member may not be folded over the looped end of the second member. The second member may be folded so that opposing longitudinal ends of the second member are longitudinally offset from one another. The first member may
25 include a material that is heat weldable to an article. The second member may include an outer material and an inner material, in which the outer material is configured to provide structural support and the inner material is configured to provide a low friction surface. In some embodiments, the tension member guide also includes a third member that is

positioned atop a proximal end of the second member so that the proximal end of the second member is disposed between the first member and the third member.

[0010] A method of coupling a tension member guide with an article, such as a shoe or footwear, includes providing a tension member guide and coupling the tension member guide with the article. The tension member guide includes a first member having a longitudinal length and a lateral width and a second member that is folded along a longitudinal length to form a loop or channel. The second member has a center portion and two end portions that are disposed on opposite sides of the center portion. The second member is formed of a lower friction material than the first member and the second member is coupled with the first member so that the second member is positioned atop one side of the first member.

[0011] The method may also include inserting a tension member through the loop or channel of the folded second member and/or heat welding the first member to the article. The first member may not be folded over a looped end of the second member and/or the tension member guide may also include a third member that is positioned atop a proximal end of the second member so that the proximal end of the second member is disposed between the first member and the third member.

[0012] According to another aspect, a tension member guide includes a material body having a channel formed therein and a reinforcement material that is disposed within the channel of the material body to reinforce the material body. The material body is folded to form a loop or channel within which a tension member may be inserted. The material body may be formed of a woven material and/or the reinforcement material may include reinforcing fibers or fiber bundles.

[0013] The material body may include a plurality of channels and the reinforcement material may be distributed among the plurality of channels so that a density of the reinforcement material within the plurality of channels is greater nearer to a center portion of the material body. The increased density of the reinforcement material near the center portion of the material body may cause the tension member guide to exhibit an increased flexing or bowing toward opposing end portions of the material body in

response to tensioning of the tension member. A low friction material may be positioned on an inner surface of the loop or channel of the folded material body.

[0014] A method of coupling a tension member guide with an article, such as a shoe or footwear, may include providing a tension member guide and coupling the tension member guide with the article. The tension member guide may include a material body having a channel formed therein and a reinforcement material that is disposed within the channel of the material body to reinforce the material body. The material body may be folded to form a loop or channel within which a tension member may be inserted. The method may also include inserting the tension member within the loop or channel formed in the folded material body.

[0015] The material body may include a plurality of channels and the reinforcement material may be distributed among the plurality of channels so that a density of the reinforcement material within the plurality of channels is greater nearer to a center portion of the material body in comparison with opposing end portions of the material body. The material body may be formed of a woven material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The present invention is described in conjunction with the appended figures:

[0017] **Figs. 1A-B** illustrate lace guides that may be used to route or direct a tension member or lace about a path of an article.

[0018] **Figs. 2A-C** illustrate additional lace guides that may be used to route or direct a tension member or lace about a path of an article.

[0019] **Figs. 3A-B** illustrate the lace guide of Fig. 2A attached to the upper of a shoe.

[0020] **Figs. 4A-C** illustrate a lace guide that is configured to provide a decreased frictional engagement between the lace guide and a lace that is inserted through the lace guide.

[0021] **Fig. 5** illustrates various lace guide configurations that may be employed to achieve a desired tensioning of an article.

[0022] **Fig. 6** illustrates a lace guide with a lace inserted through the lace guide so as to be guided and directed thereby.

[0023] **Fig. 7** illustrates effects of frictional engagement between a lace and a lace guide along a lace path of an article.

5 [0024] **Fig. 8** illustrates a representation of an article that is fitted with lace guides having an engineered degree of stretch or elasticity.

[0025] **Fig. 9** illustrates the lace guides of Fig. 8 being stretched or tensioned due to tensioning of a lace.

10 [0026] **Figs. 10A-C** illustrate a lace guide that is configured to be easily and quickly attached to an article.

[0027] **Figs. 11A-C** illustrate a lace guide that exhibits an engineered flex or stretch in response to tensioning of a lace.

[0028] **Fig. 12** illustrates a component that enables a lace guide to be quickly and easily attached to an article.

15 [0029] **Figs. 13A-D** illustrate various embodiments of attaching the component of Fig. 12 to an article.

[0030] **Fig. 14** illustrate an exemplary positioning of a guide member within an article.

[0031] **Figs. 15A-B** illustrate guide components that may be directly welded or attached to mesh material of an article.

20 [0032] **Figs. 16A-E** illustrate embodiments in which a weld area of a guide component is utilized to tighten or tension the mesh of an article in a desired manner.

[0033] **Fig. 17** illustrates several guide components coupled with mesh material of a shoe.

25 [0034] **Figs. 18A-C** illustrate a guide component that is formed via coupling a guide member between two material layers.

[0035] **Fig. 19** illustrates the guide components of Figs. 18A-C attached to shoe.

[0036] **Figs. 20A-D** illustrate a transition component that may be attached to an article to provide a transition between portions of the article and/or to conceal a guide positioned under the transition component.

5 [0037] **Figs. 21A-B** illustrate another embodiment of a transition component that may be used to hide or conceal a guide member and/or provide a relatively smooth transition between portions of an article.

10 [0038] **Figs. 22A-C** illustrate another embodiment of a transition component that may be used to hide or conceal a guide member and/or provide a relatively smooth transition between portions of an article.

[0039] **Figs. 23A-D** illustrate another guide member that may be used to route or guide a tension member about an article.

[0040] **Figs. 24A-B** illustrate another guide member that may be used to route or guide a tension member about an article.

15 [0041] **Figs. 25A-D** illustrate cover members that may be positioned over a lace guide to hide or conceal the lace guide and/or to reinforce the coupling of the lace guide with an article.

[0042] **Figs. 26A-D** illustrate a process of attaching the cover member of Fig. 25A to a shoe's upper.

20 [0043] **Figs. 27A-J** illustrate various embodiments of tension member guides that may be coupled with an article to direct or route a tension member about a path of the article.

[0044] **Figs. 28A-C** illustrate a shoe that is knitted or woven in a manner that results in different portions of the shoe bending, flexing, or moving in response to tensioning of a tension member.

25 [0045] **Figs. 29A-B** illustrate embodiments of knitted or woven sections of a shoe that may be employed to achieve a desired and conforming fit of the shoe.

[0046] **Figs. 30A-D** illustrate various methods of attaching a knitted or woven section of material to a reel based tensioning device.

[0047] **Figs. 31A-D** illustrate various methods of attaching a knitted or woven section of material to a tension member and/or reel based tensioning device.

5 [0048] **Fig. 32** illustrates a front cross section of a shoe, in which a distal end of a knitted or woven material section and a tension member are disposed within a sole of the shoe.

[0049] **Figs. 33A-E** illustrate various embodiments of attaching a knitted or woven material section to a tension member.

10 [0050] **Figs. 34A-B** illustrate alternative tightening mechanisms that may be employed to tension a tension member.

[0051] In the appended figures, similar components and/or features may have the same numerical reference label. Further, various components of the same type may be distinguished by following the reference label by a letter that distinguishes among the 15 similar components and/or features. If only the first numerical reference label is used in the specification, the description is applicable to any one of the similar components and/or features having the same first numerical reference label irrespective of the letter suffix.

DETAILED DESCRIPTION OF THE DRAWINGS

20 [0052] The ensuing description provides exemplary embodiments only, and is not intended to limit the scope, applicability or configuration of the disclosure. Rather, the ensuing description of the exemplary embodiments will provide those skilled in the art with an enabling description for implementing one or more exemplary embodiments. It being understood that various changes may be made in the function and arrangement of 25 elements without departing from the spirit and scope of the invention as set forth in the appended claims.

[0053] The embodiments described herein provide embodiments of guides or components (hereinafter guides) that may be used to route or direct a tension member or

lace about a path of an article, such as footwear. The tension member may be a lace or cord that is tensionable via operation of a tightening mechanism. The tension member may be routed about an article, via the guides, so that tensioning of the tension member causes the article to close and/or tighten. Specifically, the tension member may be routed 5 along and across an opening of the article so that tensioning of the tension member urges one side of the opening toward an opposite side of the opening in order to close and tighten the article. Various forms of footwear (e.g., shoes, boots, and the like) include such an arrangement of a tension member and guides. For example, conventional shoes and boots commonly employ shoelaces that are routed about the shoe's tongue and that 10 are tensioned to urge opposing sides of the tongue toward one another to close and tighten the shoe/boot about the user's foot.

[0054] The guide is generally positioned near the opening of the article, such as on opposing sides of the eyestay, and directs, routes, or guides the tension member along and/or across the opening. The guide may be made of a low friction material that 15 minimizes frictional engagement of the tension member and guide. The guides described herein are generally formed of a fabric or webbing type materials that is folded over to form a loop. The tension member is inserted within the loop and the loop functions to guide or direct the tension member about the path. Additional details of the guide members are described in greater detail below.

[0055] As briefly described above, the lace is tensioned via a tightening mechanism. In 20 a specific embodiment, the tightening mechanism is a reel based closure system. The reel based closure system includes a knob that may be grasped and rotated by a user to tension the lace. Exemplary embodiments of reel based closure devices are further described in U.S. Patent Application No. 13/098,276, filed April 29, 2011, titled "Reel Based Lacing 25 System", U.S. Patent Application No. 14/328,521, filed July 10, 2014, titled "Closure Devices Including Incremental Release Mechanisms and Methods Therefor," and U.S. Patent Application No. 12/623,362, filed November 20, 2009, titled "Reel Based Lacing System", the entire disclosures of which are incorporated by reference herein.

[0056] In another embodiment, the tightening mechanism is a motorized device or mechanism that tensions the tension member or lace. An exemplary embodiment of a motorized mechanism that may be used to tension the lace is further described in U.S. Patent Application No. 14/015,807, filed August 30, 2013, titled “Motorized Tensioning System for Medical Braces and Devices”, the entire disclosure of which is incorporated by reference herein.

[0057] In yet other embodiments, the tightening mechanism may be a pull cord type device that is configured to be grasped and pulled by a user to tension the lace. Exemplary pull cord devices are further described in U.S. Patent Application No. 10 14/166,799, filed January 28, 2014, and titled “Lace Fixation Assembly and System”, the entire disclosure of which is incorporated by reference herein. For ease in describing the various embodiments herein, the tightening mechanism will be referred to generally as a “reel assembly” or “reel based closure device”.

[0058] Referring now to Figs. 1A-B, illustrated are two lace guides that may be used to route or direct a lace 101 about a path. Fig. 1A illustrates a conventional lace guide 102. Lace guide 102 is formed of a fabric or webbing material that is folded backward to form a loop within which the lace 101 is inserted. The fabric or webbing material of the lace guide 102 is a solitary or single fabric material. Tensioning of the lace 101 causes opposing ends 103 of the lace guide 102 to flex and bend as illustrated. Because the lace guide 102 is made of a single or solitary material, the tension imposed or part on the lace guide 102 from the lace 101 is concentrated near the opposing ends 103, as illustrated by the tension vectors T. As illustrated, the tension T is greatest in the opposing ends 103 of the lace guide 102 and is reduced toward the center of the lace guide 102. Because the tension T is greatest near the opposing ends 103 of the lace guide 102, the lace guide 102 may experience significantly more wear near the opposing ends 103. The increased tension T experienced near the opposing ends 103 may also cause the lace guide 102 to pinch, bunch, or squeeze inward to some degree as illustrated.

[0059] As illustrated in Fig. 1B, the tension T imparted on the lace guide 108 may be more uniform if the lace guide 108 is formed to have a varying elasticity between the

opposing ends 103. The varying elasticity may be achieved by forming the lace guide of various elastic materials or sections. Specifically, Fig. 1B illustrates a lace guide 108 having a middle material or section 110 (hereinafter middle section 110), a first end material or section 112 (hereinafter first end section 112), and a second end material or section 114 (hereinafter second end section 114). The elasticity of the middle section 110 is different than either or both the first end section 112 and the second end section 114. Typically, the middle section 110 has less elasticity, stretch, or flexibility (i.e., is more rigid) than either the first end section 112 or the second end section 114. Stated differently, the first end section 112 and second end section 114 are more elastic, flexible, or stretchable than the middle section 110. As such when the lace 101 is tensioned, the first end section 112 and second end section 114 stretch, flex, or otherwise deform to a greater degree than the middle section 110. The varying elastic sections of the lace guide 108 enable the lace guide 108 to form a more natural U-shaped curve in response to tensioning of the lace 101. In this manner, the first end section 112 and second end section 114 function as a buffer or transition zone between the opposing ends 103 and the middle section 110 of the lace guide 108. As a result, the tension T that is more uniform across the lace guide 108 and less concentrated on the opposing ends 103 in comparison with the conventional lace guides 102. The uniform tension profile results in less wear and a longer life of the lace guide 108.

20 [0060] In some embodiments, the middle section 110 of the lace guide 108 is made of a different material than either or both the first end section 112 and the second end section 114. For example, the middle section 110 may be made of a material having significantly less elasticity than either or both first end section 112 or second end section 114. The first end section 112 and second end section 114 may be made of a material having a similar elasticity. In such an embodiment, the first end section 112 and second end section 114 may flex, stretch, or deform by a similar amount or in a similar manner in response to tensioning of the lace 101. In other embodiments, the first end section 112 may be made of a material that is different than, and/or that has a different elasticity than, the second end section 114. In such embodiments, the flexing, stretching, or deformation 25 of the first end section 112 may be different than that exhibited or experienced by the

second end section 114. For example, the middle section 110 and first end section 112 may be made of the same less elastic material while the second end section 114 is made of a more elastic material. In such embodiments, only the second end section 114 may stretch, flex, or deform to a greater degree than the middle section 110. Exemplary 5 materials for the middle section 110 include: Nylon, Polyester, Polyethylene, Polypropylene, etc. Exemplary materials for the first end section 112 and/or second end section include: Nylon that is blended with Lycra[®], Spandex, Elastane, etc.; Thermoplastic Polyurethane (TPU); TeflonTM; Vulcanized Rubber; etc.

[0061] The first end section 112, middle section 110, and second end section 114, are 10 formed so that the lace guide 108 is a single and solitary guide rather than three separate guides or materials positioned adjacent one another. The single and solitary lace guide 108 may be formed by weaving the more elastic materials of the first end section 112 and second end section 114 with the less elastic material of the middle section 110. In this manner, the elastic materials of the first end section 112 and second end section 114 may 15 be integrally formed with the less elastic material of the middle section 110. In other embodiments, the first end section 112 and/or second end section 114 may be separate material layers from the middle section 110. In such embodiments, the separate material layers may be coupled with a common backing via heat pressing, RF or sonic welding, and the like.

[0062] In yet other embodiments, the middle section 110, the first end section 112, and the second end section 114 may be made of the same material. The increased elasticity of the first end section 112 and or second end section 114 may be formed or constructed by varying the weave or pattern of the material. For example, the middle section 110 may have a relatively tight weave or pattern of the material while the first end section 112 and/or second end section 114 have a relatively loose weave or pattern. This may allow 25 the first end section 112 and/or second end section 114 to stretch or flex to a greater degree even though the lace guide 108 is made entirely of a single material.

[0063] The middle section 110 may also aid in preventing bunching of the lace guide 108 toward the center of the guide. For example, the less flexible material of the middle

section 110 may reinforce the guide 108 and help counteract inward forces that are exerted on the opposing ends 103 due to tensioning the lace 101. The middle section 110 may be engineered to counteract such forces by weaving the material in an engineered manner and/or by selecting appropriate materials that are able to resist compressive forces. The decreases bunching of the guide 108 may help maintain a uniform tension T laterally across the guide 108.

5 [0064] Referring now to Figs. 4A-C, illustrated is an embodiment of a lace guide 400 that is configured to provide a decreased frictional engagement between the lace guide 400 and a lace inserted through the lace guide. The lace guide 400 may be a lace guide 10 that is made of a single material, such as the lace guide 102 of Fig. 1A, or may be a lace guide that is made of multiple materials or sections, such as the lace guide 108 of Fig. 1B. Figs. 4A and 4B illustrate the lace guide 400 having a middle section 404, a first end section 402, and a second end section 406. Each of these sections may be made of the same material or different materials as previously described.

15 [0065] The use of the more elastic materials, such as in the lace guide 108 of Fig. 1B, may increase the frictional engagement of the lace and lace guide due to the increase deformation or stretching of the elastic material. To counteract this increased frictional engagement, or to merely decrease the frictional engagement of any lace guide, the lace guide 400 includes a low friction material 408 that is positioned laterally across the 20 middle section 404, the first end section 402, and the second end section 406. In some embodiments, the low friction material 408 may extend laterally across the lace guide 400 between the opposing ends. In other embodiments, the low friction material 408 may extend outward from the opposing ends of the lace guide 400 or may terminate shy of the 25 opposing ends so that the low friction material 408 is entirely enclosed within the lace guide 400 between the opposing ends (not shown).

[0066] The low friction material 408 typically extends along only a portion of a longitudinal length of the lace guide 400 (e.g., X direction) rather than along the entire longitudinal length of the lace guide 400. Stated differently, the low friction material 408 is typically shorter longitudinally than the lace guide 400. This configuration may reduce

the overall thickness of the lace guide 400 when the lace guide his coupled or attached to a shoe. For example, Fig. 4C illustrates that when the guide 400 is folded over on itself, a thickness Z is reduced due to the low friction material 408 not extending to where the opposing surfaces of the material make contact (i.e., near point 112). This configuration 5 also reduces the amount of low friction material that is required, which may reduce manufacturing costs and/or increase manufacturability. In other embodiments the low friction material 408 may extend along the entire longitudinal length of the lace guide 400 as desired.

[0067] In any embodiment, the low friction material 408 is typically attached or 10 coupled with the inner surface of the lace guide 400. As illustrated in Fig. 4C, the low friction material 408 is positioned so as to be centrally located within a loop 410 formed in the lace guide 400. The low friction material 408 extends substantially or nearly entirely around the loop 410 formed in the lace guide 400 so as to be in direct contact with a lace (not shown) that is positioned within the loop 410 of the lace guide 400. In 15 this manner, the lace contacts and slides against and along the low friction material 408 rather than against and along the middle section 404, the first end section 402, and or the second end section 406. Because the low friction material 408 has a lower coefficient of friction than either the middle section 404, the first end section 402, or the second end section 406, the frictional engagement of the lace and a lace guide 400 is significantly 20 reduced. Exemplary materials that may be used for the low friction material 408 include: Polytetrafluoroethylene (TeflonTM); Polypropylene; High-density Polyethylene (HDPE); Ultra High Molecular Weight Polyethylene (Dyneema[®]); etc.

[0068] As further illustrated in Fig. 4C, the low friction material 408 terminates short of a stitch or coupling line 412, which represents a point of line at which the lace guide 25 408 is attached to footwear or another article. In this manner, the thickness Z of the lace guide 408 at the stitch or coupling line is reduced or minimized.

[0069] Referring now to Fig. 6, illustrated is a lace guide 602 with a lace 604 inserted through the lace guide 602 so as to be guided and directed thereby. As illustrated when the lace 604 is tensioned, a force F_{lace1} is exerted on one end of the lace 604 while a force

F_{lace2} is exerted on the opposite end of the lace 604. Tensioning of the lace 604 causes a frictional engagement of the lace 604 and the lace guides 602. The frictional force exhibited between the lace 604 and the lace guide 602 may be a dynamic force that is dependent on one or more of the following factors: the lace tension, the material of lace guides 602, the sliding of the lace 604 through the lace guides 602, and various other factors. In some instances, the frictional force may be more equivalent to a frictional drag force rather than a conventional frictional force experienced between two solid objects. The frictional engagement of the lace 604 and the lace guide 602 is denoted as F_{Drag} . The force F_{lace2} is essentially equivalent to the force F_{lace1} and the frictional engagement F_{Drag} of the lace 604 and lace guide 602.

[0070] The frictional engagement F_{Drag} between the lace 604 and the lace guide 602 may cause a “loading” of lace tension in a distal portion or end of the lacing system. For example, referring briefly to Fig. 7, as the lace 704 is tensioned, the lace 704 may slide through the lace guides, 706 & 708, that are positioned in the upper portion of the lace path as the lace urges opposing eyestays of the shoe together. The lace 704 similarly slides through the lace guides, 710 & 712, positioned in the middle portion of the lace path, and slides through the lace guides, 714 & 716, positioned in the lower portion of the lace path, but the lace 704 slides through these lace guides to a lesser degree respectively due to the loss in lace tension as a result of frictional engagement with the respective lace guides.

[0071] As the user flexes their foot in the footwear, such as by walking, running, bending, and the like, the footwear’s tongue is typically flexed forward and into engagement with the upper portion of the lace 704 – i.e., the portion of the lace 704 disposed near the guides, 706 & 708, positioned in the upper portion of the lace path. The result is a temporary increase in lace tension that causes the lace 704 to slide through each of the guides, 706-716. In some instances, the opposing eyestays near the upper portion of the lace path may flex outward while the opposing eyestays near the lower portion of the lace path are pulled inward, which may result in the opposing eyestays having a V-shape or other non-parallel shape as illustrated in Fig. 7.

[0072] Due to the frictional engagement of the lace 704 and the lace guides 706-716, the lace tension along the lace path may not be able to equalize and/or return to a relatively uniform state and thus, lace tension may be trapped or captured in the lower portion of the footwear. For example, since the frictional engagement F_{Drag} of the lace

5 704 and lace guides 706-716 is a function of the lace tension, once the lace tension in the lower portion of the lace path is temporarily increased, the frictional engagement F_{Drag} of the lace 704 and lower lace guides, 714 and 716, is correspondingly increased. The increased frictional engagement F_{Drag} of the lace 704 and lower lace guides, 714 and 716, may affect the lace's ability to slide within the lower lace guide, 714 and 716, thereby 10 locking or maintaining an increased lace tension in the lower portion of the lace path relative to the other portions of the lace path. Stated differently, if the temporary increase in lace tension causes an amount X of lace 704 to slide within the lower lace guides, 714 and 716, toward the upper lace path and lace guides, the increased frictional engagement F_{Drag} of the lace 704 and lower lace guides, 714 and 716, may result in an amount X 15 minus Y (i.e., $X - Y$) sliding within the lower lace guides, 714 and 716, in the opposite direction (i.e., away from the upper lace path and lace guides), where Y represents some nominal non-zero amount.

[0073] The result is that the length of lace L between the lower lace guides, 714 and 20 716, is shortened by an amount corresponding to Y , which results in an increased lace tension between the lower lace guides, 714 and 716. Stated differently, the length L represents the difference between the amount of lace (i.e., X) that slides through the lower lace guides, 714 and 716, toward the upper lace guides, 704 and 706, due to the increased lace tensioning, and the amount of lace (i.e., $X - Y$) that returns or slides back through the lower lace guides, 714 and 716, when the lace tension is relieved. The 25 inability of the lace 704 to slide back through the lower lace guides, 714 and 716, when tension is relieved is due to the increased frictional engagement F_{Drag} of the lace 704 and lower lace guides, 714 and 716.

[0074] As the above described process is repeated due to repeated running, walking, flexing, bending, and the like of the foot, the length of lace L between the lower lace

guides, 714 and 716, may continue to be decreased, thereby resulting in a continued increase in the lace tension and shoe tightening adjacent this portion of the lace 704. A similar, although typically less dramatic, effect may occur in the middle lace guides, 710 and 712, which may result in the opposing eyestays having a constant V-shape 5 configuration, or non-parallel shape, as illustrated in Fig. 7.

[0075] An effect of this process may be that a greater lace tension is locked, captured, or maintained in the lower portions of the lace path in comparison to the upper portions of the lace path. For example, as illustrated in Fig. 7, the lower portion of the lace path may experience a lace tension of Z lbs, whereas the middle portion of the lace path may 10 experience a lace tension of Y lbs, and the upper portion of the lace path may experience a lace tension of X lbs. In some instances, Y lbs may be equal to X lbs plus some nominal non-zero amount, and Z lbs may be equal to Y lbs plus some nominal non-zero amount. In other instances, Y lbs and X lbs may be relatively the same and Z lbs may be appreciably greater than X lbs and/or Y lbs.

15 [0076] In shoes and other footwear, the result of the above described process is a pinching, tightening, or constriction of the lower portion of the lace path about a user's foot, which is commonly positioned near the toe-box. Accordingly, the user may experience some level of discomfort after extended periods of time when wearing such shoes or footwear.

20 [0077] The above issues may be alleviated or eliminated by employing lace guides that have an engineered amount of stretch. The engineered stretch results in some of the lace tension stretching the guide longitudinally rather than causing the lace to slide through the guide. As a result, the lace and guide system may experience less sliding of the lace through the guide and/or more stretching of the guide, in comparison with conventional 25 guides, due to a temporary tensioning of the lace. This may result in less locking of the lace tension in the lower portion of the lace path, such as adjacent the toe box.

[0078] Fig. 8 illustrates a representation of a shoe that is fitted with lace guides having an engineered degree of stretch or elasticity. Specifically, the shoe employs a first pair of lace guides 802a that are positioned in the upper portion of the lace path, a second pair of

lace guides 802b that are positioned in the middle portion of the lace path, and a third pair of lace guides 802c that are positioned in the lower portion of the lace path. The first set of lace guides 802a are configured or engineered to have or exhibit a stretch S_a (represented by spring element 804a). The second set of lace guides 802b are configured 5 or engineered to have or exhibit a stretch S_b (represented by spring element 804b) and the third set of lace guides 802c are configured or engineered to have or exhibit a stretch S_c (represented by spring element 804c).

[0079] Fig. 9 illustrates the lace guides with the engineered stretch (i.e., guides 802a-802c) being stretched due to tensioning of the lace 810. The tensioning of the lace 810 10 may be a temporary tensioning due to walking, running, jumping, or various other activities after the lace is initially tensioned via a reel based device or other tensioning mechanism. The temporary tensioning may cause the shoe's tongue to flare or widen in response to the foot moving within the shoe. The widening or flaring of the tongue may cause the first set of lace guides 802a to experience a load or tensioning force of A lbs, 15 which causes the first set of lace guides 802a to elastically stretch by an amount ΔX . The widening or flaring of the tongue may similarly cause the second set of lace guides 802b and the third set of lace guides 802c to experience a load or tensioning force of B lbs and C lbs, respectively, which causes the respective guides to elastically stretch by an amount ΔY and ΔZ , respectively.

[0080] The elastic stretching of the second set of lace guides 802b and/or the third set 20 of lace guides 802c is typically less than the elastic stretch of the first set of lace guides 802a, although the stretch of any of the lace guides may be engineered to exhibit a desired stretch. The elastic stretching of the lace guides, 802a-c, results in significantly less slippage or sliding of the lace 810 through the respective lace guide. Rather than the 25 lace sliding through the guides, increases in the lace tension, and specifically instant and temporary lace tension increases, causes the lace guides 802a-c to elastically stretch. As such, dynamic changes in lace tension are transferred to and stored as spring or elastic energy in the guide rather than as the frictional force F_{Drag} previously described.

[0081] The elastic stretching of the lace guides 802a-c results in a more parallel lace path as illustrated in Fig. 9, even when the lace tension is dynamically adjusted, such as in response to the user's foot moving within the shoe. The elastic stretching of the lace guides, 802a-c, also results in significantly less sliding of the lace through the lower most 5 set of lace guides (i.e., 802c), which results in less lace tension being locked or captured in the lower portions of the lace path adjacent the toe box. This may increase the user's comfort in wearing the shoe.

[0082] For example, the lower portion of the lace path adjacent the third set of lace guides 802c may experience a lace load or tension of Z lbs while the middle portion of 10 the lace path adjacent the second set of lace guides 802b experiences a lace load or tension of Y lbs and the upper portion of the lace path adjacent the first set of lace guides 802a experiences a lace load or tension of X lbs. The lace loads or tensions, X lbs, Y lbs, and Z lbs may be more uniform and/or similar than those experienced in shoes that employ conventional lace guides and thus, the shoes may be more comfortable to wear.

15 [0083] While Fig. 9 illustrates the lace path employing three sets of guides with an engineered stretch, it should be realized that the lace path may employ more or fewer lace guide sets as desired. Also, in some embodiments it may be possible to utilize the stretch of the lace guides to lock in lace tension in a desired area. For example, the lace may be initially tensioned by a desired amount in one portion of the shoe and the lace tension 20 may be locked or maintained in that portion of the shoe via the elastic stretching of the lace guides. For example, a lace guide with a desired engineering stretch may be employed in the middle portion of the shoe and used to separate the lace tension in the lower portion of the shoe from the upper portion of the shoe. The stretching of the lace guide may ensure that lace tensions in the upper portion of the shoe are not transferred to 25 the lower portion of the shoe and vice versa. The stretchable lace guides may be employed in various configurations with non-stretchable lace guides as desired to achieve any desired fit and/or performance of the shoe.

[0084] Referring now to Figs. 2A-C, illustrated are embodiments of lace guides 200 that may be employed on a shoe. The lace guides 200 may be similar to any of those

described herein, such as by employing a less frictional inner surface or liner and the like. As illustrated in Fig. 2A, the lace guide 200 includes an elongated body. The elongated body may have an engineered stretch as previously described. In some embodiments, the engineered stretch may vary along the longitudinal length of the guide 200, such as by 5 being more flexible or more stiff near the lace 202.

[0085] The lace guide 200 is designed to be attached to the shoe along its longitudinal length in order to achieve a designed effect. For example, the lace guide 200 may be attached to the shoe at a first point 212a that is near the lace 202, at a second point 212c that is near the shoe's sole, and/or at a third point 212b that is positioned between the first 10 point 212a and the second point 212c. Attaching the lace guide 200 to the shoe at these or various other points effects how the lace guide 200 functions within the shoe as further described in Figs. 3A-B. Fig. 2B illustrates that the lace guide 200 may be coupled with the shoe so that a main body of the lace guide 200 is disposed under an upper 210 of the shoe and so that a distal end of the lace guide 200 protrudes through a slit or opening 214 of the upper 210. Fig. 2C illustrates that multiple lace guides 200 may be attached to the 15 shoe in the manner illustrated in Fig. 2B. This configuration may be employed so that the majority of the lace guide 200 remains hidden from view.

[0086] Referring now to Figs. 3A-B, illustrated is the lace guide 200 attached to the upper 210 of a shoe. Fig. 3B shows the inner surface of the upper 210 and various points 20 that the lace guide 200 may be attached to the inner surface of the upper 210.

Specifically, Fig. 3B illustrates a first coupling point 212a, a second coupling point 212c, and a third coupling point 212b as previously described. Coupling the lace guide 200 at one of the various points effects how the lace guide 200 functions. For example, if the lace guide is attached to the upper 210 at the first coupling point 212a, the elastic stretch 25 of the lace guide 200 is decreased and/or the force of the lace guide 200 on the upper 210 is exerted closer to the shoe's tongue. In contrast, if the lace guide 200 is attached to the upper 210 at the second lace coupling point 212b, the elastic stretch of the lace guide 200 is significantly greater and/or the force of the lace guide 200 on the upper 210 is exerted closer to the shoe's sole.

[0087] Unlike the illustration of Fig. 2B, the lace guide 200 is illustrated in Figs. 3A-B as being entirely disposed underneath the upper 210. In this configuration, the lace 202 extends from the lace guide 200 and through the slit 214 in the upper 210. The configuration of Figs. 3A-B ensures that the lace guide 200 is entirely hidden from view, 5 which may be visually appealing or desired amongst some users.

[0088] Fig. 5 illustrates various lace guide configurations that may be employed to achieve a desired tensioning of an article, such as a shoe. For example, a relatively short lace guide 502 may be employed when minimal attachment space is available and/or when little to no stretch of the lace guide is desired. In other embodiments, an elongated 10 lace guide 504 may be employed when significantly more stretching is desired and/or when it is desirable to distribute the closure force along a length of the shoe. In other embodiments, a lace guide 506 may be employed that has a wider bottom portion in comparison with an upper portion. This lace guide 506 may be employed when it is desirable to distribute the closure force laterally about the shoe and specifically about the 15 bottom portion of the guide 506. In yet other embodiments, a lace guide 508 may have a reverse hourglass configuration having a wider midsection than either the top or bottom sections. This configuration may be employed when tensioning of a middle portion of the shoe is desired.

[0089] Referring now to Figs. 10A-C, illustrated is an embodiment of a tension 20 member guide or lace guide 1000 (hereinafter lace guide 1000) that is configured to be easily and quickly attached to an article, such as a shoe, and that is configured to direct or route a tension member or lace about a path of the article. The lace guide 1000 includes a first material member or inner member 1004 (hereinafter inner member 1004), a second material member or middle member 1006 (hereinafter middle member 1006), and a third material member or outer member 1002 (hereinafter outer member 1002). The inner 25 member 1004 includes a longitudinal length, a lateral width, a first face that is positionable against the article, and a second face that is opposite the first face. The middle member 1006 is typically positioned between and coupled to the outer member 1002 and the inner member 1004, although in some embodiments the outer member 1002

may be omitted. The middle member 1006 functions as the component of the lace guide 1000 that contacts the lace (not shown) and guides or routes the lace along a path of the article. The middle member 1006 is typically made of a less frictional material in comparison with the outer member 1002 and the inner member 1004, since the middle 5 member 1006 operationally contacts or engages the lace.

[0090] In some embodiments, the middle member 1006 comprises an outer material layer and an inner material layer, similar to the configuration illustrated in Fig. 4A. The outer material layer may be a more firm or rigid material than the inner material layer in order to reinforce or structurally support the inner material layer. The inner material 10 layer may be the low frictional material that engages and directly contacts the lace. In an exemplary embodiment, the outer material layer may be a Nylon material and the inner material layer may be a Teflon material. In other embodiments, the middle member 1006 may be a single material layer that is both low friction and structurally strong. For example, the middle member 1006 may be a Nylon/Teflon blend material layer.

15 [0091] In any embodiment, the middle member 1006 is sandwiched between and coupled to the outer member 1002 and the inner member 1004. The middle member 1006 is folded along a longitudinal length to form a loop or channel within which the lace is inserted. The looped middle member 1006 has a center portion and two end portions along a lateral width with the two end portions being disposed on opposite sides of the 20 center portion as illustrated. When coupled with the outer member 1002 and the inner member 1004, the middle member 1006 is longitudinally shorter than the outer and inner members as illustrated. This configuration allows a proximal end of the lace guide 1000 to be thinner than a distal end of the lace guide 1000. Specifically, Fig. 10C illustrates a side profile of the lace guide 1000 and shows that the proximal end of the lace guide 25 1000 has a thickness T_1 , which is significantly thinner than a thickness T_2 of the distal end of the lace guide 1000. The middle member 1006 may be positioned between the outer member 1002 and the inner member 1004 so that opposing ends of the middle member 1006 are offset from one another as shown. This configuration provides a gradual transition, rather than an abrupt transition, between the thicker distal end T_2 and

the thinner proximal end T_1 . As illustrated, when the middle member 1006 is coupled with the inner member 1004, the middle member 1006 is longitudinally aligned with the inner member 1004 and is positioned atop of the second face of the inner member 1004.

[0092] Fig. 10B illustrates the assembled components of the lace guide 1000. As

5 illustrated, the outer member 1002 and the inner member 1004 typically do not extend or fold over the middle member 1006 so that a top or looped end of the middle member 1006 remains exposed. In this configuration, the middle member 1006, which is the component of the lace guide 1000 that directly contacts and guides/routes the lace may be unencumbered by the outer and inner members, 1002 and 1004. As such, the middle
10 member 1006 may be free to flex, bend, adjust, or conform to the lace as the lace is tensioned. In such embodiments, the outer member 1002 and the inner member 1004 may be used mainly to reinforce the middle member 1006 and/or to attach the middle member 1006 to the article. In some instances, the middle member 1006 may be pivotable outward from the inner member 1004 along a coupling line formed via stitching
15 1008. In other embodiments, the outer member 1002 and the inner member 1004 may extend partially or fully over the middle member 1006 as desired. In some embodiments, a top end of the outer member 1002 may be positioned proximally of the top or looped end of the middle member 1006. A top end of the inner member 1004 may be substantially even with the top or looped end of the middle member 1006.

20 **[0093]** Since the lace guide 1000 is made of several components, stitching 1008 may be used to initially attach the various components together. The stitching 1008 may be inserted through the outer member 1002 and inner member 1004 and through a proximal portion of the middle member 1006. In other embodiments, the various members may be initially coupled via welding (heat, RF, sonic, and the like), adhesive bonding, mechanical fastening, or via any other known method. The proximal ends of the outer member 1002 and the inner member 1004 may be similarly attached via stitching, welding, bonding, and the like.
25

[0094] An inner surface 1010 of the inner member 1004 is configured to easily and quickly couple with the article. For example, the inner surface 1010 of the inner member

1004 may include an adhesive layer that enables the inner member 1004 to quickly attach to an article via heat welding, sonic welding, adhesive bonding, and the like. In a particular embodiment, the lace guide 1000 may be attached to the inner surface of a shoe's upper (not shown) by positioning the inner surface 1010 of the inner member 1004 5 against the inner surface of the upper and welding the two inner surfaces together.

Specifically, the inner surface 1010 may include a TPU material that allows the guide 1000 to be heat welded to the surface of the article.

[0095] Lace guide 1000 is a unitary component that may be quickly and easily attached to an article to form a path for routing or guiding a lace about the article. In some 10 embodiments, the middle member 1006 may be configured to more uniformly distribute lace tension as described herein.

[0096] A method of coupling the lace guide 1000 with an article includes providing a lace guide 1000 having a configuration as described above and coupling the lace guide 1000 with the article. The method also typically includes inserting a tension member 15 through the loop or channel formed in the middle member 1006. Coupling the lace guide 1000 with the article may include heat welding the inner member 1004 to the article.

[0097] Referring now to Figs. 11A-C, illustrated is an embodiment of a tension member guide or lace guide 1100 (hereinafter lace guide 1100) that exhibits an engineered flex or stretch. The lace guide 1100 is configured to direct or route a tension member or lace about a path of an article. The engineered flex of the lace guide 1100 is 20 formed via individual channels or lumens 1102 that are formed in a body of the lace guide 1100. The individual channels or lumens 1102 extend between a proximal end and a distal end of a material body of the lace guide 1100. The lace guide 1100 is woven in a manner that forms the individual channels or lumens 1102 within the material body. The 25 weft or fabric threads form walls 1104 in the fabric body that separate each of the individual channels 1102. Figs. 11A-C illustrate the lace guide 1100 having eight separate channels – i.e., channels 1102a-1102h, although it should be realized that more or fewer channels 1102 may be formed as desired.

[0098] As illustrated in Fig. 11C, the material body of the lace guide 1100 is folded between the proximal end and the distal end to form a loop or channel within which a tension member or lace 1110 (hereinafter lace 1110) may be inserted. The looped end of the material body has a central portion and opposing ends or end portions that are

5 disposed on opposite sides of the central portion as illustrated. The lace guide 1100 is configured to have more flexibility toward or at the opposing ends in comparison with the central portion of the lace guide 1100. This configuration enables the lace guide 1100 to curve and conform to the lace 1110 as the lace is tensioned, which results in a more even distribution of the lace tension over the lateral width of the lace guide 1100.

10 **[0099]** The increased flexibility of the opposing ends is achieved by stuffing or positioning a reinforcement material (e.g., fibers) within at least one channel 1102, and more commonly various channels 1102, of the lace guide's material body. The reinforcement material functions to reinforce the channels 1102 of the lace guide 1100 within which the reinforcement is positioned. Fig. 11B illustrates that fibers or fiber

15 bundles 1106 are inserted within some or all of the lace guide's channels 1102 in varying degrees. The stiffness of an individual channel 1102 increases as the number of fibers 1106 that are inserted within the channel – i.e., the fiber density within the channel – increases. Stated differently, the flexibility of an individual channel decreases as more and more fibers 1106 are positioned within the channel. This is due to the inserted fibers

20 functioning to reinforce a respective channel, which increases the stiffness and decreases the flexibility of the respective channel. As shown in Fig. 11B, the lace guide 1100 may be formed so that the central channels (i.e., channels 1102d and 1102e) have the greatest density of fibers 1106 (i.e., the most fibers 1106 positioned with the channel). The two channels immediately adjacent the central channels (i.e., channels 1102c and 1102f) may

25 have a slightly lower fiber density and the next two immediately adjacent channels (i.e., channels 1102b and 1102g) may have an even lower fiber density. The two outer channels (i.e., channels 1102a and 1102g) may have the lowest fiber density of all the channels. In this manner, the fiber density of the individual channels may gradually decrease laterally from the central portion of the lace guide 1100. As a results, as the lace

30 1110 is tensioned, the lace guide 1100 may flex and conform laterally outward from the

central portion of the lace guide 1100 in an engineered manner. The engineered flex or curvature may be designed to uniformly distribute the lace tension laterally across the lace guide 1100, which may greatly reduce lace wear on the guide.

[0100] The fibers 1106 are typically positioned within the channels 1102 during

5 weaving or formation of the lace guide 1100. Fig. 11A illustrates a representative embodiment of the fibers that may be positioned within the lace guide 1100.

Specifically, Fig. 11A illustrates that four fibers or fiber bundles may be positioned within the two central channels (1102d and 1102e), three fibers/fiber bundles may be positioned within the immediately adjacent channels (1102c and 1102f), two fibers may

10 be positioned within the next laterally adjacent channels (1102b and 1102g), and the two lateral most channels (1102a and 1102h) may be free of any fibers. The embodiment of Fig. 11A is for illustrative purposes only and is not intended to limit the lace guide 1100 to any specific configuration. Rather, as one of skill will recognize, the channel arrangement and fiber density may be varied as desired to achieve a desired flex or

15 curvature of the guide in response to lace tensioning.

[0101] The increasing fiber density toward the central portion of the lace guide 1100 also aids in preventing bunching of the lace guide 1100 toward the center of the guide.

For example, since the central channels are “stuffed” with more fibers, these channels are more readily able to resist inward compressive forces that are exerted on the lace guide

20 1100 by the lace 1110 under tension. The fiber density in the individual channels, 1102a-1102h, may be engineered to counteract the inward compressive forces and/or to provide a curvature or flex of the guide as desired. The decreased bunching of the guide 1100 and/or engineered flex/curvature may help maintain a uniform tension or load laterally across the guide 1100.

25 **[0102]** In some instances, the inner surface of the lace guide 1100 may include a low friction material that reduces frictional engagement of the lace 1110 and lace guide 1100. For example, the inner surface of the lace guide 1100 may have a configuration similar to Figs. 4A-C where a low friction material is positioned within a looped end of the guide 1100.

[0103] A method of coupling the lace guide 1100 with an article includes providing a lace guide 1100 having a configuration as described herein and coupling the lace guide 1100 with the article. The method also typically includes inserting the lace 1110 within the loop or channel formed in the folded material body of the lace guide 1100.

5 **[0104]** Referring now to Fig. 12, illustrated is an embodiment of a component 1200 that enables a lace guide to be quickly and easily attached to an article, such as a shoe. The component 1200 includes an attachment member 1202 and a guide member 1210. The guide member 1210 is folded over to form a loop 1212 through which a lace or tension member (not shown) is inserted. Opposing ends of the guide member 1210 are 10 attached to the attachment member 1202 via stitching 1214, adhesive bonding, welding (e.g., RF, heat, sonic, and the like), or via any other attachment method. An inner surface 1204 of the attachment member includes a material that aids in coupling the attachment member 1202 with the article. For example, the inner surface 1204 of the attachment member 1202 may include TPU or another material that aids in heat welding the 15 attachment member 1202 to the article. The inner surface 1204 may likewise include a pressure and/or heat sensitive material that aids in coupling the component 1200 with the article.

20 **[0105]** The attachment member 1202 provides a larger surface area that distributes any force or load applied to the guide member 1210 over a larger surface area, which helps ensure that the component 1200 does not detach from the article. In some embodiments, the surface that is opposite the inner surface 1204 (i.e., the outer surface) includes the attachment material. In such embodiments, the inner surface 1204 may be free of the attachment material. The component 1200 may be manufactured as separate individual units, which may be individually positioned about the article and coupled therewith to 25 form a lace path about the article.

[0106] Figs. 13A-C illustrate various embodiments of attaching the component 1200 to an article, such as a shoe. Fig. 13A illustrates an embodiment in which the component 1200 is attached to an article 1300. The article 1300 includes a pair of lace ports 1302 through which a lace 1304 is inserted. The component 1200 is positioned on the inner

surface of the article 1300 so that it is not visible from the article's exterior. The inner surface 1204 of the attachment component 1202 is coupled with the inner surface of the article 1300 so that the guide member 1210 is sandwiched between the inner surface of the article 1300 and the inner surface 1204 of the attachment member 1202. In other 5 embodiments, the outer surface (not numbered) of the attachment member 1202 may be attached to the inner surface of the article so that the guide member 1210 does not contact the inner surface of the article 1300.

10 [0107] The component 1200 is positioned about the article 1300 so that the loop end or edge 1220 is recessed from an edge 1310 of the article 1300. Ideally the loop edge 1220 is positioned so that when tensioned, a natural curvature of the lace 1304 causes the lace 1304 to be positioned roughly centrally through the lace ports 1302 as illustrated. Positioning the component 1200 in this manner reduces the frictional engagement of the lace 1304 with the lace ports 1302. Specifically, the configuration reduces or prevents the lace 1304 from rubbing against the top, bottom, or side edges of the lace ports 1302.

15 [0108] Fig. 13B illustrates the component 1200 positioned within the article 1300 so that the loop edge 1220 is nearer to the lace ports 1302. Specifically, the loop edge 1220 is positioned so that it is adjacent a centerline 1306 of the lace ports 1302. The loop edge 1220 may be offset from the centerline 1306 by a distance X_1 , which distance may be less than the radius of the lace ports 1302. In other embodiments, the loop edge 1220 may be 20 substantially equal with the centerline 1306 of the lace ports 1302. In some embodiments, the edges or corners of the guide member 1210 may be visible through the lace ports 1302. In any embodiment, the component 1200 should be positioned within the article 1300 so that the lace 1304 is positioned roughly centrally within the lace ports 1302 when the lace 1304 is tensioned. The configuration of Fig. 13B may be especially 25 useful when the lace 1304 is extremely flexible or bendable.

[0109] Fig. 13C illustrates an embodiment in which the component 1200 is disposed within the article 1300 so that the loop edge 1220 is significantly offset from the centerline 1306 of the lace ports 1302. The loop edge 1220 is offset from the centerline 1306 by a distance X_2 , which is significant enough that the component is far removed

from the lace ports 1302. Similar to the previous embodiments, the component 1200 is ideally positioned so that the lace 1304 is positioned roughly centrally through the lace ports 1302 when tensioned. The configuration of Fig. 13C may be especially useful for lace that is less flexible and thus, requires a greater distance to flex, bend, or curve

5 through the guide member 1210.

[0110] Fig. 13D illustrates the attachment component 1200 positioned on an inner surface of the shoe 1350 so that the component 1200 is not visible from the shoe's exterior. The inner surface 1204 of the component 1200 may be coupled with the inner surface of the shoe 1350 so that the guide member 1210 is sandwiched between the inner surface of the shoe 1350 and the inner surface 1204 of the attachment component 1200.

10 The shoe 1350 includes multiple attachment components 1200 that are arranged about the shoe 1350 to guide a lace 1304 that is positioned along a path about the shoe 1350. Fig. 13D illustrates the lace 1304 in a tensioned state where the loop edge 1220 is positioned near a centerline of the lace ports 1302. In this state, the lace 1304 is positioned roughly

15 centrally through the lace ports 1302 so that frictional engagement of the lace 1304 and lace ports 1302 is minimized. In an un-tensioned state, the loop edge 1220 may be recessed from the centerline of the lace ports 1302.

[0111] Referring now to Fig. 14, illustrated is an ideal positioning of the guide member 1402 within an article 1410. Specifically, the guide member 1402 is positioned so that a distal edge 1406 of the guide member 1402 is roughly central relative to a lace port 1412 when a lace 1404 is tensioned. For example, the lace port 1412 may have an opening width of Y and the distal edge 1406 of the guide member 1402 may be positioned at roughly $Y/2$ in relation to an upper material of the article 1410. This configuration aids in positioning the lace 1404 roughly centrally through the lace port 1412 when the lace is tensioned, which reduces frictional contact or engagement of the lace 1404 with the lace ports 1412 and article 1410.

[0112] Referring now to Figs. 15A-B, illustrated are embodiments of guide components 1510 that may be directly welded or attached to mesh material of an article, such as a shoe. Fig. 15A illustrates a guide component 1510 that includes a guide

member 1512 that is attached to an attachment member 1514. The attachment member typically has a surface area that is larger than the guide member 1512. The attachment member 1514 attaches to the mesh 1502 of the article and helps to distribute any load or force that is imposed on the guide member 1512 due to tensioning of a lace (not shown).

5 Similar to other embodiments, the guide member 1512 is folded over to form a loop through which the lace is inserted, and the guide member 1512 is attached to the attachment member 1514.

[0113] The attachment member 1514 is coupled to the mesh 1502. The attachment member 1514 is typically welded (e.g., heat welded, sonic welded, RF welded, and the like) to the mesh material 1502, although various other forms of attachment are possible, such as adhesive bonding and the like. When the attachment member 1514 is welded to the mesh 1502, a weld area is formed, which is illustrated by the cross-hatch section 1520 of Fig. 15A (hereinafter weld area 1520). The weld makes the weld area 1520 significantly more hard or rigid in comparison with the non-welded mesh 1502. The weld area 1520 defines a non-stretch area or portion of the mesh 1502, which may be utilized to tension or tighten the article as described herein below.

[0114] Fig. 15B illustrates a different embodiment of the guide component 1510. The guide component 1510 is similar to that illustrated in Fig. 15A except that the guide component 1510 does not include an attachment member (i.e., 1514). Rather, the guide component only includes a guide member 1512 that is directly coupled to the mesh 1502. In an exemplary embodiment, the guide member 1512 is coupled to the mesh 1502 via welding, which forms a weld area 1520 that is non-stretchable and may be used to influence the fit or tightening of the article in a desire manner. Fig. 15B also illustrates that the looped end of the guide member 1512 may be positioned through a slit or aperture 1506 so that the looped end is on an opposite side of the mesh 1502 from the remainder of the guide member 1512.

[0115] Referring now to Figs. 16A-E, illustrated are embodiments in which the weld area 1520 is utilized to tighten or tension the mesh 1502 in a desired manner. It is believed that the weld area 1520 affects the mesh 1502 when the weld area 1520 is

tensioned by the lace. Specifically, it is believed that when tension is applied to the weld area 1520, the area or portion of the mesh 1502 that is positioned opposite the applied force is distorted or stretched while the portion of the mesh 1502 that is positioned laterally adjacent the weld area 1520 and applied force is not distorted or stretched. As such, when the weld area 1520 is tensioned, most of the tension force is transferred to the mesh 1502 that is positioned opposite the applied force and is not applied to the laterally adjacent mesh. This effect may be exploited to tension a shoe in a unique manner.

[0116] Fig. 16A illustrates a guide component 1510 that is welded to the mesh 1502 of an article, such as a shoe. A weld area 1610 is formed on the mesh 1502 in the shape of an elongated U. The weld area 1610 forms an isolated zone or region 1612 between opposing sides of the elongated U in which the mesh 1502 is not welded together. The weld area 1610 may extend to the bottom of the mesh 1502 or may terminate proximally therefrom as desired. It is believed that the weld area 1610 will cause tensioning and/or stretching of the isolated zone 1612 when the guide member 1510 is tensioned. The portion of the mesh 1502 that is positioned laterally outside the weld area 1610 will experience significantly less tensioning or stretch than the isolated zone 1612 and thus, the weld area 1610 functions similar to a dividing member that divides the mesh 1502 into a tensionable portion and a non-tensionable portion. In such embodiments, the weld area 1610 and isolated zone 1612 will function similar to an independent panel when the lace is tensioned.

[0117] Fig. 16B illustrates another embodiment in which the guide component 1510 is welded to the mesh 1502 via a weld that forms a weld area 1520. The weld area 1520 is similar in size and shape to the guide member 1510. As shown in Fig. 16C, tensioning of the guide component 1510, via lace 1622, tensions a zone or portion 1620 of the mesh 1502 that is positioned immediately opposite the weld area 1520. Fig. 16D illustrates yet another embodiment of a guide component 1510 that is welded to mesh 1502 in a manner that defines a V-shaped weld area 1630. As shown in Fig. 16E, it is believed that tensioning of the guide component 1510 via the lace 1622 will tension a zone or portion 1620 of the mesh that is positioned immediately opposite the weld area 1630. The

tensioned zone or portion 1620 may extend downward through the mesh from the opposite ends or arms of the weld area 1630. The mesh material 1502 that is positioned outside the tensioned zone or portion 1620 may be significantly less tensioned or stretched than the mesh 1502 positioned within the tensioned zone or portion 1620. As 5 such, the weld area 1630 may be utilized to uniquely tension the mesh material 1502 in a desired manner.

[0118] It should be realized that the configurations of Figs. 16A-E are illustrative only and are not intended to limit the concept to any one particular configuration. Rather, a 10 person of skill will readily recognize that various other weld area configurations may be formed to tension the mesh material in a desired manner. Stated differently, the mesh 1502 may be uniquely tensioned by forming a desired weld area 1520 when attaching the guide member 1510, which will cause desired portions of the mesh 1502 to be selectively tensioned.

[0119] Fig. 17 illustrates several guide components 1510 coupled with mesh material 1704 of a shoe 1700. Specifically, two guide components 1510 are illustrated as coupled 15 with one side of the shoe 1700. Each guide component 1510 is welded to the mesh 1704 to form an elongated U-shaped weld area 1710 that defines an isolated region 1712 as previously described. The configuration of Fig. 17 results in relatively independent 20 tensioning or stretching of each isolated zone 1712, which pulls or wraps the mesh 1704 around and about the foot in a more form fitting manner. The isolated zones 1712 may be similar in function to independent straps that would be pulled tightly around the user's foot.

[0120] Each guide component 1510 is operationally coupled with a tension member or lace 1702, which is in turn operationally coupled with a reel based tightening mechanism 25 1706. Operation of the tightening mechanism 1706 (i.e., rotational winding of a knob component) causes the lace 1702 to be tensioned, which in turn tensions each of the guide components 1510 and mesh material 1502 in the isolated zones 1712.

[0121] Referring now to Figs. 18A-C, illustrated is an embodiment of a guide component 1810 that is formed via coupling a guide member 1802 between two material

layers. The guide member 1802 is a tube section having a lumen through which a lace is inserted. The guide member is positioned between an upper material layer 1804 and a lower material layer 1806. The guide member 1802 is usually bent or curved so as to guide or route the lace along a desired radius or curvature. In a specific embodiment, the 5 guide member 1802 may be formed of a woven sheath material.

[0122] The upper material layer 1804 is attached to the lower material layer 1806 so that the guide member 1802 is fixedly positioned there between. The upper material layer 1804 and the lower material layer 1806 may be coupled together via adhesive bonding, stitching, and the like. In an exemplary embodiment, the upper material layer 10 1804 and the lower material layer 1806 are coupled via welding (e.g., heat, sonic, RF, and the like). Once formed, the guide component 1810 may be attached to an article, such as a shoe, to form a lace path and to guide or route a tension member or lace along the lace path.

[0123] Fig. 19 illustrates a plurality of the guide components 1810 of Figs. 18A-C 15 attached to shoe 1900. The guide components 1810 form a lace path about a tongue of the shoe 1900. The lace 1902 is routed or guided along the lace path via the guide components 1810. The lace 1902 is operatively coupled with a reel based tightening mechanism 1904 in a manner that effects tensioning of the lace 1902 when the tightening mechanism 1904 is operated.

[0124] Referring now to Figs. 20A-D, illustrated is an embodiment of a transition component 2000 that may be attached to a shoe or article to provide a transition between portions of the shoe, such as between the shoe's upper and the tongue, and/or conceal or hide a guide that is positioned under the transition component 2000. The transition component 2000 includes a proximal portion 2004 that is attached to the shoe's upper 2002 near a distal edge of the upper 2002. The proximal end 2004 of the transition component 2000 may be stitched 2003, adhesively bonded, welded, or otherwise coupled with the upper 2002. In some embodiments, the proximal end 2004 may be folded at or 25 near the coupling point with the upper 2002.

[0125] The transition component 2000 also includes a distal end 2020 that is positioned on an opposite side of the upper 2002. The transition component 2000 may be folded 2010 between the proximal end 2004 and the distal end 2020 (hereinafter folded end 2010). In some embodiments, the folded end 2010 may be coupled together via stitching 5 2012, adhesive bonding, welding, and the like. The distal end 2020 is positioned under the upper 2002 so as to partially or fully cover a lace guide 2006 that is positioned under and coupled to the upper 2002. The stitching 2012, or other coupling, may help maintain the distal end 2020 in position under the upper 2002 and over the lace guide 2006. The lace guide 2006 includes a looped end 2008 through which a lace or tension member is 10 inserted. In some embodiments, the distal end 2020 of the transition component 2000 is uncoupled or unattached from the upper 2002 so that the distal end 2020 is free floating under the upper 2002.

[0126] Fig. 20B illustrates a perspective view of the transition component 2000 coupled to the upper 2002. Fig. 20B illustrates a lace 2030 positioned through the looped 15 end 2008 of the guide member 2006. Fig. 20C illustrates a bottom perspective view of the transition component 2000. As illustrated, the transition component 2000 includes lace ports 2022 that are positioned near the folded end 2010. The lace 2030 is inserted through the lace ports 2022 so as to be accessible to the guide members 2006 positioned under the transition component 2000.

[0127] Fig. 20D illustrates the transition component 2000 coupled with a shoe 2040. The transition component 2000 is coupled with opposing uppers of the shoe and is positioned to traverse along the opposing eyestays of the shoe. As illustrated in the 20 detailed view, the distal end 2020 of the transition component 2000 is positioned between the guide member 2006 and the shoe's tongue 2042. The transition component 2000 25 hides or conceals the guide member 2006 that is positioned under the transition component 2000. The concealment of the guide member 2006 may provide a smooth, seamless, uniform, or otherwise appealing look or appearance to the upper. The transition component 2000 may also provide a relatively smooth transition between the guide member 2006 and the tongue 2042, thereby reducing frictional engagement

between the lace 2030 and the tongue 2042 and/or decreasing wear between these components.

[0128] The transition is achieved due to the lace 2030 being routed within the transition component 2000 and out of the lace ports 2022 rather than experiencing an abrupt 5 transition from the guide members 2006 to the tongue 2042. The transition component 2000 may be made of a low friction material to further effect a smooth transition between the guide member 2006 and tongue 2042. The transition component 2000 may also conceal the guide member 2006 from view, thereby providing a sleek appearance of the upper that may be desired. The transition component 2000 of Figs. 20A-D is especially 10 useful in instances where the looped end of the guide member 2006 is positioned inward of the eyestay edge in which the lace may be pinched between the tongue 2042 and an inner surface of the upper 2002.

[0129] Referring now to Figs. 21A-B, illustrated is another embodiment of a transition component 2100. The transition component 2100 is similar to that illustrated in Figs. 15 20A-D in that the transition component 2100 includes a proximal end 2004 and a distal end 2020. The proximal end 2004 is coupled to the upper 2002 as previously described. The transition component 2100 also include lace ports 2022 through which the lace 2030 is routed. Unlike the transition component 2000 of Figs. 20A-D, the transition component 2100 of Figs. 21A-B does not include a folded end 2010. Rather, the distal 20 end 2020 extends laterally outward from the upper 2002. When attached to a shoe (not shown), the distal end 2020 of the transition component 2100 would lie atop the shoe's tongue. The lace 2030 would slide atop the transition component 2100 and enter the lace ports 2022 to access the guide member 2006, which may be positioned under the upper 2002 as illustrated, or atop the upper 2002 as desired. The transition component 2100 of 25 Figs. 21A-B is especially useful in instances where the looped end of the guide member 2006 is positioned at or near the eyestay edge.

[0130] Referring now to Figs. 22A-C, illustrated is another transition component 2200 that may be used to hide or conceal a guide member and/or provide a relatively smooth transition between portions of a shoe. As illustrated in Fig. 22A, the transition

component 2200 is similar to the transition component 2000 of Figs. 20A-D in that the transition component 2200 includes a proximal end 2004, a distal end 2020, and a folded or looped end 2010 that is positioned between the proximal end 2004 and the distal end 2020. The proximal end 2004 and the distal end 2020 are both attached to the upper 2002 so that the guide member 2006 is fully enclosed within the transition component 2200. The folded end 2010 may not be stitched or otherwise coupled together. The stitching or coupling of the folded end 2010 may be unnecessary since the distal end 2020 is coupled with the inner surface of the upper 2002 and, thus, does not need to be held or maintained in position by the coupled folded end 2010. The distal end 2020 may be attached to the inner surface of the upper 2002 via stitching 2021, adhesive bonding, welding, and the like. In some instances, a coupling 2005 may attach the proximal end 2004 to the upper 2002 near an edge of the upper.

[0131] Fig. 22B illustrates a perspective view of the transition component 2200. Fig. 22B illustrates that lace ports 2015 are formed in the folded end 2010 of the transition component 2200. The lace ports 2015 provide a more direct or linear access to the guide member 2006. Fig. 22C illustrates the transition component 2200 attached to a shoe. The detailed view illustrates the distal end 2020 positioned between the shoe's tongue 2042 and the guide member 2006. The stitched 2021, or otherwise coupled, distal end 2020 ensures that the distal end 2020 remains positioned between the tongue 2042 and the guide member 2006. The transition component 2200 hides or conceals the guide member 2006 and/or provides a smooth transition between the tongue 2042 and the guide member 2006 and may be ideally suited for configurations that require more direct lace access to the guide members 2006.

[0132] Referring now to Figs. 23A-D, illustrated is another guide member or component 2300 that may be used to route or guide a lace or tension member about a shoe. Figs. 23A-B illustrate that the guide member 2300 is formed by positioning a looped or folded material strip 2304 (hereinafter material guide 2304) within a window or cut away portion 2306 of a material body 2302. The window 2306 may be cut into the material body 2302 so that the size and shape of the window 2306 corresponds to the size

and shape of the material guide 2304. A proximal edge of the material guide 2304 is coupled with an inner edge of the material body 2302 via stitching 2308, adhesive bonding, welding, and the like. In some instances, the proximal end of the material guide 2304 may have a temporary coupling 2310 in order to maintain the material guide 2304 in the folded or looped configuration. The material guide 2304 may be positioned within the window 2306 and coupled with the material body 2304 so that a distal edge of the material guide 2304 is aligned with a distal end of the material body 2302 as illustrated. The material body 2302 may include multiple guides that are positioned longitudinally along or about the material body as illustrated. The positioning of the material guide 2304 within the window 2306 reduces the overall thickness of the guide member 2300 since the material guide 2404 is not positioned atop of material body 2302.

[0133] Fig. 23C illustrates a cover material 2312 that is positioned over the guide member 2300 and material guides 2304. The cover material 2312 hides or conceals the material guides 2304 so that they are not visible from the exterior of the cover material 2312. The cover material 2312 may also reinforce the coupling of the material guides 2304 and the material body 2304. The cover material 2312 may partially cover 2314 the guides or may fully cover 2316 the guides as desired.

[0134] Fig. 23D illustrates the guide member 2300 attached to an upper of a shoe 2320. In some instances, the shoe's upper functions as the material body 2302 and the material guides 2304 are positioned within windows 2306 that are formed in the upper. The cover material 2312 may then be positioned atop the upper and material guides 2304 and attached to the upper to cover and conceal the material guides 2304. In other embodiments, the material body 2302 is attached to the upper material of the shoe 2320.

[0135] The guide member 2300 is positioned along opposing eyestays of the shoe 2320 so that the guide members 2304 are able to guide or route a lace 2322 along a path across the shoe's tongue. The individual guide members 2304 are hidden or concealed from view via the cover material 2312 that is positioned atop the guide member 2300. In some instances, the cover material 2312 may wrap around the shoe's eyestay and be attached to the outer and inner surfaces of the upper.

[0136] Referring now to Figs. 24A-B, illustrated is another embodiment of a guide member 2400 that may be used to route or guide a lace about a path. The guide member 2400 includes an outer material body 2402 and an inner material body 2406 with a looped or folded material guide 2404 disposed there between. The material guide 2404 is 5 positioned with respect to the inner material body 2406 so that a proximal end of the material guide 2404 is disposed between the inner material body 2406 and the outer material body 2402 and so that a distal end of the material guide 2404 protrudes through a slot or channel 2408 in the inner material body 2406. The protrusion of the material guide 2404 through the slot 2408 allows a lace (not shown) to access and be guided or 10 routed by a looped end of the material guide 2404. In some embodiments, the material guide 2404 may be attached 2410 to the inner material body 2406 prior to coupling the inner material body 2406 and the outer material body 2402.

[0137] The distal end of the material guide 2404 may be recessed from the distal end of the inner material body 2406 as illustrated. This arrangement may enable the material 15 guide 2404 to be fully concealed or hidden from view when the guide member 2400 is coupled with a shoe. In use, the guide member 2400 may be attached to a shoe so that the outer material body 2402 is positioned on an inner surface of the shoe's upper. In this arrangement, the inner material body 2406 would face the interior of the shoe and the material guide 2404 would be hidden or concealed from the exterior of the shoe via the 20 outer material body 2402. In some embodiments, the outer material body 2402 may be the upper material of the shoe and the inner material body 2406 and material guide 2404 may be attached directly to the upper. In other embodiments, the guide member 2400 may be arranged so that the material guide 2404 faces outward of the shoe and is visible from the shoe's exterior.

25 [0138] Referring now to Figs. 25A-D, illustrated are embodiments of cover members that may be positioned over a lace guide to hide or conceal the lace guide and/or to reinforce the coupling of the lace guide with a shoe. Fig. 25A illustrates a cover member 2500 having a lower body 2502 and an upper body 2506. The upper body 2506 is configured to be folded about a fold line 2508 in coupling the cover member 2500 over a

lace guide and with a shoe as described in greater detail below. In some instance, the cover member 2500 may be slightly indented on opposing sides of the cover member 2500 at the fold line 2508. In some instances, the material of the cover member 2500 may be designed to aid in folding the cover member 2500 about the fold line 2508. For 5 example, the material may be slightly thinner and/or creased along the fold line 2508 to aid in folded the upper body 2506 about the lower body 2502. The lower body 2502 includes a pair of cuts 2504 in the material. The cuts 2504 have an arcuate or curved shape and are designed to enable opposing ends of the lace guide to protrude from within the cover member 2500.

10 [0139] Fig. 25B illustrates another embodiment of a cover member 2500' that has an nearly identical configuration to the cover member 2500 of Fig. 25A except that the cover member 2500' has a longer lateral length L than the cover member 2500 of Fig. 25A. The cover member 2500' of Fig. 25B may be employed in instances where the lace guide has a longer lateral length in comparison with other lace guides.

15 [0140] Fig. 25C illustrates a cover member 2520 that include multiple lower body members 2522 and upper body members 2526. The cover member 2520 may be employed when it is desired to cover multiple lace guides with the same cover member. As with the previous embodiment, the cover member 2520 of Fig. 25C is configured so that the upper body members 2526 fold in half about the lower body member 2522 along 20 the fold line 2528. The cover member 2520 may be indented on opposing sides along the fold line 2528 and/or include a relief cut 2532 positioned along the fold line 2528 and mid-way along the lateral length. The relief cut 2532 may aid in folding the upper body member 2526 about the lower body member 2522 and/or may allow dirt and debris that is trapped within the cover member 2520 to escape.

25 [0141] In some instances, the cover member 2520 may include additional relief cuts, 2530 and/or 2531, that are positioned between the upper body members 2526 and lower body member 2522 and protrude inward into the respective body members. The relief cuts, 2530 and/or 2531, may provide additional areas where trapped dirt and debris are

able to escape from within the cover member 2520. The relief cuts, 2530 and/or 2531, may also demarcate the upper and lower body members.

[0142] The lower body member 2522 each include a pair of cuts 2524 in the material that have an arcuate or curved shape. The cuts 2524 correspond to the shape of opposing

5 ends of the lace guide and are used to enable the opposing ends of the lace guide to protrude outward from the cover member 2520. The cuts 2524 of the lower body members 2522 may have a similar lateral spacing between each cut, or the lateral spacing may be varied to accommodate the use of different sized and shaped lace guides.

Similarly, the lower and upper body members, 2522 and 2526, may have similar lateral

10 and/or longitudinal lengths or variable lateral and/or longitudinal lengths.

[0143] Fig. 25D illustrates a cover member 2540 that includes lower body members 2522 similar to those illustrated in Fig. 25C, but that includes an elongated upper body member 2542. The elongated upper body member 2542 may be employed when it is desirable to cover a large portion of a shoe's upper as illustrated in Fig. 27D. As

15 illustrated, the opposing ends of the elongated upper body member 2542 may have different sizes and/or shapes as desired. The shape and size of the elongated upper body member 2542 may correspond to the shoe's upper and/or be designed to provide a desired visual look.

[0144] Referring now to Figs. 26A-D, illustrated is a process of attaching a cover

20 member 2500 to a shoe's upper 2602. Fig. 26A illustrates that a pair of cover members 2500 are provided in an initially unfolded state. The cover members 2500 are aligned with corresponding lace guides 2600 and with an inner surface of the upper 2602. The lace guides 2600 include a folded material that defines a looped end through which a lace may be inserted as described herein. In Fig. 26B, the lace guides 2600 are positioned

25 against the inner surface of the upper 2602 and are coupled therewith 2610 via stitching, adhesive bonding, welding (e.g., RF, sonic, etc.), mechanical fastening, and the like. The lace guides 2600 are typically attached to the upper 2602 so that a distal edge of the lace guides 2600 is recessed or offset from a distal edge of the upper 2602 as illustrated.

[0145] In Fig. 26C, the cover member 2500 is positioned adjacent the lace guide 2600 and upper 2602 so that the lace guide 2600 is disposed between the upper 2602 and the cover member 2500. The cover member 2500 is typically positioned so that it entirely covers the lace guide 2600. The opposing ends 2604 of the lace guide 2600 are then 5 pulled through, or otherwise positioned through, the pair of cuts 2504 in the lower body member 2502 of the cover member 2500 so that the opposing ends 2604 protrude outward from the surface of the cover member 2500. In this manner, the opposing ends 2604 of the lace guide, and the lace lumen or channel disposed there between, are exposed and accessible to the lace. The arcuate or curved shape of the cuts 2504 enables 10 the opposing ends 2604 of the lace guide 2600 to be easily pulled through the cuts 2504.

[0146] In Fig. 26D, the cover member 2500 is folded along the fold line 2508 over the distal edge of the upper 2602. The cover member 2500 may then be fixedly attached to the upper 2602 with the lace guide 2600 covered and concealed under the cover member 2500. In some embodiments, the lower body member 2502 may be attached to the upper 15 2602 first and the upper body member 2506 may be subsequently attached to the upper 2602. In other embodiments, the upper and lower body members, 2502 and 2506, may be simultaneously attached to the upper 2602. The cover member 2500 may be positioned so that the lower body member 2502 and lace guide 2600 are positioned on the inside of the shoe, or may be positioned so that these components are on the exterior of 20 the shoe as desired.

[0147] Figs. 27A-B illustrate the cover member 2520 being employed to cover the guide member 2300 of Figs. 23A-B. Fig. 27A illustrates the guide member 2300 having a pair of material guides 2304 positioned within corresponding windows 2306 of the material body 2302. The cover member 2520 includes multiple pairs of cuts 2524 that 25 are positioned about the lower body member 2522 so as to correspond to the position of the guide member's material guides 2304. The cover member 2520 is also shaped and sized corresponding to the shape and size of the guide member 2300. As previously described, the upper body member 2526 is configured to fold about or over the lower body member 2522 along fold line 2528.

[0148] Fig. 27B illustrates the cover member 2520 positioned over the guide member 2300. The upper body member 2526 of the cover member 2520 is folded about the fold line 2528 and is positioned on an opposite side of the guide member 2300. Opposing sides 2305 of the material guides 2304 are positioned so as to protrude through the 5 corresponding pairs of cuts 2524. As illustrated the material guides 2304 are essentially entirely covered, hidden, and concealed by the cover member 2520.

[0149] Fig. 27C illustrates a perspective view of the cover member 2520 positioned over the guide member 2300. Fig. 27C illustrates the accessibility of the opposing ends 10 2305 of the material guides 2304 due to the opposing ends 2305 be inserted through the corresponding pairs of cuts 2524. A lace is inserted through the opposing ends 2305 and through a channel or lumen that is disposed there between. With the opposing ends 2305 inserted through the pairs of cuts 2524, a bridge or strip of material 2525 is formed or defined atop the looped end of the material guides 2304. The cover member 2520 may be used to cover and conceal the material guides 2304 and/or reinforce the attachment of 15 the material guides 2304 with the material body 2302 of the guide member 2300.

[0150] Fig. 27D illustrates the cover member 2540 being positioned about a shoe so that the cover member 2540 covers multiple lace guides arranged about the shoe. The cover member 2540 is illustrated with the upper body member 2542 folded about the lower body member. The cover member 2540 covers multiple guides 2722 that are positioned 20 on an inner surface of the shoe's upper. The cover member 2540 also covers one or more lace guides 2720 that are positioned on the exterior surface of the shoe's upper. The cover member 2540 may cover the inner guides 2722 so that only the opposing ends of the inner guides 2722 protrude from the cover member 2540 as shown. In some 25 embodiments, the exterior guide(s) 2720 may protrude through a slot or channel similar to that illustrated in Figs. 24A-B. The elongated upper body member 2542 may function to both conceal the various guides and provide the shoe with a uniform look or appearance.

[0151] Figs. 27E-J illustrate an embodiment of a tension member guide 2750 that is similar to that illustrated in Figs. 27A-D. The tension member guide 2750 is coupleable

with an article, such as a shoe or other footwear, and is configured to direct or route a tension member about a path of the article. The tension member guide 2750 includes a main body or cover member 2752 (hereinafter cover member 2752) that includes a first or proximal end 2751 and a second or distal end 2753. The proximal end 2751 or 5 proximal portion may be coupleable with the article, such as a shoe or other footwear. When coupled with the shoe/footwear, the cover member 2752 typically is positioned along an eyestay of the shoe/footwear as shown in Fig. 27J. The distal end 2753 is positioned on an opposite side of the main body from the proximal end 2751 and in some embodiments, the distal end 2753 represents a seam or line upon which the cover member 2752 is folded. The cover member 2752 also includes a pair of slits or incisions 10 2754 that are positioned near the distal end 2753 of the cover member 2752.

[0152] The tension member guide 2750 also includes a guide member 2760 having a longitudinal length and a lateral width. The guide member 2760 is folded along the longitudinal length to form a loop or channel 2762 within which a tension member 2770 15 is inserted (see Figs. 27I-J). The folded guide member 2760 is similar to the material guide 2304 previously described. The guide member 2760 may be made of any of the materials described herein, or otherwise known in the art, and is typically made of a low friction material. In a specific embodiment, the guide member 2760 has a two layer construction that includes a low friction inner material and a structurally supportive outer 20 layer as described in various embodiments herein. The cover member 2752 is typically made of a structurally strong and aesthetically pleasing material and may include any of the materials described herein or otherwise known in the art.

[0153] The guide member 2760 has a center portion 2761 and two end portions 2763 along its lateral width with the two end portions 2763 being disposed on opposite sides of 25 the center portion 2761. The guide member 2760 is positioned on the cover member 2752 so that each end portion 2763 is inserted through one of the slits or incisions 2754 as illustrated. When the guide member 2760 is positioned on the cover member 2752 in this manner, the two end portions 2763 are positioned on an opposite side of the cover member 2752 from the center portion 2761. In addition, as illustrated in Fig. 27H, a

portion of the cover member 2752 that is disposed between the pair of slits or incisions 2754 covers, or is disposed or positioned over, the center portion of the guide member 2760 when the tension member guide 2750 is fully assembled and/or coupled with the article. In Fig. 27H, the reference numeral 2757 identifies the portion of the cover 5 member 2752 that covers the center portion 2761 of the guide member 2760.

[0154] As illustrated in Fig. 27E, in some embodiments the guide member 2760 may have wider proximal end than a distal end, which may aid in coupling the guide member 2760 to the proximal end of the cover member 2752. In some embodiment, the tension member guide 2750 may only include a single guide member 2760 that is positioned 10 within the cover member 2752. In other embodiment, the cover member 2752 may include an additional pair of slits or incisions 2754 as illustrated in Fig. 27E. The cover member may similarly include a tertiary pair of slits or incisions, a quaternary pair of slits or incisions, or any other number of slits or incisions that are desired. In such 15 embodiments, the tension member guide 2750 includes an additional guide member 2760 (or tertiary guide member, quaternary guide member, etc.) that is positioned on the cover member 2752 so that opposing end portions 2763 of the additional guide member 2760 are inserted through the additional pair of slits or incisions 2754 as described herein.

[0155] As illustrated in Fig. 27J, when the tension member guide 2750 is coupled with a shoe or other footwear 2780, the two end portions 2763 of one or more of the guide 20 members 2760 may be positioned on an interior side of an upper 2782 of the footwear 2780. In some embodiments, when the tension member guide 2750 is coupled with the footwear 2780, the end portions 2763 of one guide member 2760 may be positioned on an exterior surface of the upper 2782 while the end portions 2763 of another guide member 2760 are positioned on an interior surface of the upper 2782.

25 [0156] As illustrated in Fig. 27F, in some embodiments a reinforcement member 2774 is attached to the cover member 2752 and to a proximal end of the guide member 2760. The reinforcement member 2774 may be roughly rectangular in shape and may be attached to the proximal end of the guide member 2760 via heat or RF welded, adhesive bonding, stitching, mechanical fastening, and the like. The reinforcement member 2774

helps prevent separate of the guide member 2760 from the cover member 2752 by reinforcing the coupling or attachment of the guide member 2760 with the cover member 2752.

[0157] As illustrated in Fig. 27G, in some embodiments the cover member 2752 is

5 folded along the seam or distal end 2753 and over the guide member 2760. In such embodiments, a majority of the guide member 2760 is sandwiched or disposed between opposing sides of the cover member 2752. As illustrated in Fig. 27I, the cover member 2752 may then be coupled together with the opposing sides covering a majority of the guide member 2760. In coupling the tension member guide 2750 with the footwear 2780, 10 the cover member 2752 may also be folded over an eyestay edge of the footwear 2780. The coupling of the tension member guide 2750 that is illustrated in Fig. 27I may be representative of how the tension member guide 2750 is coupled with the footwear 2780 or another article. In particular, the cover member 2752 may be folded along the seam 2753 and then positioned on the footwear 2780 or other article, after which the cover 15 member 2752 may be coupled together over the guide member 2760 at the same time the tension member guide 2750 is coupled with the footwear 2780 or article. In addition, while Fig. 27I illustrates the tension member guide 2750 and/or cover member 2752 being stitched, in other embodiments the tension member guide 2750 and/or cover member 2752 may be coupled together and/or to the footwear 2780 or article via heat or 20 RF welding, adhesive bonding, mechanical fastening, and the like. In a specific embodiment, a surface or face of the cover member 2752 (typically an inner surface of face that contacts the upper 2782) includes a material that is heat weldable to the footwear 2780. The heat weldable material may be thin polymer material that is positioned on the surface or face of the cover member 2752 to enable the cover member 25 2752 to be heat welded to the footwear 2780.

[0158] A method of coupling a tension member guide 2750 with footwear 2780 includes providing the tension member guide 2750 having a configuration as described herein and coupling the tension member guide 2750 with the footwear 2780 so that the two end portions 2763 are positioned near an eyestay edge of the footwear 2780. The

method also typically includes inserting the tension member 2770 through the loop or channel 2762 of the guide member 2760. The method may further include folding the cover member 2752 over the guide member 2760 so that the guide member 2760, other than the two end portions 2763, is positioned between opposing sides of the cover member 2752. In some embodiments, coupling the tension member guide 2750 with the footwear 2780 includes heat welding a surface or face of the cover member 2752 to the footwear 2780. In some embodiments, the tension member 2770 is disposed under the cover member 2752 so that the tension member 2770, or a majority thereof, is not externally visible. In such embodiments, the visibility of the tension member 2770 and guide members 2760 may be minimized or essentially non-existent, which may provide the shoe 2780 with a relatively clean and aesthetically pleasing look.

[0159] In some embodiments, it may be beneficial to construct the shoe so that as a reel based tightening mechanism is operated, a more conforming fit of the shoe about the user's foot is achieved. The term "more conforming fit" as used herein implies that the fit of the shoe about the user's foot is increased in respect to conventional shoes in which it is difficult to pull or press portions of the shoe into contact with the user's foot, such as near the arch of the foot. One means of constructing a shoe to achieve an increased fit of the shoe about the foot is via weaving a material in a manner so that as the material is tensioned via a tension member, the weave pattern causes the material to conform to the shape of the user's foot. In particular, the weave may be chosen so that the material bends, flexes, or otherwise moves in a desired manner that may be engineered to conform to a user's foot. The concept of applying a specific material weave to achieve an engineered movement of the material may be applied to various sections of the shoe so that a unique and differing movement of the material is achieved in each of the different sections of the shoe. In this manner, the shoe may be initially shaped to facilitate in donning of the shoe and then various sections of the shoe may uniquely move, bend, flex, or otherwise conform to the user's foot in response to tensioning of a tension member.

[0160] Referring now to Figs. 28A-C, illustrated is a shoe 2800 or other footwear that is knitted or woven in a manner that results in different portions of the shoe bending,

flexing, or moving in differing and unique ways in response to tensioning of a tension member. Specifically, the shoe 2800 includes a first knitted or woven section 2802, a second knitted or woven section 2804, a third knitted or woven section 2806, and a fourth knitted or woven section 2808. In other instances, the shoe 2800 may include more or 5 fewer knitted or woven sections as desired. Each of the knitted or woven sections, 2802-2808, is knitted or woven in a manner so that the stretch, bend, or flex of the knitted or woven material in the respective sections responds to tensioning in a desired and engineered manner. For example, since the first knitted or woven section 2802 is adjacent the toe box, it may be desired to knit or weave the first knitted section 2802 so 10 that a section or zone D of the shoe 2800 is able to experience or achieve a greater amount of flexibility or stretch when tensioned in comparison with the other sections or zones of the shoe 2800. This may allow the toes to move relatively freely and comfortably even when the shoe 2800 is tightened around a user's foot. In contrast, since the third or fourth knitted or woven sections, 2806 and/or 2808, are adjacent the heel, it 15 may be desirable to knit or weave these sections so that the respective sections or zones, B and/or A, experience or achieve less stretch or flexibility and more support when tensioned. Similarly, the second knitted or woven section 2804 may be knit or woven so that as the material is tensioned the section or zone C is pulled into greater contact with the instep and/or arch of the foot. This may provide additional support to the foot and/or 20 a greater sense of comfort and/or increased feeling when wearing the shoe 2800.

[0161] The increased support may ensure that the shoe 2800 stays firmly and securely coupled to the user's foot without being uncomfortable. The support and/or comfort that is provided in one or more of these sections may be engineered based on an activity that is being performed, such as participating in a sporting event (e.g., basketball, soccer, 25 track & field, etc.), engaging in an outdoor activity (e.g., hiking, backpacking, cycling, running, etc.), and the like. The knit or weave in each section, 2802-2808, may cause the individual sections to uniquely bend, flex, stretch or move to achieve the desired fit. For example, the second knitted or woven section 2804 may be knit or woven so that in 30 response to tensioning of the material, the section or zone C is pulled inward about the shoe, which would increase the contact of the shoe 2800 with the foot. The first knitted

or woven section 2802 may flatten or widen somewhat in response to tensioning of the material so that the toes are not bunched together within the shoe and are able to assume a more natural position in relation to the foot. The fourth knitted or woven section 2808 and the third knitted or wove section 2806 may be constructed so that the material in the 5 section or zone A bends, flexes, stretches, or moves forward toward the toe box while the material in the section or zone B bends, flexes, stretches, or moves backward toward the heel, which may secure the ankle and heel tightly within the shoe 2800. The material of one or both of these zones or sections (i.e., A or B) may likewise be engineered to provide increased support to the ankle when tensioned.

10 [0162] The individual knitted or woven sections, 2802-2808, are each operationally coupled with a tightening device or mechanism, which in a preferred embodiment is a reel based device 2810, although other tightening mechanisms, such as those illustrated in Figs. 34A-B, may alternatively be employed to tension the individual knitted or woven sections, 2802-2808. In some embodiments, the reel based device 2810 is coupled with 15 the individual knitted or woven sections, 2802-2808, in a manner that allows the individual knitted or woven sections to be relatively independently tensioned. For example, as illustrated in Fig. 28C, the individual knitted sections, 2802-2808, may be independently coupled with the reel based device 2810 so that operation of the reel based device 2810 independently, and more commonly differentially, tensions the respective 20 sections. Specifically, the first knitted or woven section 2802 is coupled with the reel based device 2810 via a first tension member or lace 2822. The second knitted or woven section 2804 is coupled with the reel based device 2810 via a second tension member or lace 2824 while the third knitted or woven section 2806 and the fourth knitted section 2808 are each coupled with the reel based device 2810 via a third tension member or lace 25 2826 and a fourth tension member or lace 2828, respectively. The first, second, third, and fourth tension members, 2822-2828, are independent from one another and are directly coupled with the reel based device 2810. Operation of the reel based device 2810 causes the independent tension members, 2822-2828, to be tensioned, which independently tensions the respective knitted sections, 2802-2808. In turn, the respective 30 knitted or woven sections, 2802-2808, are knitted or woven in a manner so that

tensioning of the respective sections causes a different fit, tension, or support to be provided to the underlying foot.

[0163] In the illustrated embodiment of Fig. 28C, each of the independent tension members, 2822-2828, has a distal end that terminates or is fixedly secured to the shoe 2800. For example, the first tension member or lace 2822 has a distal end 2823 that is fixed to the shoe 2800 while the second tension member or lace 2824, the third tension member or lace 2826, and the fourth tension member or lace 2828 each have a respective distal end (i.e., 2825, 2827, and 2829) that are fixed to the shoe 2800. The respective tension members, 2822-2828, may be looped or secured with one or more portions of the knitted or woven sections, 2802-2808, to attached to respective tension member to a respective knitted or woven section. Figs. 33A-E illustrate various means in which a tension member may be attached to a knitted or woven section.

[0164] Referring now to Figs. 29A-B, illustrated are other embodiments of sections that may be used to achieve a desired and conforming fit of a shoe. In Fig. 29A, a shoe 2900 may include multiple sections or zones, 2902-2908, that are configured to uniquely and differentially stretch, bend, flex, or otherwise move in response to tensioning of said sections or zones. The illustrated sections or zones, 2902-2908, are similar to those of Fig. 28A, but the material that is employed within the sections or zones, 2902-2908, may be different than the knitted or woven material of Fig. 28A. For example, an elastic or stretchable material as known in the art may be used and may be oriented or arranged about the shoe 2900 so that a desired stretching, bending, or movement of the material is achieved when the material is tensioned. The orientation and/or arrangement of the sections or zones, 2902-2908, may be engineered to provide a desired degree of support and/or comfort when the shoe 2900 is tensioned.

[0165] Fig. 29B illustrates an embodiment of a shoe 2910 in which only a portion of the shoe 2910 includes a material that is designed to bend, flex, stretch, or move in response to tensioning of the material. The material may be oriented or arranged about a portion or section of the shoe in which an engineered fit is desired in response to tensioning of the material. For example, the material may be arranged about the instep of

the shoe 2910 to provide an increased contact between the shoe 2910 and the foot, such as pulling the medial side of the shoe's upper into engagement with the arch of the foot. In other embodiments, the material may be arranged around the collar of the shoe 2910 to provide an increased constriction of the collar about the ankle. The material may include 5 a knitted or woven material, an elastic non-knitted or woven material, other materials, or some combination thereof.

[0166] In the illustrated embodiment, the shoe 2910 includes a first section 2912 that is positioned near an upper end of the toe box and a second section 2922 that is positioned near the shoe's collar. The first section 2912 and the second section 2922 both extend 10 over the throat or instep of the shoe 2910 to the sole, although in some embodiments either or both the first section 2912 or the second section 2922 may terminate short of the sole. In the illustrated embodiment, the first section 2912 and the second section 2922 both extend into the sole of the shoe. The first section 2912 and/or the second section 2922 may extend into the sole on the lateral side and/or medial side as desired. The 15 second section 2922 includes a tapered or narrow section 2924 near the sole, which may focus the tension and/or conformance of the shoe in this region. The tapered or narrow section 2924 is operationally coupled with a tension member (not shown). In contrast, the first section 2912 widens and includes a first finger or projection 2914 and a second finger or projection 2916 near the shoe's sole. The widened section may distribute the 20 tension and/or conformance of the shoe across a wider area. The first finger or projection 2914 and/or the second finger or projection 2916 may be operationally attached to a tension member (not shown) as desired. In some embodiments, the arrangement of the narrow and wide sections may be reversed from that illustrated in Fig. 29B. The first section 2912 and/or the second section 2922 may be loosely attached or coupled together 25 as illustrated, or may be entirely detached from one another.

[0167] Referring now to Figs. 30A-31D, illustrated are various means in which a material section may be attached to a reel based device. The term "material section" as used in relation to Figs. 30A-31D refers to the end of the knitted or woven sections, elastic sections, etc. described above and illustrated in Figs. 28A-29B. In some

embodiments, the material section may be attached to a tension member that is directly coupled with the reel based device whereas in other embodiments the material section may be attached to a tension member that is indirectly coupled with the reel based device. The illustrated attachment means may be employed for any embodiment described herein 5 in which the reel based device is employed to simultaneously tension multiple sections or portions of the shoe. In most of the embodiments, a distal end of the material section is positioned within the sole of the shoe and the tension member is attached or coupled with the material section within the shoe's sole. The tension member is likewise typically routed to the reel based device within the sole of the shoe and thus, the distal end of the 10 material section and the tension member are typically hidden from external view. In other embodiments, however, the distal end of the material section and/or the tension member may be positioned and/or routed in a location other than within the shoe's sole.

[0168] In Fig. 30A, a first material section 3002 is attached to a first tension member 3003 while a second material section 3004 is attached to a second tension member 3005 15 and a third material section 3006 is attached to a third tension member 3007. Each of the tension members (3003, 3005, and 3007) is routed to a reel based device 3009 and directly attached thereto. Accordingly, operation of the reel based device 3009 simultaneously and directly tensions each of the tension members (3003, 3005, and 3007), which in turn directly tensions the respective material sections (3002, 3004, and 20 3006). In this manner, operation of the reel based device 3009 directly tensions the respective material sections.

[0169] In Fig. 30B, a single tension member 3010 is employed to tension each of the material sections. The single tension member 3010 is operationally coupled with the reel based device and with each of the material sections of the shoe. To attach the single 25 tension member 3010 with each of the material sections, the tension member 3010 branches off into smaller sub-sections that are routed to the respective material sections. For example, as illustrated in Fig. 30B, the single tension member 3010 branches off into a first sub-section 3012, a second sub-section 3014, a third sub-section 3018, and a fourth sub-section 3021, although more or fewer sub-sections may be employed as desired. The

first sub-section 3012 is routed and attached to a material section as illustrated while the second sub-section 3014, third sub-section 3018, and fourth sub-section 3021 are each further branched or divided into secondary sub-sections. Specifically, the second sub-section 3014 is further divided or branched into secondary sub-section 3015 and 5 secondary sub-section 3016, which are each routed and attached to a material section as illustrated. The third sub-section 3018 is further divided or branched into secondary sub-section 3019 and secondary sub-section 3020, which are each routed and attached to a material section as illustrated, and the fourth sub-section 3021 is further divided or branched into secondary sub-section 3022 and secondary sub-section 3023, which are 10 each routed and attached to a material section as illustrated. In some instances, the secondary sub-sections may be further divided or branched into tertiary sub-sections, which are routed and attached to material sections or further divided and branched as needed. In some embodiments, the single tension member 3010 may include a bundle of tension members that are each partitioned or separated to form the various sub-sections, 15 secondary sub-sections, tertiary sub-sections, and the like. The divided or branched tension member allows a single tension member 3010 to be attached to the reel based device and employed to simultaneously tension each material section. This configuration may render it more feasible to attach the various material sections by minimizing or preventing issues associated with multiple tension members being attached to the reel 20 based device, such as tangling of the various tension members.

[0170] Figs. 30C-30D illustrate embodiments in which a material section is indirectly attached to a reel based device. In Fig. 30C, each material section (e.g., 3032, 3034, etc.) is attached to a respective tension member (e.g., 3033, 3035, etc.), which connects to a centrally positioned tensioning rod or member 3050. The tension tensioning rod/member 25 3050 is in turn attached to a second tension member 3040 that is operationally attached to a reel based device 3042. The tensioning rod/member 3050 is positioned within the sole of the shoe so that as the second tension member 3040 is tensioned via the reel based device 3042, the tensioning rod/member 3050 slides toward the heel of the shoe, which causes the tension members (e.g., 3033, 3035, etc.) to tension the respective material 30 sections (3032, 3034, etc.) to which they are attached. The tension members (e.g., 3033,

3035, etc.) tension the respective material sections (3032, 3034, etc.) by pulling the material sections inward toward the tensioning rod/member 3050. In this manner, the material sections (3032, 3034, etc.) are indirectly tensioned by the reel based device 3042 due to sliding of the tensioning rod/member 3050 within the sole of the shoe. Fig. 30C 5 illustrates an embodiment in which only a single side of the shoe includes material sections that are operationally attached to the tensioning rod/member 3050. Fig. 30D illustrates an embodiment in which both sides of the shoe (e.g., 3052 and 3054) include material sections that are operationally attached to the tensioning rod/member 3050. The coupling of both sides of the shoe to the tensioning rod/member 3050 as illustrated in Fig. 10 30D may balance forces that are exerted on the tensioning rod/member 3050, which may render the configuration more feasible.

[0171] Fig. 31A illustrates one embodiment of coupling or attaching a material section 3102 with a tension member 3104. In the illustrated embodiment, the material section 3102 is formed of various individual fibers or threads, which is common when the 15 material section 3102 is constructed of a knitted or woven material. The individual fibers or threads that form the material section 3102 are bundled, woven, or threaded together to form the tension member 3104. Thus, the tension member 3104 is not a separate and distinct component that is attached to the material section 3102, but is instead formed from the same fibers or threads of the material section 3102 so that the material section 20 3102 and tension member 3104 are integral or different forms of the same material. Stated differently, the tension member 3104 is a cord or rope like material and the material section 3102 is the unwoven or unthreaded fibers or yarns of the tension member 3104. Coupling the material section 3102 and tension member 3104 in this manner may 25 eliminate or minimize breakage between the material section 3102 and tension member 3104 and/or increase the responsiveness of the material section 3102 due to tensioning of the tension member 3102.

[0172] Figs. 31B-31D illustrate various means in which the material section 3102 and tension member 3104 may be operationally coupled with a reel based device 3110. In Fig. 31B multiple tension members (i.e., 3104a, 3104b, and 3104c) that are each

individually attached to respective material sections (i.e., 3102a, 3102b, and 3102c) are directly coupled with the reel based device 3110. As such, operation of the reel based device simultaneously and directly tensions each of the tension members (i.e., 3104a, 3104b, and 3104c), which in turn tensions the respective material sections (i.e., 3102a, 3102b, and 3102c). In Fig. 31C, the multiple tension members (i.e., 3104a, 3104b, 3104c, and 3104d) are each directly attached to a tension rod/member 3150, which is in turn operationally coupled with the reel based device 3110 via a second tension member 3140. As such, the respective material sections (i.e., 3102a, 3102b, and 3102c) are indirectly tensioned by the reel based device 3110. A second material section 3102b is illustrated as being coupled with two tension members, 3104b and 3104c, which configuration may be employed in any of the embodiments as desired.

[0173] Fig. 31D illustrates an embodiment that is similar to Fig. 31B, except that the multiple tension members (i.e., 3104a, 3104b, and 3104c) are each individual coupled with secondary tension members 3162 via coupling components 3160. The coupling components 3160 may be ferrules, clamps, locks, or any other device or component that is useful for attached a cord, cable, thread, rope, or yarn to another cord, cable, thread, rope, or yarn. The secondary tension members 3162 are in turn attached to the reel based device 3110. The use of the secondary tension members 3162 may allow thicker tension members (i.e., 3104a, 3104b, and 3104c) to be used without requiring the thicker tension members (i.e., 3104a, 3104b, and 3104c) to be directly attached to the reel based device 3110. Rather, the thinner secondary tension members 3162 are attached to the reel based device 3110, which may facilitate in coupling of the tension members (i.e., 3104a, 3104b, and 3104c) with the reel based device 3110 easier and/or facilitate in operation of the reel based device 3110. In some embodiment, the coupling component(s) 3160 may attach the tension members (i.e., 3104a, 3104b, and 3104c) to a single secondary tension member 3162.

[0174] Referring now to Fig. 32, illustrated is a front cross section of a shoe 3200, which shows a distal end of a material section 3202 and tension member 3204 disposed within a sole of the shoe 3200. Specifically, the material section 3202 and tension

member 3204 are positioned within a channel 3210 that is formed in the sole of the shoe 3200. The material section 3202 and tension member 3204 are able to slide or move within the channel 3210, which allows the material section 3202, both within the channel 3210 and exterior to the sole, to be tensioned in response to tensioning of the tension 5 member 3202. As described herein, the tension member 3202 may be directly attached to a reel based device or indirectly attached to the reel based device via some intermediate component, such as the tension rod/member.

[0175] Referring now to Figs. 33A-E, illustrated are various embodiments that may be employed to attach a material section to a tension member. In Fig. 33A, the multiple 10 looped ends 3206 are knitted, woven, or otherwise formed in the distal end of the material section 3202. The tension member 3204 is inserted through the looped ends 3206, which causes the material section 3202 to be tensioned in response to tensioning of the tension member 3204. In Fig. 33B, the tension member 3204 is inserted directly through the distal end of the material section 3202. The tension member 3204 may be 15 woven or routed through the distal end of the material section 3202 and/or the material section 3202 may have multiple layers and the tension member 3204 may be inserted between the multiple layers. In Fig. 33C, a grommet 3226 is positioned in the distal end of the material section 3202. The tension member 3204 is inserted through an aperture within the grommet 3226. In Fig. 33D, a guide component 3236, similar to those 20 currently employed to guide or direct a tension member about a shoe, is woven, knitted, or otherwise positioned within the distal end of the material section 3202. The tension member 3204 is inserted through the guide component 3236. In Fig. 33E, a tubing section 3246 is woven, knitted, or otherwise positioned within the distal end of the material section 3202. The tension member 3204 is inserted through the channel or 25 lumen of the tubing section 3246.

[0176] Figs. 34A-B illustrate alternative tightening mechanisms that may be employed to tension a tension member 3303, which in turn tensions the respective material sections as described herein. The alternative tightening mechanisms replace the reel based device as the source of tensioning the tension member. The configuration of the material

sections and/or the means in which the material sections are attached to the tightening mechanism may remain the same as any of the embodiments described herein. In Fig. 34A, a pullcord member 3302 is coupled with the tension member 3303. The pullcord member 3302 may be pulled by a user to tension the tension member 3303. In Fig. 34B, 5 a motorized unit 3304 is attached to the shoe and to the tension member (not shown). The motorized unit 3304 is configured to tension the tension member. A control device 3306 may be used to actuate or operate the motorized unit 3304.

[0177] While several embodiments and arrangements of various components are described herein, it should be understood that the various components and/or combination 10 of components described in the various embodiments may be modified, rearranged, changed, adjusted, and the like. For example, the arrangement of components in any of the described embodiments may be adjusted or rearranged and/or the various described components may be employed in any of the embodiments in which they are not currently described or employed. As such, it should be realized that the various embodiments are 15 not limited to the specific arrangement and/or component structures described herein.

[0178] In addition, it is to be understood that any workable combination of the features and elements disclosed herein is also considered to be disclosed. Additionally, any time a feature is not discussed with regard in an embodiment in this disclosure, a person of skill 20 in the art is hereby put on notice that some embodiments of the invention may implicitly and specifically exclude such features, thereby providing support for negative claim limitations.

[0179] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. Additionally, a number of well-known processes and elements have not been described in order to avoid unnecessarily obscuring the present invention. Accordingly, the above description should not be taken 25 as limiting the scope of the invention.

[0180] Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates

otherwise, between the upper and lower limits of that range is also specifically disclosed. Each smaller range between any stated value or intervening value in a stated range and any other stated or intervening value in that stated range is encompassed. The upper and lower limits of these smaller ranges may independently be included or excluded in the 5 range, and each range where either, neither or both limits are included in the smaller ranges is also encompassed within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either or both of those included limits are also included.

[0181] As used herein and in the appended claims, the singular forms “a”, “an”, and 10 “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to “a process” includes a plurality of such processes and reference to “the device” includes reference to one or more devices and equivalents thereof known to those skilled in the art, and so forth.

[0182] Also, the words “comprise,” “comprising,” “include,” “including,” and 15 “includes” when used in this specification and in the following claims are intended to specify the presence of stated features, integers, components, or steps, but they do not preclude the presence or addition of one or more other features, integers, components, steps, acts, or groups.

WHAT IS CLAIMED IS:

1. A tension member guide that is coupleable with footwear and that is configured to direct or route a tension member about a path of the footwear, the tension member guide comprising:

a main body including:

a first end that is coupleable with the footwear so that the main body is positioned along an eyestay of the footwear;

a second end that is positioned on an opposite side of the main body from the first end; and

a pair of slits or incisions in the main body near the second end thereof; and

a guide member having a longitudinal length and a lateral width, the guide member being folded along the longitudinal length to form a loop or channel within which the tension member is insertable, the guide member having a center portion and two end portions along the lateral width, the two end portions being disposed on opposite sides of the center portion;

wherein the guide member is positioned on the main body so that each end portion of the two end portions is inserted through one slit or incision of the pair of slits or incisions such that the two end portions are positioned on an opposite side of the main body from the center portion and a portion of the main body between the pair of slits or incisions covers the center portion of the guide member when the tension member guide is coupled with the footwear.

2. The tension member guide of claim 1, wherein the main body is folded over the guide member so that a majority of the guide member is sandwiched between opposing sides of the main body.

3. The tension member guide of claim 2, wherein the main body is also folded over an eyestay edge of the footwear.

4. The tension member guide of claim 1, wherein a reinforcement member is attached to the main body and to a proximal end of the guide member.

5. The tension member guide of claim 1, wherein when the tension member guide is coupled with the footwear, the two end portions of the guide member are positioned on an interior side of an upper of the footwear.

6. The tension member guide of claim 1, wherein the main body includes an additional pair of slits or incisions and wherein the tension member guide includes an additional guide member that is positioned on the main body so that opposing end portions of the additional guide member are inserted through the additional pair of slits or incisions such that the opposing end portions of the additional guide member are positioned on an opposite side of the main body from a center portion of the additional guide member.

7. The tension member guide of claim 6, wherein when the tension member guide is coupled with the footwear, the opposing end portions of the additional guide member are positioned on an exterior surface of an upper the footwear and the two end portions of the guide member are positioned on an interior surface of the upper.

8. The tension member guide of claim 1, wherein a surface or face of the main body includes a material that is heat weldable to the footwear.

9. A tension member guide that is configured to direct or route a tension member about a path of an article, the tension member guide comprising:

a main body that is coupleable to the article and that includes a pair of slits or incisions; and

a guide member that is folded along a longitudinal length to form a loop or channel within which the tension member is insertable, the guide member having a center portion and two end portions that are disposed on opposite sides of the center portion;

wherein the guide member is positioned on the main body so that each end portion of the two end portions is inserted through one slit or incision of the pair of slits or

incisions such that the two end portions are positioned on an opposite side of the main body from the center portion.

10. The tension member guide of claim 9, wherein the main body is folded over the guide member so that the guide member, other than the two end portions, is positioned between opposing sides of the main body.

11. The tension member guide of claim 9, wherein a reinforcement member is attached to the main body and to a proximal end of the guide member.

12. The tension member guide of claim 9, wherein the article is footwear.

13. The tension member guide of claim 12, wherein the tension member guide is coupled with the footwear so that the two end portions of the guide member are positioned on an interior side of an upper of the footwear.

14. The tension member guide of claim 9, wherein the main body includes an additional pair of slits or incisions and wherein an additional guide member is positioned on the main body so that opposing end portions of the additional guide member are inserted through the additional pair of slits or incisions.

15. The tension member guide of claim 14, wherein the opposing end portions of the additional guide member are positioned on an exterior surface of the main body and the two end portions of the guide member are positioned on an interior surface of the main body.

16. The tension member guide of claim 9, wherein a surface or face of the main body includes a material that is heat weldable to the footwear.

17. A method of coupling a tension member guide with footwear, the method comprising:

providing the tension member guide, the tension member guide including:
a main body that includes a pair of slits or incisions; and

a guide member that is folded along a longitudinal length to form a loop or channel within which a tension member is insertable, the guide member having a center portion and two end portions that are disposed on opposite sides of the center portion;

wherein the guide member is positioned on the main body so that each end portion of the two end portions is inserted through one slit or incision of the pair of slits or incisions such that the two end portions are positioned on an opposite side of the main body from the center portion; and

coupling the tension member guide with the footwear so that the two end portions are positioned near an eyestay edge of the footwear.

18. The method of claim 17, further comprising inserting the tension member through the loop or channel of the guide member.

19. The method of claim 17, further comprising folding the main body over the guide member so that the guide member, other than the two end portions, is positioned between opposing sides of the main body.

20. The method of claim 17, wherein the tension member guide further includes a reinforcement member that is attached to the main body and to a proximal end of the guide member.

21. The method of claim 17, wherein the tension member guide is coupled with the footwear so that the two end portions of the guide member are positioned on an interior side of an upper of the footwear.

22. The method of claim 17, wherein the main body includes an additional pair of slits or incisions and wherein an additional guide member is positioned on the main body so that opposing end portions of the additional guide member are inserted through the additional pair of slits or incisions.

23. The method of claim 17, further comprising heat welding a surface or face of the main body to the footwear.

24. A tension member guide that is coupleable with footwear and that is configured to direct or route a tension member about a path of the footwear, the tension member guide comprising:

a first material member having:

a longitudinal length;

a lateral width;

a first face that is positionable against the footwear; and

a second face that is opposite the first face; and

a second material member having a longitudinal length and a lateral width, the second material member being folded along the longitudinal length to form a loop or channel within which the tension member is insertable, the second material member having a center portion and two end portions along the lateral width, the two end portions being disposed on opposite sides of the center portion;

wherein the second material member is formed of a lower friction material than the first material member; and

wherein the second material member is coupled with the first material member so that the second material member is longitudinally aligned with the first material member and the second material member is positioned atop of the second face of the first material member.

25. The tension member guide of claim 24, wherein the folded second material member is shorter longitudinally than the first material member such that a proximal end of the tension member guide is thinner than a distal end of the tension member guide.

26. The tension member guide of claim 24, wherein the first material member is not folded over a looped end of the second material member.

27. The tension member guide of claim 24, further comprising a third material member that is positioned atop a proximal end of the second material member such that the proximal end of the second material member is disposed between the first material member and the third material member.

28. The tension member guide of claim 24, wherein the first face of the first material member includes a material that is heat weldable to the footwear.

29. The tension member guide of claim 24, wherein the second material member is folded so that opposing longitudinal ends of the second material member are longitudinally offset from one another.

30. The tension member guide of claim 24, wherein the second material member comprises an outer material and an inner material, wherein the outer material is configured to provide structural support and the inner material is configured to provide a low friction surface.

31. A tension member guide comprising:
a first member having:

a longitudinal length; and
a lateral width; and

a second member that is folded along a longitudinal length to form a loop or channel within which a tension member is insertable, the second member having a center portion and two end portions disposed on opposite sides of the center portion;

wherein the second member is formed of a lower friction material than the first member; and

wherein the second member is coupled with the first member so that the second member is positioned atop one side of the first member.

32. The tension member guide of claim 31, wherein the folded second member is shorter longitudinally than the first member such that a proximal end of the tension member guide is thinner than a distal end of the tension member guide.

33. The tension member guide of claim 31, wherein the first member is not folded over a looped end of the second member.

34. The tension member guide of claim 31, further comprising a third member that is positioned atop a proximal end of the second member such that the proximal end of the second member is disposed between the first member and the third member.

35. The tension member guide of claim 31, wherein the first member includes a material that is heat weldable to an article.

36. The tension member guide of claim 31, wherein the second member is folded so that opposing longitudinal ends of the second member are longitudinally offset from one another.

37. The tension member guide of claim 31, wherein the second member comprises an outer material and an inner material, wherein the outer material is configured to provide structural support and the inner material is configured to provide a low friction surface.

38. A method of coupling a tension member guide with an article comprising:
providing a tension member guide that includes:

a first member having a longitudinal length and a lateral width; and
a second member that is folded along a longitudinal length to form a loop or channel, the second member having a center portion and two end portions disposed on opposite sides of the center portion;

wherein the second member is formed of a lower friction material than the first member; and

wherein the second member is coupled with the first member so that the second member is positioned atop one side of the first member; and
coupling the tension member guide with the article.

39. The method of claim 38, further comprising inserting a tension member through the loop or channel of the folded second member.

40. The method of claim 38, wherein the article is a shoe or footwear.

41. The method of claim 38, further comprising heat welding the first member to the article.

42. The method of claim 38, wherein the first member is not folded over a looped end of the second member.

43. The method of claim 38, wherein the tension member guide further comprises a third member that is positioned atop a proximal end of the second member such that the proximal end of the second member is disposed between the first member and the third member.

44. A tension member guide that is coupleable with footwear and that is configured to direct or route a tension member about a path of the footwear, the tension member guide comprising:

a material body having:

a proximal end;

a distal end; and

at least one channel that extends between the proximal end and the distal end of the material body; and

a reinforcement material that is disposed within the at least one channel of the material body to reinforce the material body;

wherein the material body is folded between the proximal end and the distal end to form a loop or channel within which the tension member is insertable, the material body having a center portion and two end portions that are disposed on opposite sides of the center portion.

45. The tension member guide of claim 44, wherein the material body includes a plurality of channels that extend between the proximal end and the distal end of the material body, and wherein the plurality of channels are separated or divided by walls between the two end portions of the material body.

46. The tension member guide of claim 45, wherein the reinforcement material is distributed among the plurality of channels so that channels that are positioned nearer to the center portion of the material body have a greater density of the reinforcement material than channels positioned nearer to, or at, the two end portions.

47. The tension member guide of claim 46, wherein the increased density of the reinforcement material near the center portion of the material body causes the tension member guide to exhibit an increased flexing or bowing toward the two end portions relative to the center portion in response to tensioning of the tension member.

48. The tension member guide of claim 44, wherein the material body is formed of a woven material.

49. The tension member guide of claim 48, wherein the reinforcement material comprises reinforcing fibers or fiber bundles.

50. The tension member guide of claim 44, further comprising a low friction material that is positioned on an inner surface of the loop or channel of the folded material body.

51. A tension member guide comprising:
a material body having a channel formed therein; and
a reinforcement material that is disposed within the channel of the material body to reinforce the material body;

wherein the material body is folded to form a loop or channel within which a tension member is insertable.

52. The tension member guide of claim 51, wherein the material body includes a plurality of channels.

53. The tension member guide of claim 52, wherein the reinforcement material is distributed among the plurality of channels so that a density of the reinforcement material within the plurality of channels is greater nearer to a center portion of the material body.

54. The tension member guide of claim 53, wherein the increased density of the reinforcement material near the center portion of the material body causes the tension member guide to exhibit an increased flexing or bowing toward opposing end portions of the material body in response to tensioning of the tension member.

55. The tension member guide of claim 51, wherein the material body is formed of a woven material.

56. The tension member guide of claim 55, wherein the reinforcement material comprises reinforcing fibers or fiber bundles.

57. The tension member guide of claim 44, further comprising a low friction material that is positioned on an inner surface of the loop or channel of the folded material body.

58. A method of coupling a tension member guide with an article comprising: providing a tension member guide that includes:

a material body having a channel formed therein; and
a reinforcement material that is disposed within the channel of the material body to reinforce the material body;

wherein the material body is folded to form a loop or channel within which a tension member is insertable; and

coupling the tension member guide with the article.

59. The method of claim 58, further comprising inserting the tension member within the loop or channel formed in the folded material body.

60. The method of claim 58, wherein the article is a shoe or footwear.

61. The method of claim 58, wherein the material body includes a plurality of channels.

62. The method of claim 58, wherein the reinforcement material is distributed among the plurality of channels so that a density of the reinforcement material within the

plurality of channels is greater nearer to a center portion of the material body in comparison with opposing end portions of the material body.

63. The method of claim 58, wherein the material body is formed of a woven material.

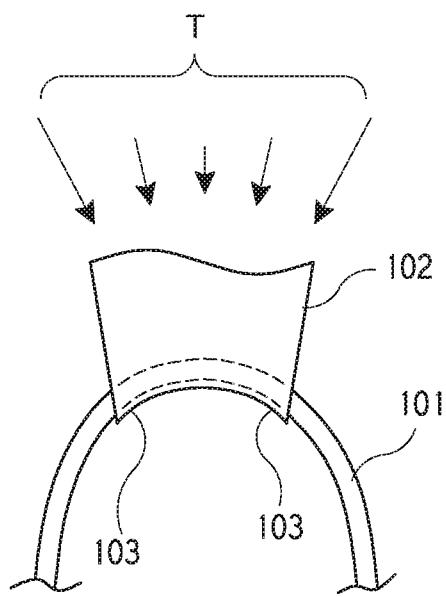


FIG. 1A

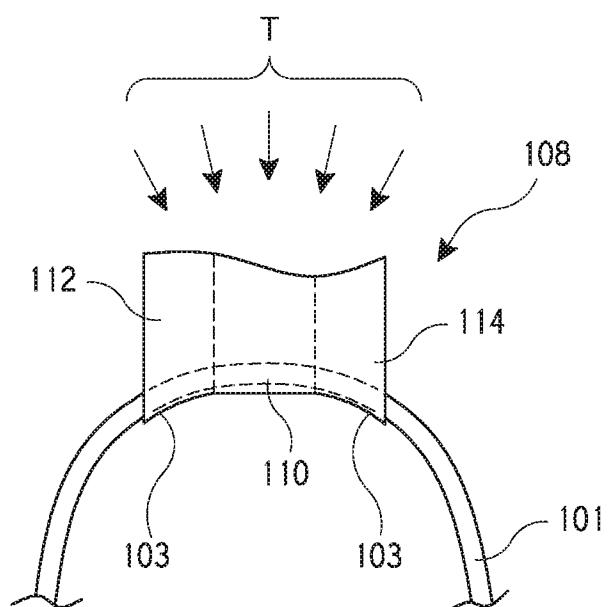


FIG. 1B

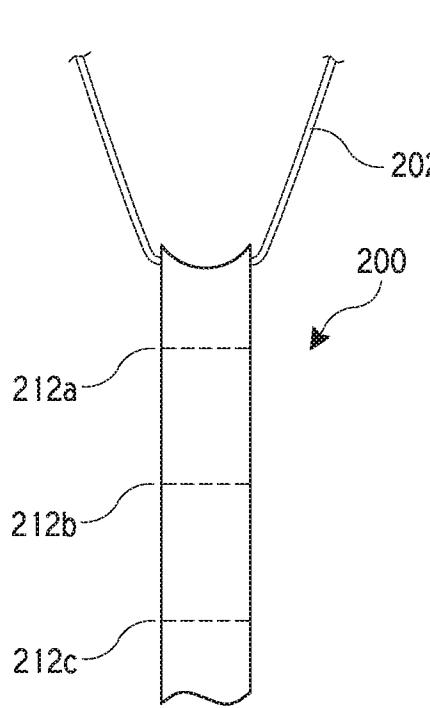


FIG. 2A

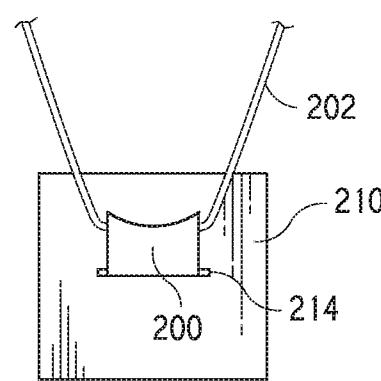


FIG. 2B

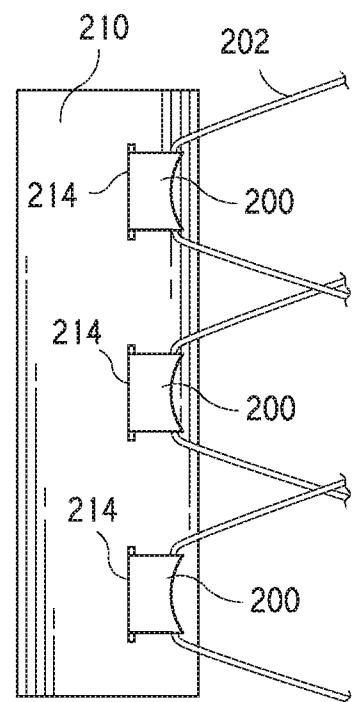


FIG. 2C

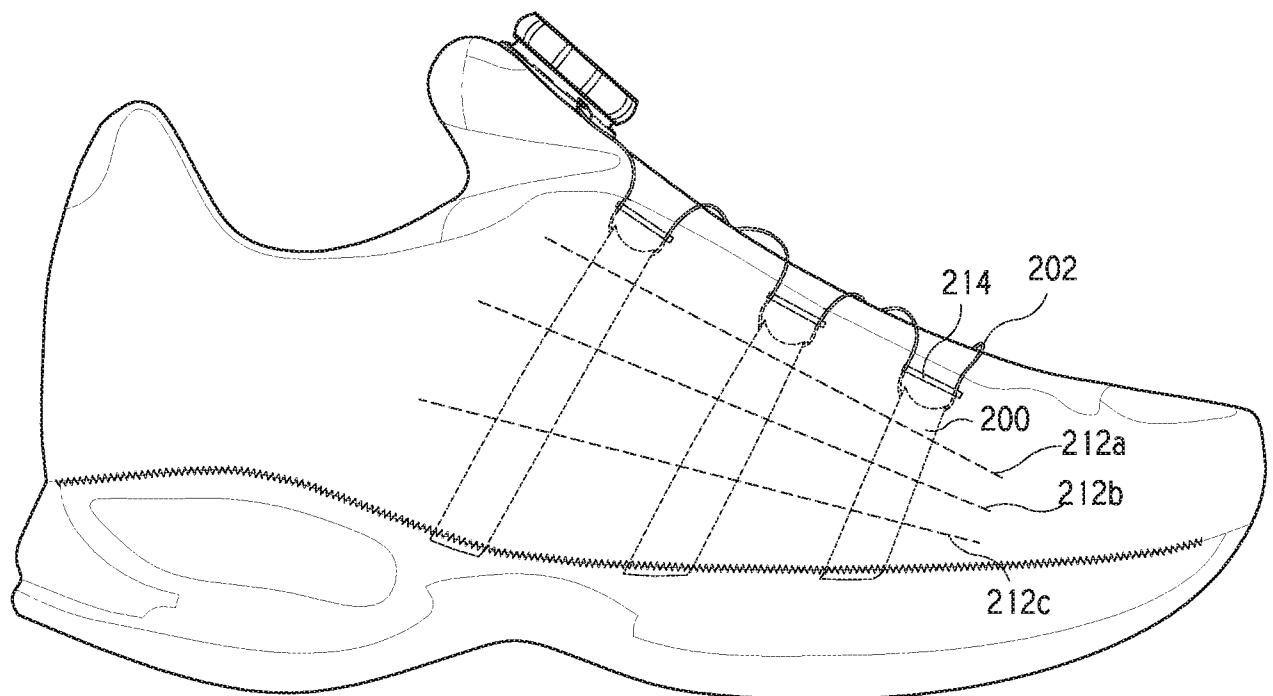


FIG. 3A

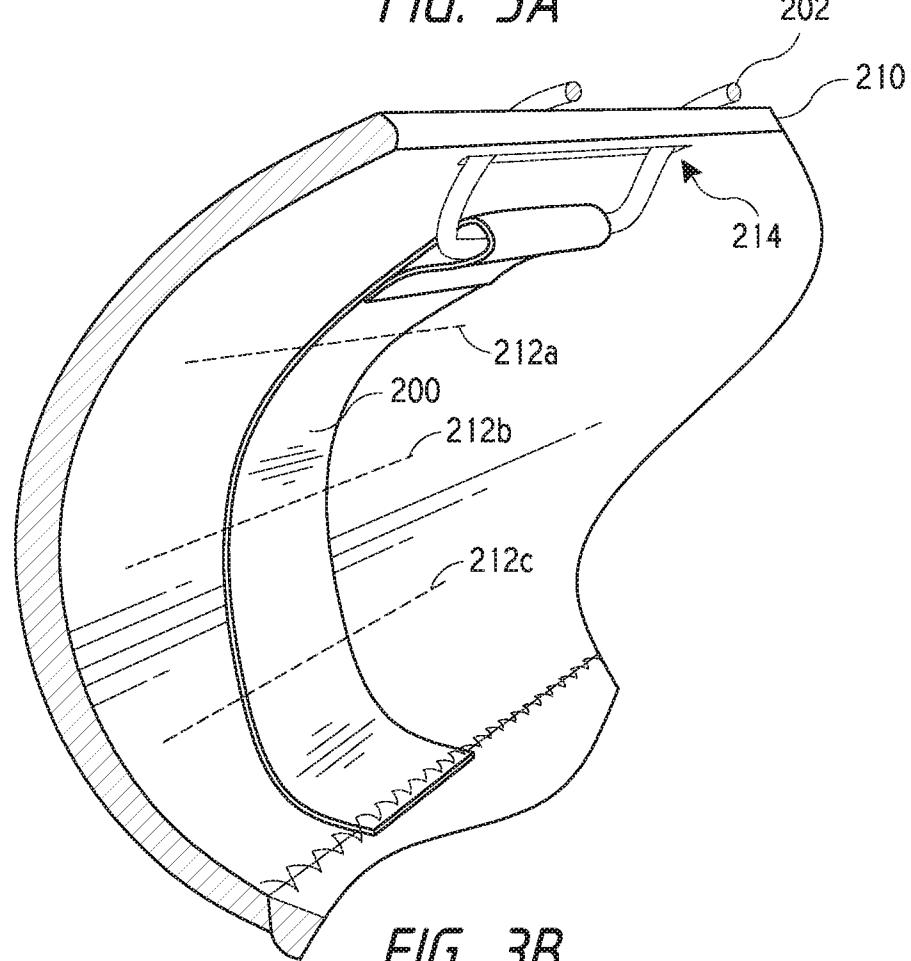


FIG. 3B

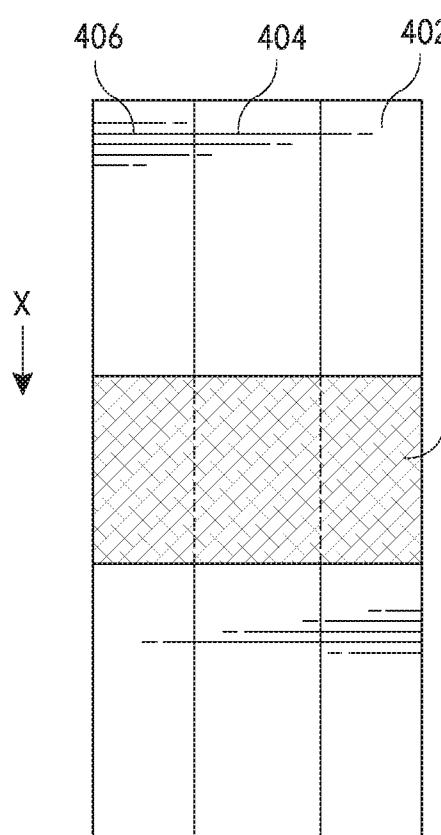


FIG. 4A

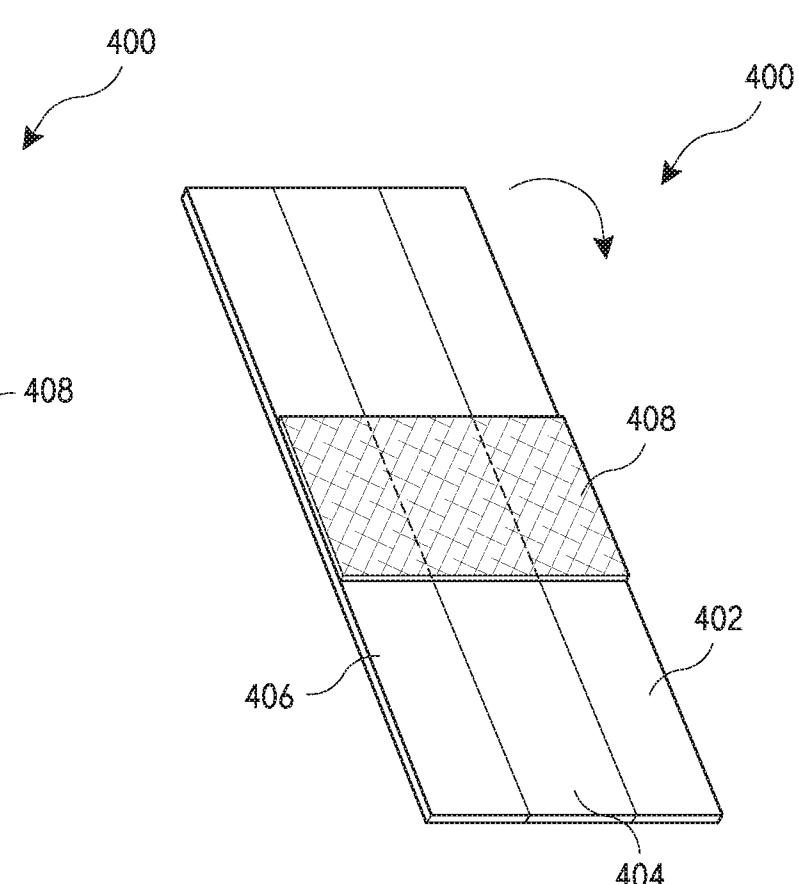


FIG. 4B

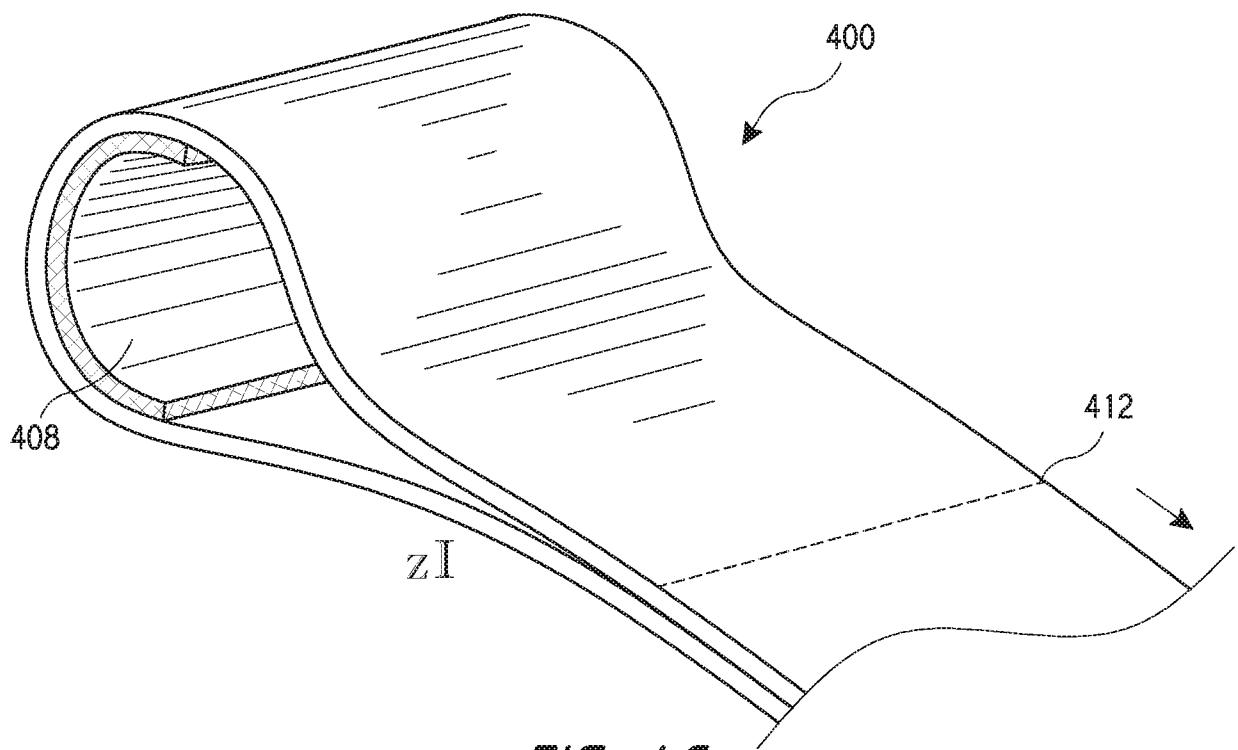
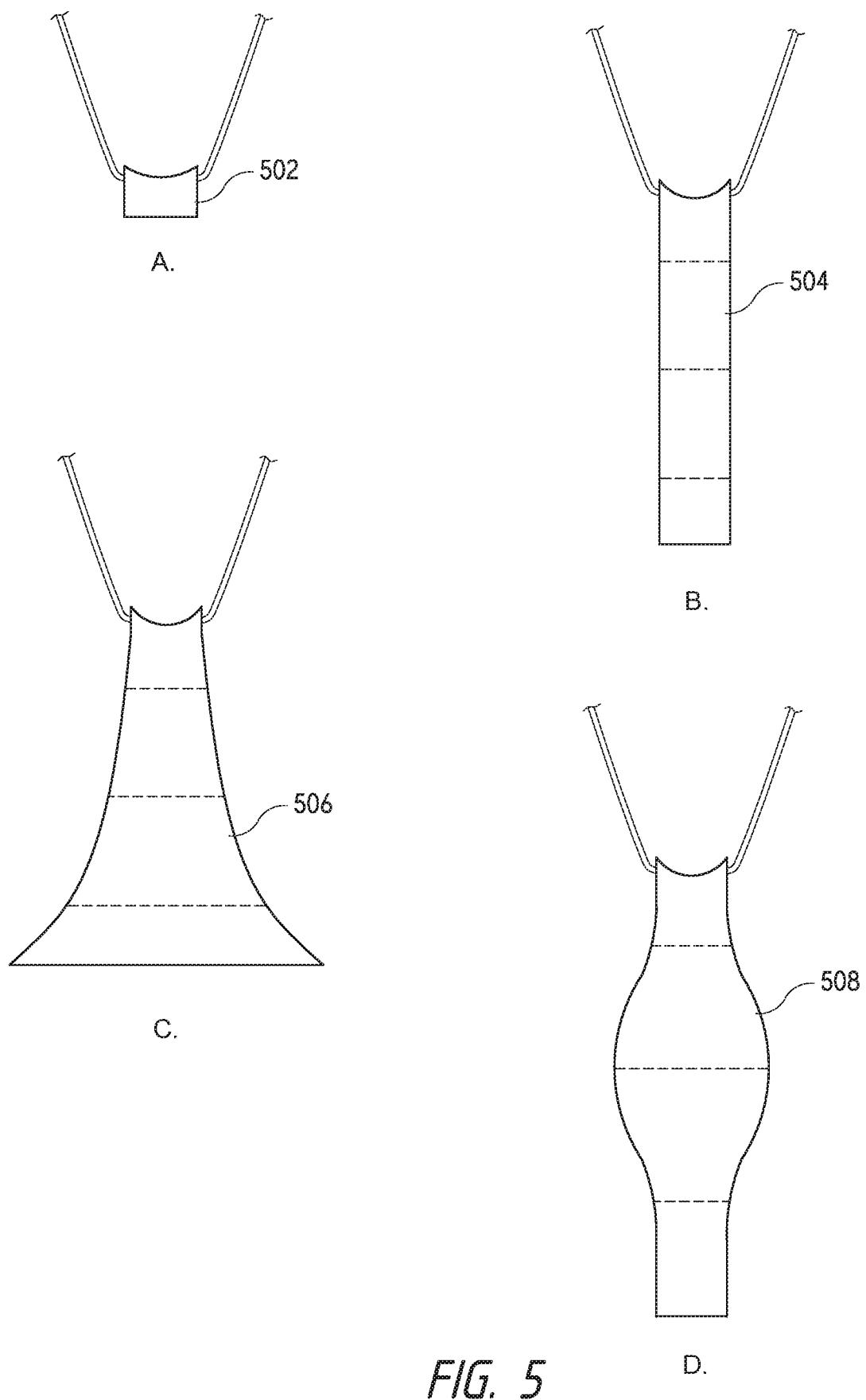


FIG. 4C

*FIG. 5***D.**

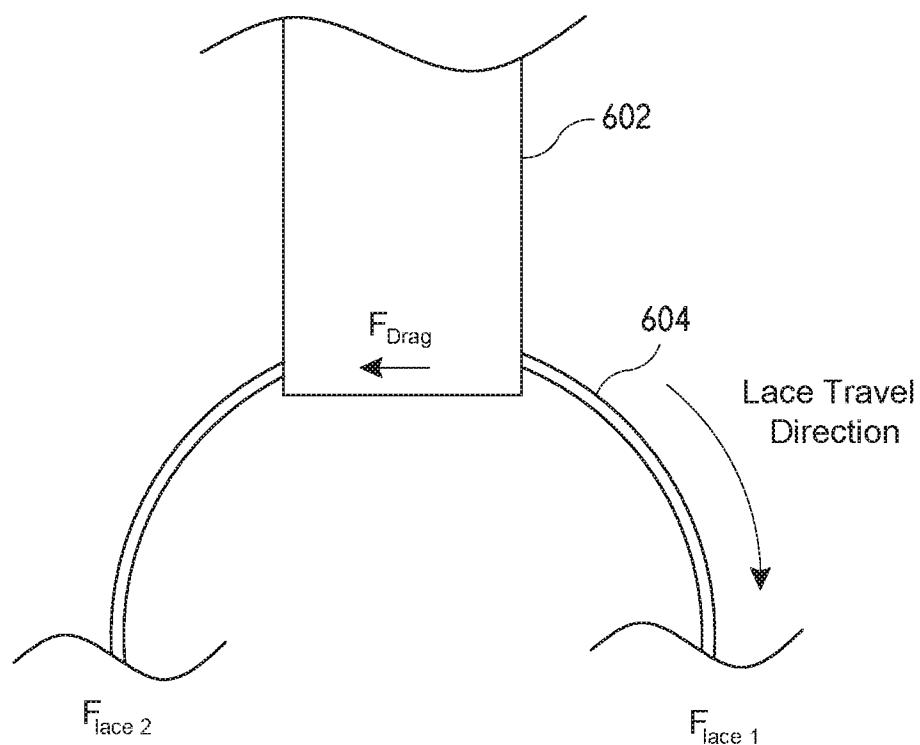


FIG. 6

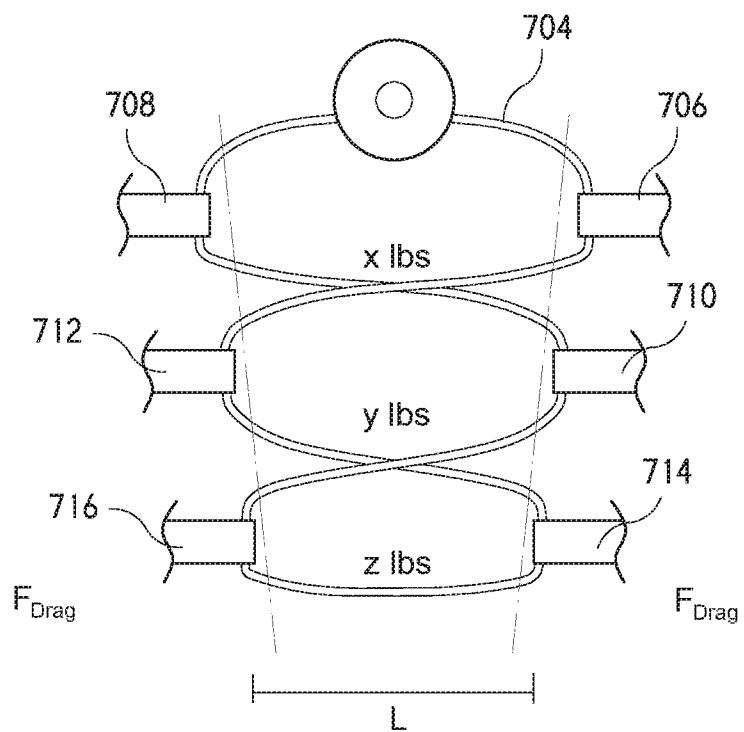
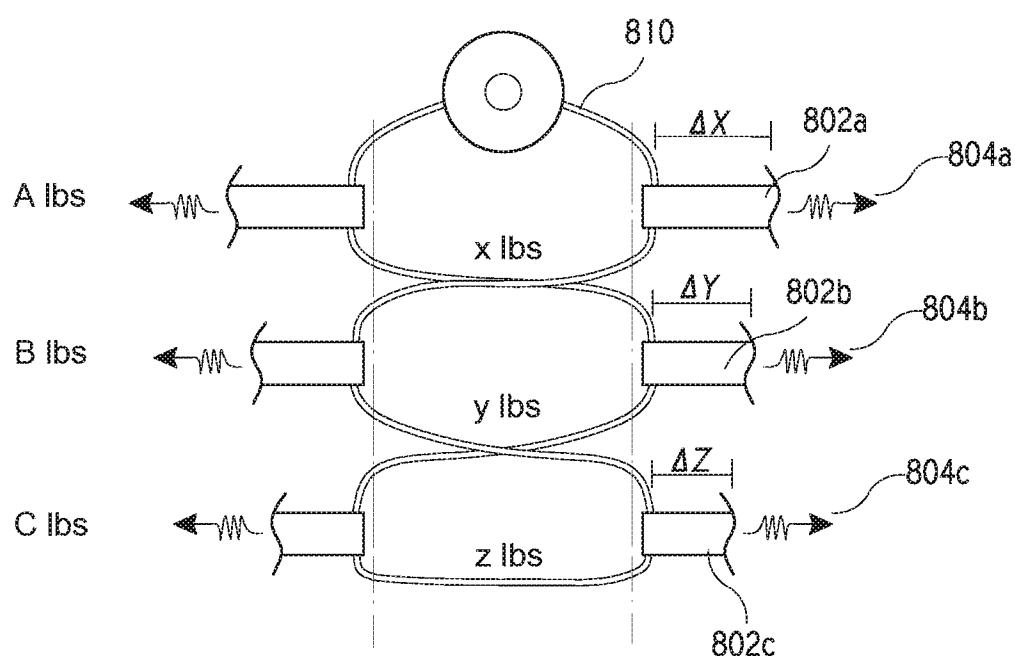
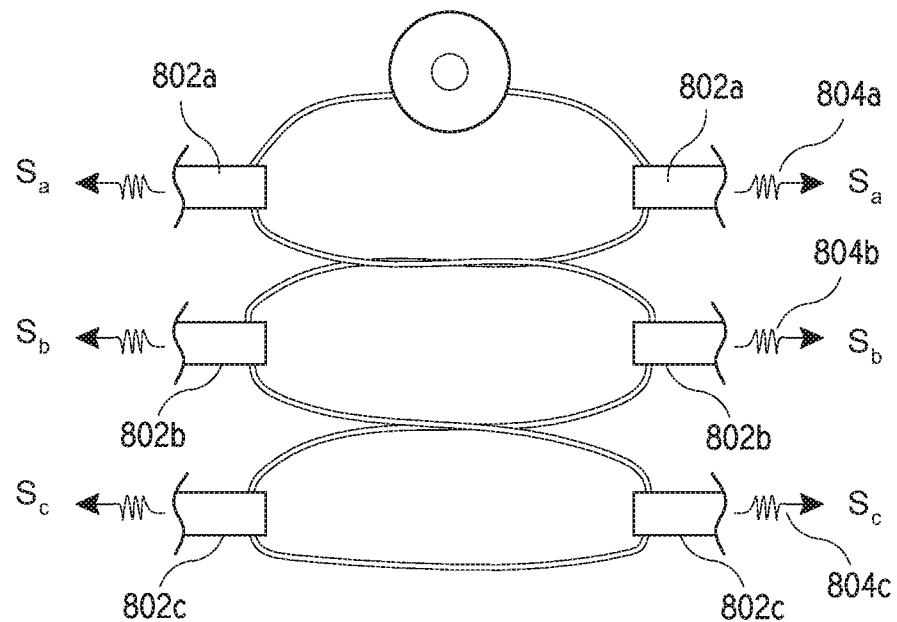


FIG. 7



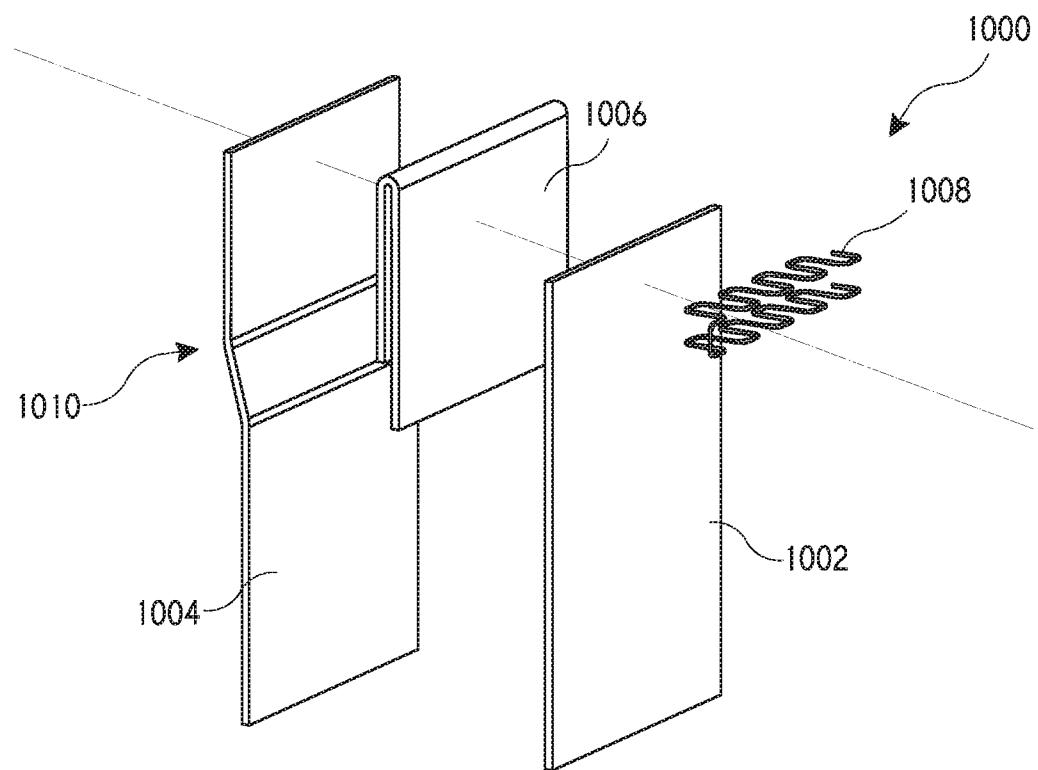


FIG. 10A

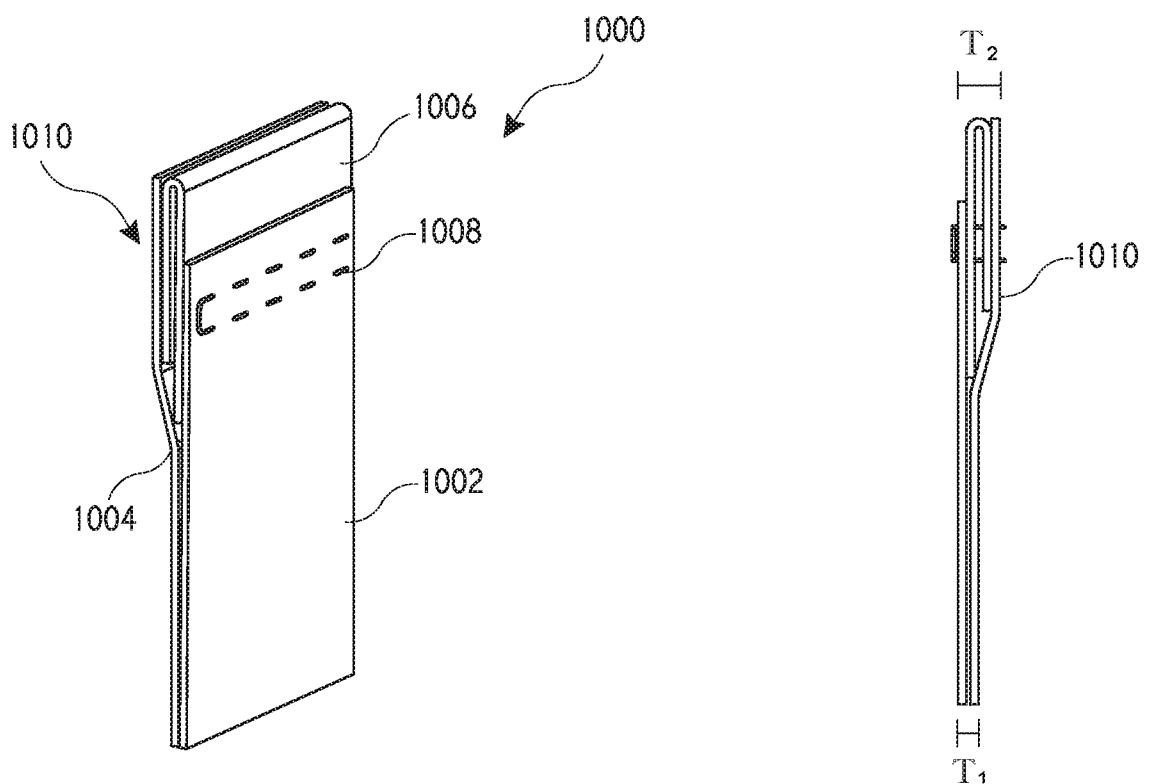


FIG. 10B

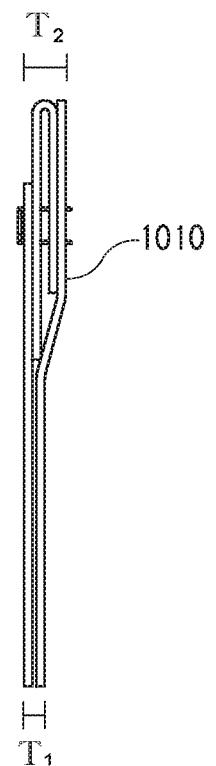


FIG. 10C

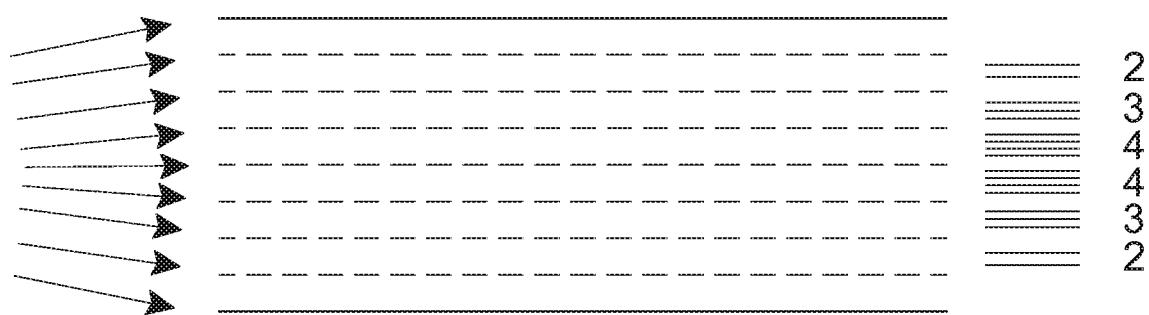


FIG. 11A

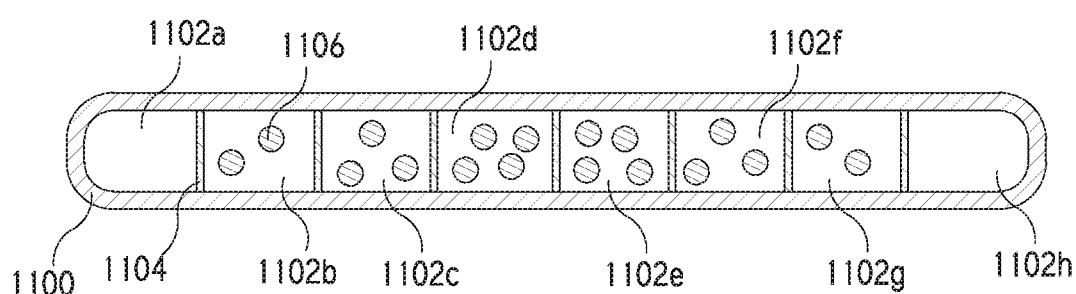


FIG. 11B

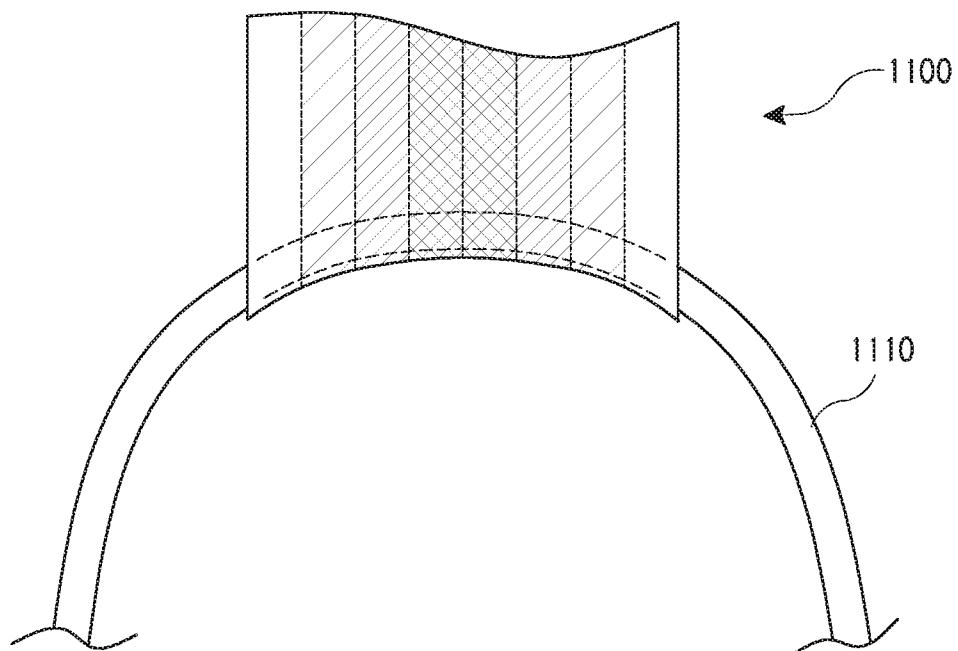


FIG. 11C

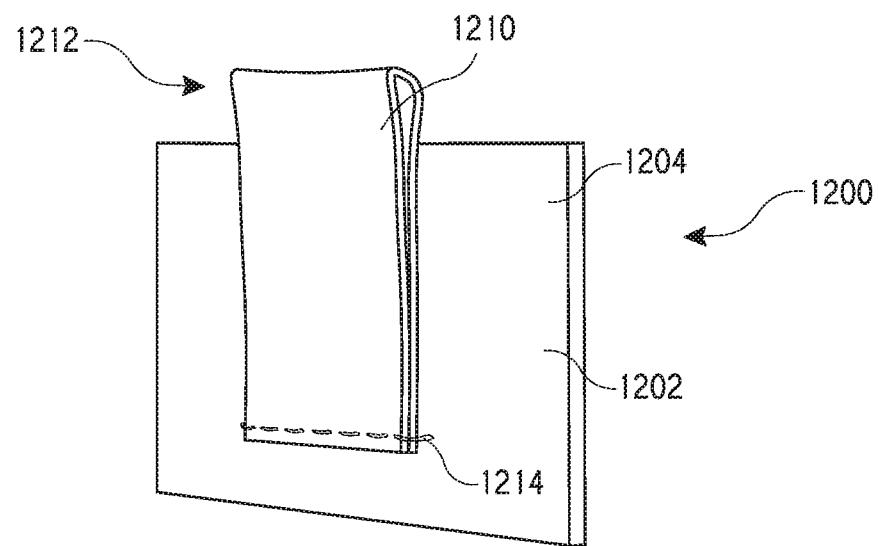


FIG. 12

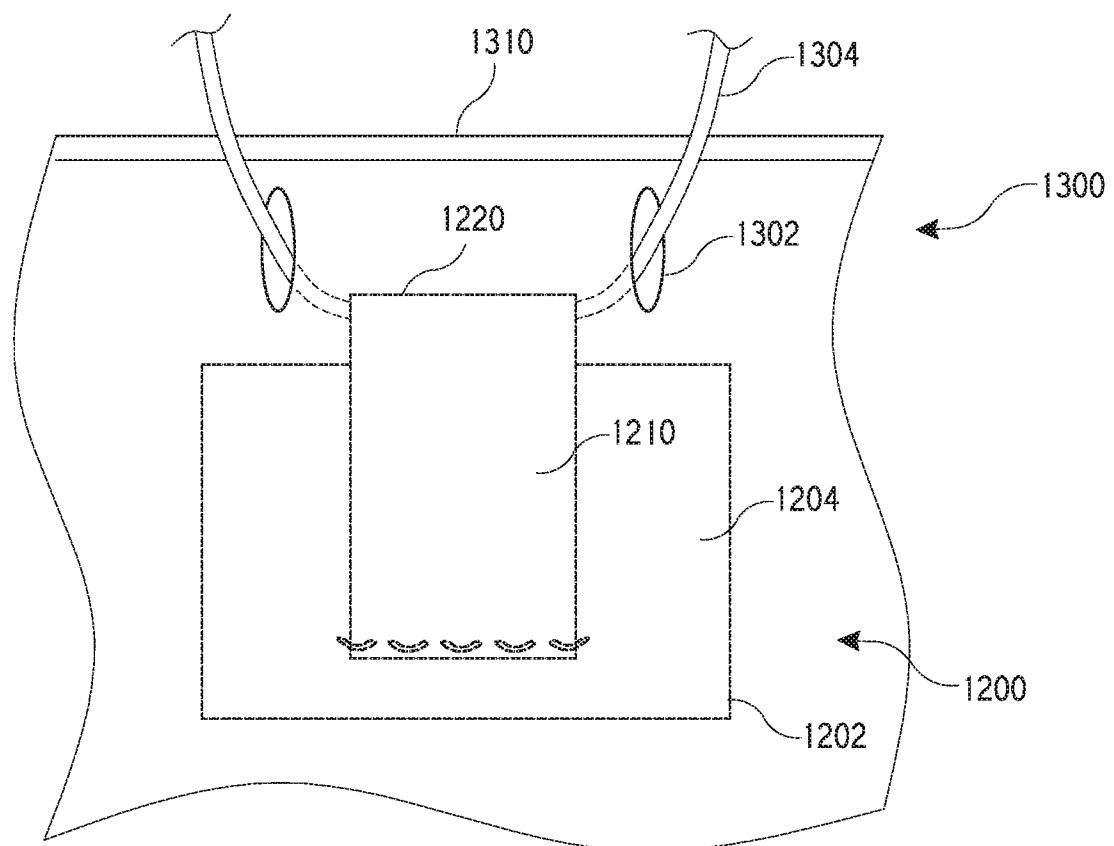


FIG. 13A

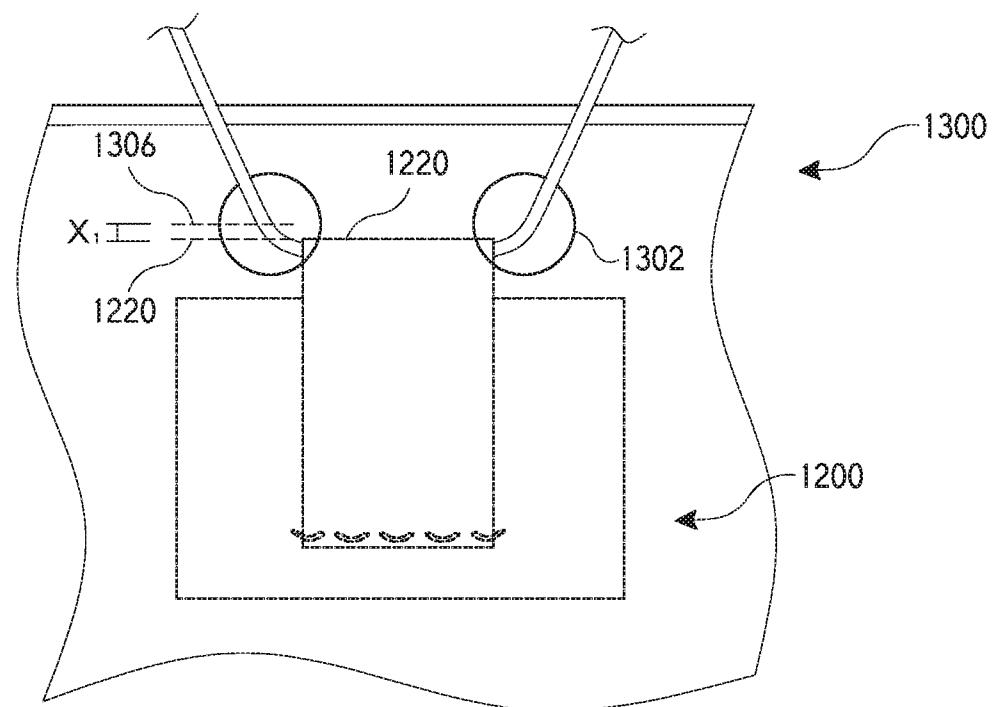


FIG. 13B

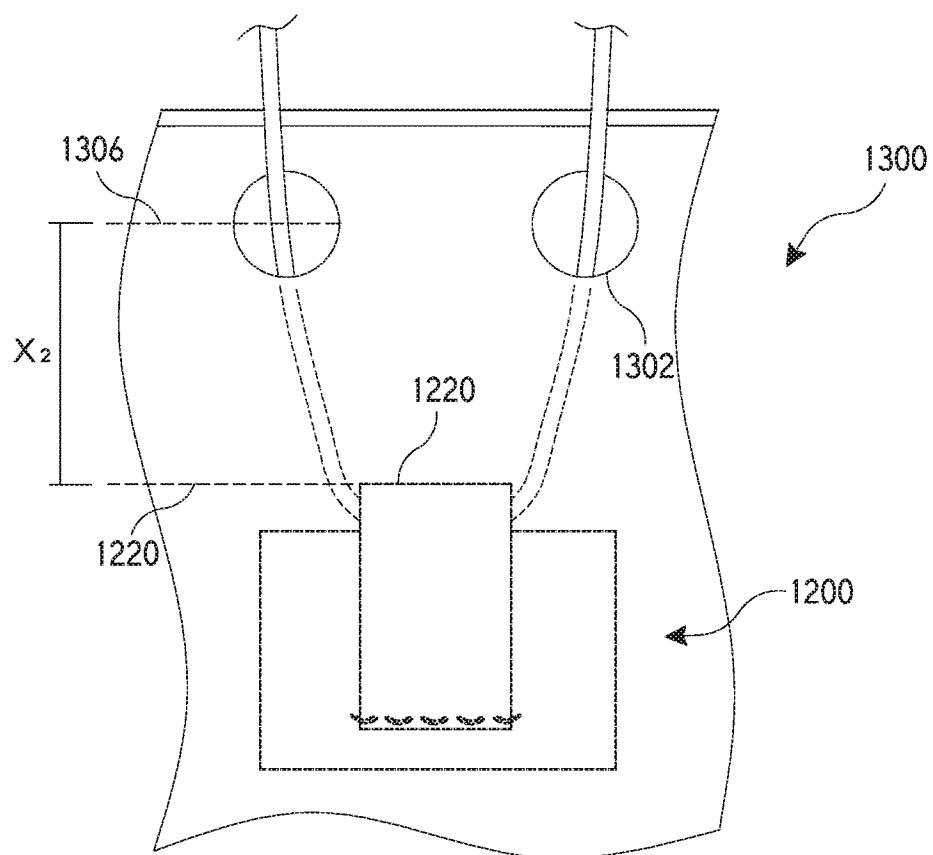


FIG. 13C

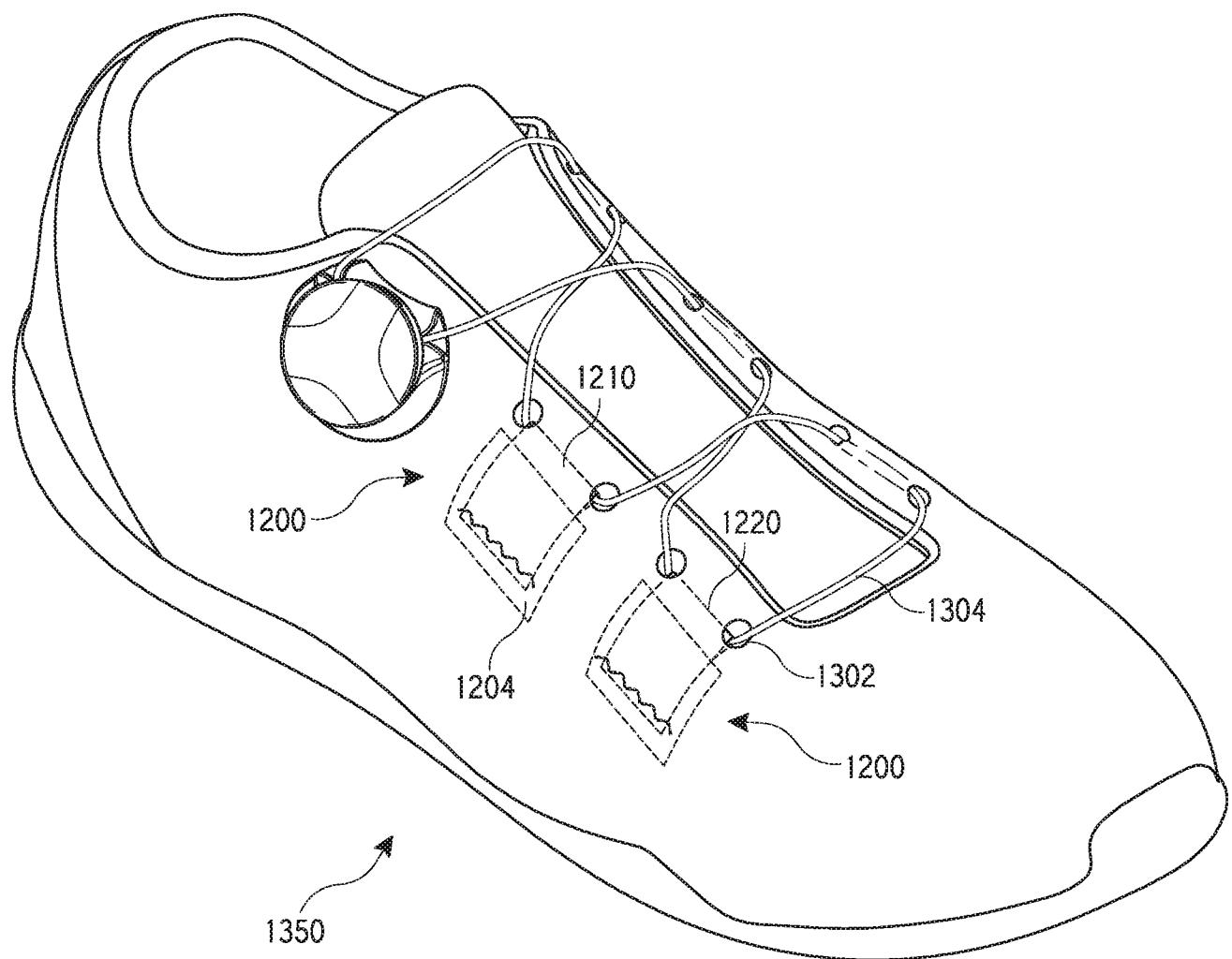


FIG. 13D

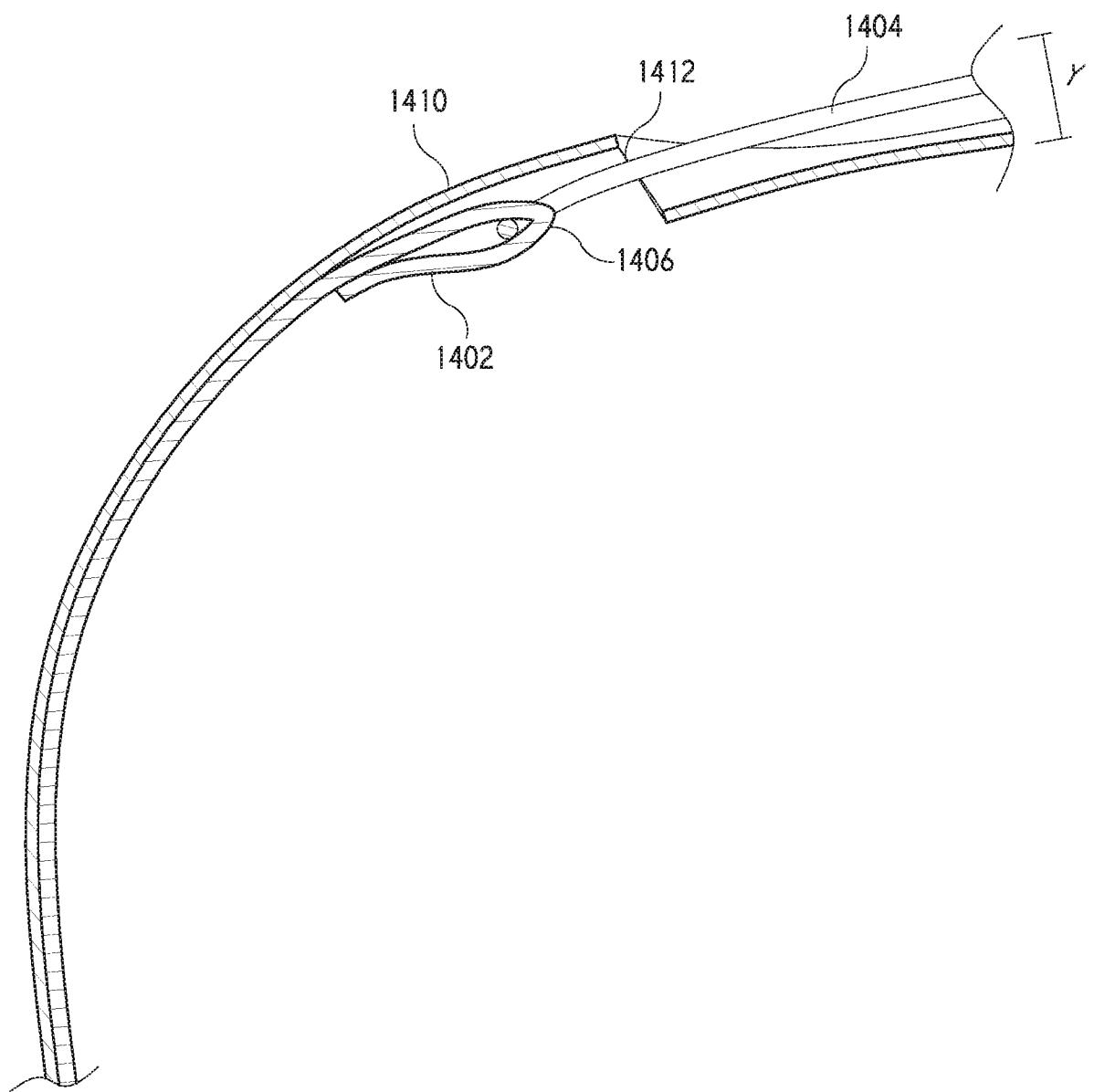


FIG. 14

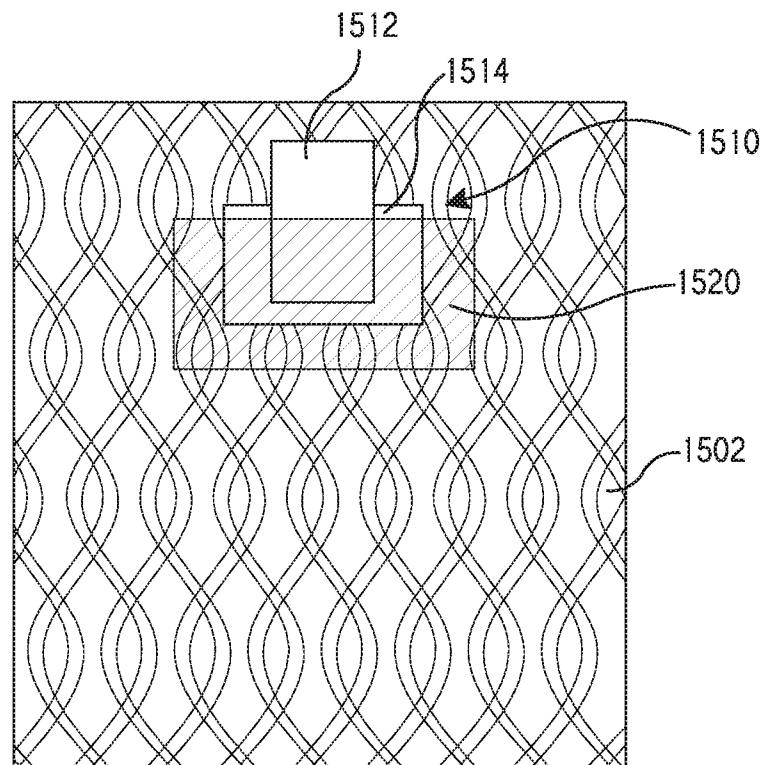


FIG. 15A

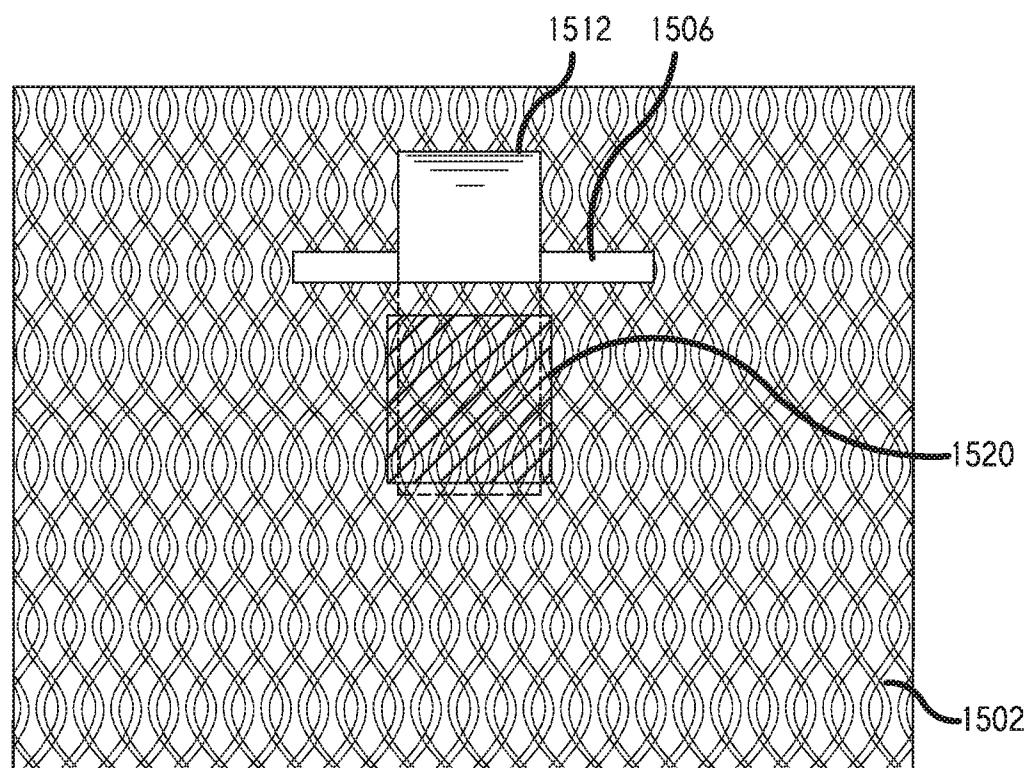


FIG. 15B

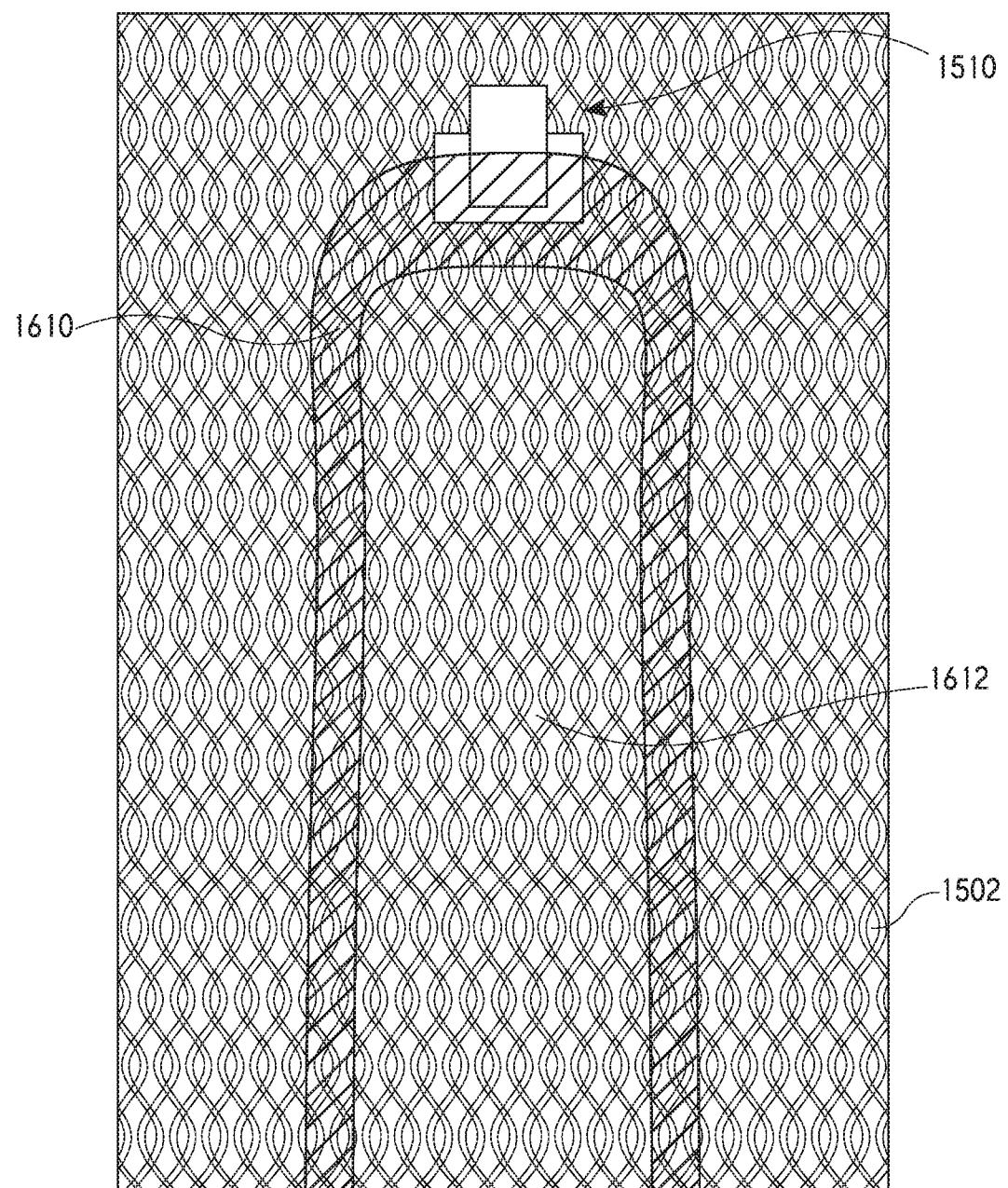


FIG. 16A

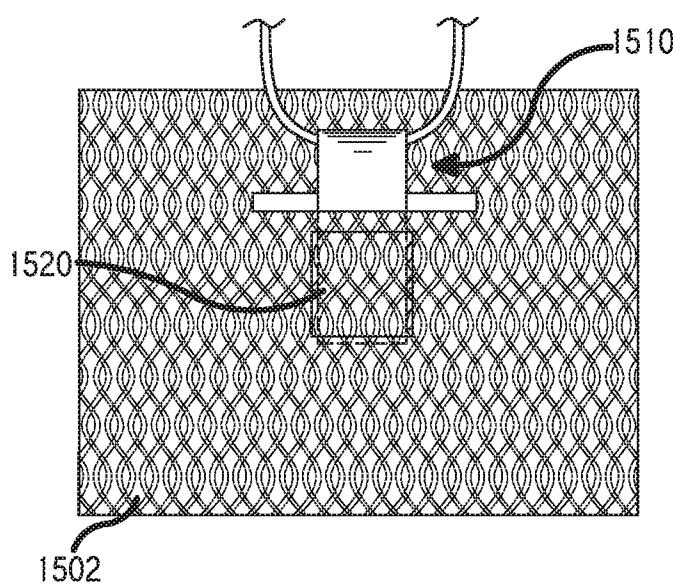


FIG. 16B

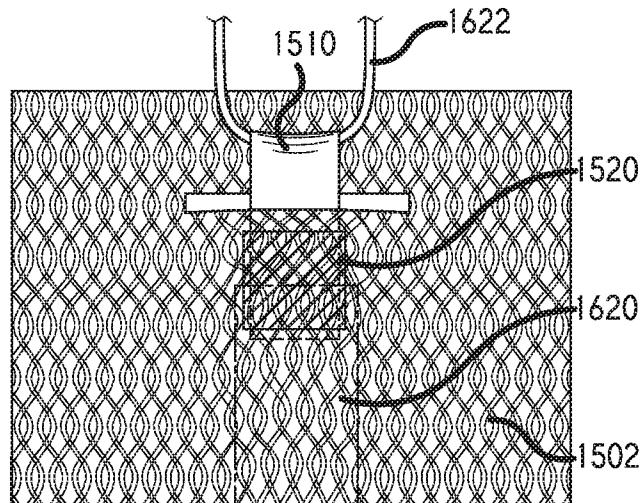


FIG. 16C

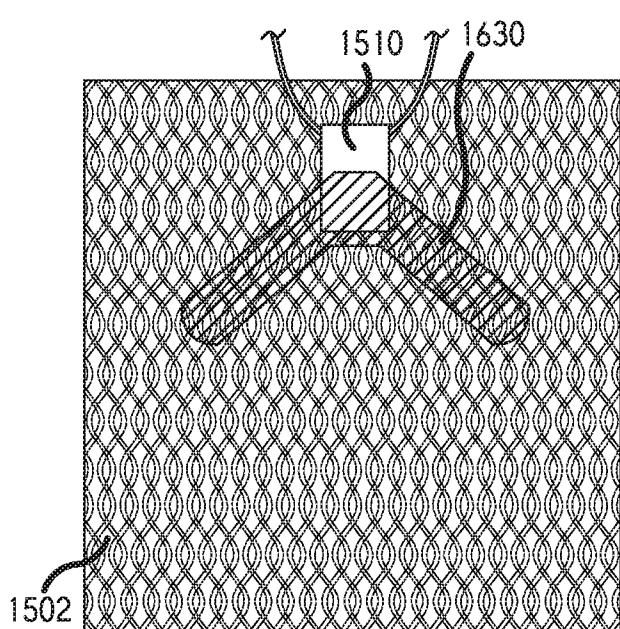


FIG. 16D

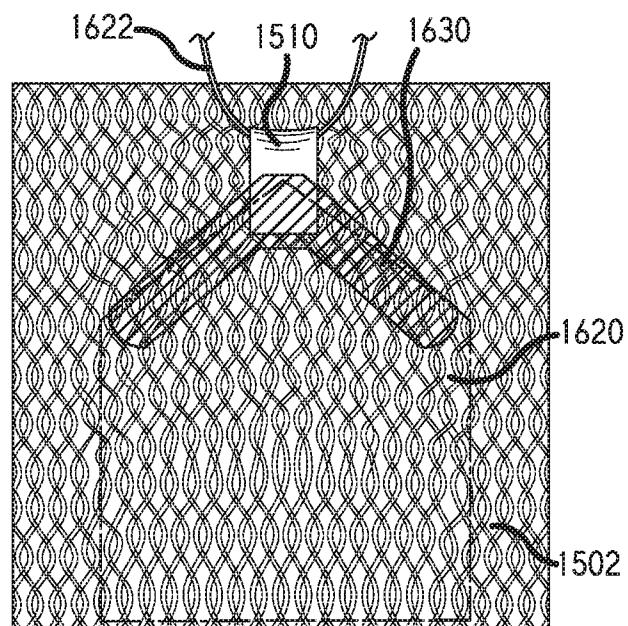


FIG. 16E

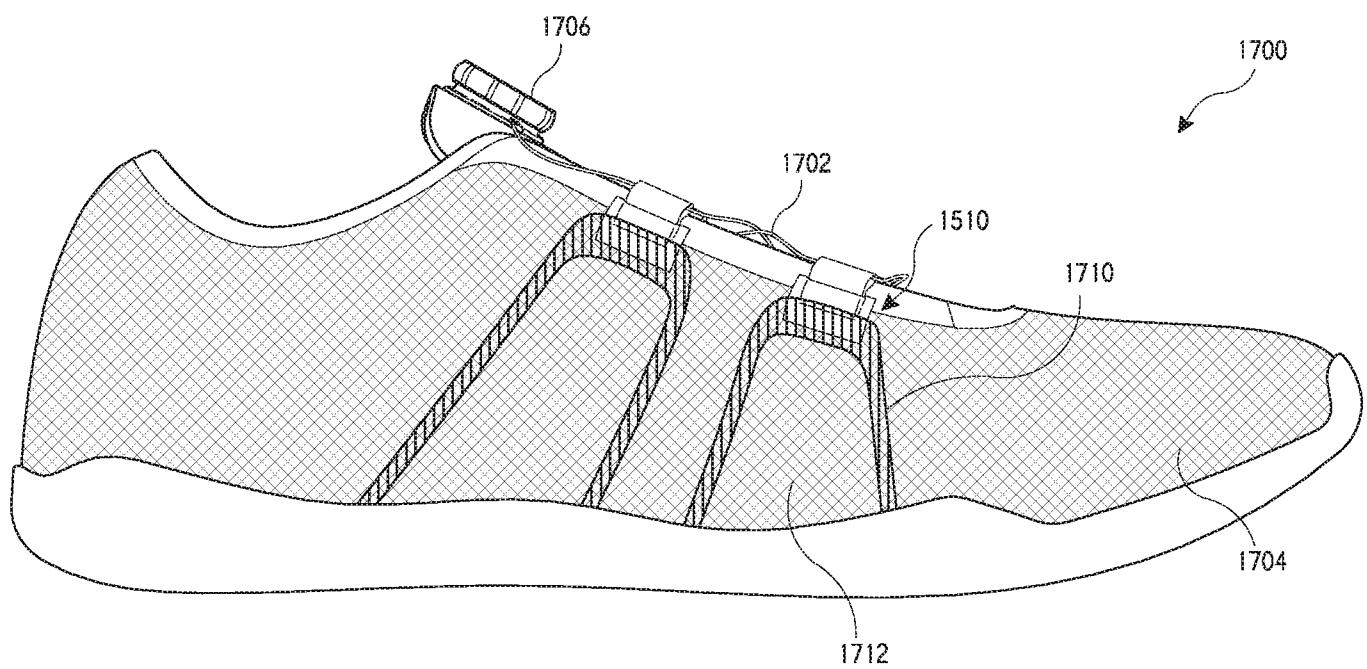
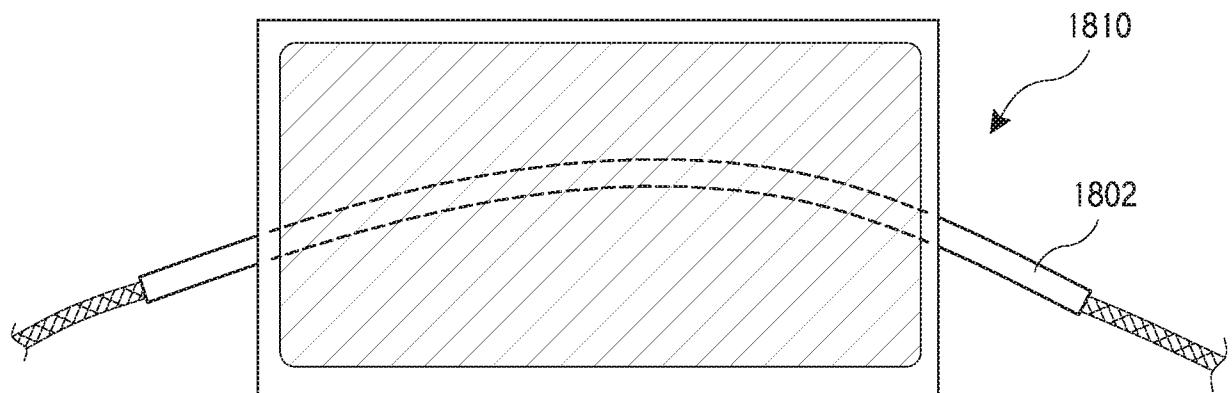
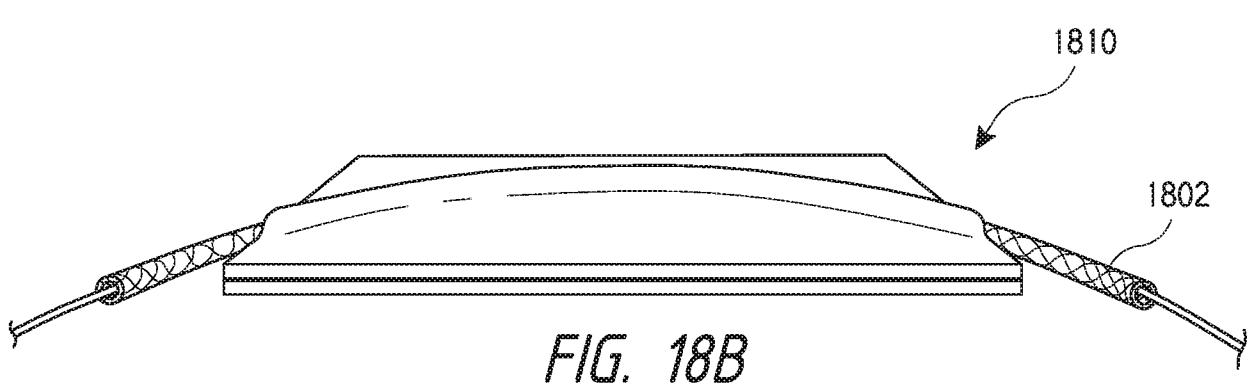
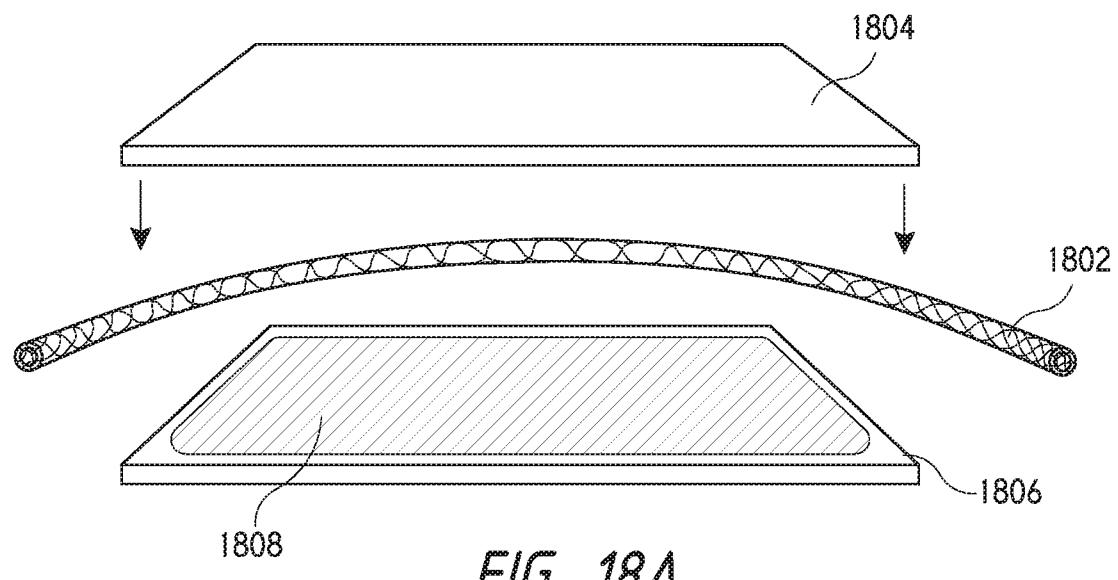


FIG. 17



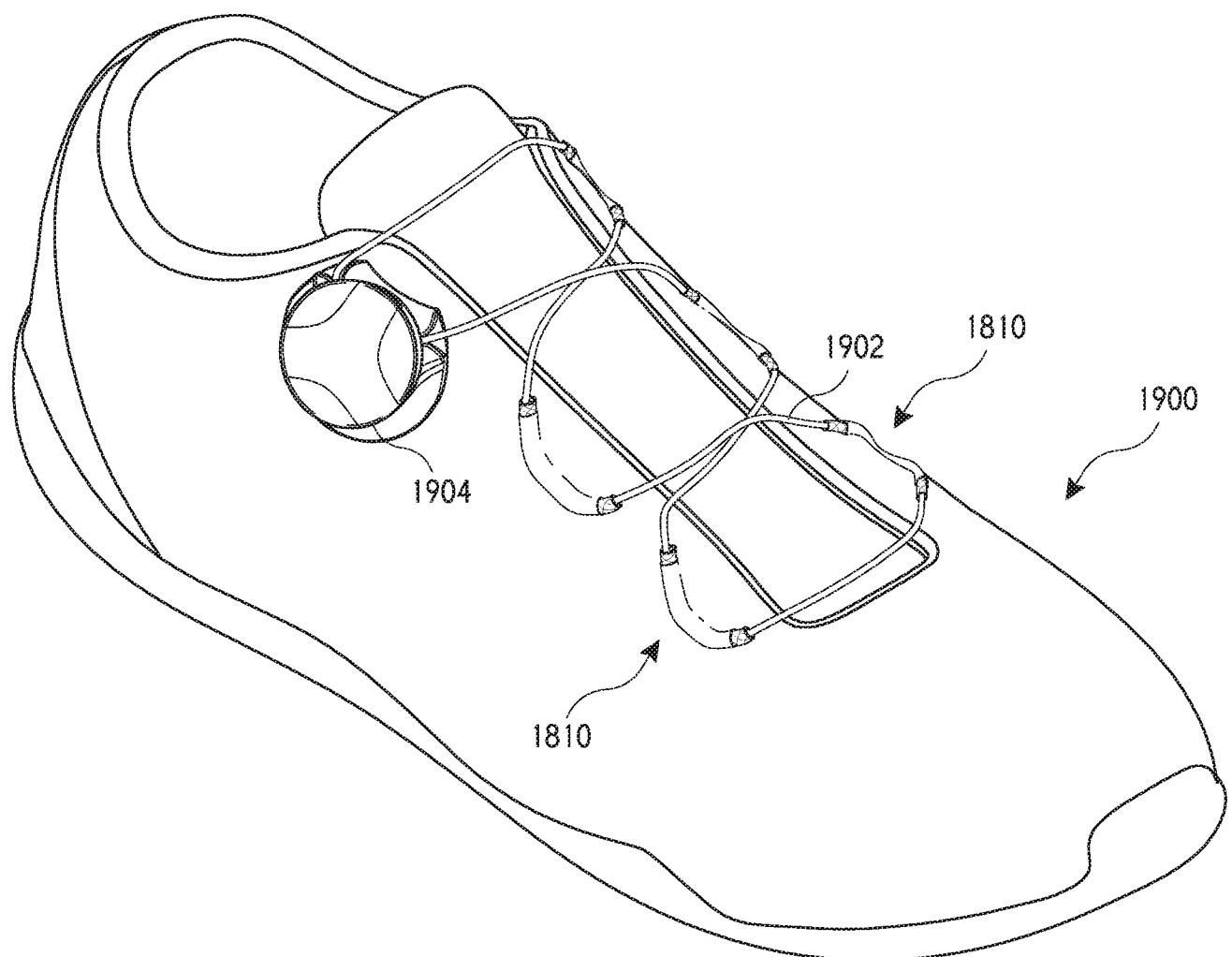


FIG. 19

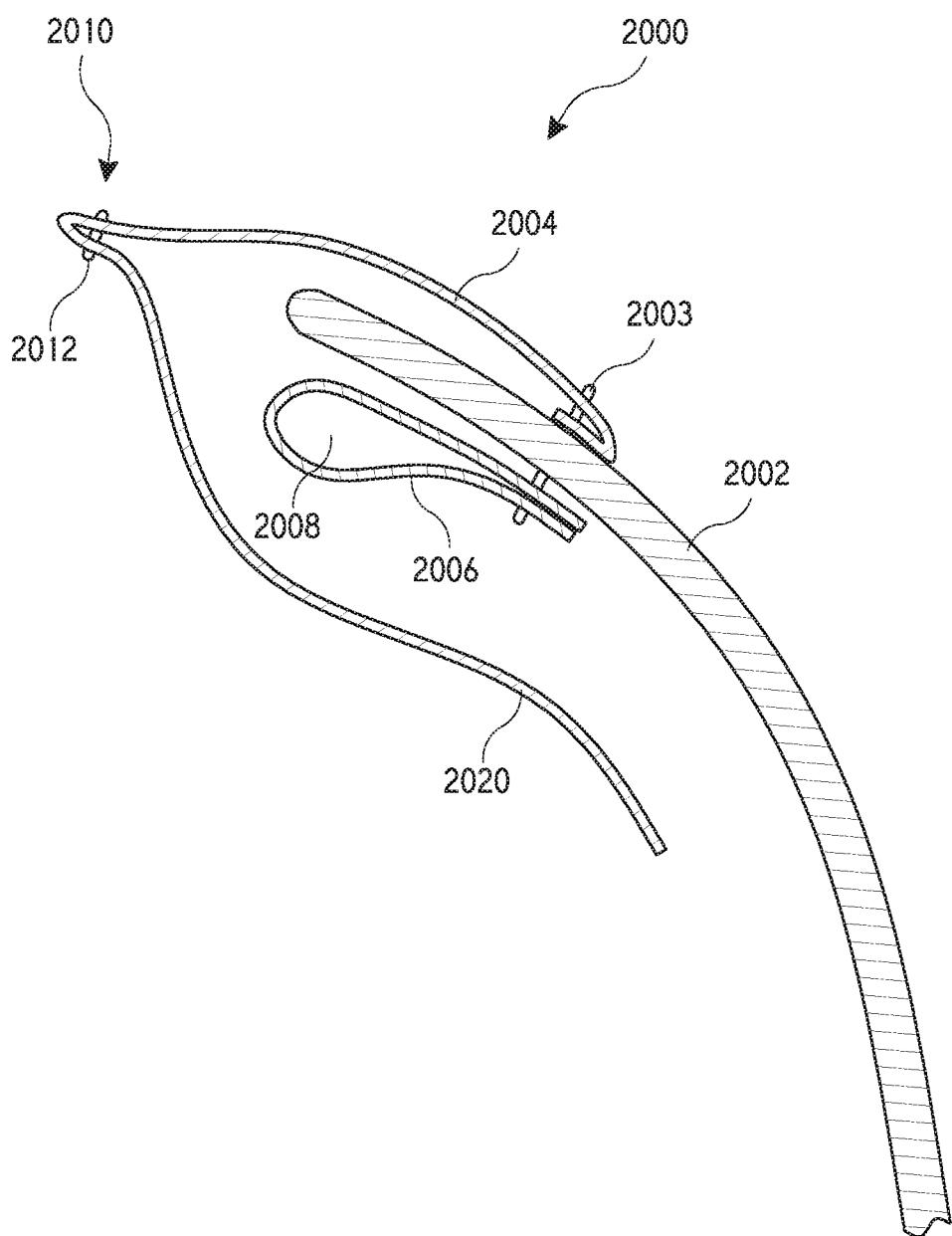
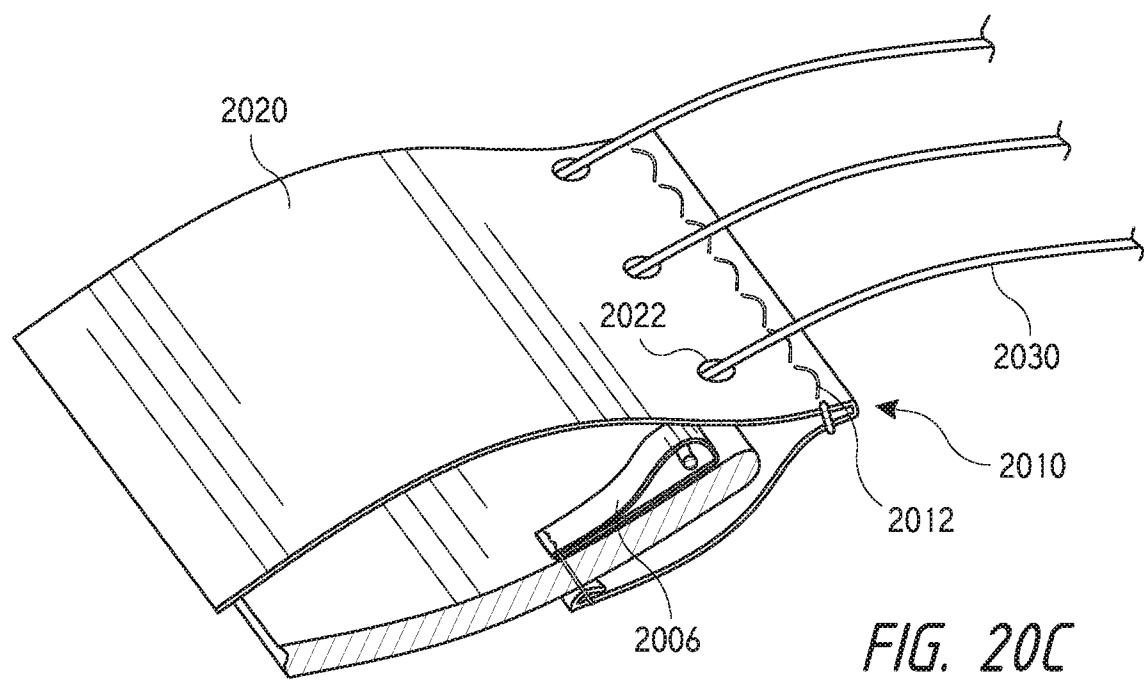
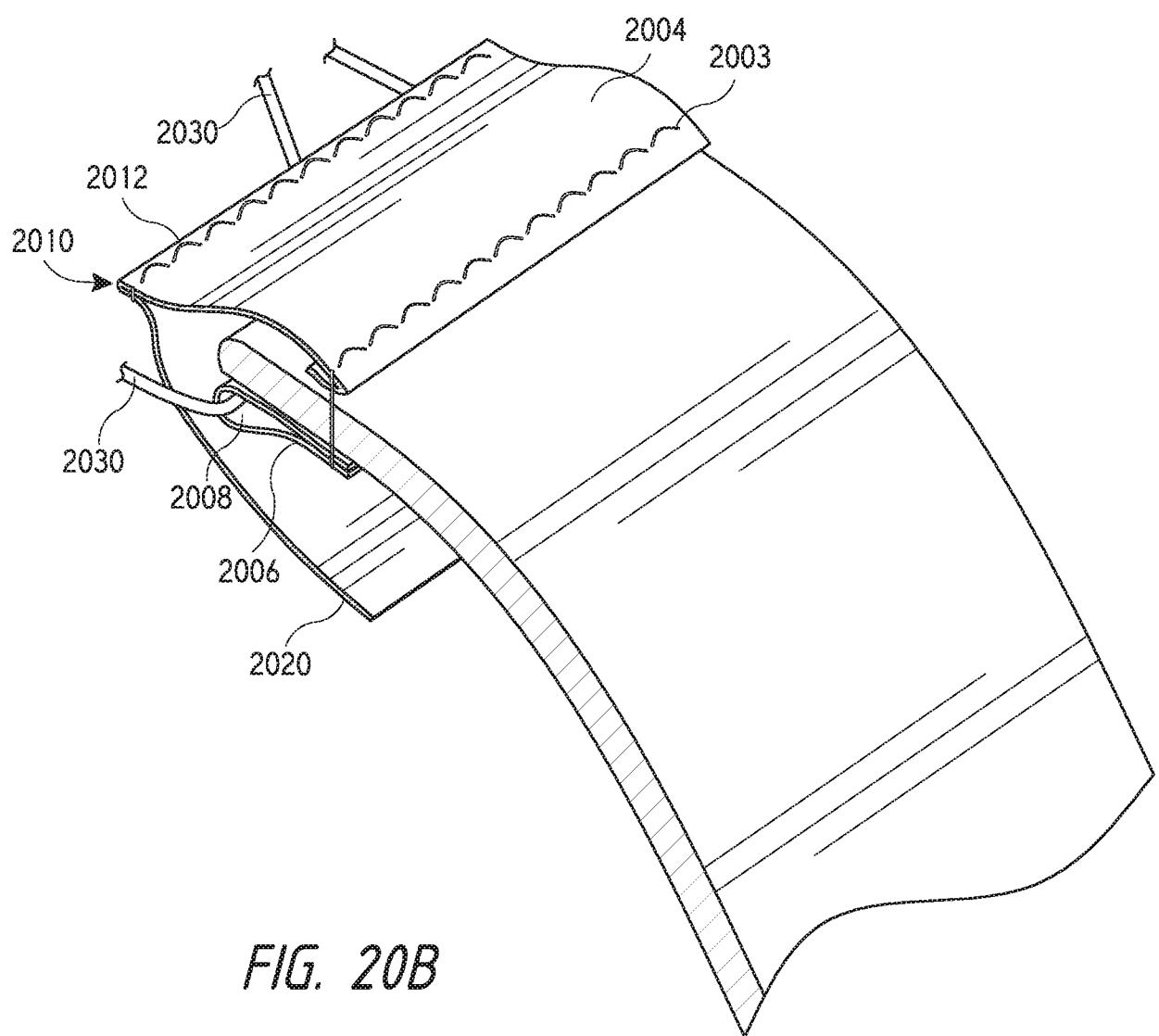


FIG. 20A



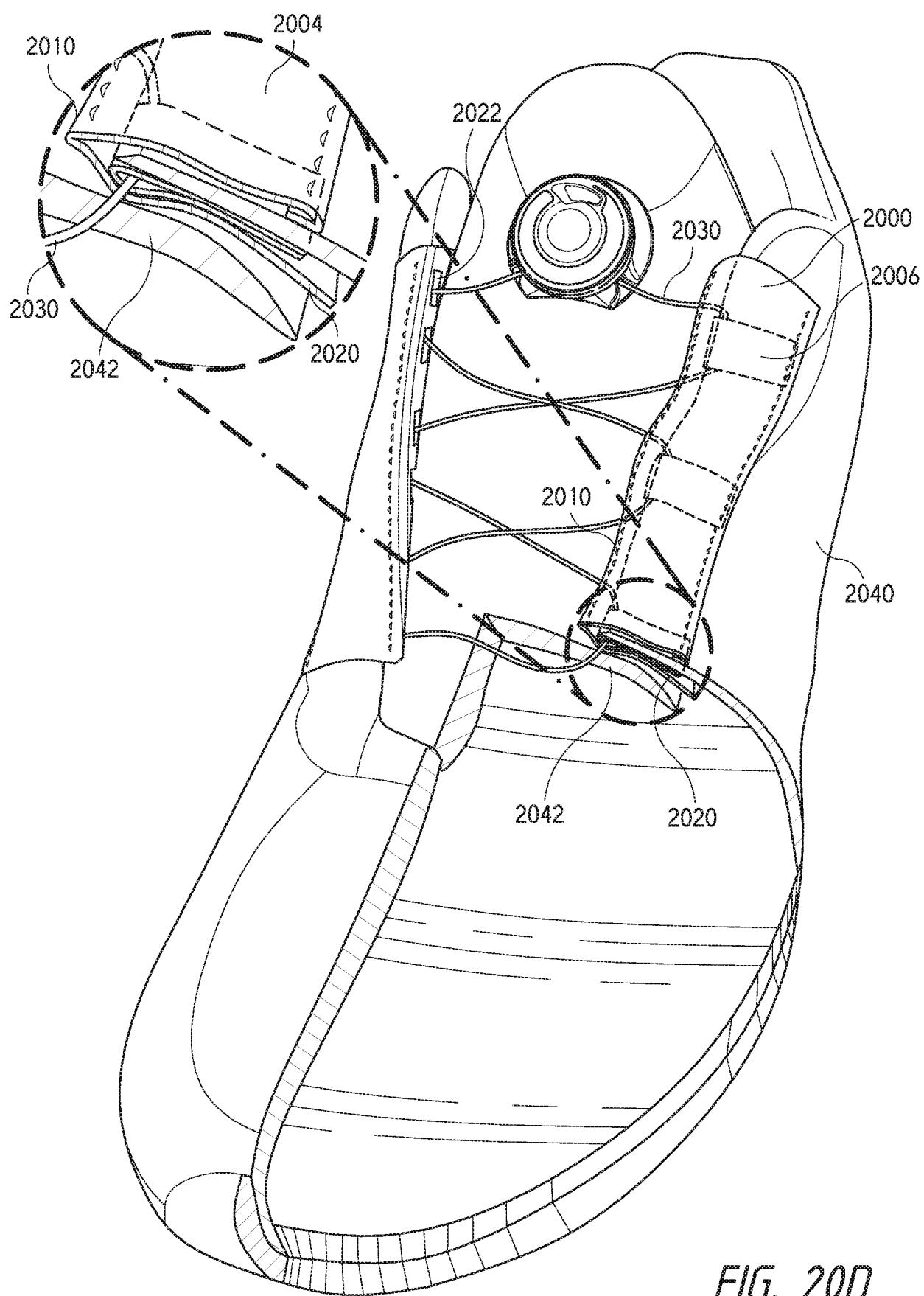


FIG. 20D

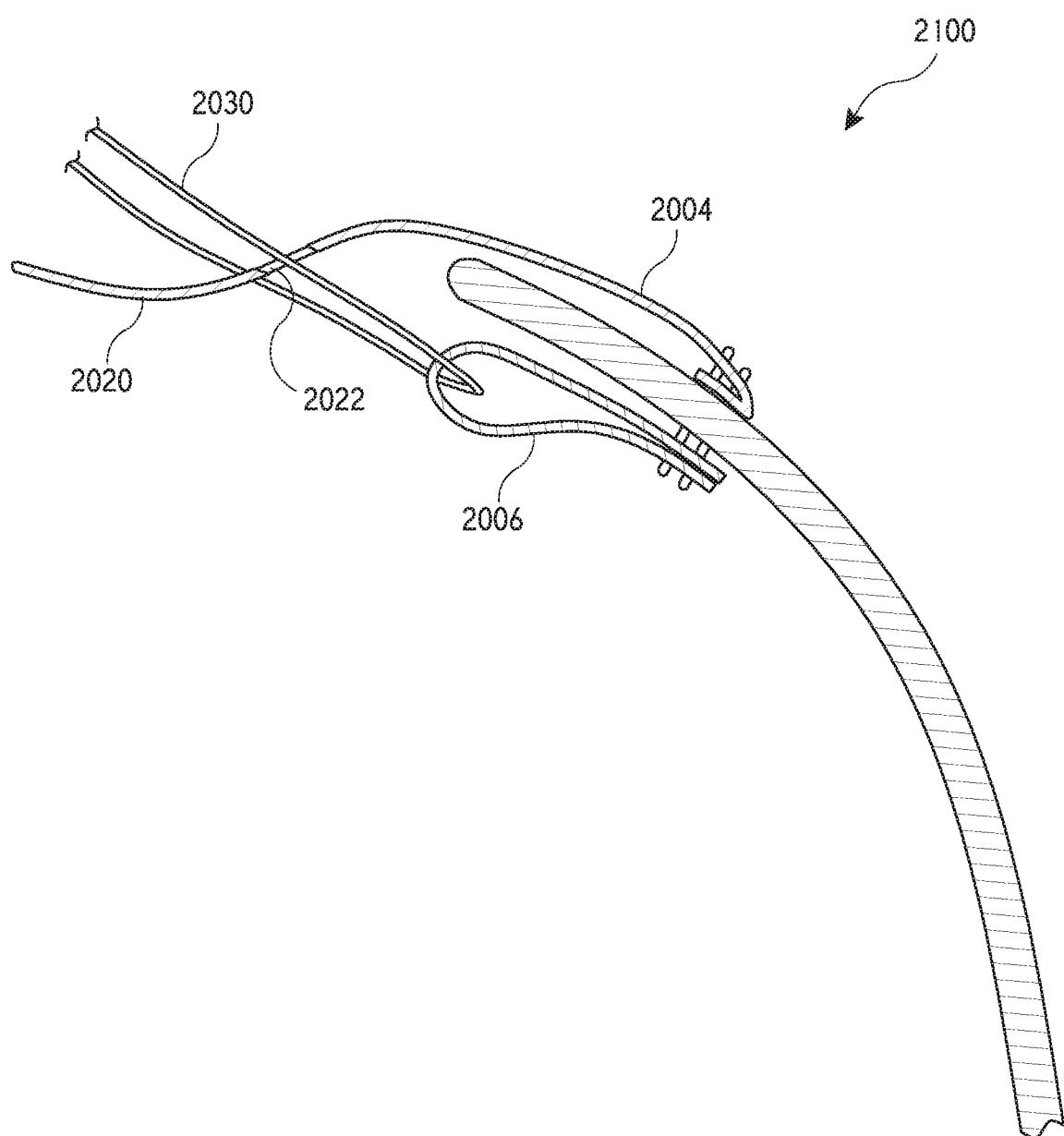


FIG. 21A

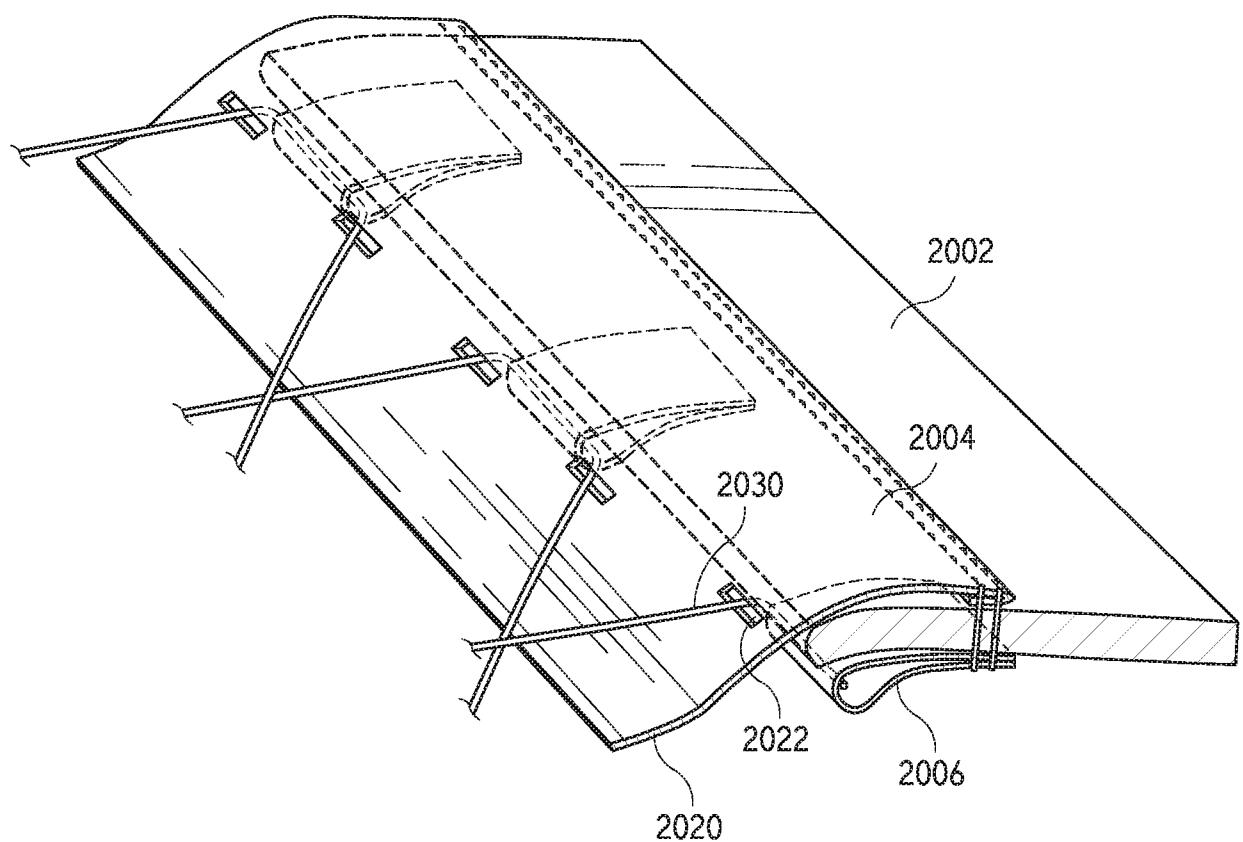


FIG. 21B

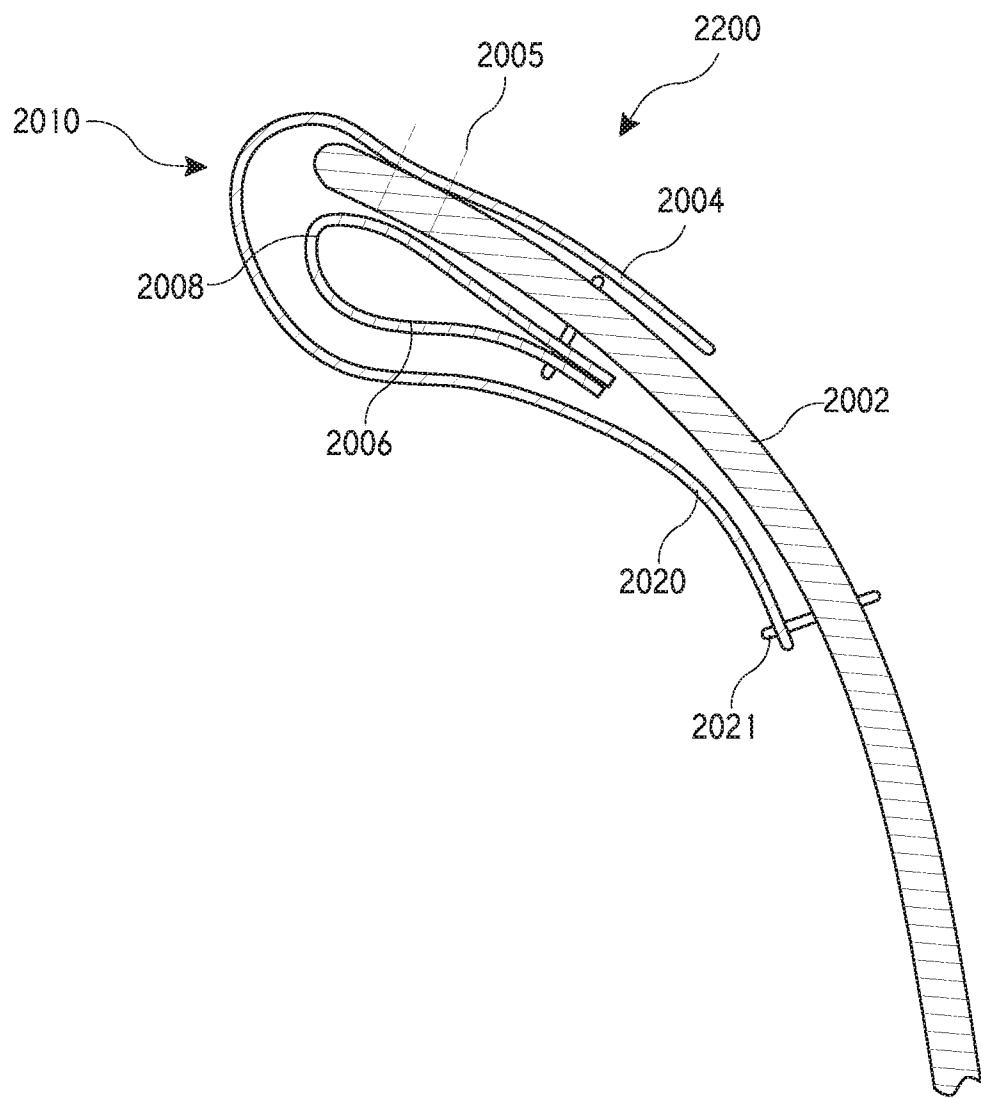


FIG. 22A

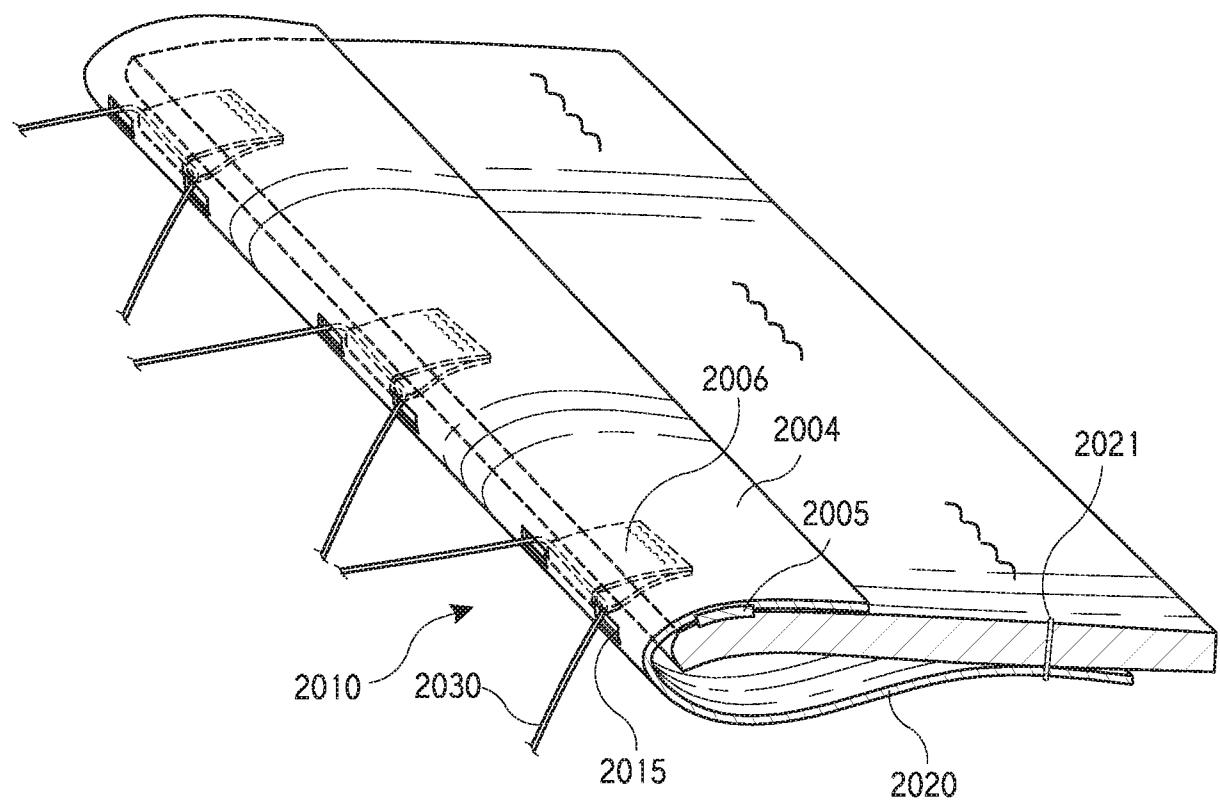


FIG. 22B

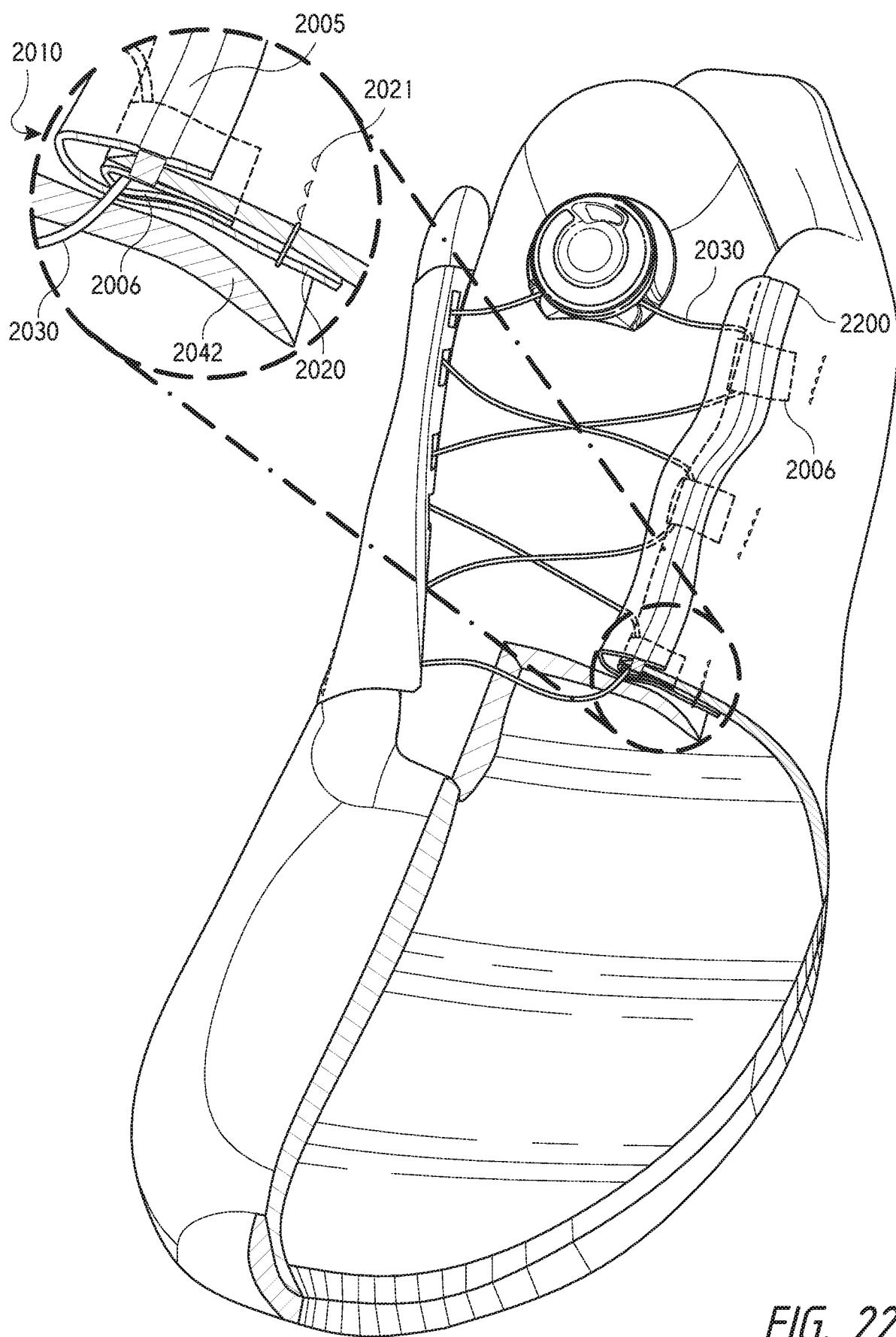


FIG. 22C

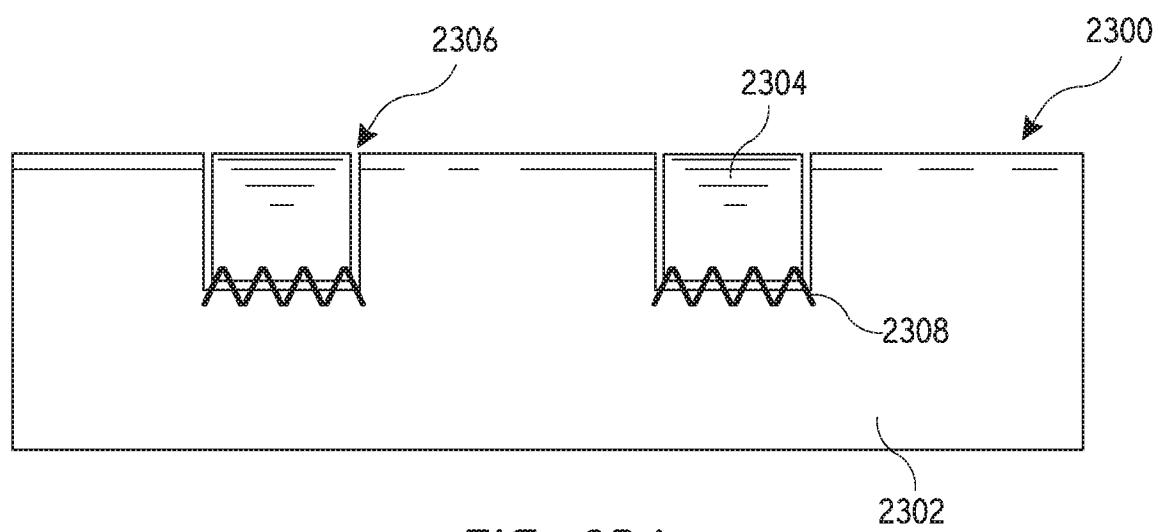


FIG. 23A

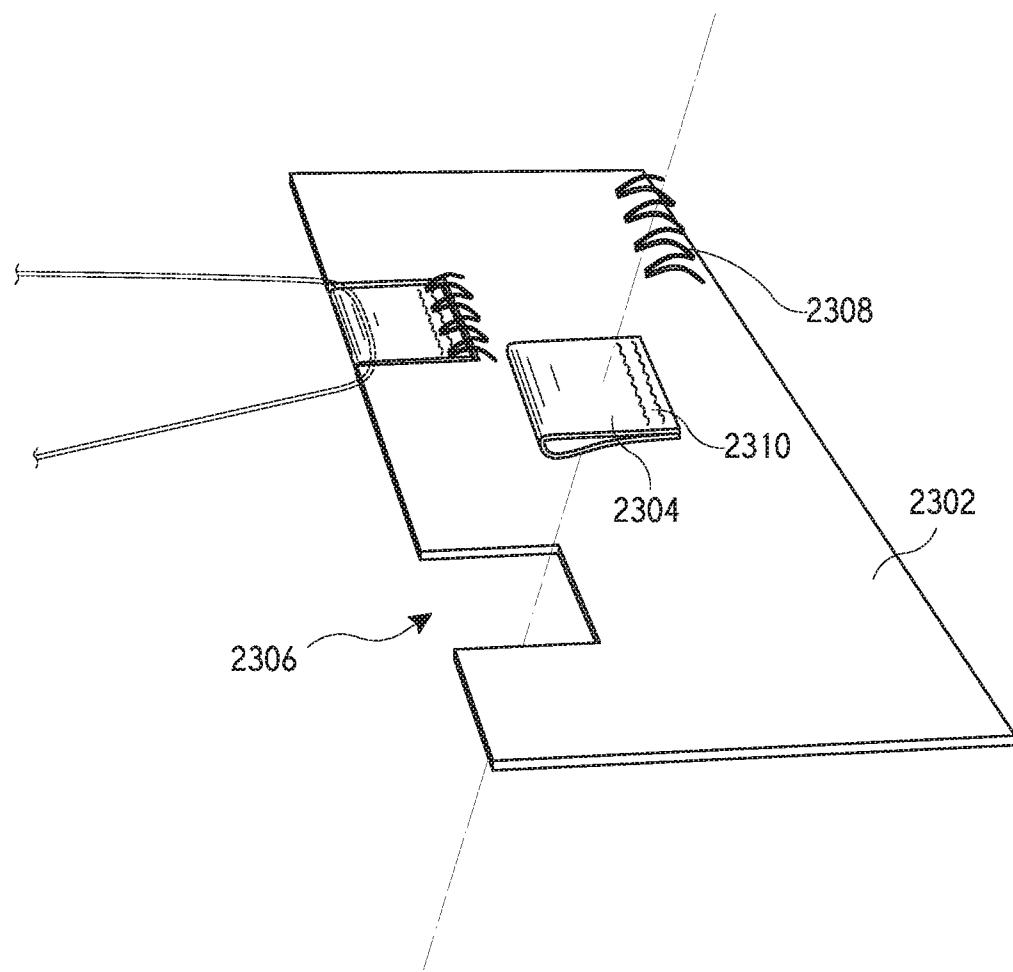


FIG. 23B

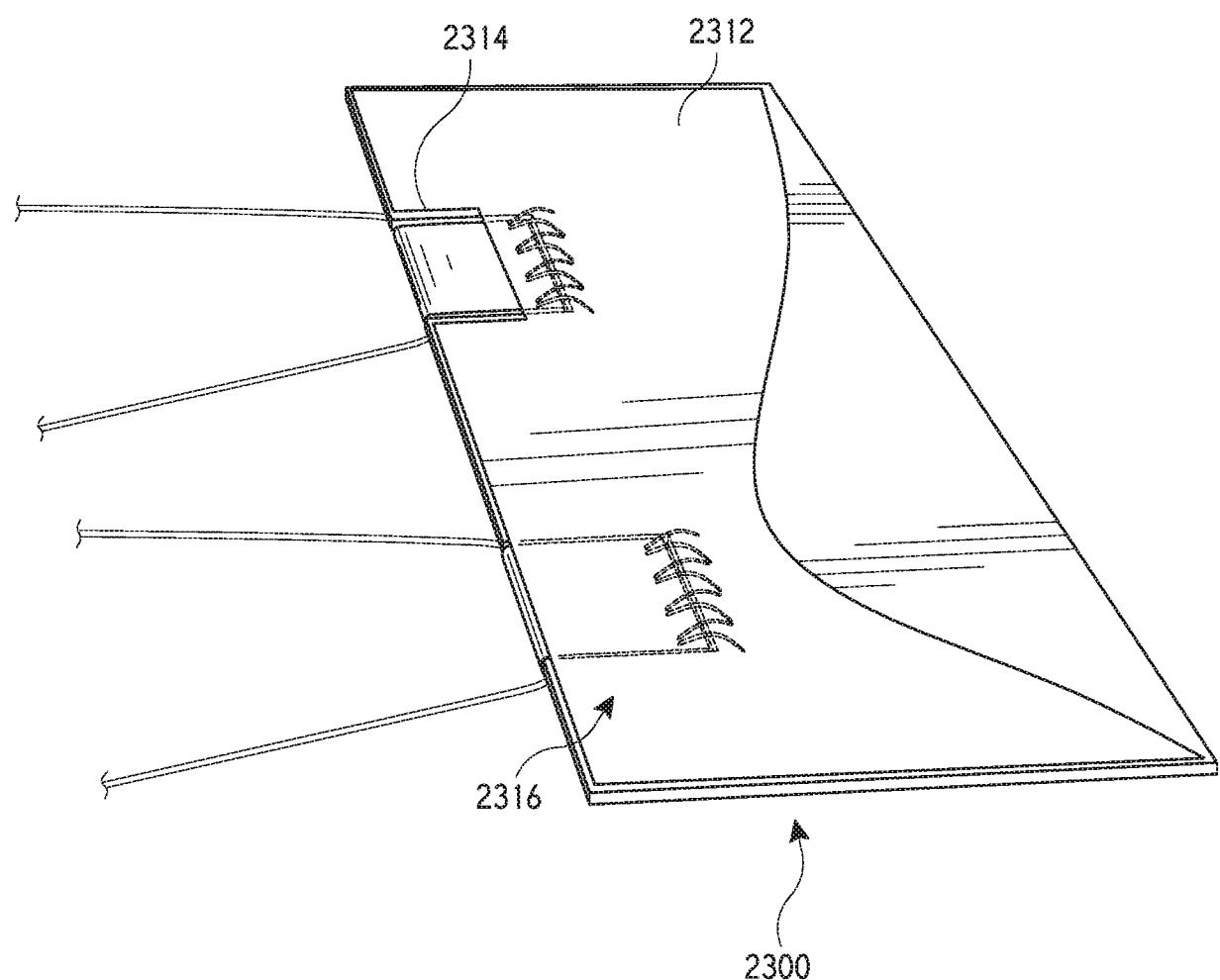


FIG. 23C

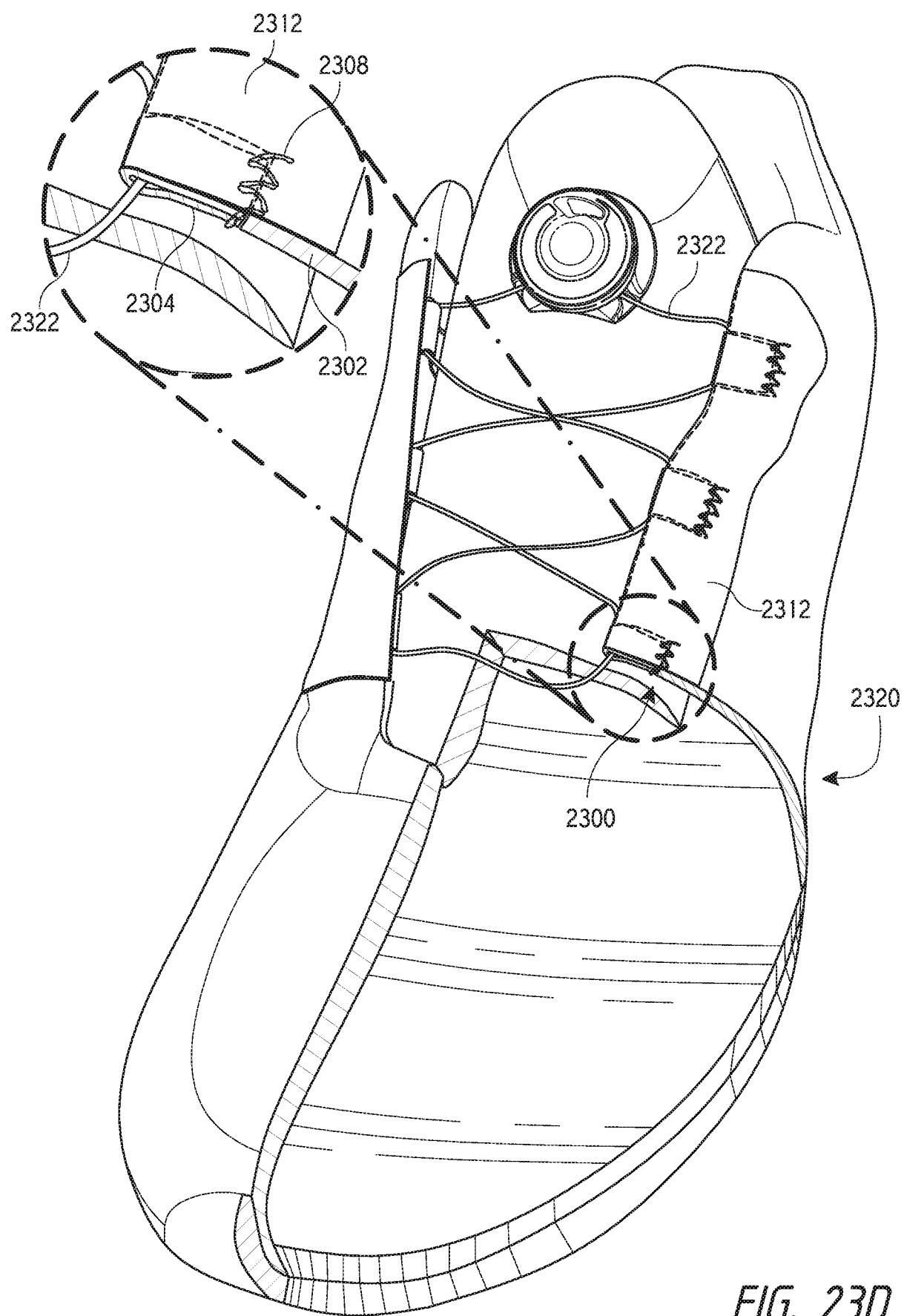
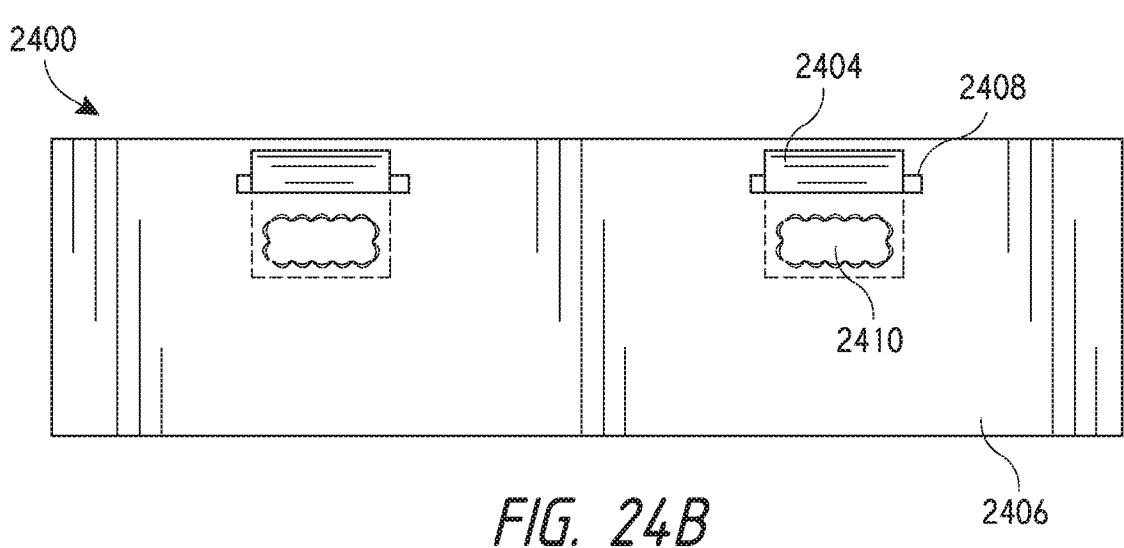
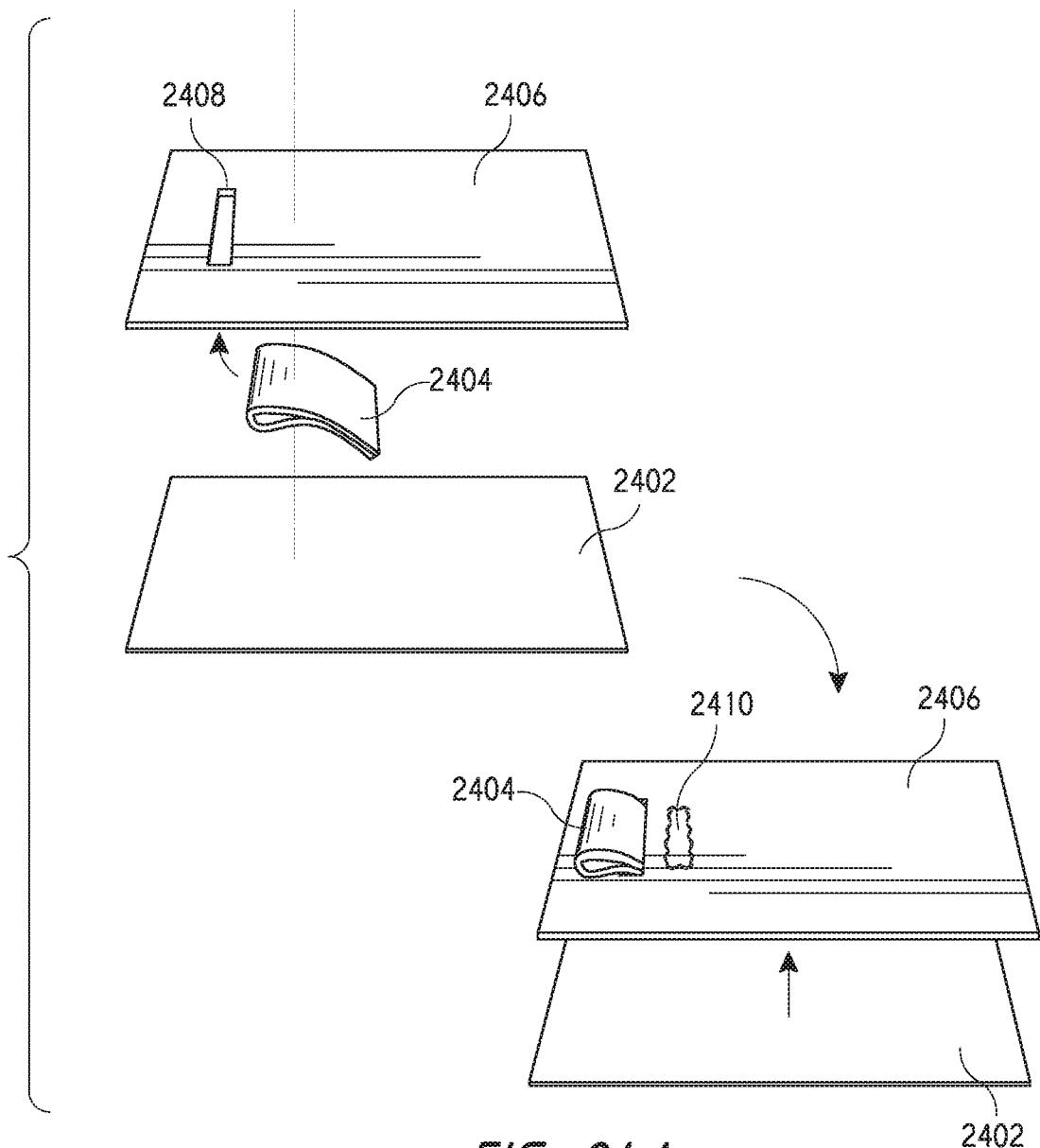


FIG. 23D



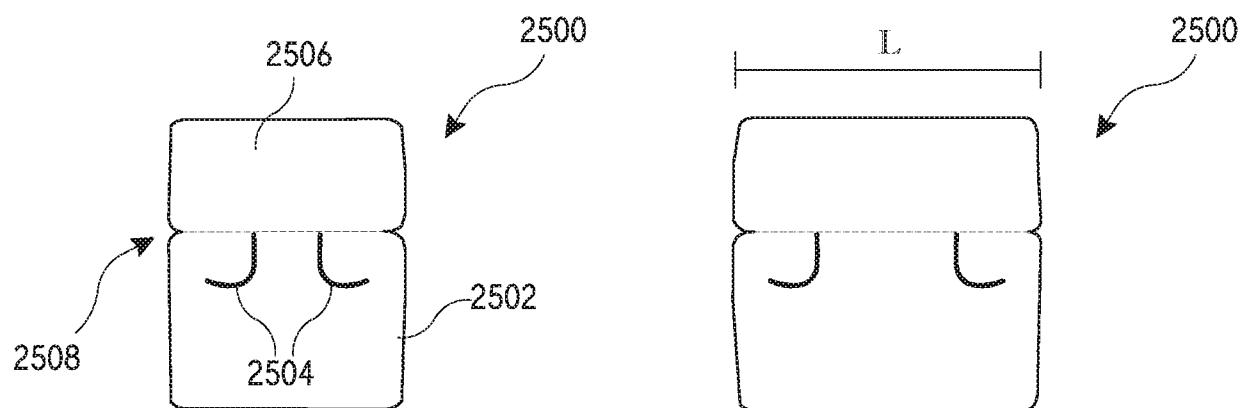


FIG. 25A

FIG. 25B

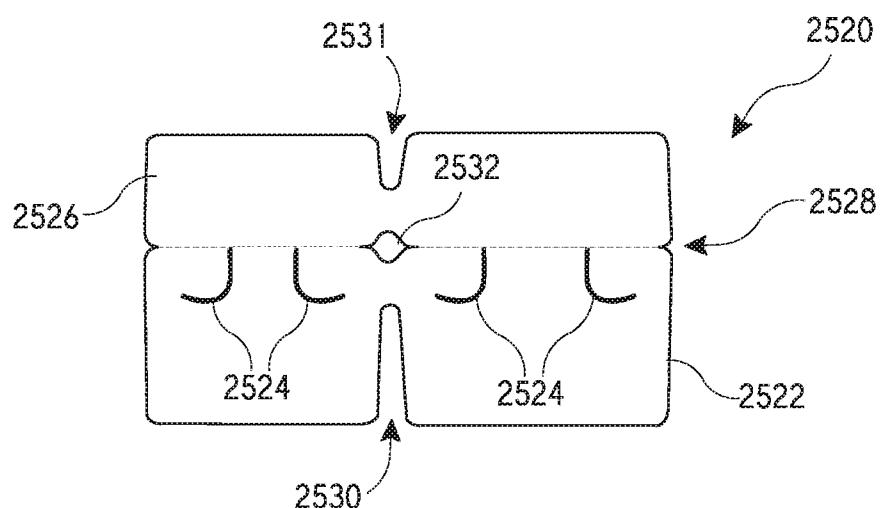


FIG. 25C

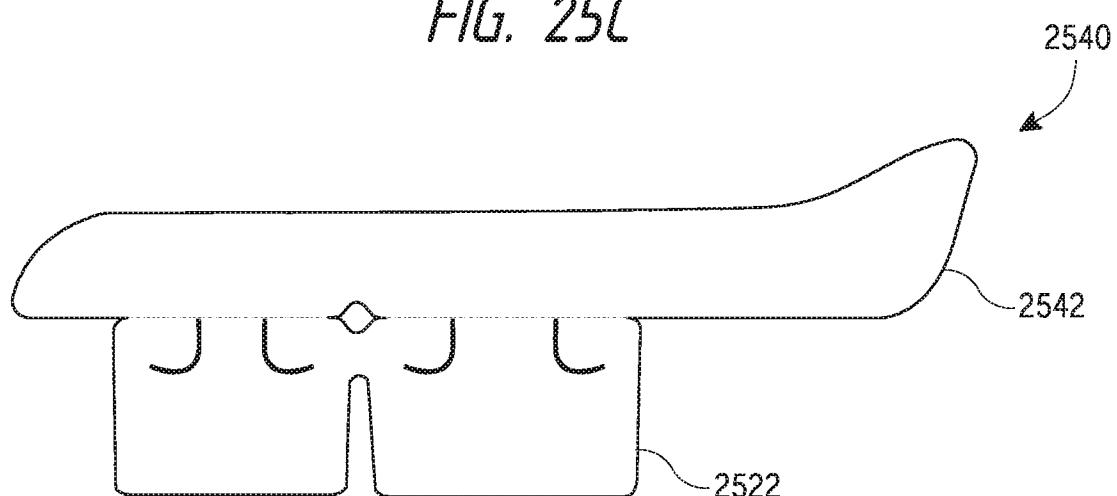
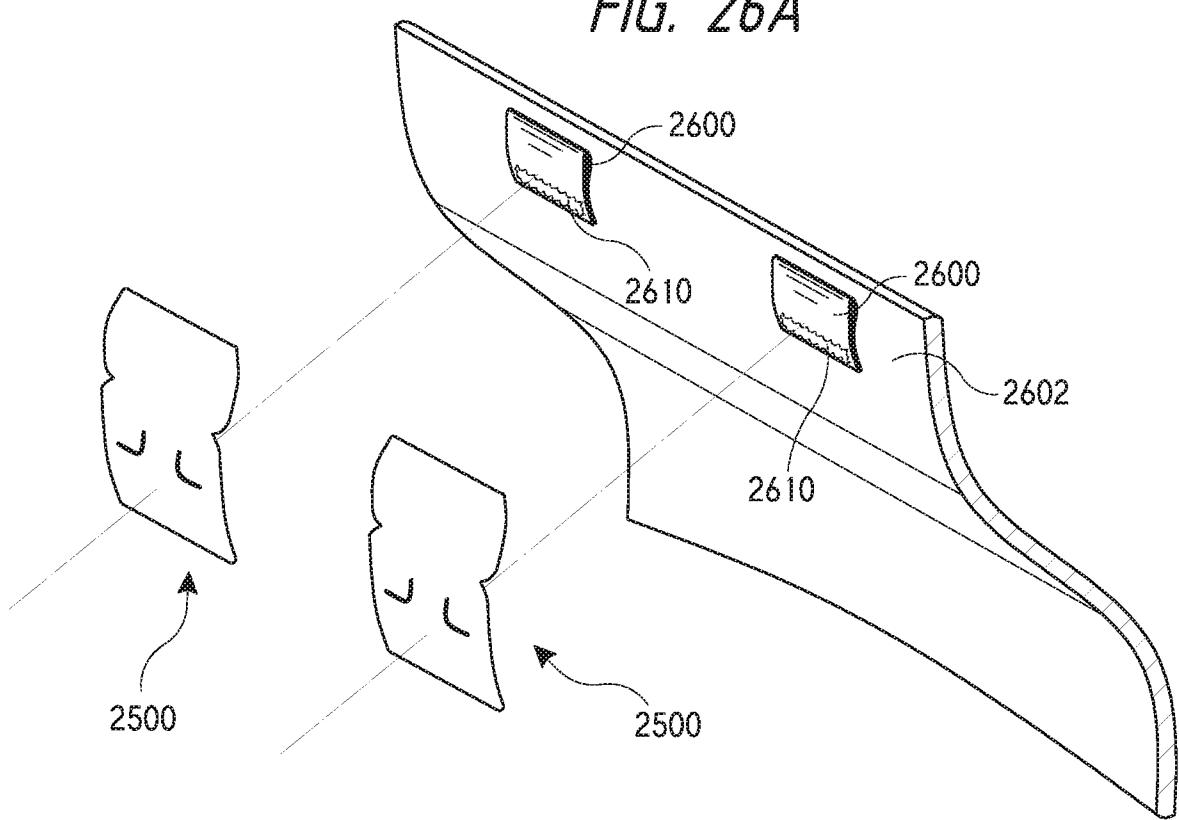
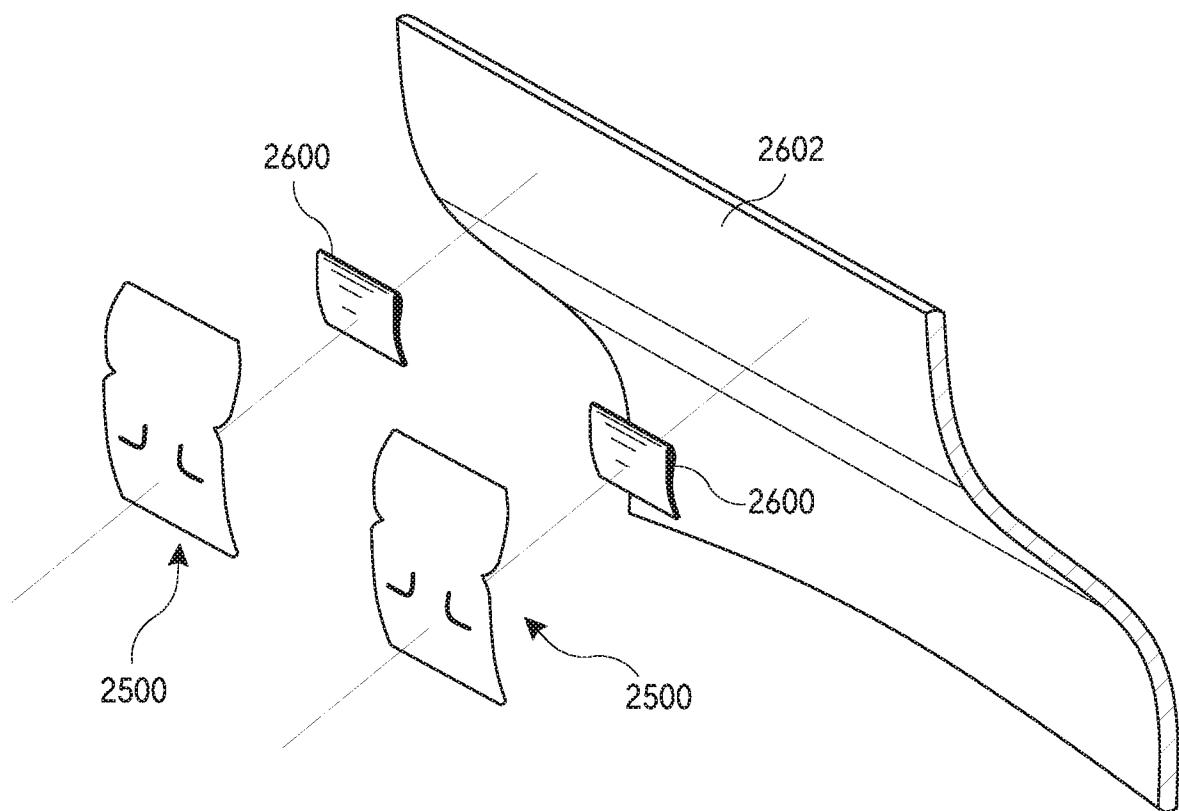
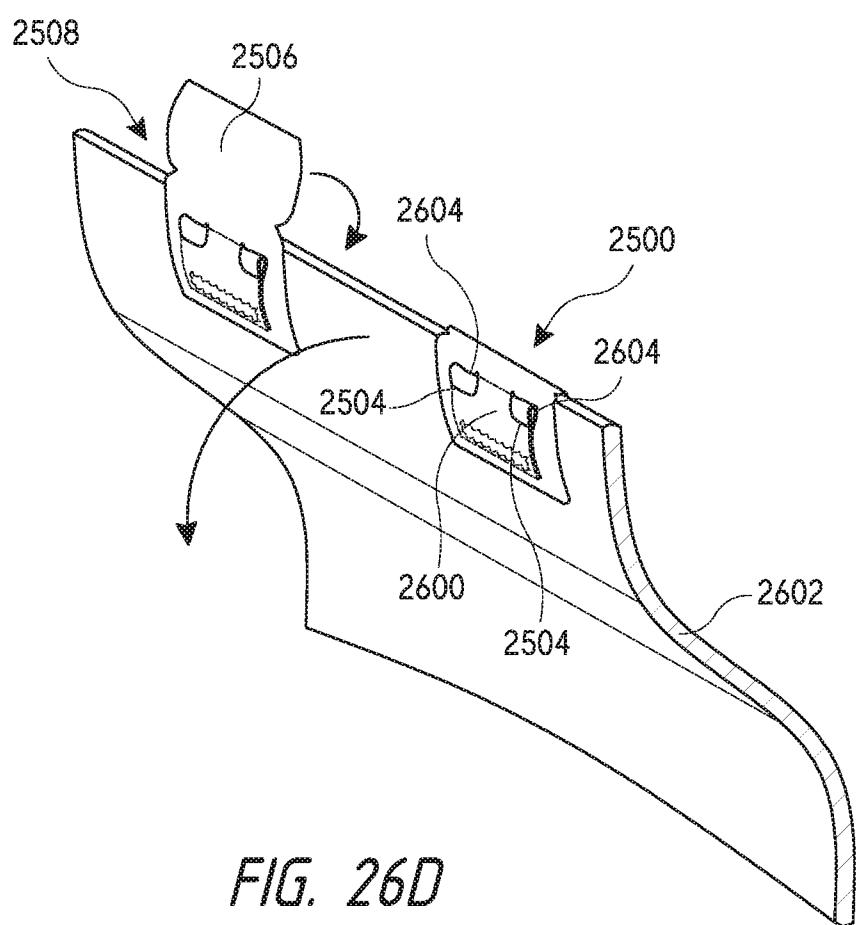
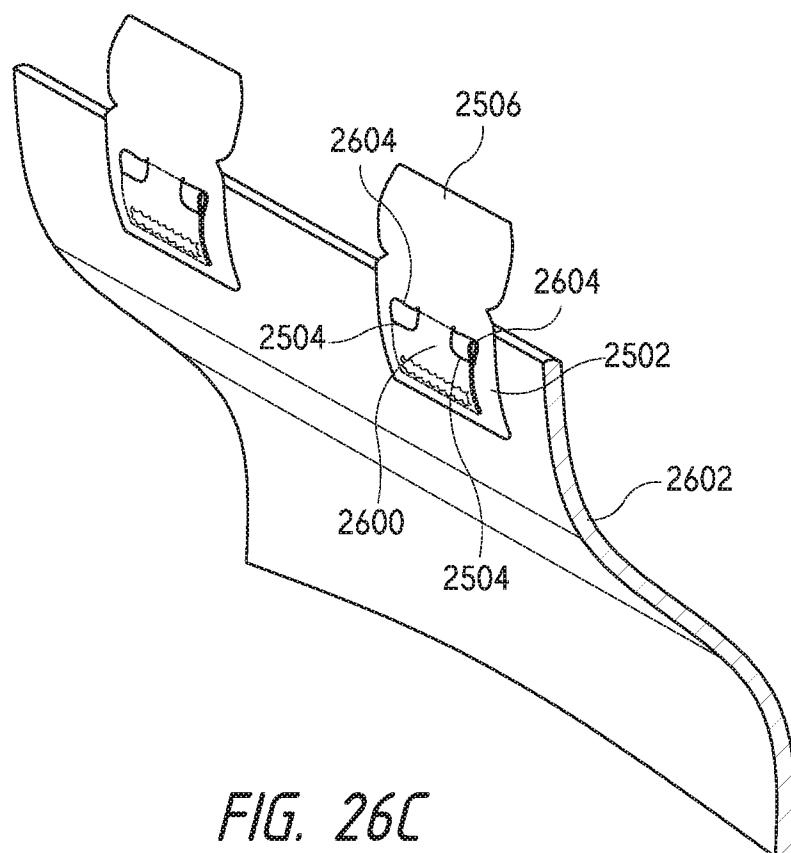
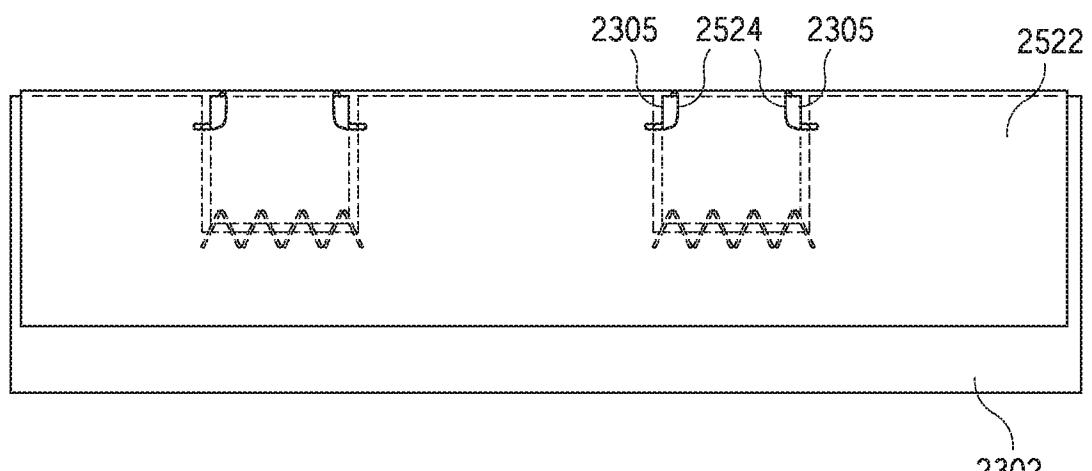
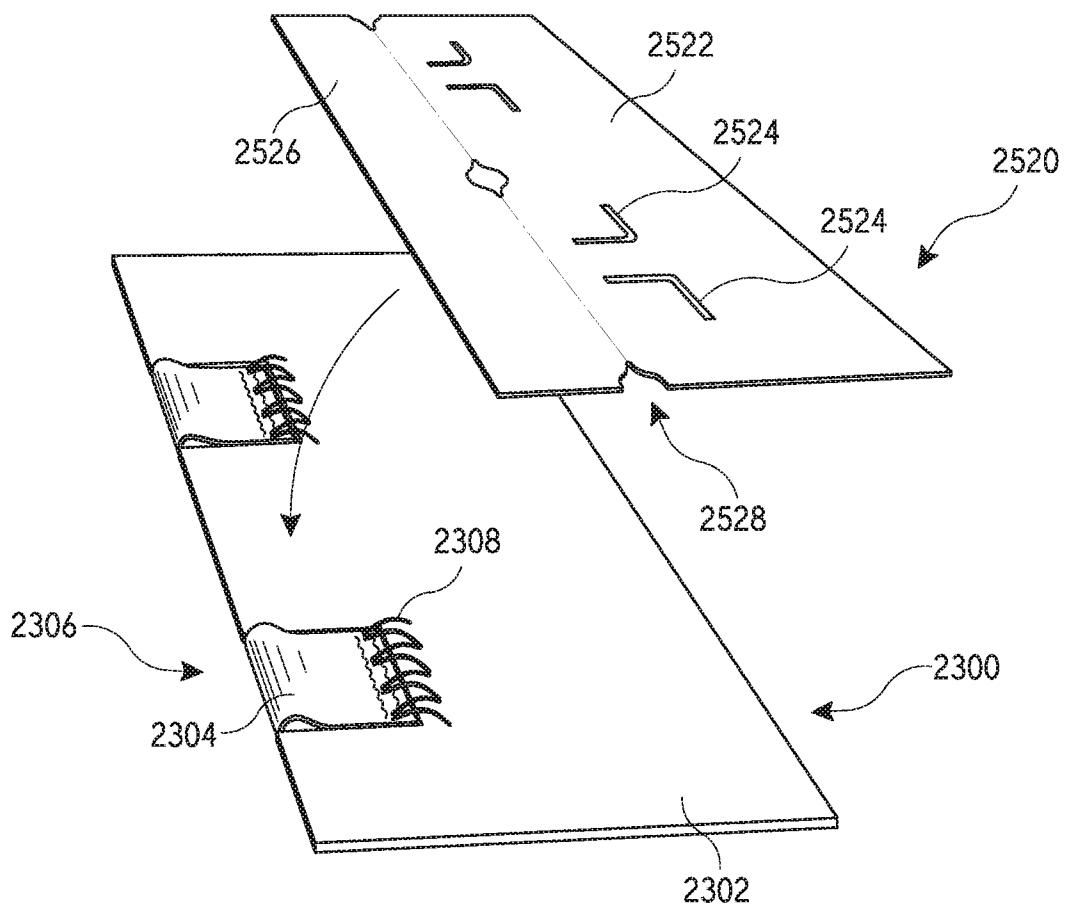


FIG. 25D







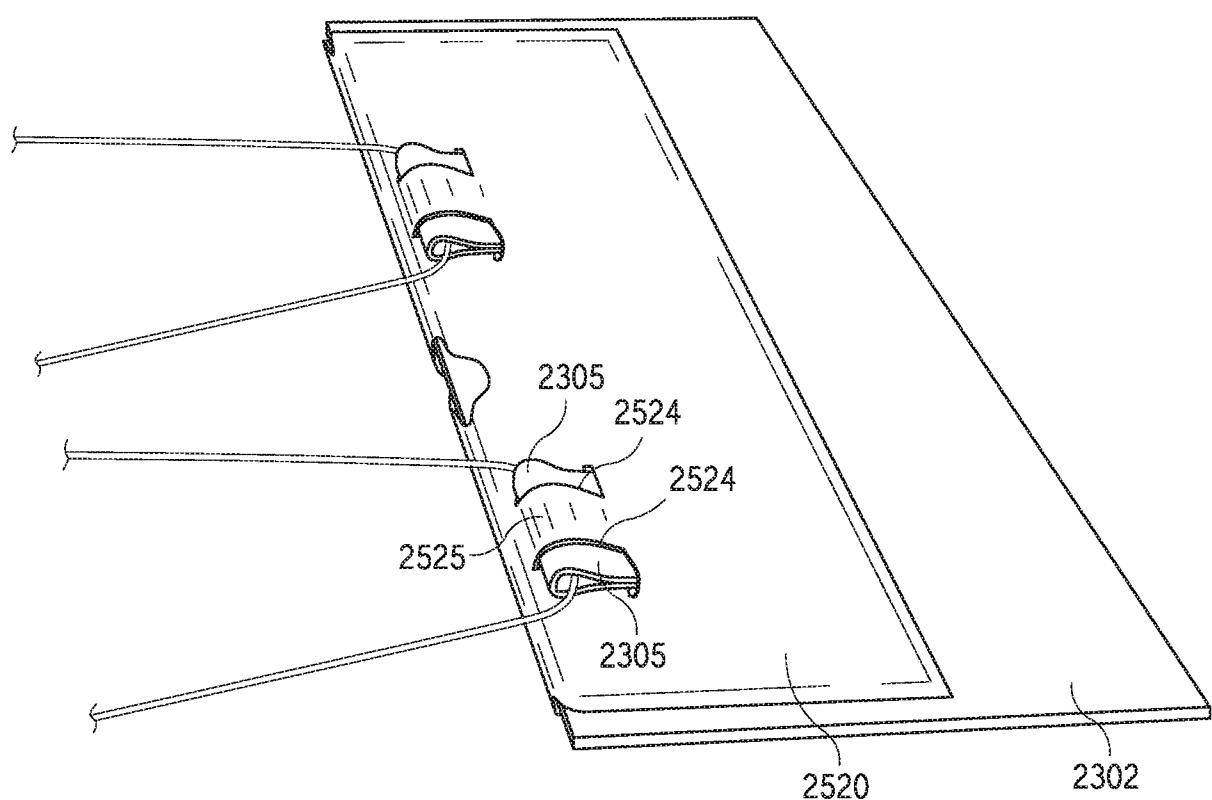


FIG. 27C

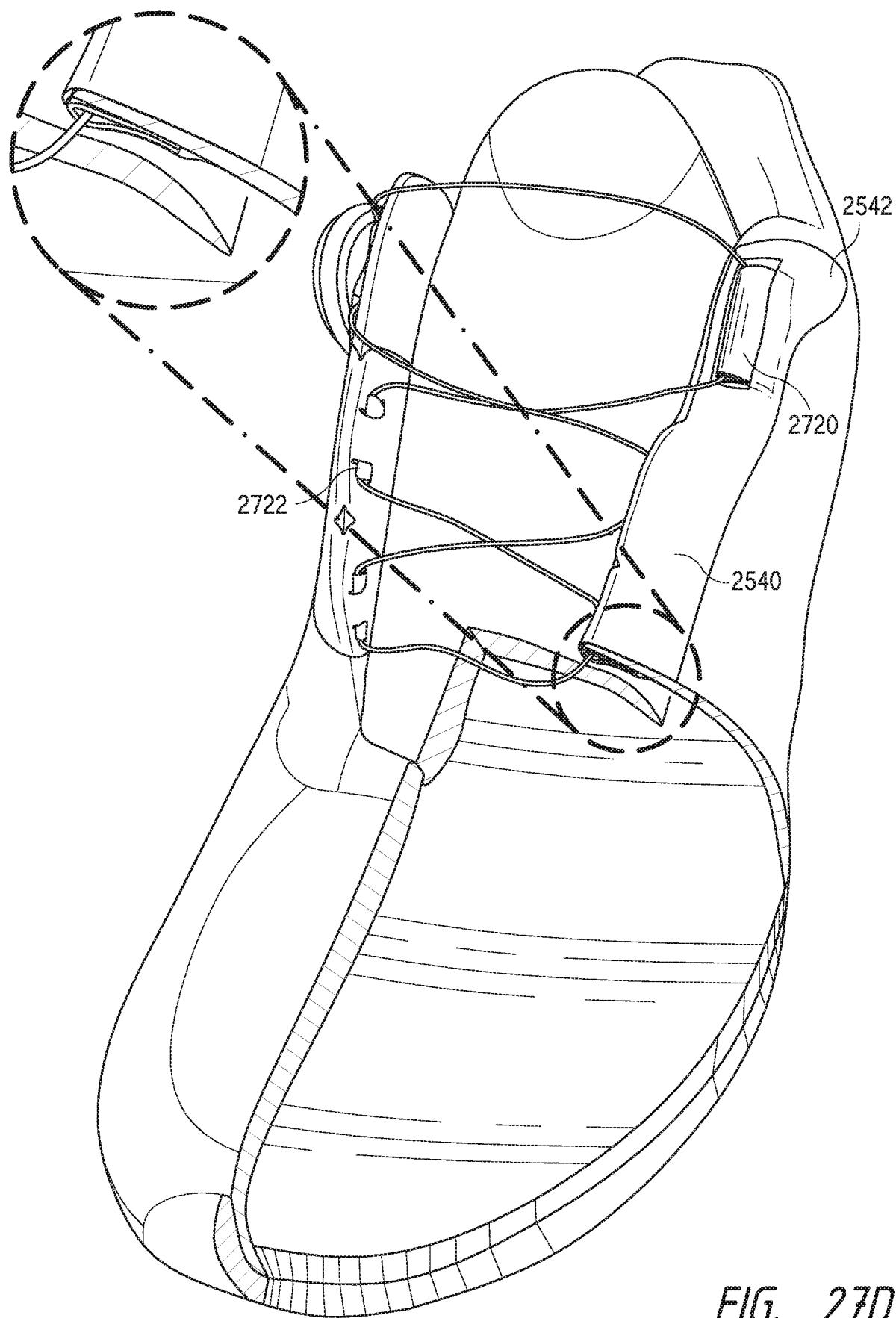


FIG. 27D

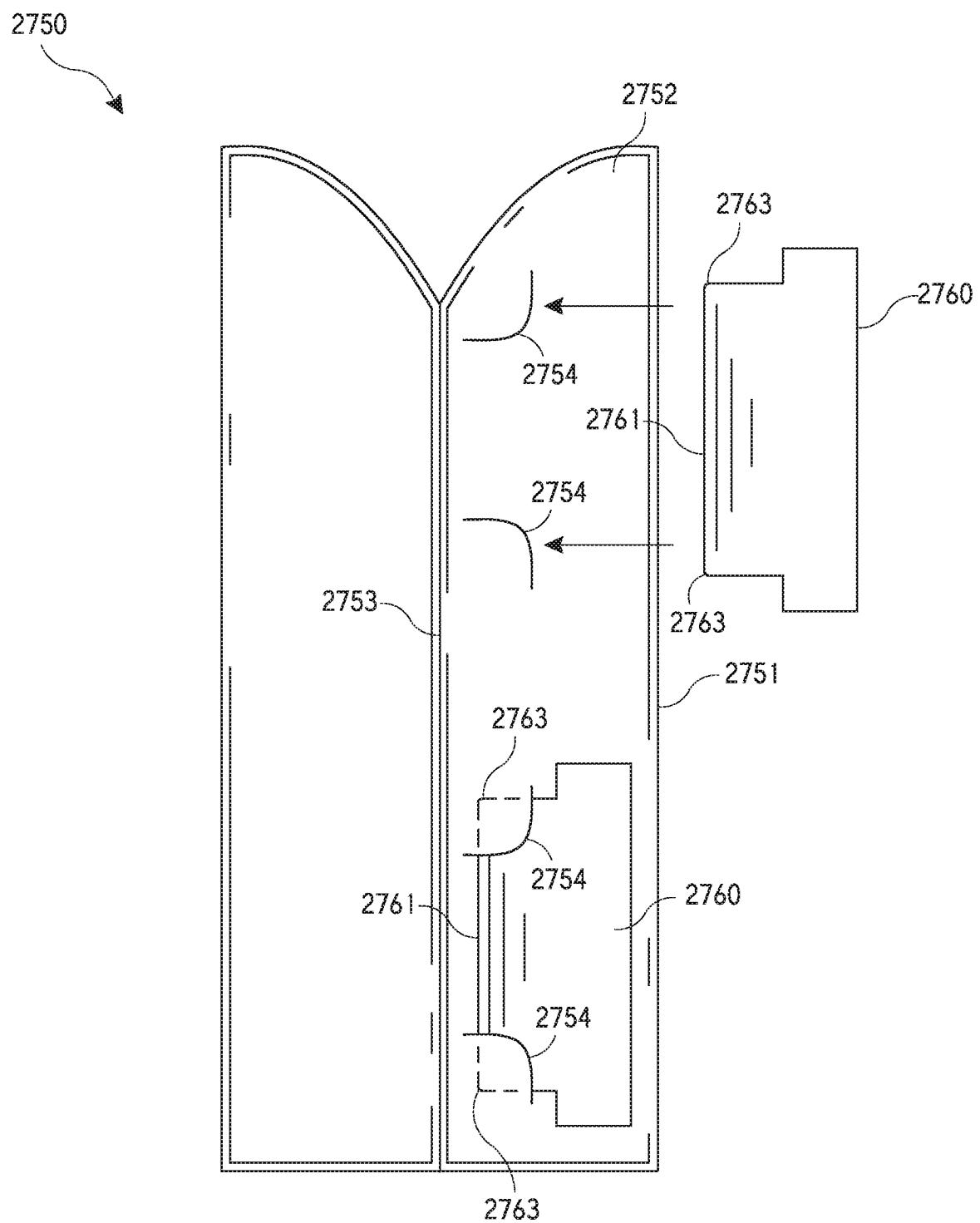


Fig. 27E

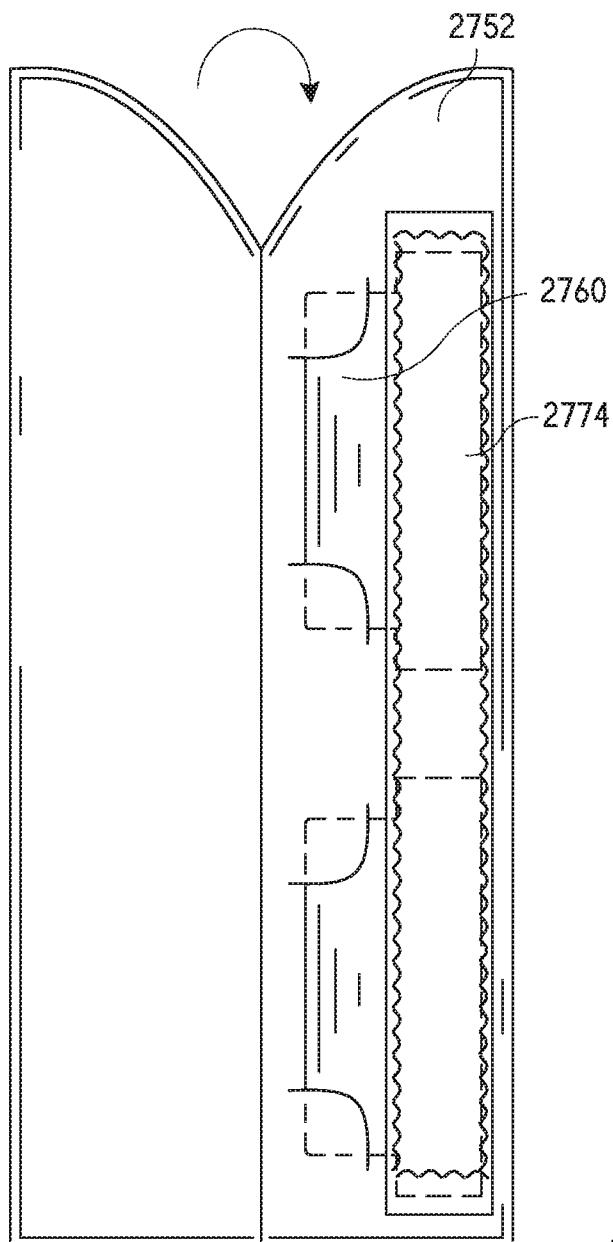


Fig. 27F

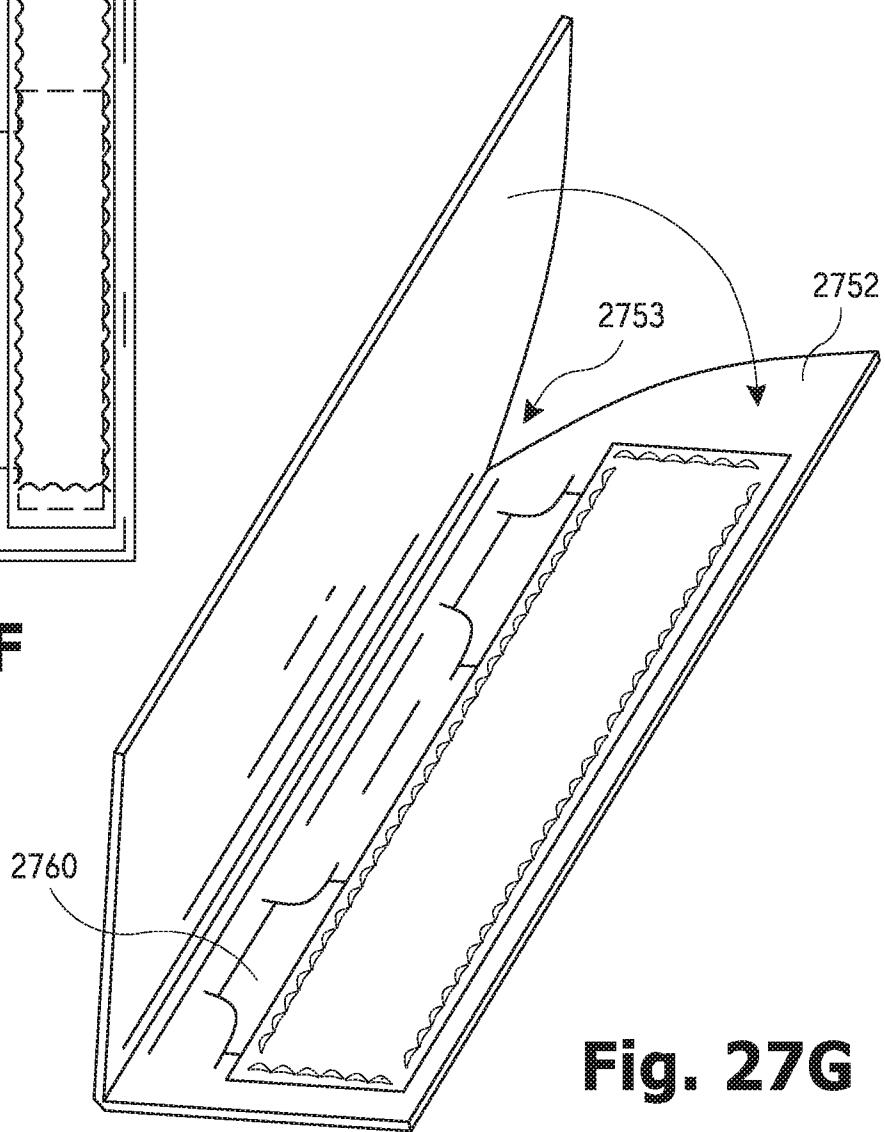


Fig. 27G

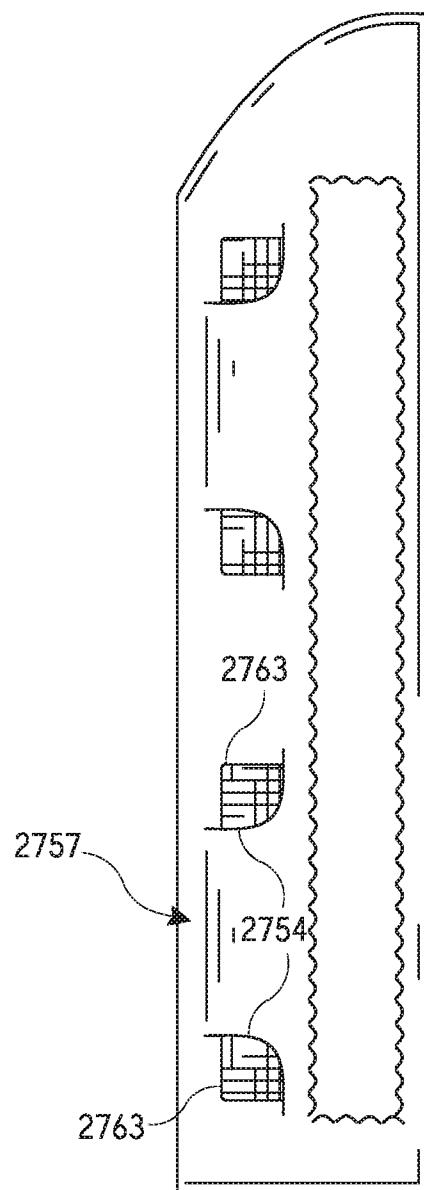


Fig. 27H

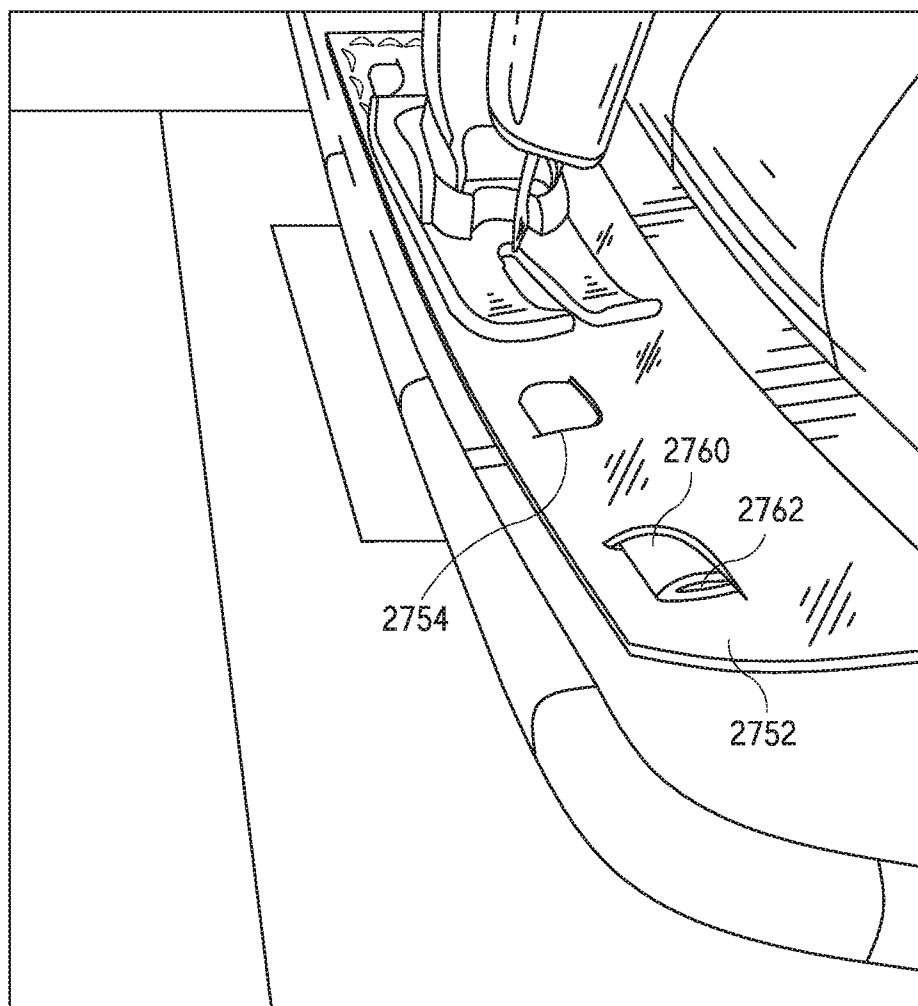


Fig. 27I

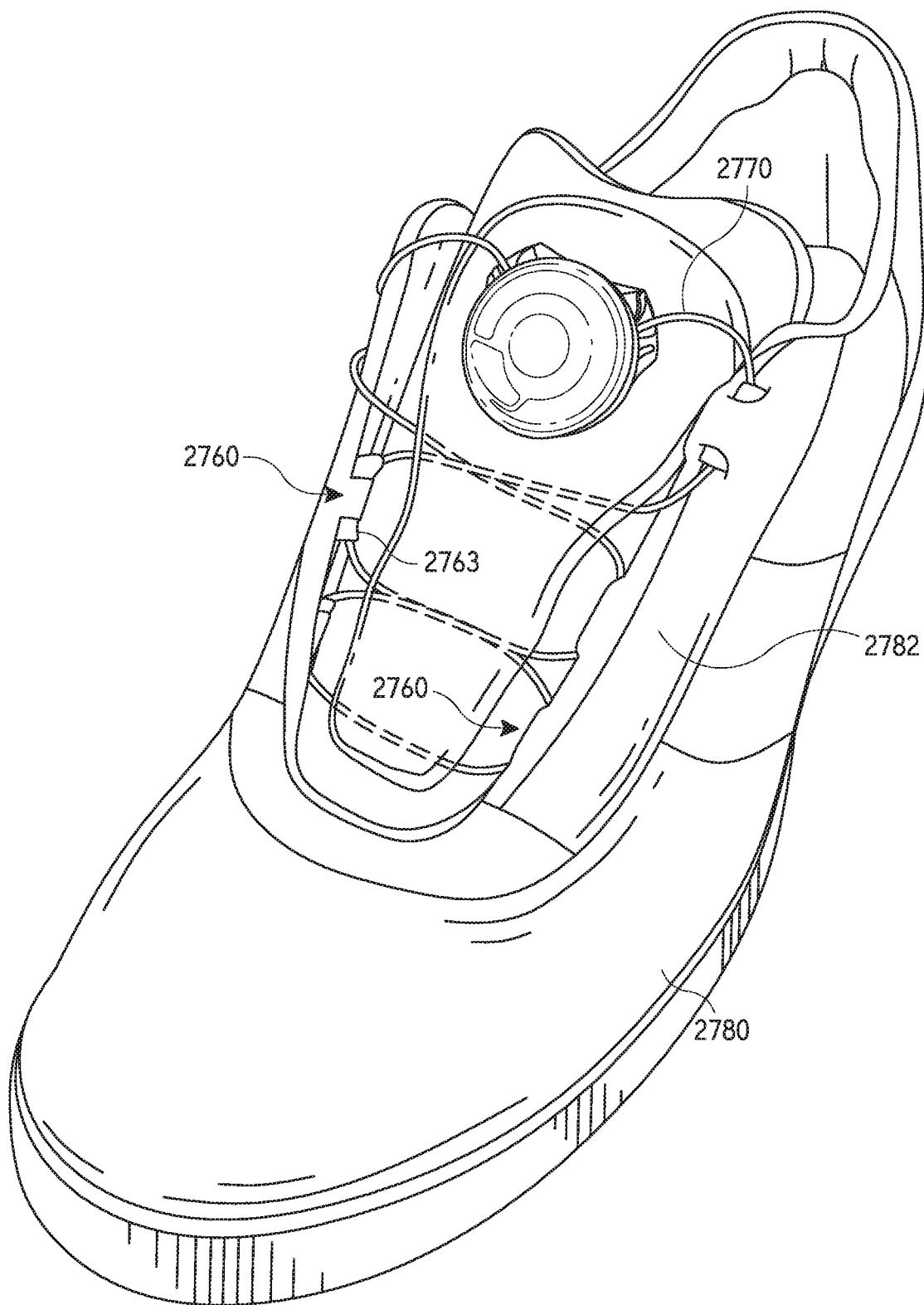


Fig. 27J

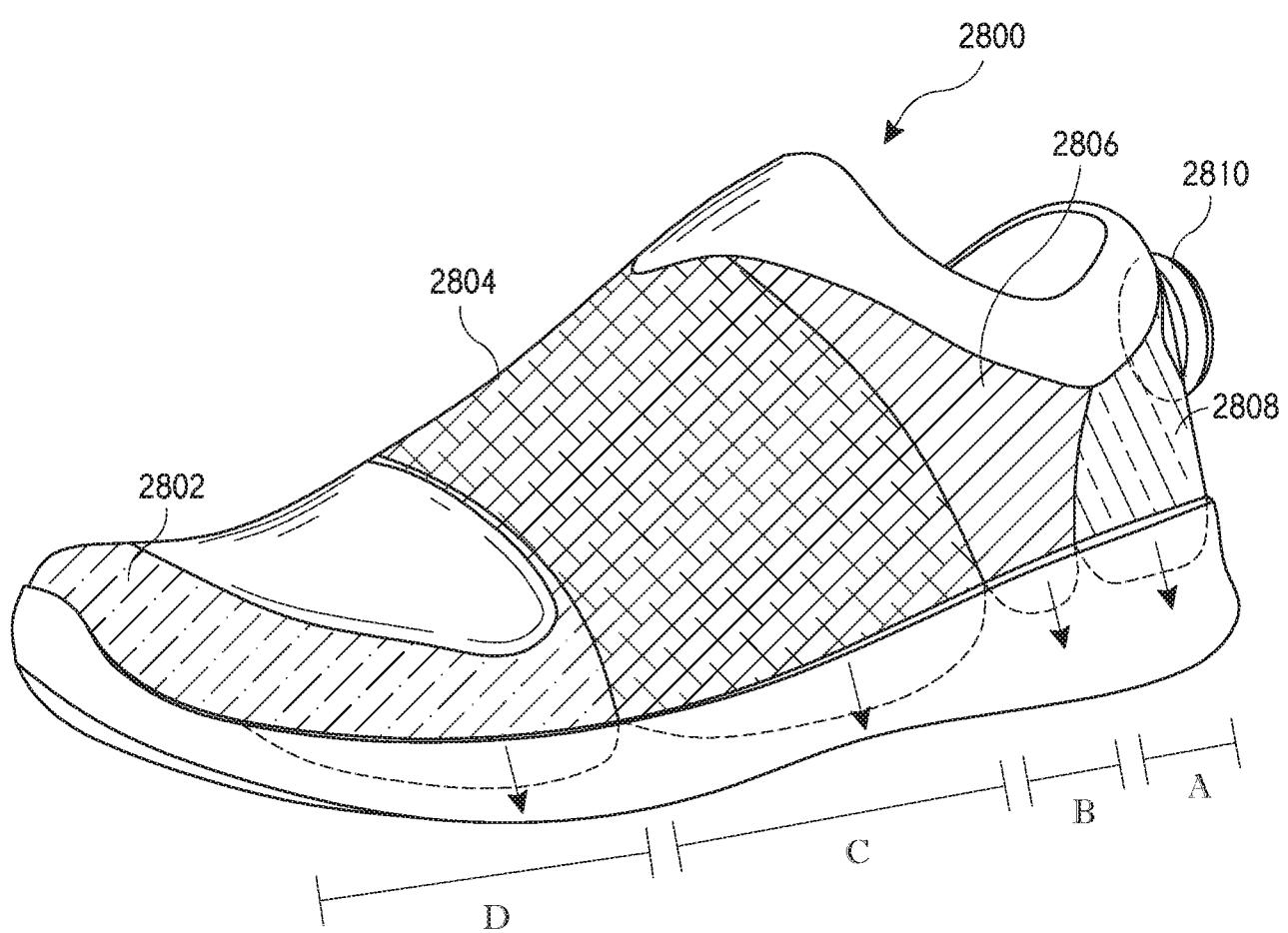


Fig. 28A

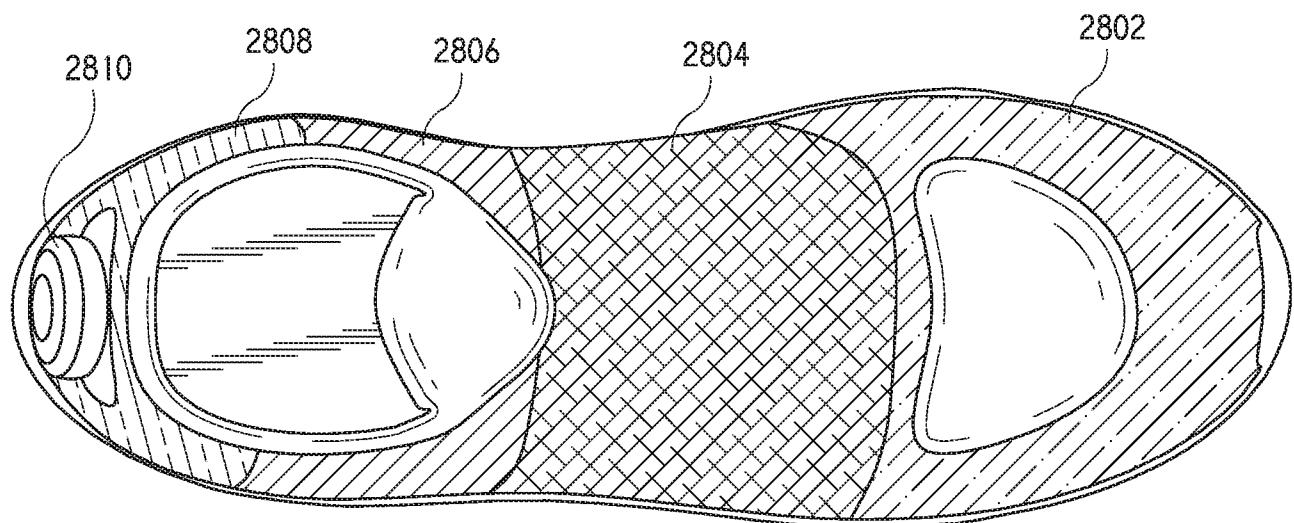


Fig. 28B

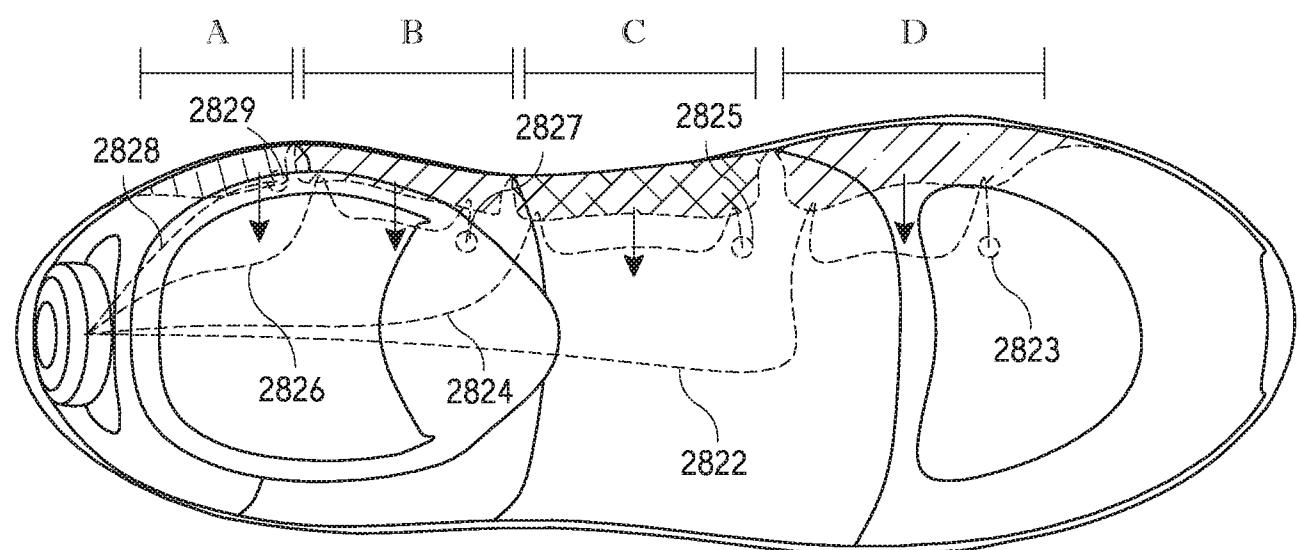


Fig. 28C

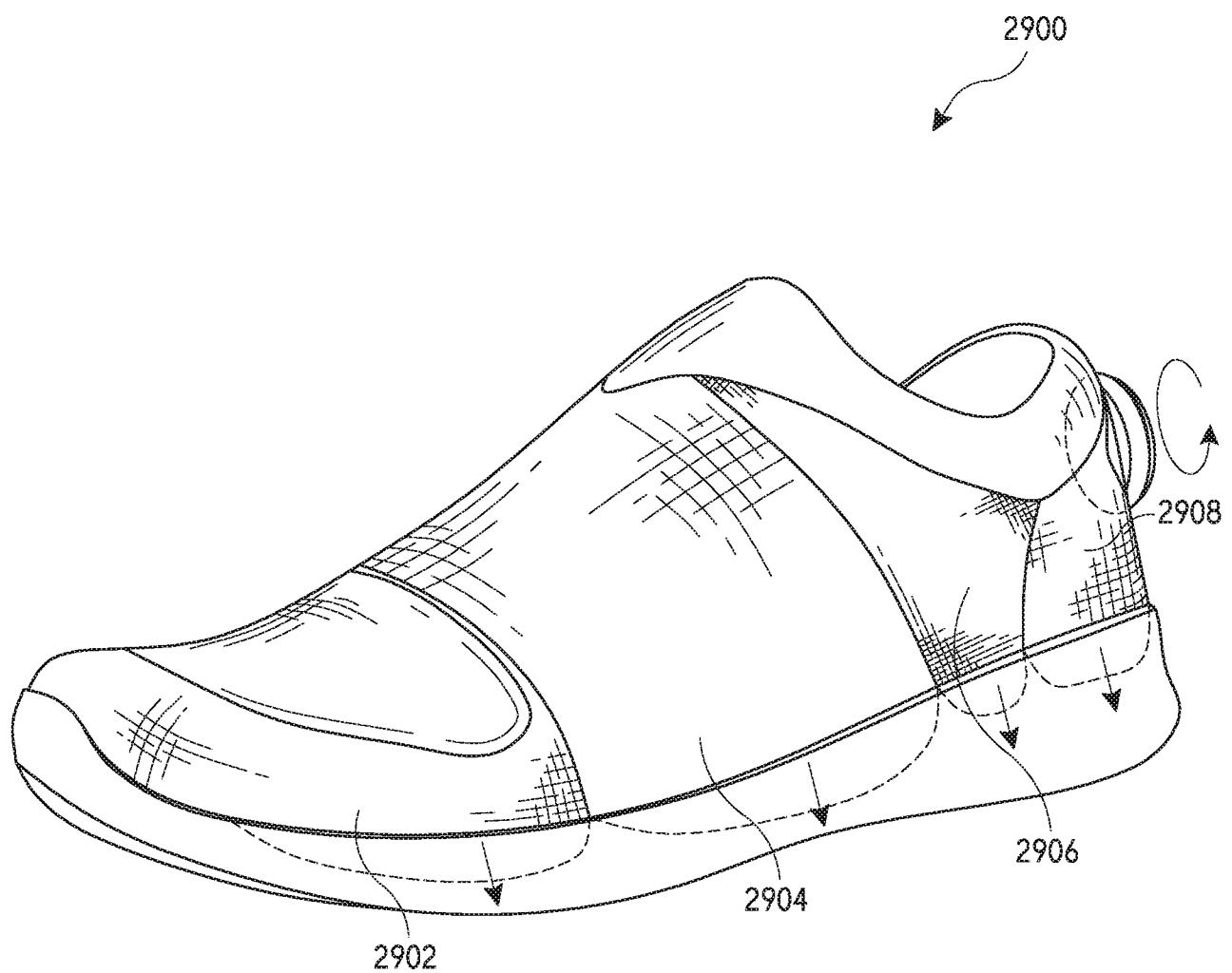


Fig. 29A

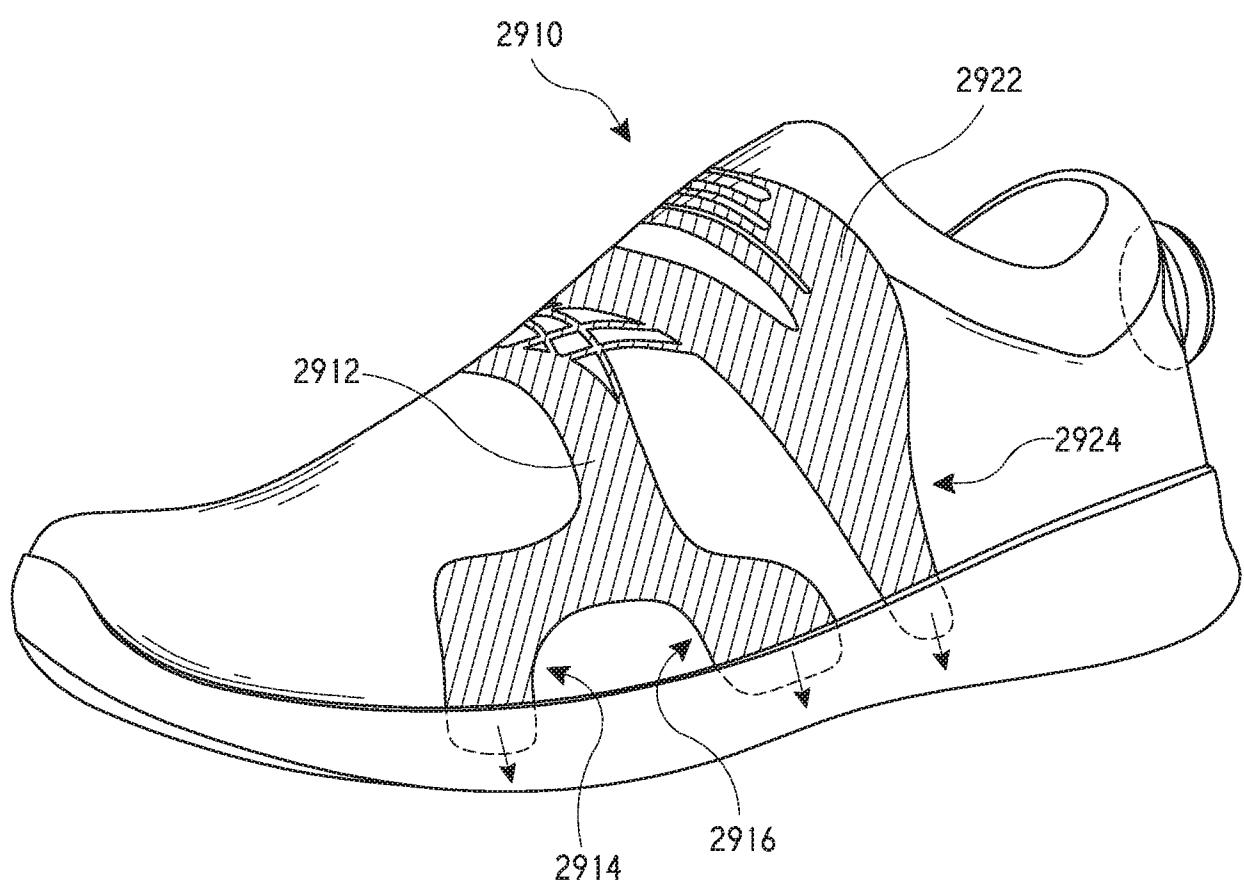


Fig. 29B

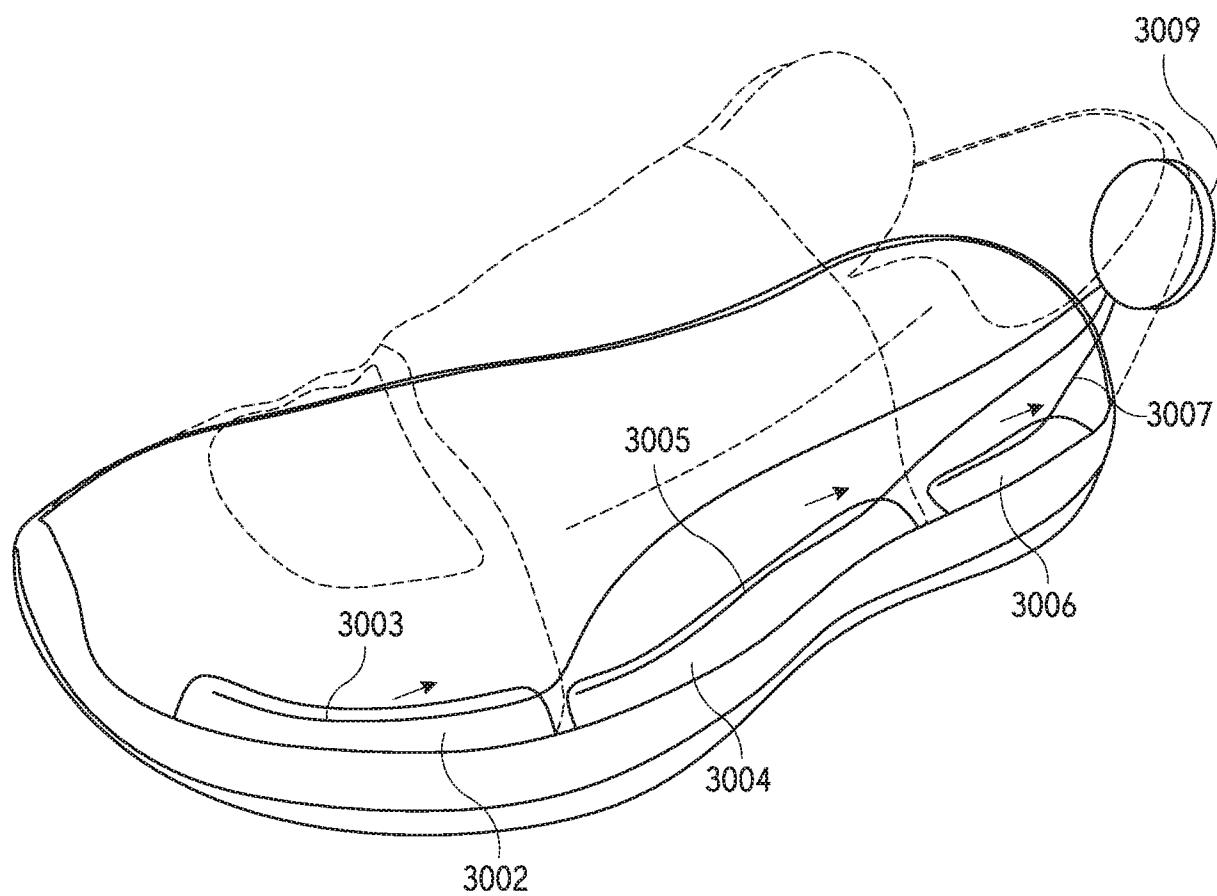


Fig. 30A

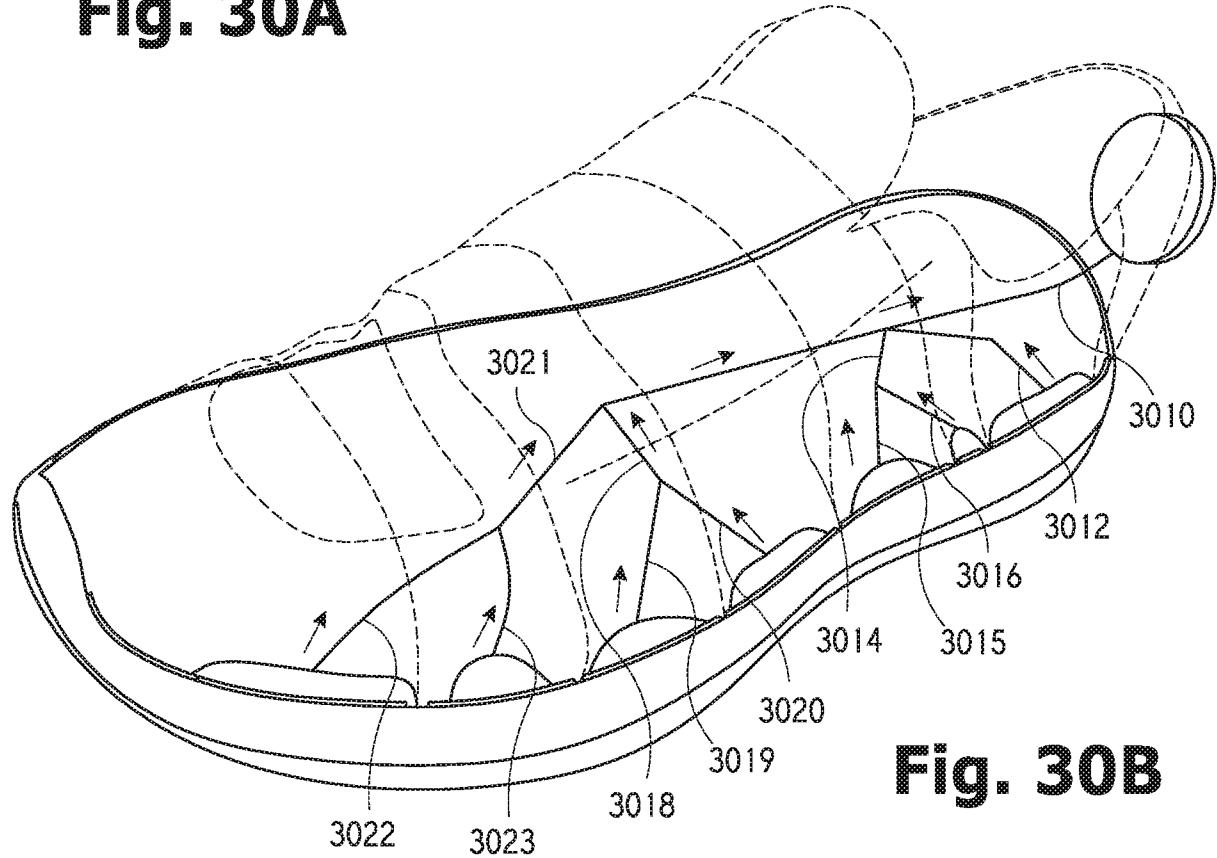


Fig. 30B

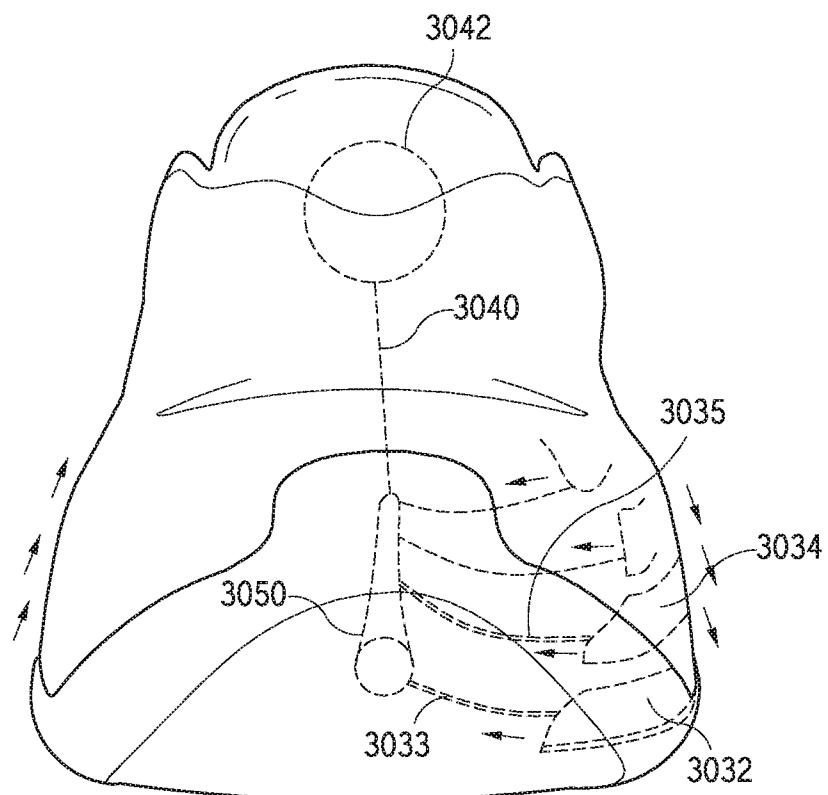


Fig. 30C

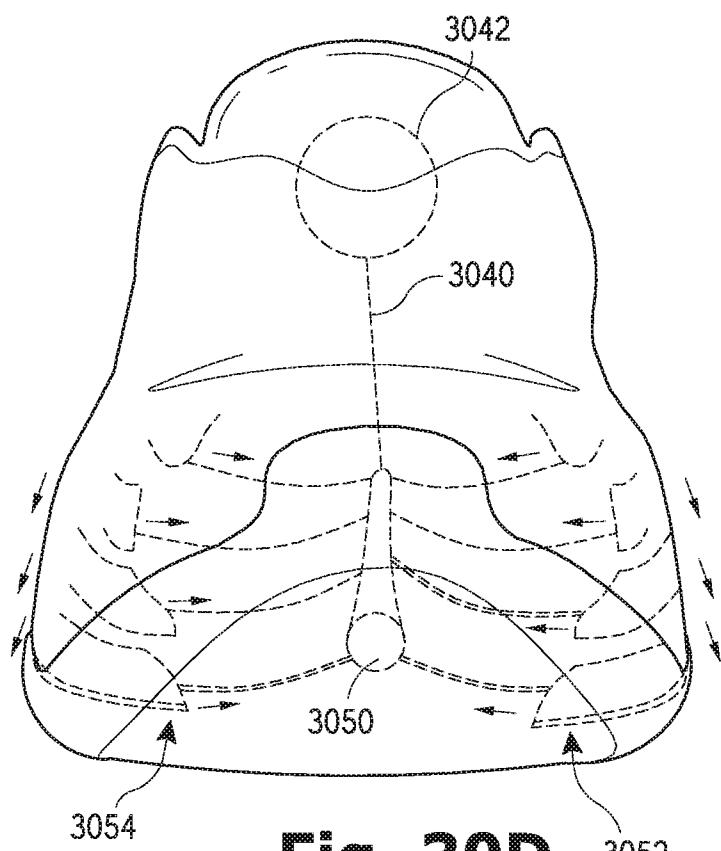


Fig. 30D

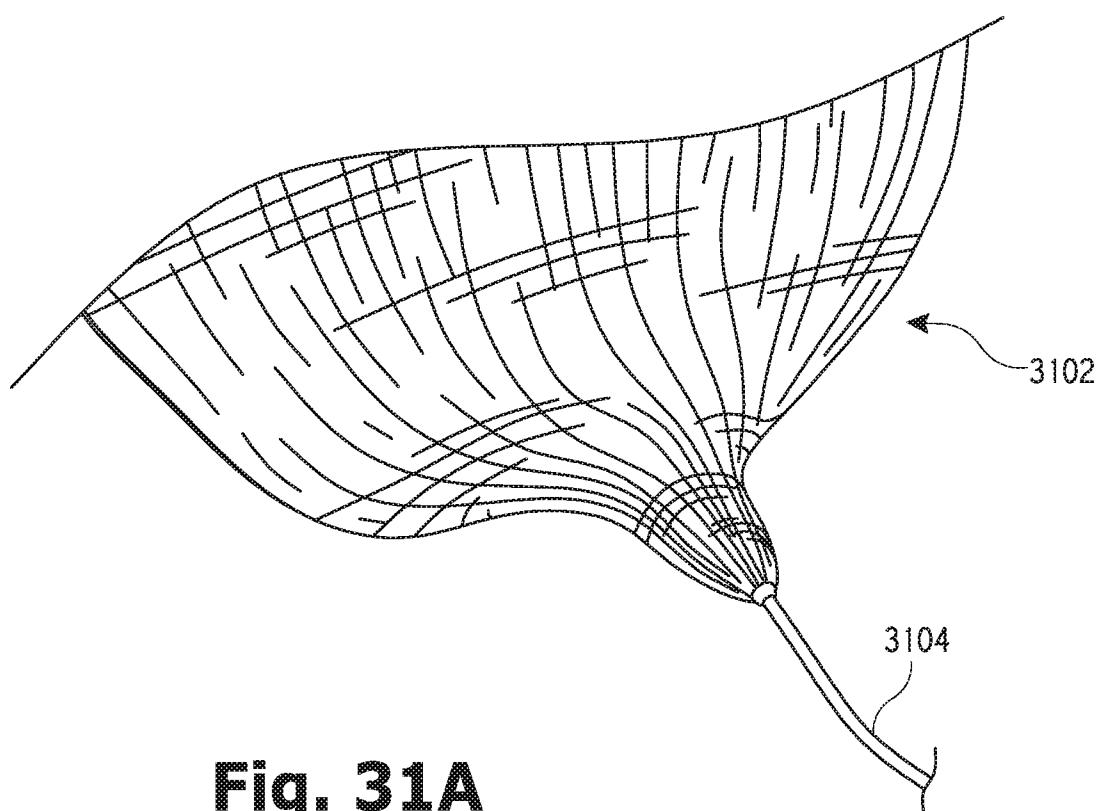


Fig. 31A

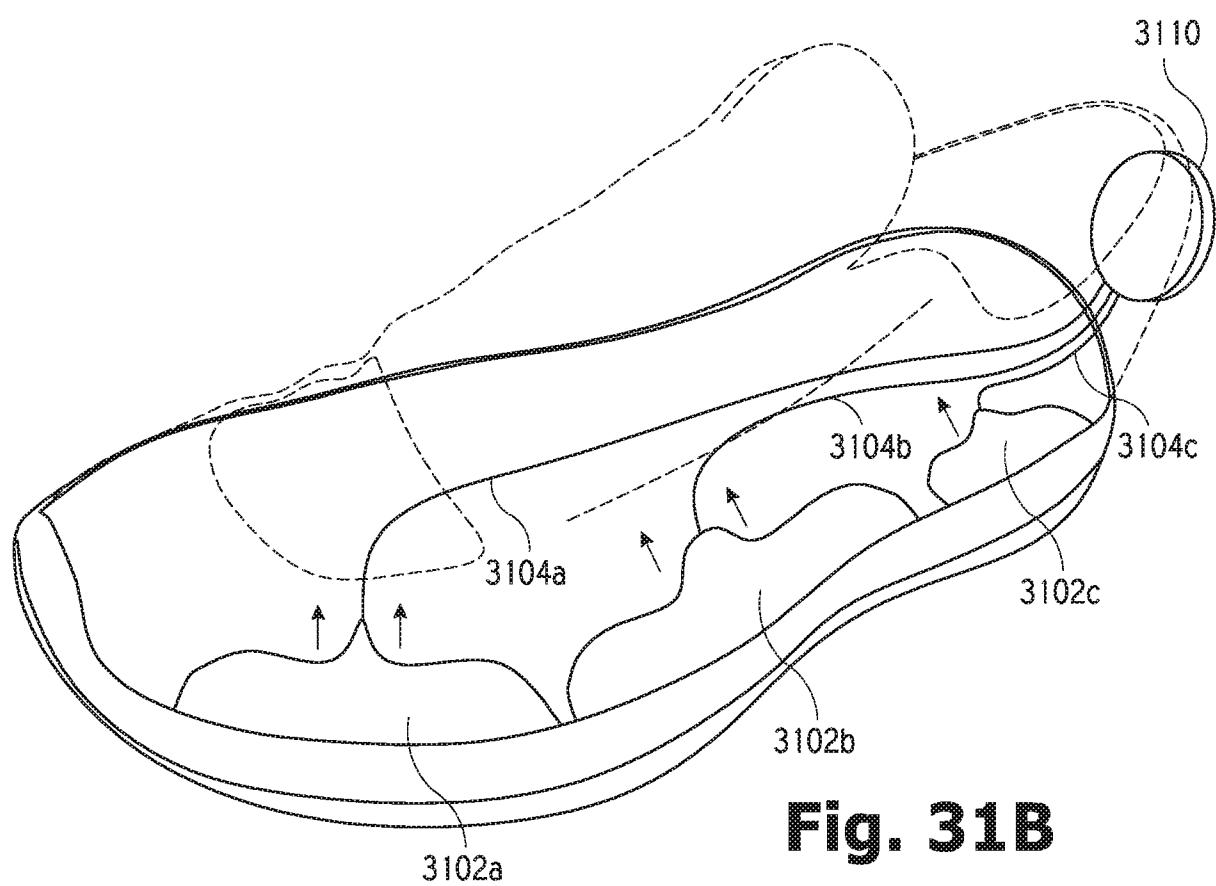


Fig. 31B

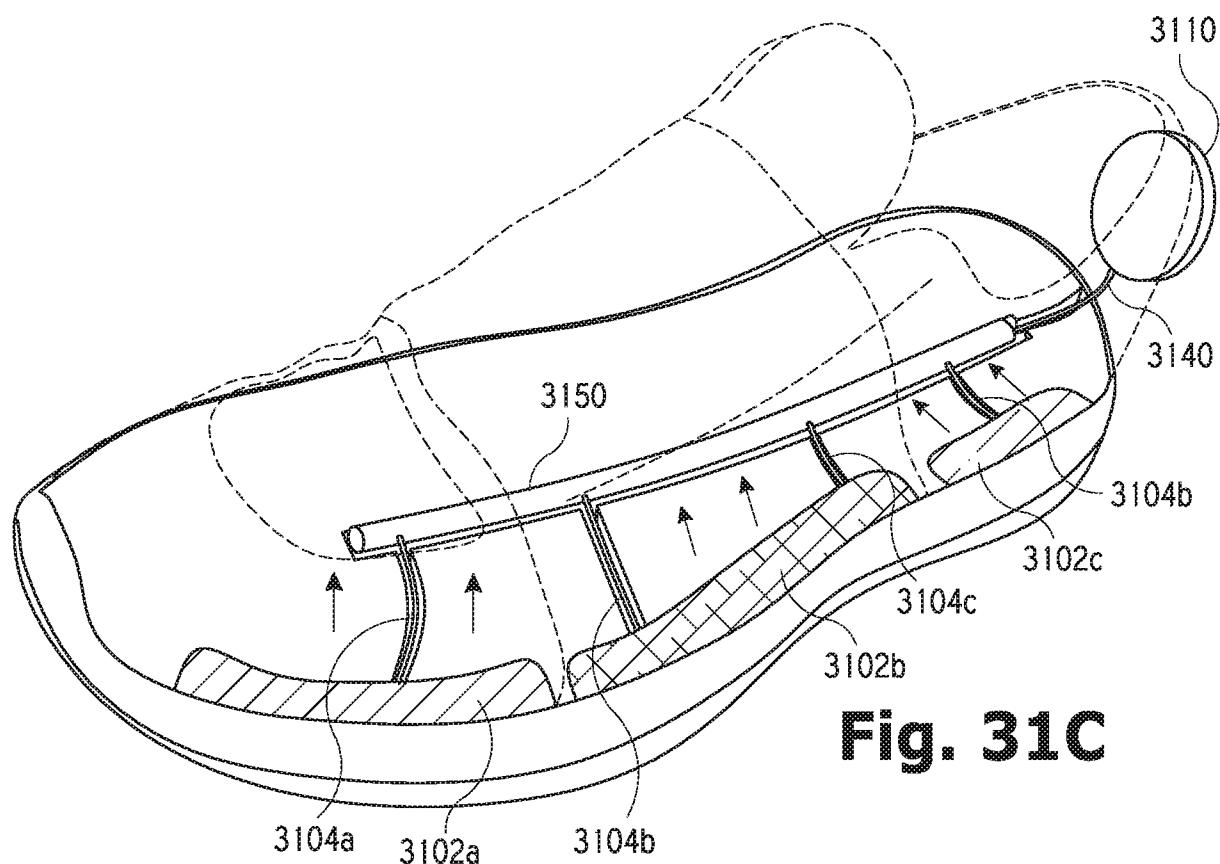


Fig. 31C

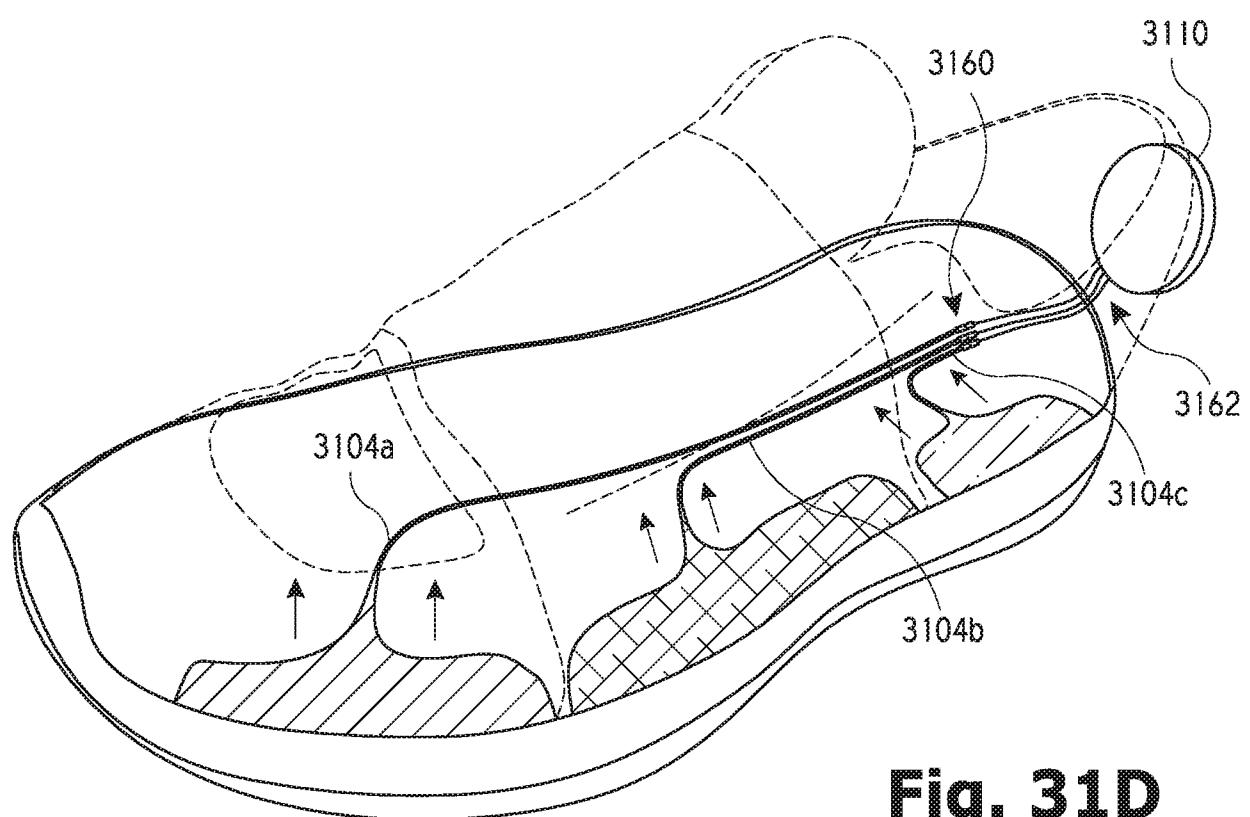


Fig. 31D

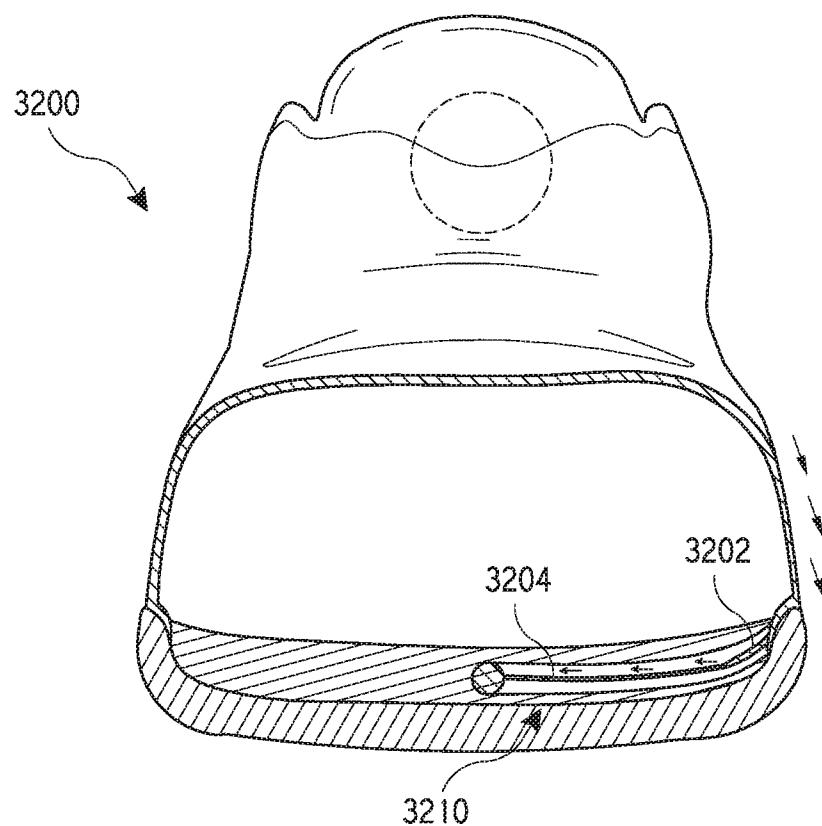


Fig. 32

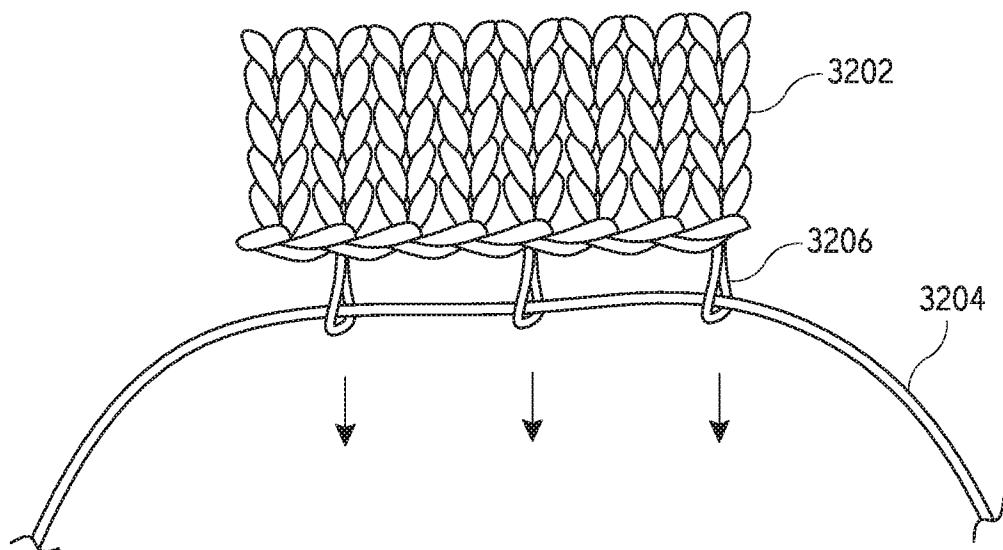


Fig. 33A

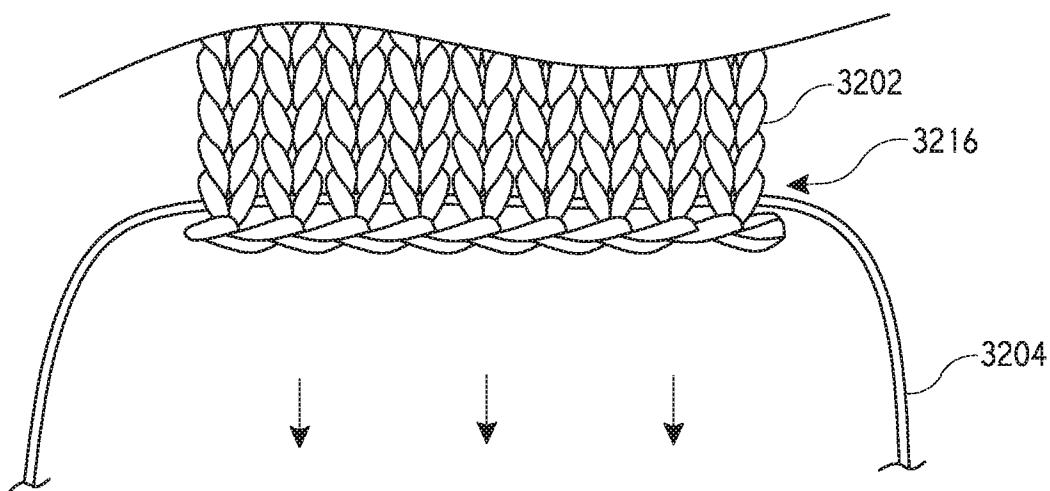


Fig. 33B

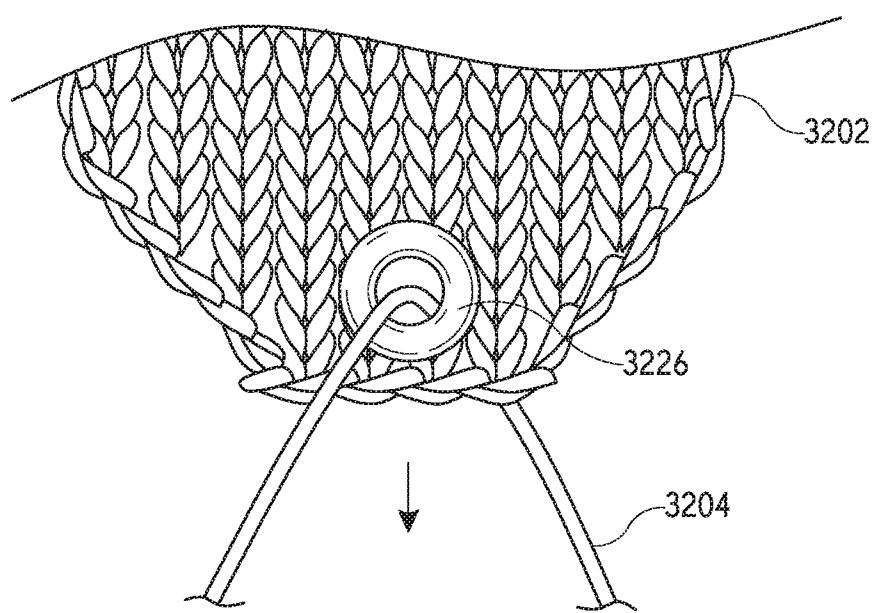


Fig. 33C

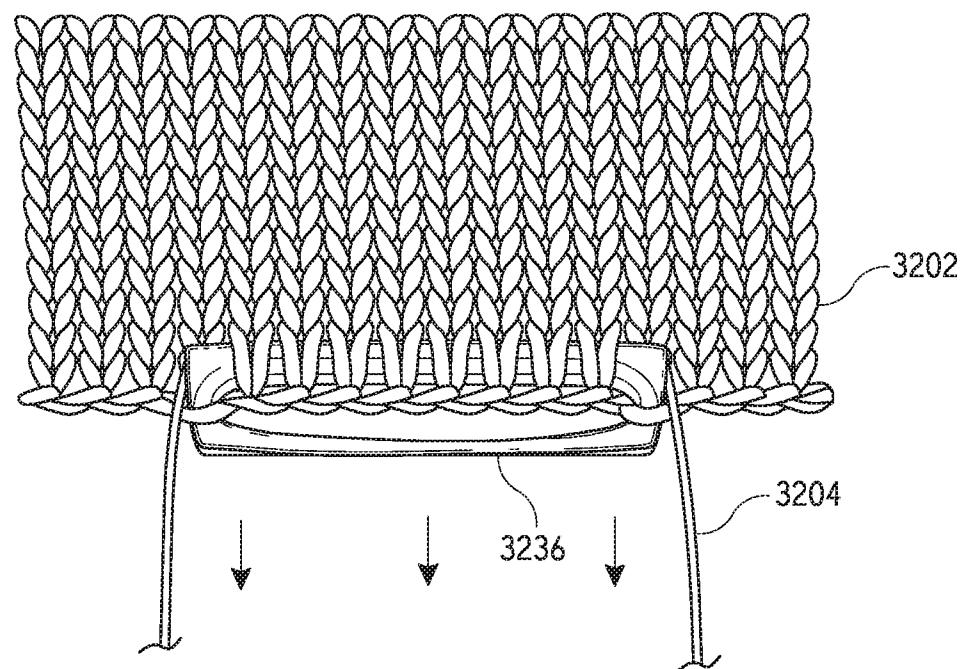


Fig. 33D

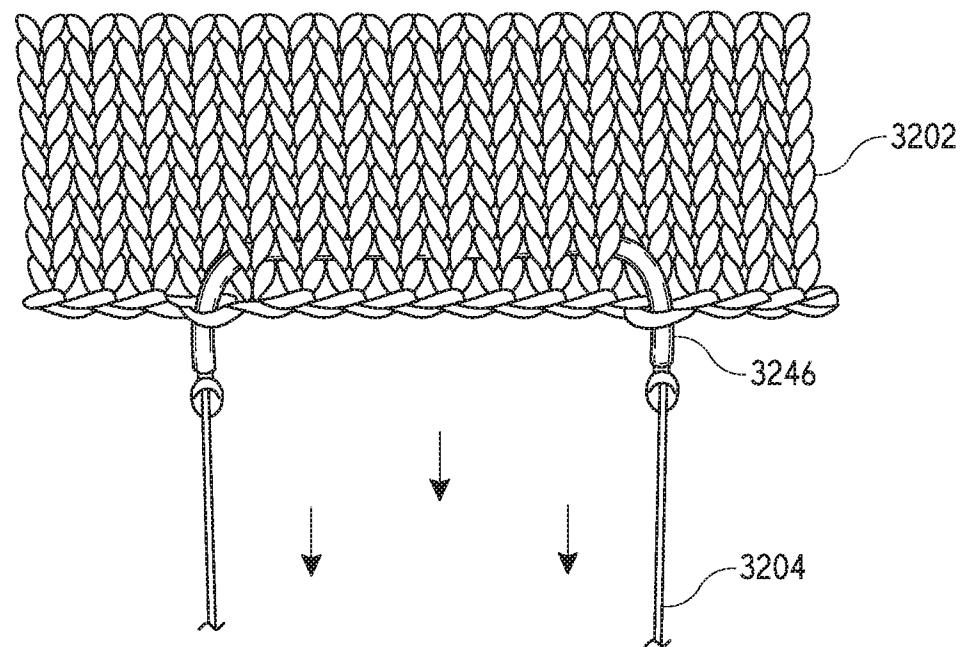


Fig. 33E

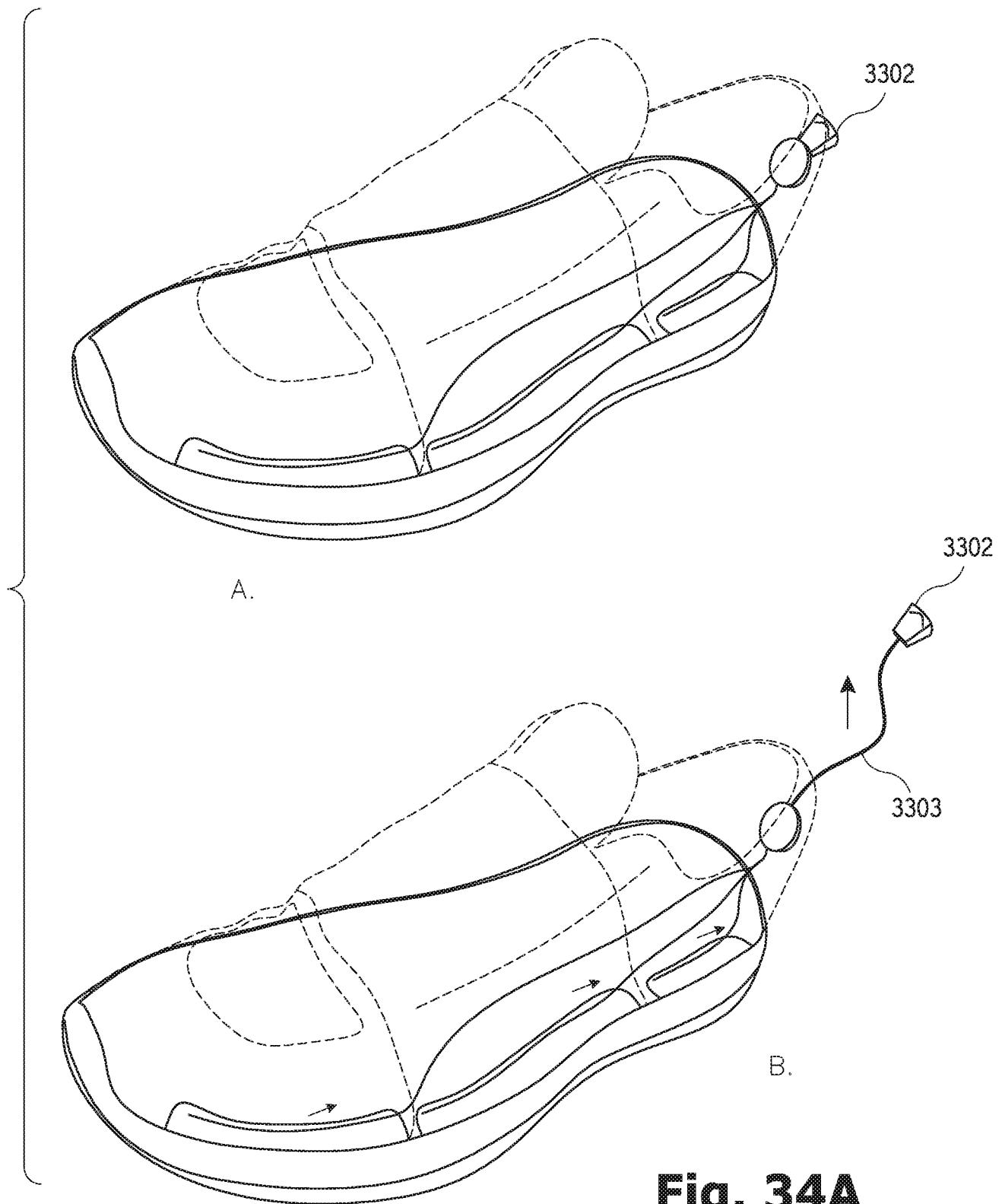


Fig. 34A

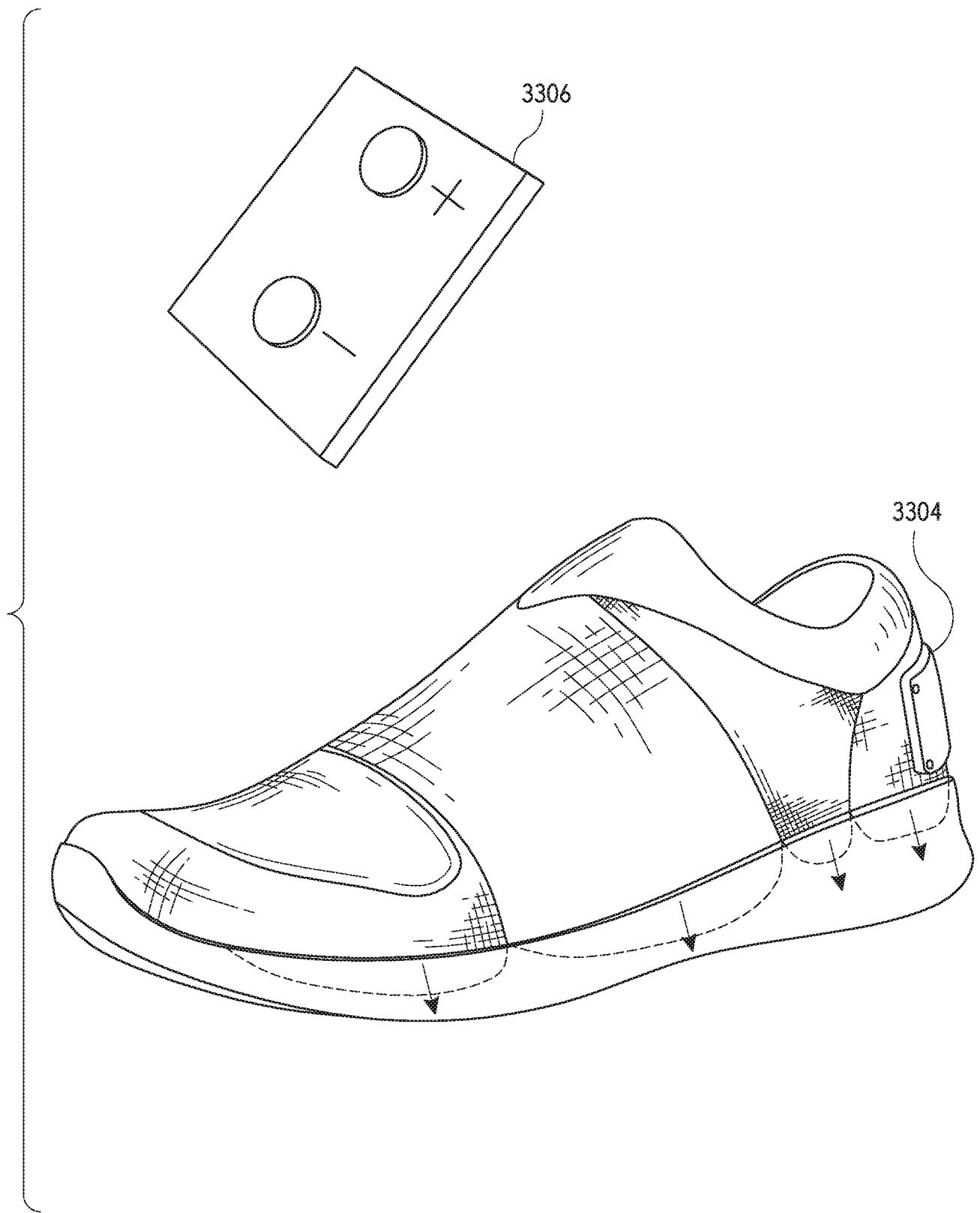


Fig. 34B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/045165

A. CLASSIFICATION OF SUBJECT MATTER

INV. A43C1/04 A43C3/00 A43C5/00 A43C11/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A43C

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 55923 A (SPRAGUE L.A.) 26 June 1866 (1866-06-26) figures 1-4	1,2,5
Y	-----	3,4,8
A	-----	6,7
Y	US 2013/192091 A1 (KOHATSU SHANE S [US] ET AL) 1 August 2013 (2013-08-01) figure 9	3
Y	-----	4
Y	DE 400 174 C (OFA G M B H) 18 August 1924 (1924-08-18) page 2, line 12 - line 13	
Y	-----	
Y	WO 97/28713 A1 (TATE AARN [GB]) 14 August 1997 (1997-08-14) page 5, line 10	8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

4 October 2017

23/10/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
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Authorized officer

Ariza De Miguel, Jon

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/045165

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: 9-63 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 9-63

In view of the number of independent claims (9 independent claims) and also the wording of the claims presently on file, which render it difficult, if not impossible, to determine the matter for which protection is sought, the present application fails to comply with the clarity and conciseness requirements of Article 6 PCT (see also Rule 6.1(a) PCT) to such an extent that a meaningful search is impossible.

In the present case and *prima facie*, the claimed subject-matters are drafted in such a way that it simply precludes the detailed analysis necessary to come to a firm conclusion regarding to the essential technical features of the invention and also the unity of the present application.

At least some of the independent claims differ from independent claim 1, in that they are drafted by means of removing features and/or adding features, thus lacking conciseness and clarity about the subject-matter to be searched.

Consequently, the search has been carried out for those parts of the application which do appear to be clear (and concise), namely independent claim 1 (product claim), and dependent claims 2-8.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2017/045165

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 55923	A	26-06-1866	NONE			
US 2013192091	A1	01-08-2013	NONE			
DE 400174	C	18-08-1924	NONE			
WO 9728713	A1	14-08-1997	AU WO	1552897 A 9728713 A1	28-08-1997 14-08-1997	