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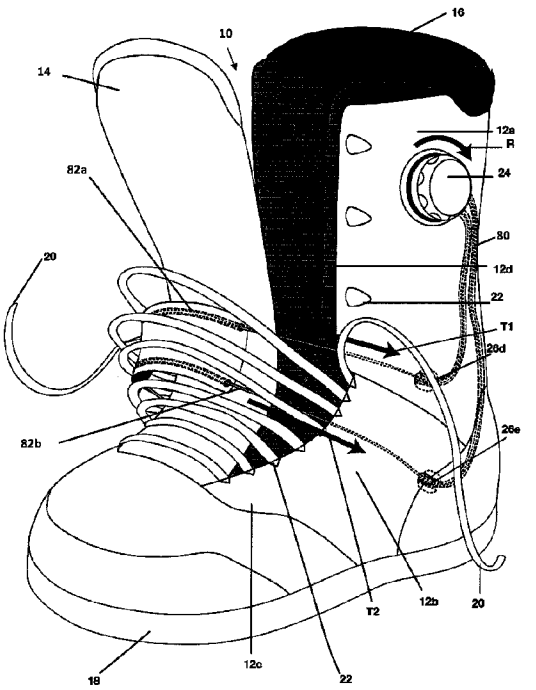

(57) Abrégé/Abstract:
A boot for a snow or skating sport has a shell configured for enclosing a foot and at least a portion of a lower leg and has a pair of opposing edges generally aligned along a top-of-foot portion of the shell and/or a front-lower-leg portion. A closure system draws the opposing edges together. A removable bootie is disposed in the shell and includes a thickened core between an outer lining of a textile or fabric and an inner lining of a textile or fabric. A tensionable cable is provided between two anchor points on opposite sides of the shell and transversely crosses an instep area and cooperates to apply a force to the instep area, providing a selectable degree of downward and rearward seating of the wearer's foot and heel. The tensionable cable can be tensioned over the instep area independently of the closure system for drawing the opposing edges towards one another.

ABSTRACT

A boot for a snow or skating sport has a shell configured for enclosing a foot and at least a portion of a lower leg and has a pair of opposing edges generally aligned along a top-of-foot portion of the shell and/or a front-lower-leg portion. A closure system draws the opposing edges together. A removable bootie is disposed in the shell and includes a thickened core between an outer lining of a textile or fabric and an inner lining of a textile or fabric. A tensionable cable is provided between two anchor points on opposite sides of the shell and transversely crosses an instep area and cooperates to apply a force to the instep area, providing a selectable degree of downward and rearward seating of the wearer's foot and heel. The tensionable cable can be tensioned over the instep area independently of the closure system for drawing the opposing edges towards one another.

TENSIONING SYSTEMS FOR FOOTWEAR

BACKGROUND

Embodiments described herein are directed to systems that tension an item of footwear to the foot and/or leg of a user so that the foot or leg is secured within the item during use. Some embodiments are particularly suitable for use in boots for snow and skating sports or any other such sport where sliding movement of the foot or leg relative to the item of footwear is undesirable and where secure coupling of the item to the foot and leg facilitates transfer of power to a board, ski, skate blade, set of skate wheels, etc., that is coupled to the item. Some embodiments include a tensioning system for a snowboard boot that tightens the boot parts around the user's instep or other anatomical areas, retracting the foot into the footbed and simultaneously retracting the heel into the heel area. The system may provide a tension path that achieves the foregoing results and routes one or more cables to a tensioning mechanism that can be operated by the user to adjustably increase or decrease cable tension.

Systems that include a tensionable band or cables over the instep of a boot are known in rigid shell ski boots, for example. The instep tensioning system retracts the foot downwardly against the footbed and rearwardly into the heel area of the footwear item. Such boots are made of stiffer plastic parts and have specially molded features for routing of tensioning cables. Such boots may not allow for easy or precise adjustment of the cable tension. The integration of such systems into boot may also pose manufacturing challenges and may be costly. Further, in the case of snowboard boots, the shells typically have opposing, spaced apart edges and a tongue disposed in the spaced area (sometimes referred to herein as a "gap"). In such boots, a lace or cable-based closure system may be used. Unfortunately, the integration of a separate instep tensioning system has proven challenging because the conventional closure system and the instep tensioning system may interfere with each other. For example, US Patent No. **7,386,947** shows a tensioning system using cords and a retractable reel mounted on the upper sides of the boot with the cable

routing over the instep. However, the cords are routed using a cumbersome harness assembly disposed within the outer shell of the boot that adds bulk and expense. The system does not integrate directly with the outer shell parts for optimal engagement with those parts.

The foregoing is not intended to be an exhaustive listing of disadvantages of the prior art and needed improvements; it is only a sampling. In view of the foregoing, there is a substantial need for improved systems for tensioning items of footwear to the feet of users.

SUMMARY

In one embodiment, there is provided an item of footwear, including a boot for a snow or skating sport, with a tensioning system. The item of footwear includes: a shell configured for enclosing a foot and at least a portion of a lower leg; the shell having a pair of opposing edges generally aligned along a top-of-foot portion of the shell and/or a front-lower-leg portion, the edges generally configured to align with a longitudinal axis of a wearer's foot and/or lower leg, the opposing edges defining opposite sides of the shell; a closure system adjacently associated with the opposing edges for drawing the opposing edges toward one another; and a tongue attached to the top-of-foot portion of the shell and positioned in a gap between the opposing edges. The item of footwear further includes a foot retraction system including a tension path, a pressure-distribution element free-floating from the tongue, and at least two anchor points disposed along the path on the opposite sides of the shell and supporting at least one tensionable cable section disposed along the path, a first anchor point including a tensioning mechanism, the tensioning mechanism configured to adjust tension in the tensionable cable section, a second anchor point being arranged on the shell, at least one of the anchor points being positioned on a lateral or a medial side of the footwear. The item of footwear further includes a removable bootie disposed in the shell, the bootie including a thickened core between an outer lining of a textile or fabric and an inner lining of a textile or fabric. A section of the tension path transversely crosses the top-of-foot portion of the shell and tongue of the item of footwear at and through the pressure-distribution element disposed between the opposing edges, the tensionable cable section crossing over an outer surface of the top-of-foot portion of the shell and tongue and under the closure system, the opposing edges and an inner surface of the shell to apply a selectable force magnitude and force direction to the top-of-foot portion of the shell and tongue, providing a

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selectable degree of downward and rearward seating of the wearer's foot and heel in the item of footwear. The tensionable cable section can be tensioned over the top-of-foot portion of the shell and tongue independently of the closure system for drawing the opposing edges towards one another.

In another embodiment, there is provided an item of footwear, including a boot for a snow or skating sport, with a tensioning system. The item of footwear includes: a shell configured for enclosing a foot and at least a portion of a lower leg of an intended wearer; the shell having a pair of opposing edges generally aligned along a top-of-foot portion of the shell and/or a front-lower-leg portion, the edges generally configured to align with a longitudinal axis of the foot and/or lower leg, the opposing edges defining opposite sides of the shell; and a foot retraction system including a first tension path and at least two anchor points disposed along the first tension path on the opposite sides of the shell and supporting a first tensionable cable section disposed along the first tension path, at least one of the anchor points including a first tensioning mechanism, the first tensioning mechanism configured to adjust tension in the first tensionable cable section, the anchor points being arranged on opposite sides of the shell that support the opposing edges, at least one of the anchor points being positioned on a lateral or a medial side of the footwear. The foot retraction system further includes a second tension path with a second tensionable cable section disposed along the second tension path, and a floating element physically coupling the first tensionable cable section disposed along the first tension path and the second tensionable cable section disposed along the second tension path to each other. The first tensionable cable section along the first tension path and the second tensionable cable section along the second tension path are independently tensionable to apply a selectable force magnitude and force direction to a wearer's instep by the floating element to provide a selectable degree of downward and rearward seating of the wearer's foot and heel in the item of footwear. The item of footwear further includes a removable bootie disposed in the shell. The bootie is disposed in an instep area disposed between the opposing edges, and the first tension path routes over the instep area. The floating element defines a first channel and a separate second channel and is positioned to contact a flex zone of the item of footwear. The flex zone corresponds to an ankle area of the footwear. A section of the first tension path transversely crosses the instep

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area and through the first channel of the floating element, the first tensionable cable section crosses over an outer surface of the instep area and under the opposing edges and an inner surface of the shell. A section of the second tension path transversely crosses through the second channel of the floating element, over the outer surface of the instep area and under the opposing edges and the inner surface of the shell. The second tension path is associated with a third anchor point disposed on a front side of the footwear, the third anchor point including a second tensioning mechanism, the second tensioning mechanism configured to adjust tension in the second tensionable cable section.

These and other embodiments are described in more detail below and in the accompanying Figures.

The foregoing is not intended to be an exhaustive list of all possible embodiments. Persons skilled in the art are capable of appreciating other embodiments and features from the following detailed description in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings in Figs. **1** through **9** show various embodiments.

Figs. **1** through **9** show left boot embodiments. Left and right boots are mirror images of each other.

Fig. **1** shows a lateral perspective view of a boot with a tensioning system in an untensioned condition.

Fig. **2** shows a medial perspective view of the boot in Fig.**1**

Fig. **3** shows another lateral view of the boot in Fig. **1**, in this case with the tensioning system under tension and engaging boot parts.

Fig. **4** shows a partial front view of a left boot with another tensioning system in a tensioned condition.

Fig. **5**A shows a lateral, side-elevation view of the boot and tensioning system shown in Fig. **4** in an untensioned condition.

Fig. **5**B shows a lateral perspective view of the boot and tensioning system shown in Figs. **4** and **5**A.

Fig. **6** shows a shell of a left boot bisected along a plane dividing the medial side of the boot from the lateral side of the boot, revealing internal features of the shell and the tensioning system.

Fig. **7** shows a lateral, side elevation view of the boot shown in Fig. **4**, with the tensioning system in a tensioned condition and a portion of the lateral eyerow folded down to reveal features of the tongue.

Fig. **8** shows a lateral view of the boot shown in Fig. **7** with the eyerow folded up.

Fig. **9** shows a lateral perspective view of the boot as shown in Fig. **8**.

DETAILED DESCRIPTION

Representative embodiments incorporating one or more aspects of the subject matter described herein are shown in Figs. 1 through **9**, wherein the same or generally similar features share common reference numerals.

In broad terms, an item of footwear is configured with a foot retraction system for closing around the foot and retracting a portion of the footwear against a user's foot into the footbed and heel area of the item. In certain respects, some embodiments generally pertain to systems for tensioning a boot to the foot of a user so that the foot is retracted as so. Some are particularly useful with snowboarding boots. Some can be used with a variety of other kinds of boots, including ski boots, skate boots, hiking boots, and any other kind of footwear where it is desirable to engage an item footwear around the foot and keep the foot from lifting or sliding in the item of footwear.

For illustrative purposes, a snowboard boot will be used as a representative boot. From the following discussion, persons skilled in the art will understand how the described subject matter may be used with other forms of boots and footwear. A snowboard boot **10** typically has an outer shell **12**. The shell is typically a semi-rigid structure made of an assembly of materials, such as one or more of sheets or layers of natural or synthetic leathers, woven or non-woven textiles, and plastics and rubbers. Some or all of the shell may be made of molded plastics or rubbers. The boot may also include a tongue **14** or a region corresponding to a tongue, in the case of a tongueless boot, such as a rear entry boot. The tongue may be part of the shell or it may be coupled to another structure in the boot, e.g., the sole or an inner liner.

The boot may have an inner liner **16**, which is usually a removable bootie but it can also be built into the shell **12**. A footbed for receiving the bottom of the user's foot is part of the boot, and may be formed in the liner material or it may be a separate structure. The boot also includes a heel cup for wrapping around and receiving the heel of a user. It is typically formed in the liner. In the representative embodiment shown in the Figures, opposing edges of shell **12** are spaced apart and in-filled by tongue **14**.

The outer shell includes an upper portion **12**a that extends upward from the instep, over the ankle, and around a lower leg portion of a user. The shell also includes a proximal foot enclosure portion **12**b, enclosing the general areas of the instep and heel and a distal portion **12**c for enclosing the top and sides of the midfoot and forefoot. The boot includes a sole **18** that connects to shell **12** and covers the bottom of the user's foot.

The outer shell **12** in a snowboard boot is made up of relatively stiff and rugged materials, such as leathers and semi-rigid or rigid plastics, rubbers, or other such materials. The shell may include an inner liner that is typically made up of a thickened set of materials that provide cushioning, comfort, and insulation to a user's foot. For example, the liner may be made of a core of foamed polyurethane (PU) or ethyl vinyl acetate (EVA) materials with outer and inner linings of a textile or fabric. The inner liner **16** may also be separate removable component such as a bootie. The tongue or tongue region **14** of the boot may be constructed in way that is similar to that of the liner.

The sole may be made of rubber, EVA, PU and other known midsole and outsole materials alone or in combination. The shell and soles may be lasted together using any known or developed techniques, including board lasting.

In the embodiment shown in the Figures, the upper portion of the shell **12** has spaced-apart, vertically-oriented edges **12**d and **12**e. A tongue **14** may be disposed on the boot in the spacing between the edges.

Boot **10** has a flex zone **13** that generally corresponds to the ankle joint of the intended wearer. The ankle joint is a hinging joint between the foot and the leg. The uppermost bone of the foot, called the talus (ankle-bone), is disposed between the two bony protuberances formed by the lower ends of the tibia (shin bone) and the fibula. By tensioning the boot over the ankle's hinge joint, the element can cause the foot to be secured over the sole of the boot, allowing for precise and controlled flexation and transmission of power to a snowboard.

Boot **10** may include a closure system that provides for converging of the opposing edges **12**d and **12**e at least partially over and against the tongue, thereby urging the shell and tongue securely around the leg of a user. One common type of closure system is a cable-based system. As used herein, a "cable" is a broad term that means any known pliant, flexible, thin, elongate, tensionable structure that allows for routing along a set of closure elements arranged on a pair of opposing edges that are to be drawn together. Accordingly, a suitable cable **20** may include any form of shoe or boot lace, cables of bundled metal fibers or of non-metals, strings, cords, chains, leather strips, etc. Closure elements **22** in a cable-based closure or tensioning system may be any combination of loops, hooks, eyelets, gilleys, and other such structures that can receive a cable. Mechanical closure systems are also well known. In a mechanical closure system, the closure elements may be buckles, straps (e.g., belt style or Velcro style), clamps, etc.

In the representative embodiment of the Figures, sets of closure elements **22**, of the same or different forms, are arranged along edges **12**d and **12**e that run from the front of the lower leg portion of the boot, downwardly and over the top of the foot, to the toe region of

the boot. Closure systems **22** for snowboard boots and various other kinds of boots are generally centered over the front of the lower leg and the top of the foot. They typically do not extend substantially beyond such centralized areas to the side portions of the boot. To illustrate the operation of a closure system, Fig. **12** shows boot **10** with edges **12**d and **12**e spaced apart; Fig. **3** shows them converged together and over tongue **14**.

Cable-based systems deployed from a retractable reel, e.g., a reel in tensioning mechanism **24** in Figs. **1** & **3**, are another form of closure system that may be used to draw together opposing edges **12**d and **12**e. Examples of such systems are found in numerous US and foreign patents, including in the examples listed below, as well as from commercial vendors, such as Boa Technology, Colorado, USA.

The inner liner **16** may include spaced apart edges and a tongue, similar to edges **12**d, **12**e and tongue **14**, and any form of closure system described above.

Some embodiments include tensioning systems that act on one or more cables **120** along a tension path to retract the foot against parts of the boot to better seat the foot in the boot. A tensioning mechanism **24** is coupled to the cable(s) to adjustably control tension. Such a foot-retraction system may be used in addition to or instead of a conventional closure system, such as those described above. In the embodiment shown, tensioning mechanism **24** is a reel-based tensioning mechanism. The cables may be of the same nature as described above for the conventional closure systems.

Arrows T**1**, T**2** and T**3** in Figs. **1-2** indicate the direction of force along the tension path when the knob on tensioning mechanism **24** is rotated in direction R, causing tensioning of cable **120**, whose ends are disposed on a spooling reel coupled to the knob. In certain embodiments, such as the one shown, one or more cables, such as cable **120**, may be routed along a tension path from one side of the boot, across the tongue or tongue region **14**, to an opposite side of the boot, to create a tension path that tensions the instep, simultaneously causing the bottom side of the user's foot to retract against the footbed and heel areas of the boot. In certain embodiments, this occurs because at least the tongue **14** is urged rearwardly and downwardly by the tensioned elements in the tension system.

In contrast to conventional closure systems arranged on opposing edges, such as edges **12**d and **12**e, in the inventive subject matter, the tension path extends over the instep area laterally and medially and substantially away from the edges. It continues beyond the edges and wrapping around the sides of the foot or lower leg. For example, the extension may be at least **2.5** cm from the edges and in some cases **5.0** cm, **7.5**, **10.0** cm, or more.

More particularly, in the embodiment shown, a tension path spans the instep or closely adjacent area above and/or below the instep. (Hereinafter the instep and closely adjacent areas may be referred to as the "instep area"). The tension path extends generally laterally and medially from the opposing edges **12**d and **12**e to the sides of the boot and at a downward angle. It continues at least to points on the lateral and medial sides of the boot that approximately align with the ankle area of the boot.

While the Figures show a tension path crossing over the instep area of a boot, the inventive subject matter also contemplates that a tension path may be constructed so that it passes transversely over longitudinal foot or leg positions ranging from about the metatarsal heads to the front lower leg area. In such cases, the tension path extends to positions on the lateral and/or medial sides of the foot that are at least at or about the ankle. One or both terminal ends of such a tension path on a boot may be vertically above, below or over the height of the ankle portion. In certain embodiments, the tension path may extend longitudinally on the foot to a position that is behind the ankle and to the side areas or rear areas of the heel.

The cable or cables associated with a tension path may be slidably disposed along the path, and therefore tension the shell and/or tongue against the top and/or sides of the user's foot. This tension will tend to cause the foot to retract into the footbed and/or heel areas of the boot. In the embodiment shown, the tension path is arranged to provide for a force vector that tensions the boot downwardly and rearwardly against top and sides of the user's foot. The result is that the user's foot is pulled down against the footbed and pulled rearwardly against the heel area, i.e., it is retracted into the areas by virtue of the boot tongue **14** pressing on the top or side surfaces of the foot. In the various tension paths contemplated herein providing a downward and rearward force vector, the tension path may include a portion that

is disposed at an angle of about **20** degrees to about **70** degrees from horizontal, providing a direction to the corresponding force vector. This downward and rearward vector V is generally indicated in Fig. **3**.

The cable or cables along such a tension path may interact with the tongue and shell in any one or more ways to tensionably engage those parts. For example, one or more sections of one or more cables may be routed over the surfaces of the parts, such as the tongue and shell, and/or the cable or cable sections may be routed in channels or guides **26** through the parts. Channels or guides, such as **26**a, **26**b, and **26**c, may be formed in the layer or layers of materials that make up the shell or liner. Guides could be constructed or formed in or on such layers in any number of ways, e.g., leather, synthetic leather, an injected/molded piece, or no guide at all, e.g., just a section of cable over a surface.

In addition to guides or channels that are integrated into a boot part, guides or channels, such as **26**d, **26**e, **26**f and **26**g may be defined by discrete elements that are attached to a boot part and define a segment of a tension path. Such elements may include tubes, collars, loops, rings, hooks, etc., that are arranged along a section of a tension path. Discrete elements may be most suitable where the tension path needs reinforcement, such as at turns in the path or at anchor points. In the example shown, the tension path includes a section that crosses transversely over the outer surface of the tongue **14**. Then it extends below the outer surface of outer shell **12**, either within the shell layer(s) or on inner surfaces of the shell. Any combination of routing--over surfaces, between surfaces, or on inside surfaces--is contemplated.

From the foregoing, it will be understood that guide elements, such as loops, rings, sleeves, tubes, etc., disposed on exterior or interior surfaces, or between surfaces, may be used to define the direction of a segment of a tension path or to facilitate a change in direction of a tension path, while maintaining tensionable engagement with boot parts along a path. Guides may be affixed to the surface of the parts or they may be free-floating or repositionable over the parts. A free-floating or repositionable element advantageously allows a user to selectively define a tension path and tune the fit of the boot. A repositionable guide also may be used in the same or different tension path to allow for clearance of objects

through the path. For example, a guide may have a portion that snaps or screws into the boot and which can easily be removed by a user's hand so that the user can pull cables out of the opening into which a foot is placed when the boot is taken on or off.

The Figures show a guide that is integrated with a pressure distribution element **28**, e.g., a pad, band, or cuff. The guide is disposed over the top of tongue **14**. The guide includes channels through which cables are slideably routed. The pressure distribution pad has a substantially broader surface than the associated cables and thereby distributes the pressure of the cables over a broader surface area. For example, the pressure distribution element could be at least **1.0** cm wide and at least **2.0** cm long, in comparison to a cable of not more than a few millimeters in diameter, typically **0.5**mm to about **8.0** mm. The pressure distribution element **28** shown is not affixed to the tongue or other part of the boot. Rather it is free-floating and vertically and/or laterally repositionable by the user in a desired location over the tongue. It may also self-position according to shape the boot takes with a given foot within it.

In other embodiments, a separate pressure element is not necessary and the tongue itself may serve that role. The tongue **14** may have external or internal guides or channels for routing of one or more cables. Guides or channel may be similarly arranged most anywhere else on or in the outer shell parts or other boot parts for routing of the cables.

The tension path may also continue beyond the paths indicated above. For example, in the Figures, the tension path on the lateral side angles or curves upwardly and extends along the side of the boot towards the top of the lateral side of the boot to a tensioning mechanism **24** (discussed in more detail below) for tensioning the cables along the tension path. Such a routing allows a user to more easily reach and manipulate the tensioning mechanism to adjustably increase or decrease tension.

One or more cables may be disposed along a given tension path. There may also be multiple tension paths, each with one or more cables. The tension on a cable in the tension path may be applied in a number of ways. In each case, the ends of the cable have anchor points that anchor the cable or a segment of the cable in tension. The anchor points can be a

fixed or adjustable structure of mechanism. At a fixed anchor point, the end of a cable or segment of a cable is fixed to the point. For example, it is stitched, glued, tied, and/or mechanically captured, to the point. In an adjustable anchor point, the end or the cable or segment of the cable may be repositioned relative to the anchor point and then fixedly captured by it. For example, there are various known spring-based clamping mechanisms for engaging a clamping element against a cable. The spring force against the clamping device fixes the cable in clamping mechanism. Depressing the spring elements disengages the clamping element and allows a user to adjust cord or cable tension.

Devices that can provide mechanical advantage or leverage when associated with a cable include shackles, blocks, pulleys, sheaves, and geared systems with reduction gears. Rotating elements as tensioning mechanisms can also provide leverage based on providing relatively large diameter wheels or levers on a pivot point to which a cable may be connected. For example, a wheel of tensioning mechanism may be configured with a diameter that enhances leverage of a cable spool (not shown) to which it is rotatably coupled.

In the embodiment shown in the Figures, a tension path has at one end a tensioning mechanism that are operationally clear and independent of the closure system on the edges **12**d and **12**e. The tension path shown is also routed under the closure system (i.e., cable **20** and closure elements **22**) so that the cables associated with the tension path and those for the closure system do not impede one another. In the embodiment shown, a single cable **80** is disposed on the tension path. Each end of the cable is connected to a rotatable tensioning mechanism so that a loop is formed. The loop has generally parallel sections **82**a, **82**b that extend over the instep area. The loop has a closed end **82**c opposite the rotatable tensioning mechanism **24**. The loop end **82**c is coupled to an anchor point **26**c disposed on the side of the boot that is opposite the side of the tensioning mechanism. In this example, the anchor point is a U-shaped channel **26**c or guide through which the end **82**c of the loop is routed. It blocks the loop end from pulling forward, allowing simultaneous tensioning of the parallel segments when the free ends are simultaneously tensioned by a tensioning mechanism. If there is not simultaneous tensioning, the cable will slide in the channel shown in the direction

of the tensioning. This may be avoided by fixedly attaching the loop end of the strand to an anchor point instead of using a U-shaped channel.

In the embodiment shown in the Figures, the anchor point **26**c is on the medial side of the boot below and aligned with or behind the ankle area of the boot. Parallel sections **82**a, **82**b route respectively through guides **26**a and **26**b across the instep area of the boot to turning elements **26**d and **26**e, e.g., collars or sleeves,that redirect the cable sections upwardly to their anchor points on a reel in the tensioning mechanism **24**. By connecting the ends of the cable sections to the reel, the sections are windable on the reel and simultaneously tensionable. The reel is contained in a housing or on base, and not shown in the Figures. The reel rotates on an axle in housing or base portion of the tensioning mechanism. The reel is rotatably coupled to a knob accessible by a user and mounted on the external side of the housing or on the base. The tensioning mechanism may include a ratchet mechanism that allows the wheel and reel to be turned by a user to apply tension from the tensioning mechanism across the cable to the medial side anchor element **26**c. When tension is applied, the part of the boot that section **26**c in which integrated urged toward the opposite part to which the tensioning mechanism is mounted.

Examples of suitable reel-based tensioning mechanisms are found in the following patents: US **7,082,701**, in the name of Vans, Inc., US **4,748,726**, and **7,512,521**. The '**521** patent discloses reel system for tensioning a cable on a tension path in an item of footwear. The '**521** patent discloses that the tensioning mechanism may include a wheel that pops out of the housing or base unit affixed to the outer shell of an item of footwear. In the out position, a ratchet in disengaged and the cable tension can be released.

Tensioning mechanisms include not only reel-based system for retracting cables, but various other tensioning mechanisms, including spring-based clamping systems, turnbuckle systems, and even simple posts, hooks, or other such receivers mountable on a boot or other item of footwear and to which cables can be tied off.

While the foregoing system is described in terms of a single cable in a loop, it will be understood by persons skilled in the art that the single loop could be replaced by two or more

individual cables, each with one end anchored to the same or different tensioning mechanisms on one side of the boot and the other end anchored to an anchor point on the other side of the boot. For example, the embodiment shown in the picture could be modified by in essence cutting the end of the loop to provide two separate cables emanating from one or more tensioning mechanisms on the opposite side of the instep, in this case the lateral side). Each free end on the medial side would be anchored to the same or different anchor points on the medial side. A tension path using guides could also be configured to allow for the tensioning mechanism and anchor point to be on the same side of the boot with the tension path crossing to opposite sides of the boot.

A leverage effect may be provided along any tension path by a having a tensioned cable pass over the instep using turning points over which the tensioned cable slides or pivots. For example, a modification to the embodiment shown could be take one cable end of the reel of tensioning mechanism and anchor it anywhere on the same side of the boot as the tensioning mechanism (in this case the lateral side). The cable would be slidably disposed over the anchor point at the medial side, which would actually become a turning point. The tensioning mechanism would wind the cable at one end and apply tension across the whole tension path, which would be disposed between the two anchor points on the lateral side. The cable could have a tension path that crosses the instep multiple times using multiple turning points on opposite sides of the instep to provide multiples of leverage. A turning element can be any kind of pivot device that allows for rolling engagement. For example, the pivot device could a low friction D-ring, O-ring, a sleeve, collar, a block, a sheave; roller, pulley wheels, etc.

Figs. **4** through **9** show another possible arrangement of a tensioning system, as described above. Figs. **4**-**5**B and **7**-**9** show external features of the arrangement, and Fig. **6** shows a bisected shell revealing internal aspects of the arrangement.

The tensioning system **100** shown in Figs. **4** through **9** includes an upper cable **110** and a lower cable **120** operatively associated with respective upper and lower tensioners **130**, **140** to form respective upper and lower cable loops in a manner described above. For

example, each of the upper cable **110** and the lower cable **120** defines opposed open ends anchored to a respective tensioner **130**, **140**, forming a respective loop.

Such an arrangement permits the upper cable **110** and the lower cable **120** to be selectively tensioned independently of each other. Additionally, a tensioning system **100** arranged as shown in Figs. **4** through **9** can draw opposed edges of the shell together with sufficient closure force as not to need or use a separate closure system (e.g., laces, as shown in Figs. **1** through **3**). Stated differently, a tensioning system **100** arranged as shown in Figs. **4** through **9** can constitute, in some embodiments, a foot retraction system.

The tensioning system **100** arrangement shown in Figs. **4** through **9** can be used in connection with a boot having a tongue **14** or a boot having a tongue-like element, just as with tensioning systems shown in Figs. **1** through **3**. In Figs. **4** through **9**, the tensioning system **100** includes a floating element **150** positioned outwardly of the tongue **14** relative to a user's leg.

The floating element **150** couples the upper loop formed by the upper cable **110** and the lower loop formed by the lower cable **120** to each other. In particular, as shown in Fig. **4**, an upper segment **121** of the lower loop passes through a lower channel **151** (e.g., a perforation) defined by the floating element **150**, and a lower segment **111** of the upper loop passes through an upper channel **152** of the floating element **150**. As with tensioning systems described in detail above, a channel permits a sliding engagement between a cable, or a segment thereof, and an adjacent, overlying structural component (e.g., an upper of the boot, the floating element).

With an engagement between the floating element **150** and the upper and the lower cables **110**, **120** as just described, a selected tension applied to the upper cable **110** and a selected tension applied to the lower cable **120** can urge the floating element **150** inwardly of the boot (e.g., toward a user's instep) in a selected manner. As but one example, with such a configuration, the floating element **150** in conjunction with the independently tensionable upper and lower cables **110**, **120** can, as indicated in Fig. **5**B, apply a selected force vector T_{1a}, T_{2a} (e.g., a selected force magnitude and a selected force direction) to a wearer's instep,

providing a user-selectable degree of comfort, together with a user-selectable degree of downward and rearward seating of the wearer's foot in the foot bed and heel in the heel cup.

For convenience, routing of the upper cable **110** and routing of the lower cable **120** are now described in relation to Figs. **4** through **9**. Nonetheless, other arrangements of cables and tensioners are possible and contemplated to be within the level of ordinary skill following a review of this disclosure.

As noted above, the lower cable **120** defines opposed ends captured by a corresponding lower tensioner **140** (Figs. **5**A-**9**). With the arrangement depicted in Figs. **4** through **9**, the lower tensioner **140** is positioned outwardly of the lateral side of the upper portion of the lower cable **120**. A position of the lower tensioner **140** can be selected elsewhere for user convenience and comfort without departing from the embodiments described.

The opposed ends of the lower cable can be affixed to the lower tensioner **140** such that portions of the lower cable **120** proximate to the lower tensioner **140** can be wound about a reel of the tensioner in a manner as described above.

With a routing as shown in Figs. **5**A-**9**, a first upper portion of the lower cable **120** can pass into a conduit **161** (or a channel), extending rearwardly of the boot from the lower tensioner **140** on the lateral side **51** of the boot **50** and around a rear portion **53** of the boot **50** in a region adjacent to or slightly above a wearer's Achilles tendon, and to an upper rear portion of the medial side **52** of the boot. The first upper portion of the lower cable can be routed downwardly along the rear portion **53** (e.g., a proximal portion) of the medial side **52** of the boot (e.g., along a portion of the boot overlying a region between the wearer's Achilles tendon and a medial protuberance of the ankle) to a lower rear portion of the medial side **52** of the boot. The first portion of the lower cable can be routed distally from the lower rear portion **53** of the medial side **52** of the boot **50** to a position **162** of the medial edge of the shell **12** overlying a lower portion of the wearer's instep, indicated by the position of the upper anchor channel **161** (sometimes referred to as an anchor point) for the lower cable **120** in Fig. **6**.

With a routing as shown in Fig. **6**, a second upper portion of the lower cable **120** can pass into a conduit **163** extending rearwardly of the boot **50** from the lower tensioner **140** and downwardly along the rear portion (e.g. a proximal portion) of the lateral side **51** of the boot **50** (e.g., along a portion of the boot overlying a region between the wearer's Achilles tendon and a lateral protuberance of the ankle) to a lower rear portion **53** of the lateral side **51** of the boot **50**. The second portion of the lower cable **120** can be routed distally from the lower rear portion of the lateral side of the boot to a position **164** of the lateral edge of the shell opposite the position **162** on the medial edge of the shell to which the first portion of the lower cable is routed.

As shown in Figs. **4-9**, the first upper portion of the lower cable **120** can span the gap **165** between the medial and the lateral edges of the shell, passing from an upper anchor channel **161** positioned adjacent the medial edge, through the lower channel **151** defined by the floating element **150**, and into an upper aperture **164** of a lower anchor channel **168** positioned adjacent the lateral edge of the shell **12**. As also shown in Fig. **4**, the second portion of the lower cable **120** can span the gap **165** between the lateral and the medial edges of the shell, passing from an upper anchor channel **163** positioned adjacent the lateral edge, through the lower channel **151** defined by the floating element **150**, and into an upper aperture **167** of a lower anchor channel **168** positioned adjacent the medial edge of the shell.

An intermediate segment **124** of the lower cable, sometimes also referred to as a lower segment, is continuous with and extends between the first upper portion and the second upper portion of the lower cable. For ease of reference, the intermediate segment **124** can be considered as extending between opposed portions of the lower cable **120** positioned adjacent the upper aperture **164** of the lower anchor channel **168** positioned adjacent the lateral edge of the shell and the upper aperture **167** of the lower anchor channel **168** positioned adjacent the medial edge of the shell. As shown in Fig. **4**, a portion of the lower segment spans a distal portion of the gap **165** between the lateral edge and the medial edge of the shell, passing through a lower tongue channel **153**.

As noted above, when a selected tension is applied to the lower cable **120**, distal portions of the opposed medial and lateral edges of the shell are urged together by forces

applied to the channels **161**, **163**, **168**, **169** by the cable **120**, and a lower portion (e.g., a distal portion) of the floating element **150** is drawn toward the user's instep in a direction and with a force magnitude (e.g., force vector T_{2a}) at least partially corresponding to a selected tension and relative positions of the user's instep, the lateral edge, and the medial edge (e.g., since the apertures of the channels **161**, **163**, **168**, **169** are positioned adjacent the edges).

Arrangements of the upper cable **110** will now be described. In Fig. **4**, an upper tensioner **130** is positioned on the tongue **12**, and the upper cable **110** extends laterally and medially outwardly of the upper tensioner **130** into upper apertures **171**, **172** of respective lateral and medial upper anchor channels **173**, **174**.

The opposed ends of the upper cable can be affixed to the upper tensioner **130** such that portions of the upper cable **110** proximate to the upper tensioner **130** can be wound about a reel of the tensioner in a manner as described above. The opposed portions of the upper cable **110** extend through the respective upper anchor channels **173**, **174** and outwardly of lower apertures **175**, **176** defined by the respective upper anchor channels **173**, **174**.

The portion of the upper segment of the upper cable extending from the lateral-side aperture **175** spans the gap **165** between the lateral and the medial edges, passing through an upper tongue channel **154** and into an aperture **177** defined by a lower anchor channel **178** for the upper cable, positioned on the medial side **52** of the shell. The portion of the upper segment of the upper cable **110** extending from the medial side aperture **176** spans the gap **165** between the medial and the lateral edges, also passing through the upper tongue channel **154** and into an aperture **179** defined by a lower anchor channel **180** for the upper cable, positioned on the lateral side **51** of the shell.

As shown in Fig. **6**, the respective medial and lateral lower anchor channels **178**, **180** for the upper cable **110** extend rearwardly from the edges of the shell to a position generally rearward of a user's ankle protuberances, downward around the ankle protuberances and forward to a position **181**, **182** generally below and slightly forward of the ankle protuberances. In some embodiments, the position generally below and slightly forward of the ankle protuberances is positioned rearwardly of, and slightly below, the medial edge of

the shell, the lateral edge of the shell, or both, as shown in Fig. **6**. In Fig. **4**, the cable is seen extending into the boot between the shell **12** and the tongue **14** toward the recessed positions of the opposed lower apertures **181**, **182** of the respective lower anchor channels **178**, **180**.

An intermediate segment of the upper cable, sometimes also referred to as a lower segment **111** (e.g., of the upper cable), extends between the respective medial and lateral apertures **181**, **182** defined by the lower anchor channels **178**, **180** for the upper cable **110**. For ease of reference, the intermediate segment **111** of the upper cable can be considered as extending between opposed portions of the upper cable.

In some embodiments, the lower segment **111** of the upper cable **110** extends from the position **181**, **182** generally below and slightly forward of the ankle protuberances in correspondence to a flexible region **185** of the boot, as shown in Figs. **4** and **6**. The flexible region **185** of the boot can be positioned to correspond to a position of the wearer's flexible ankle joint. With such an arrangement of the upper cable **110** (e.g., an arrangement in which the lower segment extends from the lower channel as a position "deep within the boot"), a selected tension in the upper cable can urge an upper portion of the floating element **150** downwardly and rearwardly against the tongue, urging a wearer's foot downwardly into the foot bed and rearwardly into the heel cup, with greater force T1a as compared to an arrangement in which the cable was routed into an anchor channel having an aperture positioned directly adjacent an edge of the shell.

Persons skilled in the art will recognize that many modifications and variations are possible in the details, materials, and arrangements of the parts and actions which have been described and illustrated in order to explain the embodiments described herein, and that such modifications and variations may merely be variants of aspects of the embodiments described herein.

As used herein, "and/or" means "and" or "or", as well as "and" and "or."

The principles described above in connection with any particular example can be combined with the principles described in connection with any one or more of the other

examples. Accordingly, this detailed description shall not be construed in a limiting sense, and following a review of this disclosure, those of ordinary skill in the art will appreciate the wide variety of systems that can be devised using the various concepts described herein. Moreover, those of ordinary skill in the art will appreciate that the exemplary embodiments disclosed herein can be adapted to various configurations.

The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the disclosed embodiments. Various modifications to those embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments. Thus, the following are not intended to be limited to the embodiments shown herein, but are to be accorded the full scope consistent with the teachings herein, wherein reference to an element in the singular, such as by use of the article "a" or "an" is not intended to mean "one and only one" unless specifically so stated, but rather "one or more".

All structural and functional equivalents to the elements of the various embodiments described throughout the disclosure that are known or later come to be known to those of ordinary skill in the art are intended to be encompassed by the recited elements of any combination of elements described herein..

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EMBODIMENTS IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An item of footwear, comprising a boot for a snow or skating sport, with a tensioning system, comprising:

a shell configured for enclosing a foot and at least a portion of a lower leg;

the shell having a pair of opposing edges generally aligned along a top-of-foot portion of the shell and/or a front-lower-leg portion, the edges generally configured to align with a longitudinal axis of a wearer's foot and/or lower leg, the opposing edges defining opposite sides of the shell;

a closure system adjacently associated with the opposing edges for drawing the opposing edges toward one another;

a tongue attached to the top-of-foot portion of the shell and positioned in a gap between the opposing edges;

a foot retraction system comprising a tension path, a pressure-distribution element free-floating from the tongue, and at least two anchor points disposed along the path on the opposite sides of the shell and supporting at least one tensionable cable section disposed along the path, a first anchor point comprising a tensioning mechanism, the tensioning mechanism configured to adjust tension in the tensionable cable section, a second anchor point being arranged on the shell, at least one of the anchor points being positioned on a lateral or a medial side of the footwear; and

a removable bootie disposed in the shell, the bootie comprising a thickened core between an outer lining of a textile or fabric and an inner lining of a textile or fabric;

wherein a section of the tension path transversely crosses the top-of-foot portion of the shell and tongue of the item of footwear at, and through, the pressure-

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distribution element disposed between the opposing edges, the tensionable cable section crossing over an outer surface of the top-of-foot portion of the shell and tongue and under the closure system, the opposing edges and an inner surface of the shell to apply a selectable force magnitude and force direction to the top-of-foot portion of the shell and tongue, providing a selectable degree of downward and rearward seating of the wearer's foot and heel in the item of footwear; and the tensionable cable section can be tensioned over the top-of-foot portion of the shell and tongue independently of the closure system for drawing the opposing edges towards one another.

2. The item of claim **1**, wherein the tension path includes at least a third anchor point disposed on the footwear and positioned to provide a routing of the tension path with an upward turn along a side of the item after crossing the instep area.

3. The item of claim **2**, wherein the tension path continues to a position rearward that is longitudinally aligned with an ankle area of the footwear.

4. The item of claim **3**, wherein the tension path is routed completely around a rearward portion of the shell from the medial and lateral sides.

5. The item of claim **4**, wherein the tension path is routed to be disposed between the intended wearer's Achilles tendon and medial protuberance of the ankle.

6. The item of claim **1**, wherein the tension path extends substantially vertically along a region adjacent an ankle area of the footwear.

7. The item of claim **1**, wherein the tension path extends adjacent a heel area of the footwear.

8. The item of claim **1**, wherein the tension path on at least one side of the footwear terminates at the tensioning mechanism disposed on the footwear above a region adjacent an ankle area of the footwear.

9. The item of claim **1**, wherein the tensioning mechanism comprises a reel-based mechanism.

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10. The item of claim **1**, wherein the tension path is routed to transversely cross a wearer's foot and continue rearwardly at about **20** to about a **70**-degree angle from horizontal to apply a rearward and downward force vector on the wearer's foot and/or lower leg.

11. The item of claim **1**, wherein a section of the tension path is disposed outwardly of an outer surface of the tongue.

12. The item of claim **11**, wherein the tension path extends from outwardly of the tongue to a region positioned inwardly of an outer surface of the outer shell.

13. The item of claim **1**, wherein the closure system comprises a set of closure elements arranged along the opposing edges.

14. The item of claim **13**, wherein the closure elements are adapted to receive laces or other cables.

15. The item of claim **14**, wherein the tensioning mechanism includes a wheel or knob operable by a user to tension the tensionable cable section.

16. The item of claim **1**, wherein the tensionable cable section is configured to have two free ends coupled to the first anchor point comprising the tensioning mechanism disposed on one of the opposing sides of the footwear, the tensioning mechanism being spaced away from and rearward of the opposing edges associated with those sides; and a closed loop end engaging the second anchor point on the opposite side of the footwear, and also spaced away and rearward of the opposing edges.

17. The item of claim **1**, wherein the tensionable cable section is configured so that the tensioning of the tensionable cable section applies a rearward and downward force vector on the wearer's foot and/or lower leg.

18. The item of claim **1**, wherein the pressure distribution element is configured to be at least one of vertically or laterally repositioned.

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19. The item of claim **1**, wherein the pressure distribution element comprises channels through which the at least one tensionable cable section is routed.

20. An item of footwear, comprising a boot for a snow or skating sport, with a tensioning system, comprising:

a shell configured for enclosing a foot and at least a portion of a lower leg of an intended wearer;

the shell having a pair of opposing edges generally aligned along a top-of-foot portion of the shell and/or a front-lower-leg portion, the edges generally configured to align with a longitudinal axis of the foot and/or lower leg, the opposing edges defining opposite sides of the shell;

a foot retraction system comprising a first tension path and at least two anchor points disposed along the first tension path on the opposite sides of the shell and supporting a first tensionable cable section disposed along the first tension path, at least one of the anchor points comprising a first tensioning mechanism, the first tensioning mechanism configured to adjust tension in the first tensionable cable section, the anchor points being arranged on opposite sides of the shell that support the opposing edges, at least one of the anchor points being positioned on a lateral or a medial side of the footwear;

the foot retraction system further comprising a second tension path with a second tensionable cable section disposed along the second tension path, and a floating element physically coupling the first tensionable cable section disposed along the first tension path and the second tensionable cable section disposed along the second tension path to each other, wherein the first tensionable cable section along the first tension path and the second tensionable cable section along the second tension path are independently tensionable to apply a selectable force magnitude and force direction to a wearer's instep by the floating element to provide a

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selectable degree of downward and rearward seating of the wearer's foot and heel in the item of footwear; and

a removable bootie disposed in the shell, and wherein the bootie is disposed in an instep area disposed between the opposing edges, and the first tension path routes over the instep area;

wherein the floating element defines a first channel and a separate second channel and is positioned to contact a flex zone of the item of footwear, wherein the flex zone corresponds to an ankle area of the footwear;

wherein a section of the first tension path transversely crosses the instep area and through the first channel of the floating element, the first tensionable cable section crosses over an outer surface of the instep area and under the opposing edges and an inner surface of the shell;

wherein a section of the second tension path transversely crosses through the second channel of the floating element, over the outer surface of the instep area and under the opposing edges and the inner surface of the shell; and

wherein the second tension path is associated with a third anchor point disposed on a front side of the footwear, the third anchor point comprising a second tensioning mechanism, the second tensioning mechanism configured to adjust tension in the second tensionable cable section.

21. The item of claim **20**, wherein the first tension path includes at least one additional anchor point disposed on the footwear and positioned to provide a routing of the tension path with an upward turn along a side of the item after crossing the instep area.

22. The item of claim **21**, wherein the first tension path continues to a position rearward that is longitudinally aligned with the ankle area of the footwear.

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23. The item of claim **20**, wherein the first tension path extends substantially vertically along a region adjacent the ankle area of the footwear.

24. The item of claim **20**, wherein the first tension path extends adjacent a heel area of the footwear.

25. The item of claim **20**, wherein the first tension path on at least one side of the footwear terminates at the first tensioning mechanism disposed on the footwear above a region adjacent the ankle area of the footwear.

26. The item of claim **20**, wherein the first tensioning mechanism comprises a reel-based mechanism.

27. The item of claim **20**, wherein the first tension path is routed to transversely cross the intended wearer's foot and continue rearwardly at about **20** to about **70**-degree angle from horizontal to apply a rearward and downward force vector on the intended wearer's foot and/or lower leg.

28. The item of claim **20**, wherein the instep area comprises a tongue positioned in a gap between the opposing edges.

29. The item of claim **28**, wherein a section of the first tension path is disposed outwardly of an outer surface of the tongue.

30. The item of claim **29**, wherein the first tension path extends from outwardly of the tongue to a region positioned inwardly of an outer surface of the shell.

31. The item of claim **20**, wherein the first tensioning mechanism includes a wheel or knob operable by the intended wearer to tension the first tensionable cable section.

32. The item of claim **20**, further comprising a footbed and heel area, wherein the first tensionable cable section forms a part of a cable along the first tension path, the cable comprises:

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a loop having two free ends coupled to a first one of the at least two anchor points comprising the first tensioning mechanism disposed on one of the opposing sides of the footwear, the first tensioning mechanism being spaced away from and rearward of the opposing edges associated with those sides, an opposite closed end of the loop engaging a second one of the at least two anchor points on the opposite side of the footwear, and also spaced away and rearward of the opposing edges, and

wherein the first tension path between the first anchor point and the second anchor point transversely crosses the instep area of the footwear and is oriented to provide the first tensionable cable section a downward and rearward force so that the sides and a tongue element positioned therebetween are configured to retract the intended wearer's foot into the footbed and heel area.

33. The item of claim **20** wherein the first tensionable cable section is configured so that the tensioning of the first tensionable cable section applies a rearward and downward force vector on the intended wearer's foot and/or lower leg.

34. The item of claim **20** wherein the first tension path is routed completely around the rearward portion of the shell from the medial and/or lateral sides.

35. The item of claim **34** wherein the first tension path is routed to be disposed between an Achilles tendon and medial protuberance of the ankle of the intended wearer.

36. The item of claim **20**, wherein the first tension path and the second tension path do not overlap with each other.

37. The item of claim **20**, wherein each of the first channel and the separate second channel is formed in a material of the floating element.

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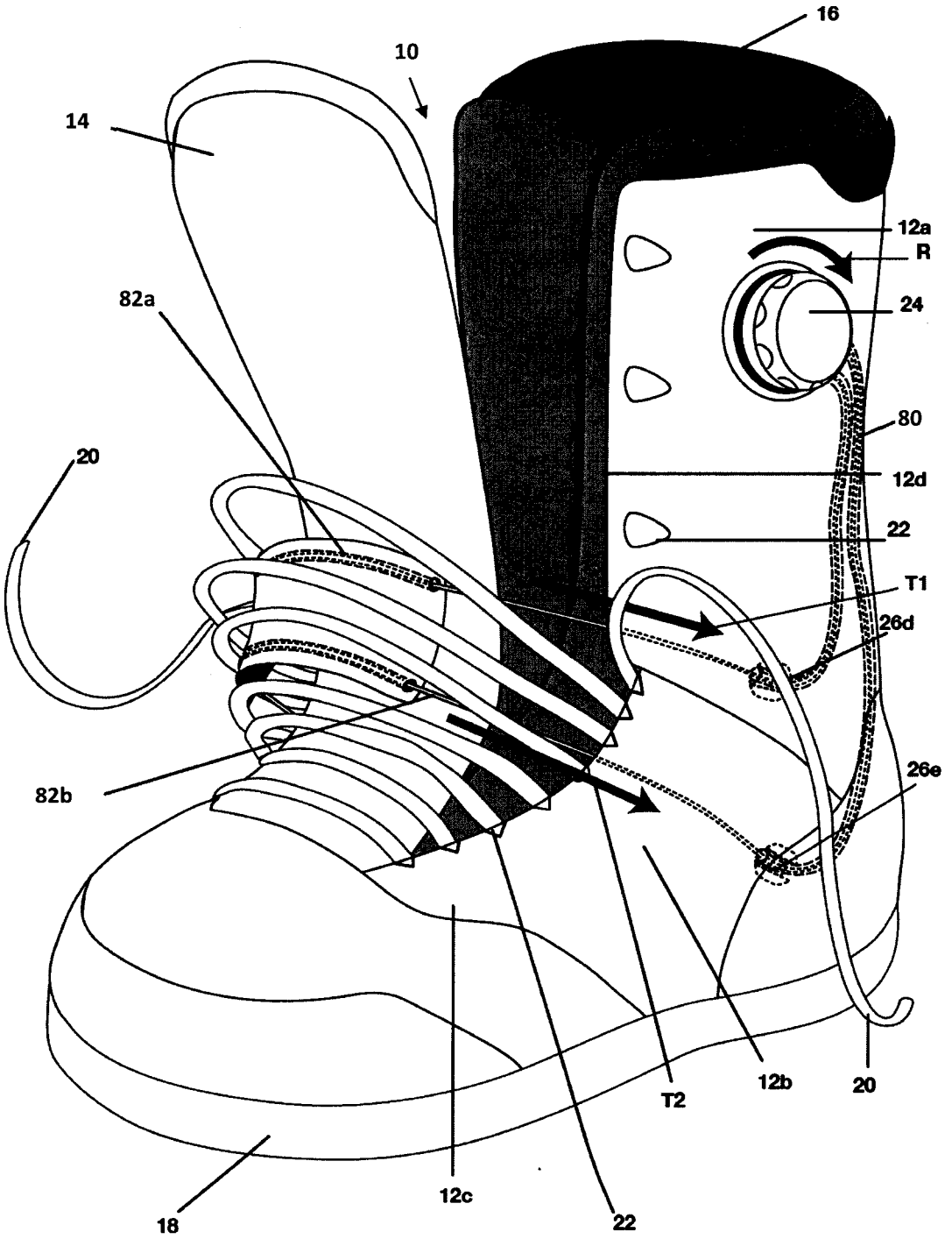

Fig. 1

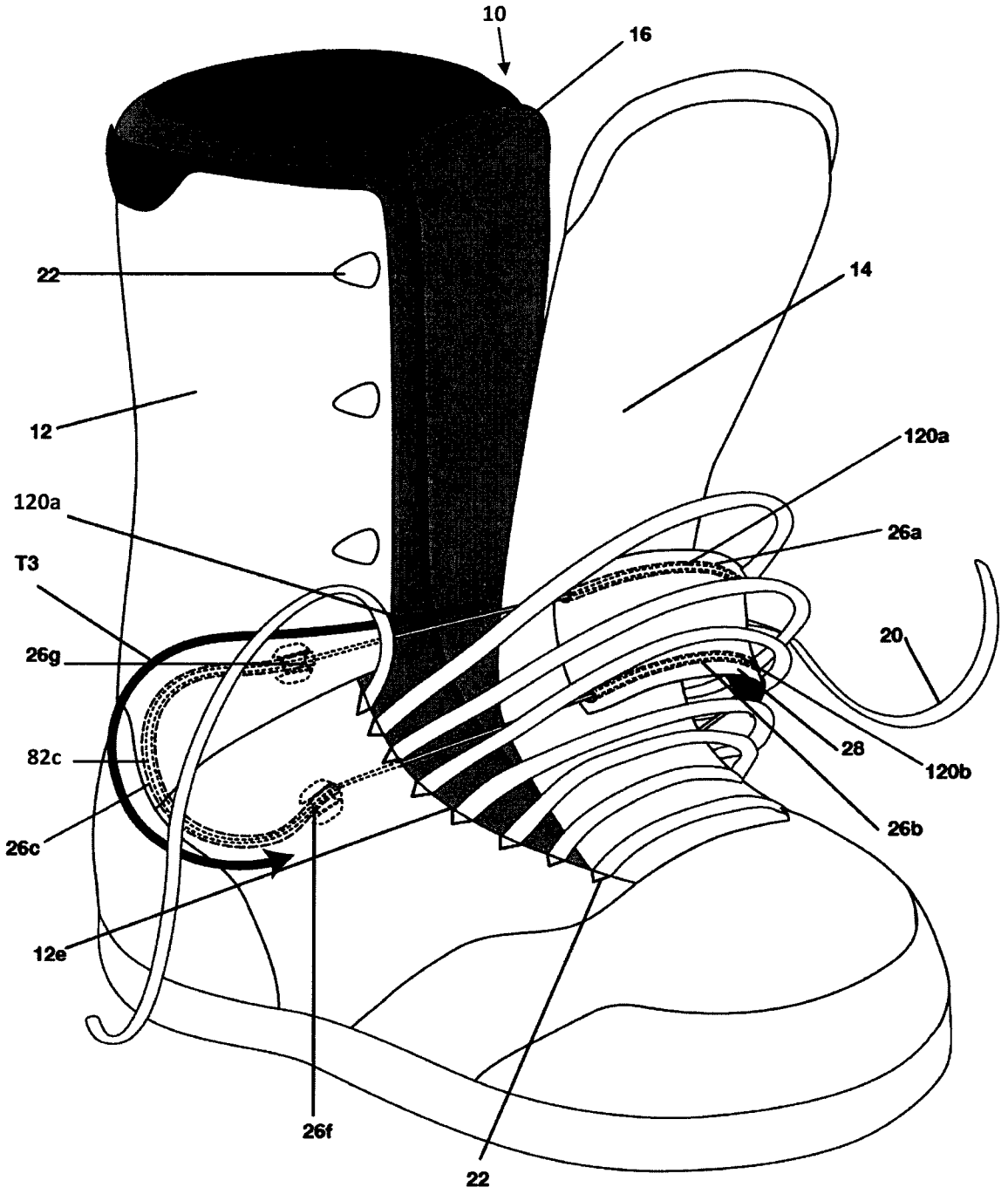
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Fig. 2

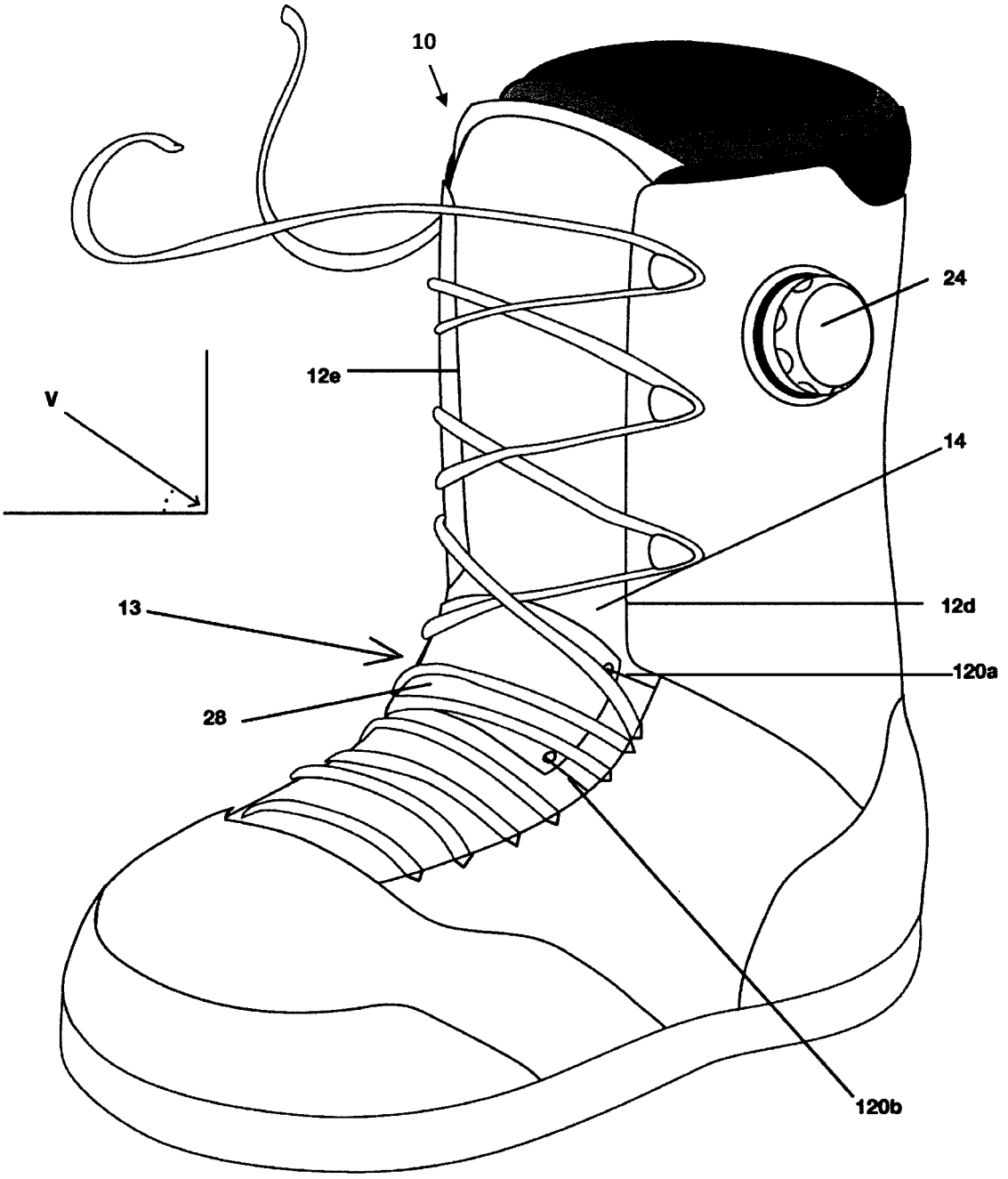

Fig. 3

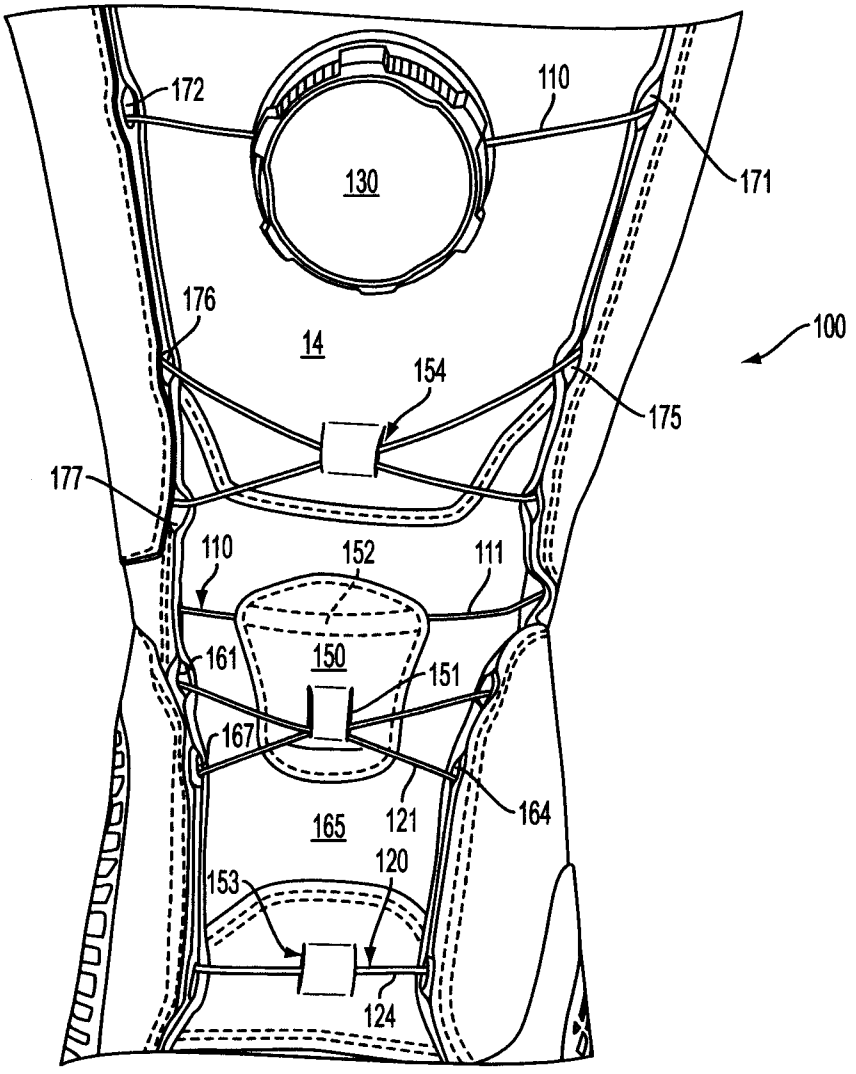
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FIG. 4

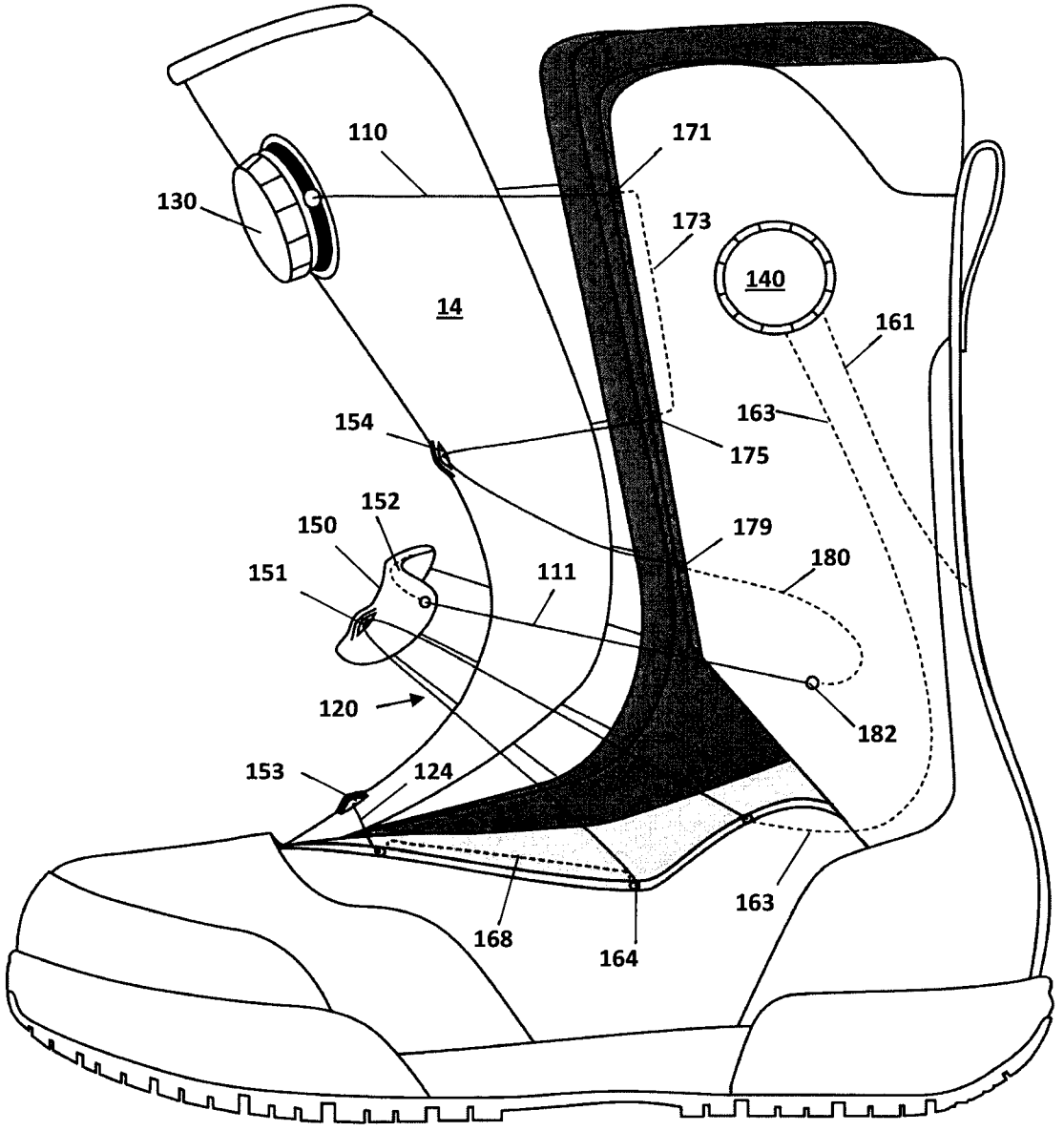
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Fig. 5A

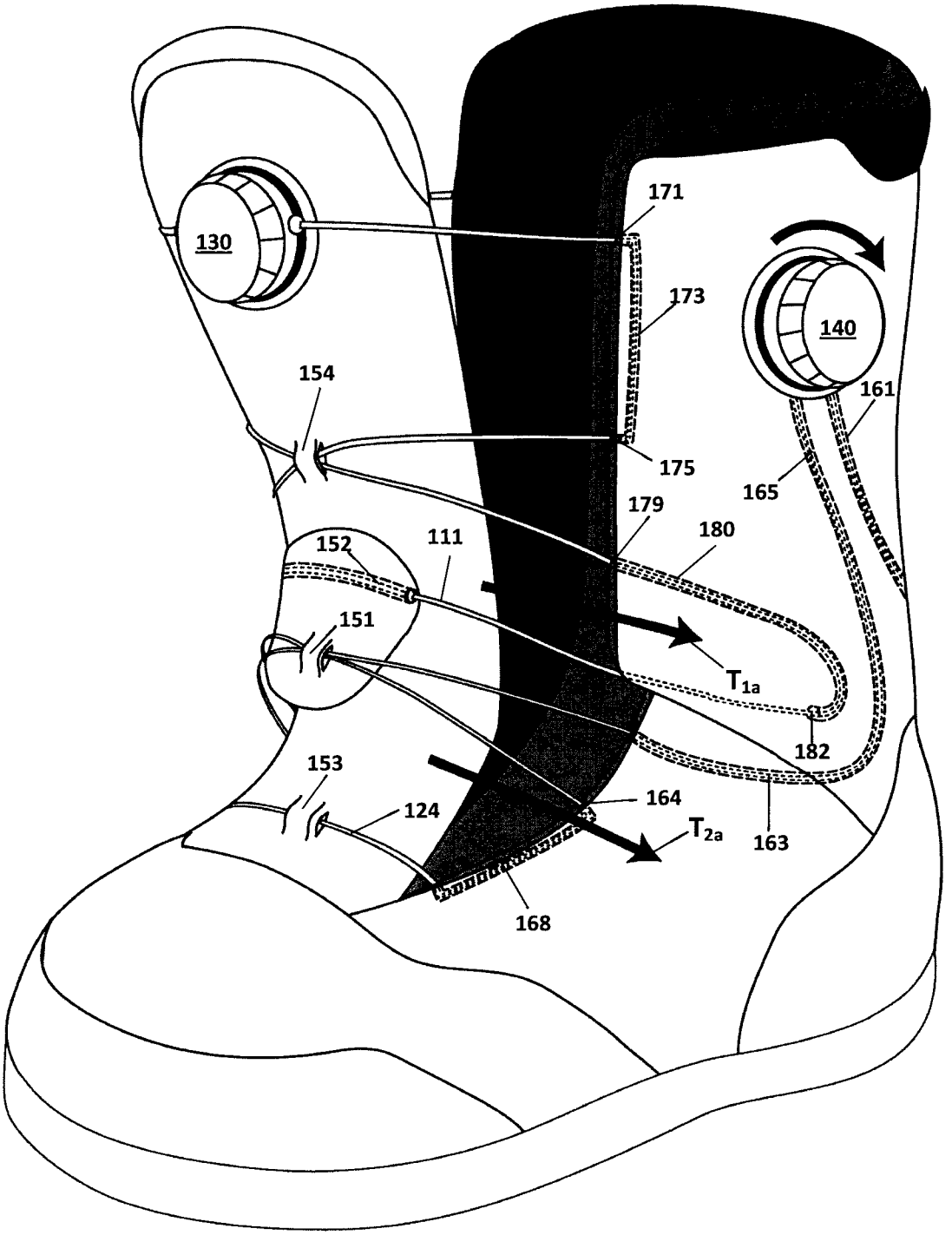
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Fig. 5B

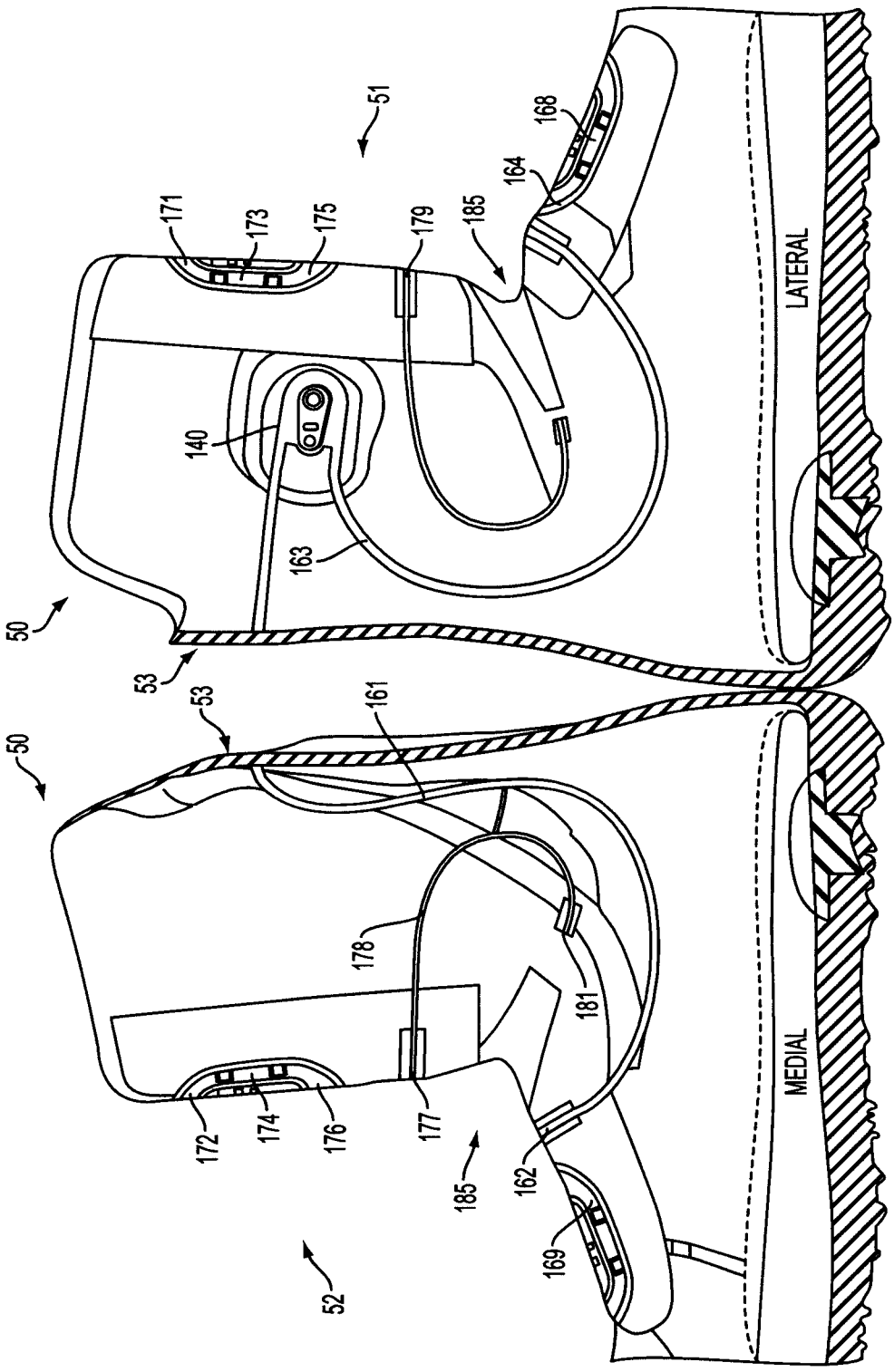
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FIG. 6

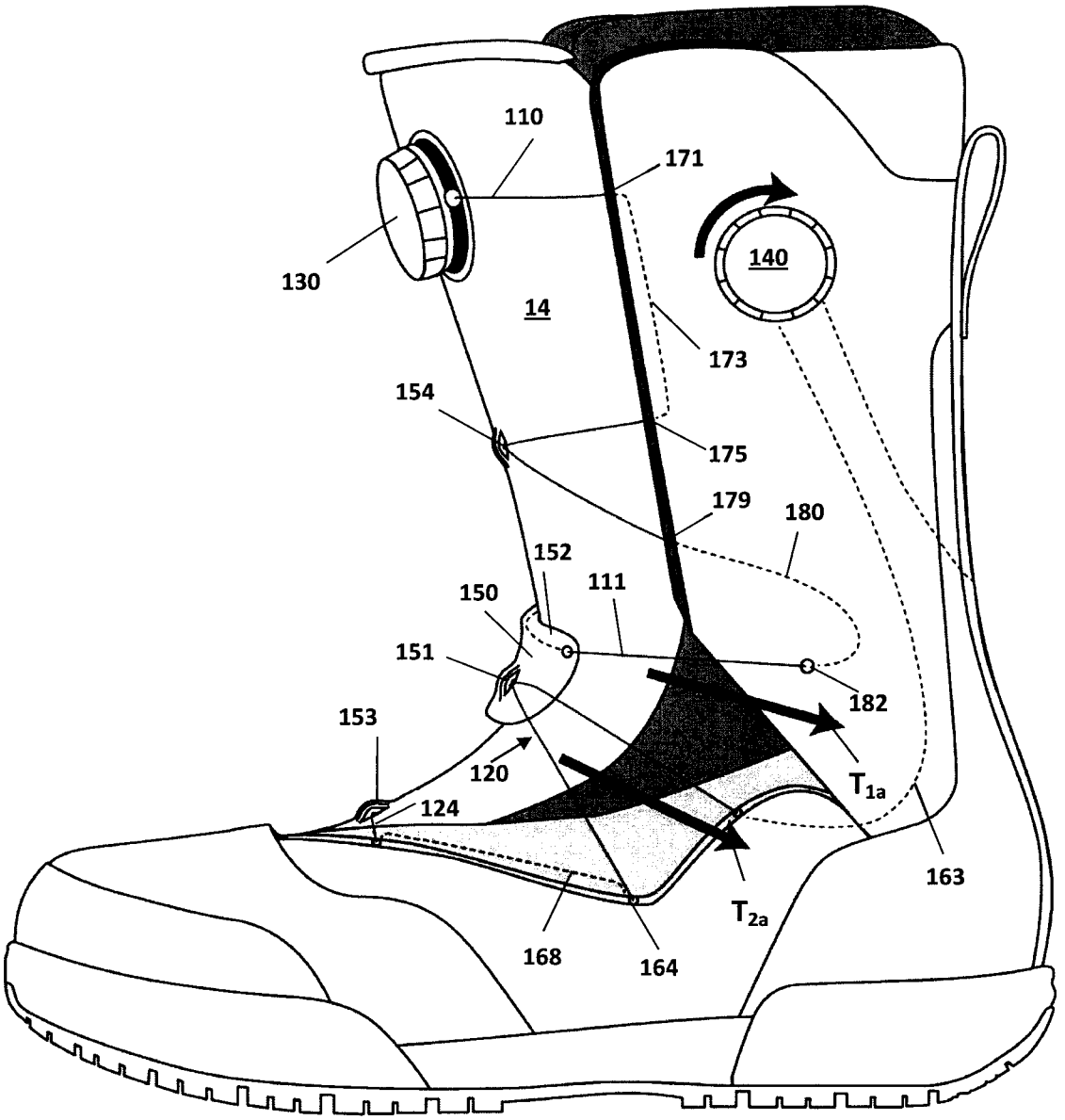
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Fig. 7

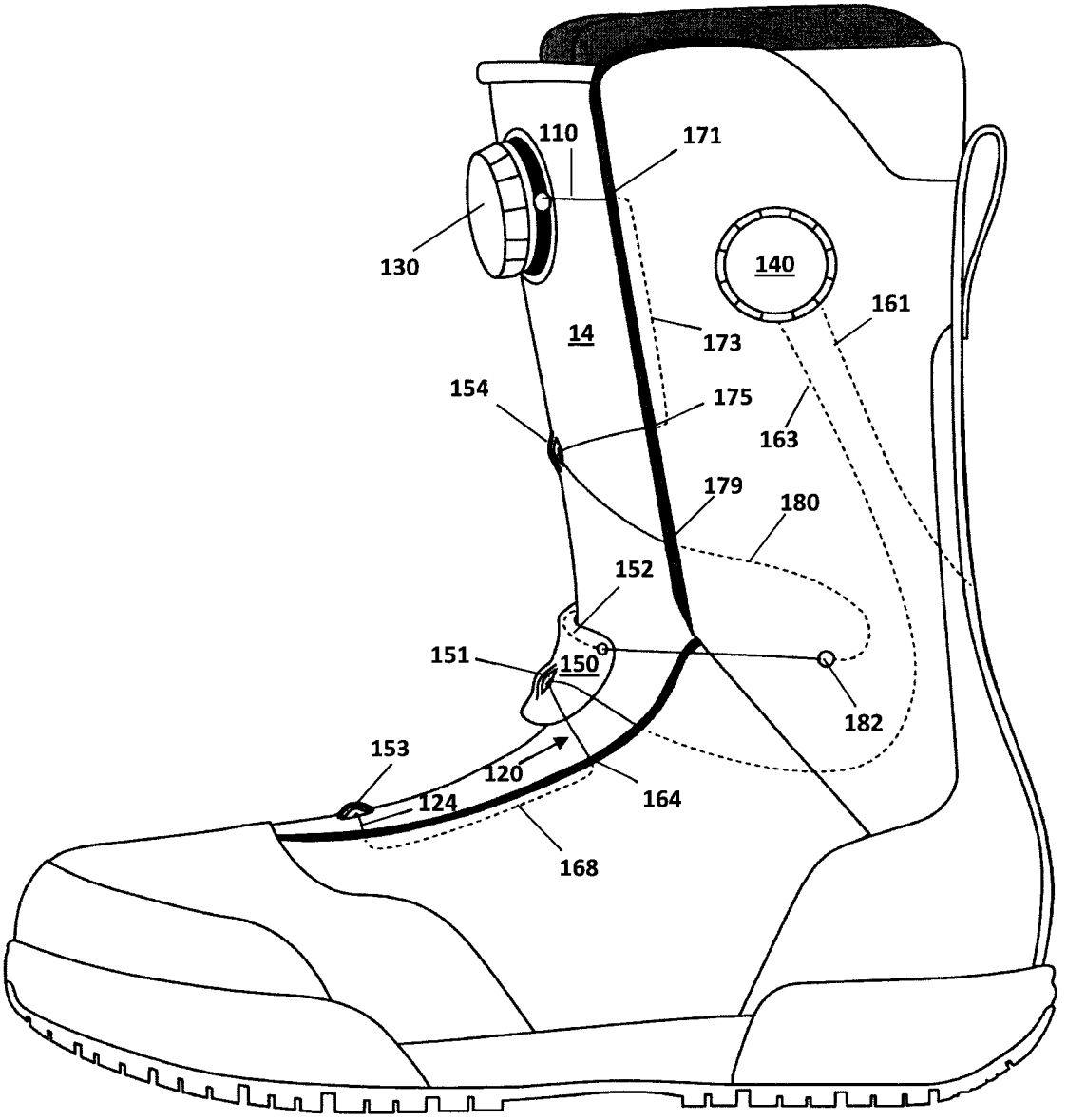
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Fig. 8

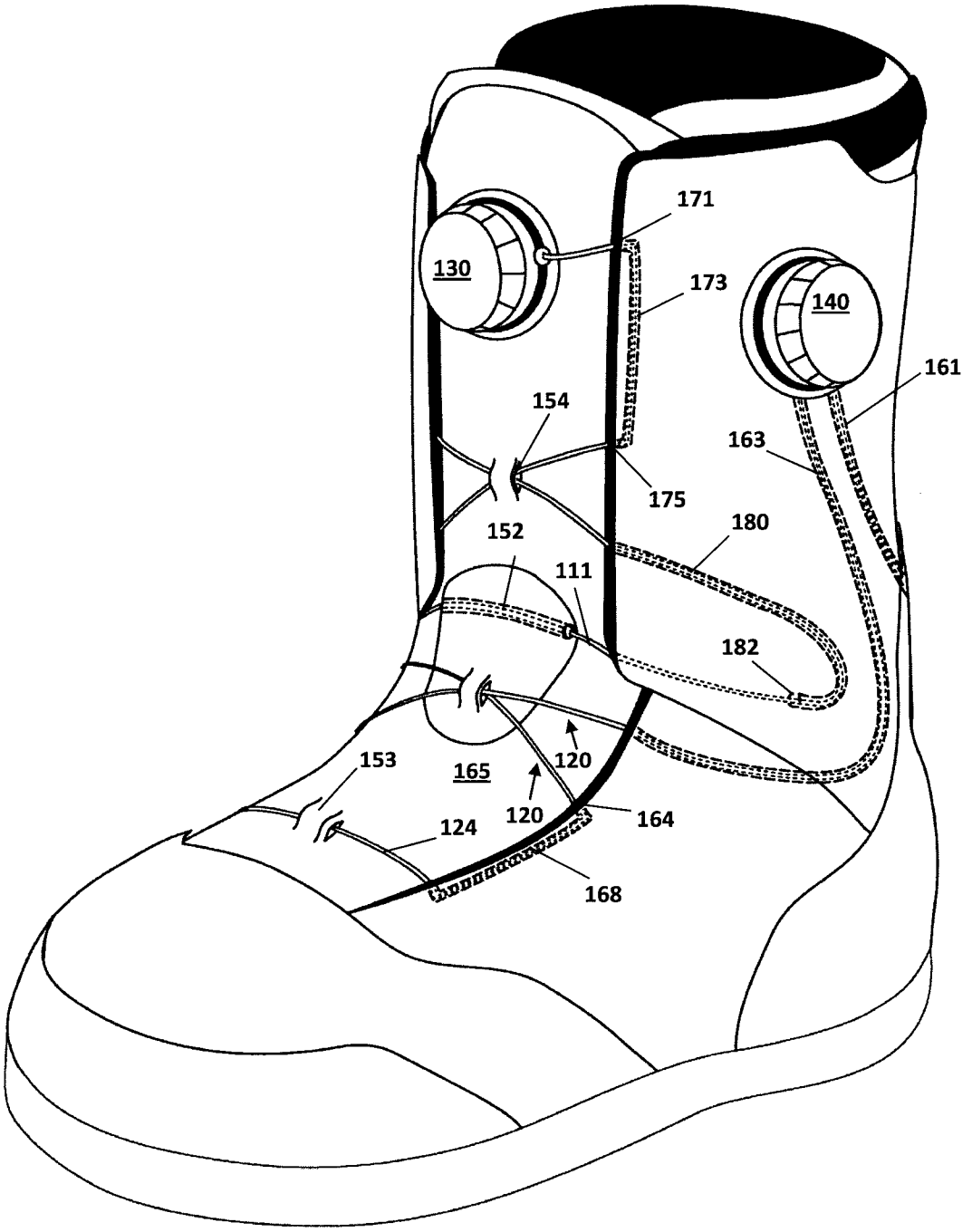
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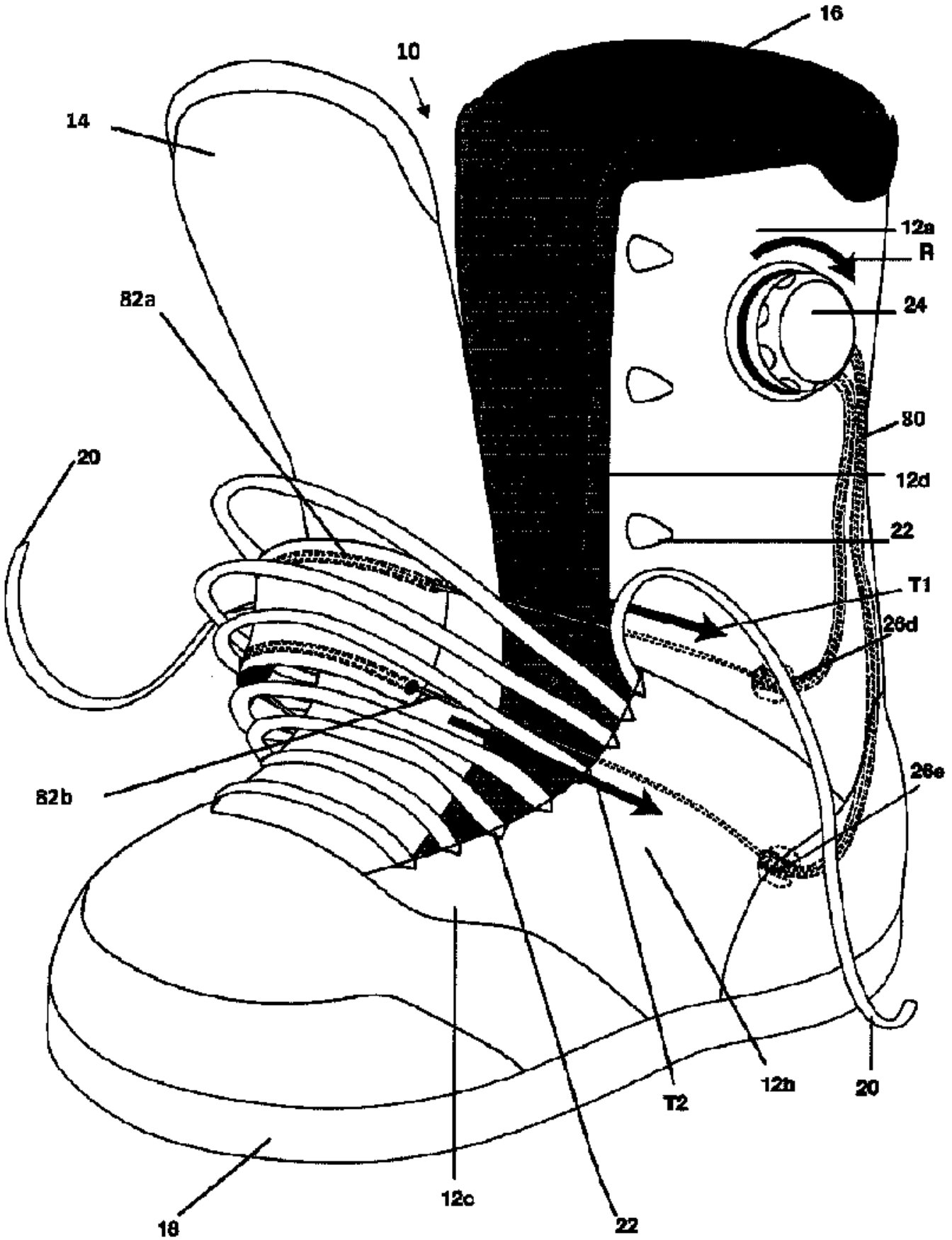
Fig. 9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T2
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12c
22
18