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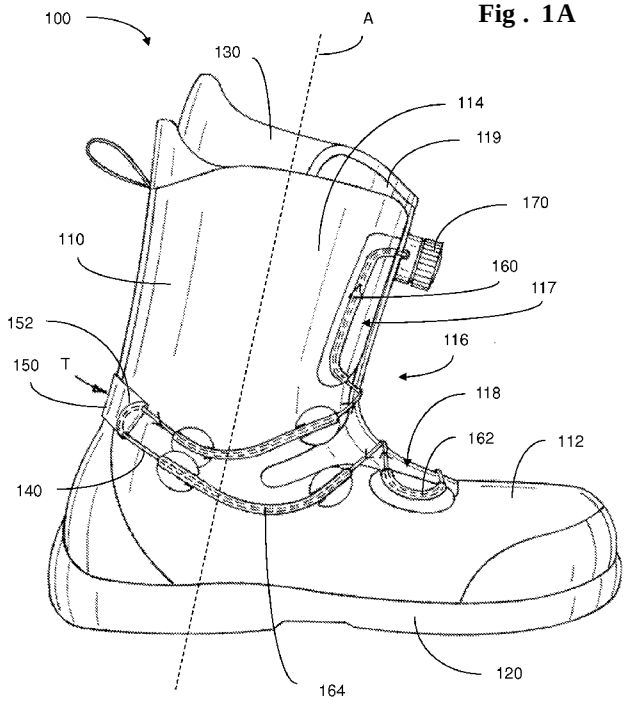

Fig . 1A

(57) Abstract: Articles of footwear (e.g., soft snowboard boots) that may be tightened from the rear side to enhance heel hold are disclosed. A lace may be coupled to a strap that extends along a portion of the rear side of the boot body. Upon tightening of the lace, the strap is pulled toward the front side and the sides of the boot are drawn inward toward the shaft region of the boot. The lacing system may employ one or more tightening zones where separate regions of the boot may be tightened independently from, or simultaneously with, one another and the various "zones" of the boot may be separately controlled, tightened independent from one another, as desired.

LACING SYSTEM FOR FOOTWEAR

RELATED APPLICATION

This Application claims the benefit of U.S. Application Serial No. 14/307179, entitled "LACING SYSTEM FOR FOOTWEAR" filed on June 17, 2014.

BACKGROUND

Field

Aspects described herein relate generally to tightening arrangements for articles of footwear, such as boots, including snowboard boots.

Discussion of Related Art

Conventional boots incorporate a lace threaded back and forth through the medial and lateral sides of the front side of the boot. Typically, the lace has two free ends protruding from the top portion of the boot, which a wearer can pull to tighten the front side of the boot about his or her foot and leg.

The same is true of many snowboard boots, particularly snowboard boots of the "soft" variety. Soft boots, as their name suggests, typically include relatively soft materials (e.g., leather, fabric, and/or thin plastic components) that are more flexible than the more rigid, typically molded plastic shell of a hard boot. Soft boots are generally more comfortable and easier to walk in than hard boots, and are often favored by riders who engage in recreational, "freestyle" or trick-oriented snowboarding.

In conventional boot lacing systems, the lace is often threaded to extend only over the tongue opening of the boot. In such arrangements, tightening of the lace is limited to the front side of the boot, which may lead to an uneven distribution of tension throughout the boot, resulting in a loose fit or feel in various parts of the boot for the wearer.

SUMMARY

In an illustrative embodiment, a soft snowboard boot is provided. The boot includes a body having a front side, a rear side, a medial side and a lateral side defining a shaft region; and a lace cooperating with a rear side of the body and arranged to be tightened to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body.

In another illustrative embodiment, a boot is provided. The boot includes a body having a front side, a rear side, a medial side and a lateral side defining a shaft region; and a lace arranged to partially circumscribe a portion of the body, and the lace arranged to be tightened to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body.

In a further illustrative embodiment, a boot is provided. The boot includes a body having a front side, a rear side, a medial side and a lateral side defining a shaft region; at least one strap extending along a portion of the rear side of the body; and a lace coupled to the at least one strap and arranged to be tightened to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body.

In yet another illustrative embodiment, a boot is provided. The boot includes a body having a front side, a rear side, a medial side and a lateral side defining a shaft region, the front side having a tongue opening; a first lace portion arranged to be tightened to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body; and a second lace portion arranged to be tightened independently from tightening of the first lace portion, to pull medial and lateral sides of the tongue opening toward one another.

In a further illustrative embodiment, a method of tightening a boot including a body having a front side, a rear side, a medial side and a lateral side defining a shaft region. The method includes tensioning a lace to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body. In another illustrative embodiment the lace is coupled to a strap.

In another illustrative embodiment, a method of tightening a boot including a body having a front side, a rear side, a medial side and a lateral side defining a shaft

region, the front side having a tongue opening. The method includes tensioning a first lace portion to draw at least one of the rear side, the medial side and the lateral side of the body toward the shaft region of the body; and tensioning a second lace portion independently from the tensioning of the first lace portion, to pull medial and lateral sides of the tongue opening of the front side of the body toward one another.

Various embodiments provide certain advantages. Not all embodiments of the present disclosure share the same advantages and those that do may not share them under all circumstances.

Further features and advantages of the present disclosure, as well as the structure of various embodiments are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1A is a plan view of the lateral side of an article of footwear in accordance with an embodiment;

Fig. IB is a plan view of the medial side of the article of footwear of Fig. 1A;

Fig. 1C is a plan view of the front side of the article of footwear of Figs. 1A-IB;

Fig. 2 is a plan view of the lateral side of another article of footwear in accordance with another embodiment;

Fig. 3A is a plan view of the lateral side of yet another article of footwear in accordance with an embodiment;

Fig. 3B is a plan view of the medial side of the article of footwear of Fig. 3A;

Fig. 3C is a plan view of the front side of the article of footwear of Figs. 3A-3B;

Figs. 4A-4B are perspective views from the lateral and medial sides of an article of footwear in accordance with another embodiment;

Figs. 5A-5B are perspective views from the lateral and medial sides of yet another article of footwear in accordance with an embodiment; and

Figs. 6A-6D show plan views from the lateral sides of various articles of footwear in accordance with some embodiments.

DETAILED DESCRIPTION

The inventors have appreciated that it may be beneficial to incorporate a lacing system in an article of footwear, such as a boot (e.g., soft snowboard boot), that provides for a greater level of tightness control in various regions of the footwear, than has previously been available. The present disclosure relates to arrangement(s) and/or technique(s) for an article of footwear to provide, when tightened, additional tightness in various regions, which may lead to increased comfort. Embodiments discussed herein may provide for a suitably close fit around the foot and ankle of the wearer, , for an enhanced heel hold or otherwise snug fit.

For example, it may be preferable, during tightening of one or more lace portions, for the rear side of the boot to be squeezed or otherwise pulled inward against the Achilles' tendon area of the wearer. Or, upon tightening, the medial and/or lateral sides of the boot may be drawn inward toward respective medial and/or lateral sides of the lower leg or ankle of the wearer. In some cases, tightening of the lace portion(s) may cause one or more straps to be pulled inward toward the front of the boot. In some embodiments, the strap(s) may be drawn inward toward the front side of the boot, or the strap(s) may remain fixed along the rear backstay. As the lace portion(s) may extend around the medial and/or lateral sides of the boot, upon tightening, the respective medial and/or lateral sides of the boot may be drawn inward toward the shaft region of the boot.

As provided herein, the shaft region of the boot is a space surrounded by an upper region of the boot which extends along the shaft axis A (depicted in Fig. 1A) toward the location within the boot where the heel of the wearer is placed. The shaft region accommodates the ankle and lower leg of a wearer therein when the boot is worn. The shaft region is the volume of space that is circumscribed by the front side, the rear side, the medial side and the lateral side of the body of the boot.

Further, tightening of the rear side, medial side and/or lateral side of the boot may occur in cooperation with tightening of the front side, simultaneously therewith or independently therefrom. In this manner, the boot is able to provide a relatively snug fit, along both the front, rear, medial and lateral sides of the foot, adding to overall secureness and/or comfort for the wearer.

This is in contrast to conventional boots noted above, where the laces of such boots are threaded so as to extend only over the tongue opening on the front side. Tightening of the lace of such conventional boots causes opposing edges of the tongue opening to be drawn toward one another, resulting in constriction of the front side of the boot without significant tightening of the rear side.

In certain embodiments of a boot in accordance with the present disclosure, upon tightening of the lace(s) of the boot, a portion of at least one of the rear side, the medial side and the lateral side of the boot may be brought inward so as to hug or squeeze into the leg or ankle, around the Achilles' tendon area of the wearer. In some embodiments, the rear side of the boot may be relatively fixed in position such that when the lace(s) of the boot are tightened, the medial and lateral sides of the boot are drawn inward toward the shaft region while the rear backstay remains substantially in place. Though, in other embodiments, the rear side of the boot may also be drawn inward toward the shaft region of the boot upon tightening. The front of the boot may also be tightened, for example, around the tongue. Such tightening of the front side may occur along with the other sides of the boot, or separately therefrom. In this manner, the boot is able to provide a snug fit, along the circumference of the lower leg.

While various embodiments of the present disclosure include a lacing system for a boot, such as a soft snowboard boot or other boot (e.g., ski boot, hiking boot, snow shoes, rain boots, etc.), aspects described herein may be incorporated with any article of footwear, for example, a shoe, skate, or other suitable covering for the foot.

The boot may include a lace, where a portion of the lace extends toward the rear of the boot, though, in certain embodiments, the lace itself is arranged to partially circumscribe a portion of the rear side of the boot body (e.g., upper region or shaft of the boot which surrounds the Achilles' tendon area). In some embodiments, while the

lace may be configured so as to extend along the medial and lateral sides of the boot and to be pulled against the rear side toward the front upon tightening, the lace is not required to completely surround the perimeter (e.g., circumference) of the upper region of the boot. For example, the lace may extend over the upper region of the front side, and portions of the medial and lateral sides of the boot without fully extending around the rear side of the boot in a manner so as to circumscribe the upper region of the boot. Alternatively, the lace may extend over the rear side of the boot, yet not extend completely over the front side of the boot. It can be appreciated that the present disclosure is not so limited in this respect, as it can be appreciated that, for some embodiments, the lace may circumscribe or completely encircle the shaft region, or another region, of the boot.

In various embodiments, the boot includes a strap that extends around a portion of the rear side of the boot body, for example, the part of the rear side that covers the Achilles' tendon area or a portion of the calf of the wearer. In some embodiments, the strap substantially covers the rear side of the boot body. The lace and the strap may be coupled together or otherwise arranged such that when the lace is tightened, the strap is pulled inward toward the front of the boot body (e.g., against the rear side of the boot), so that the boot more suitably hugs the back of the ankle region. Though, it is not necessary for the strap to move inward toward the front of the boot body; for example, as further discussed herein, the strap may remain in place adjacent the rear backstay during tensioning of the lace(s) while the medial and lateral sides of the boot are drawn inward toward the shaft region, so that the boot more suitably hugs the ankle and/or lower leg (e.g., calf/shin areas) of the wearer. For example, the rear backstay of the boot may be stiffer in comparison to the medial and lateral side walls of the boot.

As the laces are tightened, the tension of the laces increases. Accordingly, the increase in tension of the laces causes the laces to move toward a more straightened configuration. Though, because the laces are arranged to extend along the sides of the boot around a curved surface, this build-up of tension results in an overall exertion of a normal force or pressure inward toward respective sides of the boot, resulting in an inward movement thereof. In some cases, as the sides of the boot move inward

toward the shaft region of the boot, the relatively softer material on the sides of the boot may exhibit a slight accordion-like wrinkling where the material tends to buckle or otherwise slightly bunches together.

The rear backstay of the boot may incorporate any suitable composition. For instance, the rear backstay may include a relatively stiff material, such as an ionomer extrusion resin (e.g., SURLYN®), or another appropriate material. The medial and lateral sides of the boot may also include any suitable material, for example, a fabric, polymer, or other material. As a result, for some embodiments, upon tightening of the laces, the material of the rear backstay of the boot may remain stationary, maintaining its shape, while the material of the medial and lateral sides of the boot move inward and, in some cases, exhibit the above described crumpling effect.

The lace may be tightened and locked so as to retain its tension by employing any suitable mechanism. In some embodiments, the lace may be arranged so as to be graspable by a wearer or other device, pulled to a desirable tension and locked in an appropriate manner. For example, a free end of the lace may include a portion of lace that is looped back onto itself to create a handle (or a separate handle may be attached to the lace) to facilitate pulling of the lace by a wearer. Once a preferred tension is reached, the lace may be tied, or locked in place by a lace lock, so that the tension of the lace is preserved for a desired period of time, for example, until the lace is untied or unlocked. Or, in some embodiments, an optional tensioning member is coupled to the lace and used to pull one or more ends of the lace thereto. For example, a rotary closure system, described further below, may be employed. Alternatively, the tensioning member may include a ratcheting and/or buckling device that is coupled to the lace and provides tension thereto. It should be appreciated that the present disclosure is not limited to the use of any particular type of closure device, as any mechanism that is capable of taking up slack in the lace can be used in connection with various aspects of the present disclosure.

As noted above, various regions of the boot may be tightened independently from, or simultaneously with, one another.

In various embodiments of the present disclosure, the boot may be configured to have a single zone for tightening various sides (e.g., front, rear, medial, lateral

sides) of the boot at the same time. For instance, such a boot may include a lace that is threaded on the front side between medial and lateral sides of the tongue opening of the boot, for drawing medial and lateral sides of the tongue opening toward one another, and that also extends toward the rear side of the boot, for pulling of the rear side and/or medial and lateral sides of the upper region inward toward the shaft region (e.g., by being coupled with a strap). The lace may be coupled to one or more suitable tensioning members, for appropriately tightening and loosening the lace, as desired.

Or, as discussed above, for certain embodiments, the boot may be configured to have multiple zones where each zone is tightened and loosened independently from the other zone(s), separately adjustable by the wearer. Such configurations may increase overall fitting control, comfort, flexibility and/or performance for the wearer. For instance, a boot that is configured to have two tightening zones may include a first lace and tensioning member arranged so as to tighten the medial/lateral sides of the boot (medial/lateral "zone"), and a second lace and tensioning member arranged so as to tighten at least a portion of the front side of the boot (front "zone"). Accordingly, the medial/lateral zone of the boot may be tightened independent from a portion of the front zone of the boot, separately controlled, as desired. Alternatively, for some embodiments where two tightening zones are employed, a first tightening zone may be arranged so as to tighten an upper region of the front zone and the medial/lateral sides of the boot, and a second tightening zone may be arranged to tighten the lower region of the front zone, independent from the first tightening zone. In some embodiments, where the rear side of the boot is drawn inward toward the shaft region, a rear "zone" may also be provided separate from or in combination with another zone, whether the medial/lateral zone and/or front zone.

In some embodiments, each zone may include a dedicated lace and tensioning member, where the tensioning member is coupled to the lace and used to pull one or more ends of the lace thereto. For example, a boot may be configured with a first lace and tensioning member for adjusting a medial/lateral zone, to bring the medial and lateral sides of the boot inward toward the shaft region. The boot may also be configured with a separate second lace and tensioning member for adjusting a front

zone, to tighten the front side of the boot. Or, as shown and described in various embodiments below, a first lace and tensioning member may be arranged so as to be able to tighten a first lacing zone, which includes an upper region of the front side of the boot and the medial/lateral sides of the boot; and a separate second lace and tensioning member may be arranged so as to tighten a second lacing zone, including a lower region of the front side of the boot.

In such examples, the wearer can choose for part of the boot to fit more tightly, and for another part of the boot to fit less tightly. For instance, a wearer may tighten a first lacing zone to one tension with one lace, or portion of a lace, and a second lacing zone to another tension with another lace, or portion of a lace. The present disclosure is not limited in this regard, however, as the boot may be divided into lacing zones in any desired manner, and need not be divided into front or rear lacing zones. Other multiple-zone configurations are also contemplated, and will occur to one of ordinary skill in the art. For instance, more than two lacing zones (in any desired configuration) may be employed for additional flexibility, comfort and/or performance.

Aspects of the present disclosure may be employed in any suitable combination as aspects are not limited in this respect to a specific disclosed embodiment. Also, any or all of the above aspects may be employed in a soft snowboard boot; however, the present disclosure is not limited in this respect, as aspects described herein may be used on any type of footwear, including other types of boots, such as ski boots, hiking boots and non-soft snowboard boots. Various aspects and embodiments of the present disclosure will now be described in more detail with respect to the accompanying drawing figures. The present disclosure is not, however, limited to the aspects and embodiments shown.

In accordance with various embodiments of the present disclosure, each of the figures show a boot 100, configured for the right foot of a wearer, and constructed as a soft boot employing soft, flexible materials such as leather, fabrics, plastics (e.g., non-rigid plastics) or other suitable natural or manmade materials. Of course, aspects discussed are also applicable for the left foot of the wearer. As used herein, the term "lateral side" is used to refer to the side of a boot facing outward and away from the

wearer, i.e., the left side of the left boot and the right side of the right boot, when worn by the wearer. The term "medial side" is used to refer to the side of a boot facing inward toward the wearer's other foot, i.e., the right side of the left boot and the left side of the right boot, when worn by the wearer.

Figs. 1A-1C depict a boot 100 configured to have a single lacing zone for tightening the front side and shaft region (e.g., along the medial and lateral sides) of the boot, simultaneously. The boot 100 has a boot body 110, a sole 120 and an inner lining 130. The body 110 has a lower region 112 adapted to cover the foot of a wearer, and an upper region 114 adapted to cover at least a portion of the wearer's shin. The lower region 112 and upper region 114 of the body may be a part of the boot upper, which is generally known to those of skill in the art to be the portion of the boot above the sole 120. The upper region 114 may enclose the shaft region of the boot and be aligned along a shaft axis A, which extends along a direction that may be preferable to urge the leg of the wearer in an orientation that may be appropriate for the intended purpose of the boot. For example, the upper region 114 of the boot may be tilted at an angle slightly forward, or in another appropriate direction, so as to assist the wearer in conforming to a suitable riding/hiking stance. For soft boots, the shaft axis A of the upper region 114 may shift slightly during use according to the wearer's posture and weight distribution.

The liner 130 may be inserted into the interior region of the boot and, for example, may be removably attached to the body 110. In some cases, the liner may be provided with cushioning so as to provide a suitable level of comfort to the wearer. The liner 130 may also include one or more J bars (not shown in the figures) located on medial and lateral sides toward the rear of the liner. J bars are known in the art as shaped inserts that fill space by extending along various regions of the Achilles' tendon region of the boot, which may be helpful to mitigate heel lift during use. The present disclosure is not limited in this respect, as no liner or J bars need be employed.

A tongue stiffener, whether removable or not, may be employed to stiffen an otherwise flexible tongue. An example of a tongue stiffener may be found in commonly assigned U.S. Patent 6,360,454, appropriate portions of which are hereby incorporated herein by reference.

The body 110 further includes a tongue opening 116, disposed in a shin-to-toe direction. The tongue opening 116 may have an upper region 117 and a lower region 118. A tongue 119 may be disposed within the tongue opening 116, and attached e.g., via stitching, at a lower end portion to the body 110, in a conventional manner known in the art.

The sole 120 is attached or formed integral with the boot body 110 and may be made up of any suitable material, such as rubber or another synthetic material.

As shown in Figs. 1A-1C, the boot 100 includes a lace 140 that may be threaded through the medial and lateral sides of the tongue opening 116. For example, the lace 140 may be threaded via lace guides 160, 162, described further below, which have channels that accommodate passage of the lace 140 therethrough, so that the lace 140 extends over portions of the tongue opening 116.

As shown, the lace 140 extends over an upper region 117 of the tongue opening 116, passing through the lace guide 160. The lace 140 also extends over a lower region 118 of the tongue opening 116, passing through the lace guide 162. Accordingly, the lace 140 may be used to tighten the entire front side of the boot 100 at both the upper region 117 and the lower region 118. For example, tightening of the lace 140 may serve to reduce the width of the tongue opening 116 by drawing medial and lateral sides (e.g., edges) of the tongue opening 116 toward one another in a suitable manner.

The lace 140 can be arranged in a number of different ways, and the present disclosure is not limited to any particular implementation. In some embodiments, the lace 140 follows a meandering path and does not cross over itself. Or, as shown, the lace 140 may cross over itself at appropriate locations of the boot. However, the present disclosure is not limited in this regard, as other lacing patterns may be used as will be apparent to one of ordinary skill in the art. For example, a lacing pattern in which laces cross over themselves may be employed. Multiple laces may also be employed in various embodiments.

The lace 140 should be sufficiently strong so as to resist the substantial forces that can be encountered when snowboarding or performing other activities, and in this respect may require greater strength than the laces typically employed in conventional

footwear such as athletic shoes. For example, the lace 140 can be formed from a monofilament or a multistrand line.

In accordance with one illustrative embodiment of the present disclosure, the lace 140 is formed of a low-friction material capable of resisting a high tensile force without substantial elongation to minimize frictional engagement between the lace 140 and the lace guides 160, 162, and thereby facilitate even pressure distribution throughout the lacing zones. While not limited to any particular material or any particular form (i.e., woven, braided, monofilament, etc.), examples of materials that can be used for the lace 140 include various types of fabrics, plastics, cables, metals, KEVLAR® and/or SPECTRA® Cord.

Embodiments described herein may be arranged to provide a suitable degree of tightening of the rear side of the boot. As shown in Figs. 1A-1C, the lace 140 also extends from the front side of the boot rearward along the medial and lateral sides through respective lace guides 164. The lace 140 is coupled to a strap 150 that extends along the rear backstay of the boot, which is located over the Achilles' tendon area of the wearer. In some embodiments, the strap 150 wraps at least partially around and covers the rear backstay.

The strap 150 may be attached or otherwise coupled to the boot by any suitable method. For example, the strap may be stitched at its center, or other suitable location(s), to the rear side of the boot. Or, the strap may be arranged to slide through one or more layers or slits provided by the boot. For example, as shown in Figs. 2-3B, the strap 150 extends underneath, or inside of, the rear backstay of the boot.

As further shown, the strap 150 includes strap lace guides 152 located on opposite ends of the strap, for holding the lace 140 on respective medial and lateral sides of the boot. For instance, Fig. 1A shows the lace 140 extending through the passageway provided by the lace guide 152 of the strap 150 on the lateral side of the boot, and Fig. IB shows another side of the lace 140 extending through the passageway of the corresponding lace guide 152 of the strap 150 on the medial side of the boot.

Accordingly, at both the medial and lateral sides of the boot, the lace 140 forms a loop with the strap 150, or is coupled to the strap in another suitable manner,

so as to be able to pull against the strap in a direction toward the front side of the boot. For instance, when the lace is tightened, the lace 140 may pull against the strap 150 in a direction substantially parallel to the direction in which the strap extends (e.g., substantially perpendicular to the shaft axis A along which the upper region 114 of the boot is oriented), drawing or otherwise pulling against the strap 150 toward the front side of the body. In some cases, the strap 150 may be brought inward, in a suitable manner, so that a suitable pressure is applied from the rear of the boot to hug the Achilles' tendon area of the wearer. Or, the strap 150 may remain relatively fixed while the medial and lateral sides of the boot are drawn inward toward the shaft region so as to squeeze respective sides of the ankle or lower leg of the wearer. In some embodiments, the pulling action on the strap 150 causes sides of the boot surrounding the shaft region to collapse, providing a secure, yet snug, fit for the wearer. As discussed above, upon tightening, the respective tension of the laces extending along the medial and lateral sides of the boot may increase, resulting in the application of a pressure in a direction perpendicular and inward relative to the surface of the boot.

In some embodiments, and as shown in the figures, the lace 140 may be configured to only partially circumscribe the upper region 114 of the body 110. For example, the lace is not required to completely surround the circumference of the upper region of the boot body, yet may still be arranged so as to be able to pull against the rear of the body. As illustratively shown in the embodiment of Figs. 1A-1C, the lace may run along the front, medial and lateral sides of the boot and may further be coupled to a rear strap, without fully extending around the rear backstay.

Or, as illustratively shown in embodiments depicted in Figs. 4A-4B and 5A-5B, the lace may be arranged so as to extend around and cover a portion of the rear side, and may run along medial and/or lateral sides of the boot, yet without extending across the front side. In either arrangement, tightening of the lace will result in the rear side of the boot being pulled inward in a suitable manner. Of course, the present disclosure is not limited in this manner, as for some embodiments, the lace 140 may fully circumscribe the body; that is, the lace may extend completely around the circumference of the upper region of the boot body (not shown in the figures).

In some embodiments, the lace 140 may have two opposing ends where one of the ends is anchored at a suitable location of the boot and the other end is manually tensioned (e.g., by pulling). Or, both ends of the lace may be free so as to be anchored or tied at appropriate locations of the lace. In some embodiments, one or both ends of the lace 140 may be coupled to a tensioning member 170. For example, as discussed further below, the tensioning member 170 may be coupled to both ends of the lace in a rotary closure arrangement such that, upon tightening by the tensioning member, the tensioning member 170 reels or otherwise brings the lace 140 in from both ends. Or, one of the ends of the lace may be coupled to the tensioning member 170 and the opposite end of the lace may be anchored at a location away from the tensioning member. In such a configuration, with one end of the lace remaining in the anchored position, the tensioning member may pull the lace taut from the opposing end.

As noted above, any suitable tensioning member 170 may be incorporated in embodiments of the present disclosure. In various embodiments, also shown and described herein, the tensioning member 170 may employ a rotary closure device, such as the BOA® closure system. With such a device, one or both free ends of the lace may be threaded into the body of the device and wrapped around a spool as the spool is rotated to reel the lace in to achieve the desired tension. Such closure devices may be used in other applications, such as for use with a cable tightening system to replace conventional laces in an athletic shoe. Examples of such rotary closure devices are described in U.S. Pat. Nos. 3,738,027; 3,808,644; 4,433,456; 4,616,524; 4,660,300; 4,748,726; 4,761,859; 4,787,124; 4,796,829; 4,841,649; 4,884,760; 4,961,544; 5,042,177; 5,065,481; 5,150,537; 5,152,038; 5,157,813; 5,325,613; 5,600,874; 5,606,778; 5,638,588; and 5,669,116; and European patent applications EP056,953 and EP264,712.

Figs. 1A-1C illustrate an embodiment of the tensioning member 170, which has a knob that is rotatable by a wearer to tighten or loosen the lace. As further shown in this embodiment, the tensioning member 170 is coupled to both opposing ends of the lace. Accordingly, the tensioning member may be actuated to create tension in the lace by pulling the lace in from the two ends. When desired, the

tensioning member may also be actuated, for example, rotated in a loosening direction or moved to an unlocked position (e.g., by pulling the rotary knob upward relative to the base), so as to loosen the lace and, thus, create a suitable amount of slack.

For illustrative purposes, Figs. 1A-1C depict arrows along the lace 140 that indicate the direction in which tension is applied to the lace upon actuation of the tensioning member 170, for pulling the lace in and tightening of the boot. For example, Fig. 1C shows the knob of the tensioning member 170 being rotated in a clockwise direction, resulting in tightening of the lace 140 from both ends. That is, both ends of the lace 140 are pulled into the tensioning member 170, resulting in the strap 150, to which the lace is hooked at the medial and lateral sides of the boot, being pulled in a direction toward the front side of the body. In this embodiment, tightening of the lace 140 not only secures the front of the boot 100 about the tongue 112, by drawing medial and lateral edges of the upper and lower regions of the tongue opening 116 together, but also pulls against the strap 150 in a direction toward the front of the boot. This pulling action against the strap 150 may result in medial and lateral sides of the boot being drawn inward toward the shaft region.

The tensioning member 170 is shown in the figures to be secured at an upper region 114 of the body. Such a location may be convenient for a wearer to reach down and adjust the tension of the lace without having to bend over excessively. However, it can be appreciated that the tensioning member may be located at any appropriate location of the boot. For example, the tensioning member may be located on a surface of the lower region 112 of the boot, or at another suitable location. Or, the tensioning member may be located at a medial or lateral side of the boot, as further described herein.

As discussed above, in various embodiments, a number of lace guides may be provided for suitably guiding and positioning the lace 140. The lace guide(s) may be formed in any desired configuration or arrangement. For example, they may comprise tubes (e.g., defining channels or passageways) and/or openings, hooks, eyelets, posts, and any other configuration or structure suitable to guide the lace. In some embodiments, the lace guide(s) may be secured to the body of the boot substantially limiting movement of the lace guide(s). Though, in other embodiments, one or more

lace guides may be loosely coupled to the body of the boot where the lace guide(s) are attached to the boot, yet may be re-positioned as desired.

In some embodiments, the lace guides 160, 162 around the tongue opening may have semi-circular or generally "C" shaped guiding surfaces. For example, the lace guide may be partially closed to capture the lace and prevent the lace from dislodging from the lace guide when tension in the lace is relieved. The present disclosure is not limited in this regard, however, and any appropriate configuration of the lace guide to trap the lace may be used. For example, the back portion of the lace guide may comprise a piece of flexible material to block the lace from becoming dislodged when tension in the lace is relieved. Other configurations are also contemplated and will readily occur to one of ordinary skill in the art.

In one embodiment, the radius of curvature "r" of the guide surface provides a gradual reversal of direction for the lace. Such a gradual reversal reduces kink points and reduces the chance that the lace will bind in the guide. In this manner, the efficiency with which the force applied to the lace is translated to the tightening tension on the lace is maximized. That is, drag or other losses are minimized. In one embodiment, the radius of curvature "r" is approximately ½ inch. Other suitable radii of curvature, or other suitable shapes for the lace guide, may be employed as the present disclosure is not limited in this respect.

The lace guides may be made from a low-friction material, such as polytetrafluoroethylene or other plastic/polymer, to reduce frictional drag on the laces. The present disclosure is not limited in this regard, however, as the lace guides can be made from any appropriate material, such as metal, polymer(s) or fabric.

In some embodiments, one or more of the lace guides are provided so as to be suitably concealed from view. For example, the lace guide(s) may be located internal to the boot body, or positioned underneath the external surface of the body. This is in contrast to other embodiments, such as the embodiment illustrated in Figs. 1A-1C where the lace guides visibly extend over the outer surface of the boot body 110. However, in other embodiments, lace guides may be located at a position beneath the outer surface of the boot, or may otherwise be covered. As a result, a substantial portion of the lace guides and, hence, lace that runs therethrough, may be hidden from

view. In some cases, the lace guide(s) are stitched or otherwise attached to the body of the boot at a suitably concealed location.

For example, Fig. 2 shows an illustrative embodiment of a boot 100 that is similar to the boot of Figs. 1A-1C, except here, a substantial portion of the lace guides through which the lace extends is hidden from view, indicated by the dashed lines. As shown, substantial portions of the lace 140 that extend through the lace guides 160, 162, 164, and the lace guides themselves, run underneath the outer surface of the boot and are not visible to observers. In some embodiments, the lace guides are aesthetically incorporated with various layers of the boot.

Though, some parts of the lace 140 may be visible. For instance, as further shown in Fig. 2, a portion of the lace 140 that extends between the lace guides 152, 164 may be visible. In some cases, such visibility of the lace 140 may allow a wearer to assess how tightly the strap 150 has been pulled inward toward the front, the degree to which the medial and lateral sides have been drawn into the shaft region, or whether the lace is functioning properly. While various combinations of internally and/or externally positioned lace guides are described and shown in the figures, other combinations are within the scope of the present disclosure and will be apparent to one of ordinary skill in the art.

As described herein, embodiments in accordance with the present disclosure may be configured such that one or more regions of the boot may be tightened independently from one another. As shown in Figs. 1A-2 and described above, the lace 140 is arranged so as to provide a single zone where the front and medial/lateral sides of the boot may be tightened at the same time. That is, tightening of the lace 140 to pull against the strap 150 at the back of the boot not only brings medial and lateral sides (e.g., opposing edges) of the tongue opening 116 together, but also draws or otherwise pulls the medial and lateral sides of the boot inward toward the shaft region of the boot.

Figs. 3A-3C depict another embodiment of a boot 100 that incorporates a lacing system which is configured to pull against a strap 150 positioned at the rear side of the boot body 110 so that at least portions of the medial and lateral sides are brought together. Similar to Fig. 2, the lace guides 160, 162, 164 are located

underneath the outer surface of the boot and so are hidden from view. Though, in this embodiment, the boot is arranged to have more than one lacing zone.

As discussed above, it is not required for a single lace to extend over both upper and lower regions of the tongue opening 116, for tightening the front side of the boot, while also extending rearward to couple to a strap 150 at medial and lateral sides of the boot, for tightening the rear side of the boot. For certain embodiments, such as that illustrated in Figs. 3A-3C, the boot 100 may include multiple laces 140, 142 each having a tensioning member 170, 172 for manipulating the tension of the respective laces.

Alternatively, while not expressly shown in the figures, for some embodiments, a single lace may be employed for tensioning multiple zones. For example, the lace may be divided into various portions that are each arranged so as to correspond to distinct tensioning zones for the boot. One portion of the lace may be configured to tighten the front side tongue opening of the boot, and another portion of the lace may be configured to pull against the strap located along the rear side of the boot. In some cases, the lace may be appropriately anchored at particular locations of the boot so as to demarcate between lace portions that are used to tighten respective regions of the boot. In some embodiments, distinct portions of the lace used to tighten particular regions of the boot may be suitably coupled to respective tensioning members for tightening thereof. Or, a single tensioning member may be coupled to various portions of the lace, and may be used to tighten each portion of the lace and, hence, tighten each respective region of the boot.

Referring back to the embodiment of Figs. 3A-3C, a first lace 140 extends over the upper region 117 of the tongue opening 116 and also extends rearward so as to couple to the strap 150. Similar to the embodiment of Figs. 1A-2, both ends of the lace 140 are coupled to a first tensioning member 170. Accordingly, tightening of the first lace 140 results in bringing medial and lateral sides of the upper region 117 of the tongue opening 116 toward one another and also pulling against the strap 150 at the rear side of the boot. Such pulling may bring medial and lateral sides of the shaft portion of the boot together, and optionally draw the strap 150 inward toward the front as well. That is, the first lace 140, coupled with the first tensioning member

170, may be tensioned so as to tighten both the upper region 117 of the front side of the boot and the rear/medial/lateral side(s) of the boot, simultaneously, independently from the lower region 118 of the front side of the boot.

Also in this embodiment, a second lace 142, separate from the first lace 140, is threaded along medial and lateral sides of the lower region 118 of the tongue opening 116. Here, one end of the lace 140 is coupled to a second tensioning member 172 and the opposing end of the lace is anchored or otherwise secured to the body of the boot at a location 144 distal from the tensioning member 172. Accordingly, upon tightening, the tensioning member 172 draws in the one end of the lace 142 to which it is coupled while the opposite end of the lace is fixed to the boot, bringing medial and lateral sides of the lower region 117 of the tongue opening 116 toward one another. As a result, the second lace 142, coupled with the second tensioning member 172, may be tensioned so as to tighten the lower region 118 of the front side of the boot, independently from the upper region 117 of the front side and the rear/medial/lateral side(s) of the boot.

It can be appreciated that embodiments in accordance with the present disclosure may employ any suitable arrangement of lace(s) and tensioning member(s). For example, three separate laces, each optionally coupled to a respective tensioning member, or anchored/tied at suitable locations, may be used for tightening three separate zones of the boot, such as the upper region of the front side, the lower region of the front side and the rear/medial/lateral side(s) of the boot. Alternatively, as discussed above, one lace may be used to tighten multiple zones independently (e.g., by being appropriately coupled to multiple tensioning members).

In some embodiments, a cushioning member may be provided at the rear of the boot so as to provide added comfort for the wearer. For instance, it may be preferable that compressive pressure provided to the rear side of the boot be distributed in a substantially even manner. While pulling inward against the rear of the boot may provide for a more snug fit for a wearer, stress concentrations applied at certain locations may lead to overall pain or discomfort. Accordingly, a cushioning member may be provided at the rear of the boot (e.g., between the strap and the boot body), so as to provide for a more comfortable fit when the strap is tightened inward.

For example, Figs. 3A-3B show a cushioning member 180 located at the rear side of the body along the rear backstay of the boot body 110. As shown, the cushioning member is located between the boot body 110 and the strap 150. Though, other arrangements that include a cushioning member may be employed, for example, a cushioning member may be located between the interior of the boot body 110 and the foot of the wearer.

The cushioning member 180 may be useful to distribute pressure at the rear side of the body upon tightening of the lace. The cushioning member 180 may have any appropriate shape and may be relatively soft (e.g., made up of a polymer, neoprene, etc.) compared to other portions of the body, so as to provide an added amount of comfort for the wearer upon tightening of the lace. When the lace 140 and strap 150 are tightened inward, the cushioning member 180 may provide a gradual transition for the wearer from a relatively loosened position to the more tightened position.

Other configurations are possible, as particular arrangements of the lace(s) and strap(s) in accordance with the present disclosure are not limited in this respect. For example, rather than a lace being secured, looped or otherwise coupled to a strap associated with the rear side of the boot at both opposing ends of the strap, the lace may be secured to the strap at one end while the other end of the strap is anchored to the boot body. Accordingly, upon tightening of the lace, the strap may be pulled by the lace toward the opposing medial or lateral side. For example, upon tightening of the lace 140, the strap may be pulled in a direction from the medial side toward the lateral side, or from the lateral side toward the medial side, pulling the strap against the rear of the boot 100 and toward the front.

Figs. 4A-4B depict an embodiment of a boot 100 that shows such an arrangement where one end of the strap is anchored to the boot body. The boot 100 includes a lace 140 that extends from the lateral side through a strap 150 and around the rear backstay, terminating at the medial side of the boot. As shown, one end of the lace 140 extends upward so as to be coupled to a tensioning member 170 on the lateral side of the boot, and the opposite end of the lace 140 is anchored at a suitable location 144 on the medial side of the boot. When the lace 140 is tightened, the lace

140 is pulled from the medial side across the rear backstay to the lateral side of the boot, pulling the strap 150 inward against the rear of the boot, which may serve to squeeze portion of the Achilles' tendon area of the wearer. The medial and/or lateral sides of the boot may also be drawn inward. While not shown in Figs. 4A-4B, for some embodiments that incorporate the rear lacing system depicted in Figs. 4A-4B, the boot may suitably employ a separate lacing system for the tongue opening on the front side.

In some embodiments, not shown in the figures, one end of the strap may be anchored on a medial or lateral side of the boot, and the lace may form a loop or be coupled to the opposing end of the strap. The lace may pull on the end of the strap to which the lace is coupled, resulting in pulling of the strap inward so as to tighten the rear side, as well as other sides, of the boot.

In Figs. 5A-5B, the boot 100 includes a lacing system that is arranged to pull up on the strap 150 in a manner that may bring the rear side of the boot inward. In some cases, the medial and lateral sides of the boot may also be brought inward toward the shaft region. As shown, similar to other embodiments described herein, the strap 150 extends across the portion of the rear side of the boot that covers the Achilles' tendon area of the wearer. Though, in this embodiment, the ends of the strap on the lateral and medial sides of the boot are re-routed through respective adapters 154 (e.g., D-rings), so as to extend from a substantially horizontal direction to a substantially vertical direction. Here, the lace 140 extends above the strap 150 and hooks on to respective ends of the strap through the lace guides 152.

In the embodiment of Figs. 5A-5B, the tensioning member 170 is coupled to both ends of the lace 140. When the lace 140 is tightened, the strap 150 is pulled in a direction substantially parallel to the shaft axis along which the upper region of the body is oriented (e.g., in a vertical direction, substantially perpendicular to the direction in which the strap extends), cinching the strap (e.g., at the adapters) against the rear side of the boot. As tension builds in the lace 140, the strap may also be drawn inward toward the shaft region at the medial and lateral sides of the boot. Such an embodiment may be beneficial to keep the lace confined to a particular region of the boot. For example, in some cases, tensioning of the lace may cause pressure build

up in an undesirable manner in regions where the lace is located. Accordingly, it may be preferable to restrict the lace to a region of the boot where tightening thereof does not lead to discomfort.

The strap 150 may include any suitable material. For example, as discussed above, the strap may be constructed so as to provide for a relatively comfortable fit for the wearer when pulled against the Achilles' tendon area of the wearer. In some embodiments, the strap may be made up of a relatively soft material, such as a fabric, plastic/polymer (e.g., polyurethane, polyimide, polyester, polyethylene, etc.), foam, webbing or other suitable material that is able to transfer pressure (e.g., for applying compression against the rear backstay) while also having an appropriate degree of flexibility (e.g., for distributing stress in a comfortable manner).

The strap may further have any suitable shape or configuration that allows for various regions of the boot body to be pressed inward, while distributing pressure over a large area, in a relatively even manner. For instance, Figs 6A-6D illustrate a number of examples of straps 150 that are shaped so as to flare outward from the point of attachment of the lace 140, for example, at the strap lace guide.

As shown in Figs. 6A, 6B and 6D, the strap 150 may be protected or otherwise covered by a strip of material (e.g., fabric, skin, etc.) on the boot body so as not to expose the rear of the outer surface of the strap. Or, as shown in Fig. 6C, the outer surface of the strap 150 may be exposed, extending over the rear of the boot.

In some embodiments, the strap 150 may positioned over the J bar insert(s) located along the liner of the boot. Accordingly, upon tensioning of the lace portion(s), the strap may be pulled against the respective J bars, further limiting lift of the heel that may otherwise be prone to occur during use.

It should be understood that the foregoing description is intended merely to be illustrative thereof and that other embodiments, modifications, and equivalents are within the scope of the present disclosure recited in the claims appended hereto. Further, although each embodiment described above includes certain features, the present disclosure is not limited in this respect. Thus, one or more of the above-described or other features of the boot or methods of use, may be employed singularly

or in any suitable combination, as the present disclosure and the claims are not limited to a specific embodiment.

What is claimed is:

5

CLAIMS

1. A boot comprising:

a body having a front side, a rear side, a medial side and a lateral side defining a shaft region; and

a lace cooperating with a rear side of the body and arranged to be tightened to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body.

2. The boot of claim 1, further comprising a tensioning member adapted to tighten the lace to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body.

3. The boot of claim 2, wherein the tensioning member includes a knob coupled to the lace and being rotatable by a wearer to adjust tension of the lace.

4. The boot of claims 2-3, wherein the lace includes a first end and a second end and the tensioning member is coupled to at least one of the first and second ends.

5. The boot of any of the preceding claims, wherein the lace is arranged to partially circumscribe a portion of the body.

6. The boot of any of the preceding claims, further comprising at least one strap coupled to the lace, wherein tightening of the lace results in at least one of the rear side, the medial side and the lateral side of the body being drawn inward toward the shaft region of the body.

7. The boot of claim 6, wherein the at least one strap has a strap lace guide for guiding the lace.

8. The boot of any of claims 6-7, wherein the lace, upon tightening, is arranged to pull against the at least one strap from at least one of a lateral side and a medial side of the body.

9. The boot of any of claims 6-8, wherein the at least one strap extends along a portion of the rear side of the body.

10. The boot of any of claims 6-9, wherein the at least one strap is constructed and arranged to be pulled by the lace in a direction substantially perpendicular to a shaft axis along which an upper region of the body is oriented, for pulling against the at least one strap.

11. The boot of any of claims 6-10, wherein the at least one strap is constructed and arranged to be pulled by the lace in a direction substantially parallel to a shaft axis along which an upper region of the body is oriented, for pulling against the at least one strap.

12. The boot of claim any of claims 6-11, wherein the at least one strap covers a portion of the rear side of the body.

13. The boot of claim any of claims 6-12, wherein a portion of the at least one strap is fixed to the body.

14. The boot of any of the preceding claims, wherein the lace includes a first lace portion arranged to be tightened to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body, and a second lace portion arranged to be tightened independently from tightening of the first lace portion, to pull medial and lateral sides of a tongue opening of the front side toward one another.

15. The boot of claim 14, wherein the first lace portion and the second lace portion comprise a single lace.

16. The boot of claim 14, wherein the first lace portion and the second lace portion comprise separate laces.

17. The boot of any of claims 14-16, further comprising a tensioning member adapted to tighten at least one of the first lace portion and the second lace portion.

18. The boot of any of claims 14-17, wherein the tensioning member is coupled to the first lace portion and the second lace portion.

19. The boot of any of claims 14-17, wherein the tensioning member is coupled to the first lace portion for tightening the first lace portion, and further comprising an additional tensioning member coupled to the second lace portion for tightening the second lace portion.

20. The boot of any of the preceding claims, wherein the lace extends from at least one of a medial side and a lateral side of the body toward the rear side of the body.

21. The boot of any of the preceding claims, wherein at least a portion of the lace extends over the rear side of the body.

22. The boot of any of the preceding claims, wherein the front side of the body has a tongue opening, and a portion of the lace extends over the tongue opening such that, upon tightening of the lace, medial and lateral sides of the tongue opening are pulled toward one another.

23. The boot of claim 22, wherein the front side of the body has a tongue opening, and an additional lace extends over the tongue opening such that, upon tightening of

the additional lace, medial and lateral sides of the tongue opening are pulled toward one another.

24. The boot of any of the preceding claims, further comprising a cushioning member located at the rear side of the body for distributing pressure at the rear side of the body upon tightening of the lace.

25. The boot of any of the preceding claims, wherein, upon tightening of the lace, the rear side of the body remains stationary relative to the shaft region of the body.

26. The boot of any of the preceding claims, further comprising an inner lining having an insert located at a medial side or a lateral side of the body, wherein the at least one strap is positioned over the insert of the inner lining.

27. The boot of any of the preceding claims, wherein the boot is constructed as a soft snowboard boot.

28. A method of tightening a boot including a body having a front side, a rear side, a medial side and a lateral side defining a shaft region, comprising:

tensioning a lace to draw at least one of the rear side, the medial side and the lateral side of the body inward toward the shaft region of the body.

29. The method of claim 28, wherein tensioning the lace includes pulling against at least one strap, that is coupled to lace, at a lateral side or a medial side of the body.

30. The method of any of the preceding claims, wherein tensioning the lace includes pulling medial and lateral sides of a tongue opening of the front side of the body toward one another.

31. The method of any of the preceding claims, further comprising tensioning an additional lace to pull medial and lateral sides of a tongue opening of the front side of the body toward one another.

32. The method of any of the preceding claims, wherein tensioning the lace includes actuating a tensioning member to tighten the lace.

33. The method of claim 32, wherein actuating the tensioning member includes rotating a knob coupled to the lace.

34. The method of any of the preceding claims, wherein tensioning the lace includes pulling on at least one end of the lace.

35. The method of any of the preceding claims, wherein, upon tensioning of the lace, the rear side of the body remains stationary relative to the shaft region of the body.

36. The method of any of the preceding claims, further comprising:

tensioning a first lace portion to draw at least one of the rear side, the medial side and the lateral side of the body toward the shaft region of the body; and

tensioning a second lace portion independently from the tensioning of the first lace portion, to pull medial and lateral sides of the tongue opening of the front side of the body toward one another.

37. The method of claim 36, wherein:

tensioning a first lace portion to draw at least one of the rear side, the medial side and the lateral side of the body toward the shaft region of the body comprises tensioning a first lace; and

tensioning a second lace portion independently from the tensioning of the first lace portion, to pull medial and lateral sides of the tongue opening of the front side of the body toward one another comprises tensioning the first lace.

38. The method of claim 36, wherein:

tensioning a first lace portion to draw at least one of the rear side, the medial side and the lateral side of the body toward the shaft region of the body comprises tensioning a first lace; and

tensioning a second lace portion independently from the tensioning of the first lace portion, to pull medial and lateral sides of the tongue opening of the front side of the body toward one another comprises tensioning a second lace that is separate from the first lace.

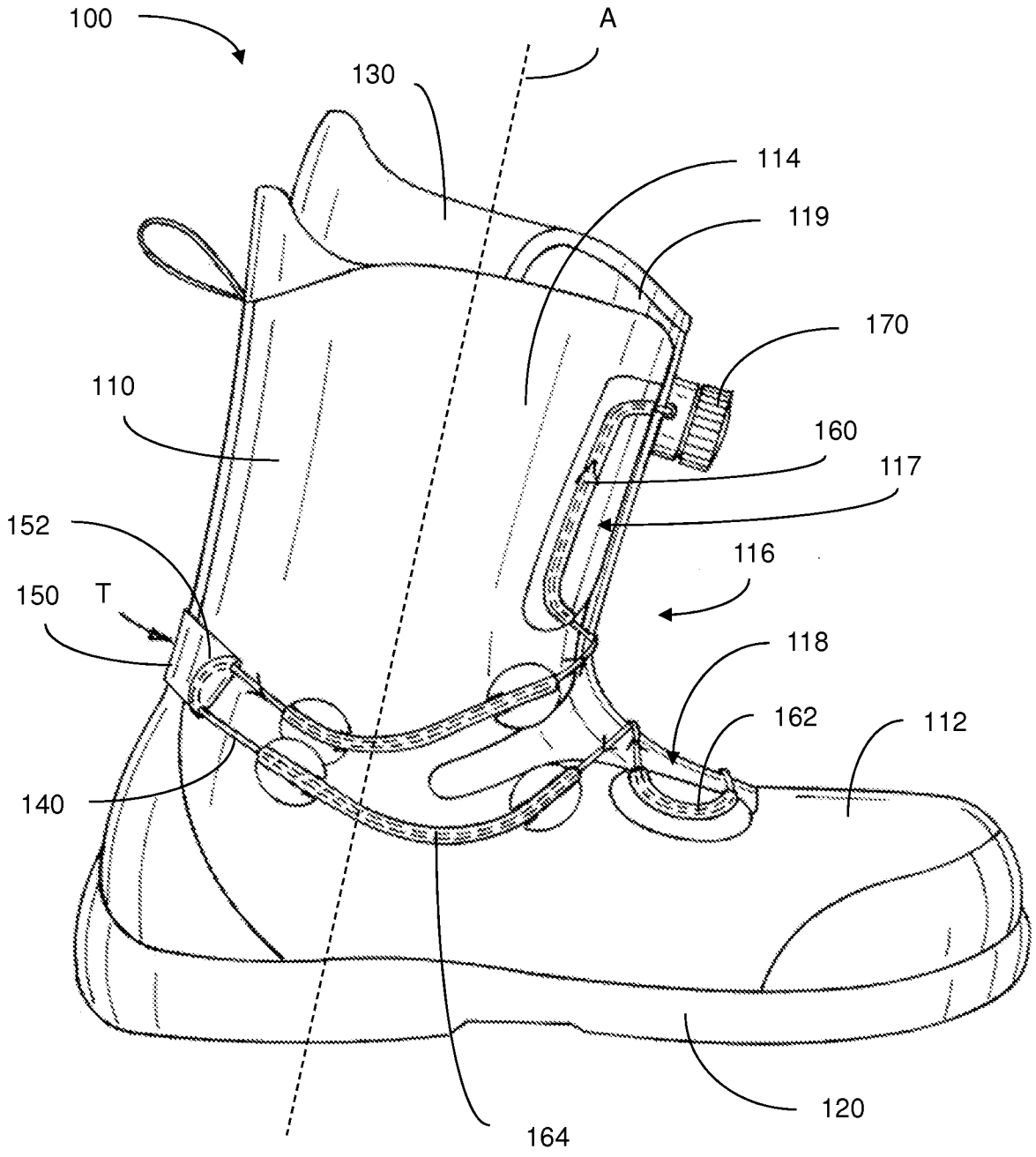
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Fig. 1A

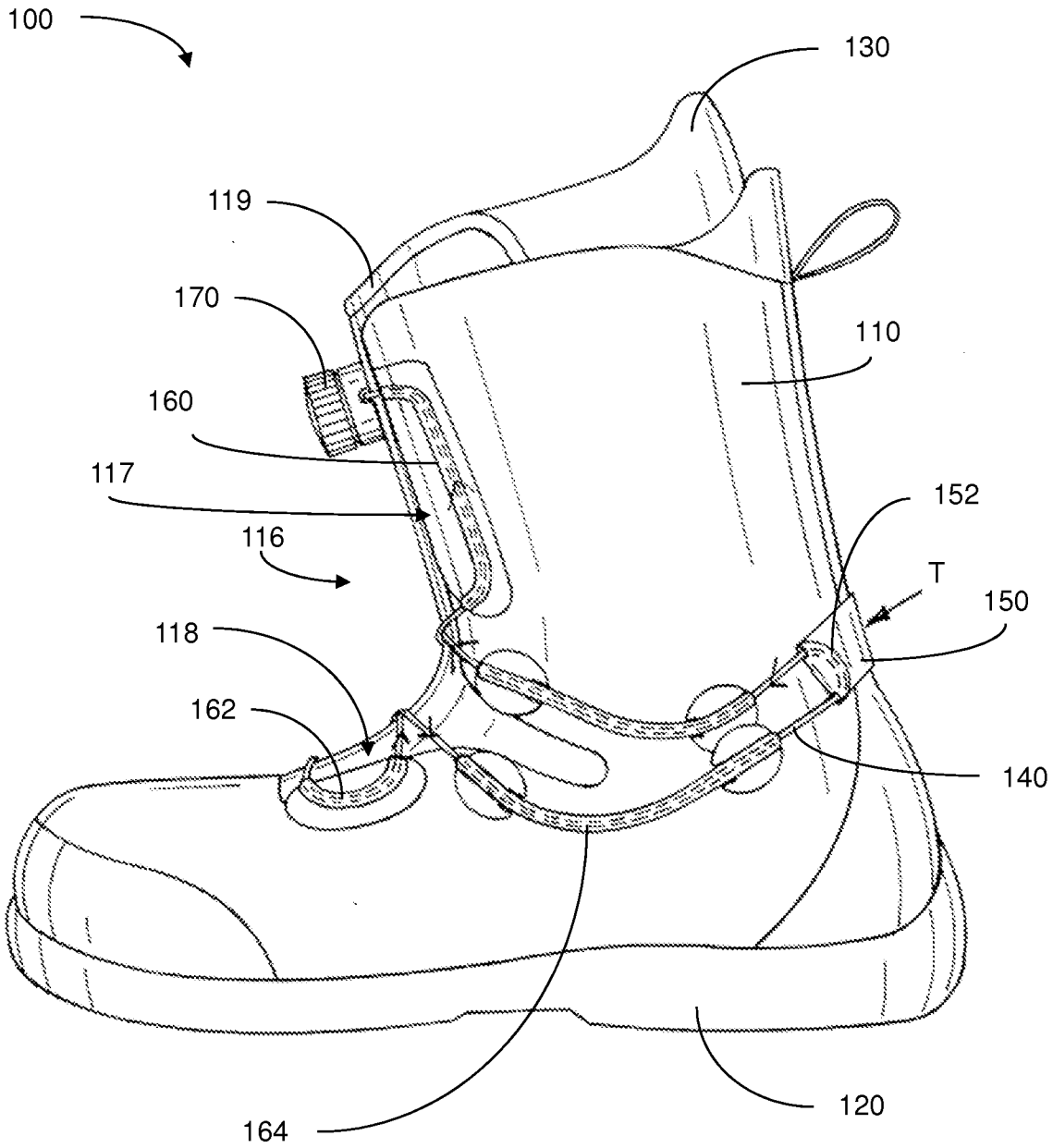

Fig. 1B

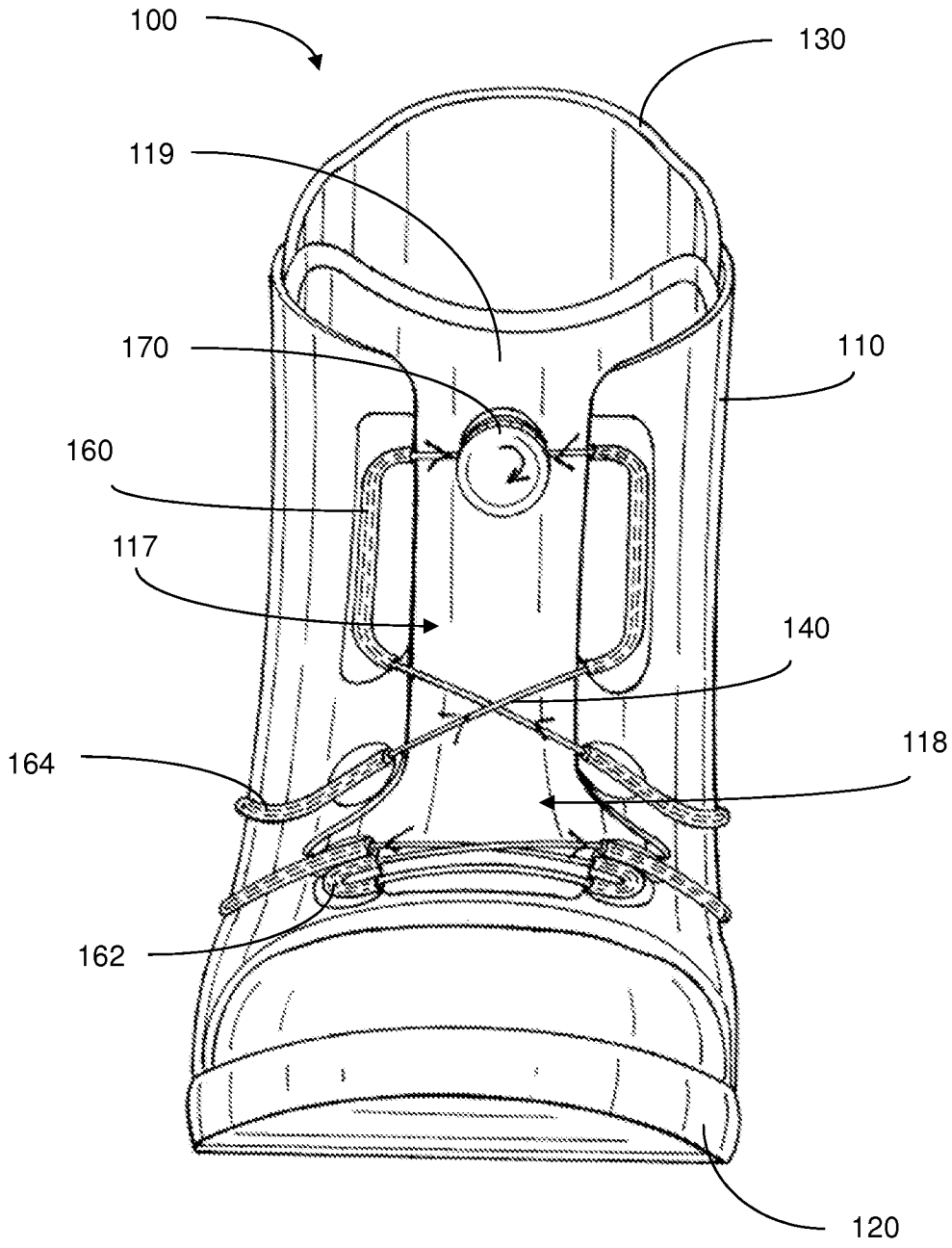

Fig. 1C

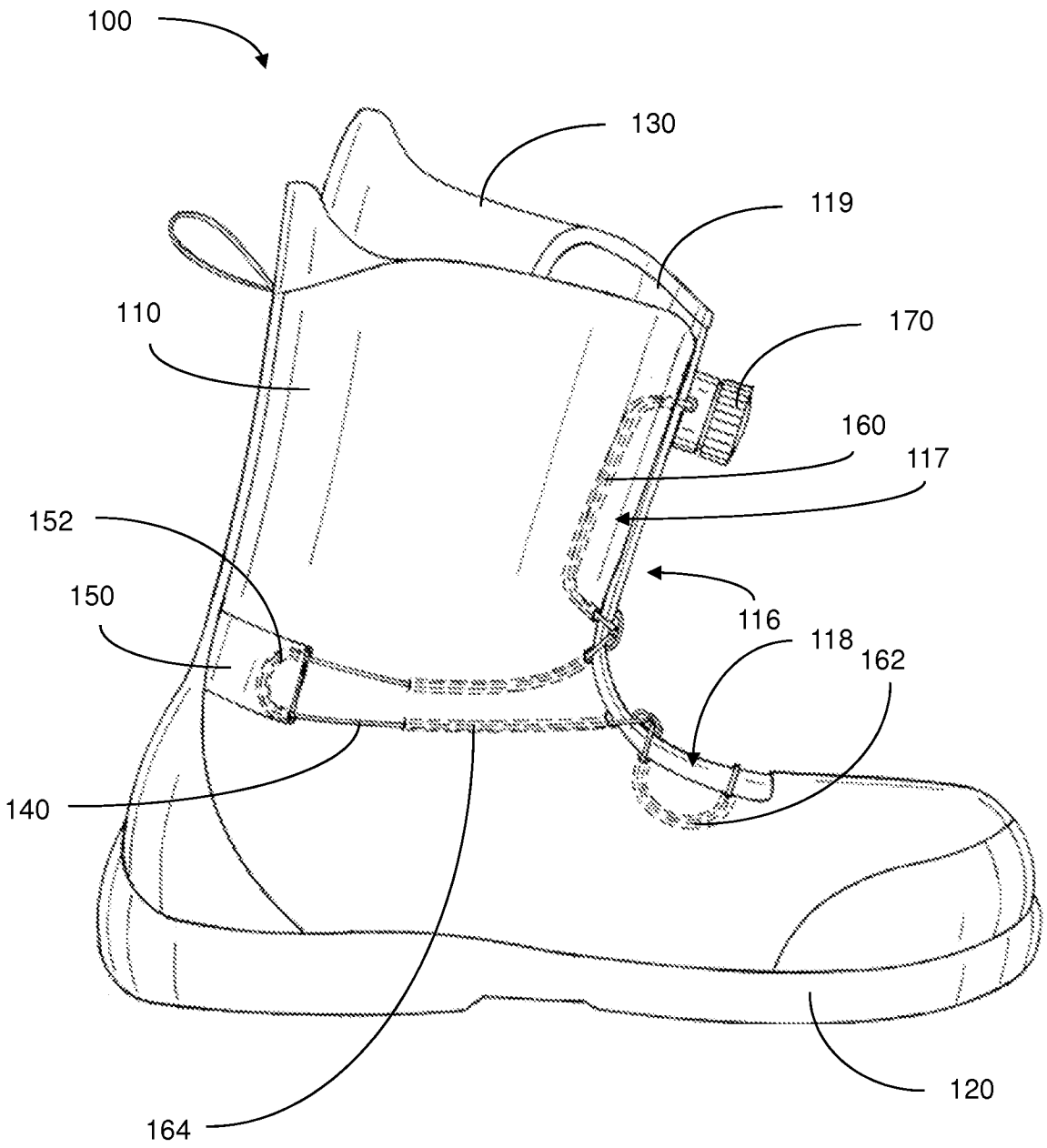

Fig. 2

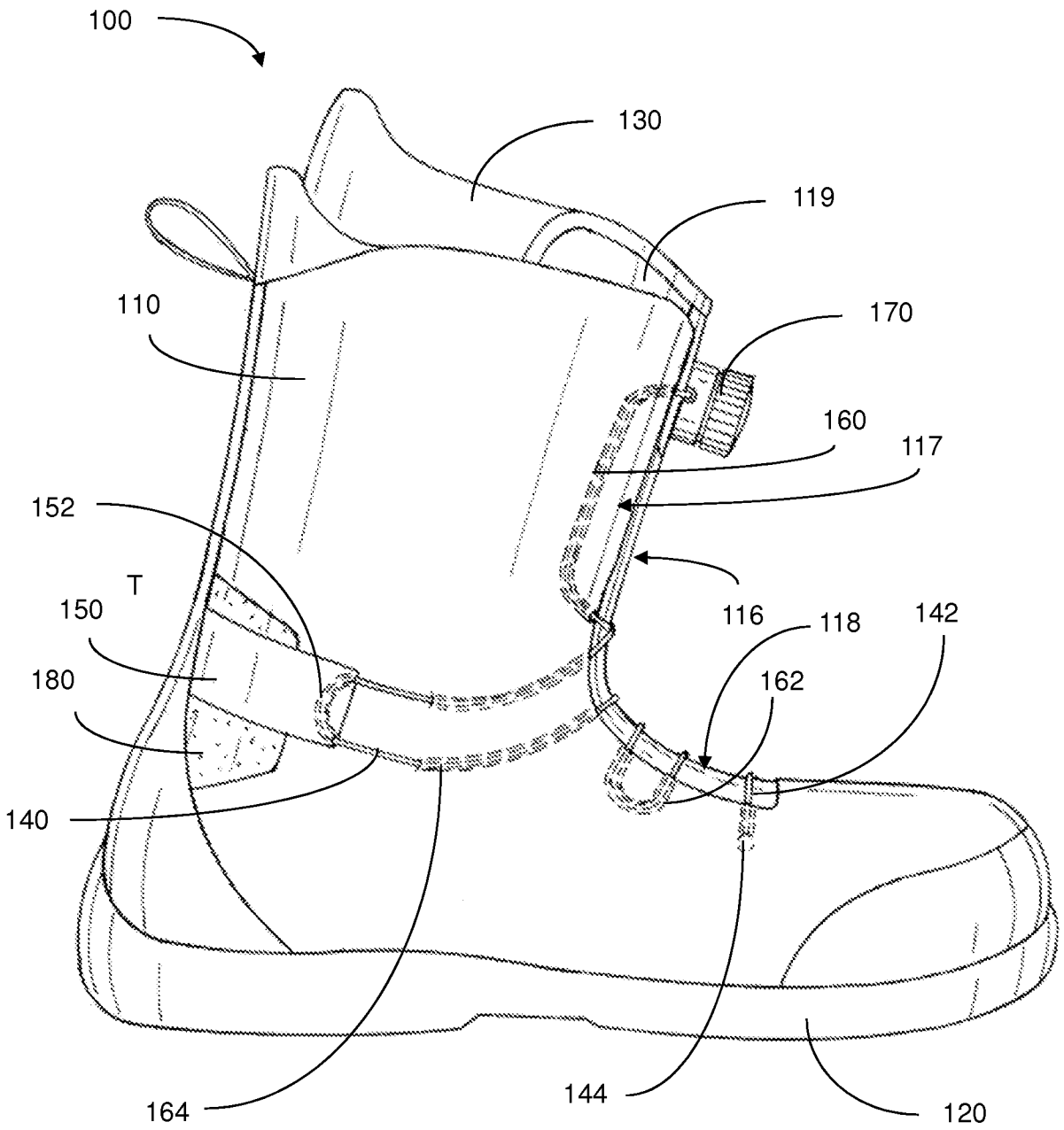
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Fig. 3A

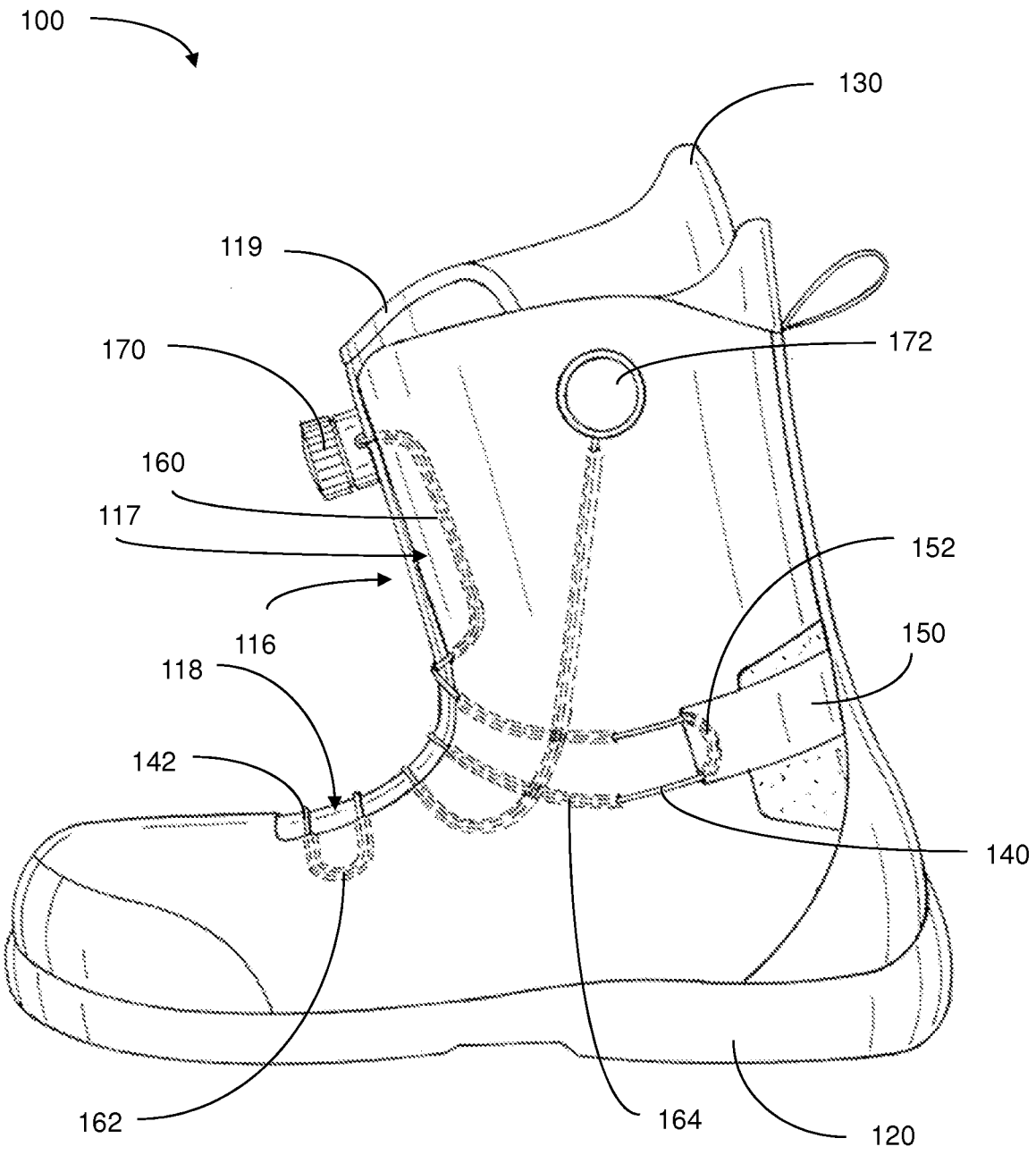

Fig. 3B

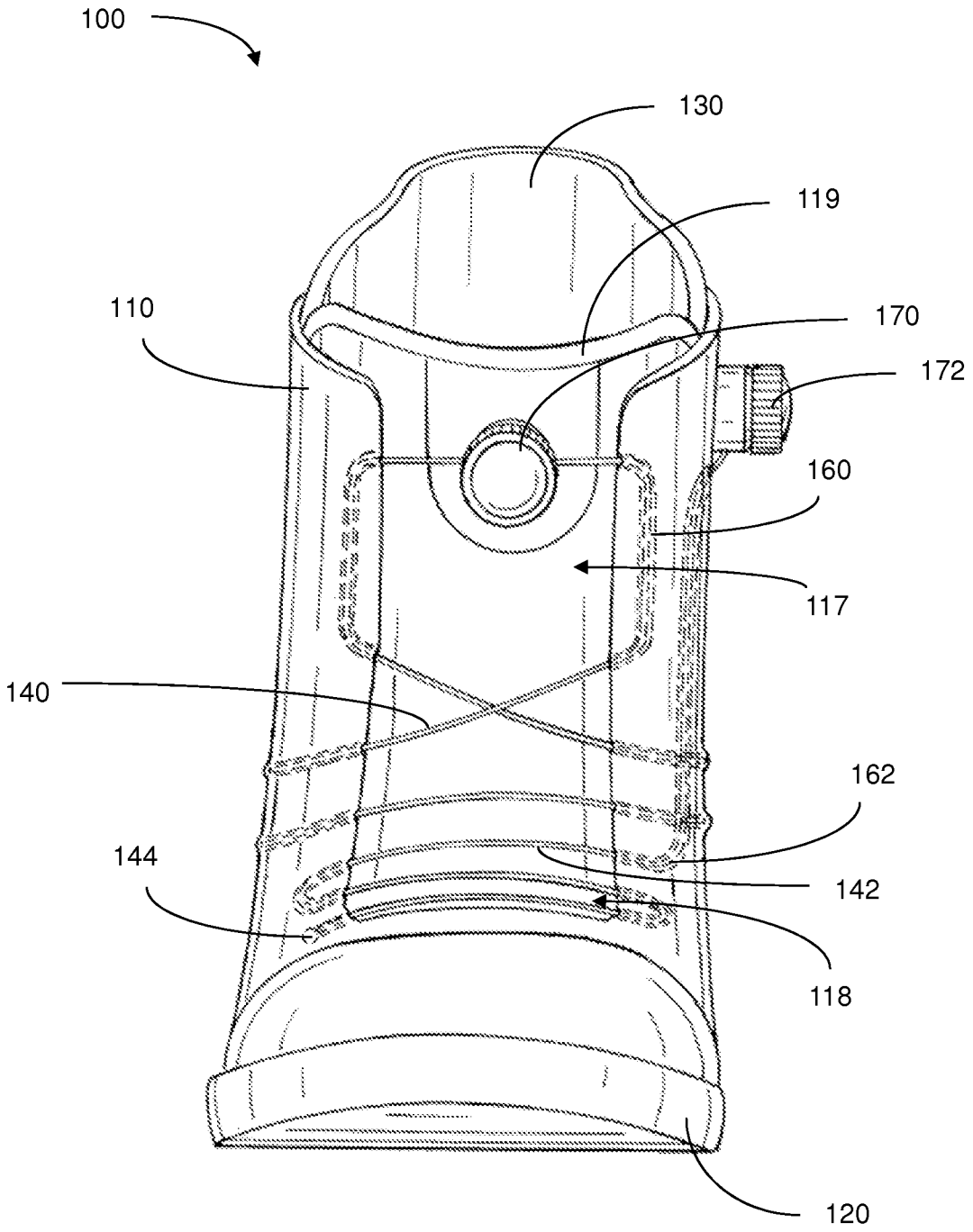

Fig. 3C

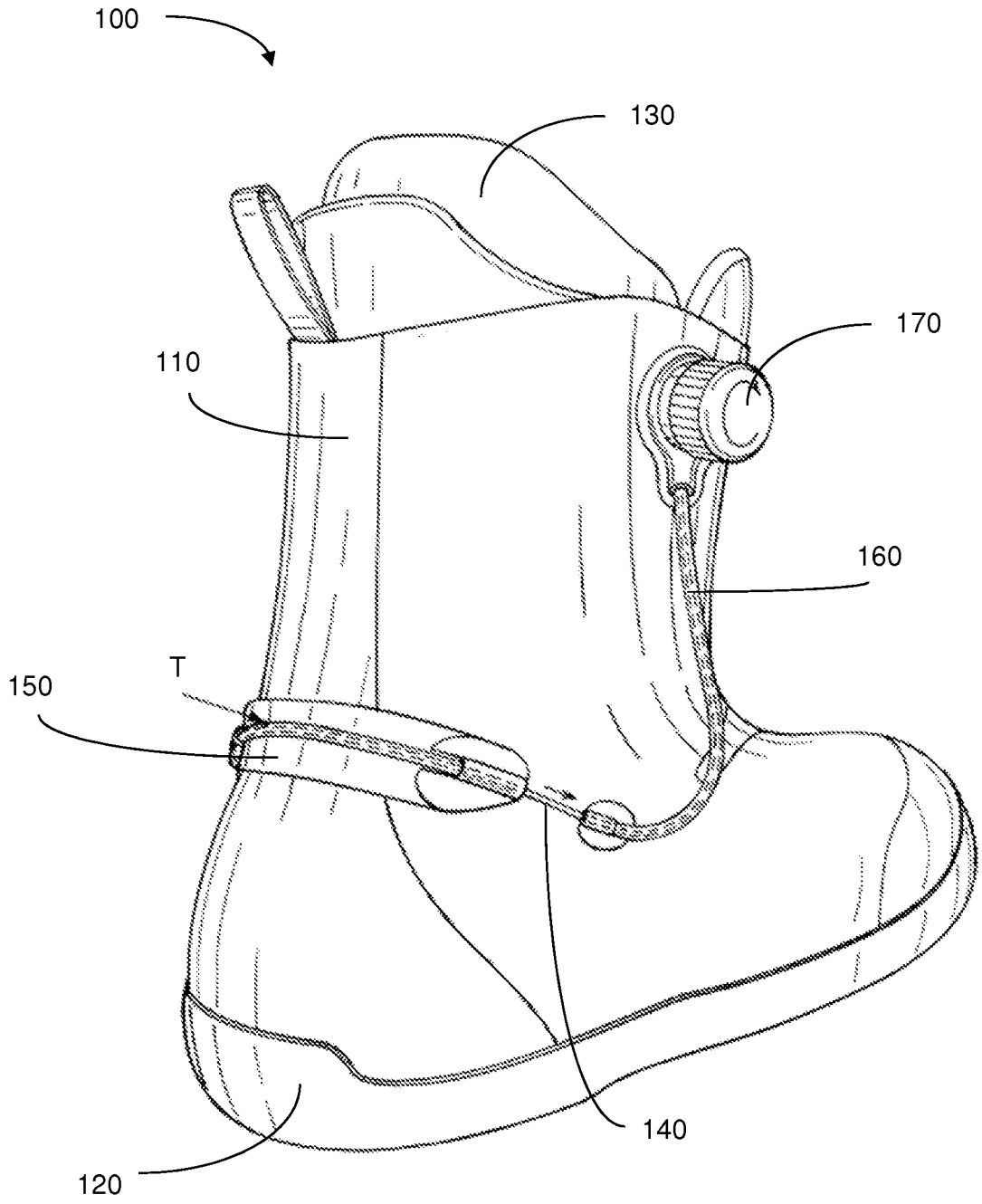

Fig. 4A

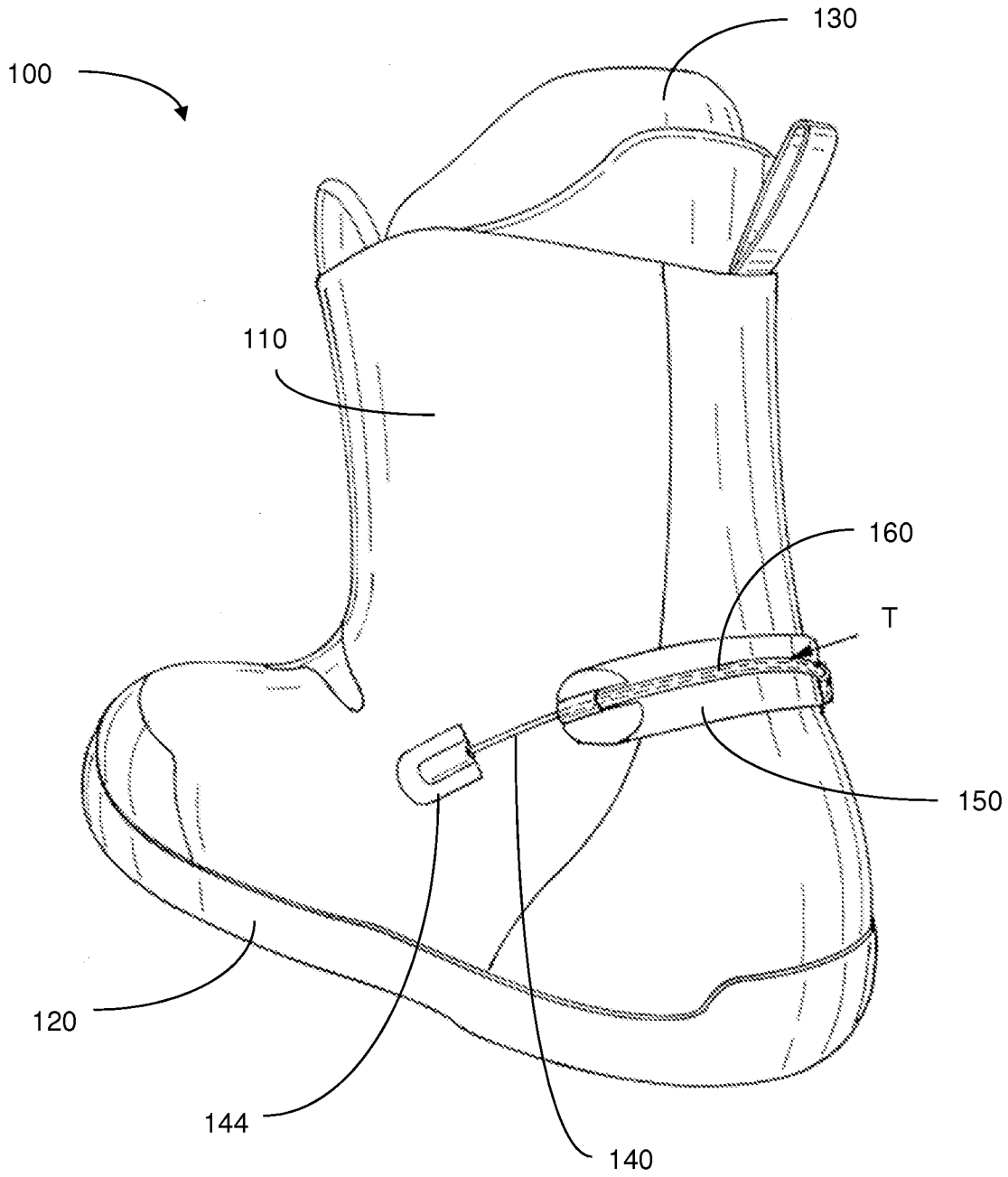

Fig. 4B

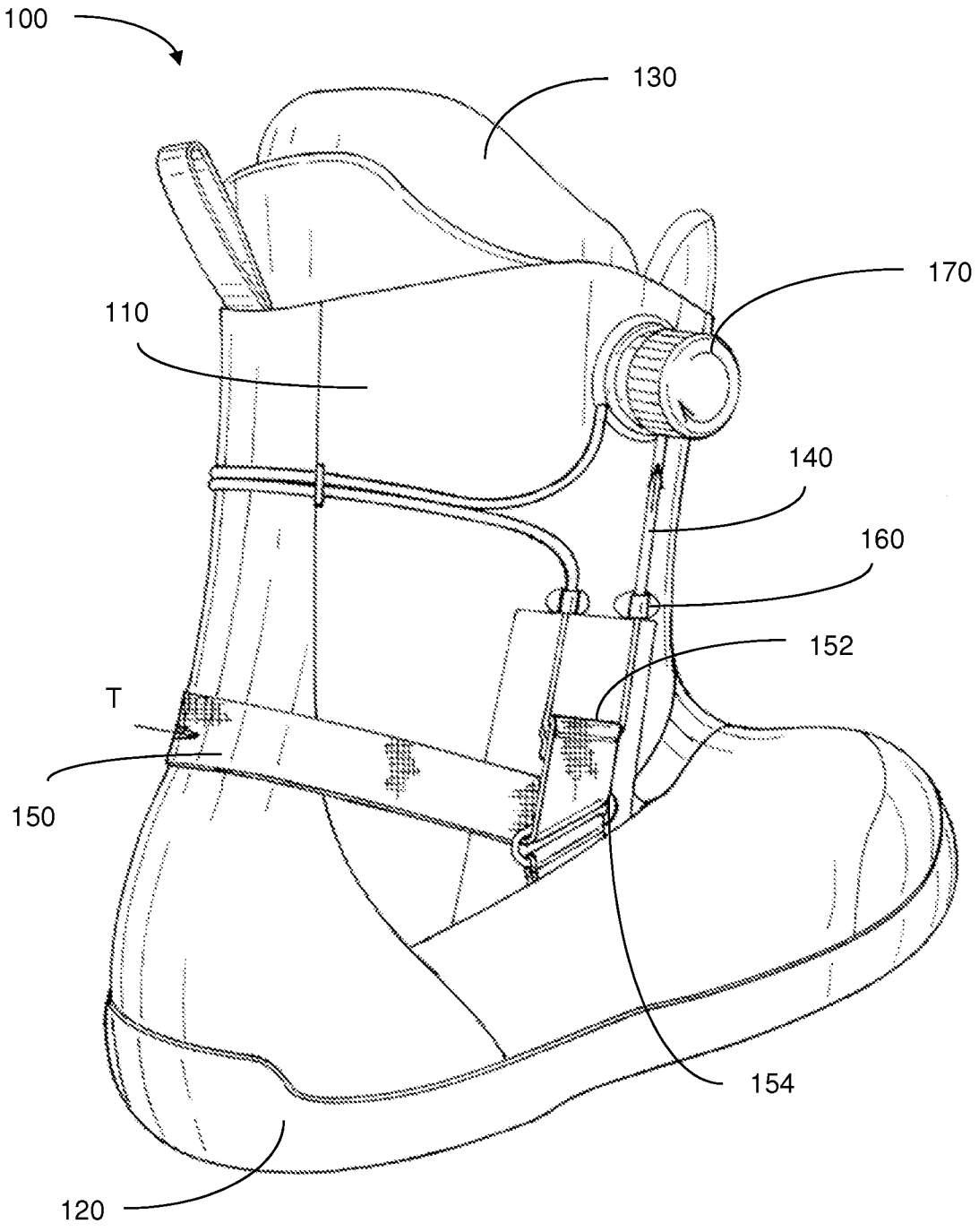

Fig. 5A

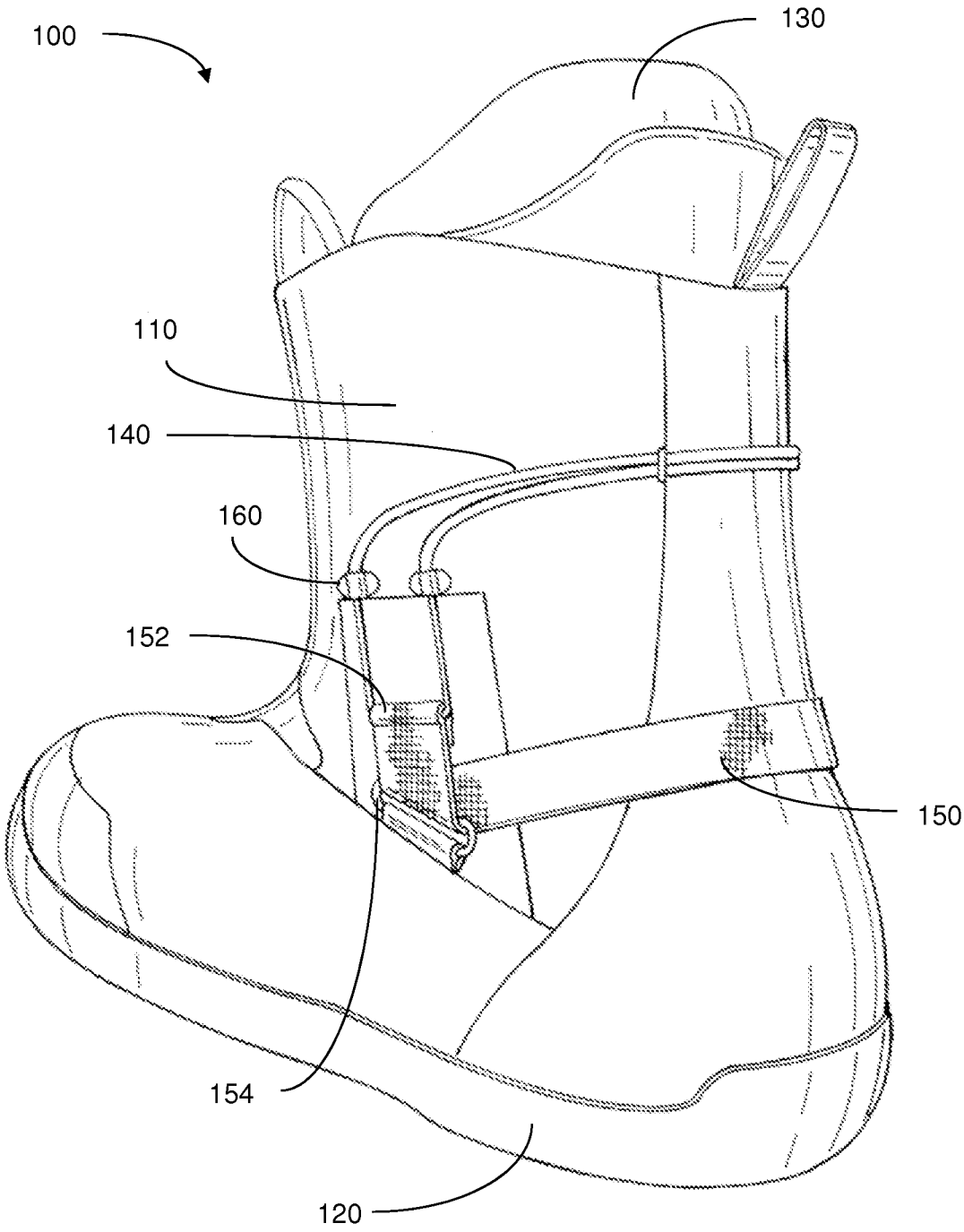

Fig. 5B

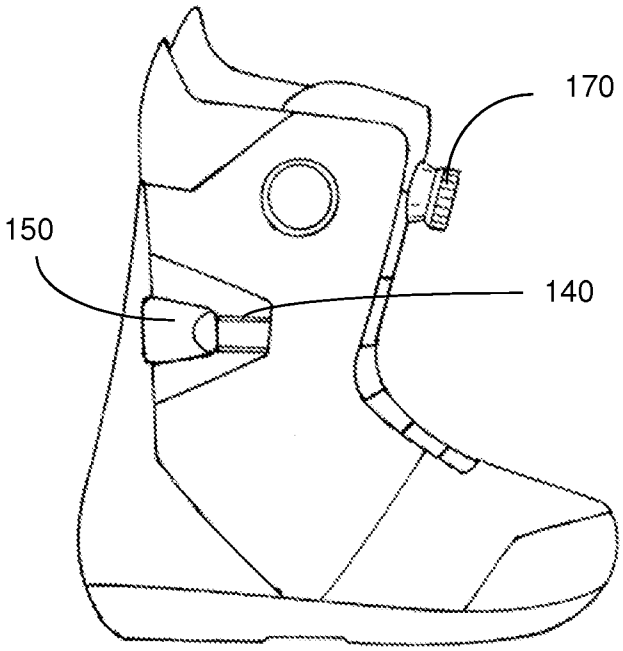

Fig. 6A

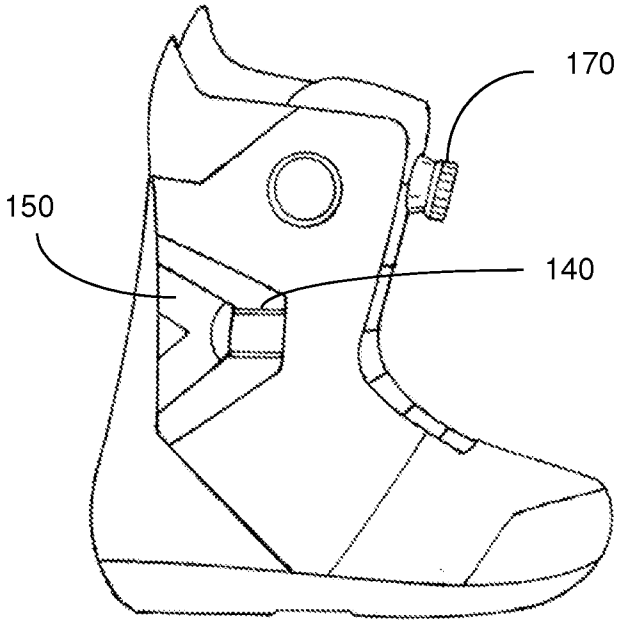

Fig. 6B

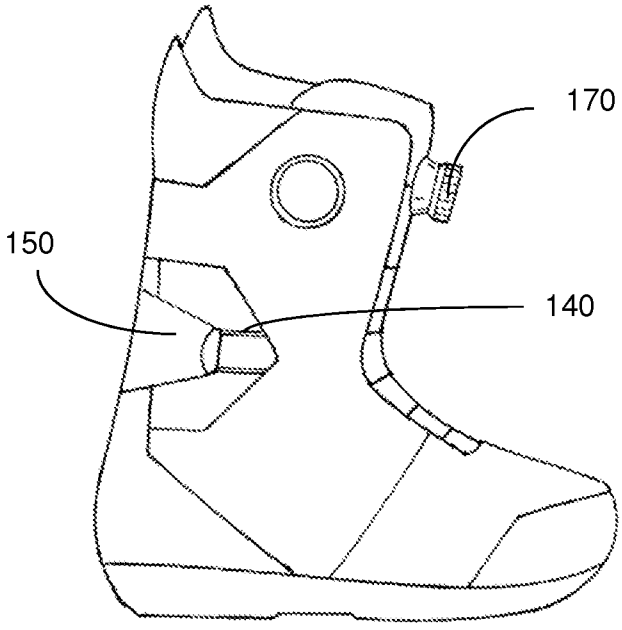

Fig. 6C

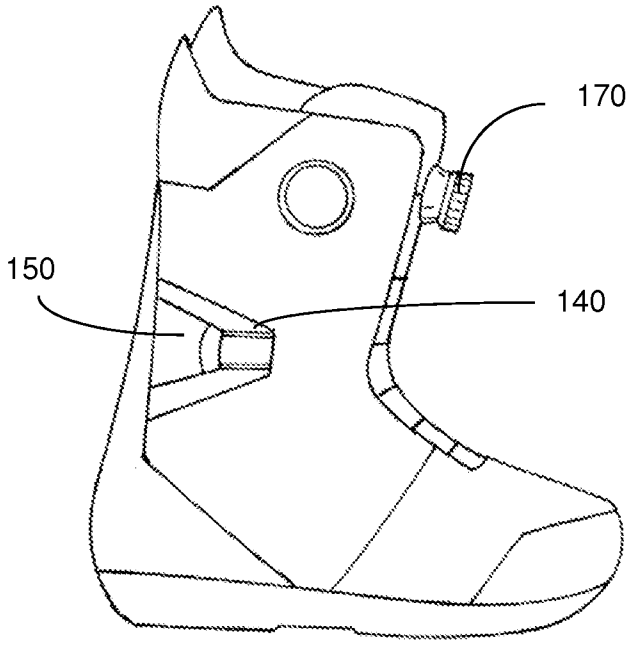

Fig. 6D

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/036164

A. CLASSIFICATION OF SUBJECT MATTER
INV. A43C1/00 A43C11/16
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	EP 1 654 947 A1 (SALOMON SA [FR]) 10 May 2006 (2006-05-10) claims; figures	1,2,4-7, 10,13, 25-32,35

X	US 2014/123449 A1 (S0DERBERG MARK [US] ET AL) 8 May 2014 (2014-05-08) paragraphs [0040], [0041]; claim 1; figures	I-4,6-9, II-24, 28-34, 36-38

X,P	W0 2014/093913 A1 (VANS INC [US]) 19 June 2014 (2014-06-19) claims; figures	1,14-17

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

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 September 2015	10/09/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Claudel, Benoit

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/036164

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1654947 A1	10-05-2006	EP 1654947 A1	10-05-2006
		FR 2877547 A1	12-05-2006
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		WO 2014074645 A2	15-05-2014
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		WO 2014093913 A1	19-06-2014