According to an embodiment, a tightening system for a climbing shoe includes a tension member, a tightening mechanism that is operationally coupled with the tension member to effect tensioning of the tension member, and a fit adjustment system. The fit adjustment system is coupled with the climbing shoe and operationally coupled with the tension member so that tensioning of the tension member effects tensioning of the fit adjustment system to adjust a fit of the climbing shoe about a user's foot. The fit adjustment system generally includes a plurality of arms or ends that extend from a mid-section. The arms or ends are typically positioned above the climbing shoe's upper and coupled near an eyestay of the shoe. The mid-section commonly extends diagonally across the bottom portion of the shoe between opposing ends or arms of the fit adjustment system.
Fig. 5A

Fig. 5B
CLOSURE DEVICES AND METHODS FOR CLIMBING SHOES

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application No. 61/951,388 filed Mar. 11, 2014, and titled “Closure Devices and Methods for Climbing Shoes,” the entire disclosure of which is hereby incorporated by reference, for all purposes, as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] Climbing shoes are often used by climbers to protect the foot and to grip or grasp ledges or surface of the rock or other object that is being climbed. Climbers commonly purchase shoes that are sized smaller than the climber’s foot in order to maximize the contact of the shoe with the foot. For example, climber’s typically want the shoe’s arch to remain firmly in contact with the foot’s arch and similarly want the toe and heel portions of the shoe to remain firmly in contact with the foot’s heel and toe. Maximum contact of the shoe with the foot often provides a significant performance advantage because it allows the climber to grip and feel the surface of the object that is being climbed. These smaller shoes, however, are often uncomfortable and even painful to wear, especially after extended periods of time. The discomfort and/or pain is normally tolerated due to the performance advantage that is achieved via the smaller sized shoes.

BRIEF SUMMARY OF THE INVENTION

[0003] The present invention is related to closure devices for footwear. The closure devices and other embodiments described herein may be particularly useful for closing and tightening a climbing shoe about a user’s foot, although the embodiments may be employed in various other types of footwear. According to one aspect, a tightening system for a climbing shoe includes a tension member that is routed about the climbing shoe along a path via one or more guide members. A tightening mechanism is operationally coupled with the tension member to effect tensioning of the tension member. The tightening system also includes a fit adjustment system that includes a first end, a second end, and a mid-section that extends between the first and second ends. The fit adjustment system also includes a third end, a fourth end, and a mid-section that extends between the third and fourth ends.

[0004] The first end, second end, third end, and fourth end are each: 1) positioned above an upper of the climbing shoe, 2) attached to the climbing shoe near an eyestay of the climbing shoe, and 3) operationally coupled with the tension member so that tensioning of the tension member effects tensioning of the fit adjustment system. The first end of the fit adjustment system is positioned on a first side of the climbing shoe adjacent an upper portion of the eyestay and the second end is positioned adjacent a lower portion of the eyestay on a second side of the climbing shoe opposite the first side of the climbing shoe. The mid-section of the fit adjustment system extends under an insole and diagonally across the climbing shoe between the first and second ends. The third end of the fit adjustment system is positioned on the second side of the climbing shoe adjacent the upper portion of the eyestay and the fourth end is positioned adjacent the lower portion of the eyestay on the first side of the climbing shoe. The mid-section of the fit adjustment system extends under the insole and diagonally across the climbing shoe between the third and fourth ends.

[0005] In one embodiment, the fit adjustment system is a harness. In such an embodiment, the mid-section is a main body and the first end, the second end, the third end, and the fourth end extend from the main body. In a specific harness embodiment, the first and third ends extend approximately horizontally from the main body and the second and fourth ends extend approximately diagonally from the main body. In another embodiment, the fit adjustment system is a pair of independent straps. In such an embodiment, the mid-section is a main body of each strap and the first and second ends and the third and fourth ends are respective end portions of each strap.

[0006] In some embodiments, the first end, the second end, the third end, and the fourth end are each coupled with the climbing shoe to form a loop within which the tension member is inserted. In such embodiments, each of the formed loops forms a guide member for routing the tension member along the path. In some embodiments, the tightening system further includes a heel component that is positioned around a heel portion of the climbing shoe and operationally coupled with the tension member. In such embodiments, tensioning of the tension member effects tensioning of the heel component and thereby adjusts a fit of the heel portion about a user’s heel.

[0007] In some embodiments, the mid-section of the fit adjustment system is positioned within a channel or groove of a rand or outsole, or the mid-section is otherwise unattached from the rand or outsole of the climbing shoe. In such instances, the mid-section is slidably under or relative to the insole of the climbing shoe. In other embodiments, the mid-section of the fit adjustment system is coupled with a rand or outsole of the climbing shoe. In some embodiments, the tightening mechanism is positioned remotely of the climbing shoe or otherwise not attached directly to the climbing shoe. In some embodiments, a knob of the tightening mechanism is removably couplable to the climbing shoe.

[0008] According to another aspect, a method for configuring a climbing shoe with a tightening system is provided. The method includes routing a tension member about the climbing shoe along a path via one or more guide members and operationally coupling a tightening mechanism with the tension member. The tightening mechanism is configured to effect tensioning of the tension member upon user operation of the tightening mechanism. The method also includes coupling a fit adjustment system with the climbing shoe. The fit adjustment system includes a first end, a second end, and a mid-section that extends between the first and second ends, and also includes a third end, a fourth end, and a mid-section that extends between the third and fourth ends.

[0009] Coupling the fit adjustment system with the climbing shoe includes positioning the first end, the second end, the third end, and the fourth end above an upper of the climbing shoe. The first end is positioned on a first side of the climbing shoe adjacent an upper portion of the eyestay and the second end is positioned on a second side of the climbing shoe opposite the first side of the climbing shoe. The mid-section of the fit adjustment system extends under an insole and diagonally across the climbing shoe between the first and second ends. The third end is positioned on the second side of the climbing shoe adjacent the upper portion of the eyestay and the fourth end is positioned on the first side of the climbing shoe adjacent the lower portion of the eyestay.
portion of the eyestay. The mid-section extends under the
insole and diagonally across the climbing shoe between the
third and fourth ends.

[0010] Coupling the fit adjustment system with the climb-
ing shoe also includes attaching the first end, the second end,
the third end, and the fourth end to the climbing shoe near an
eyestay of the climbing shoe and operationally coupling the
first end, the second end, the third end, and the fourth end with
the tension member so that tensioning of the tension member
effects tensioning of the fit adjustment system.

[0011] In one embodiment, the fit adjustment system is a
harness. In such an embodiment, the mid-section is a main
body of the harness and the first end, the second end, the third
end, and the fourth end extend from the main body. In a
specific harness embodiment, the first end and the third end
extend approximately horizontally from the main body and
the second end and the fourth end extend approximately
diagonally from the main body. In another embodiment, the
fit adjustment system is a pair of independent straps. In such
an embodiment, the mid-section is a main body of each strap
and the first and second ends and the third and fourth ends are
respectively end portions of each strap.

[0012] The method may further include coupling the first
end, the second end, the third end, and the fourth end with the
climbing shoe so that each end forms a loop within which the
tension member is insertable. In such embodiments, each of
the formed loops forms a guide member for routing the ten-
sion member along the path. The method may additionally
include positioning a heel component around a heel portion of
the climbing shoe and operationally coupling the heel compo-
nent with the tension member so that tensioning of the
tension member effects tensioning of the heel component and
thereby adjusts a fit of the heel portion about a user’s heel.

[0013] In some embodiments, the method may additionally
include positioning the mid-section of the fit adjustment sys-
tem within a channel or groove so that the mid-section is
unattached from a rand or outsole of the climbing and so that
the mid-section is slidable under the insole of the climbing
shoe. In other embodiments, the method may additionally
include coupling the mid-section of the fit adjustment system
with the rand of the climbing shoe. In some embodiments, the
tightening mechanism may be positioned remotely of the
climbing shoe so that the tightening mechanism is not
attached directly to the climbing shoe. In some embodiments, a
knob of the tightening mechanism may be removably cou-
plable to the climbing shoe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention is described in conjunction
with the appended figures:

[0015] FIGS. 1-3 illustrate embodiments of climbing shoes
having a heel based mechanism and straps that tighten
the climbing shoe about the foot.

[0016] FIG. 4 illustrates a harness that may be used in place
of the straps illustrated in FIGS. 1-3 to tighten the climbing
shoe about the foot.

[0017] FIGS. 4A-4C illustrate various embodiments of har-
nesses that may be used to tighten the climbing shoe about
the foot.

[0018] FIGS. 5A & 5B illustrate cross-sectional views of a
climbing shoe having a harness or strap.

[0019] FIGS 6A & 6B illustrate embodiments in which a
strap, harness, or lace is coupled with the rand of a climbing
shoe.

[0020] FIGS. 7A-D illustrate embodiments that provide an
adjustment of the heel portion of the climbing shoe about
the user’s heel.

[0021] FIG. 8A illustrates an embodiment of a reel based
mechanism having a knob that is removable from a body of
the climbing shoe.

[0022] FIGS. 8B & 8C illustrate embodiments of a reel
based mechanism that is located remotely of the climbing
shoe.

[0023] FIG. 9 illustrates another embodiment of climbing
shoe having a reel based mechanism and one or more straps or
harnesses that are operable to tighten the climbing shoe about
a user’s foot.

[0024] In the appended figures, similar components and/or
features may have the same numerical reference label. Fur-
ther, various components of the same type may be distin-
guished by following the reference label by a letter that dis-
tinguishes among the similar components and/or features. If
only the first numerical reference label is used in the specifi-
cation, the description is applicable to any one of the similar
components and/or features having the same first numerical
reference label irrespective of the letter suffix.

DETAILED DESCRIPTION OF THE INVENTION

[0025] The ensuing description provides exemplary
embodiments only, and is not intended to limit the scope,
applicability or configuration of the disclosure. Rather, the
ensuing description of the exemplary embodiments will pro-
vide those skilled in the art with an enabling description for
implementing one or more exemplary embodiments. It being
understood that various changes may be made in the function
and arrangement of elements without departing from the
spirit and scope of the invention as set forth in the appended
claims.

[0026] The embodiments described herein provide various
improvements for footware that is used in rock climbing
(hereinafter climbing shoe). The embodiments are directed
toward closure devices for climbing shoes and various strap
or tension member configurations associated therewith. The
closure devices generally include tension members that are
tensioned via a tensioning device or mechanism. The tension
members are tensioned to tighten the climbing shoe about
a user’s foot. In many embodiments, the tension member may
be a lace or cord that is often constructed of metal, polymer
fibers or materials, or some combination thereof. In other
embodiments, the tension member may include fabric or
other straps and/or a combination of straps and lace. The
tightening mechanism used to tension the tension members
and thereby tighten the climbing shoe may include a reel
based mechanism.

[0027] The reel based mechanism may include a reel
assembly having a knob that is grasparable by a user and a
spool that is contained within a housing. The tension member (e.g.,
lace) may be coupled with a channel of the spool and wind-
able there around by grasping and rotating the knob in a
tightening direction (i.e., clockwise). Winding of the tension
member around the spool may tension the tension member and
tighten the climbing shoe. The tension of the tension
member may likewise be released via operation of the reel
based mechanism. For example, the knob may be grasped and
pulled axially upward relative to the housing to release the
tension, or the knob may be rotated in a loosening direction
(e.g., counter-clockwise) to release the lace tension. In other
embodiments, a button, lever, or other mechanism may
used to release the lace tension. The reel based mechanism may include various other internal components, such as interlocking teeth, pawls, clutching mechanisms, springs, clamps, and the like, that enable the various functions of the reel based mechanism. Exemplary embodiments of reel based mechanism are further described in U.S. Patent Application No. 2011/0266384, filed Apr. 29, 2011, and titled “Reel Based Lacing System”; U.S. patent application Ser. No. 14/328,521, filed Jul. 10, 2014, and titled “Closure Devices Including Incremental Release Mechanisms and Methods Thereof;” the entire disclosures of which are incorporated herein by reference.

[0028] For convenience in describing the embodiments herein, the tightening mechanism will be generally referred to as being a reel based mechanism, such as those described above. It should be realized, however, that many of the embodiments described herein may be used with other tightening mechanisms, such as pull cord based mechanisms, tie or knot based mechanisms, and the like.

[0029] In some embodiments, it may be desirable to limit the rotation of the climbing shoe about the user’s foot. For example, climbers often place a portion of their shoes on rather small ledges or protrusions and press against the ledges or protrusions in climbing. The climber may position any portion of the shoe against the ledge or protrusion in climbing (e.g., the toe, heel, medial, lateral, upper, or sole of the shoe). In pressing against the ledge or protrusion, significant rotations or torsional forces may be imparted to the shoe. For gripping purposes and/or to transfer a force to the ledge or protrusion, the climber may not want the climbing shoe to twist or rotate about the foot due to the imparted torsional forces. In some embodiments, a harness or straps may be used to limit or minimize the rotation of the climbing shoe due to the torsional forces.

[0030] An additional concern with climbing shoes is the fit of the shoe about the climber’s foot. Climbers commonly purchase shoes that are 1-2 sizes smaller than the climber’s foot to maximize the contact of the shoe against the foot. For example, climber’s typically want the shoe’s arch to remain firmly in contact with the foot’s arch and similarly want the toe and heel portions of the shoe to remain firmly in contact with the foot’s heel and toe. Maximum contact of the shoe with the foot often provides a significant performance advantage.

[0031] The smaller sized shoes, however, may be uncomfortably and even painful to wear, especially after long periods of time. The discomfort and/or pain are often tolerated due to the performance advantage that is achieved via the smaller sized shoes. The straps or harness described herein should thus also provide a performance advantage by enabling the climber to wear larger sized climbing shoes without sacrificing the fit or contact of the shoe with the foot. For example, the harness and/or straps may pull the shoe’s arch, forefoot, and heel firmly against the foot’s arch, toes, and heel, respectively. Accordingly, the embodiments described herein may maximize the climbing shoe’s performance while increasing user comfort in wearing and using the shoe.

[0032] Referring now to FIGS. 1-4, illustrated are embodiments of harnesses or straps that may be used to prevent or limit rotation of the climbing shoe and/or improve the fit and comfort of wearing the climbing shoe. FIG. 1 illustrates a first embodiment of a climbing shoe 100 having a reel based mechanism 102 that is operable to tension lace 104 that is guided or routed along a path about a tongue portion of the shoe 100. Tensioning of the lace 104 causes opposing sides of the tongue portion of the shoe to be pulled toward one another, which tightens the shoe about the user’s foot. The shoe 100 includes an upper 112 that is commonly made of fabric or another lightweight, durable, and breathable material. The shoe 100 also includes a sole or rand 110 that is commonly made of an elastic and grippable type material, such as rubber. The rand 110 aids in gripping small and/or tight spaces of the rock or object the individual is climbing.

[0033] A pair of straps 106 and 108 are positioned on an outer surface of the upper 112 and within the rand 110. The pair of straps 106 and 108 crisscross one another near a bottom surface of the shoe and under the rand 110. The crisscrossing of the straps, 106 and 108, result in opposing end portions of the straps being positioned toward the heel and toward the forefoot of the shoe 100. For example, a proximal end of strap 106 is positioned toward the heel and coupled near the shoe’s eyestay adjacent the reel based mechanism 102. The strap 106 traverses underneath the rand 110 and toward the forefoot of the shoe 100 so that a distal end of the strap 106 is positioned toward the forefoot of the shoe and is coupled near the shoe’s eyestay on the opposite side of the shoe’s tongue. Similarly, a proximal end of strap 108 is positioned toward the forefoot of the shoe 100 and is coupled near the shoe’s eyestay. The strap 108 traverses underneath the rand 110 (crossing strap 106) and toward the heel of the shoe 100 so that a distal end of the strap 108 is positioned toward the heel and is coupled near the shoe’s eyestay on the opposite side of the shoe’s tongue.

[0034] The straps, 106 and 108, are coupled to the shoe to form loops or guides 114 through which the lace 104 is inserted. Tensioning of the lace 104 causes the straps, 106 and 108, to be tensioned, which pulls the shoe 100 tightly against the user’s foot. The shoe 100 may also include one or more additional fabric loops or guides 116 through which the lace 104 is inserted. The straps, 106 and 108, are made of a relatively inelastic material such that the straps do not stretch or deform under tension. Because the straps, 106 and 108, crisscross in the above-described manner and are made of a relatively inelastic material, the straps minimize or limit rotation of the shoe 100 due to torsional forces imparted to the shoe 100 during climbing. In addition, because each of the straps, 106 and 108, traverse from near the heel toward the forefoot of the shoe 100, the straps pull the forefoot of the shoe against the user’s toes and pull the heel of the shoe against the user’s heel. Further, because each of the straps, 106 and 108, traverse under the rand 110 near the shoe’s arch, the shoe’s arch is pulled upward and against the foot’s arch.

[0035] Because the shoe’s forefoot, heel, and arch are pulled tightly against the foot’s toes, heel, and arch, respectively, the fit or contact of the shoe with the foot is greatly increased. This allows larger shoes to be worn—e.g., shoes closer to the user’s foot size—without sacrificing the performance of the shoe, thereby increasing the comfort and performance of the shoe.

[0036] In some embodiments, the straps, 106 and 108, may be positioned under the rand 110 so as to be movable relative thereto. For example, the rand 110 may include channels or tunnels within which the straps, 106 and 108, are positioned. The channels or tunnels of the rand 110 may allow the straps, 106 and 108, to slide or move relative to the rand 110. This configuration may allow the straps, 106 and 108, to increase the contact and fit of the shoe 100 about the user’s foot and/or limit rotation of the shoe since the tension and torsional forces
are imparted on the straps, 106 and 108, and not necessarily to the shoe’s other materials. In some embodiments, the channels or tunnels may be formed via stitching or adhesion of the adjacent material layers, such as the rand, upper, and/or sole material. Exemplary embodiments of forming tunnels or channels via stitching or adhesion of adjacent material layers of a shoe are described in U.S. patent application Ser. No. 14/479,173, filed Sep. 5, 2014, and titled “Guides and Components for Closure Systems and Methods Therefor,” the entire disclosure of which is incorporated herein by reference.

[0037] In other embodiments, the straps, 106 and 108, may be coupled with the rand 110 so that tensioning of the straps tensions the rand. Tensioning of the rand 110, via the straps, 106 and 108, may cause the rand to deform or stretch, which may pull the shoe’s arch into contact with the foot’s arch and/or otherwise cause the tension and/or torsional forces to be imparted to the straps.

[0038] Referring now to FIG. 2, illustrated is another embodiment of a climbing shoe 200 having a heel based mechanism 202 that is configured to tension lace 204. The shoe 200 includes a pair of straps, 206 and 208, that are attached near the shoe’s eyestay and that traverse between the heel and the forefoot of the shoe as previously described. The straps, 206 and 208, crisscross beneath the rand 210 of the shoe 200 to provide torsional or rotational resistance as previously described. In the embodiment of FIG. 2, each strap, 206 and 208, is configured to traverse between the heel and forefoot of the shoe 200 to form a W type pattern. For example, a proximal portion of strap 206 is positioned near the shoe’s heel and is coupled near the shoe’s eyestay. The strap 206 traverses under the rand 210 so that a middle portion of the strap 206 is positioned on the opposite side of the shoe and is coupled near a mid-point along the shoe’s tongue and eyestay. The strap 206 again traverses under the rand 210 so that a distal portion of the strap 206 is positioned near the forefoot of the shoe and is coupled near the shoe’s eyestay. The resulting configuration forms a W-type or shaped pattern between the shoe’s heel and forefoot. Strap 208 has a similar configuration, but on the opposite side of the shoe. The additional crossing of the straps, 206 and 208, may aid in pulling the shoe more tightly against the foot and/or limit the rotation of the shoe due to torsional forces imparted on the shoe when climbing. As with the embodiment of FIG. 1, the straps, 206 and 208, may be positioned above the upper 212 and within tunnels or channels formed with or between the rand 210, or the straps, 206 and/or 208, may be fixedly attached to the rand 210. Tensioning of the lace 204 causes the straps, 206 and 208, to be tensioned.

[0039] FIG. 3 illustrates a shoe 300 having a similar embodiment to FIG. 2, except that the straps, 306 and 308, are positioned above the rand 310 rather than below the rand. In some embodiments, the rand 310 may be “floating” or unattached to the upper material. Positioning the straps, 306 and 308, above the rand 310 may cause the rand 310 to be pressed against the shoe and against the user’s foot as the straps are tensioned via the lace and reed based mechanism.

[0040] Referring now to FIGS. 4A-C, illustrated are various embodiments of harnesses that may be coupled with the climbing shoe. The harnesses may be used in place of the straps described in the previous embodiments. For example, as shown in FIG. 4, a harness 402 may be coupled with the shoe so that a main body portion of the harness 402 is positioned under the shoe’s rand 410. Opposing arms, 404 and 406, that extend from the harness’s main body may extend from the rand 410 and be positioned above the shoe’s upper 412. The opposing arms, 404 and 406, may be tensionable via lace (not shown) and function similar to the straps described in the previous embodiments to limit rotation of the shoe and/or pull the shoe’s arch, forefoot, and heel tightly against the foot’s arch, toes, and heel, respectively. In many embodiments, the harness 402 may be made of a single piece of material, such as fabric or various other inelastic materials. In other embodiments, the harness 402 may be made of multiple sections.

[0041] FIGS. 4A-C illustrate various embodiments of other harnesses that may be used to prevent rotation of the shoe and/or pull the shoe tightly against the user’s foot. As shown in FIG. 4B, a first embodiment of a harness 430 may have a roughly X configuration. First harness 430 may be used in instances where it is not desired to pull the forefoot of the shoe tightly against the user’s toes. This embodiment may be ideal for beginning climbers or other climbers that are mostly interested in comfort. Harness 430 includes a pair first arms 434 and a pair of second arms 432 that extend from the main body portion of harness 430 in roughly opposite diagonal directions to form the X configuration. Tensioning of harness 430 simultaneously pulls the main body portion of harness 430 toward the forefoot and heel of the shoe. As such, the tension placed on the arms, 432 and 434, slightly counteracts so that the forefoot and heel of the shoe are pulled against the foot’s toes and heel, respectively, but not as aggressively as in the other illustrated harness configurations. The angle of the arms, 432 and 434, may be varied as desired to alter the force with which the harness 430 pulls the forefoot and heel against the user’s foot.

[0042] As shown in FIG. 4A, harness 420 is similar to harness 430 except that a first pair of arms 422 extend roughly orthogonally from the main body portion of harness 420 while a second set of arms 424 extend at an angle from the main body portion. The harness 420 may be coupled with the shoe so that the first pair of arms 422 are closer to the forefoot than the second pair of arms 424. Stated differently, the harness 420 may be positioned with respect to the shoe so that the second pair of arms 424 point toward the heel of the shoe. In other embodiments, this orientation may be reversed. This configuration results in the first pair of arms 422 tensioning the shoe circumferentially about the foot so that the portion of the shoe adjacent the first pair of arms 422 is pressed or pulled tightly against the user’s foot. This configuration also results in the first pair of arms 422 counteracting the tension of the second pair of arms 424 to a much lesser degree than harness 430. As such, the second pair of arms 424 are able to pull the forefoot of the shoe more tightly against the user’s toes. This configuration may be ideal for climber’s that are relatively interested in comfort, but also concerned with increasing shoe/foot contact.

[0043] As shown in FIG. 4C, harness 440 is similar to the previous harnesses except that both a first pair of arms 442 and a second pair of arms 444 are angled in roughly the same direction with respect to the main body portion. The harness 440 may be coupled with the shoe so that the first pair of arms 442 and the second pair of arms 444 are directed roughly toward the heel. In other embodiments, this orientation may be reversed so that the first pair of arms 442 and the second pair of arms 444 point toward the forefoot. This configuration results in the tension provided of the first pair of arms 442 and the second pair of arms 444 cooperating to aggressively pull the forefoot of the shoe against the user’s toes. The config-
ration may be ideal for climbers that are most interested in maximizing the contact of the shoe with the foot in addition to limiting rotation of the shoe.

[0044] Referring now to FIGS. 5A-B, illustrated are cross-sections of a climbing shoe showing various configurations of a harness or strap. Specifically, FIG. 5A illustrates a harness 502 that is positioned above the shoe’s upper or insole 504 and below the shoe’s rand 506. The harness 502 may be positioned within channels or tunnels of the rand 506 or may be fixedly attached thereto as previously described. The rand 506 in turn is coupled with the upper or insole 504. The shoe may also include an outsole 508 that is coupled or otherwise positioned above the rand 506.

[0045] FIG. 5B illustrates a harness 512 that is positioned above an upper or insole 514 and below the rand 516. Harness 512 may transition from above the upper 514 to below the upper and within the shoe at or near the intersection of the rand 516 and the upper 514. FIG. 5B also illustrates the rand 516 “floating” or otherwise being unattached to the upper 514. In these embodiments, the rand 516 may flex or bend away from the upper 514. The shoe may also include an outsole 518 coupled with or otherwise positioned above the rand 516.

[0046] Referring now to FIG. 6A, illustrated is an embodiment in which the previously described straps and/or harnesses may be coupled with the shoe’s rand. A distal end of the strap 602 is coupled with the upper material 606 near the shoe’s eyestay 604. The strap 602 extends across the shoe’s upper 606 and is coupled with the rand 608. Tensioning of the strap 602 causes the rand 608, which is typically made of a relatively elastic material, to stretch and conform to and/or about the user’s foot. In some embodiments, the upper material 606 may also be made of a stretchable or elastic material, or a fabric material that is designed or arranged to stretch, so that the upper 606 stretches to some degree and thereby conforms to the user’s foot. In other embodiments, the upper material 606 may be made of a relatively inelastic material so that the upper 606 does not stretch as the strap 602 is tensioned.

[0047] FIG. 6B illustrates an embodiment in which the straps are replaced with lace, such as the lace that is coupled with the heel based mechanism. In such embodiments, a first guide 624 is attached to the rand 618 while a second guide 620 is attached to the upper material 616 near the shoe’s eyestay 614. The lace 612 is routed between the first and second guides, 624 and 620, and may be tensionable via operation of a heel based mechanism (not shown). The lace 612 functions similar to the previously described straps and/or harnesses. In some embodiments, the lace includes a gross adjustment components 622 that allows a length of the lace between the rand 618 and the eyestay 614 to be adjusted. For example, the lace 612 may include one or more coupling components, protrusions, or knobs that may be releasably coupled with an aperture of the second guide 620. The lace 612 may be pulled relative to the second guide 620 and coupled thereto to adjust a length of the lace between the first guide 624 and the second guide 620.

[0048] In some embodiments, it may be desirable to pull the heel portion of the climbing shoe tightly against the user’s heel and/or to adjust the fit of the heel portion of the shoe about the user’s heel. FIGS. 7A-D illustrate various embodiments that may be used to pull the heel portion of the climbing shoe tightly against the user’s heel and/or to adjust the fit of the heel portion of the shoe about the user’s heel. Referring now to FIG. 7A, illustrated is an embodiment of a climbing shoe 700 in which the lace 702 is wrapped around the heel portion of the shoe 700 to pull or press the heel portion of the shoe firmly against the user’s heel. Specifically, as the heel based mechanism 708 is operated, the lace 702 is tensioned, which presses the heel portion of the shoe against the user’s foot. The lace 702 is coupled with a guide 704 that is attached to the heel portion of the shoe. In some embodiments, the guide 704 includes a plurality of channels 706 within which the lace 702 is positioned. Repositioning of the lace 702 within a respective channel 706 vertically adjusts the position of the lace 702 about the heel portion of the shoe. This vertical adjustment of the lace 702 relative to the shoe’s heel portion alters the force with which the heel portion is pressed against the user’s heel.

[0049] FIG. 7B illustrates another embodiment of a climbing shoe 710 having a component that presses or pulls the heel portion of the shoe against the user’s heel. Specifically, the lace 712 is coupled with a first strap 714 that is in turn coupled with a second strap 716 via a coupling component 718, such as a D-ring. The second strap 716 is coupled with the heel portion of the shoe so that tensioning the second strap 716 causes the heel portion to be pulled or pressed firmly against the user’s heel. First strap 714 is tensioned as the lace 712 is tensioned via a heel based mechanism. In some embodiments, the second strap 716 may span a flexible portion 717 of the shoe that is designed to flex or bend as the second strap 716 is tensioned, thereby aiding in the heel portion of the shoe 710 being pressed or pulled firmly against the user’s heel.

[0050] FIG. 7C illustrates another embodiment of a climbing shoe 720 having a component that presses or pulls a heel portion of the shoe firmly against the user’s heel. As in the embodiment 710 of FIG. 7B, the component 724 of shoe 720 is tensioned via lace 722. The component 724 is coupled with the heel portion of the shoe so that as the component 724 is tensioned, the heel portion of the shoe is pulled or pressed firmly against the user’s heel. In some embodiments, component 724 includes an elongate strap that is coupled with the heel portion of the shoe 720. The elongate strap 724 may span a flexible portion 726, such as an opening or gap, is designed to flex or bend as the elongate strap 724 is tensioned.

[0051] FIG. 7D illustrates another embodiment of a climbing shoe 730 having a component that is configured to pull or press the heel portion of the shoe firmly against the user’s heel. Specifically, a strap 734 is coupled near the midpoint of the shoe and is positioned so as to traverse around the shoe’s heel. The strap 734 is folded back on itself near the midpoint of the shoe and functions as a guide for a lace 732. The strap 734 is also positioned within a first guide 738 (e.g., D-ring) that is coupled near the shoe’s heel and within a second guide 736 that is positioned on or about the shoe’s heel. In some embodiments, the first guide 738 is movable longitudinally relative to the shoe. The term longitudinally as used herein means a direction aligned with a line extending from the forefoot to the heel. The first guide 738 may move longitudinally relative to the shoe within or about a track 737 that is attached to or formed from the shoe 730. FIG. 7D illustrates the first guide 738 being moved from a roughly midpoint of the track 737 to a distal end of the track 737. Moving the first guide 738 longitudinally about the shoe 730 allows the force imparted on the shoe’s heel portion to be adjusted or altered, thereby allowing the force with which the heel portion of the shoe is pulled or pressed against the user’s heel to be adjusted as desired.
[0052] Referring now to FIG. 8A, illustrated is an embodiment of a reed based mechanism 808 having a knob portion 802 that is removable from a body 800 of a footwear (i.e., climbing shoe). The knob portion 802 includes a shaft 804 that is insertable within an aperture 806 of the reed based mechanism 808. The shaft 804 may be keyed so as to engage with a corresponding keyed or geared mechanism within the reed based mechanism 808. Rotation of the knob portion 802 may cause the lace 810 to be wound around a spool (not shown) that is positioned within the reed based mechanism 808. The removable knob 802 may allow a climber to tighten the shoe and then remove the knob 802 to prevent accidental opening or contact with the knob 802. A cover member (not shown) may particularly cover the aperture 806 when the knob 802 is removed to prevent dirt and debris from contaminating and/or fouling the internal components of the reed based mechanism 808. In some embodiments, the climber’s gear or apparel may include a knob storage pocket or receiver (not shown) that is configured to house the knob 802 when the knob is removed from the climbing shoe.

[0053] Referring now to FIG. 8B, illustrated is an embodiment of a climbing shoe 820 in which a reed based mechanism 822 is located remotely of the shoe. For example, the reed based mechanism 822 may be attached to a sleeve 830 that may be fit about the user’s leg. The lace 826 of the reed based mechanism 822 may be routed from the reed based mechanism 822 to the shoe 820 via tubing 824. In some embodiments, the body of the tubing may include a plurality of beads 828 having a central aperture or lumen through which the lace 826 is inserted. The beads 826 may allow the tube body to bend or flex to a relatively high degree as the user moves his or her foot during climbing. Remotely locating the reed based mechanism 822 from the shoe 820 allows the climber to use the full surface of the shoe without worrying about nearby objects contacting or hitting the reed based mechanism 822. Remotely locating the reed based mechanism 822 also prevents the reed based mechanism 822 from catching or hanging up on objects as the user climbs and manipulates the shoe 820 about challenging terrain.

[0054] FIG. 8C illustrates a similar embodiment of a climbing shoe 840 having a remotely located reed based mechanism 842. Unlike the embodiment of FIG. 8B, however, the reed based mechanism 842 is not attached to a sleeve 830. Rather, the reed based mechanism 842 may be removable attached to various objects or materials. For example, as shown in FIG. 8C the reed based mechanism 842 may be coupled with the climber’s sock. In other embodiments, the reed based mechanism 842 may be attached to the user’s pant or elsewhere as desired. The reed based mechanism 842 may include a Velcro surface, or other coupling mechanism, that allows the reed based mechanism 842 to be releasably coupled with the climber’s apparel or other objects as desired. Similar to the embodiment of FIG. 8B, the lace 846 of the reed based mechanism 842 may be routed through tubing 844 that may include a plurality of beaded surfaces 848 to increase the flexibility of the tubing 844.

[0055] Referring now to FIG. 9, illustrated is another embodiment of a climbing shoe 900 having a reed based mechanism 902 that is openable to tension lace 903 and thereby tighten the climbing shoe 900. The reed based mechanism 902 is positioned about a panel 904 that is foldable over the shoe’s tongue portion. The reed based mechanism 902 is positioned about the panel 904 so as to be located on the lateral side of the shoe 900 between the shoe’s eyestay and tongue. Positioning of the reed based mechanism 902 in this location typically decreases a chance of contact between the reed based mechanism 902 and surrounding objects since this portion of the shoe 900 is not commonly used in rock climbing. Coupling of the reed based mechanism 902 in this location and/or the use of panel 904 also relocates the closure zone 906 of the lace 903 from the shoe’s tongue toward the lateral side of the shoe. Positioning of the closure zone 906 toward the lateral side of the shoe 900 may decrease the pressure points about the user’s foot that may be formed from closure zones positioned closer to the tongue. The creation of pressure points may be problematic in climbing shoes due to the smaller shoe sizes commonly used. Decreasing such pressure points may increase the comfort of wearing the climbing shoe 900. Climbing shoe 900 also includes a first side 910a, around the heel portion of the shoe 900, and a second side 910b of the shoe. The shoe 900 may also include one or more wider straps 908a and 908b, that wrap around the shoe 900 toward the forefront of the shoe and help close the shoe 900 about the user’s foot.

[0056] Although the above embodiments are directed mainly toward climbing shoes, it should be realized that the embodiments, or various aspects or features thereof, may be used with any shoe to achieve a desired fit or tightening capability of the shoe about the user’s foot. The above embodiments are thus not limited for use only in climbing shoes, but may be used with any other type of footwear, including: outdoor shoes, sporting shoes, dress shoes, running shoes, outdoor boots, work boots, and the like.

[0057] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. Additionally, a number of well-known processes and elements have not been described in order to avoid unnecessarily obscuring the present invention. Accordingly, the above description should not be taken as limiting the scope of the invention.

[0058] Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates otherwise, between the upper and lower limits of that range is also specifically disclosed. Each smaller range between any stated value or intervening value in a stated range and any other stated or intervening value in that stated range is encompassed. The upper and lower limits of these smaller ranges may independently be included or excluded in the range, and each range where either, neither or both limits are included in the smaller ranges is also encompassed within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either or both of those included limits are also included.

[0059] As used herein and in the appended claims, the singular forms “a”, “an”, and “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to “a process” includes a plurality of such processes and reference to “the device” includes reference to one or more devices and equivalents thereof known to those skilled in the art, and so forth.

[0060] Also, the words “comprise,” “comprising,” “include,” “including,” and “includes” when used in this specification and in the following claims are intended to specify the presence of stated features, integers, components,
or steps, but they do not preclude the presence or addition of one or more other features, integers, components, steps, acts, or groups.

What is claimed is:

1. A tightening system for a climbing shoe comprising: a tension member that is routed about the climbing shoe along a path via one or more guide members; a tightening mechanism that is operationally coupled with the tension member to effect tensioning of the tension member; and a fit adjustment system having a first end, a second end, and a mid-section that extends between the first and second ends, and having a third end, a fourth end, and a mid-section that extends between the third and fourth ends, wherein:
   the first, second, third, and fourth ends are each:
   1) positioned above an upper of the climbing shoe,
   2) attached to the climbing shoe near an eyestay of the climbing shoe, and
   3) operationally coupled with the tension member so that tensioning of the tension member effects tensioning of the fit adjustment system;
   and wherein:
   1) the first end is positioned on a first side of the climbing shoe adjacent an upper portion of the eyestay,
   2) the second end is positioned on a second side of the climbing shoe opposite the first side, and is positioned adjacent a lower portion of the eyestay,
   3) the mid-section extends under an insole and diagonally across the climbing shoe between the first and second ends;
   4) the third end is positioned on the second side of the climbing shoe adjacent the upper portion of the eyestay,
   5) the fourth end is positioned on the first side of the climbing shoe and is positioned adjacent the lower portion of the eyestay, and
   6) the mid-section extends under the insole and diagonally across the climbing shoe between the third and fourth ends.

2. The climbing shoe of claim 1, wherein the fit adjustment system comprises a harness, wherein the mid-section comprises a main body, and wherein the first, second, third, and fourth ends extend from the main body.

3. The climbing shoe of claim 2, wherein the first and third ends extend approximately horizontally from the main body and the second and fourth ends extend approximately diagonally from the main body.

4. The climbing shoe of claim 1, wherein the fit adjustment system comprises a pair of independent straps, wherein the mid-section is a main body of each strap, and wherein the first and second ends and the third and fourth ends are respective end portions of each strap.

5. The climbing shoe of claim 1, wherein the first, second, third, and fourth ends are each coupled with the climbing shoe to form a loop within which the tension member is inserted, wherein each of the formed loops forms a guide member for routing the tension member along the path.

6. The climbing shoe of claim 1, further comprising a heel component that is positioned around a heel portion of the climbing shoe and operationally coupled with the tension member so that tensioning of the tension member effects tensioning of the heel component and thereby adjusts a fit of the heel portion about a user's heel.

7. The climbing shoe of claim 1, wherein the mid-section of the fit adjustment system is positioned within a channel or groove, or unattached from a rand of the shoe, so as to be slideable under the insole of the climbing shoe.

8. The climbing shoe of claim 1, wherein the mid-section of the fit adjustment system is coupled with a rand of the climbing shoe.

9. The climbing shoe of claim 1, wherein the tightening mechanism is positioned remotely of the climbing shoe or otherwise not attached directly to the climbing shoe.

10. The climbing shoe of claim 1, wherein a knob of the tightening mechanism is removably couplable to the climbing shoe.

11. A method for configuring a climbing shoe with a tightening system comprising:
   routing a tension member about the climbing shoe along a path via one or more guide members;
   operationally coupling a tightening mechanism with the tension member, the tightening mechanism being configured to effect tensioning of the tension member; and
   coupling a fit adjustment system with the climbing shoe, the fit adjustment system having a first end, a second end, and a mid-section that extends between the first and second ends, and having a third end, a fourth end, and a mid-section that extends between the third and fourth ends, wherein coupling the fit adjustment system with the climbing shoe comprises:
   1) positioning the first, second, third, and fourth ends above an upper of the climbing shoe with:
      a) the first end being positioned on a first side of the climbing shoe adjacent an upper portion of the eyestay,
      b) the second end being positioned on a second side of the climbing shoe adjacent a lower portion of the eyestay with the mid-section extending under an insole and diagonally across the climbing shoe between the first and second ends,
      c) the third end being positioned on the second side of the climbing shoe adjacent the upper portion of the eyestay, and
      d) the fourth end being positioned on the first side of the climbing shoe adjacent the lower portion of the eyestay with the mid-section extending under the insole and diagonally across the climbing shoe between the third and fourth ends,
   2) attaching the first, second, third, and fourth ends to the climbing shoe near an eyestay of the climbing shoe, and
   3) operationally coupling the first, second, third, and fourth ends with the tension member so that tensioning of the tension member effects tensioning of the fit adjustment system.

12. The method of claim 11, wherein the fit adjustment system comprises a harness, wherein the mid-section comprises a main body, and wherein the first, second, third, and fourth ends extend from the main body.

13. The method of claim 12, wherein the first and third ends extend approximately horizontally from the main body and the second and fourth ends extend approximately diagonally from the main body.

14. The method of claim 11, wherein the fit adjustment system comprises a pair of independent straps, wherein the
mid-section is a main body of each strap, and wherein the first and second ends and the third and fourth ends are respective end portions of each strap.

15. The method of claim 11, further comprising coupling the first end, the second end, the third end, and the fourth end with the climbing shoe so that each end forms a loop within which the tension member is insertable, wherein each of the formed loops forms a guide member for routing the tension member along the path.

16. The method of claim 11, further comprising positioning a heel component around a heel portion of the climbing shoe and operationally coupling the heel component with the tension member so that tensioning of the tension member effects tensioning of the heel component and thereby adjusts a fit of the heel portion about a user’s heel.

17. The method of claim 11, further comprising positioning the mid-section of the fit adjustment system within a channel or groove so that the mid-section is unattached from a rand of the climbing shoe and so that the mid-section is slidably under the insole of the climbing shoe.

18. The method of claim 11, further comprising coupling the mid-section of the fit adjustment system with a rand of the climbing shoe.

19. The method of claim 11, further comprising positioning the tightening mechanism remotely of the climbing shoe so that the tightening mechanism is not attached directly to the climbing shoe.

20. The method of claim 11, wherein a knob of the tightening mechanism is removably couplable to the climbing shoe.

* * * * *