Title: RETRACTABLE MEMBERS AND SYSTEMS FOR FOOT WEAR

Abstract: Embodiments of the present invention are directed to retractable members for use on shoes, boots and other footwear. Various embodiments are directed to a retractable member actuation systems that can facilitate the extension and retraction of retractable members such as cleats. The various embodiments include retractable members and/or components of the retractable member actuation system that may be separate from or molded as part of the sole material, such as the tread face or tread block material, or the inner sole.
RETRACTABLE MEMBERS AND SYSTEMS FOR FOOT WEAR

Cross-Reference to Related Application

[0001] The present application claims priority to U.S. Provisional Application No. 61/115,402, filed on November 17, 2008, the entire disclosure of which is hereby incorporated by reference in its entirety.

Technical Field

[0002] Embodiments of the present invention relate to footwear, such as boots, shoes, specialty field shoes, woman’s shoes, etc, and, more particularly, to retractable members and retractable member systems adapted to control extension and retraction of the retractable members relative to the bottom of the footwear.

Background

[0003] Specialty footwear is currently available for a variety of sports and other activities. For example, shoes used in some sports include cleats protruding from the bottom of the soles to improve traction and balance. Roller skates include wheels affixed to the sole of a shoe, allowing the user to glide along a flat surface such as pavement. While mobility, balance and traction may be enhanced by the specialty footwear currently available, the utility of such footwear is limited. Non-specialty footwear is much more versatile but is less than optimal for users on slick surfaces or for users who wish to alter their traction, mode of transport, height, etc. While footwear users have the option of bringing specialty footwear for use as needed, a better option is to increase the versatility of specialty and non specialty footwear.
Brief Description of the Drawings

[0004] Embodiments of the present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings. Embodiments of the invention are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings.

[0005] Figures 1A-1D illustrate a retractable member and retractable member control system in accordance with various embodiments;

[0006] Figures 2A-2L illustrate a retractable member control system in accordance with various embodiments;

[0007] Figures 3A-3L illustrate a retractable member control system in accordance with various embodiments; and

[0008] Figures 4A-4H illustrate a retractable member control system in accordance with various embodiments.

Detailed Description of Embodiments

[0009] In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which are shown by way of illustration embodiments in which the disclosure may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present disclosure. Therefore, the following detailed description is not to be taken in a limiting sense, and the scopes of embodiments, in accordance with the present disclosure, are defined by the appended claims and their equivalents.

[0010] Various operations may be described as multiple discrete operations in turn, in a manner that may be helpful in understanding embodiments of the present invention; however, the order of description should not be construed to imply that these operations are order dependent.

[0011] The description may use perspective-based descriptions such as up/down, back/front, and top/bottom. Such descriptions are merely used
to facilitate the discussion and are not intended to restrict the application of embodiments of the present invention.

[0012] The terms “coupled” and “connected,” along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Rather, in particular embodiments, “connected” may be used to indicate that two or more elements are in direct physical or electrical contact with each other. “Coupled” may mean that two or more elements are in direct physical or electrical contact. However, “coupled” may also mean that two or more elements are not in direct contact with each other, but yet still cooperate or interact with each other.

[0013] For the purposes of the description, a phrase in the form “A/B” or in the form “A and/or B” means (A), (B), or (A and B). For the purposes of the description, a phrase in the form “at least one of A, B, and C” means (A), (B), (C), (A and B), (A and C), (B and C), or (A, B and C). For the purposes of the description, a phrase in the form “(A)B” means (B) or (AB) that is, A is an optional element.

[0014] The description may use the phrases “in an embodiment,” or “in embodiments,” which may each refer to one or more of the same or different embodiments. Furthermore, the terms “comprising,” “including,” “having,” and the like, as used with respect to embodiments of the present invention, are synonymous.

[0015] Embodiments of the present invention are directed to retractable members for use on shoes, boots and other footwear. Various embodiments are directed to actuation systems for such retractable members. The various embodiments include retractable members and/or components of the retractable member actuation system that may be separate from or molded as part of the sole material, such as the tread face or tread block material, or the inner sole.

[0016] Figures 1A-1D illustrate various views of a retractable member actuation system in accordance with various embodiments of the present invention. An upper portion or inner cover 10 may be coupled to the sole of the footwear, either as an additional component or integrated as part of one
or more layers of the sole such as the inner or upper sole portion. A fluid responsive moving member, generally referred to as diaphragm 12 may be coupled to upper portion 10, thereby forming a media or fluid chamber 14. In various embodiments, a retractable member housing (or cleat housing as used in regard to the exemplified embodiment) 20 may be coupled to the inner cover 10 and include an upper cavity 18 which can accommodate movement of the diaphragm 12 towards the retractable member housing 20. In various embodiments, one or more channels 16 may be adapted to direct fluid into the fluid chamber 14, thereby causing expansion and retraction of the diaphragm 12. Channels 16 may be formed within either sole layer and/or a combination of both as shown.

[0017] A retractable member stud 22 may have a first end portion 21 that helps couple the stud to the diaphragm 12, rendering it movable therewith depending on pressurization and depressurization of the fluid chamber 14. In various embodiments the first end 21 of the retractable member stud 22 may be coupled to the diaphragm in a number of ways, including but not limited to gluing and/or integrating the retractable member stud 22 as part of the diaphragm material. The stud 22 may have a second or distal end portion 23 adapted to allow a retractable member (e.g. a cleat) 24, to couple thereto (for example, via a threaded arrangement). The stud 22 may have a body portion 25 that may be sized and/or shaped the same as or differently than the second end portion 23 and adapted to pass through a similarly sized and/or shaped aperture 27 in a retractable member stop 26 disposed in the retractable member housing 20. In various embodiments, the geometric shape of the body portion 25 and corresponding stop aperture 27 may be such that rotation of the retractable member within the retractable member housing due to torsional forces encountered by the retractable member may be resisted.

[0018] The retractable member housing 20 may include a retractable member cavity 28 and sized to accommodate retractable member 24. So configured, as the diaphragm 12 expands due to pressurization of the fluid chamber 14, the retractable member 24 may move axially outward from the
retractable member cavity 28 and retractable member housing 20. When
the fluid is removed from fluid chamber 14, the depressurization of the fluid
chamber may allow the retractable member 24 to axially move back into the
retractable member cavity 28 and retractable member housing 20.

[0019] In various embodiments a retractable member seal 29 may be
disposed about the retractable member cavity 28 and size to closely
surround and/or engage retractable member 24 in such a manner that
retractable member 24 may move axially with respect to retractable member
housing 20, and yet debris, water and the like, may be resisted from
penetrating the seal and entering the retractable member cavity 28 of
retractable member housing 20. In various embodiments a variety of seal
mechanisms may be used, including but not limited to a flange, O-ring, lip
seal, labyrinth seal, etc. In one embodiment, a tapered seal may be used
such that as the retractable member 24 retracts axially into the retractable
member housing 20, any debris that is adhered to the retractable member
may be effectively scraped off as it passes the edge of the seal 29 and into
the retractable member housing 20.

[0020] Figures 2A-2L illustrate respective views of a retractable
member actuation system in accordance with various embodiments. A sole
portion 200 may include a plurality of retractable member housings 220 that
are coupled thereto. A fluid chamber 214 may be disposed on or within all or
part of sole 200. In various embodiments, a retractable member stud 222
may include a second end portion 223 adapted to couple to a retractable
member 224, such that movement of the stud 222 may cause axial
movement of the retractable member 224. The retractable member 224 may
be sized to axially move within retractable member cavity 228 of retractable
member housing 220. Stud 222 may have a first portion 221 that helps align
the stud 222 within and stud cavity 231 and further helps minimize side to
side movement within the cavity 231. First portion 221 may also help form a
seal with a stud cavity 231 of retractable member housing 220, such that
fluid may be kept from entering the stud cavity 231 or otherwise getting
between the first stud portion 221 and the stud and retractable member stop
226. In various embodiments, the first stud portion 221 may include an o-ring seal seat 260 and an o-ring 262 to provide the sealing mechanism.

[0021] The retractable member stud 222 may have a body portion 225 that in various embodiments may be of a variety of configurations to help resist rotational movement when engaged with a correspondingly shaped stud aperture 227 in the stop 226. The upper portion of the first stud portion 221 may be exposed to the fluid chamber 214. Thus, as the pressure is increased in the fluid chamber 214 the retractable member stud 222 may be forced to move axially outward, thereby causing the retractable member 224 to extend axially outward from the retractable member housing 220. In various embodiments a seal 229 may be coupled to the end of the retractable member housing 220 so as to help resist infiltration of debris into the retractable member housing cavity 228.

[0022] In various embodiments, fluid within the fluid chamber 214 may be used to move the retractable member stud 222 and thus drive retractable member 224 axially with respect to the retractable member housing 220. In various embodiments, the axial movement of the retractable member 224 may be limited to the distance equal to or less than the height of stud cavity 231. In various embodiments, the distance of axial movement of the stud 222 is illustrated by distance 233.

[0023] To cause actuation of the retractable members, fluid chamber 214 may be disposed under portions of the foot that experience the primary downward forces when the wearer is walking, running or moving in general. In various embodiments, such locations may include the heel area 237, the ball of the foot area 239, and/or the area along the outside of the foot, generally opposite the arch. So position, as the footwear user steps on one of these designated pressure areas, a flexible upper portion 240 of the fluid chamber 214 may depress, thus forcing the fluid in the fluid chamber 214 to act on the upper stud portion 221, thereby causing the stud 222 to move into the stud cavity 231. Such movement will drive the attached retractable member 224 to move axially outward of the retractable member housing 220. In various embodiments, the outward extension of the retractable
members may be limited by the upper stud portion 221 engaging stop 226. Likewise, the inward movement of the retractable members 224 may be limited by the retractable member 224 engaging the stop 226.

[0024] In various embodiments, the fluid chamber 214 may be disposed directly over the top surfaces of the upper stud portions, such as in the case where the retractable members 224 generally directly underlie the heel force region. In various embodiments where the retractable members 224 may be somewhat offset from the general foot force region, such as the ball of the foot, channeling 216 may be employed to direct the fluid from the fluid chamber 214 to the first stud portions 221 in order to cause axial movement of the offset studs 222 and corresponding retractable members 224. In various embodiments, a combination of direct overlie and channeling may be used.

[0025] In one embodiment, as the wearer is running, for example, as the wearer first steps on the heel, fluid will be forced from the heel fluid chamber thereby forcing the retractable members under the heel to move axially out of the retractable member housing. Where the retractable members are cleats, for example, this may help improve traction generally at the moment when the traction is needed most. As the wearer rocks towards the ball of the foot and applies pressure to the forward fluid chamber, the force on the forward fluid chamber will cause displacement of the studs and force axial movement of the retractable members at the forward portion of the footwear. In the cleat example, as illustrated, this again may cause extension of the cleats at the time that traction may be needed the most.

[0026] In various embodiments, the retractable member actuation system may be configured by having the chamber upper portion 240 couple to a sole first part 210 (e.g. upper or inner sole), thereby forming a part of the fluid chamber 214. A lower sole portion 211 having a partial recess 213 dimensionally similar to the upper portion 240 of the fluid chamber may be bonded to the upper sole portion 210, thereby forming the fluid chamber 214. In various embodiments, the lower sole portion may carry the retractable member housings 220.
In various embodiments, the flexible upper portion 240 of the fluid chamber 214 may be made of a resilient material that will tend to move back to a home undepressed position as the force is removed, thereby helping to urge the studs 222 to move in the reverse axial direction and urge retraction of the retractable members 224 back into the retractable member housing 220. In various embodiments, biasing members may be disposed in the fluid chamber 214 to increase resistance to fluid chamber deformation, where the forces applied are particularly high (e.g. heavier person or highly mobile sport), as well as help urge movement of the flexible upper portion 240 to its home position. In various embodiments, a biasing member may be disposed in the stud cavity to help accomplish the same effects. Biasing members may include elastomers, springs, or other resilient members. In one embodiment, a honeycomb structure may be disposed in the fluid chamber.

In various embodiments, the fluid chamber of a designated pressure region, for example the heel region, may be coupled to the retractable members in a different region of the sole, such as the toe area, via channels. Thus, when pressure is exerted on the fluid chamber in the particular pressure zone, the retractable members in a different portion of the footwear sole will extend. This may generally be referred to an opposite drive effect. In various embodiments, this may allow the wearer to extend the forward retractable members by pressing down on one heel. Once extended, the retractable members may be locked in the extended position. To lock the retractable members in place, a valve closure system may be used to prevent fluid from flowing back to the fluid chamber when the force is released. Likewise a valve may be used to lock the retractable members in a retracted position or any position between fully retracted and fully extended. In various embodiments, a mechanical locking system may be used to lock the retractable members in place.

Figures 3A-3L illustrate various views of a retractable member actuation system in accordance with various embodiments. Illustrating a similar actuation system as that described with respect to the example
embodiment shown in Figures 2A-2L, Figures 3A-3L illustrates another embodiment of a retractable member design, such as a cleat for use in sports such as football, baseball and soccer. In various embodiments, the movable or retractable member is disposed on the outside of the retractable member housing, which may increase the strength of the retractable member.

[0030] In various embodiments, the retractable member may have a retractable member inner cavity 344 adapted to engage a protrusion 348 of retractable member housing 320 and move axially relative there to. A stud coupling member 350 may be disposed in retractable member inner cavity 344, and adapted to couple to the stud second end portion 323, such that axial movement of the stud 322 will cause axial movement of the retractable member 324 about retractable member housing protrusion 348. Actuation of the stud 322 via movement from the fluid chamber 314 may cause the inner wall of the retractable member cavity 344 to generally slide along the outer portion of the retractable member housing protrusion 348. Similarly, the outer portion of the stud coupling member 350 may slidingly engage the retractable member housing protrusion cavity 352.

[0031] Retractable member configurations in accordance with such embodiments provides enhanced surface to surface engagement and therefore improves support for the retractable member. This may enhance the strength and ability to withstand laterally directed forces. Further, in such embodiments, the double engagement of the retractable member with the housing protrusion may also provide two retractable member seals 329 and 329’, which may improve the resistance of infiltration of debris into the actuation system. In various embodiments, the amount of engagement between the retractable member and the retractable member housing protrusion can vary to increase or decrease support or increase or decrease resistance to movement there between.

[0032] Figures 4A-4G illustrate a retractable member actuation system in accordance with the various embodiments. The footwear may have an external or partially external fluid reservoir 415 disposed in a region
of the footwear which does not typically encounter force during walking, running or other typical movements. In various embodiments, the external fluid reservoir 415 may be disposed in the arch region of the footwear. The fluid reservoir 415 may be coupled to a retractable member driver systems (e.g. diaphragm system of Figures 1 or sealed stud system of figures 2 and 3) via channels 416. To actuate the retractable members, an external reservoir actuator 460 may force fluid from the external fluid reservoir 415 into the actuation system fluid chambers 414 disposed about the retractable member actuators 422 (e.g. studs) to actuate the retractable members 424.

In various embodiments, the external fluid actuator 460 may be, for example, a strap that when tightened drives the fluid in the retractable member actuation system (as illustrated). In various embodiments, the external fluid actuator may be a zipper that when zipped compresses the external fluid reservoir and forces the fluid into the retractable member actuation system. In various embodiments, other drivers may be used.

In various embodiments, the retractable members 424, when actuated, may be generally held in the extended position by ensuring the external fluid reservoir actuator is held in position where the external reservoir 415 remains compressed. In various embodiments, the locking of the retractable members in either the extended or retracted position may be enhanced by actuating a valve 470 such that the fluid may be prevented from flowing back into or out of the external fluid reservoir 415.

To retract the retractable members 424, the pressure on the exterior fluid reservoir 415 may be released. The retractable members may be retracted by resiliency in the actuation mechanisms, examples of which were described above, and/or via pressure exerted by the user on the retractable members 424.

The term “fluid” used herein is used in the broadest sense, and includes, but is not limited to, liquids, such as hydraulic fluids and self sealing liquids, and gasses, such as air.

Although certain embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art
that a wide variety of alternate and/or equivalent embodiments or implementations calculated to achieve the same purposes may be substituted for the embodiments shown and described without departing from the scope of the present invention. Those with skill in the art will readily appreciate that embodiments in accordance with the present invention may be implemented in a very wide variety of ways. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that embodiments in accordance with the present invention be limited only by the claims and the equivalents thereof.
Claim

I claim:

1. An article of footwear, comprising:
   A plurality of retractable members configured to move relative to a bottom portion of the footwear; and
   A control system coupled to the retractable members configured to extend and retract the retractable members relative to the bottom portion of the footwear.