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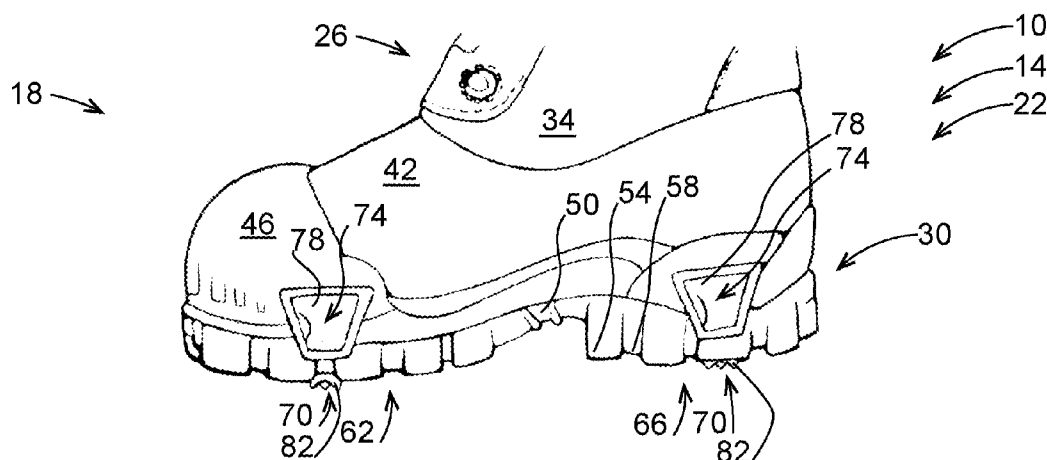
ABSTRACT

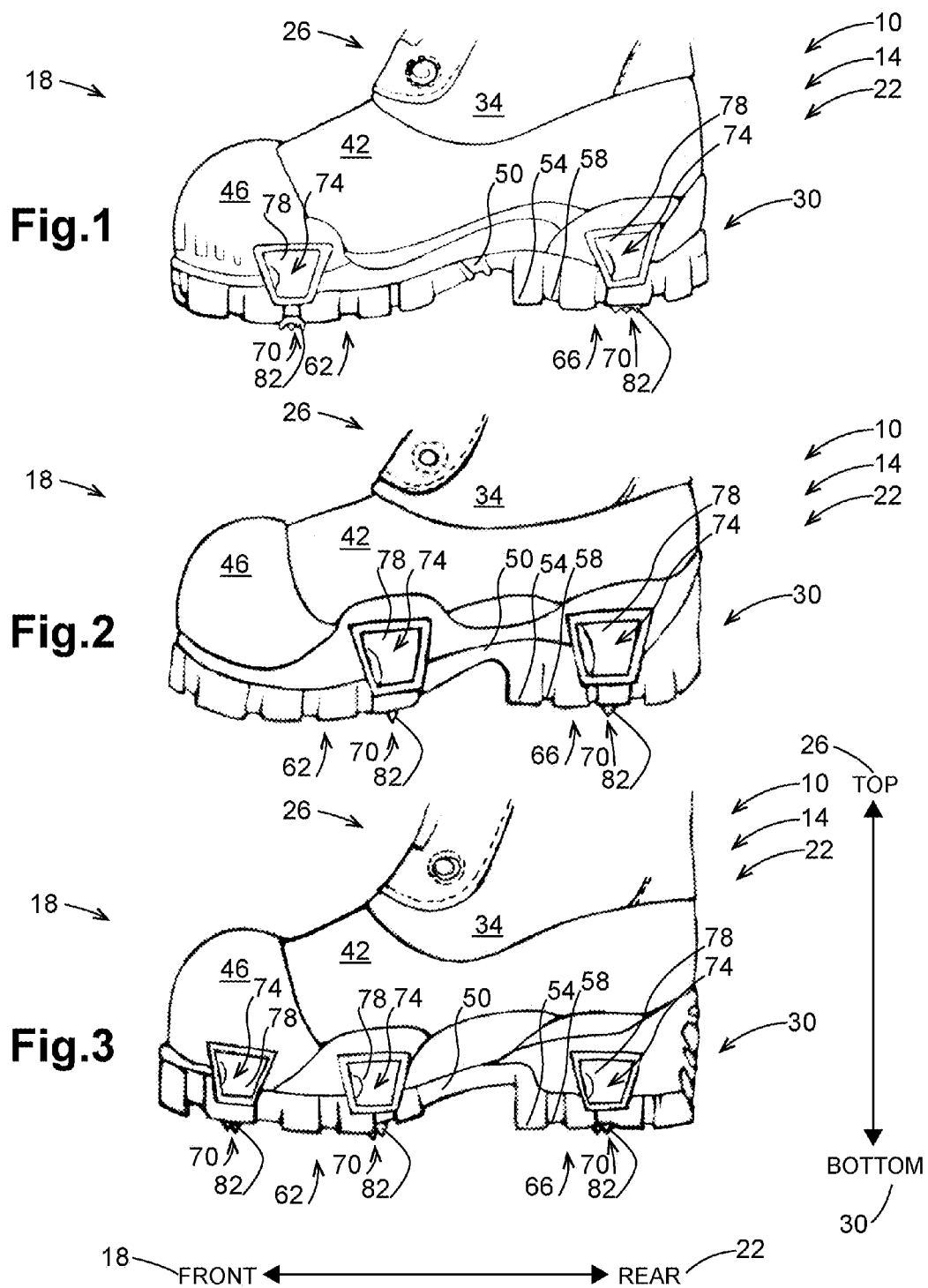
(22) Filed: **Jan. 9, 2015**

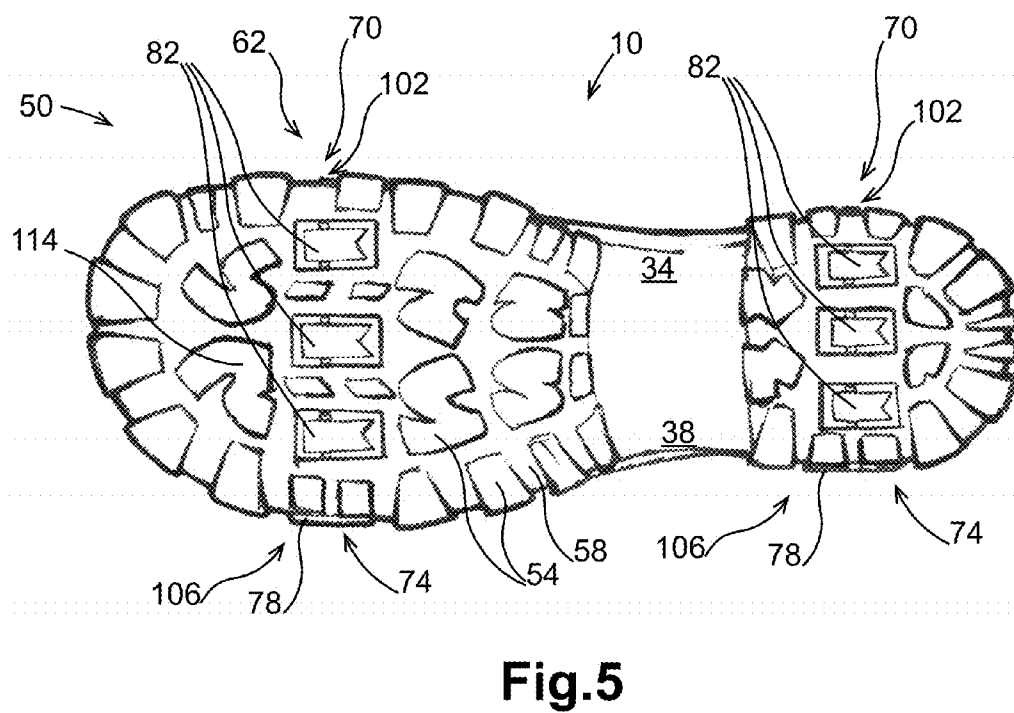
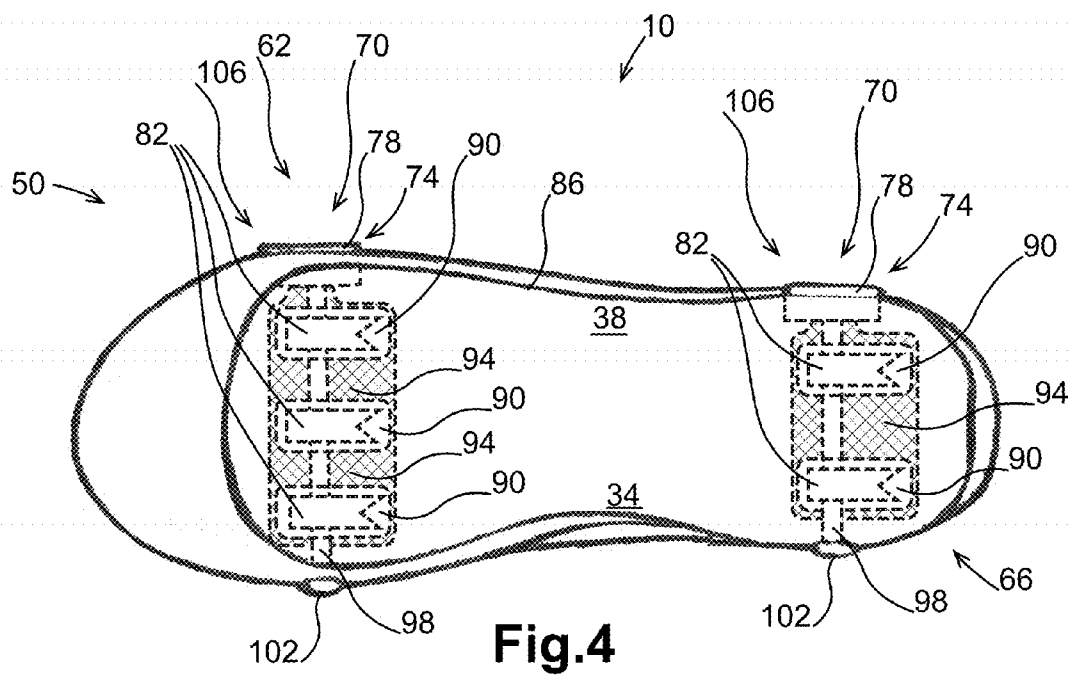
A footwear including a retractable anti-slip mechanism is presented, the anti-slip mechanism comprising at least one retractable ground-engaging member disposed in a sole of the footwear and pivotally connected to a pivot member extending on a side of the footwear for selectively expanding the at least one retractable ground-engaging members under the sole to engage with the ground and retracting the at least one retractable ground-engaging members in the sole to prevent engaging the ground.

Related U.S. Application Data

(60) Provisional application No. 61/933,486, filed on Jan. 30, 2014.







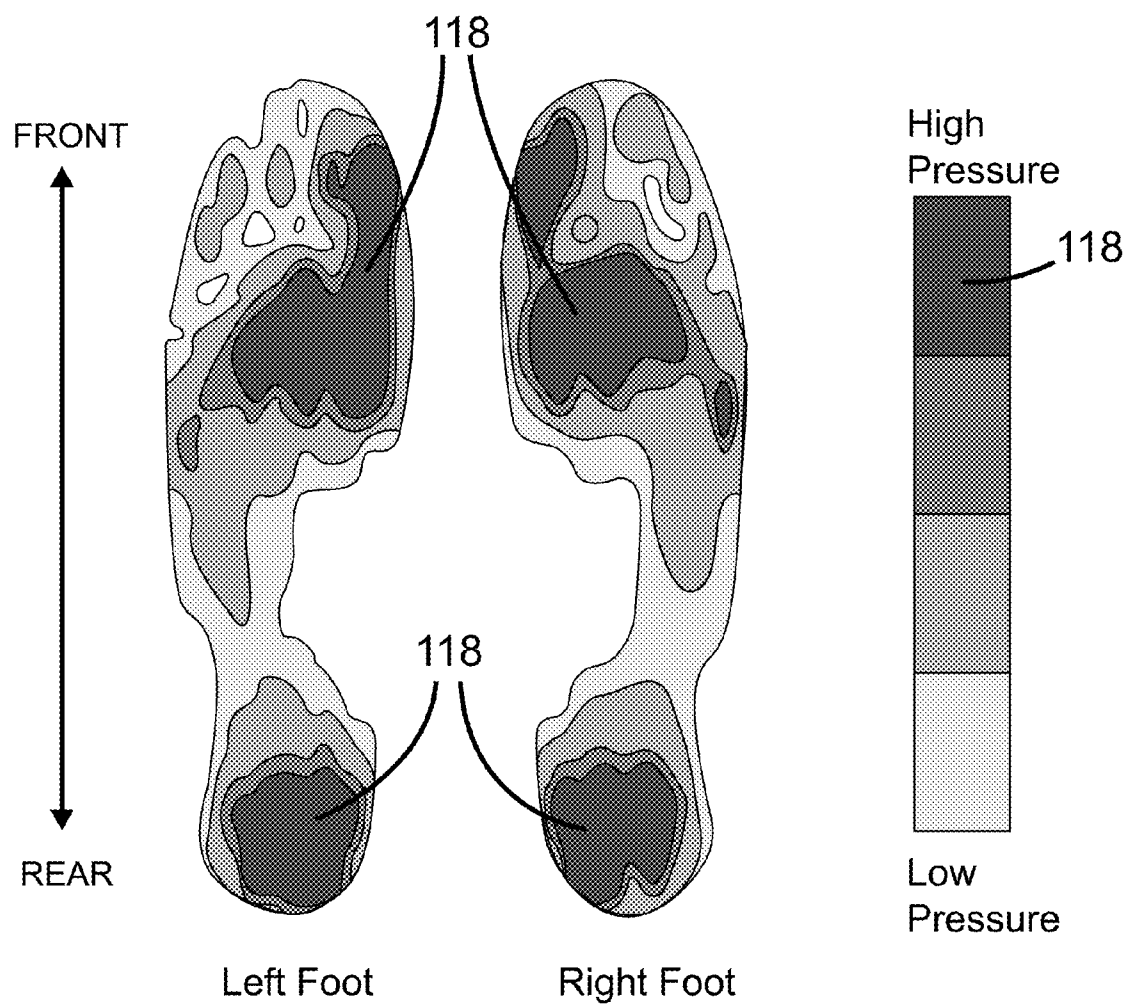


Fig. 6

Fig.7

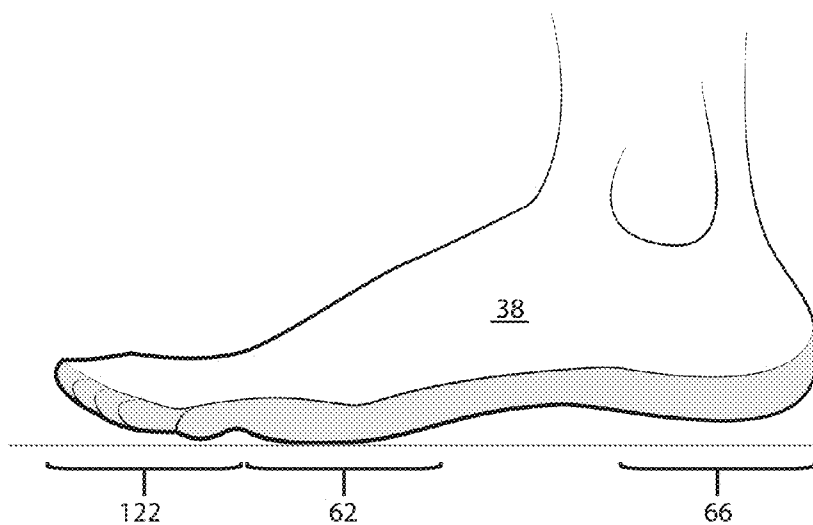


Fig.8

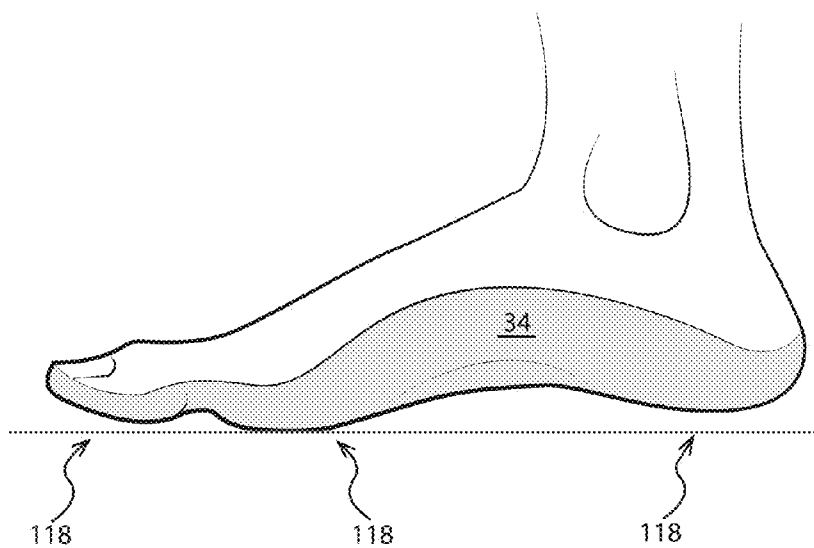
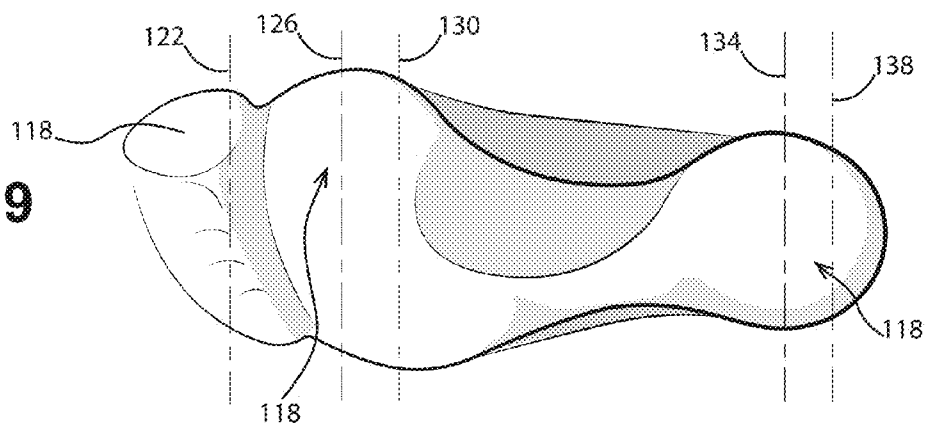


Fig.9



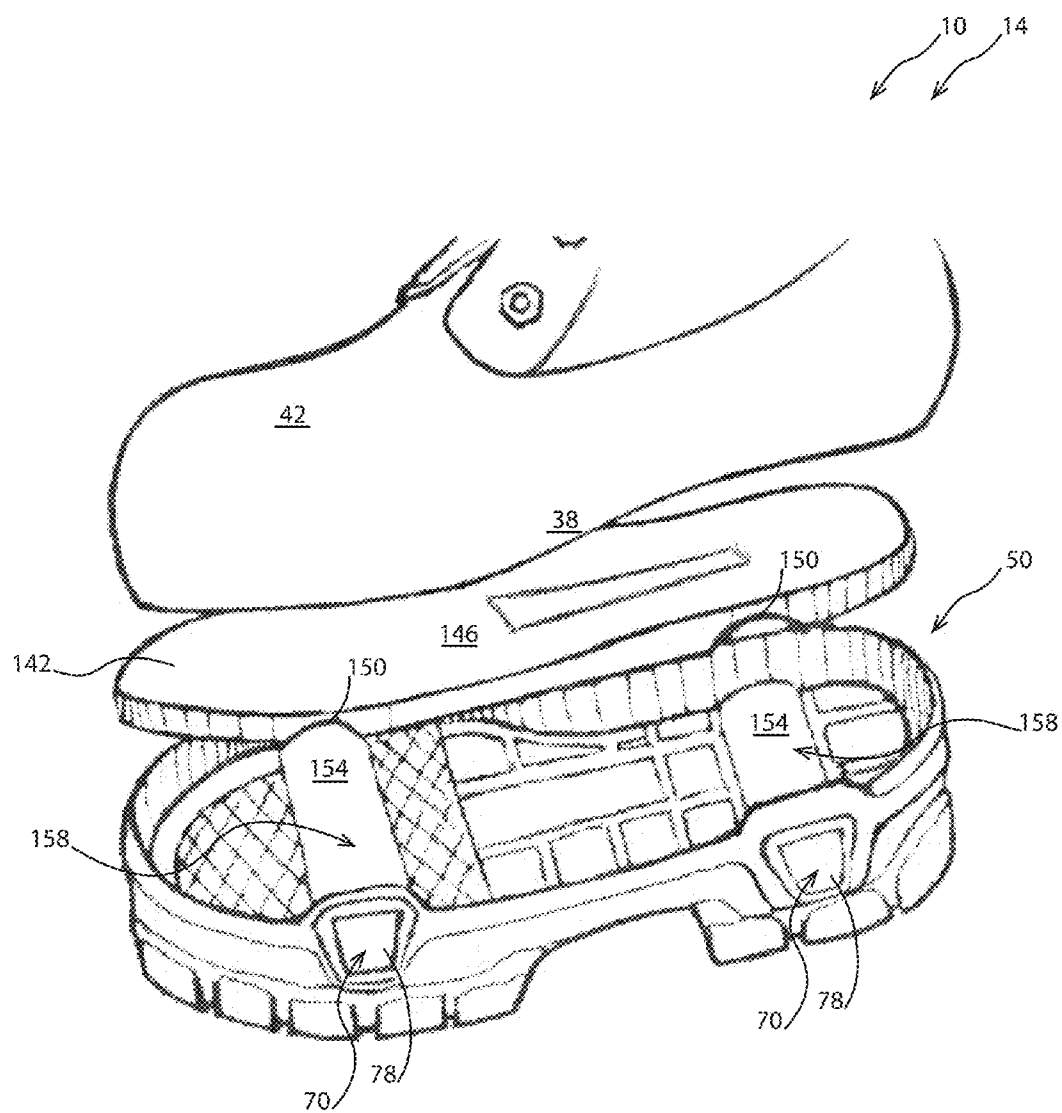


Fig.10

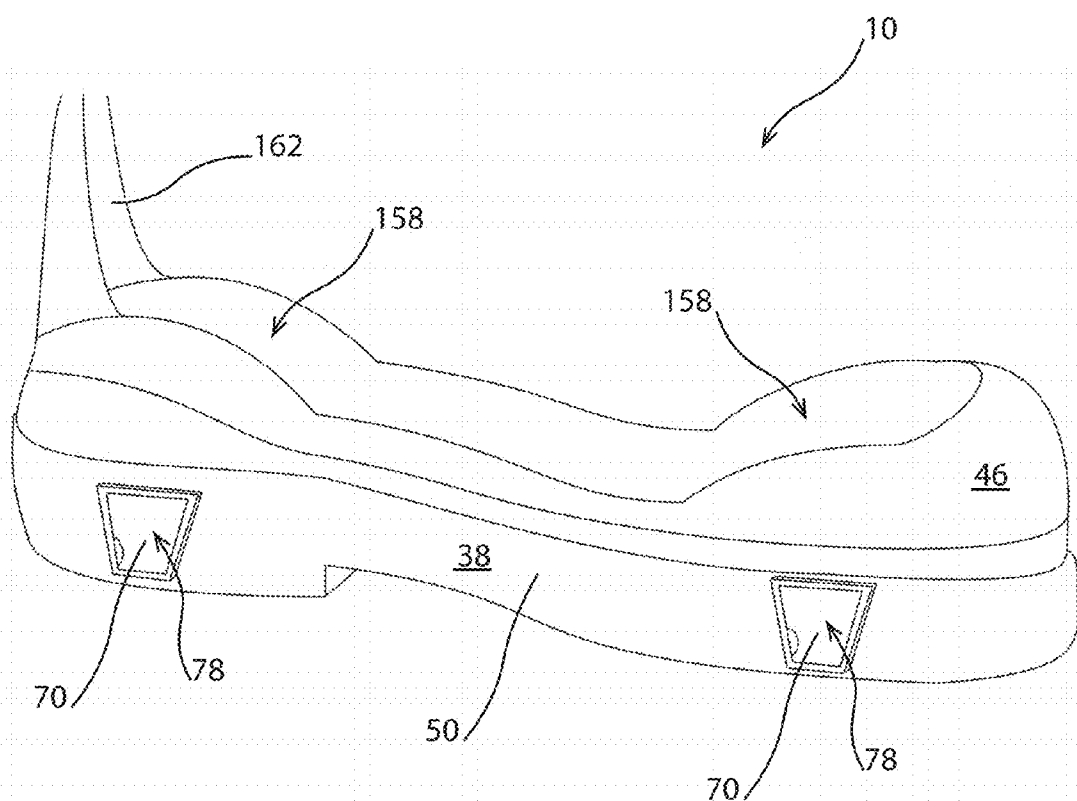


Fig.11

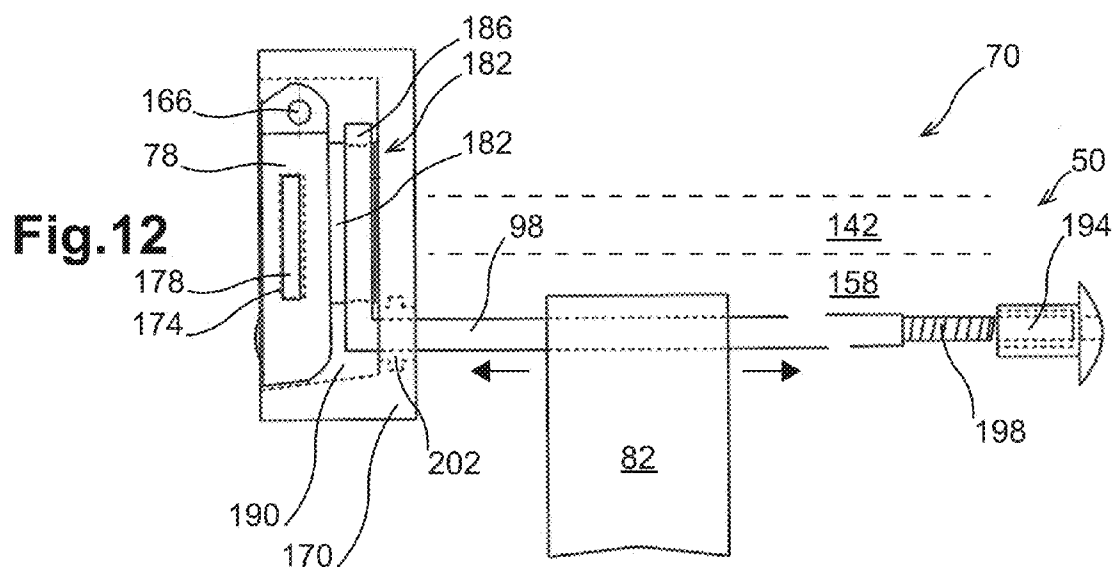


Fig.13

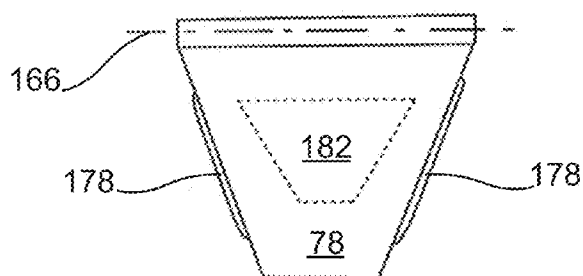
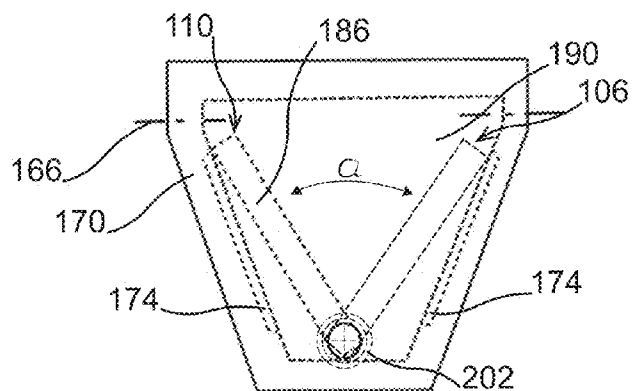


Fig.14



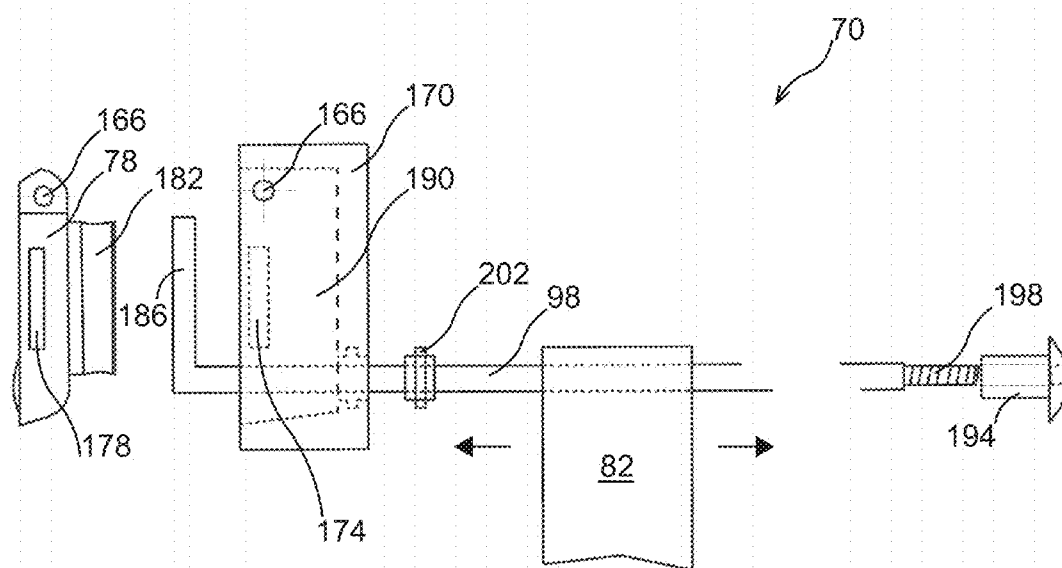


Fig. 15

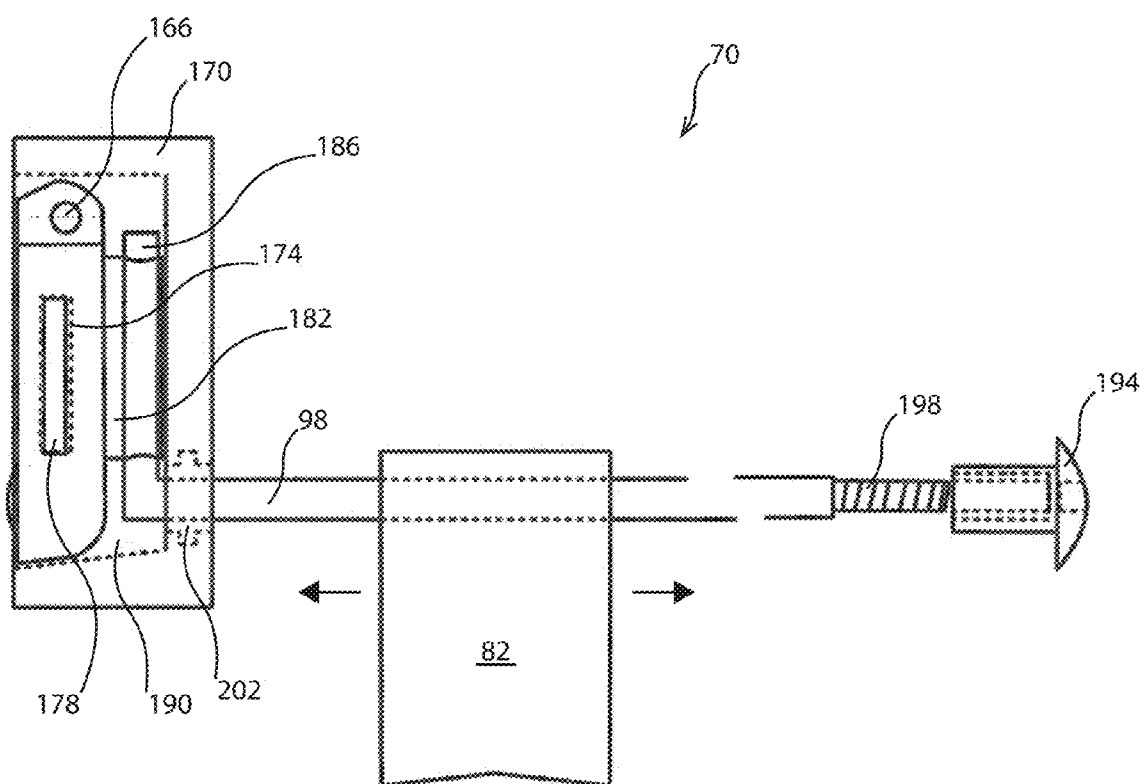


Fig.16

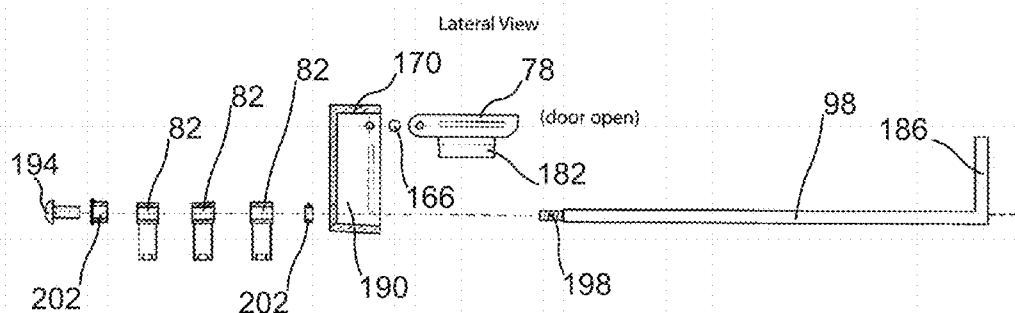


Fig.17

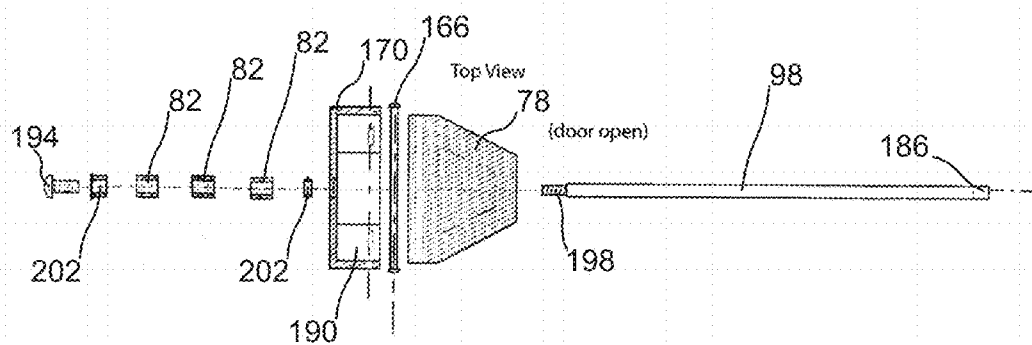


Fig.18

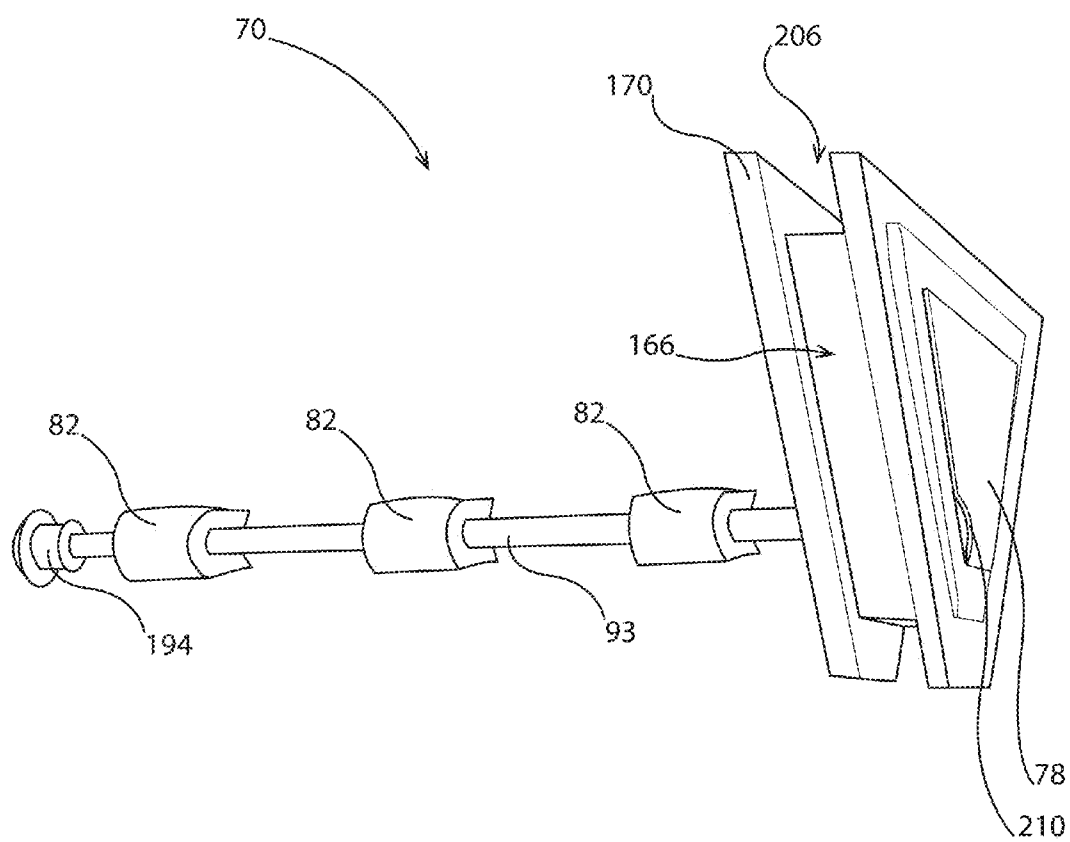


Fig.19

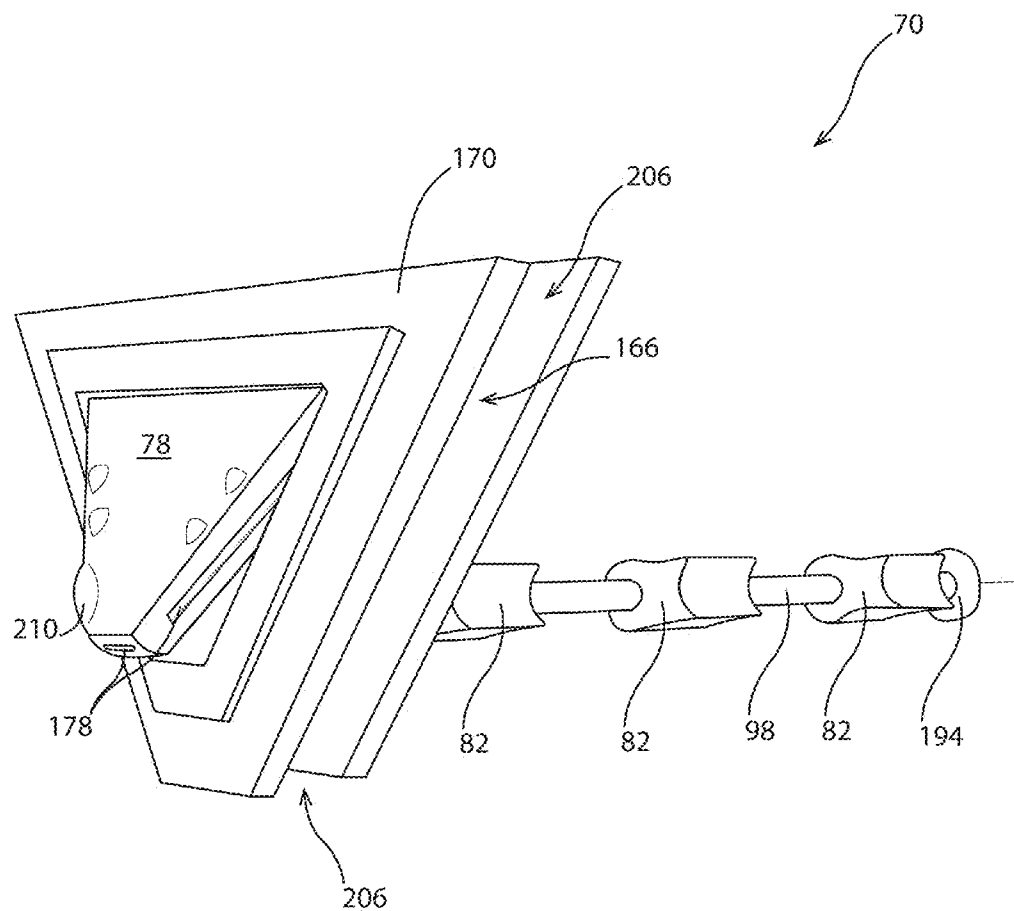


Fig.20

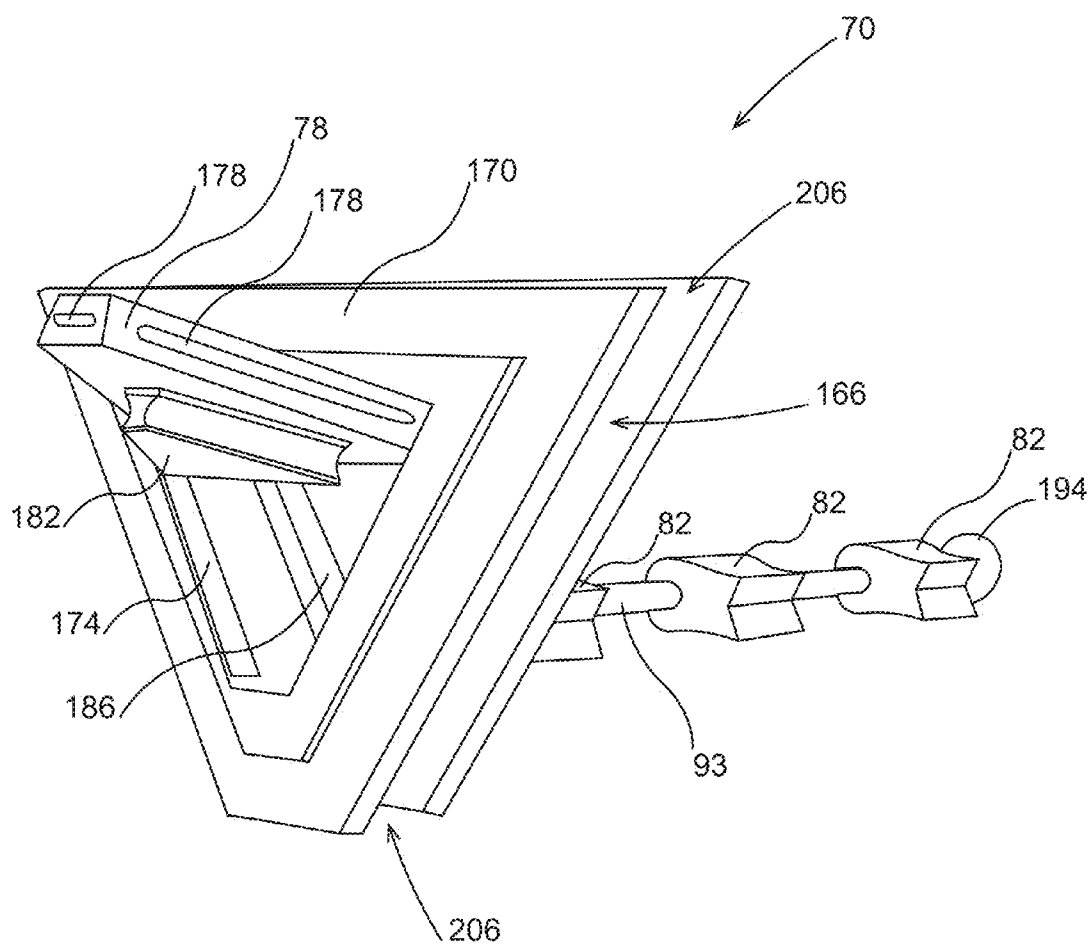
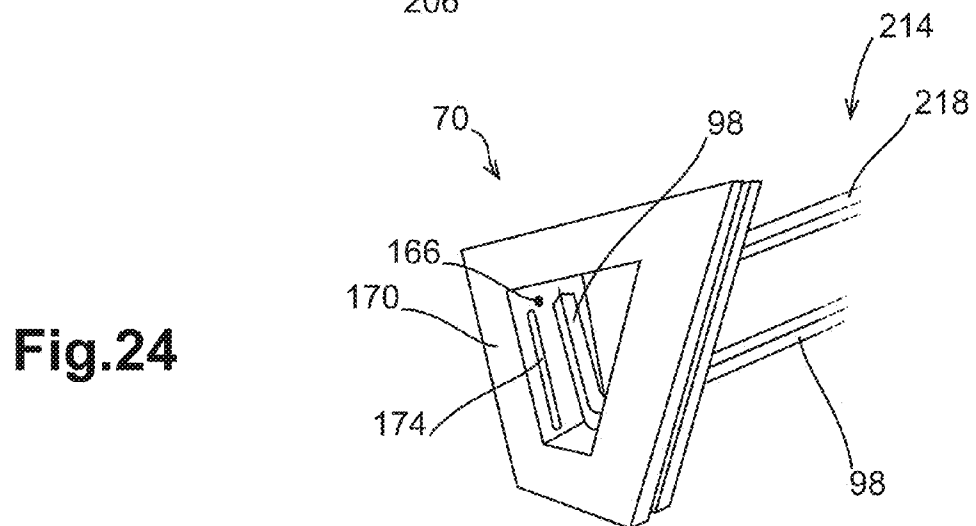
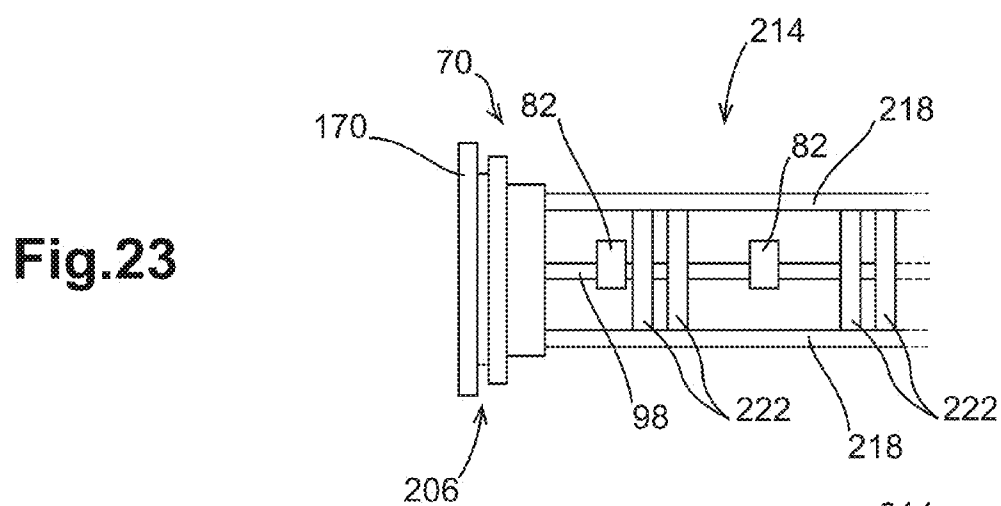
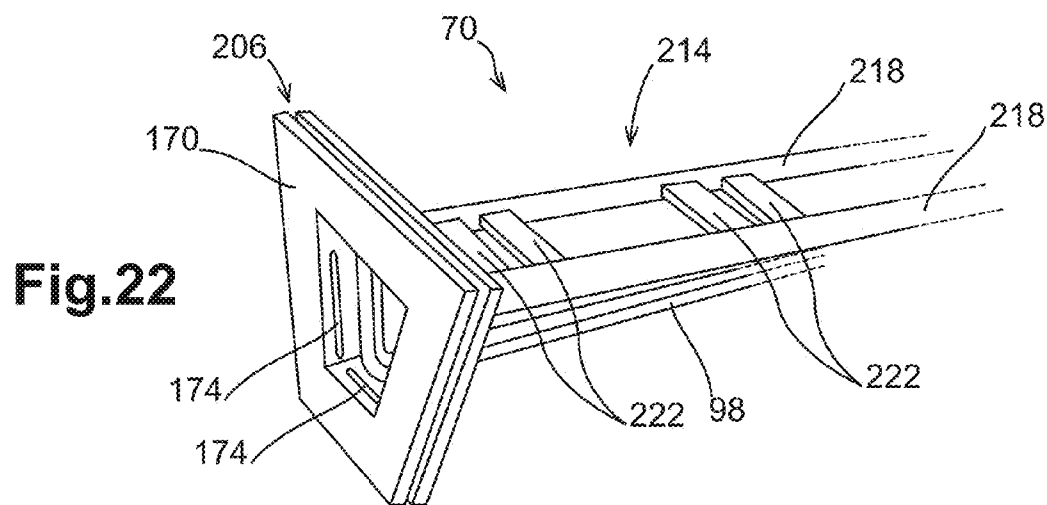
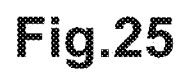


Fig.21





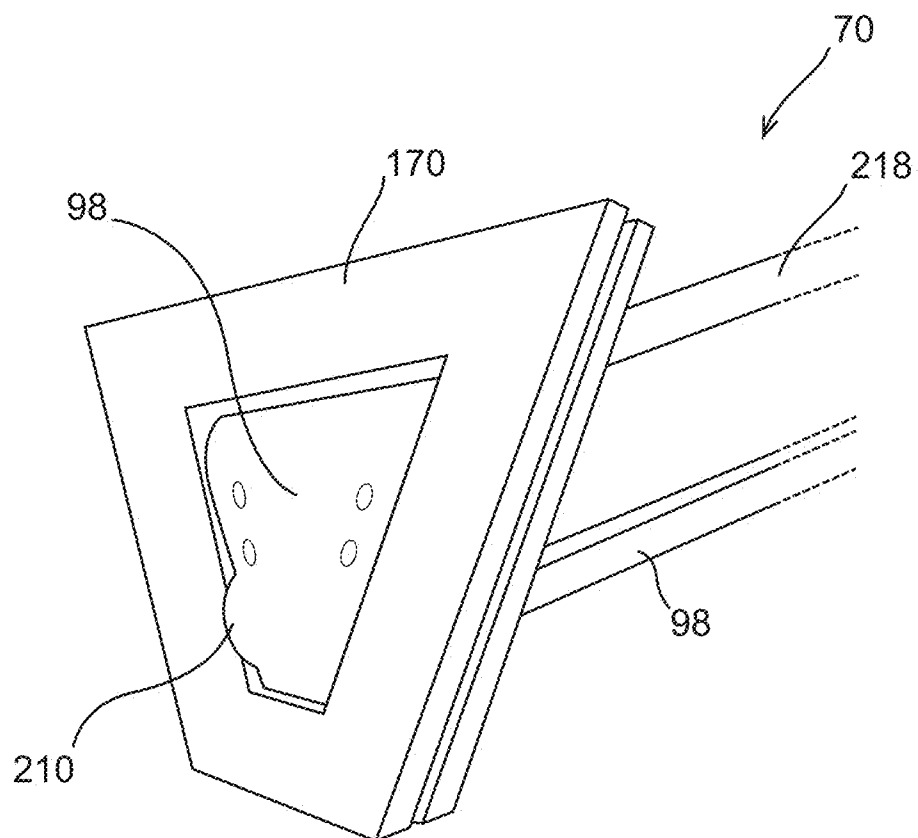


Fig.26

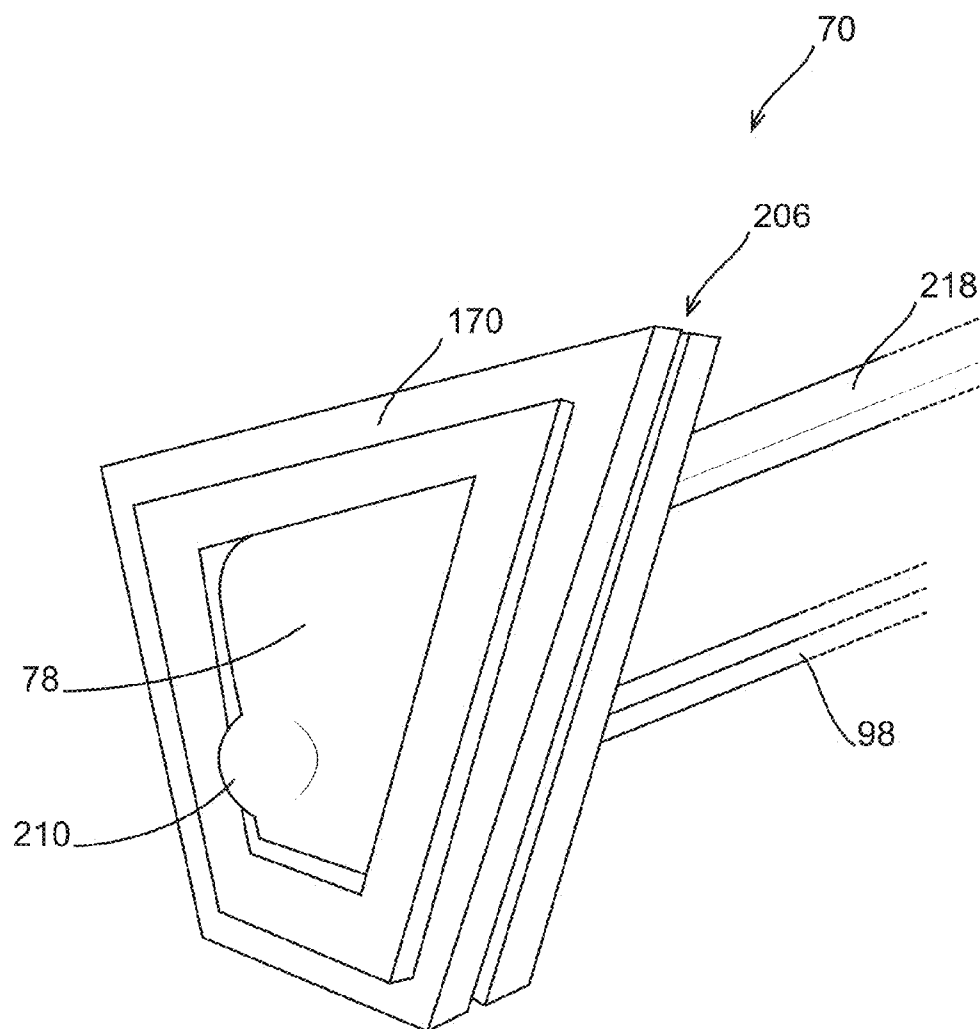


Fig.27

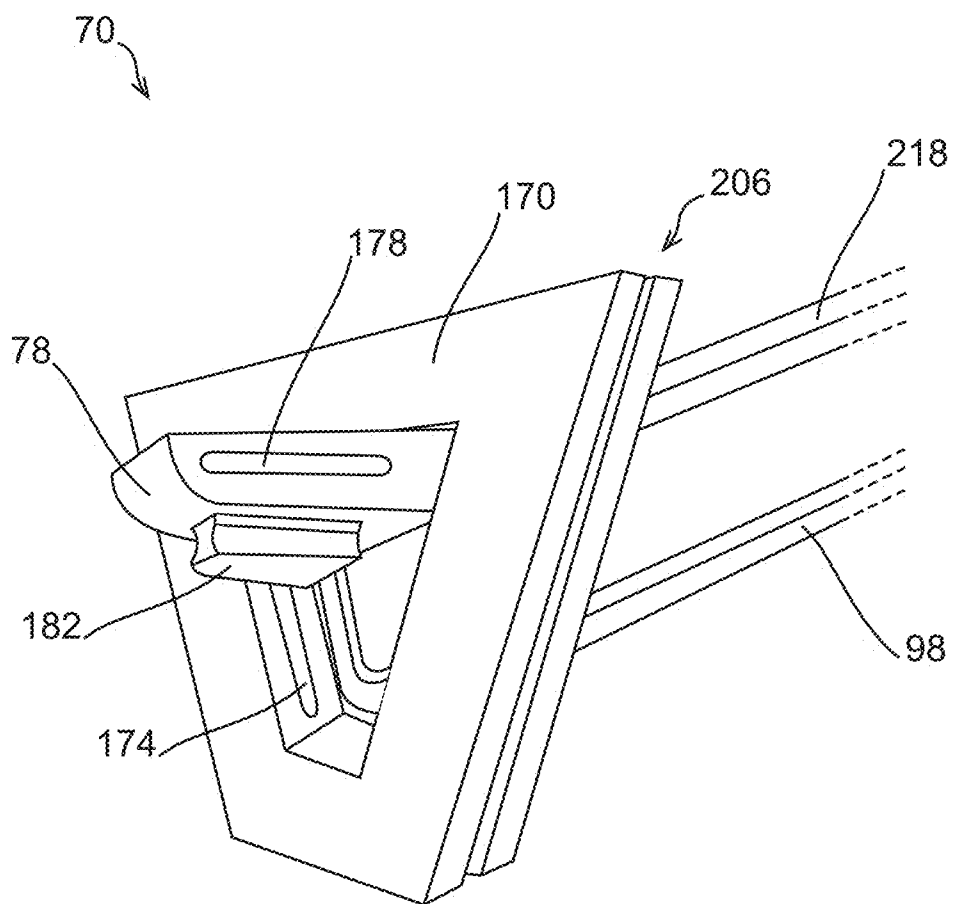


Fig.28

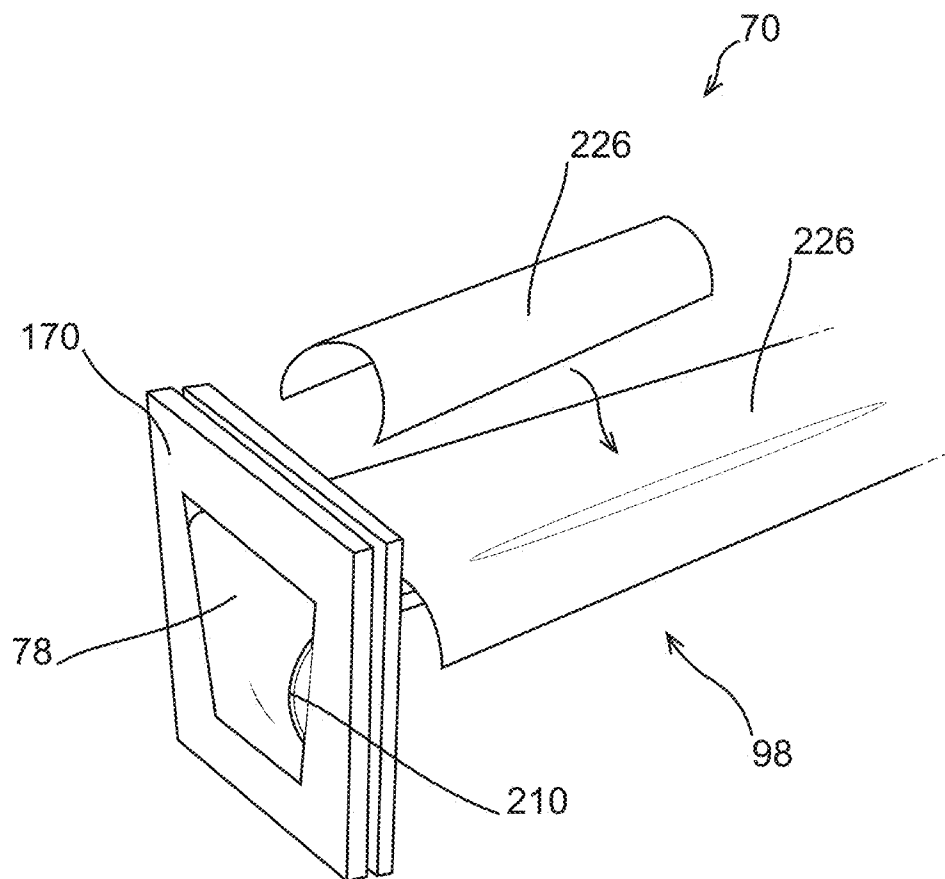


Fig.29

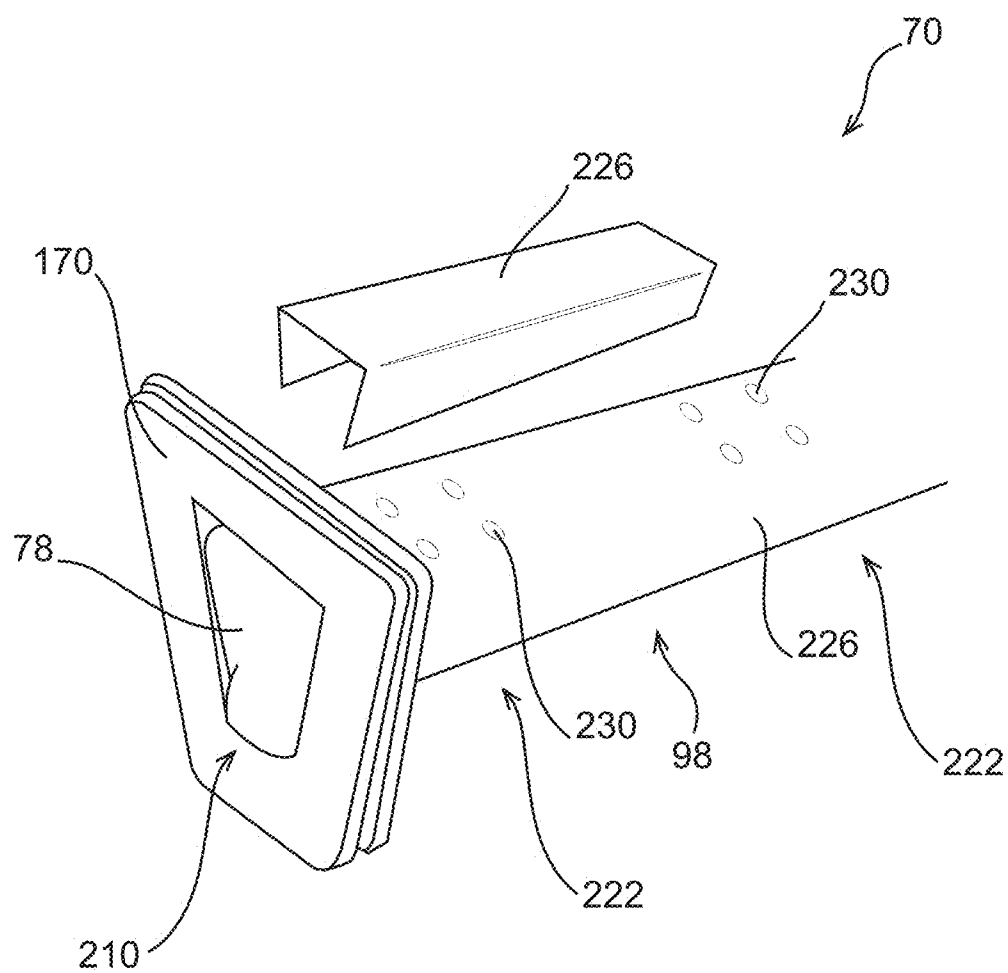


Fig.30



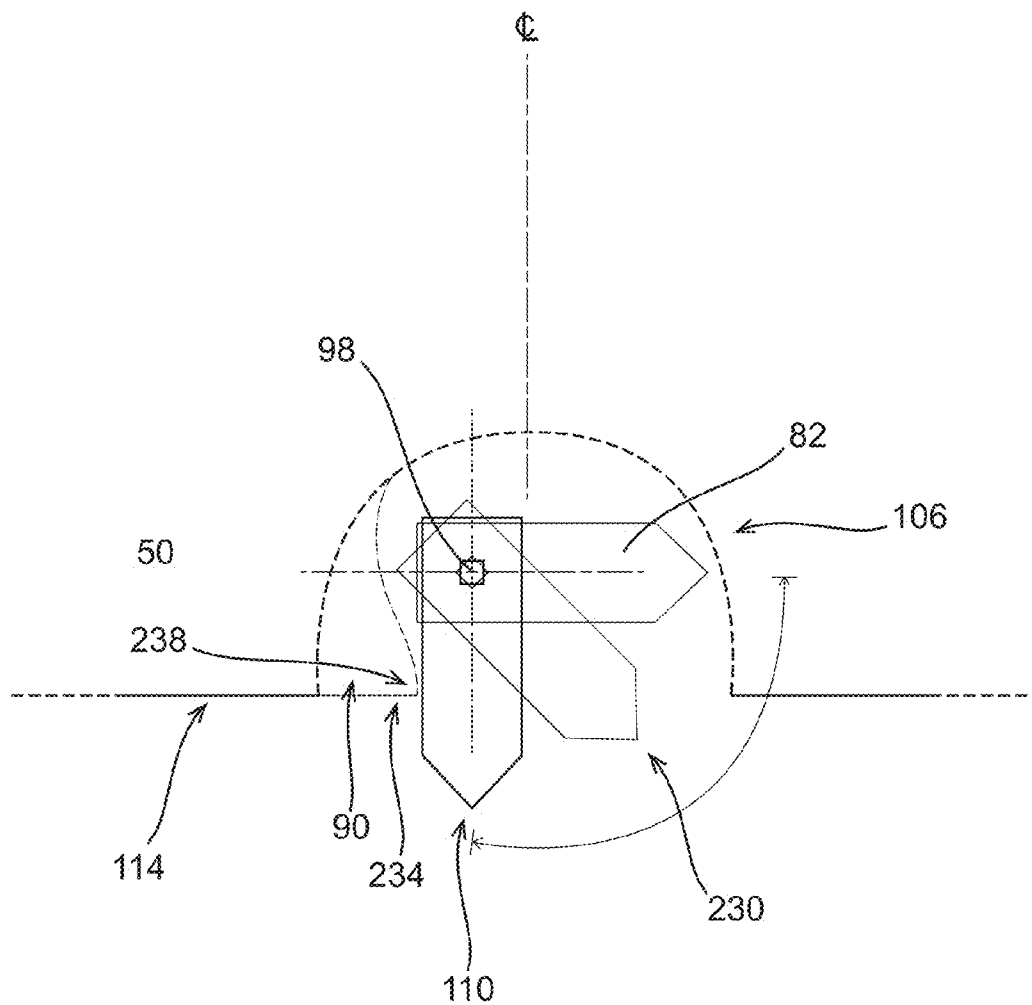


Fig.32

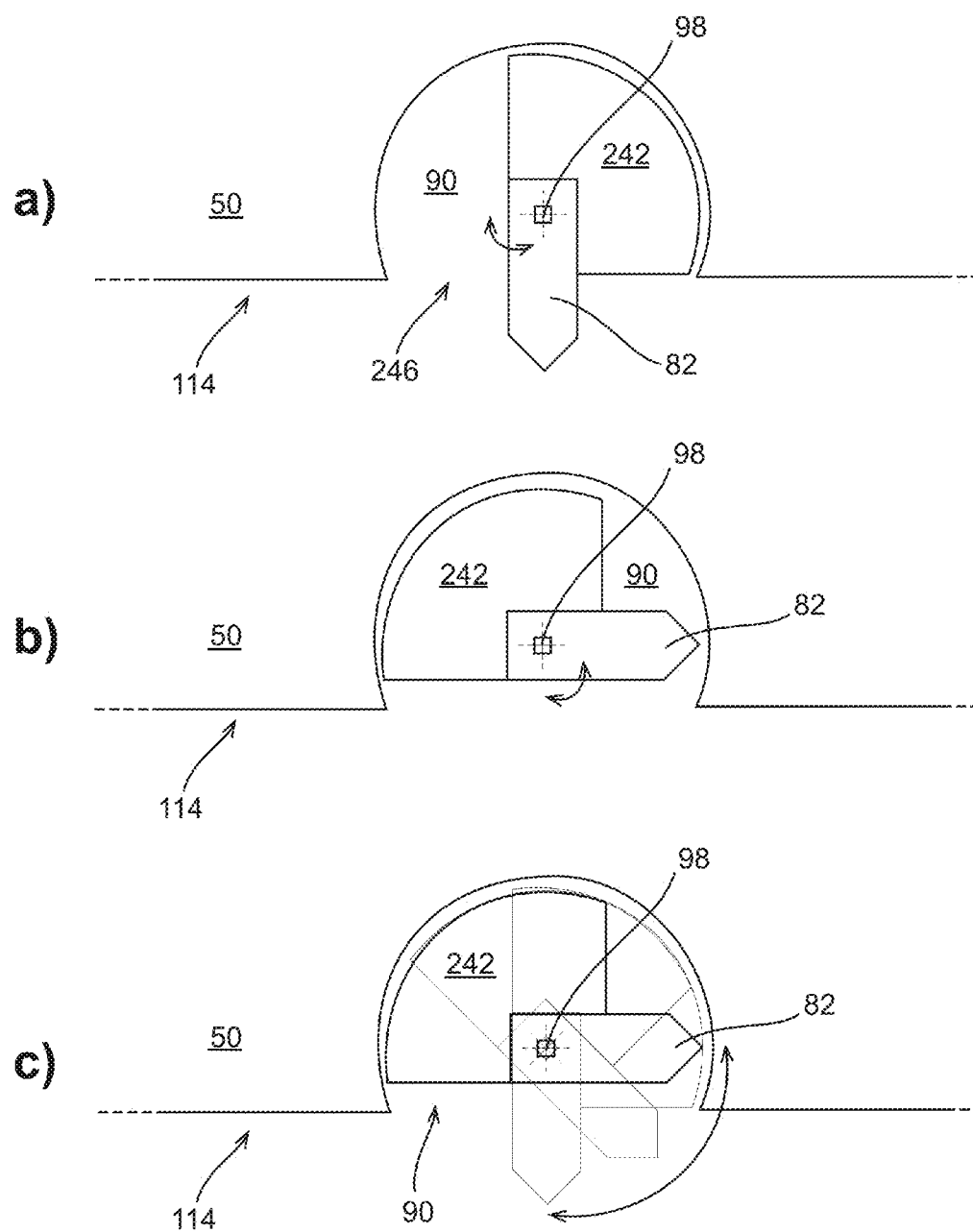


Fig.33

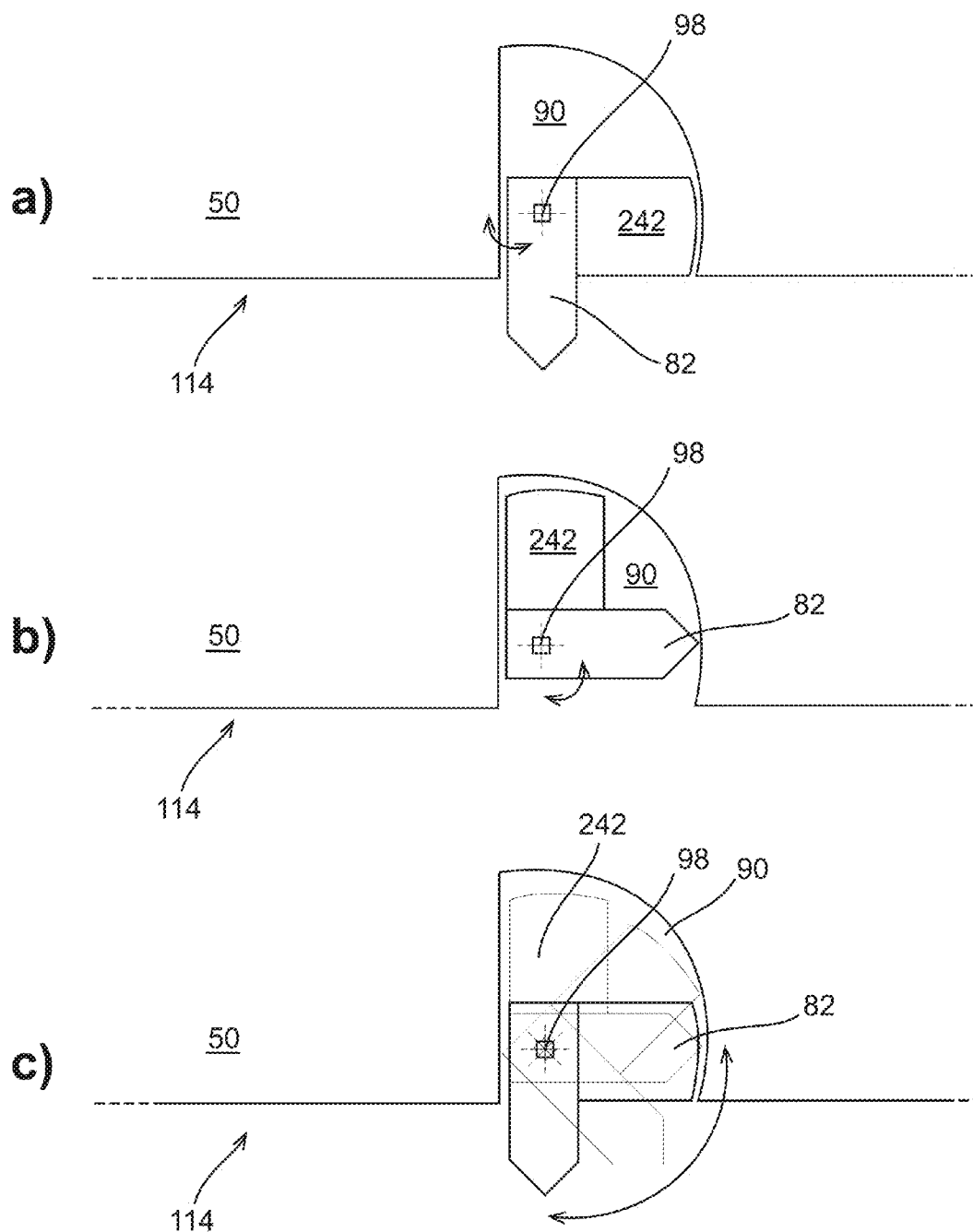


Fig.34

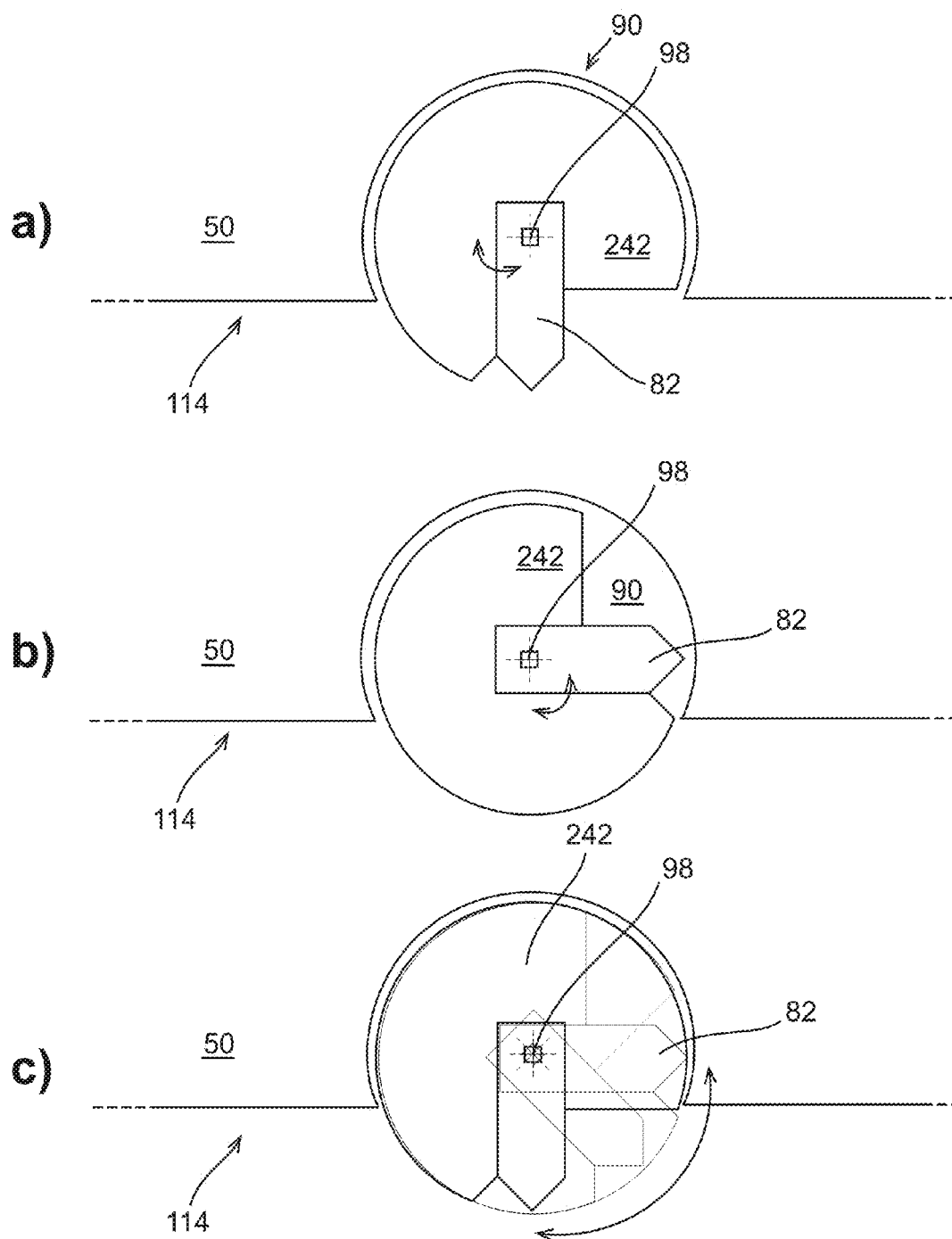


Fig.35

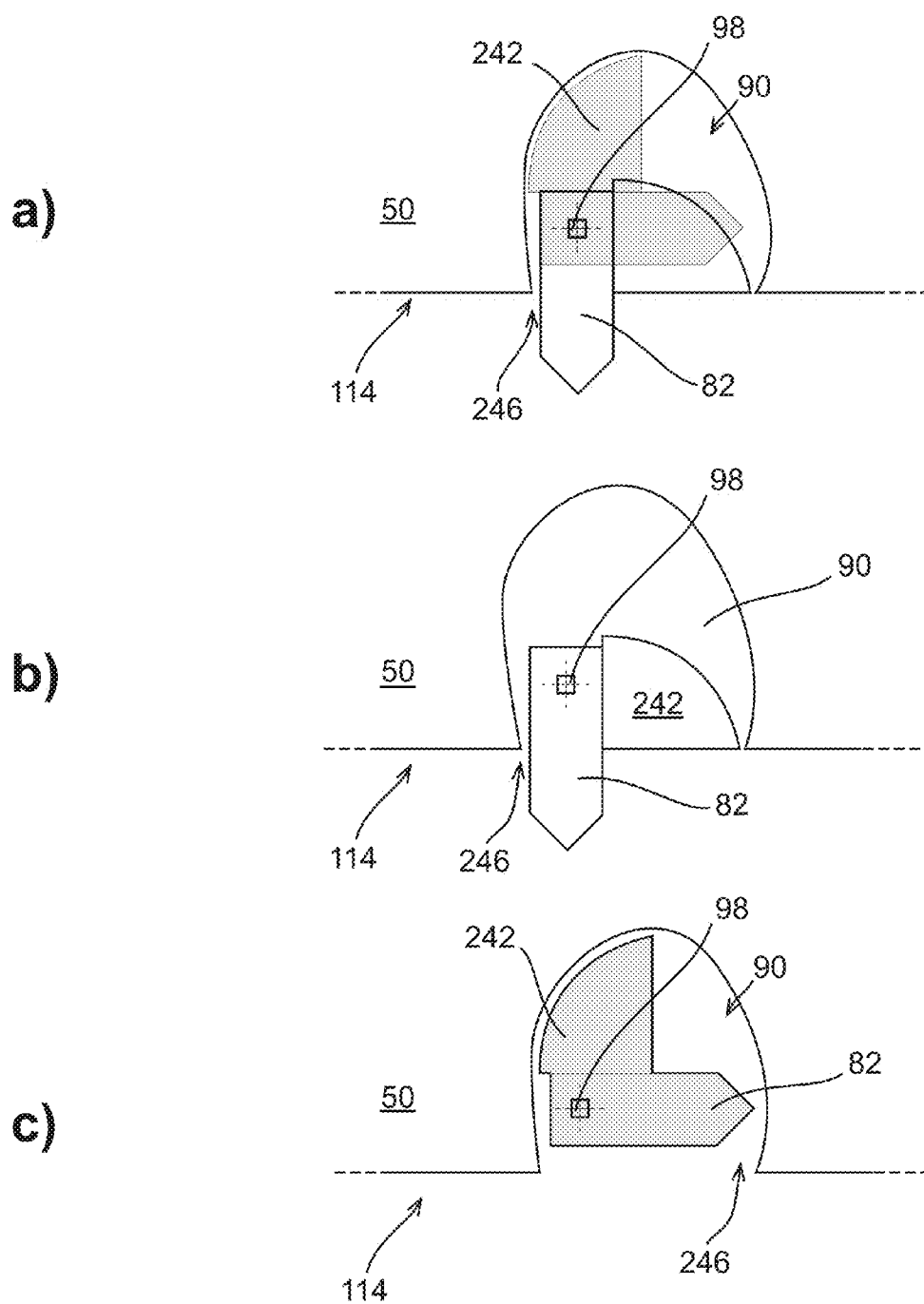


Fig.36

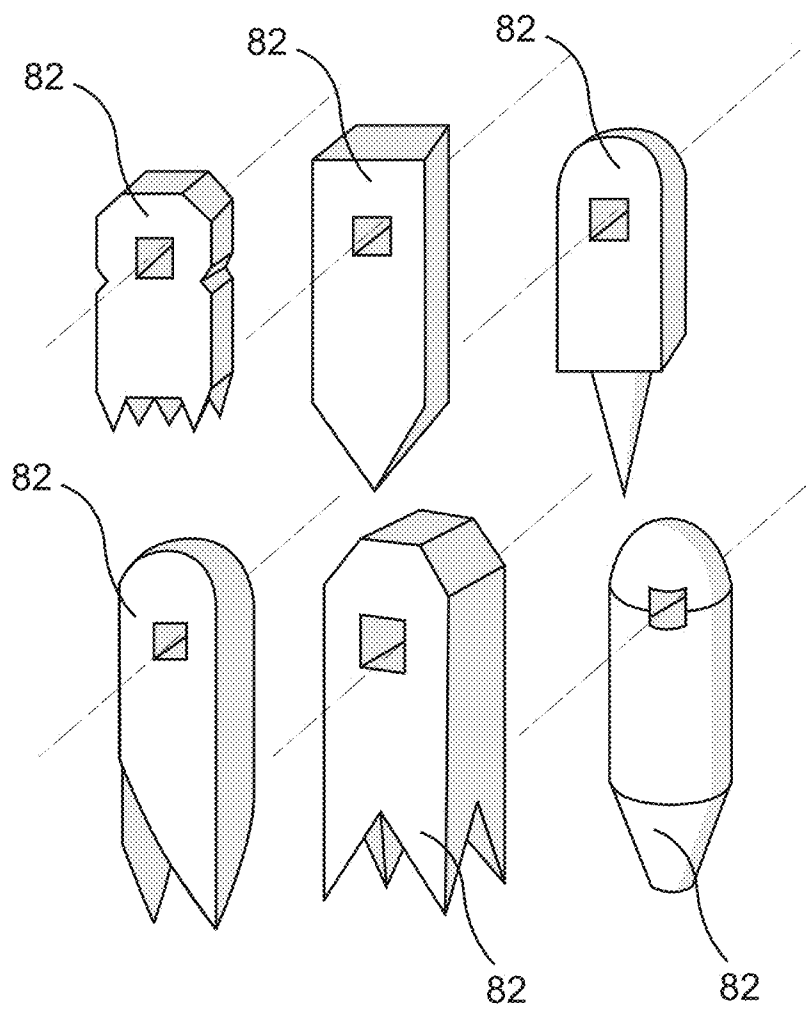


Fig.37

ANTI-SLIP MECHANISM FOR FOOTWEAR THEREOF

CROSS-REFERENCES

[0001] The present application is a nonprovisional of, and claims priority under 35 U.S.C. 119(e) to, U.S. provisional patent application No. 61/933,486, filed Jan. 30, 2014, entitled ANTI-SLIP MECHANISM FOR FOOTWEAR, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] This invention generally relates to an anti-slip mechanism adapted to be embedded in a sole of a footwear to increase the friction with the ground. The present invention more specifically relates to a retractable anti-slip mechanism that can be selectively actuated.

[0004] 2. Description of the Related Art

[0005] Shoes, boots and other foot garments include a sole to contact the ground and provide friction thereof. It happens that shoes, boots and other footwear have limited friction and traction with the ground and can become slippery when stepping over a smooth or slippery surface despite using aggressive sole pattern designs and sole materials that offer significant friction with the ground.

[0006] The art provides devices adapted to be added over the footwear. These devices include aggressive patterns or studs adapted to increase friction with ice. These devices must be removed when not required to prevent damaging the floor and should be carried separately causing an additional burden.

[0007] Another alternative is a mechanism located in the sole that can be flipped between a limited traction side and an increased traction side. The mechanism should be handled manually on the sole that can be dirty or stuck with dirt and debris.

[0008] Some prior art anti-slip systems are rigidifying the sole of the footwear and prevent the footwear to flex when a wearer is walking. This is happening, inter alia, when the anti-slip system requires longitudinal rigid members for actuating the mechanism. The rigid longitudinal members are thus preventing the sole to flex.

[0009] The weight of prior art system is also a concern. The prior art teaches anti-slip mechanisms that are heavy given the number of parts thereof and the sturdiness of the mechanism.

[0010] Also, prior art anti-slip mechanisms are often fragile, because of the interaction of parts thereof and the type of materials thereof, and are easily challenged by environmental elements.

[0011] Prior art systems do not allow for easy maintenance, cleaning and replacement of parts. The anti slip mechanism is often assembled in a fashion that does not allow disassembling of the mechanism. Broken or dull prongs cannot be easily maintained and require to change the complete footwear, which is not desirable for economical and environmental purposes.

[0012] It is therefore desirable to provide a footwear with increased friction with the ground over the existing art.

[0013] It is desirable to provide a footwear with an anti-slip mechanism that can selectively increase friction with the ground when standing or walking on a slippery surface.

[0014] It is desirable to provide an anti-slip mechanism that can easily actuated.

[0015] Other deficiencies will become apparent to one skilled in the art to which the invention pertains in view of the following summary and detailed description with its appended figures.

SUMMARY OF THE INVENTION

[0016] One aspect of the present invention is to alleviate one or more of the shortcomings of the background art by addressing one or more of the existing needs in the art.

[0017] The following presents a simplified summary of the invention in order to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the invention. It is not intended to identify key/critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented later.

[0018] The invention is generally described as an anti-slip mechanism for footwear.

[0019] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides an anti-slip mechanism that is embedded in the footwear.

[0020] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides an anti-slip mechanism that is embedded in the sole of the footwear.

[0021] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides an anti-slip mechanism that is self-contained in the sole of the footwear.

[0022] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a plurality of independently anti-slip mechanisms embedded in the footwear. Each anti-slip mechanisms being adapted to be independently actuated.

[0023] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides an anti-slip mechanism footwear that is removable from the footwear for maintenance, cleaning and replacement of parts thereof.

[0024] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides an anti-slip mechanism allowing the footwear to longitudinally flex when a wearer is walking.

[0025] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides an anti-slip mechanism having ground-engaging members removably and rotatably secured to a pivot member.

[0026] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a sole of a footwear that is adapted to receive therein a retractable anti-slip mechanism.

[0027] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a footwear sole comprising at least one convex extending portion extending on top of the sole and adapted to define a watertight compartment configured to receive therein an anti-slip mechanism.

[0028] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a footwear mid-sole having transversal thickness variations sized and designed to provide a substantially flat and comfortable foot support in compensation of a sole comprising at least one substantially convex extending portion.

[0029] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively

retractable anti-slip mechanism substantially disposed, separately or collectively, under the ball of the feet and under the heel of the feet.

[0030] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism that is actuated with a rotational movement. The rotational movement of the mechanism is adapted to be manually actuated.

[0031] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism that is adapted to be actuated when the foot rests on the ground. The mechanism can be accessed by a side of the footwear. The mechanism is also adapted to be housed in the footwear not to be cumbersome by extending from the footwear.

[0032] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism that is actuated with a quarter turn movement.

[0033] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism that is pivotable about a transversal pivot axle located in the footwear and supporting at least one ground-engaging member thereon.

[0034] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism that is adapted to collectively actuate a plurality of ground-engaging members. Each ground-engaging member is preferably separated from the other with a portion of sole.

[0035] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism having ground-engaging members adapted to substantially close their respective sole opening when the ground-engaging member is in the retracted position and adapted to be close to said respective opening when the ground-engaging member is in the extracted position.

[0036] At least one aspect of the invention, in accordance with at least one embodiment thereof, provides a selectively retractable anti-slip mechanism comprising a frame thereof adapted to increase rigidity of the ground-engaging member support assembly.

[0037] Each of the embodiments of the present invention has at least one of the above-mentioned objects and/or aspects, but does not necessarily have all of them. It should be understood that some aspects of the present invention that have resulted from attempting to attain the above-mentioned objects may not satisfy these objects and/or may satisfy other objects not specifically recited herein.

[0038] Additional and/or alternative features, aspects, and advantages of embodiments of the present invention will become apparent from the following description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] FIG. 1 is a schematic illustration of a possible configuration for the anti-slip mechanism for footwear in accordance with an embodiment of the invention;

[0040] FIG. 2 is a schematic illustration of a possible configuration for the anti-slip mechanism for footwear in accordance with an embodiment of the invention;

[0041] FIG. 3 is a schematic illustration of a possible configuration for the anti-slip mechanism for footwear in accordance with an embodiment of the invention;

[0042] FIG. 4 is a schematic illustration of the anti-slip mechanism inside the footwear's sole in accordance with an embodiment of the invention;

[0043] FIG. 5 is a schematic illustration of the bottom view of the footwear's sole equipped with the anti-slip mechanism in its retracted position in accordance with an embodiment of the invention;

[0044] FIG. 6 is a pressure chart of the feet's pressure as it is exerted on the footwear's sole;

[0045] FIG. 7 is a profile illustration of a human foot in standing position showing which portion of the foot are used to maintain the person stood up;

[0046] FIG. 8 is a profile illustration of a human foot in standing position showing the foot's area exerting pressure;

[0047] FIG. 9 is an illustration of human foot's sole illustrating which parts of the foot's sole exert pressure in standing position and how the pressure is distributed along the foot's width;

[0048] FIG. 10 is a schematic illustration of an exploded view of the footwear equipped with the anti-slip mechanism and illustrating how the footwear's parts are fitting together in accordance with an embodiment of the invention;

[0049] FIG. 11 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0050] FIG. 12 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0051] FIG. 13 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0052] FIG. 14 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0053] FIG. 15 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0054] FIG. 16 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0055] FIG. 17 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0056] FIG. 18 is a schematic illustration of the anti-slip mechanism assembly in accordance with an embodiment of the invention;

[0057] FIG. 19 is a schematic illustration of the door receiving element to access the anti-slip mechanism;

[0058] FIG. 20 is a schematic illustration of the door receiving element to access the anti-slip mechanism;

[0059] FIG. 21 is a schematic illustration of a possible embodiment of the frame structure that can reinforce additional structure of the anti-slip mechanism in accordance with an embodiment of the invention;

[0060] FIG. 22 is a schematic illustration of a possible embodiment of the frame structure that can reinforce additional structure of the anti-slip mechanism in accordance with an embodiment of the invention;

[0061] FIG. 23 is a schematic illustration of a possible embodiment of the frame structure that can reinforce addi-

tional structure of the anti-slip mechanism in accordance with an embodiment of the invention;

[0062] FIG. 24 is a schematic illustration of a possible embodiment of the frame structure that can reinforce additional structure of the anti-slip mechanism in accordance with an embodiment of the invention;

[0063] FIG. 25 is a schematic illustration of a possible embodiment of the frame structure that can reinforce additional structure of the anti-slip mechanism in accordance with an embodiment of the invention;

[0064] FIG. 26 is a schematic illustration of a possible embodiment of the door allowing access to the anti-slip mechanism in the closed position in accordance with an embodiment of the invention;

[0065] FIG. 27 is a schematic illustration of a possible embodiment of the door allowing access to the anti-slip mechanism in the closed position in accordance with an embodiment of the invention;

[0066] FIG. 28 is schematic illustration of an embodiment of the anti-slip mechanism when opened by the wearer;

[0067] FIG. 29 is a schematic illustration of a possible embodiment of the cover to the anti-slip mechanism in accordance with an embodiment of the invention;

[0068] FIG. 30 is a schematic illustration of an possible embodiment of the cover to the anti-slip mechanism in accordance with an embodiment of the invention;

[0069] FIG. 31 is a schematic illustration of the various position of the ground-engaging member of the anti-slip mechanism with its surrounding components in accordance with an embodiment of the invention;

[0070] FIG. 32 is a schematic illustration of the reduced gap in the receptacle when the ground-engaging member is in its expanded position in accordance with an embodiment of the invention;

[0071] FIG. 33 is a schematic illustration of a possible embodiment of an additional volume to the ground-engaging member to file the space between the ground engaging member and the sole portion in accordance with an embodiment of the invention;

[0072] FIG. 34 is a schematic illustration of a possible embodiment of the receptacle being sized to only allow for the movement of the ground-engaging member in accordance with an embodiment of the invention;

[0073] FIG. 35 is a schematic illustration of a possible embodiment of a cylindrical mechanism to file a portion of the space in the receptacle in accordance with an embodiment of the invention;

[0074] FIG. 36 is a schematic illustration of possible embodiment in which a volume with the ground-engaging member is coupled with an asymmetrical receptacle to file the space in the receptacle in accordance with an embodiment of the invention; and

[0075] FIG. 37 is schematic illustration of possible ground-engaging members of various size and shape that can be used with the anti-slip mechanism.

DESCRIPTION OF EMBODIMENT(S) OF THE INVENTION

[0076] Our work is now described with reference to the figures. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention by

way of embodiment(s). It may be evident, however, that the present invention may be practiced without these specific details.

[0077] A footwear 10, embodied as a boot 14, is illustrated in FIG. 1. The footwear 10 includes a front portion 18, a rear portion 22, a top portion 26 and a bottom portion 30. A proximal side 34 and a distal side 38, not illustrated in FIG. 1. The footwear 10 includes a foot-covering structure 42 that can be made of leather or any other suitable material for protecting the top portion of the foot in the footwear 10. The footwear 10 exemplified in FIG. 1 is a protection boot and is provided with a toe-protecting structure 46 extending over a section of the front portion of the footwear 10 to increase the wear resistance and also increase the shock resistance of the footwear 10. The footwear 10 also includes a sole portion 50 covering the bottom portion of the footwear 10 connecting the foot-covering structure 42 and adapted to provide suitable contact with the ground with treads 54 and grooves 58 thereon. The sole portion 50 generally defines two main sections, the ball section 62 and the heel section 66 that can be ergonomically shaped to fit the foot. The sole 50 further mates with the foot-covering structure 42 in a watertight fashion by, inter alia, fusing or gluing both portions together.

[0078] The footwear 10 of FIG. 1 further includes two anti-slip mechanisms 70 respectively disposed at the ball section 62 and the heel section 66. The embodied anti-slip mechanisms 70 are configured to be retractable and are actuated via an actuation mechanism 74 extending to the side of the sole portion 50. The actuation mechanism 74 is covered by a door 78 in FIG. 1 and will be discussed in further details below. Each of the actuation mechanism 74 comprises at least retractable one ground-engaging member 82 adapted to extend below the sole portion 50 to increase the friction with the ground, when desired. FIG. 2 and FIG. 3 are illustrating other possible configurations where the anti-slip mechanisms 70 are disposed at different locations on the footwear 10.

[0079] Moving now to FIG. 4 illustrating the construction of the sole portion 50, viewed from the inside of the footwear 10, in accordance with a possible embodiment. The sole portion 50 has been cut 86 in the center in FIG. 4 to see the anti-slip mechanisms 70. The uncut sole portion 50 is going to be depicted in other figures. It is possible to appreciate, with the anti-slip mechanism 70 at the ball section 62, that three (3) ground-engaging members 82 are in a retracted position and stowed into their respective receptacles 90, spaced apart by intervening sole portions 94. The three ground-engaging members 82 are pivotally connected to a pivot member 98 extending to at least one side of the sole portion 50 to be pivoted to actuate the ground-engaging members 82. The pivot member 98 could be embodied as a cylindrical rod and as other rods sections like square or triangular to help prevent rotation of the ground-engaging member 82 about the pivot member 98. In the present embodiment, the pivot member 98 extends through the distal side 38 where the door 78 is located. The pivot member 98 could alternatively extend through the sole portion 50 on the opposite proximal side 34 to be actuated on the proximal side 34 without departing from the scope of the invention. Returning to the embodiment depicted in FIG. 4, the pivot member 98 also extends on the proximal side to be held by a securing member 102. A second anti-slip mechanism 70 is located at the heel section 66 using the same principle as the previously described anti-slip mechanism 70 at the ball-section 62 but is using two ground-engaging members 82.

[0080] FIG. 5 depicts a sole portion 50, viewed from the bottom, with the sole sculpted design 114, equipped with two anti-slip mechanisms 70 therein. It is possible to appreciate that the ground-engaging members 82 are in the retracted position 106. As is can be appreciated, the location of the ground-engaging members 82 is of significant importance to ensure proper traction with the ground. Different embodiments presented therein are using different numbers of anti-slip mechanisms 70 disposed at various locations on the sole portion 50 of the footwear 10. The anti-slip mechanisms 70 are preferably located on the sole portion 50 in function of the pressure of the foot on the ground and the physical configuration of the bones and articulations of the foot.

[0081] FIG. 6 illustrate a typical pressure chart of two feet indicating the regions of high pressure 118 and low pressure when a human stand on its feet on the ground. From this chart, turning to FIG. 7, FIG. 8 and FIG. 9, it is possible to determine preferred anti-slip mechanisms 70 exemplary transversal locations: toe location 122, ball locations 126, 130, heel locations 134, 138. These locations can be used individually or collectively without departing from the scope of the present application.

[0082] An exploded view of a footwear 10 is illustrated in FIG. 10. The foot-covering structure 42 of the footwear 10 is covering the sole portion 50 to protect the foot in the footwear 10. A molded sole portion 50 is depicted illustrating an embodiment with integrated toe-protecting structure 46 and heel-protecting structure 162. One can appreciate a mid-sole 142 is covering the sole portion 50. The mid-sole 142 includes a foot-receiving side 146, adapted to comfortably receive thereon a foot, and, on an opposite side of the foot-receiving side 146 of the mid-sole 142, includes cavities 150 adapted to cooperate with convex portions 154 in the sole portion 50. The cavities 150 provide an even foot-receiving side 146 despite the uneven shape of the sole portion's 50 interior portion given the volume required to accommodate the anti-slip mechanisms 70 therein. The housing 158 in the convex portions 154 is sized and designed to receive therein the anti-slip mechanism 70. The convex portion 154 is generally molded or shaped with the sole 50 to be watertight. Each housing 158 is sized and designed to receive and secure therein an anti-slip mechanism 70 and is configured to be closed by a door 78.

[0083] The housing 158 produced in the sole portion 50 to receive therein a respective anti-slip mechanism 70 therein allows for removal and replacement of parts of the anti-slip mechanism 70. As it will be appreciated in FIG. 12 throughout FIG. 21, the anti-slip mechanism 70, as embodied, can be disassembled by removing the securing fastener 194 and axially pulling on the pivot member 98 from the housing 158. The ground-engaging members 82 are going to remain in their respective receptacles 90 while the pivot member 98 slides and let free the ground-engaging members 82 that can be removed from the receptacle 90 and cleaning, maintenance and replacement of parts can be easily achieved.

[0084] An anti-slip mechanism 70 assembly is exemplified in FIG. 12 through FIG. 21. The anti-slip mechanism 70 includes the door 78 pivotally mounted about a pivot 166 held in a door-receiving element 170 provided with a locking mechanism embodied with a cooperating concave portion 174 and convex portion 178 adapted to selectively lock the door 78 when closed in the door-receiving element 170. The door 78 further includes an extending portion 182 extending toward the interior of the door-receiving element 170, in a

cavity 190, to secure the actuation member 186 in either of a ground-engaging member 82 retracted position 106 or expanded position 110 when the actuation member 186 is pivoted of the prescribed angle α , which is preferably about 90°. The embodiment of FIG. 12 is using an angle α of about 85°. Embodiments of the invention are contemplating angles between 70° and 105°. The extending portion 182 is used to lock the actuation member 186 in the desired position upon closing of the door 78 in the door-receiving element 170 by maintaining the actuation member 186 between the extending portion 182 and the door-receiving element 170. The actuation member 186 pivotally connects the pivot member 98 to which is secured the ground-engaging member 82. In the illustrated embodiment, the actuation member 186 passes across the sole portion 50 and is secured on the opposite side of the sole portion 50 with a fastener 194 engaging a threaded portion 198. A bushing 202 is optionally disposed in the door-receiving element 170 to facilitate pivotal of the actuation member 186.

[0085] Is it possible to appreciate from FIG. 12, in relation with FIG. 1, that the door-receiving element 170, the actuation member 186 and the door 78 are vertically extending above the housing 158 and the mid-sole 142 to provide an easy actuation of the anti-slip mechanism 70 by a wearer. The actuation member 186 even vertically extends above a level where the foot is in the footwear 10. This is possible because the actuation member 186 and the door 78 are located on a side of the footwear 10.

[0086] Referring more precisely to FIG. 19 to FIG. 21, one can appreciate the door-receiving element 170 has an exterior shape defining a groove 206 therein adapted to secure the door-receiving element 170 in the sole-portion 50 offering a corresponding opposite shape. It is also possible to appreciate the door 78 has a handle 210 allowing a wearer of the footwear 10 to open the door 78 when the door 78 is closed in the door-receiving element 170.

[0087] FIG. 21 throughout FIG. 25 are depicting additional structure of the anti-slip mechanism 70 that, in embodiments thereof, can be reinforced with a frame structure 214. The frame structure 214 embodied is composed of rods 218 made of steel, fiberglass, plastic, or any other structural materials. The frame structure 214 can optionally be further reinforced by cross-members 222 configured to bridge parallel rods 218 together. The frame structure 214 can be secured by molding a side of the frame structure 214 with the door-receiving element 170. The embodiments in FIG. 22, FIG. 23 and FIG. 24 are using two rods 218 although a different number of rods could be used without departing from the scope of the present invention as it is illustrated in FIG. 25. Four rods 218 are used in the embodiment of FIG. 25 and the rods 218 are collectively secured with cross-members 222.

[0088] FIG. 26 and FIG. 27 are depicting the anti-slip mechanism 70, when it is retracted, illustrating two possible embodiments for the door-receiving element. The door 78 is fitted inside the door-receiving element 170, which is illustrated with two different contour variations in FIG. 27 and FIG. 28. The door 78 includes a handle 210 for the wearer to open it with a finger or a nail. When closed, the door 78 protects the access to the pivot member 98 and the rods 218. FIG. 28 illustrates the groove 206 in the door-receiving element 170, which is used to actuate the anti-slip mechanism 70.

[0089] FIG. 28 is depicting the anti-slip mechanism 70 when the wearer of the footwear 10 opens the door 78. The

wearer unlocks the convex portion 178 releasing the door 78 from the cooperative concave portion 174 of the door-receiving element 170. The wearer gets access to pivot member 98 to engage the anti-slip mechanism 70 in the desired position. Extending portion 182 is used in groove 206 to lock the anti-slip mechanism actuation. Moving now to FIG. 29 and FIG. 30 illustrating two embodiments providing a cover 226 to the anti-slip mechanism 70. The cover 226 is applied over the anti-slip mechanism 70 to protect the anti-slip mechanism 70 from a compression of the foot in the footwear 10 that could result in preventing proper working of the movable parts in the anti-slip mechanism 70. The cover 226 can be embodied as a separate part as it is in FIG. 29 and FIG. 30 respectively illustrating half a cylinder of fiberglass or carbon composite material and a metallic shaped member, like stainless steel, aluminum or metal, that could be secured 230 to the cross-members 222 (visible in FIG. 30).

[0090] FIG. 31 illustrate the position of the ground-engaging member 82 with the surrounding components, particularly the sole portion 50 and the receptacle 90 in which the ground-engaging member 82 is housed and moves. The dimensions are going to be presented in Table 1 for ease of understanding.

TABLE 1

Identification		FIG. 31 a) When viewed in the front-rear direction	FIG. 31 b) When viewed in the lateral direction
A	Desirable	5-20 mm	—
A	More desirable	6-15 mm	—
A	Most desirable	7-13 mm	—
B	Desirable	2-10 mm	2-10 mm
B	More desirable	3-7 mm	3-7 mm
B	Most desirable	4-5 mm	4-5 mm
C	Desirable	5-15 mm	5-15 mm
C	More desirable	7-12 mm	7-12 mm
C	Most desirable	9-11 mm	9-11 mm
D	Desirable	12-25 mm	12-25 mm
D	More desirable	11-22 mm	11-22 mm
D	Most desirable	10-20 mm	10-20 mm
E	Desirable	5-15 mm	5-15 mm
E	More desirable	4-12 mm	4-12 mm
E	Most desirable	3-10 mm	3-10 mm
F	Desirable	—	5-15 mm
F	More desirable	—	2-8 mm
F	Most desirable	—	0-5 mm
G	Desirable	0-3 mm	—
G	More desirable	0-2 mm	—
G	Most desirable	0-1 mm	—
H	Desirable	—	5-20 mm
H	More desirable	—	6-15 mm
H	Most desirable	—	7-13 mm

[0091] We will now address with more details the layout and the functioning of the ground-engaging member 82 in relation with the sole portion 50 and the receptacle 90. The ground-engaging members 82 are located in the sole of the footwear 10 and it is subject to dirt, dust, sand and other debris. It is desirable to limit the risk of filling the receptacle with the undesirable dirt by limiting the size of the space between the sole portion 50 and the ground-engaging member 82. In one embodiment, the pivot member 98 is located offset in the receptacle leaving more room on the side 230 the ground-engaging member 82 is going to rotate to nest in the receptacle. This leaves a reduced gap on the opposite side 234 as illustrated in FIG. 32. There could be no space left on the side 234 when the ground-engaging member 82 is in the

expanded position 110 and the sole portion 50 could optionally act to limit 238 the rotational movement of the ground-engaging member 82.

[0092] FIG. 33 a), b) and c) depict an embodiment adding additional volume 242 to the ground-engaging member 82 in order to fill at least a portion of the space left between the ground-engaging member 82 and the sole portion 50. The additional volume 242 can be added to the ground-engaging member 82 or the ground-engaging member 82 can have a shape including the additional volume 242 as a unique part. One can appreciate that the asymmetrical shape of the ground-engaging member 82 with the additional volume is going to reduce or close the gap 246 between the ground-engaging member 82 and the sole portion 50. An alternative design is illustrated in FIG. 34 a), b) and c) where the receptacle 90 has a reduced size configured to just allow enough room for the movement of the ground-engaging member 82. An embodiment using a cylindrical mechanism for the additional volume 242 and the ground-engaging member 82 in order to fill at least a portion of the space in the receptacle 90 and the ground-engaging member 82 in relation with the sole portion 50 is presented in FIG. 35 a), b) and c). In this embodiment, the ground-engaging member 82 is configured as a cylinder rotating in a counterpart cylindrical receptacle 90.

[0093] FIG. 36 a), b) and c) is illustrating a ground-engaging member 82 with additional volume 242 coupled to an asymmetrical receptacle 90 that substantially reduce the size of the receptacle 90. With such a design, the gap 246 is significantly reduced in both the expanded position 110 and the retracted position 106.

[0094] FIG. 37 is illustrating different ground-engaging member 82 designs with various typical size and shape to be fitted with the anti-slip mechanism.

[0095] The description and the drawings that are presented above are meant to be illustrative of the present invention. They are not meant to be limiting of the scope of the present invention. Modifications to the embodiments described may be made without departing from the present invention, the scope of which is defined by the following claims:

What is claimed is:

1. A retractable anti-slip mechanism for a footwear, the anti-slip mechanism comprising at least one retractable ground-engaging member disposed in a sole of the footwear and pivotally connected to a pivot member extending on a side of the footwear for selectively expanding the at least one retractable ground-engaging members under the sole to engage with the ground and retracting the at least one retractable ground-engaging members in the sole to prevent engaging the ground.

2. The retractable anti-slip mechanism for a footwear of claim 1, wherein the anti-slip mechanism is enclosed in the sole and does not communicate with the interior of the footwear to prevent water to get in the footwear.

3. The retractable anti-slip mechanism for a footwear of claim 1, wherein the pivot member extending on the side of the footwear is covered by a door.

4. The retractable anti-slip mechanism for a footwear of claim 3, wherein the door is configured to lock the pivot member to maintain the retractable anti-slip mechanism in one of an expanded position and a retracted position.

5. The retractable anti-slip mechanism for a footwear of claim 1, wherein the ground-engaging member of the retractable anti-slip mechanism is configured to extend below a

surface of the sole from a receptacle thereof in an expanded position, and is configured to retract inside the sole within the receptacle thereof and close the receptacle thereof to prevent foreign material to get inside the receptacle in the sole when the ground-engaging member is in a retracted position stowed in the sole.

6. The retractable anti-slip mechanism for a footwear of claim 1, wherein the ground-engaging member is a plurality of ground-engaging members assembled along the pivot member.

7. The retractable anti-slip mechanism for a footwear of claim 1, wherein the ground-engaging member is replaceable on the pivot member.

8. The retractable anti-slip mechanism for a footwear of claim 1, wherein the at least one retractable ground-engaging member disposed in the sole of the footwear is located under a ball of a foot.

9. The retractable anti-slip mechanism for a footwear of claim 1, wherein the at least one retractable ground-engaging member disposed in the sole of the footwear is located under a heel of a foot.

10. The retractable anti-slip mechanism for a footwear of claim 1, wherein the at least one retractable ground-engaging member disposed in the sole of the footwear is a plurality of ground-engaging members symmetrically disposed in respect of the sole along the pivot member.

11. A footwear including a retractable anti-slip mechanism, the anti-slip mechanism comprising at least one retractable ground-engaging member disposed in a sole of the footwear and pivotally connected to a pivot member extending on a side of the footwear for selectively expanding the at least one retractable ground-engaging members under the sole to engage with the ground and retracting the at least one retractable ground-engaging members in the sole to prevent engaging the ground.

12. The footwear of claim 11, wherein the anti-slip mechanism is enclosed in the sole and does not communicate with the interior of the footwear to prevent water to get in the footwear.

13. The footwear of claim 11, wherein the pivot member extending on the side of the footwear is covered by a door.

14. The footwear of claim 13, wherein the door is configured to lock the pivot member to maintain the retractable anti-slip mechanism in one of an expanded position and a retracted position.

15. The footwear of claim 11, wherein the ground-engaging member of the retractable anti-slip mechanism is configured to extend below a surface of the sole from a receptacle thereof in an expanded position, and is configured to retract inside the sole within the receptacle thereof and close the receptacle thereof to prevent foreign material to get inside the receptacle in the sole when the ground-engaging member is in a retracted position stowed in the sole.

16. The footwear of claim 11, wherein the ground-engaging member is a plurality of ground-engaging members assembled along the pivot member.

17. The footwear of claim 11, wherein the ground-engaging member is replaceable on the pivot member.

18. The retractable anti-slip mechanism for a footwear of claim 11, wherein the at least one retractable ground-engaging member disposed in the sole of the footwear is located under a ball of a foot.

19. The footwear of claim 11, wherein the at least one retractable ground-engaging member disposed in the sole of the footwear is located under a heel of a foot.

20. The footwear of claim 11, wherein the at least one retractable ground-engaging member disposed in the sole of the footwear is a plurality of ground-engaging members symmetrically disposed in respect of the sole along the pivot member.

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