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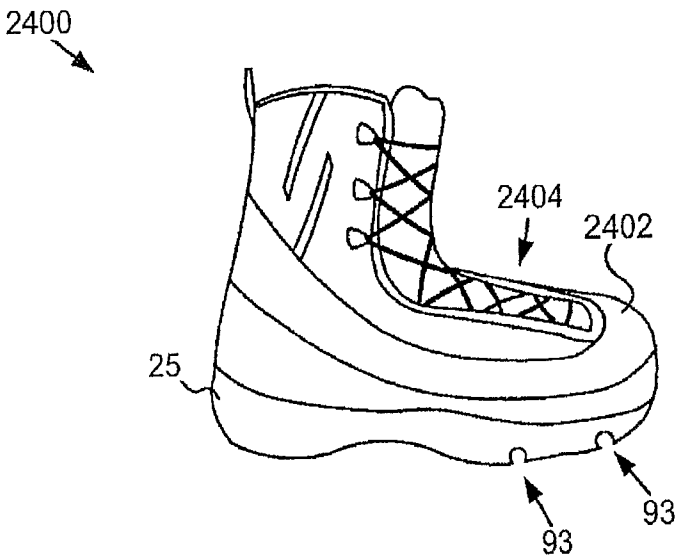
(54) **Title:** PIVOTING FOOTWEAR SYSTEMS AND, CONFIGURABLE TRACTION SYSTEMS



(57) **Abstract:** A device is disclosed that traverses terrain. The device includes a removable axle 52, where the device is configured to traverse terrain, a groove 93 connected with a boot 2400 for receiving the axle 93, the groove 93 is configured to enable the boot 2400 to pivot about the axle 5200 and securely couple the boot 2400 with the axle 52. The groove 93 may be formed in a boot 2400 and configured to receive the axle 52, or the groove 93 may be formed in a mounting plate 1604 removably attachable with the boot 2400 and configured to receive the axle 52.

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PIVOTING FOOTWEAR SYSTEMS AND, CONFIGURABLE TRACTION SYSTEMS

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to winter sports equipment and more particularly relates to a winter footwear pivot system allowing transition from one binding apparatus to another providing different modes of winter foot travel with a footwear pivot system. Also disclosed is a configurable crampon and a strapless crampon system as well as configurable traction.

DESCRIPTION OF THE RELATED ART

Approach "randonee" climbing skiing is a popular winter sport that provides backcountry exploration, exercise, and entertainment. Likewise, cross-country skiing, downhill skiing, and snowboarding are enjoyed for many of the same reasons. In a single day, backcountry enthusiasts typically approach ski or snowshoe to their destination and return on skis, snowshoes, or snowboards. Unfortunately for such adventures, enthusiasts must pack extra equipment or heavy equipment for traversing winter terrain. The added weight and hassle of packing up the necessary gear is an obvious disadvantage of these activities of hiking up an incline to then ski or snowboard down an incline.

A solution to the added weight and expense of extra gear, space consuming gear, or heavy gear, is to offer a footwear system in which the boot or shoe of the user is able to mount up to an approach ski system in a fashion wherein the footwear becomes part of the binding. Combining the footwear and the binding eliminates the need for a mounting base or plate for the footwear to mount to. The footwear is then easily removed by quick-release means. When fully released from the approach ski the footwear can be immediately used on a snowboard binding or other winter gear. The ski or (optional) configurable binding plate, in accordance with the present invention may be made of carbon fiber and/or other extremely lightweight materials. Prior approach ski snowboard systems have been extremely heavy to operate and are expensive.

Approach skis are heavy and most do not accept snowboard boots. They do not pack very easily, and they do not offer multi-functions wherein the user may quick release and attach a variety of foot binding set-ups. A split-board is a snowboard design which is able to split into two approach skis able to aid a user in climbing up an incline. When the user desires to snowboard back down the incline they reattach the two approach skis forming a snowboard set-up. The problem with this system includes: weight, expense, does not ski well down hill, and the snowboard does not ride as comfortably as a normal snowboard setup. The approach ski mode is too heavy and limits the range a user can hike because of fatigue.

Three current solutions exist that enable a winter enthusiast to hike up and slide down on

a snowboard. The first solution is to use snowshoes up an incline and then snowboard down the incline. Snowshoes are too bulky and do not pack well. They are also to slow in a constant up and down hike in which every small hill you must hike over the snowshoes can only walk down every hill instead of sliding. This method is more tiring and time consuming. Typical snowshoe bindings also offer a flimsy foot binding that prevents the binding and the snowshoe from working effectively together. The second solution is using a split-board which is very heavy, and it is very expensive. The third solution is to use current approach free heel designs that are too heavy and expensive and do not pack well.

What is needed is a device that overcomes weight, expense, and the current function in the art to hike a snowboard enthusiast into the backcountry to eventually ride the snowboard down an incline. What is needed is a light weight device that is relatively inexpensive, easy to use, and is easy to store on a back pack when the snowboard is in use. Additionally, what is needed is a strapless, and extreme light weight foot retention means to hold a hiking boot or snowboard boot to an approach ski without the need of a mounting base plate. A system is needed that eliminates foot retention hardware and straps wherein only the footwear the user uses acts as the binding when coupling means is placed through the footwear.

Additionally, what is needed is a ski that has the capability to have a plurality of foot retaining mounting binding plates that are quick-release and have a variety of designs and functions. One function that includes a detachable ski mounting plate that includes quick-release traction cleats that sit in the heel region and in the toe region forming a crampon with full heel to toe traction. Furthermore, detachable cleats for the mounting plate as well as snowshoes and snowshoe ski systems need a detachable cleat that includes snow and ice sticking repellent in the form of a coupled plastic piece to the crampon.

SUMMARY OF THE INVENTION

The present invention is in response to the current state of the art, and in particular, in response to the problems and needs in the art that have not been fully solved by current available ski, snowboard, snowshoe, their foot binding devices, and needed footwear. Accordingly, the present invention has been developed to provide pivotally equipped able footwear, a light weight climbing approach ski system, and a heel to toe detachable traction for a ski foot binding device or snowshoe binding system in response to needed gear not yet available or developed for backcountry snowboarders, snowshoers, and skiers.

The apparatus, in one embodiment includes a device having a removable axle, the device configured to traverse terrain, a groove connected with a boot for receiving the axle, and wherein the groove is configured to enable the boot to pivot about the axle and securely couple the boot

with the axle. In a further embodiment, the groove is formed in the boot, or alternatively, the groove is formed in a mounting plate removably attachable with a boot. In one embodiment, the groove is configured to receive an axle slidably inserted into the groove, or the groove is configured to snap onto the axle.

In one embodiment, the device is selected from a group comprising a ski, snowshoe, snowboard, hybrid snowshoe ski, or an approach ski. The apparatus may also include a plurality of grooves connected with a boot, and/or a plurality of pivot slots for receiving the axle and configured to support the boot. Furthermore, the apparatus includes a quick-release toe crampon having traction cleats configured to couple to the boot.

Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present invention should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present invention. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

Furthermore, the described features, advantages, and characteristics of the invention may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the invention may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the invention.

These features and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

Figure 1 is a side view diagram illustrating one embodiment of footwear in accordance with the present invention;

Figure 2 is a side view diagram illustrating one embodiment of pivoting footwear and its plurality of uses including that of an approach ski and a snowboard in accordance with the present invention;

Figure 3 is a top perspective view illustrating one embodiment of a ski in accordance with the present invention;

Figure 4 is a side perspective view illustrating an alternative embodiment of footwear in accordance with the present invention;

Figure 5 is a side perspective view illustrating one embodiment of a mounting plate that has a quick-release toe cleat portion and coupling system and a quick-release heel cleat portion and coupling system in accordance with the present;

Figure 6 is a side perspective view illustrating pivoting footwear on ski and snowshoe devices and a strapless toe crampon device in accordance with the present invention;

Figure 7 is a side perspective view illustrating snowshoe pivotally mountable footwear in accordance with the present invention footwear with approach ski means and snowshoe pivot means in accordance with the present invention;

Figure 8 is a side perspective view illustrating one embodiment of pivotally mountable footwear with a spring loaded axis in accordance with the present invention;

Figure 9 is a top plan view illustrating one embodiment of a winter device that uses pivotally mountable footwear in accordance with the present invention;

Figure 10 is a top plan view illustrating one embodiment a sliding device and a bottom plan view of pivotally mountable footwear in accordance with the present invention;

Figure 11 is a side perspective view illustrating one embodiment of pivoting footwear and a strapless toe and the ball of the foot crampon system in accordance with the present invention;

Figure 12 is a top plan view illustrating ski devices and pivoting footwear in accordance with the present invention;

Figure 13 is a top plan view and side perspective view illustrating a sliding and snowshoe device that accepts pivoting footwear, climbing skins, and foot binding plates in accordance with the present invention;

Figure 14 is a side perspective view illustrating one embodiment of a heel to toe traction and configurable crampon system able to split into a front strapless toe under the ball of the foot crampon and a rear portion of a foot crampon (heel crampon) in accordance with the present invention;

Figure 15 is a perspective view illustrating traction that can be raised and lowered through a sliding surface in accordance with the present invention;

Figure 16 is a top plan view illustrating one embodiment of the configurable mounting plate through the plane pivot of the present invention.

Figure 17 is a top plan view illustrating one embodiment of the configurable mounting plate top pivot of the present invention.

Figure 18 is a bottom perspective view diagram illustrating one embodiment of the spiked traction binding strap in accordance with the present invention.

Figure 19 is a top perspective view illustrating one embodiment of the pointed traction strap in accordance with the present invention.

Figure 20 is several perspective views illustrating an embodiment of detaching and attaching traction through the base of the ski in accordance with the present invention.

Figure 21 is several perspective views of an embodiment illustrating retracting traction and recessed traction on a mounting plate in accordance with the present invention.

Figure 22 is a top perspective view diagram illustrating a multipivoting ski in accordance with the present invention.

Figure 23 is a side perspective view illustrating footwear including a boot that is configured with multi-pivot axis points for a variety of foot placement on a winter device in accordance with the present invention.

Figure 24 is a side view diagram illustrating an alternative embodiment of the boot in accordance with the present invention.

Figure 25 is a side view diagram illustrating an alternative embodiment of the boot in accordance with the present invention.

Figure 26 is a side view diagram illustrating another embodiment of the boot in accordance with the present invention.

Figure 27 is a side view diagram illustrating another embodiment of the boot in accordance with the present invention.

Figure 28 is a perspective view diagram illustrating one embodiment of the approach ski in accordance with the present invention.

Figure 29 is a side view diagram illustrating an alternative embodiment of the approach ski in accordance with the present invention.

Figure 30 is a perspective view diagram illustrating a single universal mounting plate able to be used on a snowshoe, a ski, a snowboard, a hybrid snowshoe ski, and a split-board.

Figure 31 is a perspective view diagram illustrating another embodiment of the boot in accordance with the present invention.

Figure 32 is a side view diagram illustrating one embodiment of the mounting plate in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment," "in an embodiment," and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided in order to give a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

Figure 1 is a side perspective view diagram illustrating one embodiment of footwear 10 and toe pivot 77. In one embodiment the footwear 10 is configured to accept an axle 51 (axis) in accordance with the present invention. In one embodiment, the footwear 10 may secure a users foot by the use of laces 57, Velcro (not shown), or ski buckles (not shown). The heel portion 25 of the footwear 10 can be locked to retard or stop the pivoting motion. The footwear 10 may be in the form of a hiking boot, snowboard boot, or shoe with a single pivot toe pivot 77 in the toe region of the footwear allowing the footwear to pivot on a ski or snowshoe device.

Figure 2 is a side perspective view illustrating sliding devices including a snowboard 15, snowboard bindings 23, approach skis 31, and toe pivoting 77 footwear 10. In one embodiment, the pivoting footwear 10 can be removed from the approach ski 31 by moving the axle 51 from its locked position allowing the footwear 10 to release from the approach ski 31 in a quick-release manner. When the footwear 10 is released it may be placed in the snowboard binding 23 if the footwear is a snowboard boot. The approach skis 31 can be fitted together and stowed away in a back pack allowing the user to freely use the snowboard 15 with the pivotally equipped footwear 10.

Figure 3 is a top plan view illustrating approach ski 31 sliding devices that use pivotally

quick mountable footwear in accordance with the present invention. Toe pivot slots 20 allow either one setting (not shown) or a plurality of settings as illustrated by slots 20. A plurality of pivot slots 20 allow different sizes of footwear 10 as well as a comfortable adjustment on the sliding ski device.

The approach ski 31 may include a heel lift 17 to maintain a proper skiing platform. The heel lift may also include a footwear heel lock 51 mounted to the top side of the approach ski (not shown). Also, an adjustable heel lift may be used to relieve stress on the calve muscle when climbing inclines. The axle 52 may be stored on the sliding device 2 when the footwear 10 is removed from the sliding device 2.

Figure 4 is a side perspective view illustrating footwear 90 that contains a toe pivot 77 which allows a pivoting approach ski and a snowshoe pivot 64 that allows a pivot in a snowshoe style. The snowshoe pivot 64 allows the toe of the footwear 90 to pivot through the device it is mounted to with axle 51. The heel lock 25 may be used to lock the heel of the footwear 90 to the sliding device or snowshoe (not shown). The strapless toe crampon lock hole 121 is located on both sides of the footwear and retains the spring loaded pin which holds in place the strapless toe crampon 92 (see figure 11 and Figure 13).

Figure 5 is a side perspective view illustrating a platform for footwear called a mounting plate 59 that has a toe cleat 18 system that may couple to the mounting plate 59. The toe cleat 18 system consists of a spring loaded pin 137 to couple the toe cleat to the foot plate and a plurality of cleats 110 for traction. The toe cleat 18 system can be used together with a heel portion of traction by attaching the heel cleat 12 and the toe cleat 18 traction to the mounting plate 59. A spring loaded pin 138 located on the heel cleat 12 is used to couple the heel cleat to the mounting plate 59 or a snowshoe, cleat ski, or snowshoe ski hybrid (not shown). When the heel cleat 12 is quick-released from the mounting plate 59, the heel cleat 12 can be quickly attached to a snowshoe or a snowshoe ski hybrid device (not shown) for traction.

The toe cleat 18 may also be used when the mounting plate 59 is attached to a snowshoe or hybrid snowshoe ski. Foot coupling straps may bolt to nut and bolt holes 160. The mounting plate heel area may lock by engaging heel lock hole 109 which prevents mounting plate from pivoting allowing the heel portion to move up and down. Also, disclosed is a plastic cleat piece 210 that couples to the toe cleat 18 or heel cleat 12 by coupling means 208 and coupling means 207. The plastic cleat cover repels snow and ice build-up on the metal quick-release cleats. When the toe cleat 18 and the heel cleat 12 are quick-released from the foot mounting plate 59 they may be detachably coupled (222) to one another with the spring loaded pin 137 holding them together for easy pack storage. A plastic snow repellent guard may also be placed on a metal

version of the mounting plate. (*See* Fig. 6 and Fig. B).

Figure 6 is a side perspective view illustrating the snowshoe ski hybrid 80 using footwear 90 with a multi-pivoting system built in to the footwear 90. The toe pivot 77 allows the device to become an approach ski when the toe pivot 77 is locked in place with the toe pivot slot 20 on the device with axle axis 51. The snowshoe pivot 60 and 64 allows the footwear 90 to pivot through the plane of the device allowing the spring loaded strapless toe crampon system 92 and cleats 44 to grip snow and ice. The climbing skin 33 may be used when the ski mode is configured.

Figure 7 is a side perspective view illustrating one embodiment of a single snowshoe axis pivot 64 on footwear 81 in accordance with the present invention. This system can only be used on a snowshoe (Not shown) or devices that are hybrid snowshoe skis 200. Footwear 81 may be a shoe, boot, or snowboard boot. (*See* Figure 12).

Figure 8 is a side perspective view illustrating one embodiment of pivoting footwear 80 that uses a "footwear spring loaded axis axle 99 technology", The footwear spring loaded axis 99 retracts and expands to allow the footwear to quickly attach or detach from the device the footwear is mounting or dismounting to. A mechanism manipulates the release and lock sequence of the footwear spring loaded axis axle 99. The footwear spring loaded axis axle 99 may be mounted to approach skis and snowshoes (Not shown) which may have a plum1ity of mount settings.

Figure 9 is a top plan view illustrating a spring loaded axis axle 85 built into the device 2. The device may be a foot mounting Plate, ski, snowshoe ski hybrid, or a snowshoe able to receive footwear that contains pivoting technology built in accordance with the present invention. In a further embodiment, the drawstring 29 manipulates an open or closed position of the spring loaded axis axle 85.

Figure 10 is a top plan view illustrating sliding devices or snowshoes 2 and bottom plan views of footwear soles 23 and 71. In one embodiment, the sliding device or snowshoe 2 includes a fixed axle 84 that sole 71 mounts to by means of a groove 93 with groove locks (not shown). The fixed axle 84 may be moved to holes 76 to change the position of footwear pivoting.

In another embodiment, the footwear 71 may have one or more axle axes that footwear 71 can mount or dismount to in a quick fashion. The side rail 66 may be present wherein axis fittings are located. The side rail may be included in all of the foot pivoting embodiments in accordance with the present invention.

Figure 11 is a side perspective view of pivotally mountable footwear 90 that has a strapless toe crampon 92 attached and fitted under the ball of the foot. The strapless toe crampon

92 is held to footwear by a button tab 154 and spring loaded pins 125. The crampon also includes a plurality of cleat traction 44 to grip snow and ice. The strapless toe crampon may be released with the spring loaded release pins 125. When the snowshoe pivot 64 is being utilized in the footwear 90 on certain snowshoe ski hybrids and snowshoes then the toe crampon 92 is used. To form a conventional crampon the footwear is released from the device with the toe crampon attached to the footwear and the heel crampon 9 can be attached to the front toe crampon 98. (*See* figure 5 and Figure 14).

Figure 12 is a top perspective view of two pivotally mountable footwear modes. In one embodiment the footwear can pivot at the toe using pivot hole 20. When the user desires to lock the heel the heel lock 39 is engaged into heel portion 25 of the footwear. In another embodiment the footwear is pivoting in the snowshoe pivot 60 with the strapless toe crampon 92 attached. The rear detachable crampon 12 is used to provide further traction when in the snowshoe mode. The rear detachable crampon fits on the surface area of the snowshoe, snowshoe ski hybrid, or ski that contacts the snow and may be locked and unlocked with lock 39.

Sliding winter device 80 shows a movable portion 65 which pivoting footwear may rotate through when the portion 65 is opened. Sliding winter device 31 shows a typical ski sliding surface in which the pivoting footwear can also be used with when mounted to pivoting holes 20 in accordance with the present invention.

Figure 13 is several perspective views illus1rating equipment that is used in conjunction with pivoting footwear 90. The footwear 90 has pivot holes 77 for approach skiing. The footwear 90 has snowshoe pivot holes 64 for snowshoe style pivoting. The pivot equipped footwear is mounted to any of the pivoting style holes by inserting an axis axle 51 into the pivot position 20 or 60 on the ski, snowshoe ski hybrid, or snowshoe device, and locking the axis axle in to place by inserting a cotter pin 16. A c-c1amp 61 may also be used. A climbing skin 33 may be included in any number of climbing configurations that include pivotally mountable footwear. Pivoting footwear equipped skis, snowshoe ski hybrids, and snowshoes may also optionally use a mounting plate. Rear lock 39 locks attachable cleat traction and also locks the heel of pivoting footwear and the heel of a mounting plate. A further embodiment shows cleat traction 12 able to mount to the bottom surface of a ski 80 on the portion that faces the terrain.

Figure 14 is a side perspective view illustrating an embodiment of a separate strapless toe crampon system and a separate heel crampon system joined to form a complete heel to toe traction crampon system 98 in accordance with the present invention. The strapless toe crampon may be joined to the heel crampon 104 by using coupling strap 101 and connecting coupling strap 101 to toe crampon loop 114 forming a conventional heel to toe crampon system 98. Strap

positioner 132 built in to the footwear 90 encourages the heel crampon portion to stay firm on the footwear 90. The heel crampon 104 has downward pointing traction cleats 42 as well as heel coupling means to the footwear 90.

Figure 15 shows perspective views of an embodiment of movable traction 355 that can be raised and lowered through ski slots 370 sliding surface 367 forming friction enhancement when lowered and friction decrease when raised. Toothed traction 391 is one embodiment of traction means. The moveable traction 355 is raised and lowered on traction hinge 379 and the movable traction is locked with the movable traction lock hole 380 when a metal axle 51 is placed through it.

Figure 16 is a perspective view diagram of a mounting plate axis 1602 able to pivot a configurable mounting plate 1604 through the snowshoe ski hybrid 80 by moving front mounting plate portion 1606 outward rotating on the configurable mounting plate 1604 portion axis 1608. The front quick-release mounting plate traction 1610 can be attached to mounting plate by moving the mounting plate traction lock lever 1612 into slot 1614. A portion of the ski hybrid 80 (*See* Figure 6) must be opened and in this configuration the sliding device can climb similarly to a snowshoe and the configurable mounting plate can also be used as a separate climbing device when released from the ski. The heel of the configurable mounting plate 1604 can be locked or unlocked by moving the heel lock 1616 to open or closed position.

Figure 17 is a perspective diagram view of a mounting plate pivot axis 1602 able to pivot the mounting plate 1604 above the sliding device by moving the front mounting plate portion 1606 inward by rotating on the configurable mounting plate 1604 portion axis 1616. In this configuration the sliding device can climb like an approach ski with skins (not shown) with the configurable mounting plate 1604 pivoting on the top side of the hybrid ski. The configurable mounting plate 1604 can lock so that the mounting plate cannot not move by locking heel lock 1616.

Figure 18 is a bottom perspective view illustrating a mounting plate strap 1800 used for mounting boots, shoes, and various footwear to a sliding device, non-sliding winter foot travel, or snowshoe. The strap contains pointed strap traction 1802 facing into the boot or shoe which holds the boot on the device in a non-slip manner. The traction strap can be mounted to a wide variety of winter foot transportation devices by coupling means and to mounting plate holes 1804. This type of strap also allows a single strap set-up instead of the standard multiple strap systems found on snowboard bindings and some snowshoes.

Figure 19 is a top view diagram illustrating the strap buckle system 1806 which is used to couple the straps together and may even include a ratchet system. The binding holes 1808 provide coupling means to a winter foot travel device.

Figure 20 is several perspective views of a configurable ski 2000 that may have traction 2002 mounted through a slot or opening 2001 in the ski 2000 with the traction being locked into place by the use of a lock 2004. The ski 2000 may have a hole 2006 through its base to allow the mounting plate to rotate through or in a second option it may rotate only above the plane of a typical ski 2000.

Figure 21 illustrates two perspective views illustrating retractable or foldable traction 2102 on a mounting plate or binding. The traction retracts into a recess. The mounting plate 2104 for the retaining the foot of the user contains retracting traction 2102. The retracted mounting plate traction position 2106 and extended traction position 2108 eliminate the need for removable quick-release mounting plate traction as another option. The traction rotates on traction axis 2110. The mounting plate includes holes 2112 for coupling straps to the mounting plate 2104. It must be noted that the retracting traction system can also be used on other type device bindings and mounting plates as well and would be obvious to one skilled in the art to utilize retracting traction cleats on other winter foot bindings and mounting plate devices not named in this disclosure.

Figure 22 is a perspective view diagram illustrating a configurable ski 2200 with a plurality of axis pivots 2202 in which to pivot the mounting plate or boot 2204 (*See* Figure 23). The axle 2206 can be removed by releasing the locking pin 2208 and allowing the axle to be placed in any of the plurality of axis pivots 2202 on the configurable ski 2200. The mounting plate may also have a plurality of pivots as well to have a wide range in which the user can customize the set up in a snowshoe style pivot or an approach "randonee" style pivot dependent on his choice of setting the axle (axis) 2210 and locking it in place with the locking pin 2208.

Figure 23 is a side perspective view illustrating foot wear or a boot 2204 with a plurality of axis pivot points 2302 allowing the position of pivoting determined in the boot 2204 apparatus. This particular set up offers an alternative to a multi-pivoting mounting plate and a configurable mounting plate in which the boot 2204 with a plurality of pivoting can achieve the same task of coupling a user in a plurality of pivot positions customizing the pivot for approach skiing or snowshoeing etc. In another embodiment the foot ware or boot 2204 may contain only a single pivot in the sole (not shown).

Figure 24 is a side view diagram illustrating an alternative embodiment of the boot 2400 in accordance with the present invention. As described above with reference to Figures 1, 2, 4,

and 23, the boot may be configured with one or more multiple pivot points. The pivot points may be configured to receive the axle 52 by either sliding the axle 52 through an opening in the sole of the boot (as in Figures 1, 2, and 4) or alternatively the boot may be configure to "step on" the axle as depicted in Figure 10 and in greater detail in Figures 24-27. Likewise, the groove 93 may be closed as depicted in Figures 1, 2, and 4, or alternatively the groove 93 may comprise an open portion for receiving the axle 52. As depicted, the boot 2400 has at least one groove 93 in the sole of the boot for receiving the axle 52. The groove 93 may be circular as depicted (for receiving a round axle 52) or, alternatively, the groove 93 may be formed in a shape suitable for the axle being used.

The groove 93, in one embodiment, requires that pressure be applied in order to "snap" onto the axle 52. As such, similar pressure is required to remove the boot. In a further embodiment, the boot may comprise a plurality of grooves 93 positioned in order to enable various different pivot points. For example, if the boot were being used in an approach ski configuration, then a user will snap the axle into a groove 93 under the toe portion 2402 of the boot. Alternatively, if the boot were being used in a snowshoe configuration then a user will snap the axle into a groove 93 under the ball of the user's foot, as indicated by arrow 2404. This beneficially allows for the boot 2400 to pass through the plane of the snowshoe and allow the user to gain traction by digging the toe portion 2402 of the boot into snow or ice.

Figure 25 is a side view diagram illustrating an alternative embodiment of the boot 2400 in accordance with the present invention. The boot 2400, as depicted, may couple with a ski, snowboard, snowshoe, or other device capable of traversing snow and ice covered terrain. As described above, the ski 31 comprises multiple pivot slots 20 for positioning the axle 52. In one embodiment, the boot 2400 together with multiple grooves 93 allows for positioning of the boot in order to accomplish different pivot points. Alternatively, the pivot slots 20 accomplish similar functionality by enabling a boot with a single groove 93 to be positioned. In another embodiment, a boot with multiple grooves 93 and a ski 31 with multiple pivot slots 20 enables a myriad of boot and pivot configurations.

Figure 26 is a side view diagram illustrating another embodiment of the boot 2400 in accordance with the present invention. The boot 2400, or other suitable footwear, is depicted "stepping" or "snapping" onto the axle 52. The opening of the groove 93 may be slightly smaller than the axle 52 in order to secure the boot 2400 with the axle 52. Alternatively, the boot 2400 may comprise a removably coupled plate (not shown) that secures the axle 52 in the groove 93.

Figure 27 is a side view diagram illustrating another embodiment of the boot 2400 in accordance with the present invention. The boot 2400, in one embodiment, may comprise a

replaceable groove 2702. The replaceable groove 2702 enables the replacement of a worn groove 93 without the requirement of purchasing a new boot 2400. The replaceable groove 2702 may be attached by any attachment means including, but not limited to, glueing, snapping, or screwing. Additionally, alternative attachment devices may be substituted in place of the replaceable groove 2702 in order to enable the boot to interface with devices including, but not limited to, bicycles, water skis, etc.

Figure 28 is a perspective view diagram illustrating one embodiment of the approach ski 31 in accordance with the present invention. The approach ski 31, in one embodiment, may comprise a removable portion 2802 coupled with the approach ski 31. The removable portion 2802 is configured to form, together with the approach ski, a substantially continuous skiing surface 2804. The removable portion 2802, when removed, allows the footwear of a user to pass through a plane defined by an upper surface 2806 of the approach ski 31. The removable portion 2802 may be hinged and therefore rotatable, or alternatively the removable portion 2802 may be completely separated from the approach ski 31.

Figure 29 is a side view diagram illustrating an alternative embodiment of the approach ski 31 in accordance with the present invention. In one embodiment, the removable portion 2802 may be pivoted in a direction indicated by arrow 2902. As depicted, the removable portion pivots downward about a hinge until resting against the skiing surface of the approach ski 31. Similarly, the removable portion 2802, for example, could pivot to the front 2904 or laterally to the sides of the ski 31.

Figure 30 is a perspective view diagram illustrating a single universal mounting plate 3002 able to be used on a snowshoe 3004, a ski 3006, a snowboard 3008, a hybrid snowshoe ski 3010, and a split-board (not shown). The mounting plate 3002, boot, or configurable mounting plate, may be attached and detached from all of these winter devices that are compatible in a quick-release manner by removing the locking pin 3012 and moving the axle 3014 from the mounting holes 3016. The snowboard has an adapter plate 3018 with adapter plate mounting holes 3020 to allow the universal binding system to be mounted to the snowboard 3008. Straps 3022 to bind the foot couples the user to the universal mounting plate. Quick-release traction 3024 mounts to the universal mounting plate 3002.

Figure 31 is a perspective view diagram illustrating another embodiment of the boot 2400 in accordance with the present invention. As described above, with reference to Figures 24-27, the boot 2400 comprises a groove 93, that in one embodiment, is embedded in the sole 3102 of the boot 2400. The groove 93 is configured to receive and secure the axle 52. The boot 2400 may be configured with multiple grooves 93 (not shown here, see Figure 24).

Figure 32 is a side view diagram illustrating one embodiment of the mounting plate 1604 in accordance with the present invention. The mounting plate 1604 comprises straps 3202, 3204 for securing a boot or shoe to the mounting plate 1604. The straps 3202, 3204 may be configured in a similar manner to the strap 1800 of Figures 18 and 19. The mounting plate 1604, in one embodiment, comprises a groove 93 for securing the axle 52 as described above with reference to the boot 2400. This beneficially enables footwear that is not configured with a groove 93 to couple with skis, snowshoes, snowboards, approach skis, etc. that are configured with the axle 52.

Figure 33 is a schematic top view diagram illustrating one embodiment of an approach ski 31 in accordance with the present invention. As described above with reference to Figures 28 and 29, the approach ski is configured with the removable portion 2802. The removable portion 2804 is lockable in a closed position as illustrated in Figures 28 and 33, and also in the open position illustrated in Figure 29. The removable portion 2804 is hingedly attached to the approach ski by a hinge 3302. Alternatively, the removable portion 2804 may be completely removed from the approach ski 31 and stored in a backpack, for example.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS

1. An apparatus for coupling footwear with a device, the apparatus comprising:

a device having a removable axle, the device configured to traverse terrain;

a groove connected with a boot for receiving the axle; and

wherein the groove is configured to enable the boot to pivot about the axle and securely couple the boot with the axle.

2. The apparatus of claim 1, wherein the groove is formed in the boot.

3. The apparatus of claim 1, wherein the groove is formed in a mounting plate removably attachable with a boot.

4. The apparatus of claim 1, wherein the groove is configured to receive an axle slidably inserted into the groove.

5. The apparatus of claim 1, wherein the groove is configured to snap onto the axle.

6. The apparatus of claim 1, wherein the groove comprises an open portion for receiving and securing the axle by stepping on the axle.

7. The apparatus of claim 1, wherein the groove is formed in a removable portion coupled with the boot.

8. The apparatus of claim 1, wherein the device is a ski.

9. The apparatus of claim 1, wherein the device is a snowshoe.

10. The apparatus of claim 1, wherein the device is a snowboard.

11. The apparatus of claim 1, wherein the device is a hybrid snowshoe ski.

12. The apparatus of claim 1, wherein the device is an approach ski.

13. The apparatus of claim 1, further comprising a plurality of grooves connected with a boot.

14. The apparatus of claim 1, wherein the device comprises a plurality of pivot slots for receiving the axle and configured to support the boot.

15. The apparatus of claim 1, further comprising a quick-release toe crampon having traction cleats configured to couple to the boot.

16. An apparatus for coupling footwear with a device, the apparatus comprising:

a device having a removable axle, the device configured to traverse terrain;

a groove formed in a boot and configured to receive the axle; and

wherein the groove is configured to enable the boot to pivot about the axle and securely couple the boot with the axle.

17. The apparatus of claim 16, wherein the groove is configured to receive an axle slidably inserted into the groove.

18. The apparatus of claim 16, wherein the groove is configured to snap onto the axle.

19. The apparatus of claim 16, wherein the groove comprises an open portion for receiving and securing the axle by stepping on the axle.

20. The apparatus of claim 16, wherein the groove is formed in a removable portion coupled with the boot.

21. The apparatus of claim 16, wherein the device is a ski.

22. The apparatus of claim 16, wherein the device is a snowshoe.

23. The apparatus of claim 16, wherein the device is a snowboard.

24. The apparatus of claim 16, wherein the device is a hybrid snowshoe ski.

25. The apparatus of claim 16, wherein the device is an approach ski.

26. The apparatus of claim 16, further comprising a plurality of grooves connected with a boot.

27. The apparatus of claim 16, wherein the device comprises a plurality of pivot slots for receiving the axle and configured to support the boot.

28. The apparatus of claim 16, further comprising a quick-release toe crampon having traction cleats configured to couple to the boot.

29. An apparatus for coupling footwear with a device, the apparatus comprising:

a device having a removable axle, the device configured to traverse terrain;

a groove formed in a mounting plate removably attachable with a boot and configured to receive the axle; and

wherein the groove is configured to enable the boot to pivot about the axle and securely couple the boot with the axle.

30. The apparatus of claim 29, wherein the groove is configured to receive an axle slidably inserted into the groove.

31. The apparatus of claim 29, wherein the groove is configured to snap onto the axle.

32. The apparatus of claim 29, wherein the groove comprises an open portion for receiving and securing the axle by stepping on the axle.

33. The apparatus of claim 29, wherein the groove is formed in a removable portion coupled with the boot.

34. The apparatus of claim 29, wherein the device is a ski.

35. The apparatus of claim 29, wherein the device is a snowshoe.

36. The apparatus of claim 29, wherein the device is a snowboard.

37. The apparatus of claim 29, wherein the device is a hybrid snowshoe ski.

38. The apparatus of claim 29, wherein the device is an approach ski.

39. The apparatus of claim 29, further comprising a plurality of grooves connected with a boot.

40. The apparatus of claim 29, wherein the device comprises a plurality of pivot slots for receiving the axle and configured to support the boot.

41. The apparatus of claim 29, further comprising a quick-release toe crampon having traction cleats configured to couple to the boot.

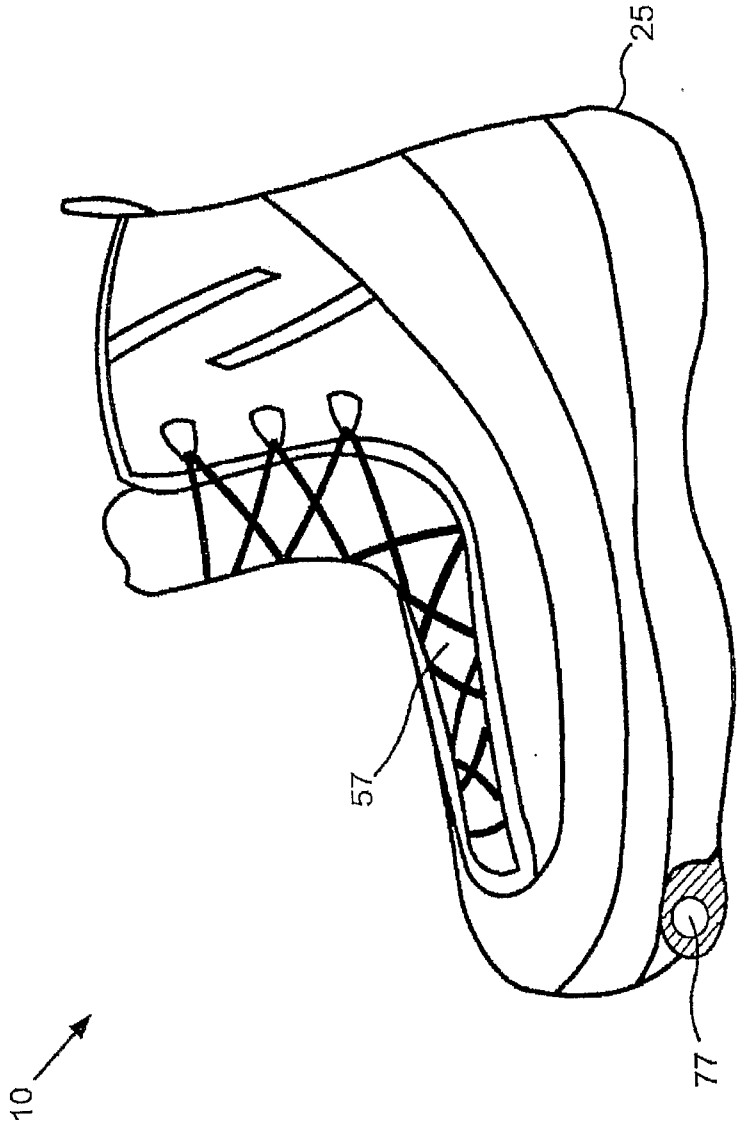

FIG. 1

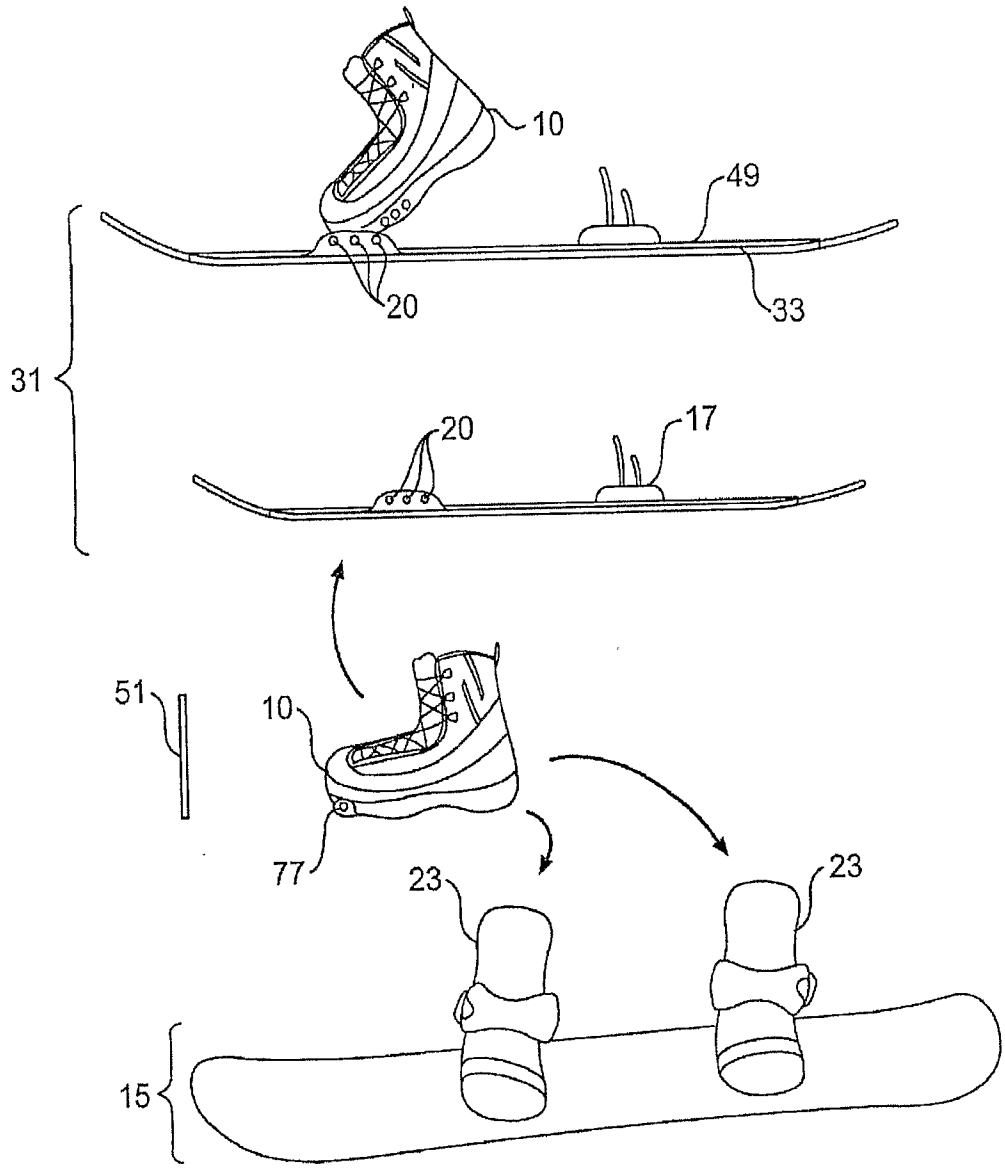

FIG. 2

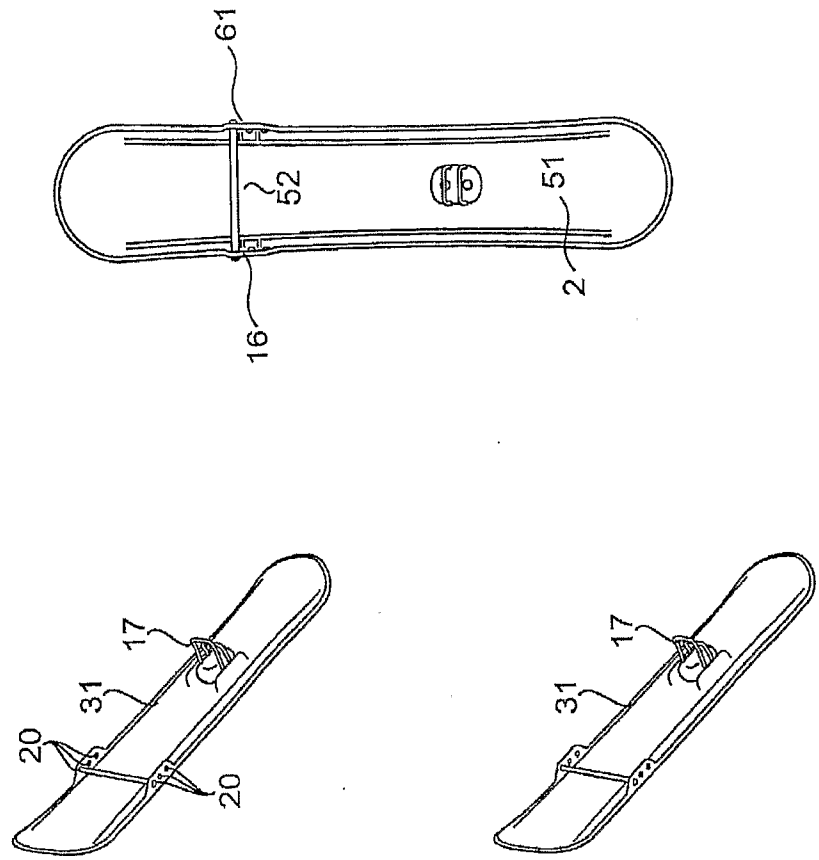

FIG. 3

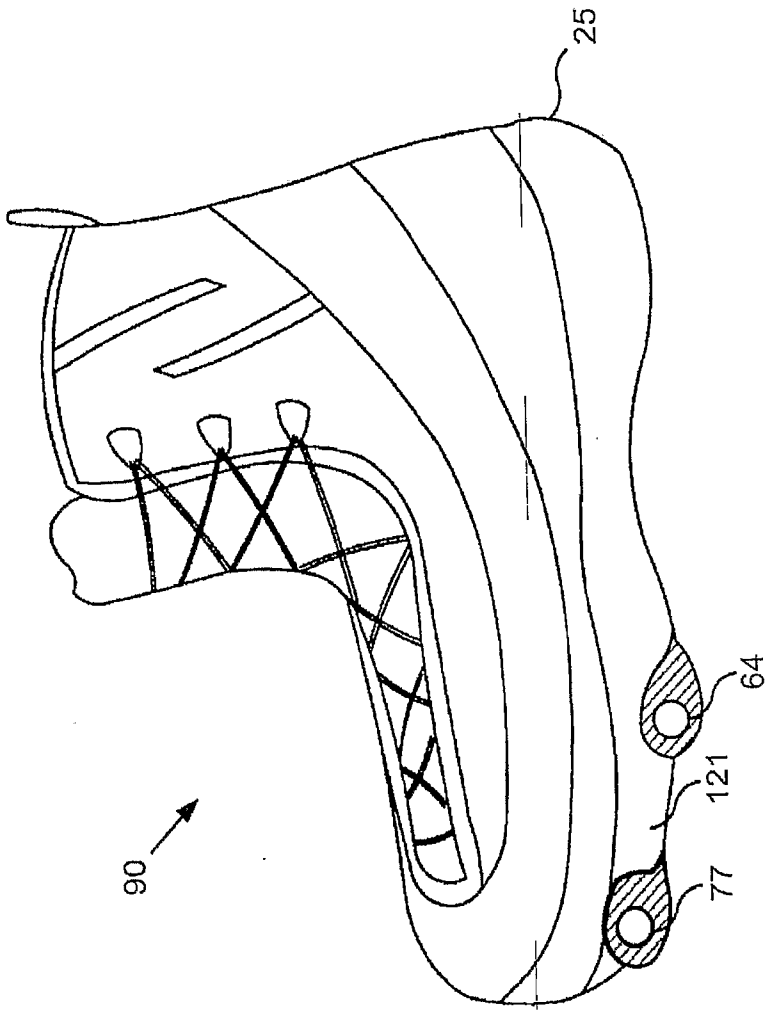

FIG. 4

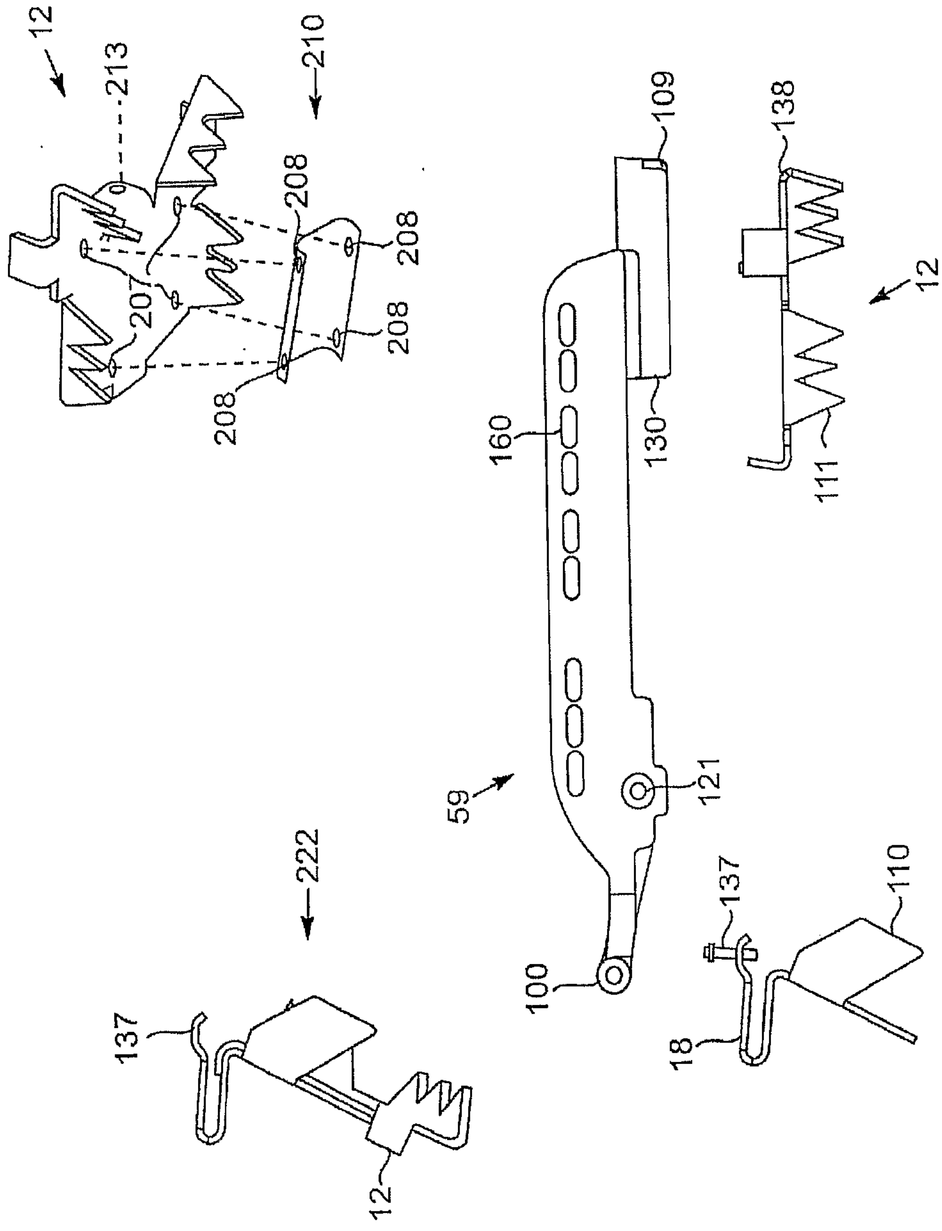
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FIG. 5

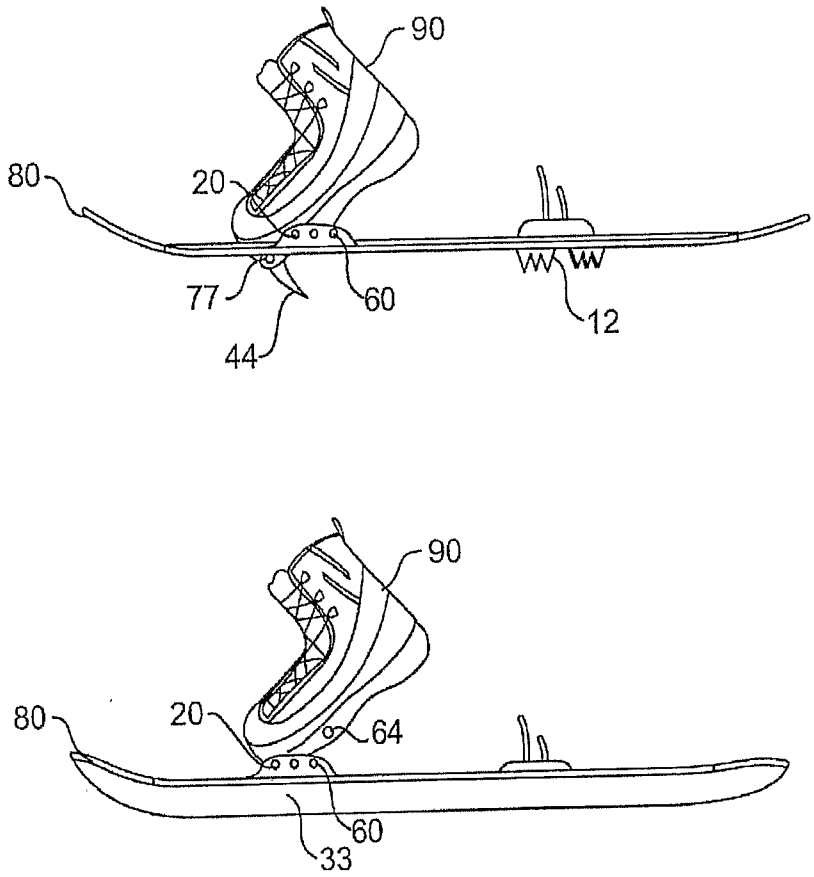

FIG. 6

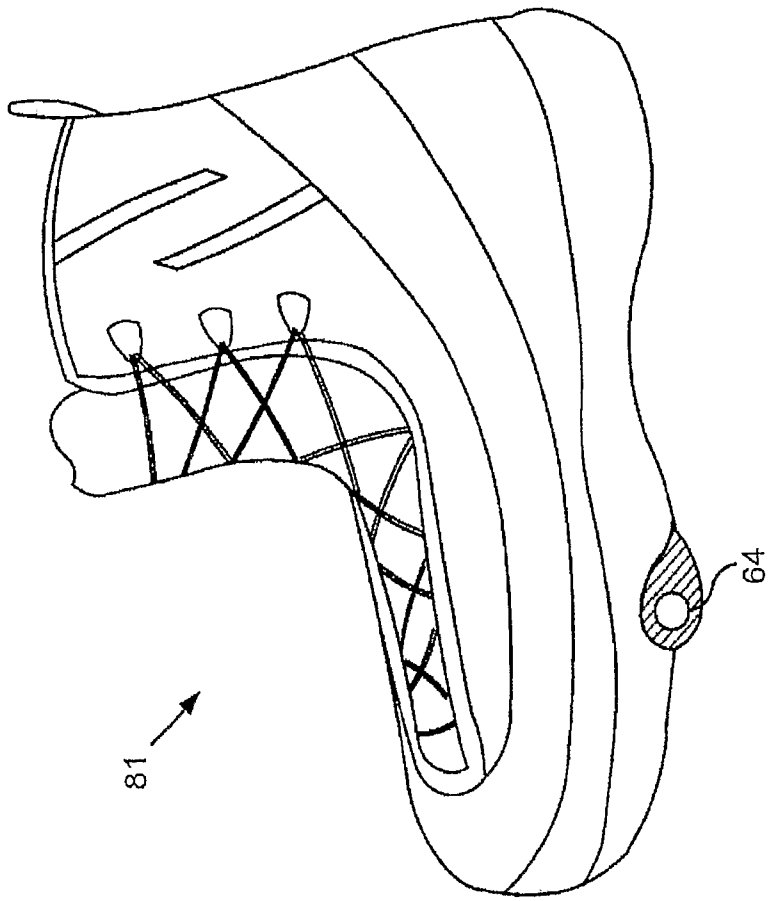

FIG. 7

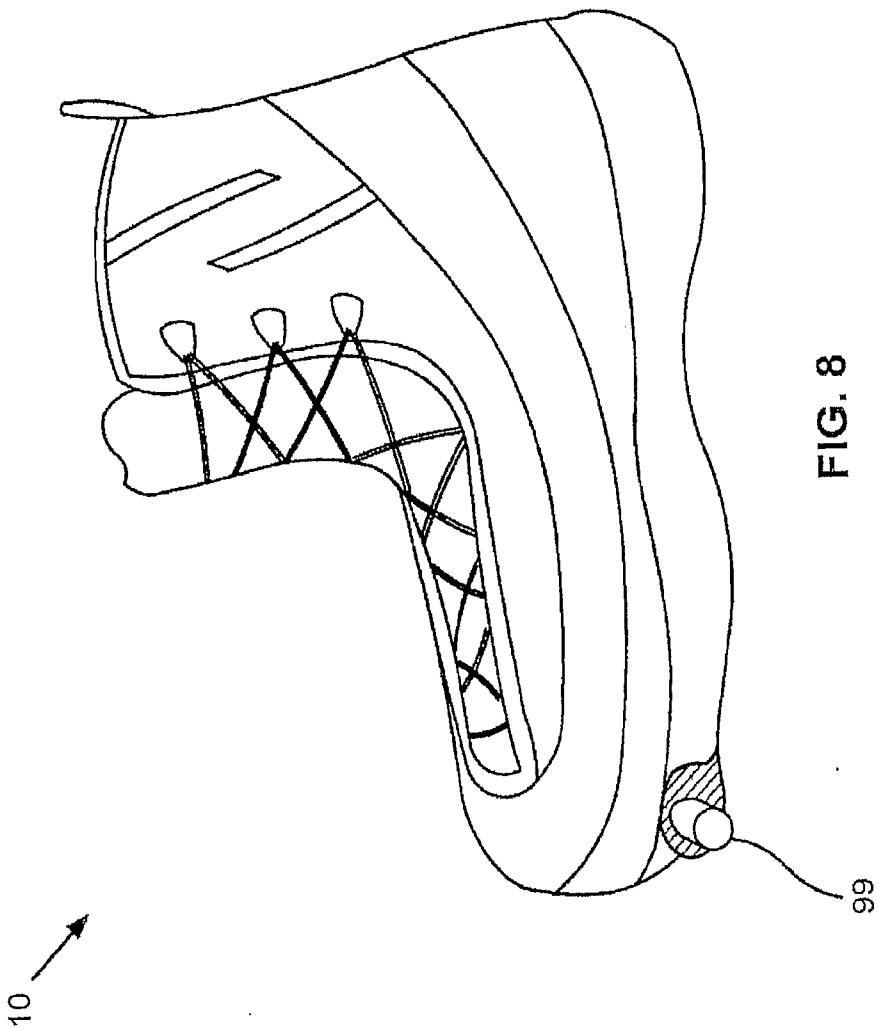

FIG. 8

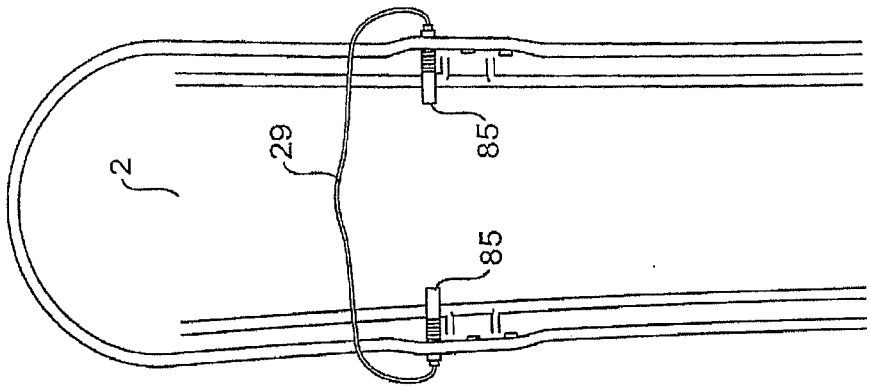

FIG. 9

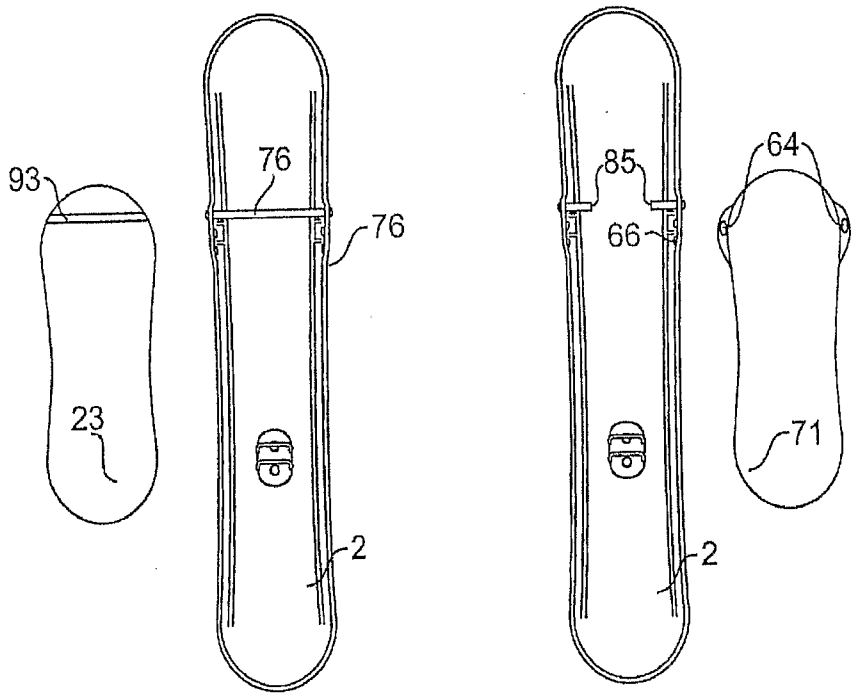

FIG. 10

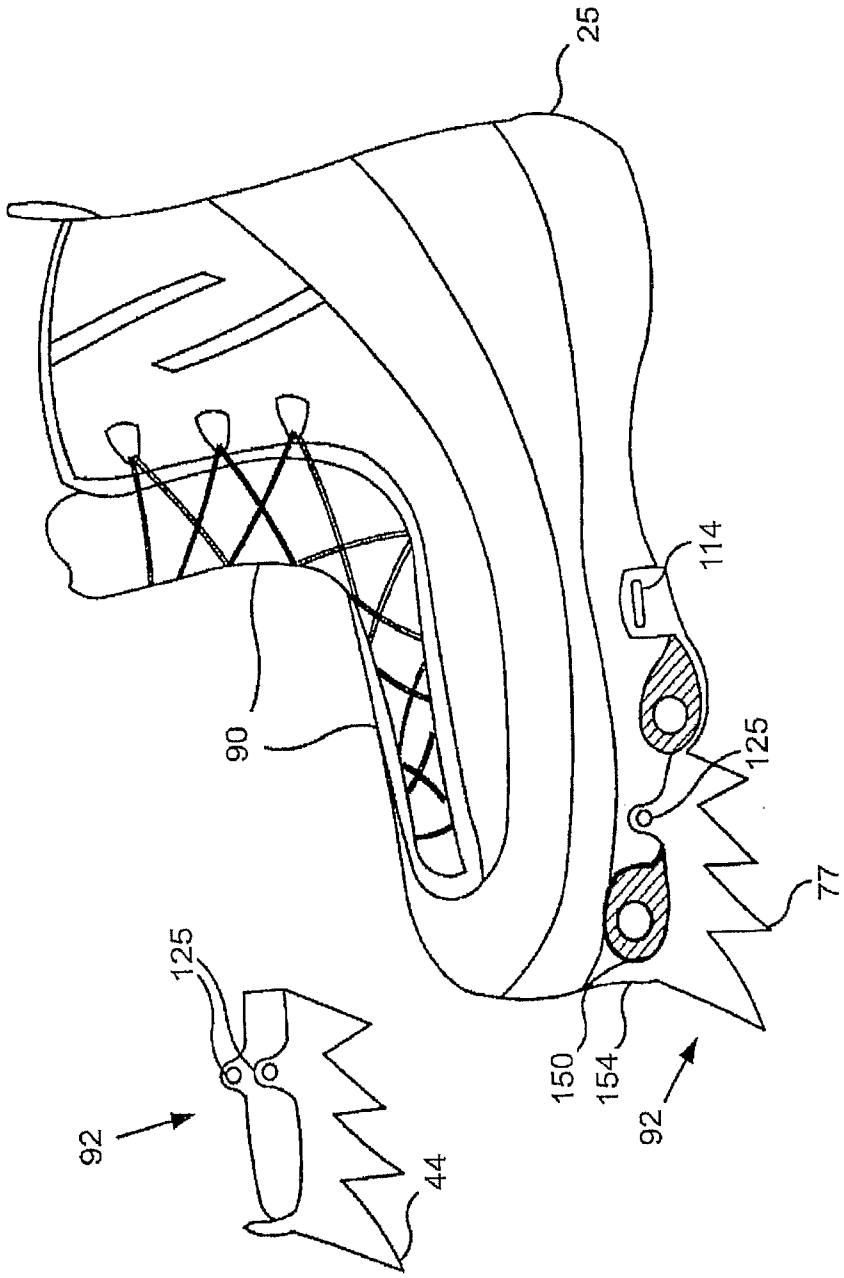

FIG. 11

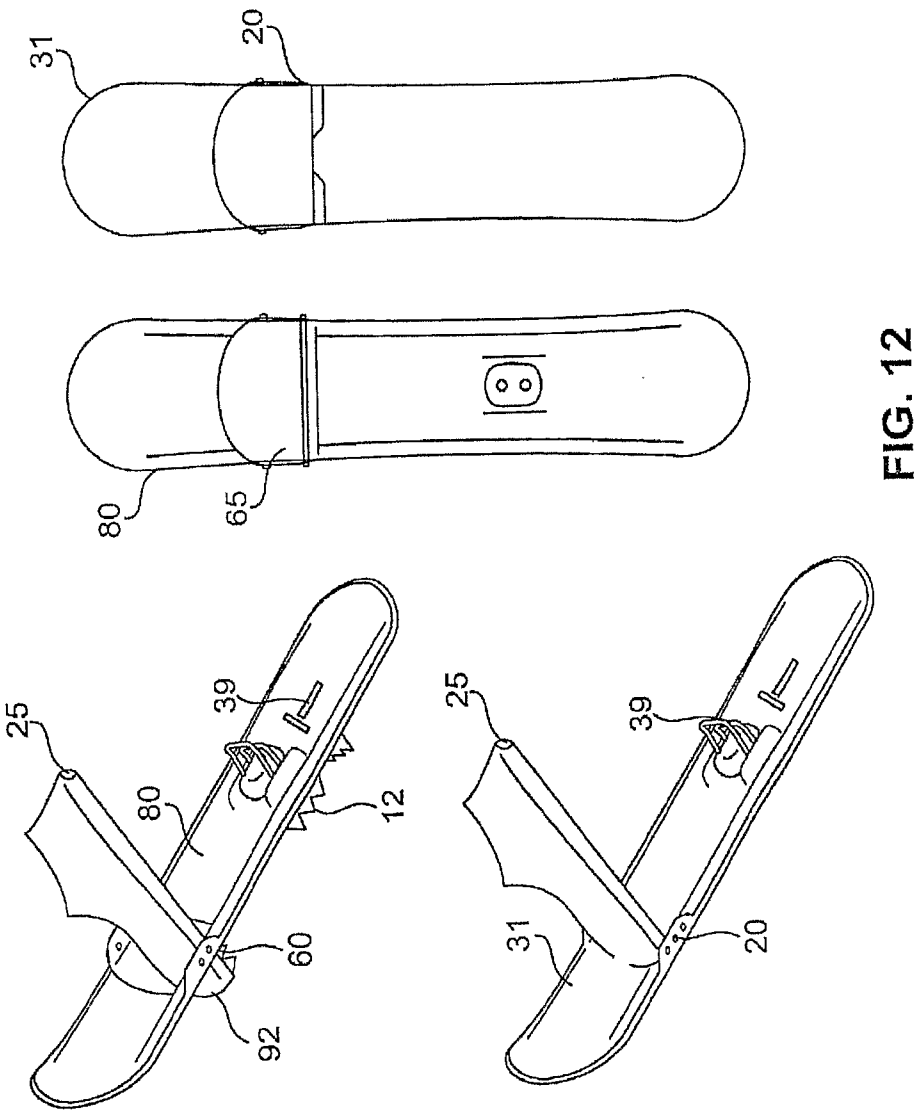

FIG. 12

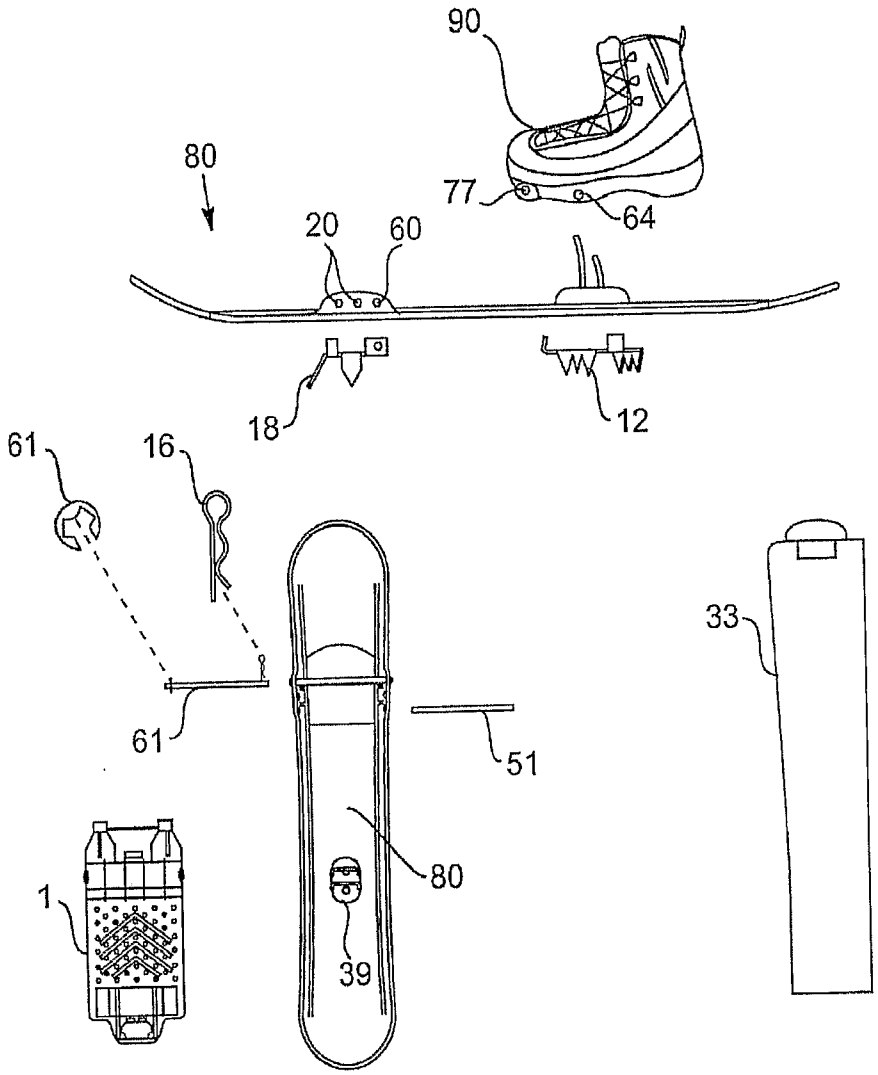

FIG. 13

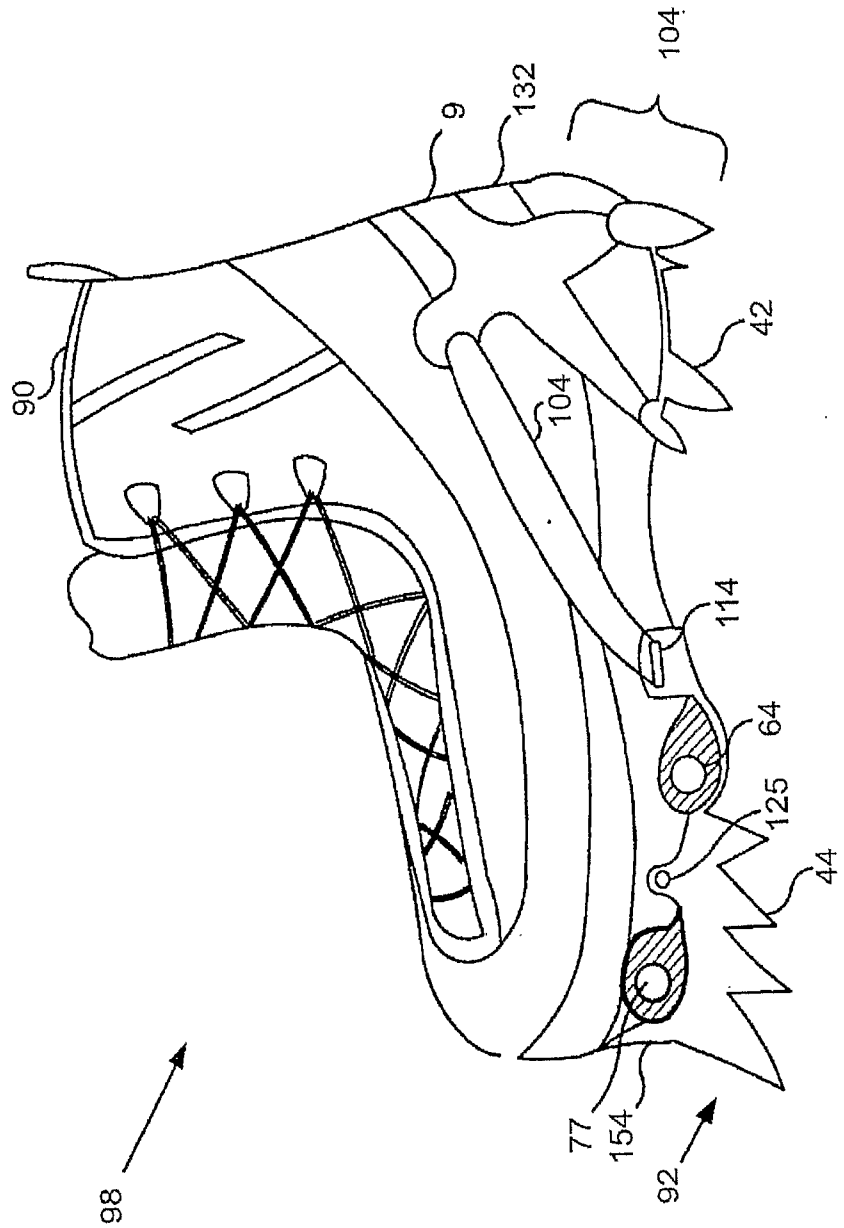

FIG. 14

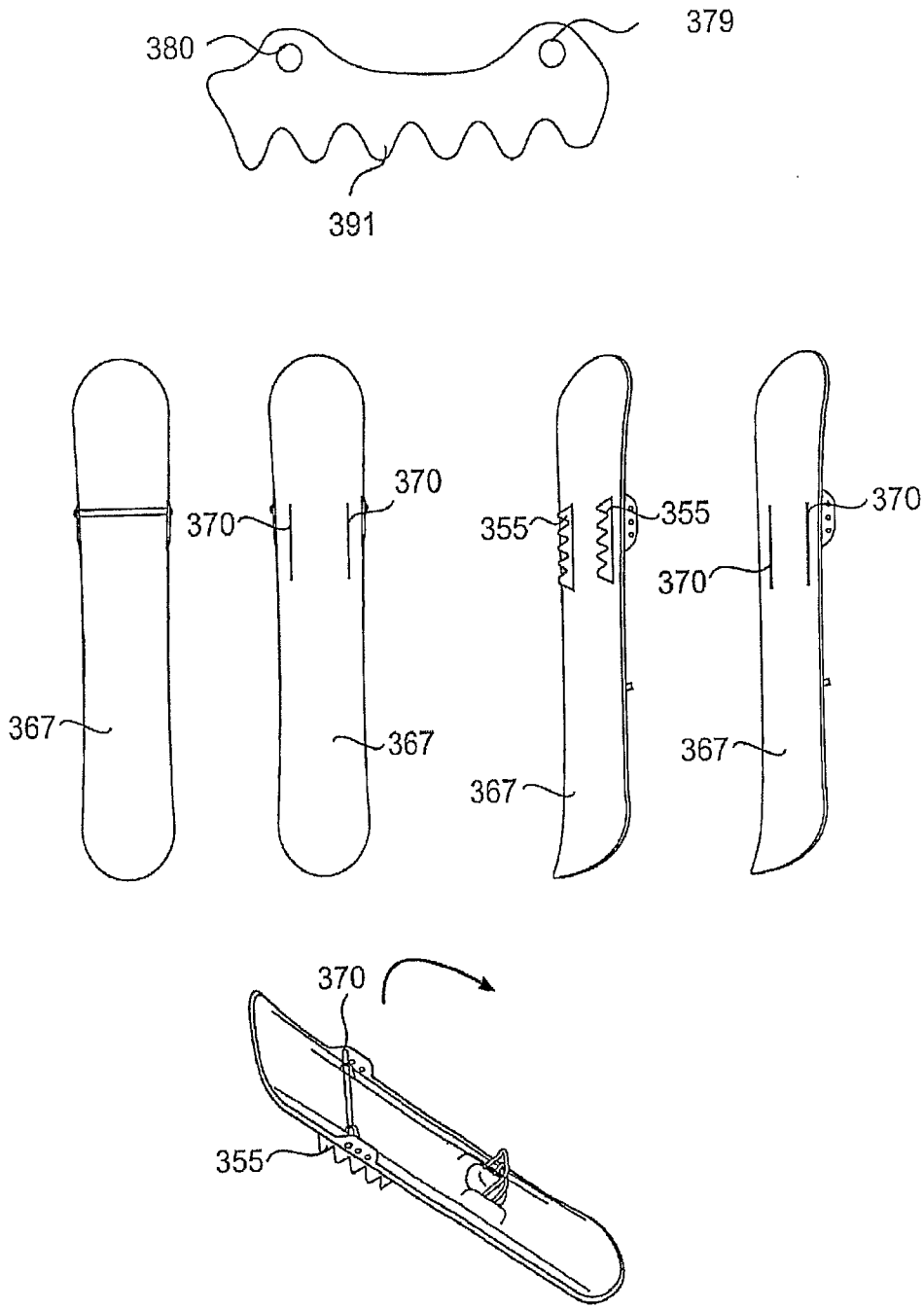

FIG. 15

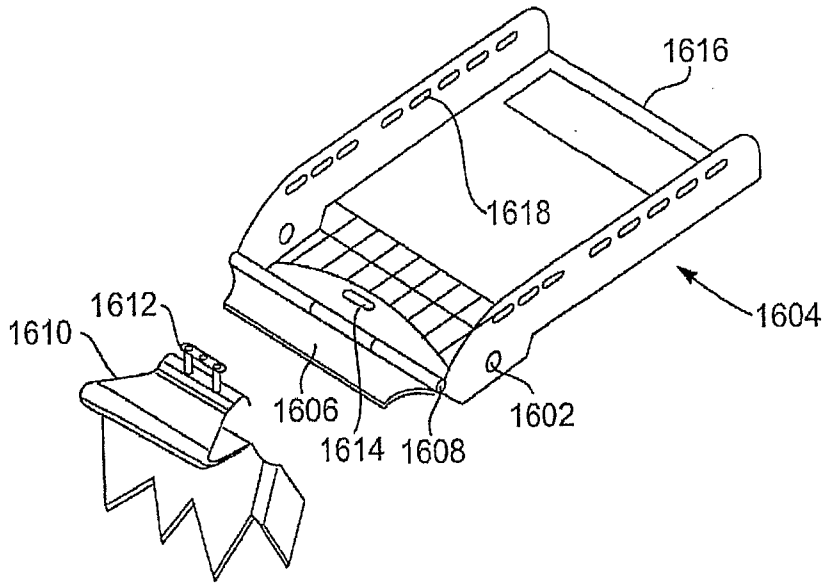
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FIG. 16

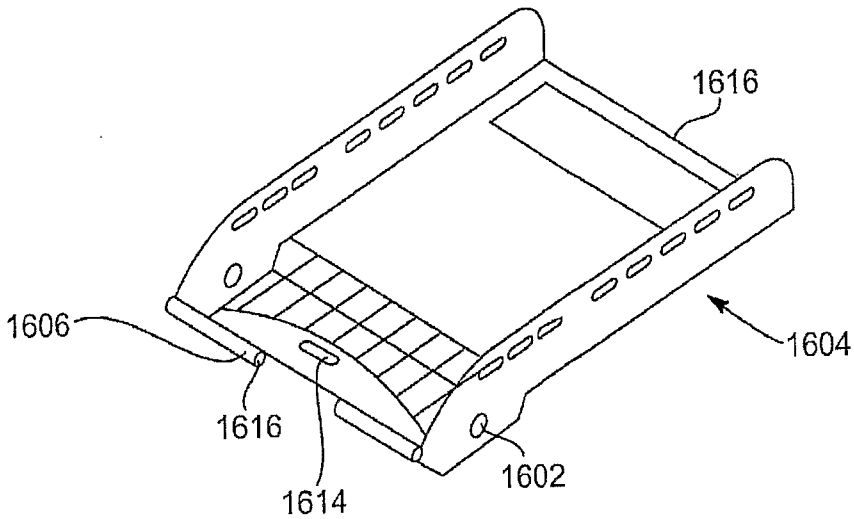
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FIG. 17

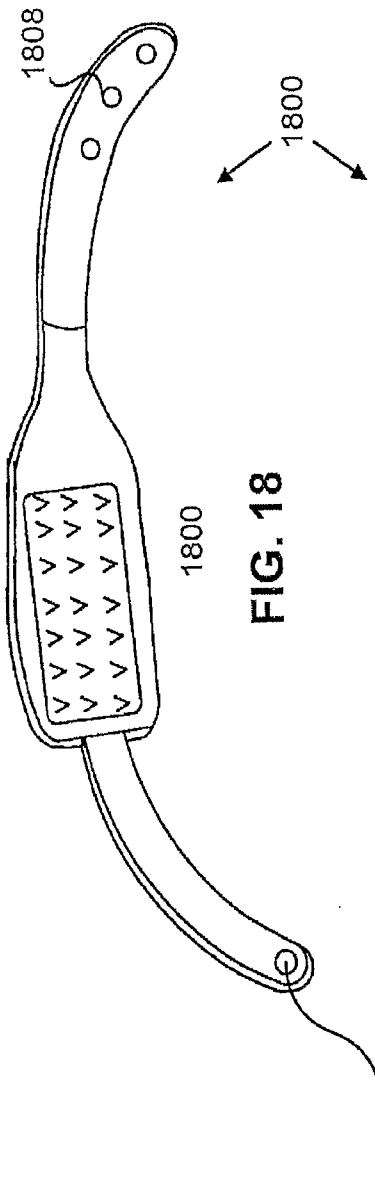

FIG. 18

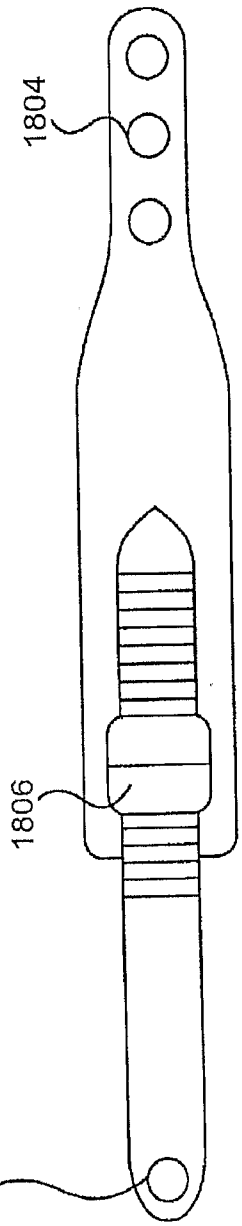

FIG. 19

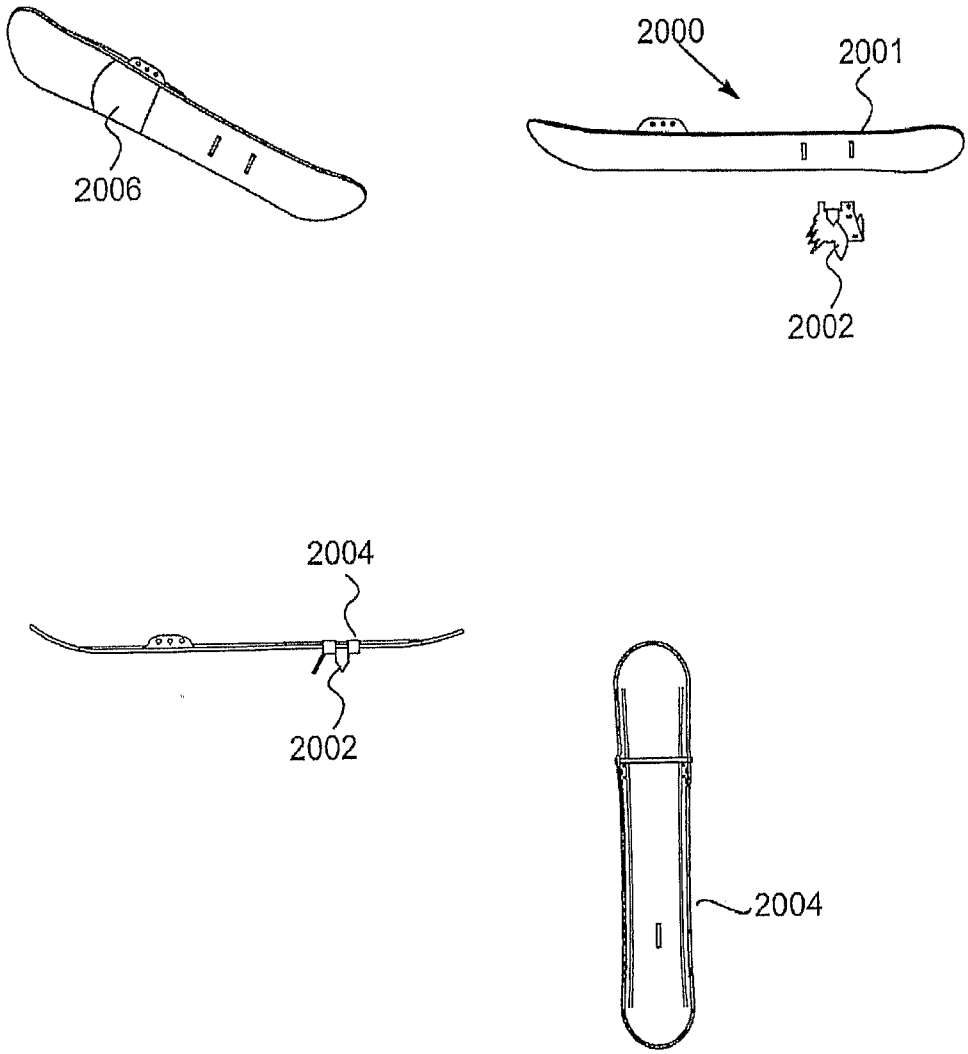

FIG. 20

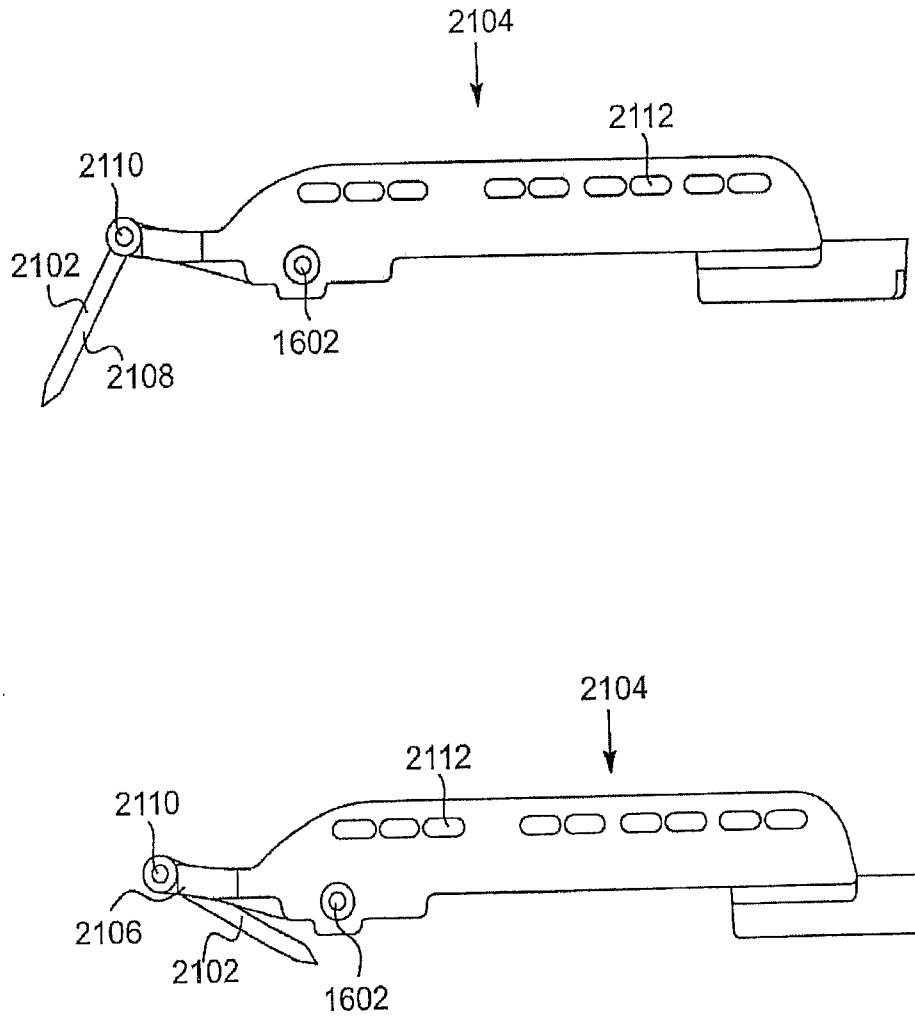

FIG. 21

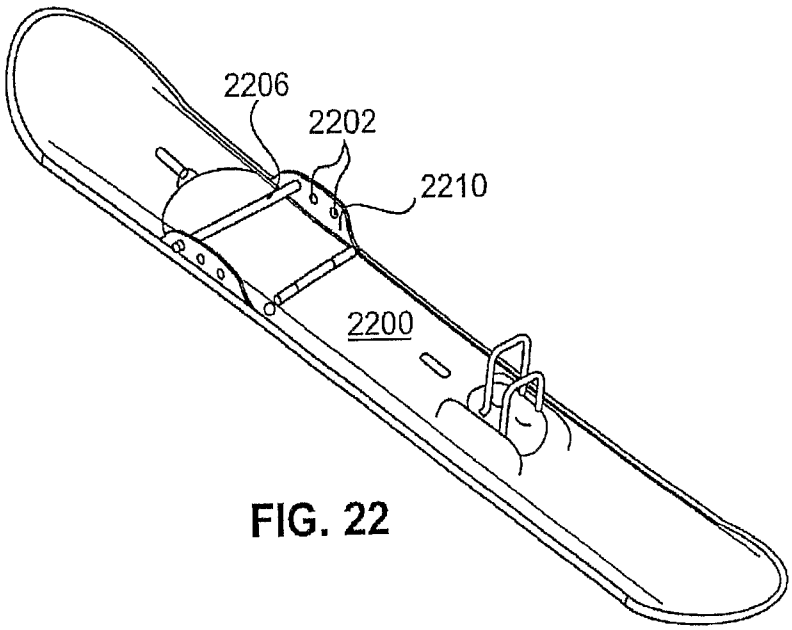

FIG. 22

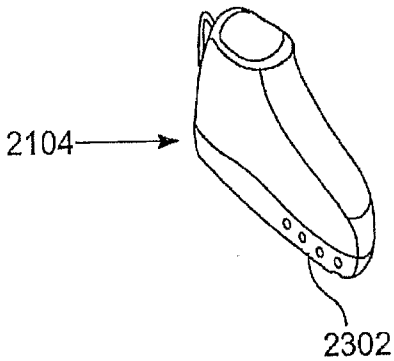

FIG. 23

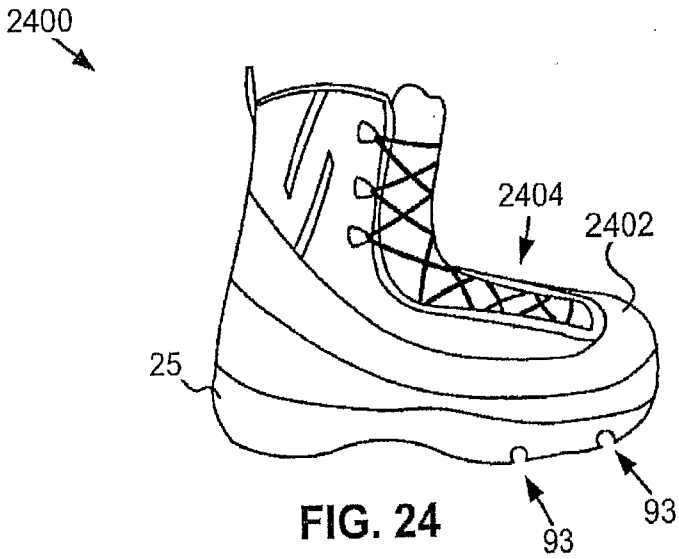

FIG. 24

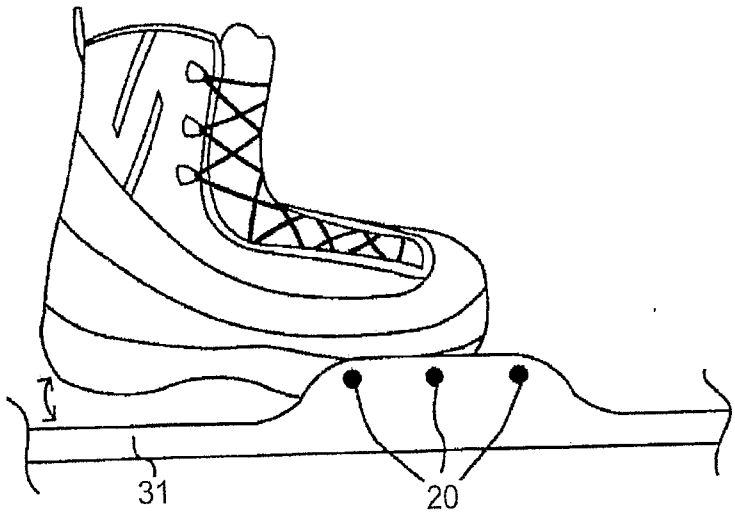

FIG. 25

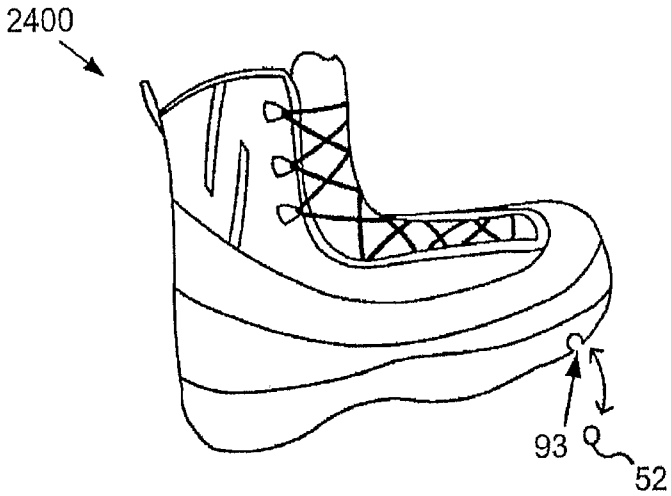

FIG. 26

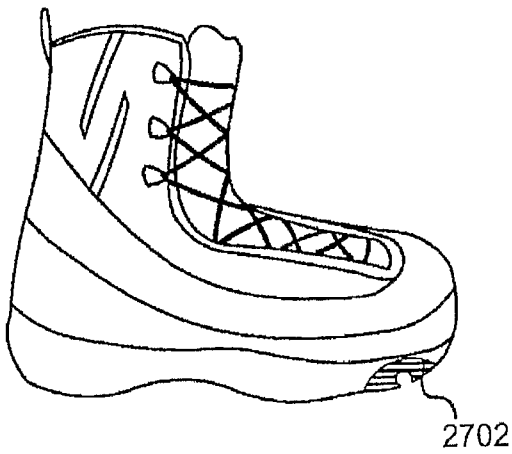

FIG. 27

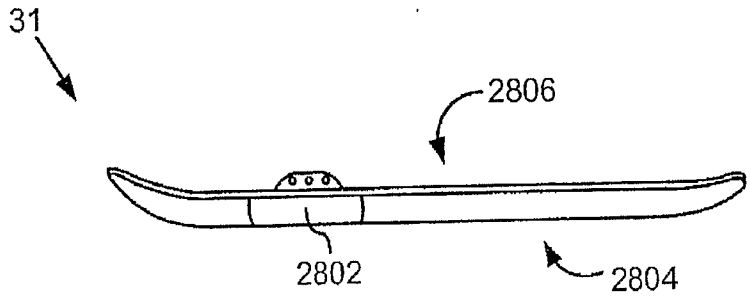

FIG. 28

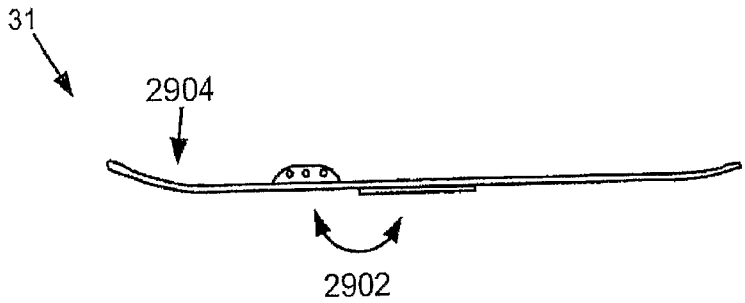

FIG. 29

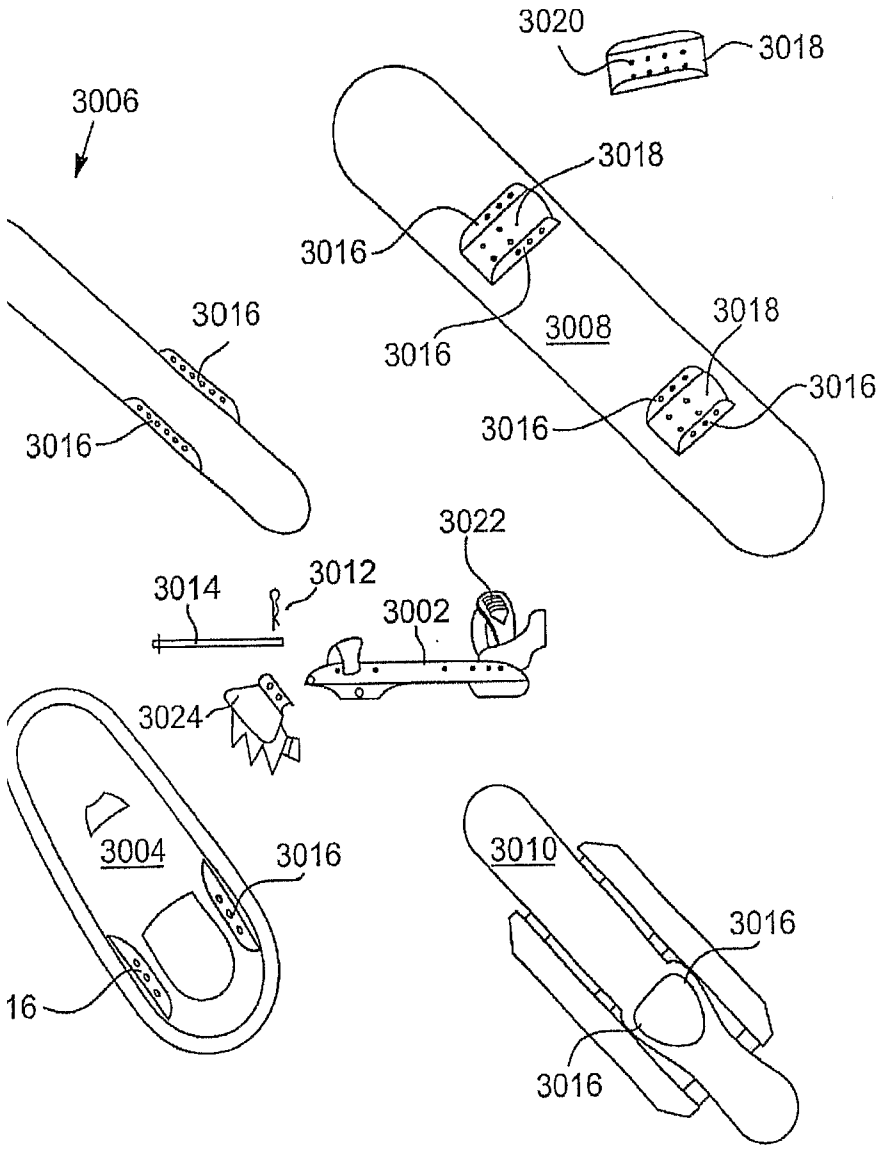
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FIG. 30

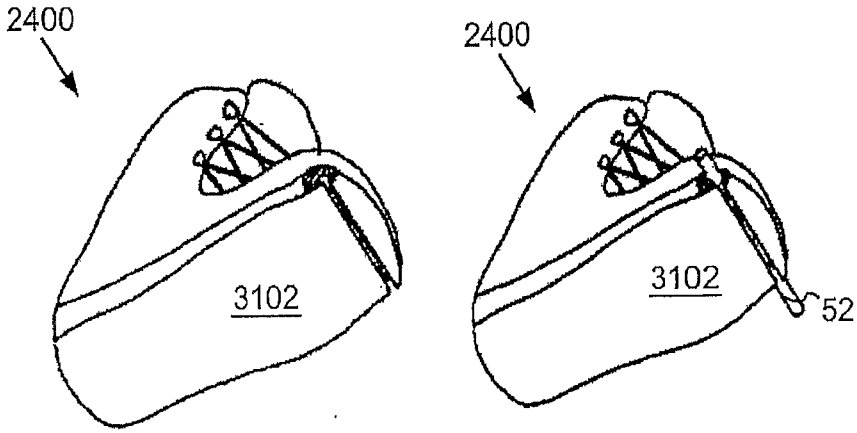

FIG. 31

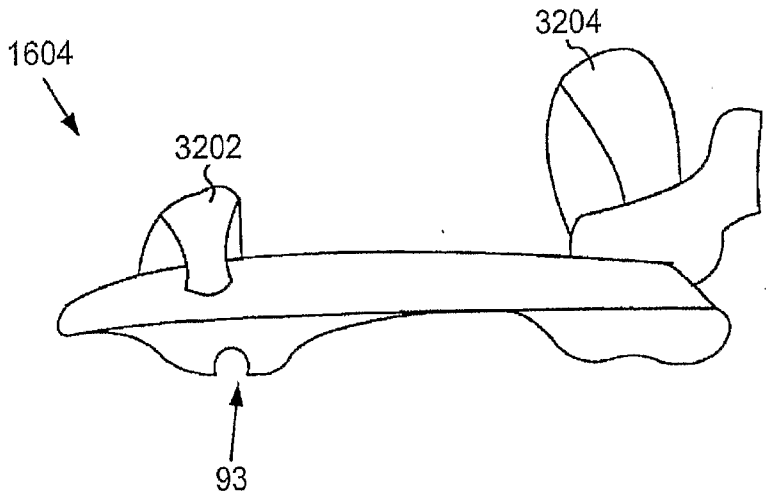

FIG. 32

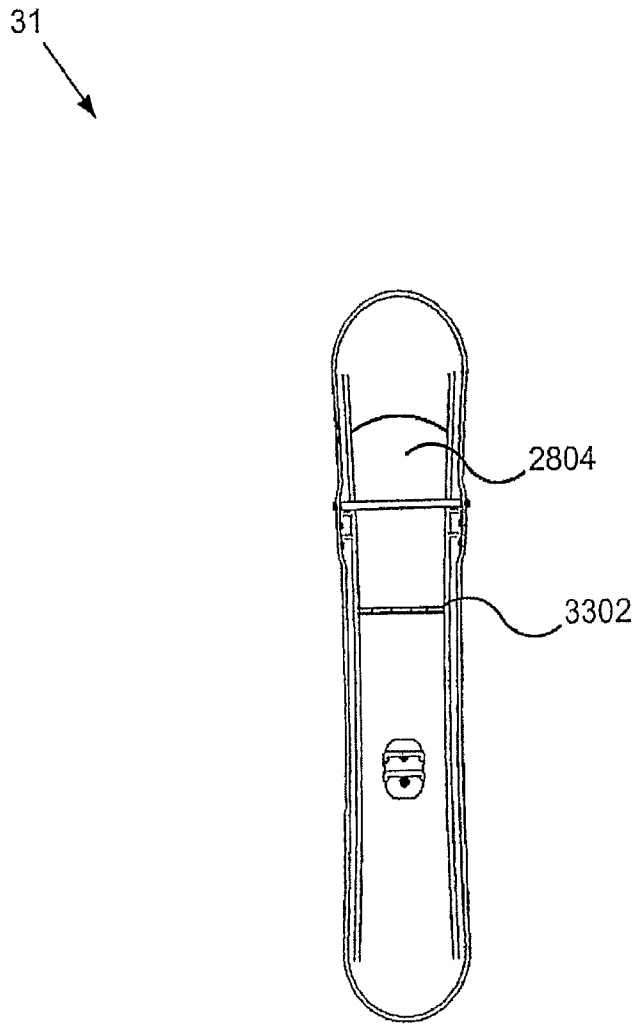

FIG. 33