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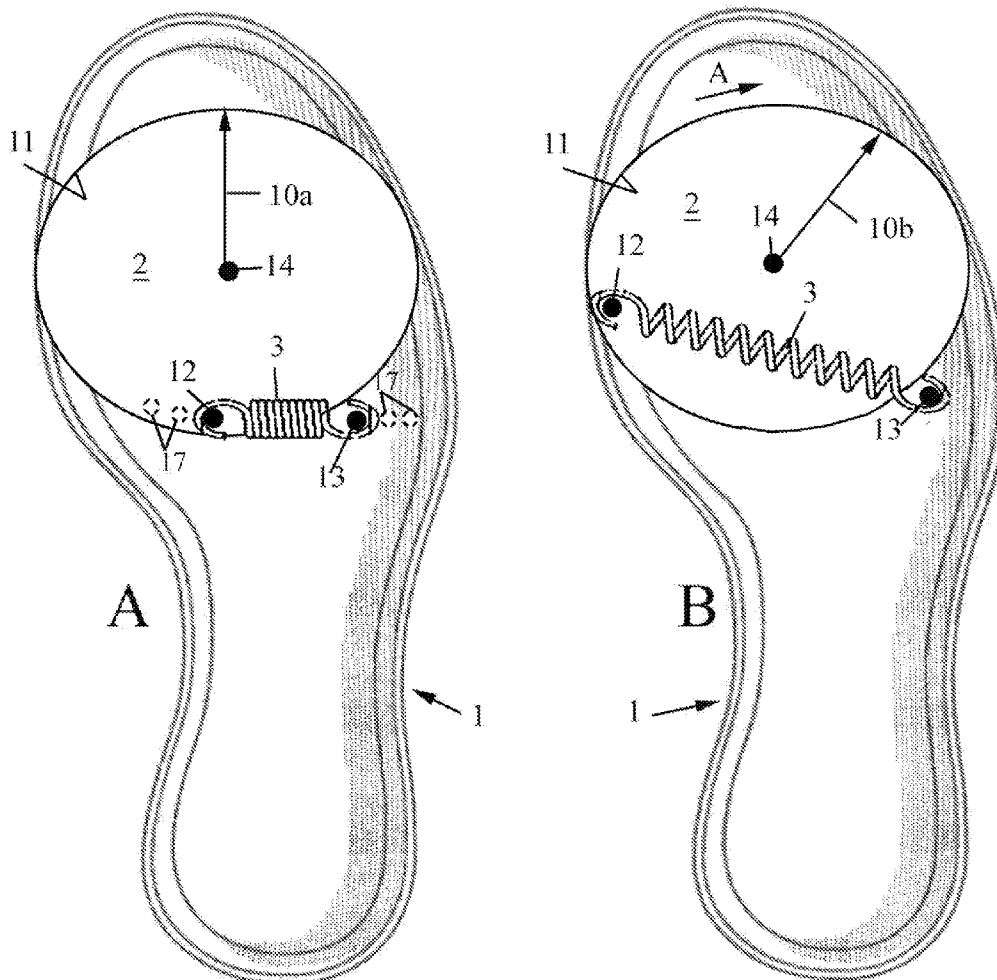
Related U.S. Application Data

(57) **ABSTRACT**

A sports shoe is disclosed for playing golf, having a sole fitted with a rotation mechanism, the rotation mechanism being provided with a rotary element rotatable against a biasing force provided to the rotary element by a biasing mechanism coupled to the rotary element. Further, a ground plate device is provided, in particular for use in playing golf, the ground plate device comprising a rotation mechanism, the rotation mechanism being configured to receive a section of a sole of a sports shoe, especially a golf shoe, and being provided with a rotary element rotatable against a biasing force provided to the rotary element by a biasing mechanism coupled to the rotary element. In a preferred embodiment, the ground plate device further comprises fastening means for detachably or not-detachably fastening the sports shoe.

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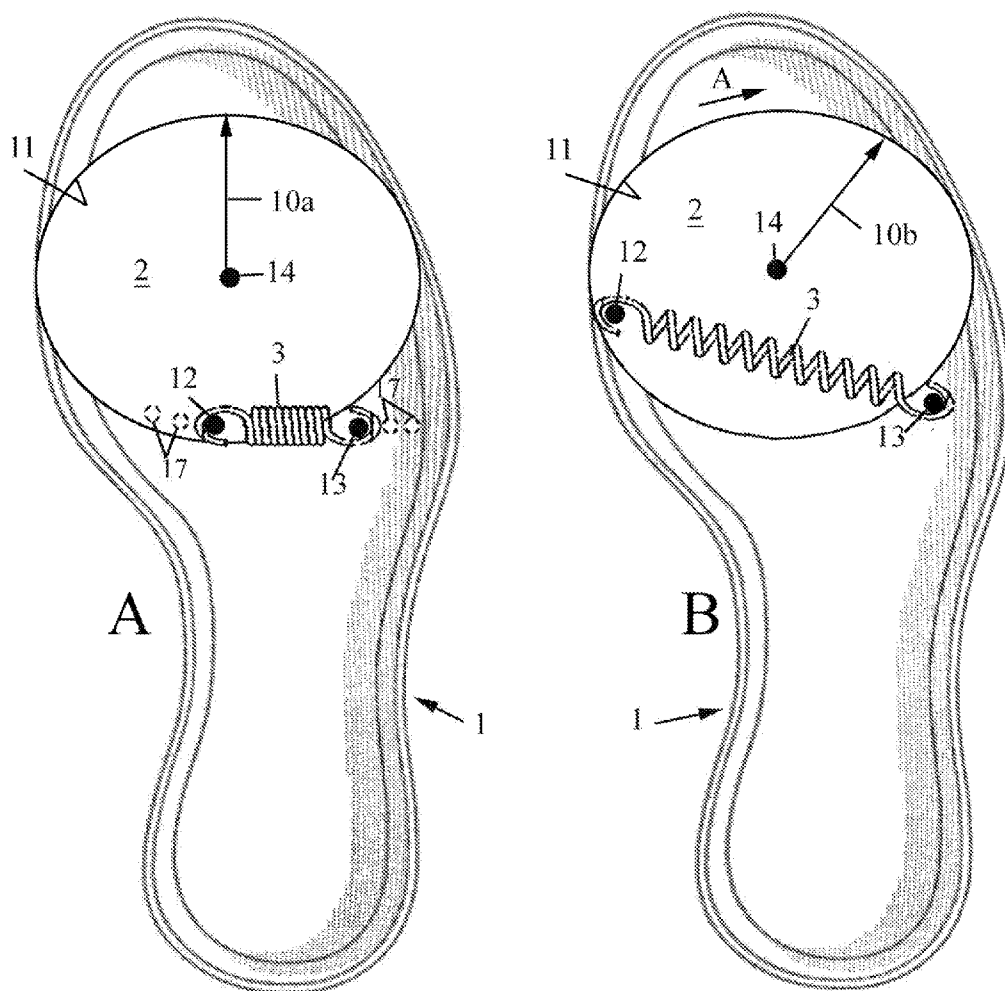


FIG. 1

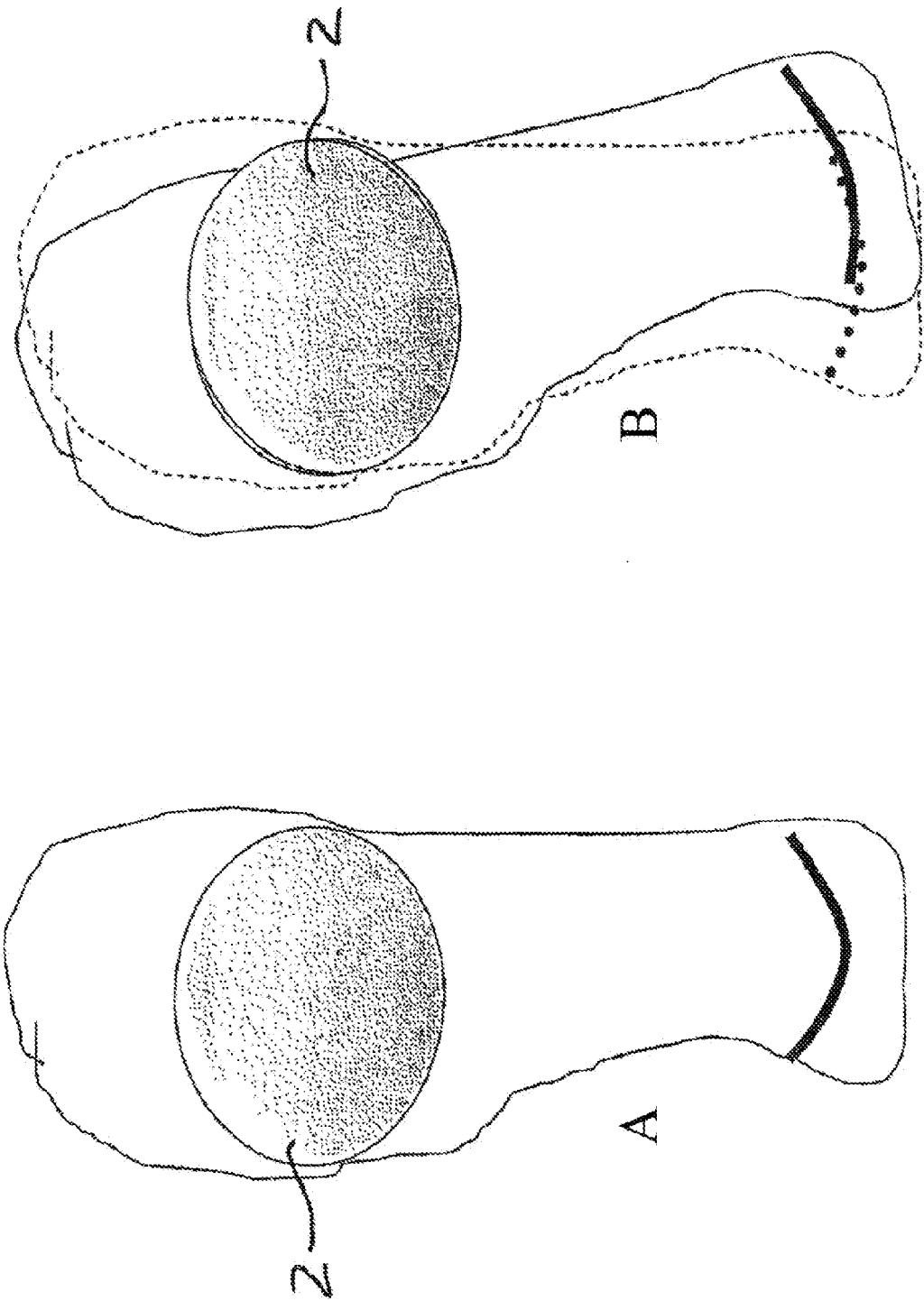


FIG. 3

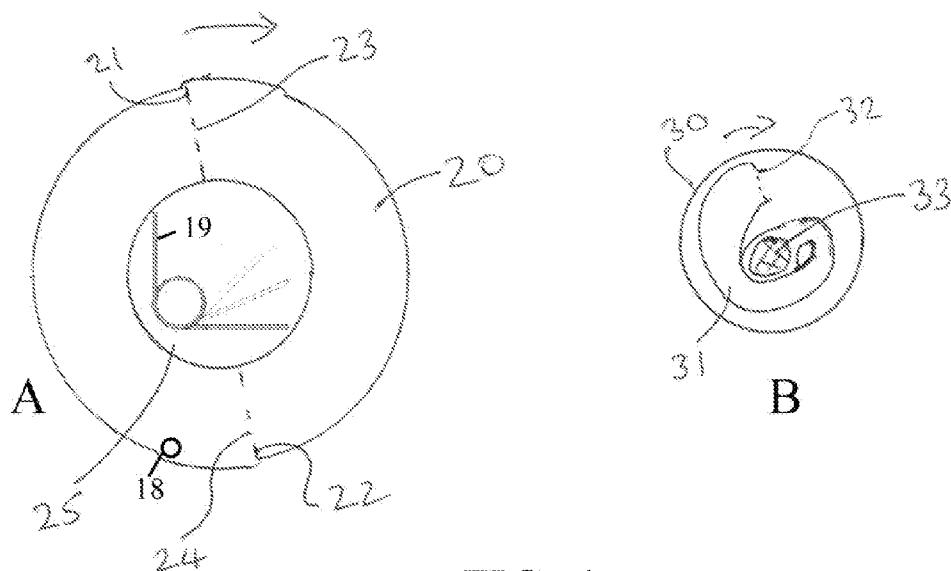


FIG. 4

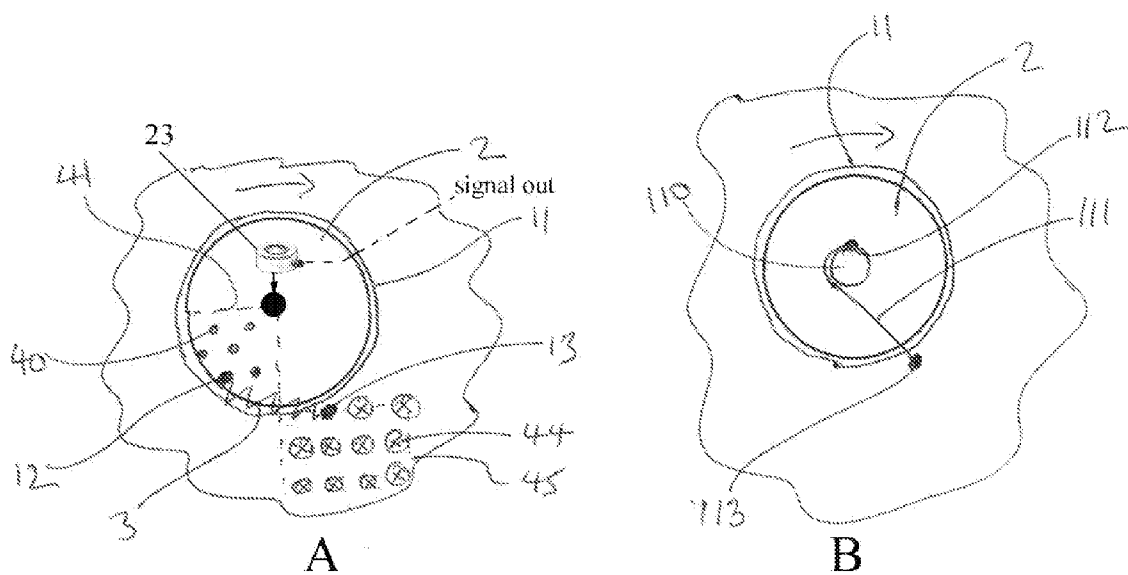
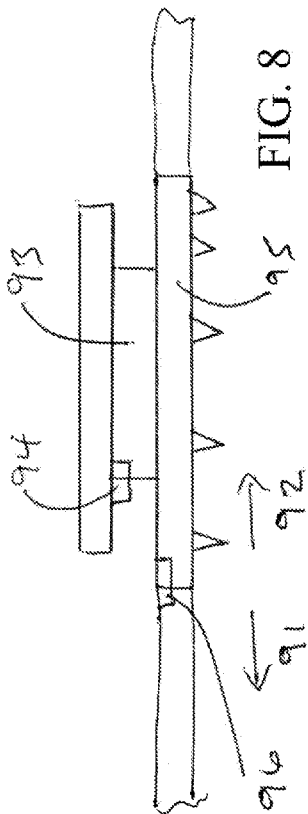
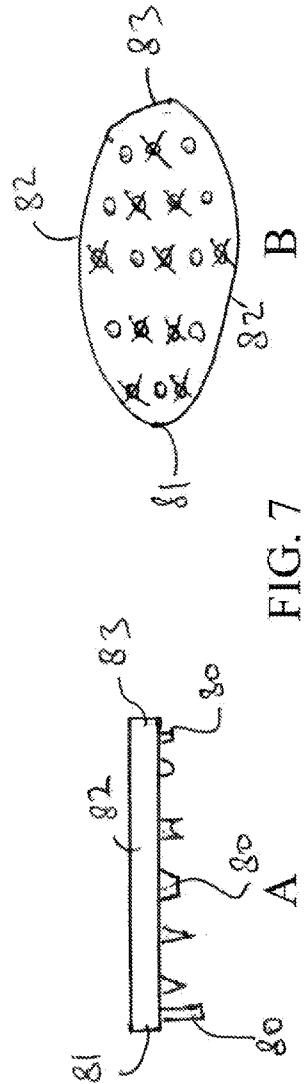
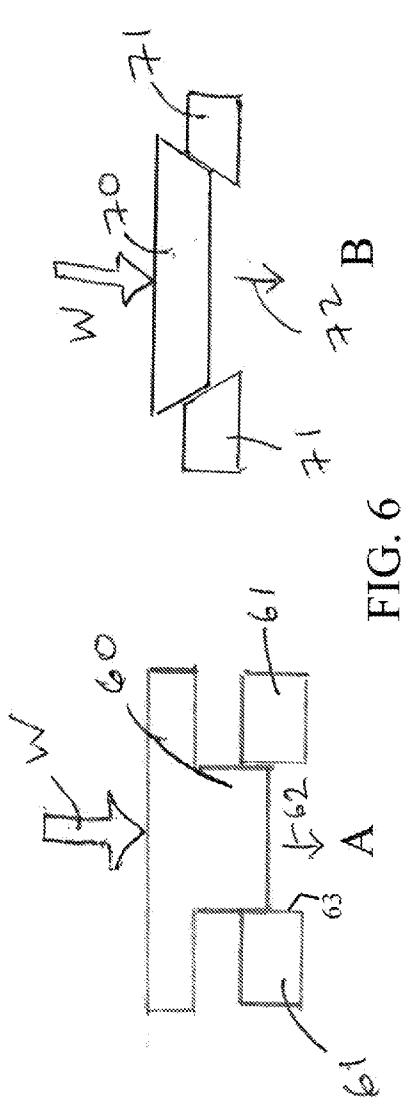


FIG. 5



SPORTS SHOE AND A GROUND PLATE DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. patent application Ser. No. 12/685,739, filed Jan. 12, 2010, which derives priority from U.S. Provisional Patent Application No. 61/146,729 filed Jan. 23, 2009.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to a sports shoe and a ground plate device, in particular for playing golf.

[0004] 2. Description of the Background

[0005] A 'twisted knee' is a common injury in number of sports such as golf, baseball, and field athletics as well as some physically demanding jobs. There is a need for a device which can act as a knee saver, a safety aid and as potentially as a therapeutic aid, once damage has been done, by allowing gradual increases in resistance, range and confidence to a user.

[0006] Of course the main use of aspects of the present invention will be in relation to sports where any torsion of the body i.e. scything action is applicable as with baseball, skiing, cricket, tennis or field hockey. A torn meniscus is the usual medical indication of damage that cannot only be painful but may require long term treatment and may be career limiting for a professional athlete.

[0007] Ideally, the device should be able to provide aspects of the following:

[0008] Adjustable torque;

[0009] Torque profiling i.e. torque varies according to angle bi-direction function;

[0010] Force/speed sensors with some kind of feedback;

[0011] Transmission to a smartphone;

[0012] Non-sports applications;

[0013] Game play e.g. skiing games (without the skis);

[0014] Orthopaedic anti-twist, post-knee and post-hip operations;

[0015] Alarm—if the torque is exceeded it sounds a whistle in 'training mode';

[0016] Golf swing 'follow-through' leads to strain on knee ligaments because left foot (right hander) cannot rotate on the ground due to studs. Some player's particular golf style leads to over-rotation and knee ligament overstrain. This has led to bone avulsions and joint disruption. Such players may be an extreme (or just in the public eye) but the problem is surprisingly common. The problem resides in the rotation about a fixed foot where the knee is the weak point—like an unfolding rope twist.

SUMMARY OF THE INVENTION

[0017] It is, therefore, an object of the present invention to provide an improved sports shoe and a ground plate device, in particular for use in playing golf, avoiding the above-mentioned problem.

[0018] According to an aspect of the invention, a sports shoe, in particular for playing golf, is provided, comprising a sole fitted with a rotation mechanism, the rotation mechanism being provided with a rotary element rotatable against a biasing force provided to the rotary element by a biasing mechanism coupled to the rotary element.

[0019] According to another aspect of the invention, a ground plate device is provided, in particular for use in playing golf, the ground plate device comprising a rotation mechanism, the rotation mechanism being configured to receive a section of a sole of a sports shoe, especially a golf shoe, and being provided with a rotary element rotatable against a biasing force provided to the rotary element by a biasing mechanism coupled to the rotary element. In a preferred embodiment, the ground plate device further comprises fastening means for detachably or not-detachably fastening the sports shoe.

[0020] The invention enables the ball of the foot to rotate against a biasing force provided e.g. by a spring, but only when the knee strain is excessive. At all other times the shoe feels 'normal.' In one aspect of the invention, by "free-floating" against the biasing force a section of the sole on a bearing or slippery surface, the rotary mechanism is used to soften the process of over extension; offloading the sudden tension on the knee ligaments. Either a biasing element, e.g. a spring, can be of a fixed tension or adjustable to account for different styles and body weights. In a preferred embodiment, the biasing element is sufficiently tight to make the shoe seem normal for walking and other non-rotational functions. The biasing force provided to the rotary element will restore the sole after the swing is over.

[0021] Advantageous developments of the invention are disclosed in dependent sub-claims.

[0022] In a preferred embodiment of the invention, the biasing mechanism comprises a spring element providing the biasing force to the rotary element.

[0023] In another preferred embodiment of the invention, the biasing mechanism is provided as an adjustable biasing mechanism configured to adjust the biasing force.

[0024] In still another preferred embodiment of the invention, the biasing mechanism is configured to adjust the biasing force in dependence on a rotation position of the rotary element.

[0025] In an embodiment of the invention, the biasing mechanism is configured to increase the biasing force in dependence on a rotation position of the rotary element.

[0026] In a preferred embodiment of the invention, the rotary element is provided with a rotatable disc, the disc being rotatable against the biasing force.

[0027] In a further embodiment of the invention, the rotation mechanism is received in a recess of the sole.

[0028] In still a further embodiment of the invention, on an outer surface of the rotary element a plurality of studs is provided.

[0029] In still another preferred embodiment of the invention, the rotary element has its rotation axis in a section intended to receive the ball of a foot. In an alternative embodiment, the rotary axis is provided in a section located back from the section intended to receive the ball of the foot.

[0030] The ground plate device may be provided with one or more of the advantageous features disclosed for the sports shoe above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] Other objects, features, and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiments and certain modifications thereof when taken together with the accompanying drawings in which:

[0032] FIG. 1 is a composite view showing a sports shoe from below with a rotary element in a normal position (A) and a rotary position (B), respectively, a rotary axis of the rotary element being located in a section intended to receive the ball of a foot.

[0033] FIG. 2 is a side cross-section view of the sports shoe of FIG. 1.

[0034] FIG. 3 is a composite view showing a sports shoe from below with a rotary element in a normal position (A) and a rotary position (B), respectively, wherein the rotary axis is located back from the section intended to receive the ball of a foot.

[0035] FIG. 4 is a composite view showing in plan cross-section the use of dash pot type arrangements (A & B) to provide variable resistance to rotation in the rotary element device;

[0036] FIG. 5 is a composite view showing in plan cross-section variable mounting positions for a resistance bias such as a spring or hydro gas strut in a rotary element device;

[0037] FIG. 6 is a composite view showing in side cross-section the use of overlapping surfaces for variation in rotational friction braking as a resistance in a rotary element device;

[0038] FIG. 7 is a composite view showing in side cross-section (A) and in plan cross-section (B) variations in stud or spike distributions in a rotary element device; and

[0039] FIG. 8 is a side cross-section of an arrangement for “parking” (immobilizing rotation) in a rotary element device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0040] Following the invention will be described in further detail, by way of example, with reference to preferred embodiments.

[0041] FIG. 1 shows a sports shoe 1 from below with a rotary element 2 in a normal position (A) and a rotated position (B), respectively. The rotary element 2 which is part of a rotary mechanism (see FIG. 2 below) is provided as a disc like element. In case of using the sports shoe 1 for playing golf, FIG. 1(B) represents the sports shoe 1 at the end of a swing where a spring 3 providing a biasing force to the rotary element 2 is extended.

[0042] FIG. 2 shows the sports shoe from FIG. 1 in a side cross-section view. The rotary element 2 is fitted to a support element 4 embedded in the sole of shoe 1 by a rotary bearing 5. On an outer surface 6, the rotary element 2 is provided with studs 7 (e.g. golf spikes).

[0043] FIG. 3 shows a sports shoe 1 from below with a rotary element 2 in a normal position (A) and a rotary position (B), respectively, wherein the rotary axis (14 in FIG. 1) is located back from the shoe 1 section intended to receive the ball of a foot.

[0044] The rotary element 2 described above, in another embodiment, may be provided in a ground plate device (not shown) which is not part of the sports shoe of a user. The golfer may step on to the ground plate device, in his/her current shoes for the demanding (and potentially damaging) drive. An external ground plate device, in preferred embodiments, incorporates one or more features described for the sports shoe above. To specify, this external device (not included in a sports shoe) leads to additional advantages. First, such an external ground plate device may be provided as a separate article. It would be easier to allow the heel component in an external plate, as well as adjustable pivot points/

fulcrum to optimize the process. The act of turning on the ball of the foot during a strenuous activity such as during sports has inherent dangers particularly if not properly warmed up or on uneven ground. However it is also important that footwear is sure, reliable and has a predictable response even if adjustable for level of skill, exertion or training.

[0045] As indicated above, ideally and as potentially provided by aspects of the present invention, a device in footwear 1 is provided which allows adjustable torque, torque profiling i.e. torque varies according to angle and use of bi-direction force/speed sensors with some kind of feedback function. The core of aspects of the present invention relate to provision of a specific rotational resistance control so asymmetric or lopsided bias typically through a spring 3, or alternatively using dash pot flows (described below) with fluids and hydraulics, along with suitable sensors also discussed below. The non-uniform resistance provided by the present invention offers a more natural correlation with the straining and stressing of the user's joint or joints, that is to say knee, ankle and hip. It will be understood in a golf swing as the player turns, both in the back swing and in the follow through, their body through the joints essentially winds-up, placing strain on those joints. A constant resistance does not act sympathetically and proportionately with the player's movement but simply adds resistance so making the chances of injury less as the user must act against the same and uniform resistance throughout the activity rather than providing proportionate resistance just when need normally for example at the extremities of a golfer's swing. With the present invention the resistance to turning of the studs increases particularly at or towards the ends of the follow through swing whilst in the ‘power’ phase in the middle of the swing the resistance is lowest and may be negligible. In such circumstances a player may feel more confidence to give it their all without fear of over-stretching joints which may be advantageous particularly with less skilled and/or less supple or/and heavier players.

[0046] Returning to FIG. 1 the rotary element 2 generally moves in the direction A so that a rotational forward direction shown by arrow 10 moves angularly between position 10a in FIG. 1(A) and position 10b in FIG. 1(B). The rotary element 2 is a disc seated within a recess 11 and acts against a bias spring 3 but it should be appreciated that the rotary element 2 in the embodiment shown may be oval so that rotation of the oval rotary element 2 in recess 11 as shown in FIG. 1 (A & B) and FIG. 2 also provides increasing resistance with rotation with increasing range. The combination of the bias spring 3 and rotary element 2 engagement to recess 11 determines the resistance to turning in use.

[0047] It should also be understood that the rotary element 2 to recess 11 association is frictional and susceptible to wear. In such circumstances continuous and ideally consistent engagement is achieved by rendering one or both of the mountings 12, 13 adjustable, such that they may be adjusted toward or away from each other. This allows for a pre-bias to spring 3 which load accommodates for any wear in the rotary element 2 to recess 11 engagement. The adjustment may be through spaced screw thread receptacles 17 for seating the mountings 12, 13 (shown in dotted lines in FIG. 1(A)), or other suitable separator or pull/push ratchet to contact engagement. Such adjustment will also allow the range of rotation and/or the resistance to rotation variation to be changed dependent upon requirements.

[0048] A mechanical spring 3 such as the illustrated extension spring can be used, but it should also be understood that

rotational resistance can be provided by other means including loaded or free dash pot arrangements and hydro-struts.

[0049] FIG. 4 provides illustrations of dash pot arrangements to provide resistance, “dash pot” being herein defines as a damper which resists motion via viscous friction. For example, FIG. 4(A) shows a closed annular chamber 20 filled with a fluid, and one or two movable baffles or blade elements 21, 22 within the fluid inside chamber 20. Upon rotation of the rotary element 2 fluid flow around the edges and/or apertures 23, 24 in the baffles or blades 21, 22 is restricted. The restriction will be dependent upon rotational speed, the configuration of the edges, the size of the apertures 23, 24 and differences in size between apertures 23, 24 in different baffles and blades 21, 22 as well as the compressibility of the fluid in the chamber 20. In an embodiment one baffle or blade 21 may be fixed in the chamber 20 which in turn is fixed to the shoe body 1 whilst the other baffle or blade 22 may be fixed to or associated with the rotary element 2, thereby give a differential squeezing action in use.

[0050] It will be understood that a central hub 25 may include a bias spring (e.g., a torsion spring 19) or other biasing means which will also provide resistance to rotation and return the device to an original condition. In any event some stop may be provided by a detent 18 in the chamber engaging the rotation baffle or blade 22 to stop further rotation. The detent 18 and/or the blade 22 or a part of the blade may be flexible to prevent an abrupt stop but rather flexing of the blade or stop and so increased resistance to a stop over a range of rotation.

[0051] In FIG. 4(B) a further alternative is provided in which a small spiral element 30 is provided in a chamber 31 filled with fluid so that rotation of the spiral element 30 forces fluid into an open end or an end with apertures at least such that the narrowing spiral constricts the fluid providing increased resistance with further rotation. A compressive element 33 such an inflated balloon or foam element or rubber insert may be placed in the spiral to provide further control of fluid flow into the spiral and so rotational resistance.

[0052] In the above circumstances it will be appreciated that aspects of the present invention are not limited to a mechanical spring but rotational resistance variation can be provide by a number of approaches including use of flexible foam or rubber or plastics materials in tension as well as in compression across the fixed chamber or mounting to the shoe and the rotor with studs or spikes.

[0053] It will be noted that the mountings 12, 13 in FIG. 1 are respectively at or near the edge of the rotary element 2 and the aperture 11 within which the rotary element 2 is positioned. In terms of adjustment it will be understood that the mounting 12 could be moved to a new position nearer to the center 14 of the rotary element 2 and/or the mounting 13 moved to a new position away from the edge of the aperture 11 in the sole of the shoe 1. Such shifts in the relative positions of the mountings will alter the response of the bias to rotation and so the use of the shoe 1 in terms of restraining undue twisting about the joints of a user. To allow adjustment typically the mountings will be upon inner surfaces of the shoe 1 so the rotary element 2 will be removed to expose the mountings 12, 13 and so the bias 3 typically in the form of a mechanical spring released so that the mountings 12, 13 positions changed prior to re-assembly.

[0054] A number of mounting 12, 13 positions may be pre-determined and so the combinations of mountings 12, 13 may be specified for user weight, ability and objectives in

accordance with experience and/or through look up tables. If the mountings 12, 13 are associated with slide or screw thread adjustment mechanisms or similar then a visible marking (alpha-numeric) may be used in selecting desired combinations to match user weight, ability, height and conditions.

[0055] FIG. 5 provides illustrations of different position for the mountings 12, 13.

[0056] In FIG. 5(A) the mounting 12 for the resistance bias or spring 3 as illustrated and described previously is substantially on the rim of the rotary element 2 but alternatively could be moved to a number of predetermined indexed positions 40 normally within in a quadrant or area marked by a broken line 41 of the rotary element 2. The mounting 13 for the spring 3 also can be as described previously at the edge of the recess 11 for the rotary element 2 but could be moved to a number of predetermined indexed positions 44 typically in a quadrant or area marked by a broken line 45. It will be understood by varying the relative positions of the mountings 12, 13 that the response of the bias or spring 3 will be altered over the different extension and contraction lengths and so the rotational resistance response of a device.

[0057] In FIG. 5(B) a mounting 112 to a capstan or drum 100 is provided at one end of a bias such as an elastic tether or belt 111 with the other end of the belt 111 secured to a mounting 113 which may be positioned in a number of locations as required. The drum 100 may be changed in terms of diameter so that the winding of the belt 111 varies over a rotational range with changes in resistance. The drum 100 may be circular or cylindrical or oval again to alter the rotational response and so resistance in use.

[0058] It is by controlling resistance variation over a range and predictably that particular advantages with the present invention can be achieved. Normally, as indicated above at least one and desirably two or more resistance elements or bias mechanisms are provided including the spring 3 or other compression or tension bias element, alone or in combination with frictional interference between rotary element 2 and sidewalls of recess 11 to accommodate it and possibly a simple friction rotation brake about a mounting upon which the rotary element 2 is presented, although such a simple rotation brake by its nature imparts constant resistance rather than proportionate to rotation and so has limited application with regard to aspects of the invention other than providing an activation force level for operation. Nevertheless it will be understood that in particularly sporting activities it is not desirable to be even or flat footed in terms of weight so normally it is desirable to be on the balls of the feet so leaning forwards with more weight on the ball of the foot. This weight shift might be used to engage the bias mechanism to increase or decrease resistance in due proportion. For example with a friction brake more weight might increase friction and so resistance to rotation or a dashpot type arrangement is provided then the fluid flow thorough the regulator apertures in the baffle or rotor blades may increase or decrease when compressed to varying extents by the weight shift to ball area of the shoe 1.

[0059] In FIG. 2 the support 4 is generally flat and provides a stable base for the bearing 5 and rotary element 2 in the shoe 1. It will be understood that the support 4 provides an anchor in the shoe 1 but need not necessarily be flat to spread load but may be shaped to concentrate load for friction resistance purposes so for example if slightly wedge shaped towards the front or rear or side of the principal direction of the shoe the thicker end may come into more forcible engagement with a

friction surface of the rotor so increasing resistance proportionately. The support may also be slightly convex or concave or otherwise contoured to adjust and manage weight shifts to best advantage in terms of friction engagement. It will also be understood that the support 4 could be as depicted in FIG. 6(A), comprising a core 60 with a concentric collar 61 in frictional engagement with each other so that as more weight W is applied to the core 60 it is forced down (indicated by direction 62) resulting in more frictional engagement with the collar 61 at contact surfaces 63 and more resistance, or vice versa. In such circumstances there may be some natural adjustment of resistance and variation thereof for user weight, gait and posture. It will also be understood that, rather than a flat upright concentric ring surface engagement, the association could be tapered or conical or curved to enhance or decrease friction surface engagement. This arrangement is depicted in FIG. 6(B) with a conical core 70 and counter-conical collar 71 in forced engagement in the direction 72 with friction surface to surface contact 73.

[0060] It should also be noted in FIG. 2 that the outer surface 6 of the rotary element 2 is not flat but rather curved (preferably convex) and that the spikes or studs 7 are not of uniform length. In use the shoe 1 and the user will naturally rock or tilt in the direction of arrowhead C. The curvature of the outer surface 6 facilitates this natural rocking motion. The rocking motion may be personal and distinct to a particular user or type of user. In such circumstances as indicated above the rotary element 2 may be removable/replaceable so that a range of rotary elements 2 of differing curvature may be provided. The various rotary elements 2 may be indexed and labeled to allow selection based on a user's preponderance for rock, roll and tilt, the curvatures being measured so that a particular rotary element 2 curvature can be recommended for the individual user and this recommendation may be dependent upon skill level and conditions e.g. soft ground or hard ground.

[0061] Traditional shoes for some sporting activities such as golf shoes have had readily removable spikes or studs so that spikes or studs can be inter-changed for example between those suitable for Winter and Summer. It is expected that such inter-changeability will also be advantageous with regard to aspects of the present invention. However, again with regard to the desire to provide tailored rotation resistance and control it will be understood that rather than use the same spike or stud type across the sole of the shoe and rotary element 2 in accordance with aspects of the present invention variations in spike or stud type could be provided. Thus, the spikes or studs 80 as illustrated in FIG. 7 at the front 81 or sides 82 or rear 83 of the rotor could have a different length or thickness or elasticity or taper, or otherwise vary to affect rotation resistance. An individual user may again be tested and a recommended spike or stud distribution and pattern suggested to that user which may even be different for each foot so respective shoe. In view of the potential number and variation in stud types and distribution (shown in FIG. 7(B)) with crosses for studs and holes for gaps in the distribution) it would be expected that the suggested distribution and pattern may be assembled into the shoe 1 by a specialized retailer or sports technician who will also have the necessary test and evaluation equipment to provide the suggested distribution and pattern.

[0062] It will be understood that comfort is a particular factor with shoes. The rotary nature particularly with a vigorous or a hefty user may mean that there is a slight wobble or

twist upon about the rotor in normal walking. In such circumstance it is envisaged that the device in accordance with aspect of the present invention as shown in FIG. 8 may be 'parked' or immobilized by forwards 91 and rearwards 92 stamping in which the inline shift knocks a rotor mounting 93 to a locked position with a latch 94 preventing rotation and/or forces the rotor plate 95 itself into engagement with a lock latch 96 to stop rotation. The lock 94, 96 will be released by a reverse forwards or rearwards stamping so freeing the rotor 95 to rotate as required in accordance with aspects of the invention.

[0063] By the above means it will be understood that it is possible to provide adjustable torque, torque profiling with angle, bi-directional resistance by combination of bias, rotor shaft braking and rotor in a recess shaping.

[0064] In addition, sensors may be added to the shoe 1 (or at least a standardized test shoe to allow for customized shoes for an individual to be provided). Force, load and/or speed sensors may be associated with the rotor, the recess accommodating the rotor, the mounting for the rotor, the bias means such as for rate of spring extension, to the support for load distribution in a swing action along with other parts of the shoe. These sensors will prove absolute values in terms of highs and lows and transients, and also rates and trends useful in determining the right resistance profile over a range for an individual use or type. The sensors may be linked to processing means which analyze the results and suggest alteration in terms of movement and the positioning of the bias, the shape of the rotor and distribution as well as type of spikes or studs used.

[0065] The sensor(s) will tend to be electro-mechanical so force measurement will be derived from strain gauges, or piezo electric devices. For example, FIG. 5(A) illustrates a conventional quartz rotary torque sensor 23 may be mounted to the axial central hub 25 of the rotary element 2 to provide feedback (signal out). Motion sensing will be derived from a magnet and coil device or with piezo surfaces, piezo tuning forks, lasers and fluid pressure sensing (of a confined liquid). However any suitable sensor could be used from the basic to more complex instruments. The sensor(s) may be in wireless contact with a personal digital or mobile device such as smart-phone to provide results but alternatively for example a simple LED light and/or audible sound/alarm in the shoe could illuminate or be operative if the range/rate of rotation has been exceed or was within desired range. The sensors can also be used to monitor a program or progress with an individual user in training or convalescing in terms of increasing range in a controlled manner after an injury or surgery and could provide a clinician with a record as to activity with remedial therapy.

[0066] The features disclosed in this specification, claims and/or the figures may be material for the realization of the invention in its various embodiments, taken in isolation or in various combinations thereof.

[0067] It should now be apparent that the above-described method and apparatus effectively dampens the rebound of a lacrosse ball received in a head 10 pocket particularly in which the webbing is stung taught according to the rules of the game. Having now fully set forth the preferred embodiment and certain modifications of the concept underlying the present invention, various other embodiments as well as certain variations and modifications of the embodiments herein shown and described will obviously occur to those skilled in the art upon becoming familiar with said underlying concept.

It is to be understood, therefore, that the invention may be practiced otherwise than as specifically set forth in the appended claims.

What is claimed is:

1. A sports shoe, in particular for playing golf, comprising a sole fitted with a rotation mechanism, the rotation mechanism being provided with a rotary element rotatable against a biasing force provided to the rotary element by a variable biasing mechanism coupled to the rotary element.

2. The sports shoe according to claim 1, wherein the variable biasing mechanism comprises a spring element providing the biasing force to the rotary element.

3. The sports shoe according to claim 1, wherein the variable biasing mechanism comprises two or more biasing mechanisms configured to adjust the biasing force by association with the rotary element.

4. The sports shoe according to claim 1, wherein the biasing force provided by the variable biasing mechanism proportionately changes on rotation of the rotary element.

5. The sports shoe according to claim 4, wherein the biasing force provided by the variable biasing mechanism increases on rotation of the rotary element relative to the sole.

6. The sports shoe according to claim 1, wherein the rotary element comprises a rotatable disc, the disc being rotatable against the biasing force.

7. The sports shoe according to claim 1, wherein the rotation mechanism is received in a recess of the sole.

8. The sports shoe according to claim 1, wherein a plurality of studs is provided on an outer surface of the rotary element.

9. The sports shoe according to claim 1, wherein the rotary element has a rotation axis positioned relative to a section of the sports shoe adapted to receive a ball of a wearer's foot.

10. A ground plate device, in particular for use in playing golf, comprising a rotation mechanism, the rotation mechanism being configured to receive a section of a sole of a sports shoe, especially a golf shoe, and being provided with a rotary element rotatable against a biasing force provided to the rotary element by a variable biasing mechanism coupled to the rotary element.

11. The ground plate device according to claim 10, further comprising fastening means for detachably or not-detachably fastening the sports shoe.

12. The ground plate device according to claim 10, wherein the variable biasing mechanism comprises a spring element providing the biasing force to the rotary element.

13. The ground plate device according to claim 10, wherein the variable biasing mechanism is provided as a combination of biasing mechanisms configured to adjust the biasing force by association with the rotary element.

14. The ground plate device according to claim 10, wherein the biasing force provided by the variable biasing mechanism proportionately changes on rotational position of the rotary element relative to the shoe.

15. The ground plate device according to claim 13, wherein the biasing force provided by the variable biasing mechanism proportionately increases dependent upon rotation position of the rotary element relative to the sole.

16. The ground plate device according to claim 10, wherein the rotary element is provided with a rotatable disc, the disc being rotatable against the biasing force.

17. The ground plate device according to claim 10, wherein the rotary element has a rotation axis positioned proximate a ball of a user's foot.

* * * * *