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(54) **CLEATED FOOTWEAR**

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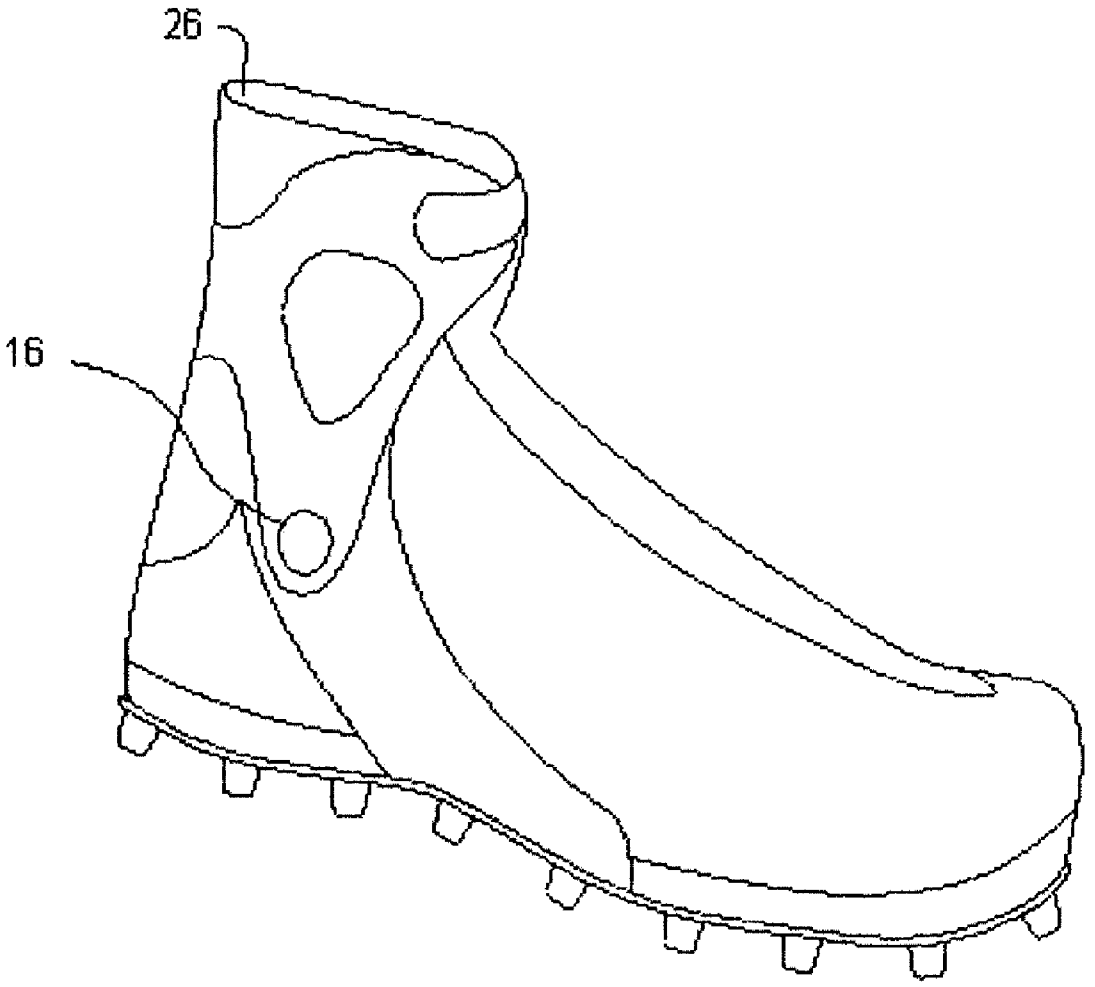
(52) **U.S. Cl.** ..... **36/89**; 36/114; 36/67 A

(57) **ABSTRACT**

An article of footwear, such as a cleated shoe, includes a sole portion with cleats which taper transversely, protruding less at the sole edges and more towards the middle of the sole. The footwear may take the form of a substantially flat sole to which the cleats are anchored and a shock-absorbing outsole portion that the cleats protrude through. The footwear also includes mini cleats arranged along the sole, and the sole includes plural thickness demarcators. The footwear also includes integral ankle protectors, a hinged cuff, and an inner boot.



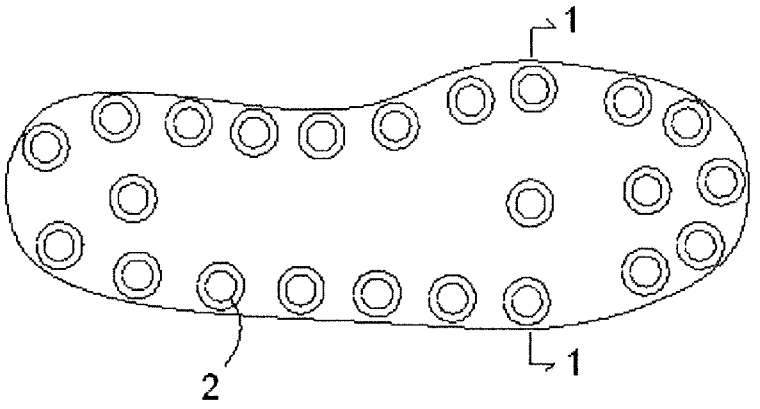


Fig. 1

Fig. 1a

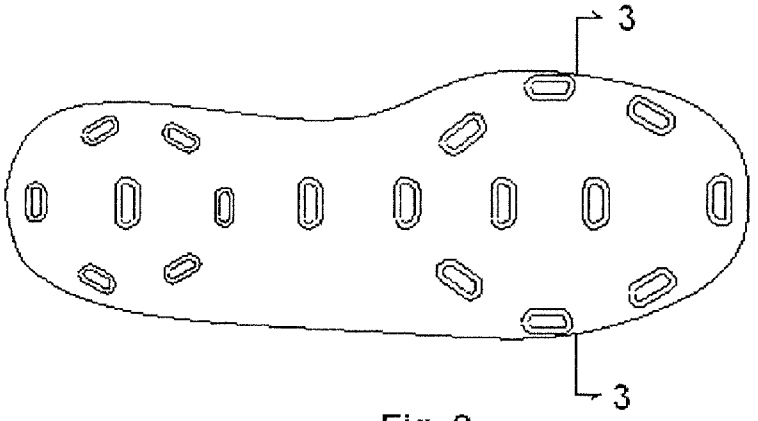


Fig. 2

Fig.2a

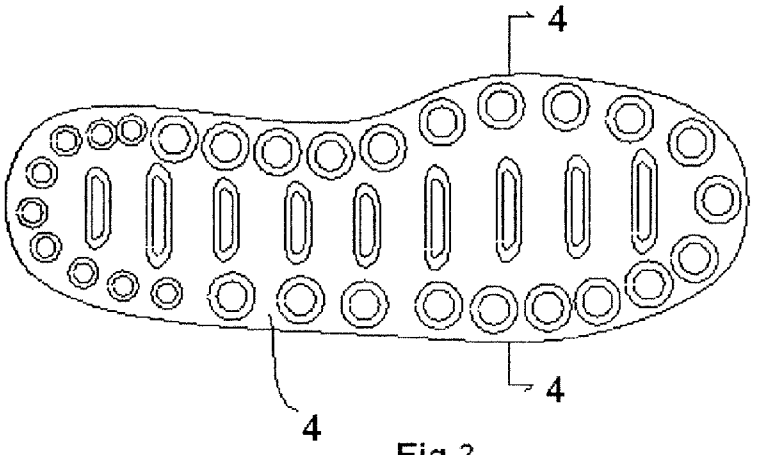


Fig.3

Fig. 3a

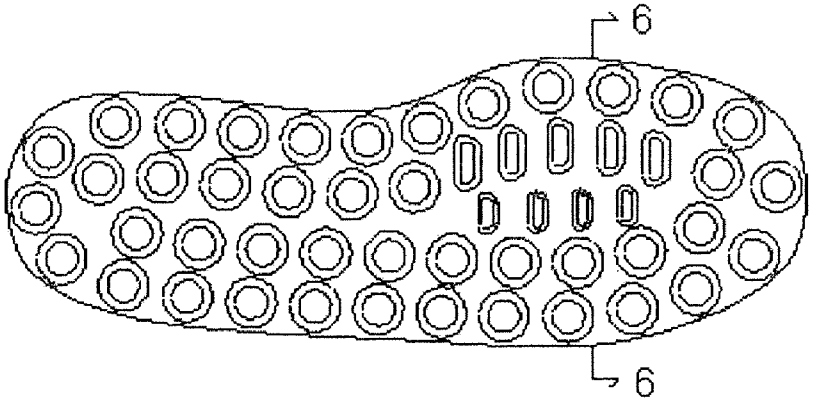


Fig. 4

Fig. 4a

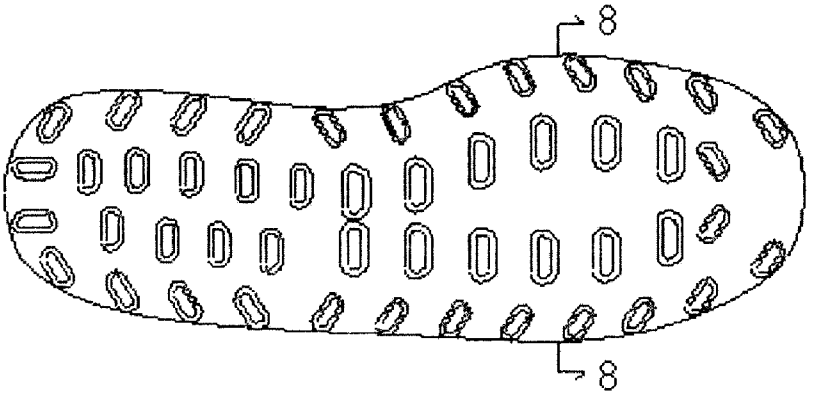


Fig. 5

Fig. 5a

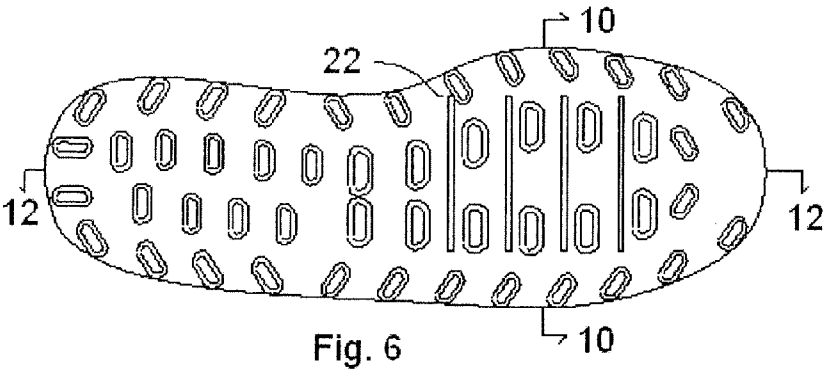


Fig. 6

Fig. 6a

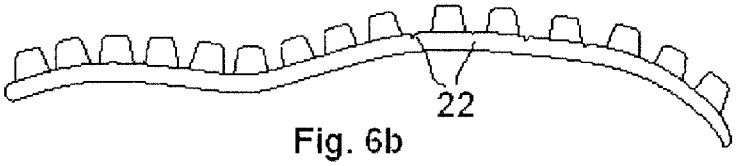


Fig. 6b

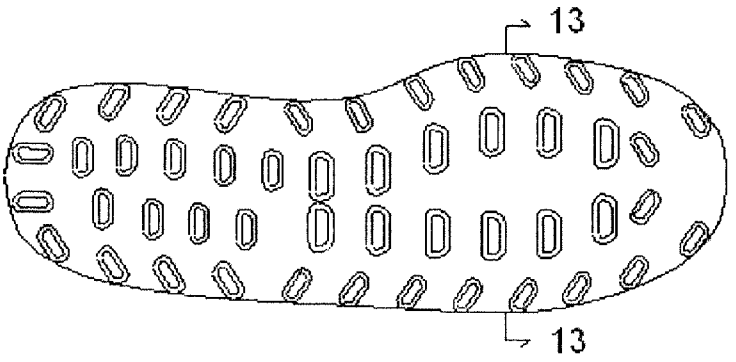


Fig. 7

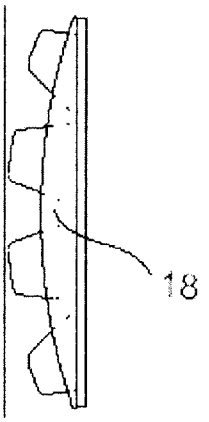


Fig. 7a

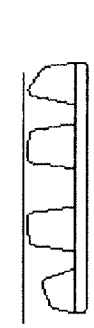


Fig. 8a

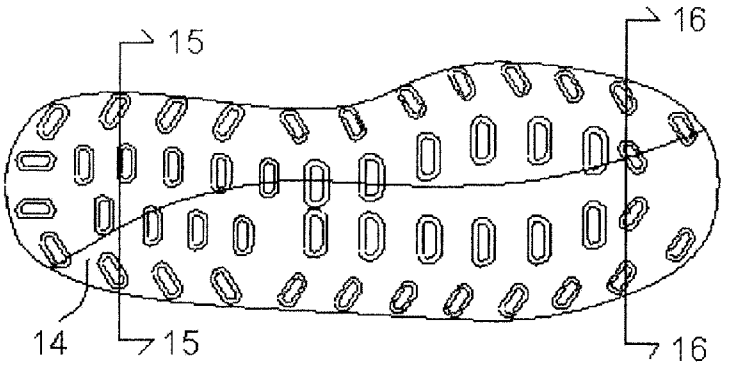


Fig. 8

Fig. 8b

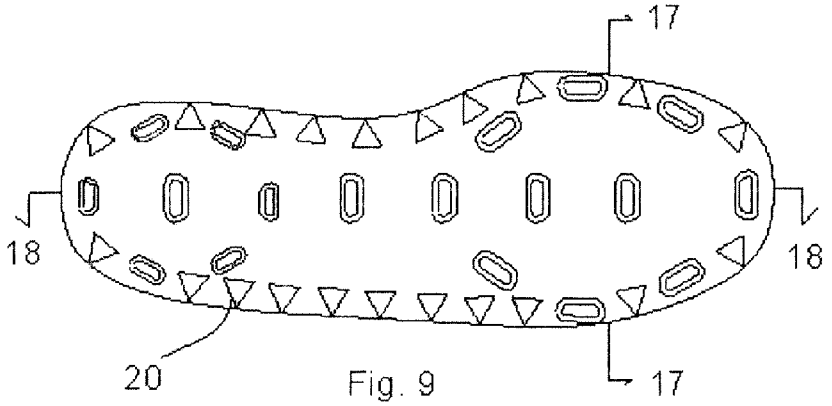


Fig. 9

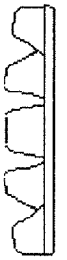


Fig. 9a

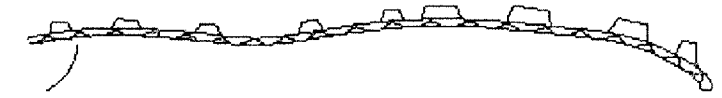


Fig. 9b

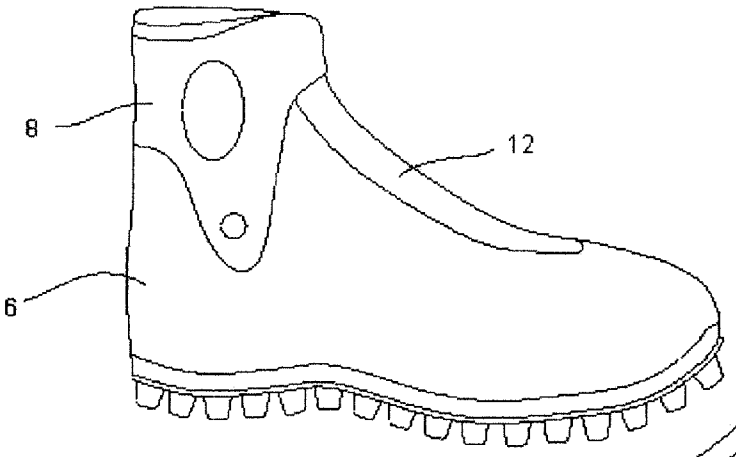


Fig. 10

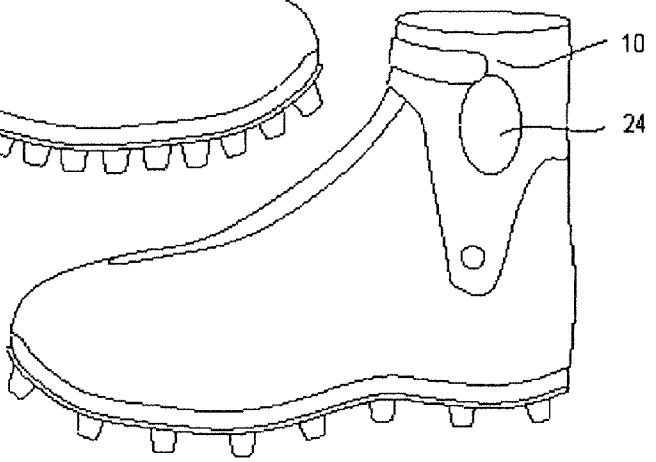


Fig. 11

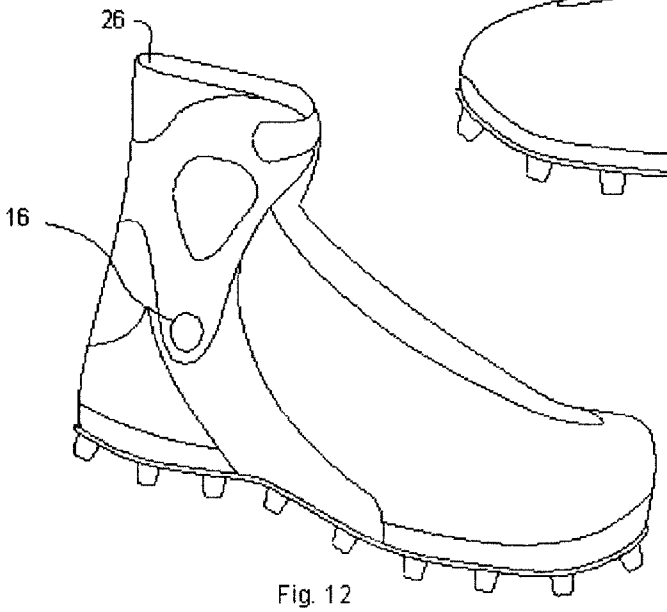


Fig. 12

CLEATED FOOTWEAR

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 60/830,807, filed Jul. 13, 2006 and entitled "CLEATED FOOTWEAR", the complete disclosure of which is herein incorporated by reference for all purposes.

BACKGROUND

[0002] The footwear of the present inventive concept is designed to optimize the natural biomechanics of the ankle/foot, promoting better performance and causing fewer injuries than the cleated shoes of the prior art. The primary biomechanical dynamic being addressed with the present inventive concept is enhancement of the foot's natural tendency to stay relatively perpendicular to the tibia when making lateral cutting moves—something standard cleated shoes do not allow.

[0003] The most prominent injury by far in any of the cleated-shoe sports is ankle sprain. This is due to the fact that cleated shoes create a significant lever for torsional/pivoting forces (due to the increased distance off the ground), and said lever is not countered by any effective means of stabilizing the ankle and/or reducing the lever force.

[0004] Most prior art focuses on increasing traction, not on making the foot respond in a biomechanically efficient manner. Cleats and stiff soles, coupled with irregular fields and poor traction create a situation that severely compromises the foot and lower leg, leading to injuries and decreased athletic performance. The footwear of the present inventive concept allows for biomechanics akin to the unshod foot, thereby increasing both comfort and performance.

SUMMARY

[0005] U.S. Pat. No. 4,776,111 discloses a plastic cuff on an article of footwear, as does U.S. Pat. No. 5,177,884. These address the need for increased ankle support through the use of a relatively rigid hinging cuff. Neither patent addresses the increased angular forces (due to height off the ground and sharp sole edges) that necessitated such a cuff. By simply incorporating a hinging cuff without altering the configuration of the sole, one is merely creating a more uncomfortable shoe, since, in order to overcome the lever force of the wide flat sole the cuff has to be of a stiffness similar to the cuff on alpine ski boots for the foot to actually role naturally perpendicular to the tibia. In short, proper medio-lateral rolling of the foot does not happen simply by incorporating an ankle cuff or "hightop" with no tapered sole profile, as the hard edges and flat soles of standard shoes counter the lever force exerted by the ankle cuff/hightop, resulting in the shoe's sole remaining flat while the cuff applies undo pressure to the ankle during angular cutting moves.

[0006] Frampton Ellis has numerous US patents based on U.S. Pat. No. 4,989,349, all of which address the dynamics of angular forces and how alterations in the sole itself can decrease such forces. His designs teach away from the sole of the present inventive concept however, as they are comprised of uniform sole thickness, bulges, sipes, and contoured portions that are integral with the sides of the shoe, etc. Ellis' notion of uniform sole thickness (mimicking the contours of the foot) still creates an unnessarily large lever force when the sole is on either lateral edge, as the thickness of the sole itself at its edges adds to the lever length (the lever length being the distance between the center of ankle rotation and the most lateral portion of the sole). The footwear of the present inventive concept includes a very thin sole at its edges, while bulging towards the center, thus with the present concept the lever length is decreased commensurate with the difference between the thicknesses of the soles at their edges. No prior art teaches a sole configuration similar to that of the present invention—thickest in the middle and narrow at the edges, coupled with a hinging upper and integral ankle protector.

[0007] Advantages of the present inventive concept include:

[0008] Reduction of injuries;

[0009] Better performance due to active medio-lateral canting of the ankle.

[0010] Better protection from blows to the ankle;

[0011] A smoother transition between the foot and the ankle, making contact with the ball more reliable.

[0012] FIG. **1** shows a shoe sole germane to the art wherein all the cleats are parallel to the ground. The footwear of the present inventive concept teaches directly away from such art —instead focusing on a rounded cleat profile (transversely) and sole that tapers toward the edges.

[0013] The foregoing is not intended to be an exhaustive list of embodiments and features of the present inventive concept. Persons skilled in the art are capable of appreciating other embodiments and features from the following detailed description in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. **1** shows a cleated sole germane to the art.

[0015] Fig. **1***a* shows a transverse section at line **1**.

[0016] FIG. **2** shows the sole of an embodiment with circular cleat patterns.

[0017] FIG. **2***a* shows the transverse section at line **3**.

[0018] FIG. **3** shows the sole of another embodiment.

[0019] FIG. **3***a* shows the transverse section at line **4**.

[0020] FIG. **4** shows the sole of another embodiment.

[0021] FIG. **4***a* shows the transverse section at line **6**.

[0022] FIG. **5** shows the sole of another embodiment.

[0023] FIG. **5***a* shows the transverse section at line **8**.

[0024] FIG. **6** shows the sole of an embodiment with arced sole.

[0025] FIG. **6***a* shows the transverse section at line **10**.

[0026] FIG. **6***b* shows the longitudinal section at line **12**.

[0027] FIG. **7** shows an embodiment similar to the previous but with an arced elastomer outsole.

[0028] FIG. 7*a* shows the transverse section at line **13**.

[0029] FIG. **8** shows another embodiment with a thickness demarcator.

[0030] FIG. **8***a* shows the transverse section at line **15**.

[0031] FIG. **8***b* shows the transverse section at line **16**.

[0032] FIG. **9** shows a version with mini-cleats at the edge of the sole.

[0033] FIG. **9***a* shows the transverse section at line **17**.

[0034] FIG. **9***b* shows the longitudinal section at line **18**.

[0035] FIG. **10** shows a right elevational view of the shoe with hinged plastic cuff.

[0036] FIG. **11** shows a left elevational view of the same shoe with cuff tightener.

[0037] FIG. **12** shows another embodiment with plastic cuff, inner boot and ankle protector.

DETAILED DESCRIPTION

[0038] Representative embodiments of the present inventive concept are shown in FIGS. **2-12**, wherein similar features share the common reference numerals listed below:

[0039] **2** Cleat

[0040] **4** Sole

[0041] **6** Upper

[0042] **8** Cuff

[0043] **10** Cuff tightener

[0044] **12** Laces

[0045] **14** Thickness demarcator

[0046] **16** Cuff hinge

[0047] **18** Outsole

[0048] **20** Mini-cleats

[0049] **22** Flex grooves

[0050] **24** Ankle protector

[0051] **26** Inner boot

[0052] The salient features of the present inventive concept are: tapered sole/cleat profile, integral ankle protection, and hinging cuff—the most prominent feature being the tapered transverse profile of the cleats. As FIGS. **2-6** illustrate, regardless of the cleat pattern (on X-Y axes) on the sole, the cleats are always tapered transversely (laterally in z axis) such that in relation to any flat surface the footwear can role easily medio-laterally. The cleats are highest relative to the ground near the center of the shoe, while tapering upward towards the foot (in the z axis) at the edges. There may be a relative flat area near the center of the sole, as long as the edges taper appreciably. The ankle/foot is naturally inclined to roll subtly back and forth at various parts of a normal stride, and thus the arc of the sole should be such that it compliments such rolling.

[0053] A tapered sole is of course inherently less stable than a flat sole if not coupled with a hinged cuff which supports the ankle. For example, when making a cutting turn to the right the left tibia is necessarily canted towards the right off the vertical 10-30 degrees. In the present inventive concept the sole of the left foot is allowed to roll naturally in the same direction as the tibia (angling 10-30 degrees), thus the sole of the foot maintains an angle roughly perpendicular to the tibia, as would occur if one were barefoot in sand.

[0054] There are many possibilities for combining a hinged cuff and tapered sole, as illustrated in FIGS. **2-12**. The circular cleat pattern shown in FIG. **2** is a preferred embodiment due to the fact that it also addresses pivoting (rotational around the Z axis) forces. With such pivoting there is a great deal of rotational force applied to the leg, especially if the cleats are far apart. Such forces can result in torn collateral or cruciate knee ligaments. By keeping the cleats in the same radius (via a circular pattern) in relation to the ball of the foot, this torsional force is reduced.

[0055] FIGS. **2-5** illustrate various configurations of cleats, but as FIGS. **2***a*-**5***a* show, the cleats are anchored to a flat sole and always tapered towards the edge regardless of a given cleat pattern. FIG. **6** shows how, instead of rounding the cleats on the edges relative to a flat sole (as in FIGS. **2-5**), the cleats may be the same height relative to a tapering (laterally in the Z axis) sole. Thus the cleats remain roughly the same height relative to the tapered sole, but they appear tapered at the edges relative to the ground. In order for such a sole to flex optimally fore-aft flexion grooves (FIG. **6***b*) may be included, since such a curved surface can exhibit more rigidity than a non-tapered sole. The flexion grooves promote flexing in the longitudinal axis due to the decreased thickness of the sole at the flexion grooves.

[0056] As FIGS. **7-7***a* show, another way of achieving a similar dynamic is to anchor the cleats to a flat sole while incorporating an arced outsole made of a flexible shock absorbing material (such as that typically used in the midsoles of athletic shoes), said material arcing transversely relative to the harder flat sole it's anchored to. The cleats are tapered towards the edge and may be orthogonal or slightly radial (relative to the Z axis), appearing to splay outward at the edges, as the cross section in FIG. **7***a* illustrates. By virtue of its relatively low durometer, the outsole may also act as cushioning—a quality sorely lacking in cleated shoes. In addition, the outsole inhibits the accumulation of mud/grass between the cleats, since it compresses and rebounds with each stride, effectively forcing mud/soil away from the cleats.

[0057] Instead of arranging the arc of the sole relative to the sole edges it's possible to incorporate a thickness demarcator, as illustrated in FIGS. **8-8***b*. Such a demarcator can allow for more optimum canting of the shoe on inside and outside turns, depending on field conditions. The thickness demarcator is the thickest portion of the sole; an example shows a transverse section on lines **16** (as in FIG. **8***b*) with the medial cleats protruding less than the lateral cleats. A transverse section on linel**5** shows just the opposite—the medial cleats protrude more than the lateral The thickness demarcator may take many forms, and it may be wider than the single line shown, dividing the shoe sole/cleats into two or more symetric or asymetric zones of thickness and relative flatness towards the center of the sole.

[0058] The sole shown in FIGS. **9-9***b* illustrates how mini cleats may be positioned at the edges of the sole or elsewhere throughout the sole. These enhance traction when the

sole is rolled medio-laterally, as when executing a tight turn. Since the shoe of the present inventive concept is designed to roll so that the bottom of the foot remains largely perpendicular to the tibia, it's advantageous to include as much traction-inducing surface as possible along the edges of the sole. As FIG. **9***b* illustrates, the mini cleats are cleats with lower profile than the larger cleats by necessity, as its important not to add too much thickness to the sole near the edges, in order to reduce lever forces and facilitate a natural medio-lateral roll.

[**0059**] Cleated shoes are offered in both low and high-top versions, hightops generally offering greater stability. By extending higher than the malleoli of the ankles hightops brace the ankle to varying degrees. Hightops are insufficient however, as they don't offer enough lateral ankle protection, and they invariably restrict fore-aft flexion of the ankle. A better alternative is a hinged cuff similar to that found on nordic ski boots and inline skates. See FIGS. **10-12** for examples of such a cuff. This type of cuff is much more desirable than a standard hightop, as it confers much better lateral support, while offering very little fore-aft resistance. Incorporation of a hinged cuff for cleated shoes has the additional advantage of protecting the ankle from blows such as "cleating"—when the player gets struck above the shoe by another player's shoe.

[**0060**] There are many possibilities for cuff configurations and actual hinging hardware, but in general the cuff hinge should be placed near the malleoli, and the cuff itself should extend far enough upward so that it gives the support needed to counteract any lateral forces. The shoe upper may extend up past the cuff, and/or incorporate some sort of inner boot similar to that used with inline skates, as in FIG. **10**. The ankle protector may be a bulging portion of the plastic cuff or some exposed inner boot with reinforcement. The whole cuff should be stiff enough to withstand blows to the ankle area. Generally plastic is the best material, although stiff leather or composites are fine. A means of tightening the cuff around the ankle should be incorporated—a buckle, loop and hook fastener, or laces are fine—anything that allows for adjustment and ease of use. A zipper, hook and loop, laces or other fastening means may be used on the lower portion of the shoe below the hinged cuff, and these means may also extend up through the cuff.

[**0061**] For soccer shoes specifically it may be advantageous to have a bit more lateral play in the hinged cuff in order to execute ball handling moves which involve rolling the ankle laterally. This can be achieved via a vertical slot or other sliding means on either the shoe and/or the hinged cuff, allowing the hinge to slide vertically. This vertical slot in combination with an elastomer or other absorptive means adjacent to the hinge could allow for linear resistance to any lateral ankle forces engendered during play. A means for adjusting minimum and maximum lateral play may be included, similar to the mechanisms germane to skiboots. Thus various ball handling moves meet with little lateral resistance, while sprain-inducing rolls of greater magnitude are nullified at the given maximum lateral angle the hinges/cuffs are set at. Lateral play may also be promoted via a cuff which floats on the shoe upper, being secured by either an elastomer hinge or other means of attachment which allows for fore/aft play and some lateral laxity. All such hinges should use materials which eliminate the possibility of squeaking, being that there are invariably at least two surfaces sliding against each other.

[**0062**] The hinged cuff and its interface with the shoe should be smooth in order to enhance contact with the ball. This can be a huge advantage, as the above-ankle interface in standard soccer shoes is not smooth at all due to protruding malleoli, bulbous ankle protectors (if employed), and the irregular borders of shin guards.

[**0063**] A shoe that is designed to attach to a shin guard may be desirable, and it would be easy to do by connecting the hinged cuff to the lower portion of a shin guard with an integral attachment means.

[**0064**] Although having a hinged cuff is a salient feature of the present inventive concept, it is possible to capture the same dynamics of medio-lateral foot roll without the use of any sort of hinged cuff. It's largely a matter of how strong a person's ankle ligaments are. Although they are less ideal than a hinged cuff, standard hightops may be coupled to the tapered sole of the present inventive concept in lieu of a hinged cuff.

[**0065**] It's evident that there are a variety of options available for various combinations of tapered soles and hinged cuffs. The tapered sole and hinged cuffs are somewhat dependent on each other in order for this design to work optimally. High top shoes are simply not that effective when used with standard flat soles/cleats. That's why U.S. Pat. No. 4,776,111 is not practical. By using a cuff to stiffen the ankle without addressing the forces exerted on the sole itself (which then translate up through the ankle) one creates even more ankle discomfort than if one had not used a cuff at all. That approach has already been tried by various companies, with negative results. A flat sole half an inch thick effectively nullifies the lever force a stiff cuff exerts. In addition, with a flat sole there is no smooth transition between being flat and stable on the ground and a full-blown ankle-roll situation, as the ankle pivots suddenly around the edge of the sole (the effective fulcrum) with great force when the center of ankle rotation moves lateral to the sharp sole edge.

[**0066**] The tapered sole and hinged cuff of the present inventive concept may also be adapted to court shoes such as basketball or tennis shoes. A tapered/rounded sole (tapered/thin at the edges, thicker in the middle) coupled with a hinged cuff enhances efficiency in all court sports. The prior art for court shoes is focused largely on ways of broadening the shoe sole as a means of maximizing stability, as opposed to recognizing that the ankle's stability is already hugely compromised when wearing an athletic shoe (due to height off the ground and sole shape). Thus the ankle must be actively braced via a hinged cuff, while lever forces originating in the sole need to be reduced via a sole that is thin at the edges and thickest near the middle.

[**0067**] Accordingly, it can be seen that the cleated footwear of the present inventive concept ushers in a whole new realm of possibilities for traction, safety, performance and comfort. Although the description above contains many specificities, these should not be construed as limiting the scope of the invention, but as merely providing illustrations of some of the preferred embodiments of the present inventive concept. Various other embodiments and ramifications are possible within its scope.

[0068] Persons skilled in the art will recognize that many modifications and variations are possible in the details, materials, and arrangements of the parts and actions which have been described and illustrated in order to explain the nature of this inventive concept and that such modifications and variations do not depart from the spirit and scope of the teachings and claims contained therein.

[0069] While the inventor understands that claims are not a necessary component of a provisional patent application, and therefore has not included highly detailed claims, the inventor reserves the right to claim, without limitation, at least the following subject matter.

I claim:

1. An article of footwear, such as a cleated shoe, comprising: a sole portion with cleats which taper transversely, protruding less at the sole edges and more towards the middle of the sole.

2. The footwear of claim 1 further including mini cleats arranged along the sole.

3. The footwear of claim 1 comprising a substantially flat sole the cleats are anchored to and a shock-absorbing outsole portion that said cleats protrude through.

4. The footwear of claim 1 wherein the sole includes a plurality of thickness demarcators.

5. The footwear of claim 1 further including integral ankle protectors.

6. The footwear of claim 1 further including a hinged cuff.

7. The footwear of claim 6 further including a hinged cuff with lateral play.

8. The footwear of claim 7 wherein said hinged cuff includes a means for adjusting lateral play.

9. The footwear of claim 1 further including an inner boot.

10. The footwear of claim 1 wherein the cleats are arranged in a circular pattern, thereby minimizing torsional stresses on the knee and ankle.

11. The article of footwear of claim 6 that includes a hightop in lieu of a hinged cuff.

12. The article of footwear of claim 1 that includes a means for attachment of the shoe to a shin guard.

* * * * *