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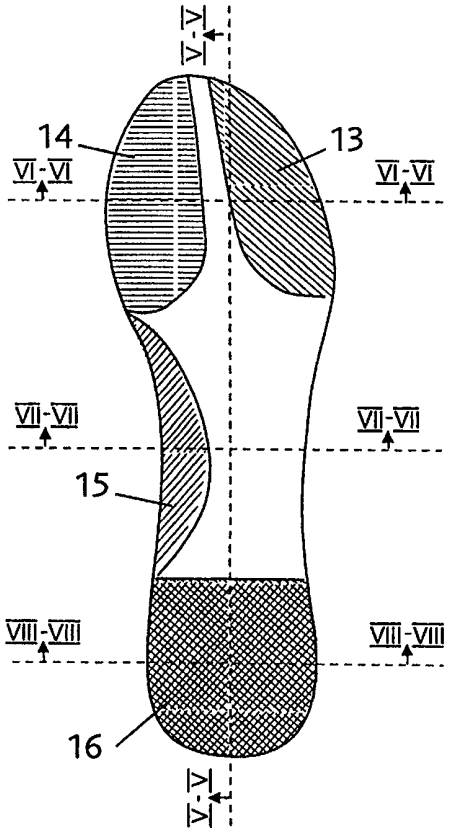
(57) Abstract

An article of footwear, such as a football or rugby boot, comprises orthotic arch support means (12) formed integrally with the sole (11) for providing medial arch support for the foot of the wearer and biomechanical correction. The invention counteracts biomechanical problems associated with the playing of sport with boots having no integral orthotic support.



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IMPROVEMENTS IN FOOTWEAR

This invention relates to footwear for participating in a variety of different sports and particularly, to football (American and soccer) boots and rugby boots. Many people use orthotic devices in footwear. Orthotic devices are recommended by podiatrists and physiotherapists for prevention and treatment of biomechanically related problems. Orthotic devices provide support for feet during gait (the motion of the feet during footsteps) and correct biomechanical defects of the wearer's gait. However, use of such devices may lead to, for example aches and pains in the wearer's legs and back.

Generally, an orthotic device comprises a substantially planar insert with contoured upper and lower surfaces. It is placed in a shoe to cushion the sole of the foot during gait. The medial arch of the foot flattens during gait, a process known as pronation, and many orthotic devices are designed to reduce the effect of this process by providing means for supporting the medial arch. Whilst pronation is a natural process, a tendency to overpronate can cause injury. Additionally, the process of pronation and the subsequent recovery of the curved shape of the medial arch, a process known as supination, requires more effort in the absence of medial arch support, thus decreasing efficiency.

Orthotic inserts may also be designed to decrease "roll-out" and "roll-in" of the foot during gait. "Roll-out" and "roll-in" is a tendency for an outer or inner edge of a foot to contact the ground at the start of a footstep and the opposite edge of the foot to bear the pressure of pushing off from the ground surface at the end of the footstep, the foot rolling from one edge to the other edge while in contact with the ground.

It is therefore expected that during physical activity (such as football, rugby or athletics) orthotic users would require orthotic devices in their sports footwear. These probably would exceed the requirements for orthotic devices for normal footwear, since the feet would be under considerably greater stress during the twisting and turning movements of the physical exercise in which the wearer participates. For example, dribbling a football, or evading a tackle in rugby would require considerable twisting movements and result in increased stresses on vulnerable parts of the foot relative to those during normal gait. It is surprising therefore that many orthotic users, and those that may only need orthotics specifically for playing sport, do not use the required inserts in their sports footwear.

Even for non-orthotic users, a particular problem with sports footwear, such as rugby and soccer boots is the absence of any medial arch support. Lack of such medial arch support can reduce shock absorption at the foot level and may predispose players to injury. At a professional level this can cost the player and club, time and money.

EP 16891 describes an article of sports wear and a method of its manufacture. The insole is substantially planar.

US 5713143 describes an orthotic insole pad. The pad comprises a U-shaped heel cup comprising a lateral and medial arm and a bight. The heel is received in the bight. An extension of the medial arm of the heel cup extending to a point about perpendicular with the metatarsal heads provides longitudinal arch support. A midfoot support is provided separated from the cup by an aperture. A metatarsal pad is provided joined to the longitudinal arch support and separated from the midfoot support by a further aperture.

It may be considered that the problem could be solved by custom made orthotic inserts in the sports footwear. However, many sports persons prefer not to use orthotics because the inserts have significant disadvantages. With most boots the dimensions from the sole of the foot to the ankle is insufficient to accommodate an insert comfortably i.e. the heel of the foot tends to be lifted out of the boot which can be uncomfortable for the wearer and may result in the boot coming off the foot during active participation in sport. A boot could be constructed to accommodate such an insert, but the raised rear portion resulting, may cause injuries to the Achilles tendon and so negate any positive effect from the orthotic insert.

Further, other serious problems are associated with orthotic inserts in sports footwear. Such footwear is often carefully and deliberately designed by the manufacturer to allow a snug fit of the foot in the boot, whilst providing a functional shape to confer a maximum advantage to the wearer. An orthotic insert can ruin the careful balance between fit, feel and comfort of the boot. Also deformation of the boot caused by an insert can result in accelerated wear of specific parts of the boot decreasing durability.

Perhaps, most importantly, the use of an orthotic insert in a boot can alter the user's ball control as the fit of the boot around the foot of the wearer is disrupted especially in the toe region. This may cause sports players to discard orthotic inserts, and thereby risk injury, so that they do not lose their competitive edge while playing.

Furthermore, such inserts often move within the boot during physical exercise, causing discomfort, skin irritations, blisters and instability. This is also the situation for custom made inserts. The distraction to the user can also cause a decrease in performance levels.

According to the present invention there is provided an article of footwear comprising integral orthotic arch support means for the orthotic user and the general sports participant.

The present invention thus provides an article of footwear providing medial arch support and biomechanical correction of the foot, which is desirable when playing sport. This is of use to those requiring orthotic devices in their footwear and to those not requiring orthotic devices normally.

According to an aspect of the invention there is provided footwear having a sole with integral orthotic arch support, the orthotic arch support comprising:

i) lateral support comprising a wedge formation having a maximum height in the range 3 to 9 mm preferably 5 to 7 mm; and

ii) an arch support in the range 8 to 15 mm preferably 10 to 12 mm.

The footwear may further comprise medial support having a height in the range 3 to 8 mm preferably 3 to 5mm.

The footwear may further comprise a heel raise having a height in the range 8 to 15 mm preferably 8 to 10 mm.

The heights are calculated from a datum which be heights above the lowest foot engaging portion of the insole.

The arch support can comprise a wedge formation.

The medial support can comprise a wedge formation.

The support means can be formed integrally with the sole and can be continuous with the sole. The heel raise section which may be of 8-10mm can be continuous with the sole, and reduces friction between the Achilles tendon and the heel counter along with reducing strain on the tendon, when the studs (if provided) sink into the ground.

The arch support means can be of 10-12mm and provides shock absorption and/or stability, which advantages are conferred on the wearer without compromise of the fit, feel or comfort of the footwear.

If the wearer of the footwear uses orthotic devices in normal footwear a constant biomechanical environment will be maintained.

The article of footwear according to some embodiments of the present invention can further comprise integral lateral and/or medial forefoot support means in a wedge formation of for example 5-7mm and 3-5mm respectively. The integral lateral support prevents "roll-out" of the foot within the footwear. This "roll-out" process may occur when foot position is corrected by the medial arch support. Boots also tend to deform in this direction as they wear, causing the same problem. The integral lateral forefoot support means can prevent injuries associated with biomechanical defects, along with reducing wear of the outside edge of the footwear.

The heel raise section in the rearfoot graduates from the heel through the medial arch to the forefoot wedges, and is integral with the sole. This prevents strain on the Achilles tendon which is put in a stretched position when the studs (if present) sink into the ground. In this position, the tendon is more susceptible to shear forces which lead to acute and overuse injuries. The invention comprises any one or more of the following features:

the medial arch support of for example 10-12mm,
the lateral forefoot wedge of for example 5-7mm,
the medial forefoot wedge of for example 3-5mm and
the heel raise of for example 8-10mm.

The invention provides biomechanical correction and shock absorption.

The heel may be raised to 8-10mm graduating through the medial arch to the forefoot wedges, to further prevent injuries to the Achilles tendon and calf complex. All four features can be integral to the sole of the boot. In embodiments of the invention the innersole can be provided with a medial arch support of 10-12mm, coupled with a lateral forefoot wedge of 5-7mm. It is preferable to include a heel raise of 8-10mm and a medial forefoot wedge of 3-5mm to balance the innersole. The footwear of the invention provides biomechanical correction and shock absorption.

Also according to the present invention, there is provided a method of manufacturing the footwear comprising the step of forming the footwear so as to include an integral orthotic support means.

Embodiments of the invention will now be described by way of non-limiting example only and with reference to the accompanying drawings in which:

Figure 1 is a side view (medial) of a right prior art orthotic device for insertion in a shoe;

Figure 2 is a side view (lateral) of a right prior art orthotic device for insertion in a shoe;

Figure 3 is a plan view of right prior art orthotic device for insertion in a shoe;

Figure 4 is an elevation of an embodiment of an article of footwear in accordance with the present invention;

Figure 5 is an expanded view of the main components of Figure 4;

Figure 6 is a section of the line iv-vi of Figures 4 and 5;

Figure 7 is a cross-section of the line v-v of Figure 6;

Figure 8 is a transverse cross-section of the line vi-iv of Figure 6, representing the lateral and medial forefoot wedges;

Figure 9 is a transverse cross-section of the line vii-vii of Figure 6 representing the arch support; and

Figure 10 is a transverse cross-section of the line viii-viii of Figure 6 representing the rearfoot heel raise.

Referring now to Figs. 1, 2 and 3 of the drawings, there is shown a right prior art orthotic device comprising a substantially planar insert 1 having a contoured lower surface 2 and contoured upper surface 3 and having a peripheral configuration 4 such as to provide for fit into a shoe (not shown). The contoured upper surface 3 provides support for the sole of the foot. The insert 1 may be provided in standard form or customised to suit individual orthotic requirements as recommended by a podiatrist.

Referring now to Figs. 4, 5 and 6 of the drawings, there is shown an embodiment of an article of footwear in accordance with the present invention comprising a right football boot 5. (Fig. 4) The boot 5 is formed of lightweight waterproof leather upper 7, a rigid plastic heel counter 6 and a midsole 10 of intermediate density polyurethane. The forefoot of the boot may be double stitched as shown at 9. A tongue 8 of protective leather may also be provided. The medial and lateral

forefoot may be padded (not shown). The studs (12) shown in Figures 4 and 5, may be screwed into the moulded sole (11), or in the case of moulded boots, would be continuous with the sole. The boot 5 may be externally shaped in the same way as any other football boot, resulting in a boot which is cosmetically pleasing to the orthotic user.

The boot 5 is also formed to provide a sole 11 having integral arch support means 15, of 10-12mm. The integral arch support means 15 is an arch formation which is continuous with the sole of the boot 5 and which in use provides support for the arch of the foot and stability and/or shock absorption. The boot 5 thus provides an article of footwear suitable for playing sport having the advantages inherent in footwear containing orthotic insert devices known hitherto, such as negation of sub-talar pronation which frequently results in injuries to sportspersons, which otherwise would not be available because of the problems associated with combining orthotic insert devices and sports footwear.

Referring now to Figure 6 of the drawings, there is shown an embodiment of an article of footwear in accordance with the present invention in which there is provided lateral and medial forefoot means (13 and 14) counteracting functional "rolling-out" of the foot in the boot during forefoot compensation. The lateral support means 13 comprises a wedge formation which is 5-7mm angled from the plane of the sole of the boot. The medial support means 14 comprises a wedge formation which is 3-5mm angled from the plane of the sole of the boot. A transverse cross-section of the lateral (b) and medial (a) forefoot wedges is depicted in Figure 8. The arch support (c) graduates into the sole as shown (d). The heel raise section 16 is 8-10mm at the heel section, graduating through the midfoot to the respective forefoot wedges. The

heel raise (e and f) is shown in Figure 10 as a cross-section of the line viii-viii of Figure 6. Figure 7 depicts a side view of the graduation of the components of the boot through the sole.

The wedge formation provides biomechanical correction for wearers having significant pronation characteristics which cause moderate to serious biomechanical defects. The forefoot support means (13 and 14) and the sole of the boot would be formed of a semi-rigid material, such as cross-linked polyethylene foam, Nickelplast™ or Ethylene Vinyl Acetate (EVA).

This type of boot may be suitable for all wearers including those who require orthotic devices in their footwear.

It will be appreciated that articles of footwear in accordance with the present invention provide orthotic support without necessitating an orthotic insert.

Furthermore, it will also be appreciated that articles of footwear in accordance with the present invention can assist in correction of biomechanical deficiencies of the foot and injuries with which such deficiencies are associated.

Injuries which may be prevented and corrected by the present invention include:

Stress fractures of the metatarsals, tibia and fibula.

Sesamoiditis.

Tendinitis (Achilles, Flexor Hallucis Longus, Tibialis Posterior, Iliotibial band and Patellar).

Patellofemoral maltracking.

Patellar subluxation/dislocation.

Calf tears.

Lower limb compartment/overuse syndromes.

Plantar fascitis.

Shin splints.

Hip and Lumbar spine pain.

Subluxation of the metatarsal heads.

Hallux Valgus (Great toe bunion)

Such injuries are often associated with incorrect biomechanics of the foot which may be prevented and corrected by sports or athletic footwear according to the present invention.

CLAIMS

1. Footwear having a sole with integral orthotic arch support, the orthotic arch support comprising:

i) lateral support comprising a wedge formation having a maximum height in the range 3 to 9 mm preferably 5 to 7 mm; and

ii) an arch support in the range 8 to 15 mm preferably 10 to 12 mm.

2. Footwear as claimed in claim 1 further comprising medial support having a height in the range 3 to 8 mm preferably 3 to 5mm.

3. Footwear as claimed in claim 1 or claim 2 further comprising a heel raise having a height in the range 8 to 15 mm preferably 8 to 10 mm.

4. Footwear as claimed in any one of the preceding claims wherein the arch support comprises a wedge formation.

5. Footwear as claimed in any one of claims 2 to 4 wherein the medial support comprises a wedge formation.

FIG 1

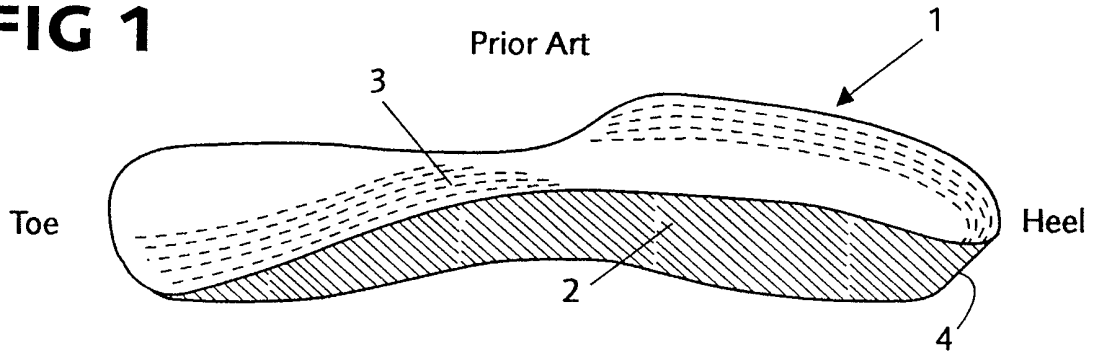


FIG 2

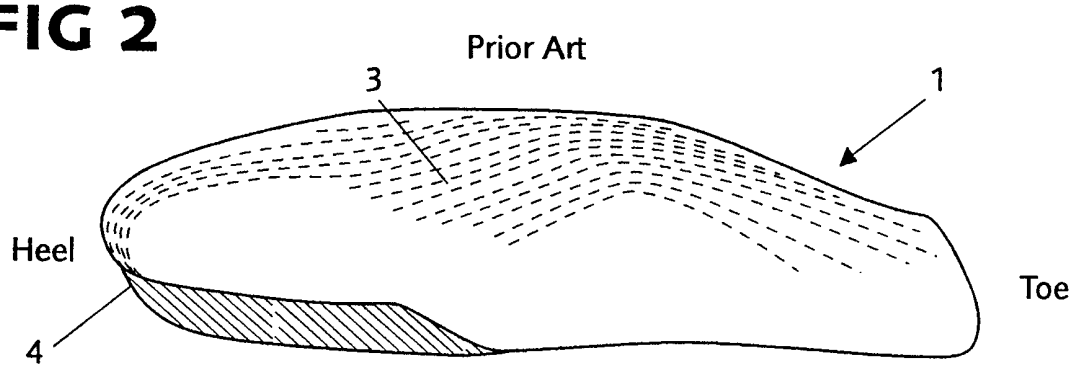


FIG 3

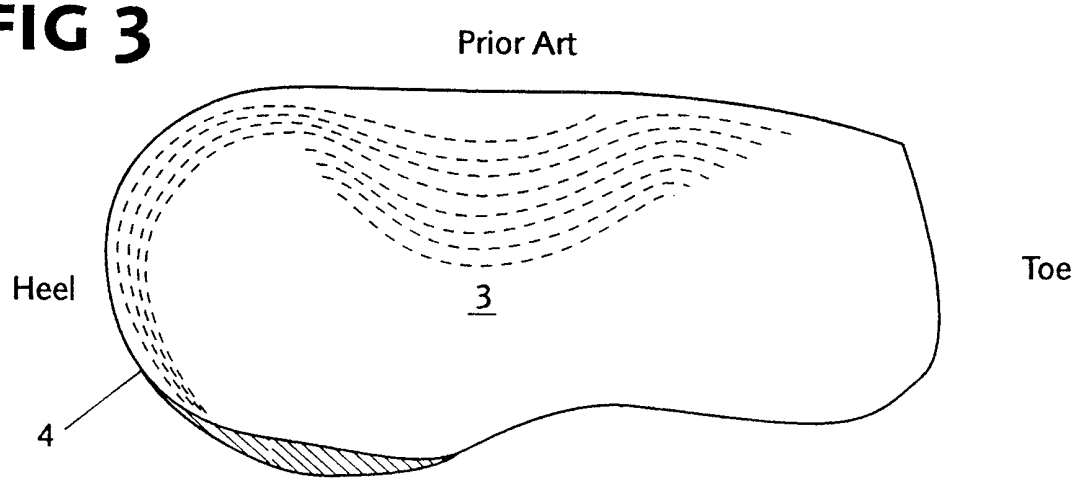


FIG 4

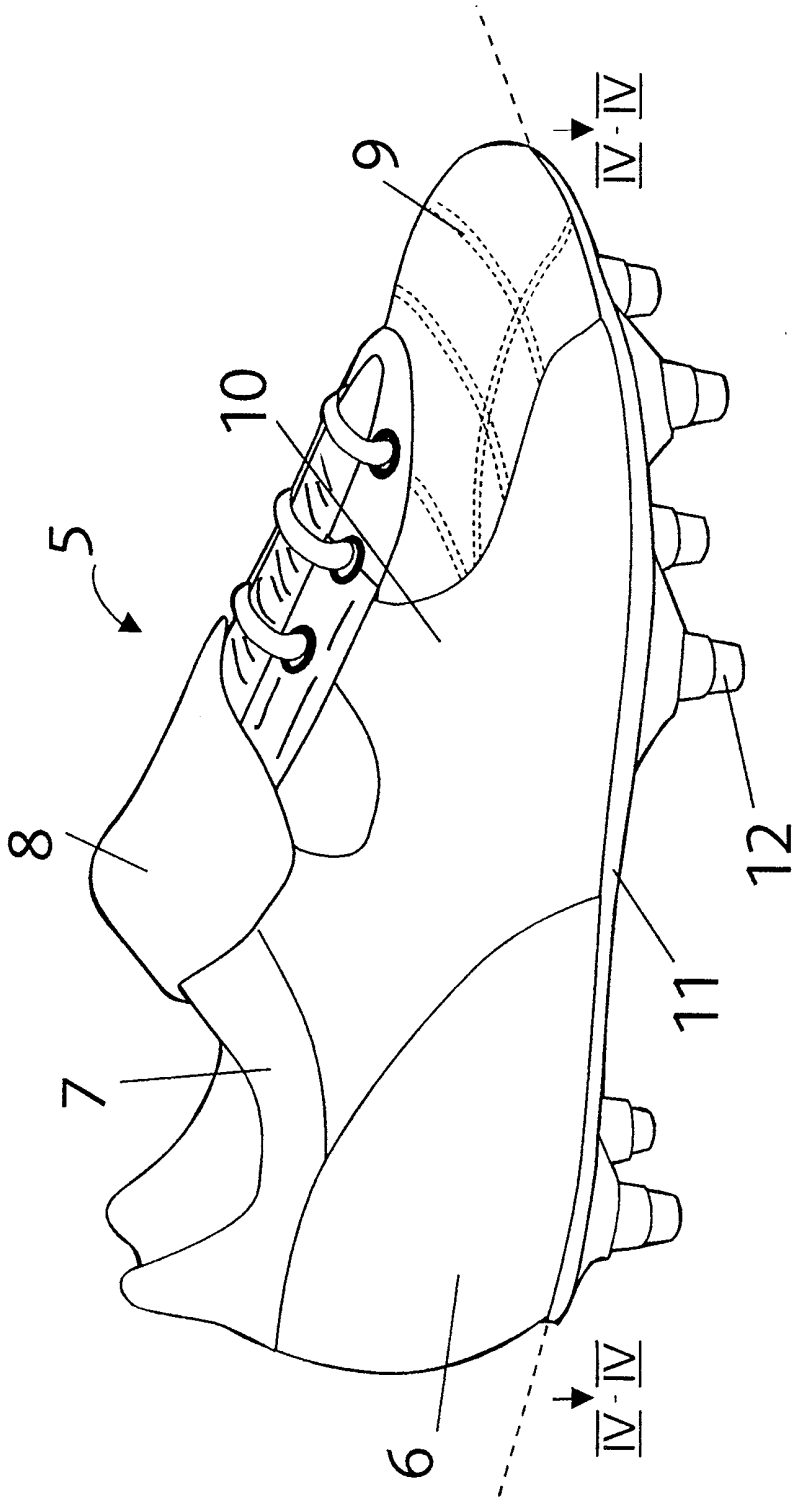


FIG 5

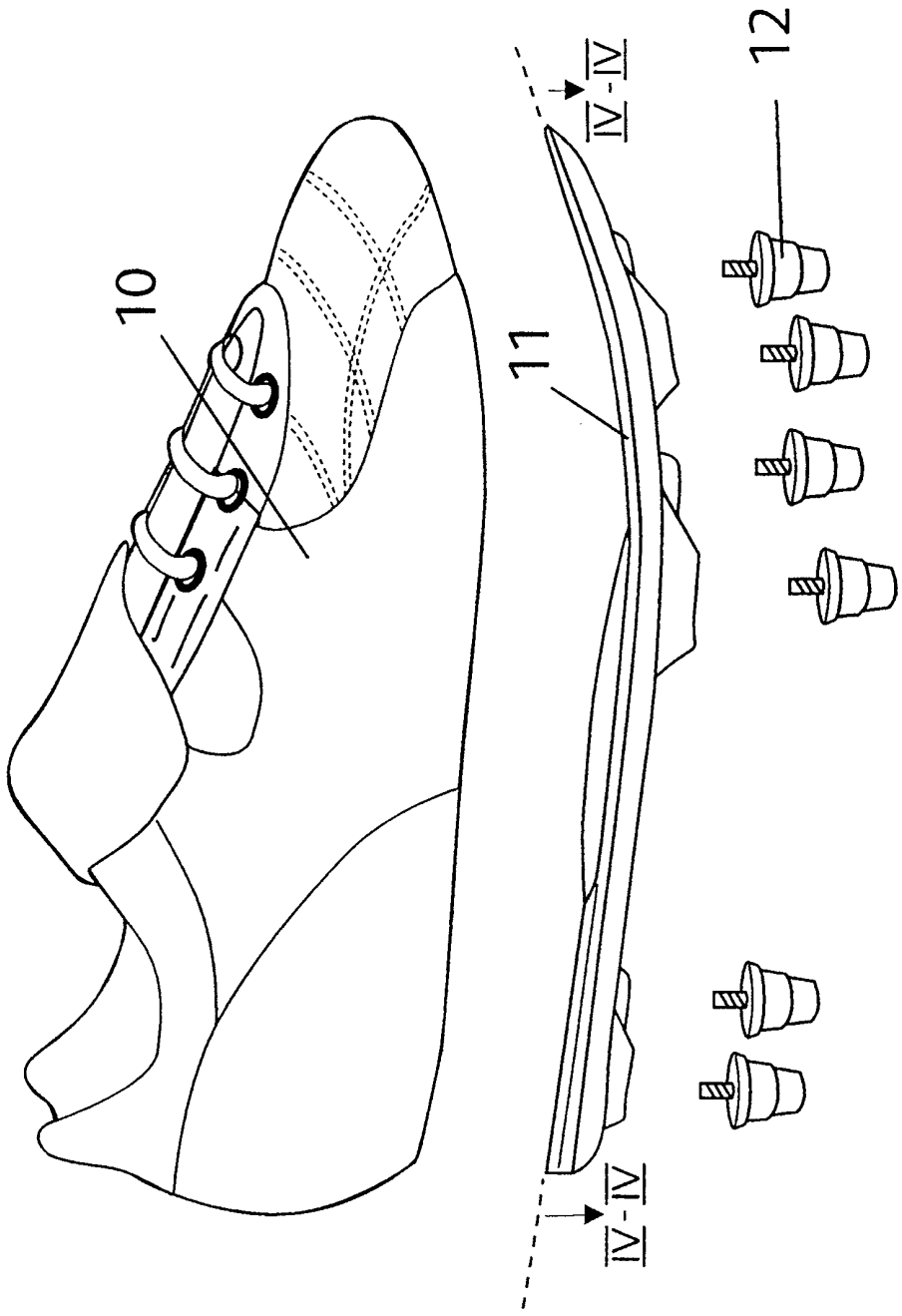
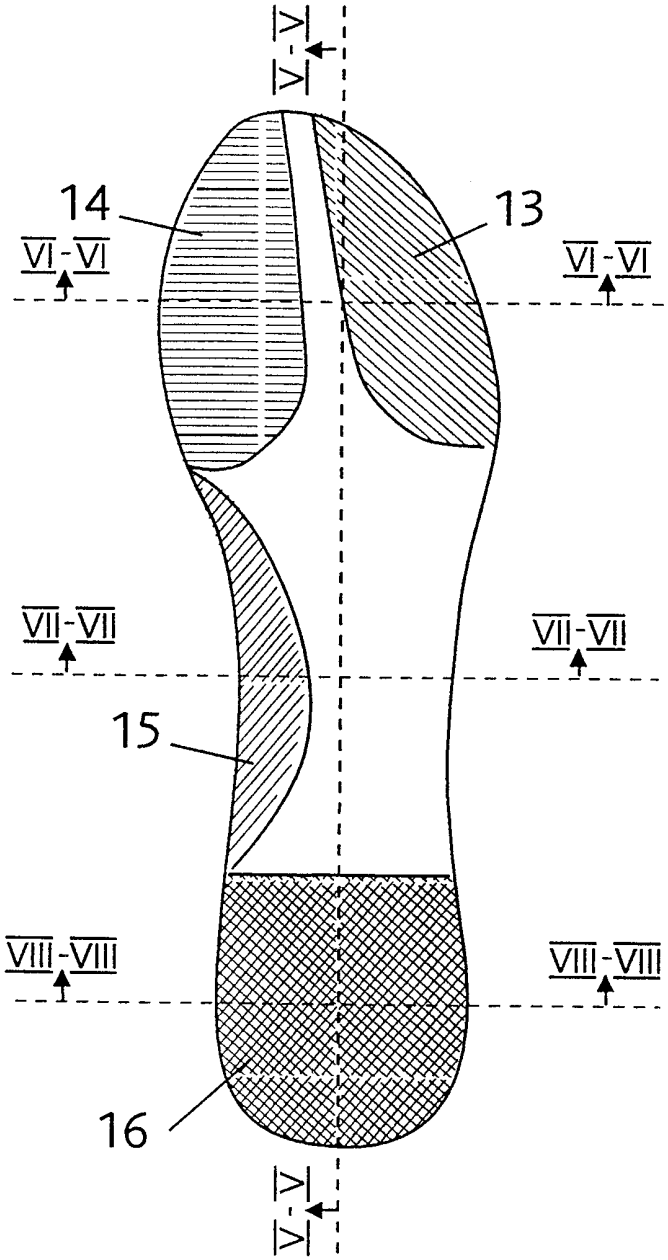


FIG 6.


V-V
14
13
VI-VI
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VII-VII
15
VIII-VIII
VIII-VIII
16
V-V

FIG 7.

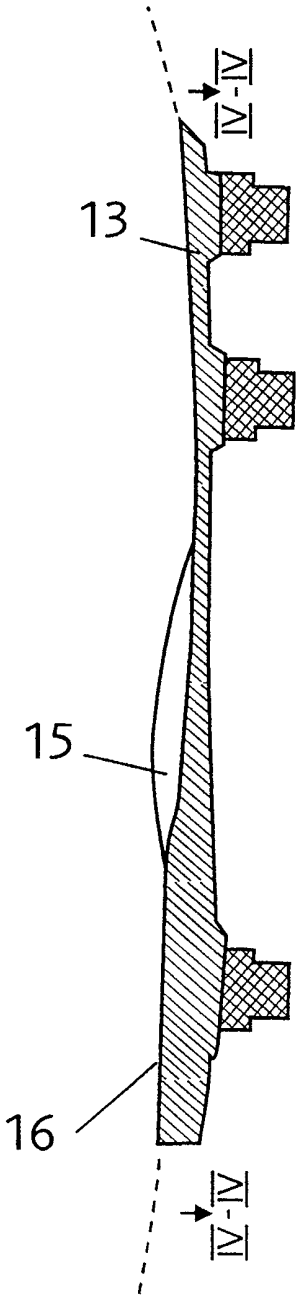

IV-IV
13
15
16
IV-IV

FIG 8. Forefoot

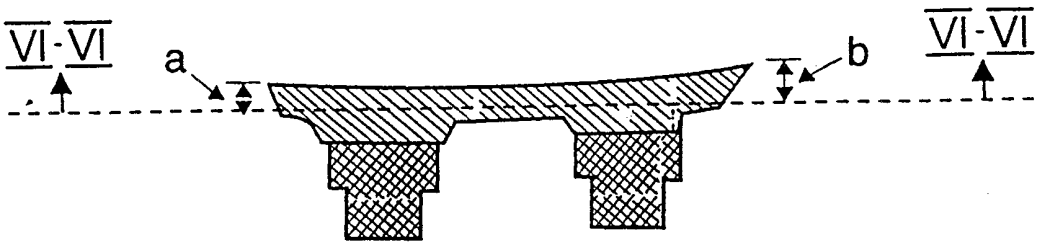


FIG 9. Midfoot

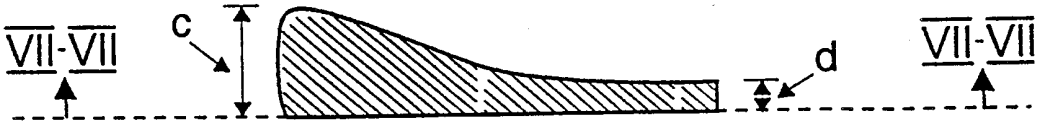
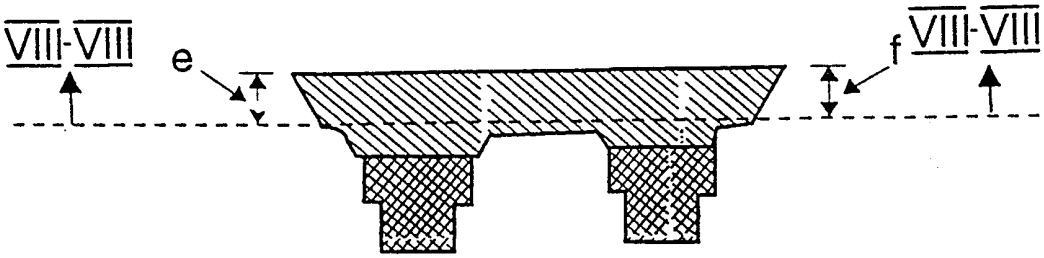


FIG 10. Rearfoot



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A43B5/02 A43B7/24 A43B7/16 A43B7/22 A61F5/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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