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(56) Documents Cited:
**EP 1219193 A1** **WO 1996/013995 A1**
**DE 003347343 A1** **US 6341432 B1**
**US 6115941 A1** **US 4656760 A1**
**US 4551930 A1** **US 4259792 A1**

(58) Field of Search:
UK CL (Edition X ) **A3B**
INT CL[7] **A43B**
Other: **WPI, EPODOC**

(54) Abstract Title: **Footwear**

(57) Footwear such as a running shoe that has a forward sloping sole made of resilient material where the heel of the wearer is positioned further away from the ground than the ball of the foot when the wearer is stationary but is compressed to an approximately flat sole during vigorous activities such as running and jumping. The impact of the heel of the wearer is absorbed before the heel comes to a standstill since the deceleration of the heel takes place over a greater distance the chances of injury are reduced. The sole is preferably made from a material that is resilient such as viscoelastic or elastic material that can be compressed to 1% - 50% of its original height when a downward force is applied. The gradient of the sole before it is compressed may be between 1:8 - 1:2.

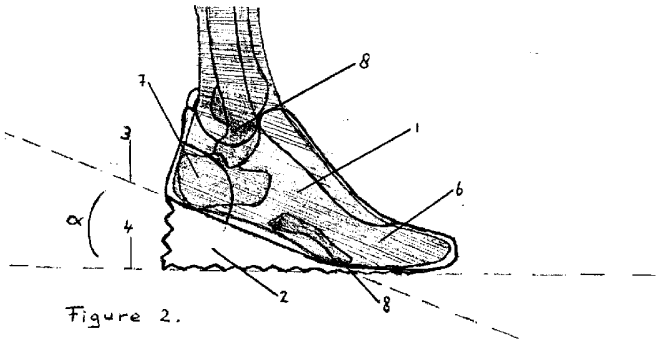


Figure 2.

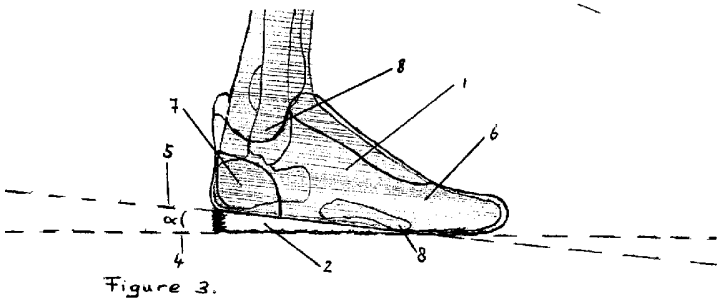


Figure 3.

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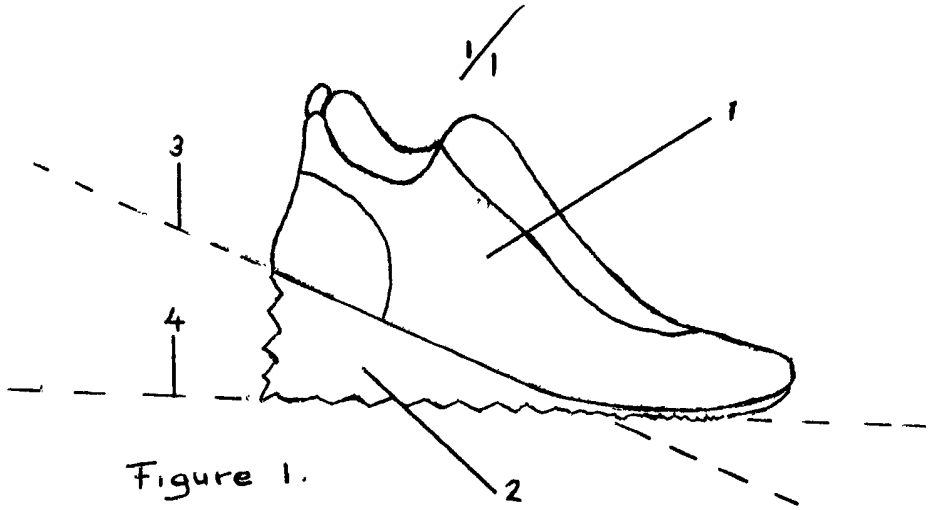


Figure 1.

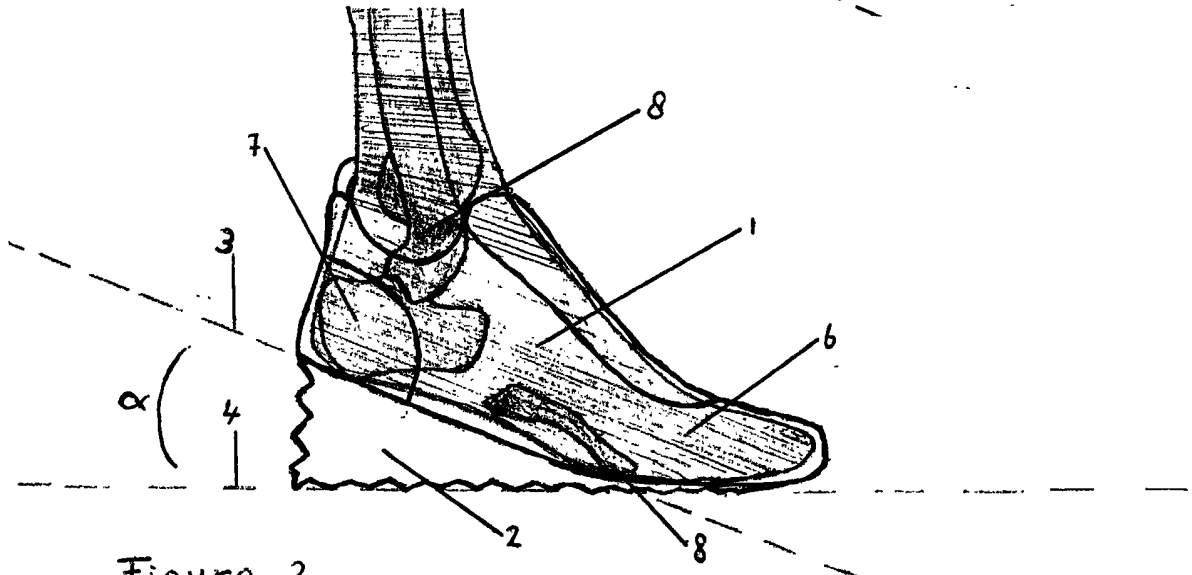


Figure 2.

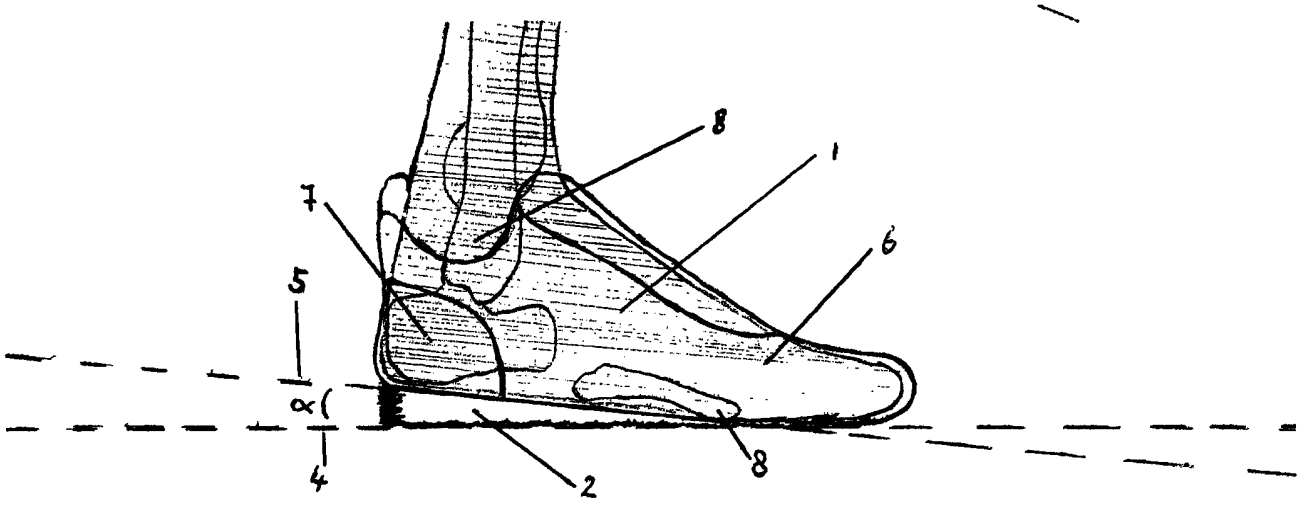


Figure 3.

# Shoe with slanted sole

This invention relates to a shoe for running and jumping

High impact forces during running and jumping are a major contributor to musculoskeletal injuries The sudden increase in vertical ground reaction force (shock), repeatedly applied to the body can cause the breakdown of components of the musculoskeletal system

Impact forces are reduced when the deceleration of the body mass is more gradual, i e over a greater distance prior to hitting the ground fully During running and jumping the shock is therefore reduced when the time between the shoe hitting the ground and the calcaneus (heel bone) coming to a standstill is greater In conventional running shoes this time is very brief because they encourage the runner to land on their heels and the heel component of the shoes is of limited thickness

With this invention the calcaneus is further away from the ground at the very start of the foot strike The composite materials of the sole decelerate the calcaneus over a longer period of time with a less rapid increase of vertical ground reaction force as a result Lower impact forces reduce the chance of injury and increase the enjoyment of running and jumping

As in a conventional running shoe the heads of the metatarsal bones (ball of the foot) are close to the ground during the stance phase of a step and therefore the thicker sole does not reduce the effectiveness of pushing off from the floor and therefore does not inhibit performance

The sole of the shoe can be of various shapes, provided that the area for the heel bone is considerably further away from the ground than the area for the ball of the foot, when no downwards pressure is applied to the shoe The sole of the shoe can be attached to the upper of the shoe in various ways The nature of the sole materials can also be varied, provided that the material is resilient and compresses to 1%-50% of its original height when a downwards force of 600 Newton -6000 Newton is applied Such viscoelastic or elastic material could be made from a range of composites in a range of combinations

An example of the invention and its mechanics will now be described by referring to the accompanied drawings
-figure 1 shows a lateral view of the shoe resting on a surface
-figure 2 shows a lateral view of the shoe and the foot with the calcaneus, fifth metatarsal, fibula and tibia bones during the first five milliseconds of foot strike whilst running, and
-figure 3 shows a lateral view of the shoe, and the foot with the calcaneus, fifth metatarsal, fibula and tibia bones during the middle of the stance phase of a step whilst running

In figure 1, 2 and 3, an upper unit 1 is attached to a slanted sole 2 In figure 1 and 2 the top of the sole 2 is at a slant represented by line 3, which is at a specific angle $\alpha$ with line 4, which is greater than with a conventional running shoe In figure 3 the top of the sole 2 is at a slant represented by line 5, which is at a specific angle $\alpha$ with line 4, which is small as in a conventional running shoe

During vigorous activities such as running and jumping foot 6, especially calcaneus (heel bone) 7 moves downwards The ankle joint 8 is plantar flexed on foot strike as shown in figure 2 and dorsal flexes during the first part of the stance phase, which prevents high impact forces on the body Figure 2 shows a rate of plantar flexion which is higher than with conventional running shoes at foot strike Figure 3 shows a rate of dorsal flexion in the middle of the stance phase of a running step which is similar to the rate of dorsal flexion with conventional running shoes Figure 2 and 3 show the head of the fifth metatarsal bone 8 not moving downwards much as in conventional running shoes

**Claims**

1 A shoe which, when on a flat surface and no pressure is applied, has a forward slant between the area of the heel bone and the area of the ball of the foot, which is at a considerable gradient, but which decreases to a gradient of 1 8 or less steep, when a person wearing the shoe applies downwards forces whilst running and jumping

2 A shoe as claimed in claim 1 which, when on a flat surface and no pressure is applied, has a forward slant between the area of the heel bone and the area of the ball of the foot which is at a gradient of 1 7 –1.6

3 A shoe as claimed in claim 1 which, when on a flat surface and no pressure is applied, has a forward slant between the area of the heel bone and the area of the ball of the foot which is at a gradient of 1 6 –1 5

4 A shoe as claimed in claim 1 which, when on a flat surface and no pressure is applied, has a forward slant between the area of the heel bone and the area of the ball of the foot which is at a gradient of 1 5 –1.4

5 A shoe as claimed in claim 1 which, when on a flat surface and no pressure is applied, has a forward slant between the area of the heel bone and the area of the ball of the foot which is at a gradient of 1 4 –1 3

6 A shoe as claimed in claim 1 which, when on a flat surface and no pressure is applied, has a forward slant between the area of the heel bone and the area of the ball of the foot which is at a gradient of 1 3 –1 2

**Application No:** GB0508953.7 **Examiner:** Sally Vaughan

**Claims searched:** 1 - 6 **Date of search:** 17 August 2005

# Patents Act 1977: Search Report under Section 17

**Documents considered to be relevant:**

| Category | Relevant to claims | Identity of document and passage or figure of particular relevance |
|---|---|---|
| X | At least claim 1 | US4656760 A1 (TONKEL et al) see Fig 4, 9 - 13 and col 8 lines 10 - 28 |
| X | At least claim 1 | US4551930 A1 (GRAHAM et al) see fig 4, col1 lines 47 - 64 and col 4 lines 23 - 41 |
| X | At least claim 1 | US4259792 A1 (HALBERSTADT) see all figs, col 1 line 57 - col 2 lines 41 - 68 and col 4 lines 23 - 43 |
| X | At least claim 1 | DE3347343 A1 (KVL), WPI Abstract Accession No. 1985/178118-30 and all figs |
| X | At least claim 1 | WO96/13995 A1 (JNOWHOW) see all figs, page 2 lines 23 - 29, page 3 lines 22 - 30, page 8 lines 3 - 17, lines 30 - 37 and page 14 lines 5 - 8 |
| X | At least claim 1 | US6341432 B1 (MULLER) see all figs, col 1 lines 5 - 10, col 2 lines 63 - 67 and col 4 lines 6 - 23 |
| X | At least claim 1 | US6115941 A1 (ELLIS III) see figs 11A - 11E, col 3 lines 48 - 51 and col 8 lines 22 - 27 |
| X | At least claim 1 | EP1219193 A1 (MIZUNO) see 2 & 3 and paras 0006, 0012 - 0019 |

Categories:

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|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category | P | Document published on or after the declared priority date but before the filing date of this invention |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application |

**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

A3B

Worldwide search of patent documents classified in the following areas of the IPC[07]

A43B

The following online and other databases have been used in the preparation of this search report

Online: WPI, EPODOC