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(12) # EUROPEAN PATENT APPLICATION

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(54) **Improvements in or relating to footwear.**

(57) A sole unit for a shoe or sandal or slipper and having a toe portion (2), a shank portion (3) and a heel portion (4) including a heel cup (14), said sole unit being of at least two materials of different hardness, of which a softer and flexible material forms an outsole and a harder and relatively inflexible material forms a sole block (5), wherein the harder material forms the heel cup region and a region of the shank portion supporting the outer longitudinal arch of the foot, and the sides of the heel and the area under the main longitudinal arch of the foot are formed by the softer material, the upper surface of the softer material being of a relatively high contour under the main longitudinal arch of the foot so as to support and to massage the main longitudinal arch favourably in walking.

EP 0 099 439 A1

"IMPROVEMENTS IN OR RELATING TO FOOTWEAR"

This invention relates to footwear, in particular to a novel type of sole unit and to shoes, sandals and slippers manufactured therefrom.

Shoes, sandals and slippers having soles substantially of wood that has been shaped to conform to the sole of the foot have become popular in recent years. The sole unit of the shoe has a heel cup, a raised portion under the arch of the foot, depressions under the metatarsal heads of the big and little toes and a ridge (or gripper bar) just ahead of the front transverse arch to support the toes, especially the four small toes. In particular, such a shoe in the form of a slipper with a strap across the metatarsal heads of the toes encourages the wearer to move his toes while walking and grip the ridge or gripper bar, and this exercise massages the foot and also the leg muscles. A sole unit of this type is described in British Patent Specification No. 877,365.

Unfortunately, such sole units have shown a number of disadvantages, for example:

1) No mass-produced sole unit can be contoured to accommodate every shape of foot. In particular, depending upon the height of the main longitudinal arch, the wearer may have the uncomfortable feeling that his arch has too little support or too much support.

2) The heavy loading of the skin around the heel during walking, as it presses upon the hard wooden surface, tends to cause hard skin or callus with some users.

3) Such a shoe sole, made largely of wood, is relatively heavy.

4) Wood is in any case by now a very expensive material, especially in the quality desired for manufacturing such sole units, and a cheaper substitute for at least part of the wood is highly desirable.

It is an object of the invention to provide an improved sole unit and also shoes and slippers incorporating such a sole unit in which at least some, preferably all, of the foregoing disadvantages are at least reduced.

According to the invention, therefore, we provide a sole unit for a shoe or sandal or slipper and having a toe portion, a shank portion and a heel portion including a heel cup, said sole unit being of at least two materials of different hardness, of which a softer and flexible material forms an outsole and a harder and relatively inflexible material forms a sole block, wherein the harder material forms the heel cup region and a region of the shank portion supporting the outer longitudinal arch of the foot, and the sides of the heel and the area under the main longitudinal arch of the foot are formed by the softer material, the upper surface of the softer material being of a relatively high contour under the main longitudinal arch of the foot so as to support and to massage the main longitudinal arch favourably in walking.

Preferably the sole block has its upper surface shaped to the contour of the foot. Thus the sole unit can have a heel cup, a shank portion to support the longitudinal arches, depressions for the metatarsal heads of the big and little toes, and a rounded ridge (or toe barrier) as a gripping bar for the four small toes.

Both the softer and the harder materials can if desired be of synthetic, polymeric material. For example, the softer

material can be of soft polyurethane foam or of thermo rubber or of polyvinylchloride, and the harder material can be of hard polyurethane. However, the softer material is preferably of soft and flexible polyurethane foam and the harder material is preferably of wood, in particular a high-quality wood such as poplar or especially beech.

The softer material preferably has a Shore hardness of 45 to 60, and the harder material may for example be one having a Shore hardness of at least 60, e.g. 60 to 75.

The harder material is preferably cut away under the longitudinal arch so that the softer material can fill this space and better accommodate itself to pressure under the arch. This softer material is preferably set relatively high under the arch so that the arch will come into contact with it during walking and will thereby be massaged by it. This has a very healthy effect upon the muscles and ligaments associated with the region of the arch of the foot. As the softer material yields under the arch, it will not be uncomfortable during walking, even if the wearer's arch is relatively low.

The softer material preferably extends all the way around the harder material, even around the toe region of the foot. This can have two advantages: the softer material will be less dense than the harder material and the sole unit is correspondingly lighter; and any tendency of the edges of the harder material, if made of wood, to splinter or split will be strongly reduced.

A further advantage of continuing the softer material all around the harder material is that the whole shoe under these circumstances can be made antistatic. It has been seriously suggested that static electricity can cause or aggravate various diseases.

In the heel region of the sole unit, the side part formed of the softer material must be wide enough for at least part of the skin of the heel of the wearer to rest upon the softer material, which will of course yield more than the harder material in walking. For this reason, the new design of sole unit will tend to reduce callus formation at the heel.

For the better understanding of the invention, a preferred embodiment thereof will be described with reference to the accompanying drawings in which:

Fig. 1 is a plan view of a sole unit for the right foot in accordance with the invention;

Fig. 2 is a section of the sole unit of Fig. 1 on the line II-II of Fig. 1;

and Fig. 3 is a section of the sole unit of Fig. 1 on the line III-III of Fig. 1.

The sole unit 1 of Figs. 1 - 3 consists of a toe portion 2, a shank portion 3 and a heel portion 4. It is made of a sole block 5 of wood, having a heel cup 14, a depression 15 for the metatarsal head of the big toe and another depression 16 for the metatarsal head of the little toe. The rounded ridge or gripper bar 17 just forward of the metatarsal heads of the four small toes is indicated in section in Fig. 2 and by a broken line (showing its crest) in Fig. 1.

Under the sole block 5 there is an outsole 13 having an edge portion 12 extending up the sides of the sole block 5. It is clear from Fig. 1 that the general outline of the polyurethane edge 12 conforms roughly to the outline of the foot, whereas the shape of the sole block 5 conforms more to the general shape of the imprint of a foot.

The general line of the main longitudinal arch of a foot

is shown at 8. Thus the sole unit 1 is designed so that most of the arch of the foot will be situated over and supported by the softer material, namely polyurethane foam, which is raised progressively from the level of the sole block 5 in the direction of the inside edge of the sole unit 1. Thus a supporting slope 9 is provided as shown in Fig. 3, to massage the arch of the foot during walking.

Preferably the polyurethane foam completely surrounds the edges of sole block 5 as shown in Fig. 1. It should in any case extend around the heel at least from point A to point B, preferably to point C. Forward of points A and C, that is over the areas A-E, and C-D, a simple supporting strap (not shown) can be attached to provide a foot-exercising sandal. If desired, the polyurethane at the areas A-E and C-D where the strap is attached may be cut away to provide recesses to receive the ends of the strap, so that the strap itself does not protrude from the side of the sandal. Alternatively, such recesses to accommodate the ends of the strap can be produced during manufacture by injection moulding.

The new type of sole unit 1 is preferably manufactured from a thin block of wood as sole block 5 having a flat lower face 6 as clearly shown in Fig. 2. Thus the sole block 5 must be shaped around the sides and on the top surface only; in this way the wood is economically used and processed, since there is very little wastage and relatively little working to do. The sole block 5 can then be placed inside a mould and the polyurethane can be injected around it in known manner. Usually this method is highly advantageous since, under these circumstances, the polyurethane forms a very good and lasting bond to the wood. However, under other circumstances it may be preferable to mould the polyurethane (or other plastic) portion as an outsole 13 with edge portion 12 and a recess to accommodate the sole block 5, which is then inserted and glued in to provide the finished sole unit 1.

The finished sole unit 1 can then be made into a shoe in known manner by attachment of an appropriate upper. Alternatively, the upper can be attached to the sole block 5 (for example under its lower face 6) and the polyurethane can be injected around it to secure it thoroughly.

The sole unit for a left foot is of course simply a mirror image of the sole unit for the right foot illustrated e.g. in Figs. 1 - 3.

CLAIMS

1. A sole unit for a shoe or sandal or slipper and having a toe portion, a shank portion and a heel portion including a heel cup, said sole unit being of at least two materials of different hardness, of which a softer and flexible material forms an outsole and a harder and relatively inflexible material forms a sole block, wherein the harder material forms the heel cup region and a region of the shank portion supporting the outer longitudinal arch of the foot, and the sides of the heel and the area under the main longitudinal arch of the foot are formed by the softer material, the upper surface of the softer material being of a relatively high contour under the main longitudinal arch of the foot so as to support and to massage the main longitudinal arch favourably in walking.

2. A sole unit as claimed in claim 1 wherein the sole block has its upper surface shaped to the contour of the foot, the sole unit preferably having a heel cup, a shank portion to support the longitudinal arches, depressions for the metatarsal heads of the big and little toes, and a rounded ridge as a gripping bar for the four small toes.

3. A sole unit as claimed in claim 1 or claim 2 in which the softer and the harder material are of synthetic polymeric material, preferably wherein the softer material is of soft polyurethane foam or of thermo rubber or of polyvinylchloride and the harder material is of hard polyurethane.

4. A sole unit as claimed in claim 1 or claim 2 wherein the softer material is of synthetic polymeric material, e.g. soft flexible polyurethane foam, and the harder material is of wood.

5. A sole unit as claimed in claim 4 wherein the harder material is of poplar or beech.

6. A sole unit as claimed in any of claims 1 to 5 wherein the soft material completely surrounds the edges of the hard

material.

7. A sole unit as claimed in any of claims 1 to 6 wherein the hard material has a flat lower face.

8. Footwear, especially a shoe or sandal or slipper, including a sole unit as claimed in any of claims 1 to 7.

9. A sole unit (1) for a shoe or sandal or slipper and of at least two materials of different hardness, of which a softer and flexible material forms an outsole (13) and a harder and relatively inflexible material forms a sole block (5) that has its upper surface shaped to the contour of the foot, said sole unit having at its heel (4) a heel cup (14), a shank portion (3) to support the longitudinal arches, depressions (15, 16) for the metatarsal heads of the big and little toes, and a rounded ridge (17) as a gripping bar for the four small toes, wherein the harder material forms the heel cup region and a region of the shank portion supporting the outer longitudinal arch of the foot, and the sides of the heel and the area under the main longitudinal arch of the foot are formed by the softer material (at 12), the upper surface of the softer material being of a relatively high contour (at 9) under the main longitudinal arch of the foot so as to support and to massage the main longitudinal arch favourably in walking.

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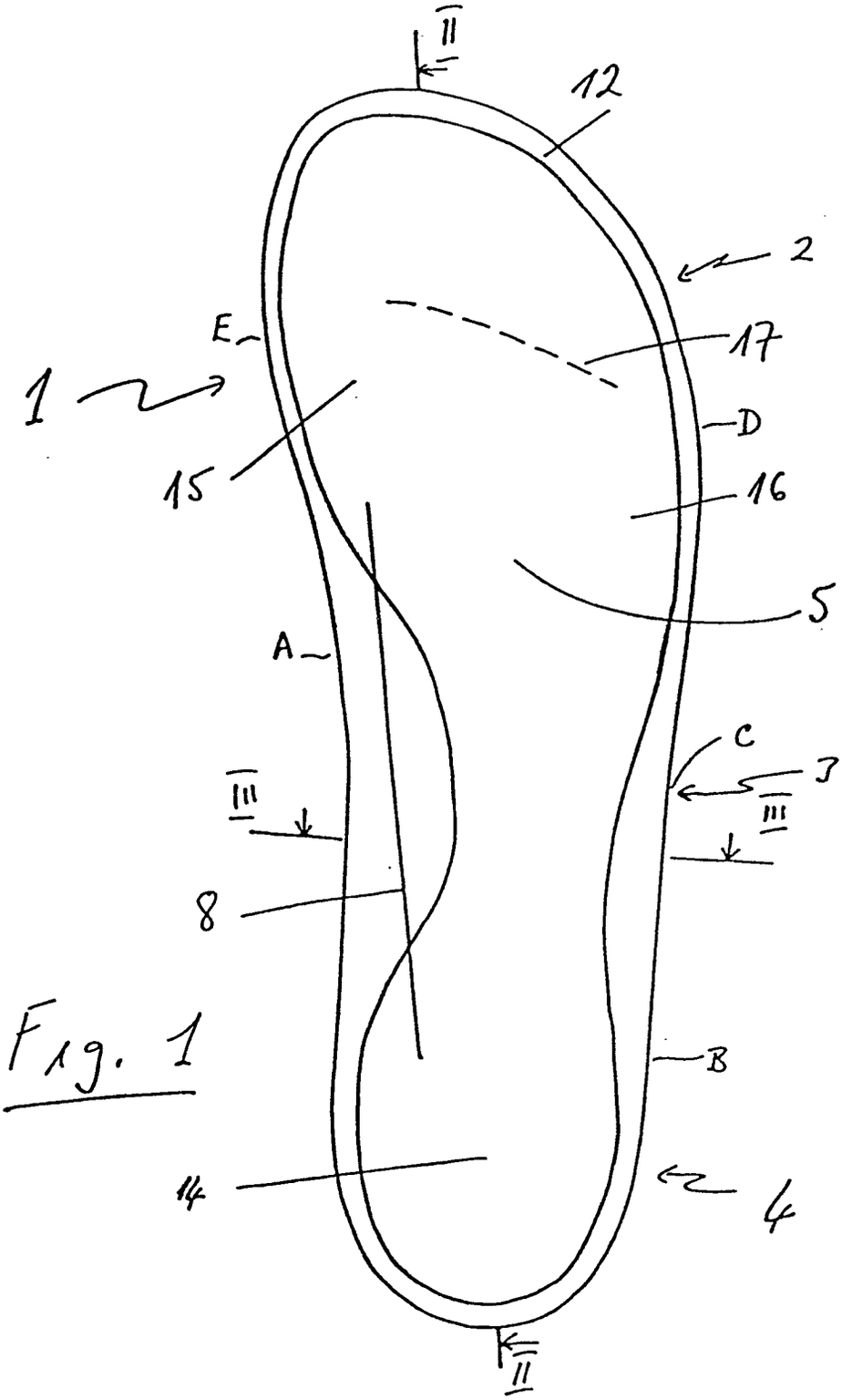

Fig. 1

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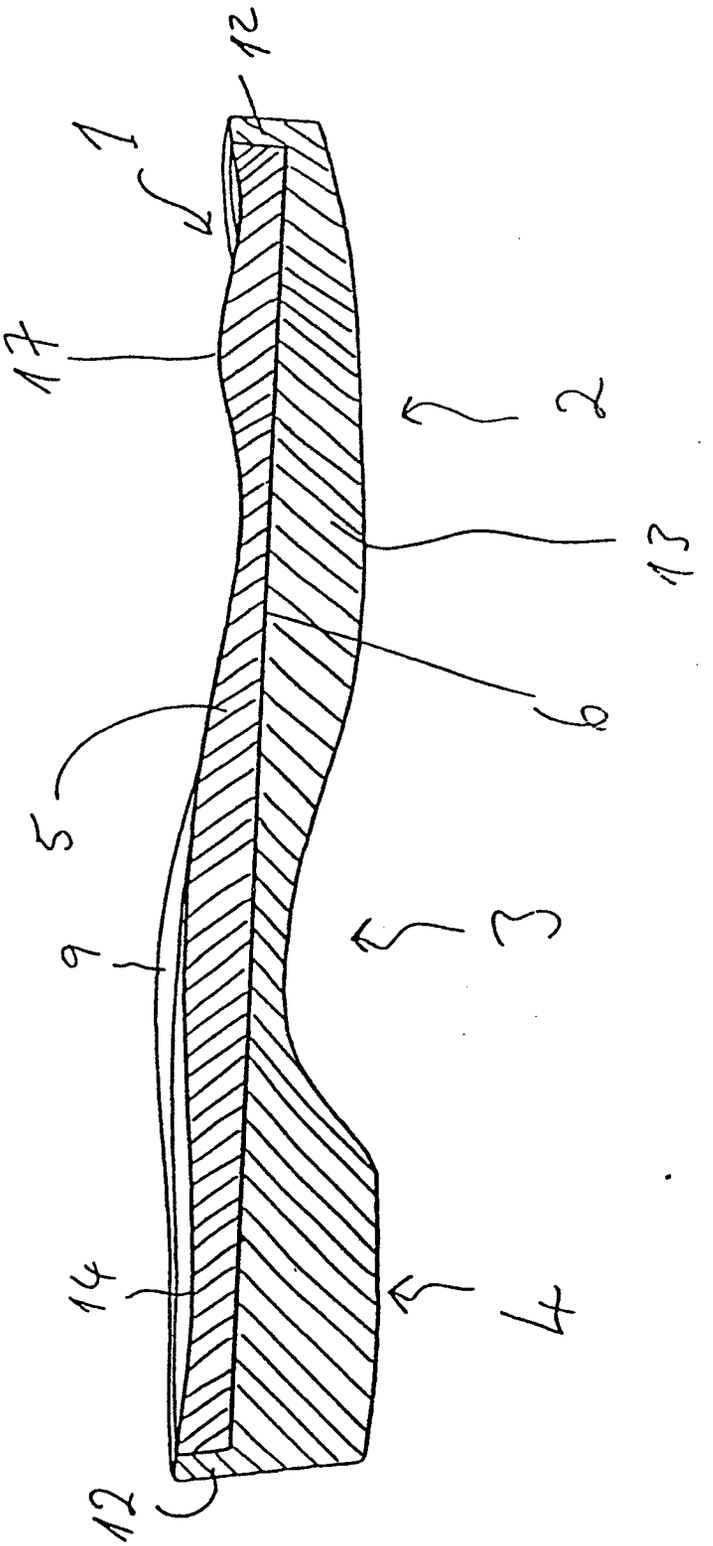

Fig. 2

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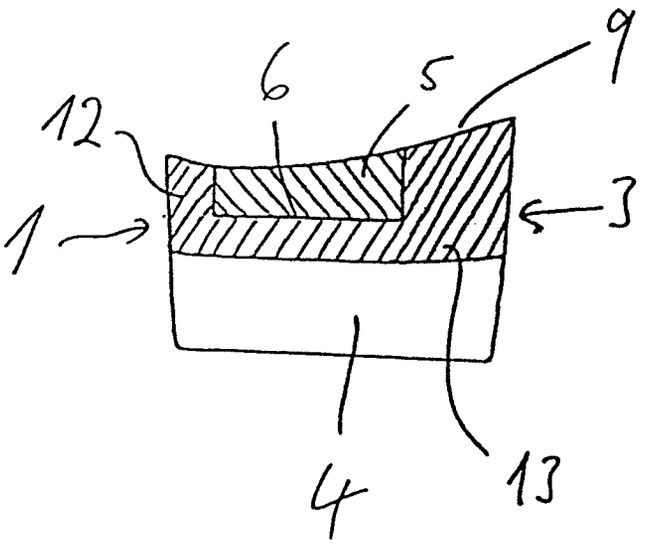

Fig 3

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EUROPEAN SEARCH REPORT

Application number

EP 82 81 0309

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	GB-A-2 046 579 (SUSUMU TAKAOKA) *Page 1, lines 24-31,97-107; figures 1-6*	1-3,6, 8,9	A 43 B 13/12
Y	GB-A-1 558 195 (M.J.DELPORT) *Page 6, lines 40-57; figures 1-20*	1,8,9	
Y	FR-A-2 272 618 (E.MEIER et al.) *Page 14, lines 8-23; figures 24-37*	1,7-9	
Y	FR-A-2 304 299 (SANIPED FUSSKOMFORT) *Page 8, lines 26-35; figures 1-16*	4,9	
Y	FR-A-2 125 801 (J. SUBIROS) *Page 1, lines 30-38; figure 2*	1	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) A 43 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-03-1983	MALIC K.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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