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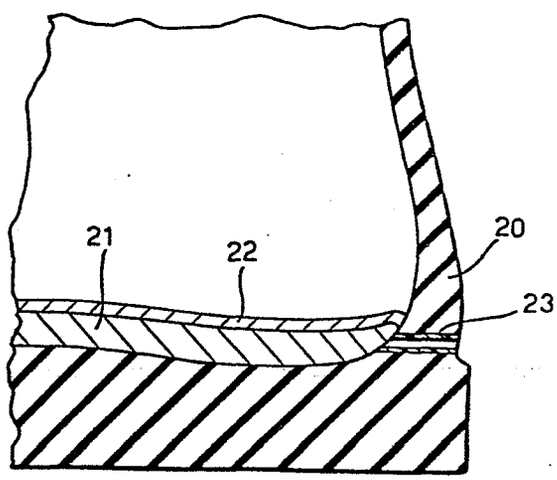
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(54) **Footwear adapted to absorb perspiration from the feet.**

(57) Footwear adapted to absorb perspiration from the foot and keep the foot substantially dry includes a layer of sponge material (2, 21) with open intercommunicating cells, which is substantially non elastically deformable under the compressive stress due to the weight of the person wearing the footwear. The layer of sponge material is intended to be interposed between the sole of the footwear and the foot of the user, and is preferably constituted by a highly porous sponge metal. The invention is particularly useful in the manufacture of sports footwear.

FIG. 2



EP 0 127 592 A1

"Footwear adapted to absorb perspiration from the feet"

The realization of footwear adapted to absorb perspiration from the feet, which is a source of serious discomfort as well as damage to the epidermis of the feet, is a problem that has not been solved until now by the footwear industry.

The remedy adopted up to now consists of providing means for absorbing perspiration within the footwear, the means being constituted by an arch-support of soft, absorbent material such as felt or cloth. This remedy is, however, only a limited solution to the problem. The perspiration is in fact absorbed by the arch-support but is then partly re-absorbed by the feet themselves, through the pores of the skin, as a result of the impermeability of the footwear caused by the adhesives which are widely used today in footwear manufacture. Moreover, when the arch-support is subjected to compression under the weight of the person wearing the footwear, the liquid with which the arch-support is saturated is expelled into direct contact with the sole of the foot.

The object of the present invention is to avoid the disadvantages mentioned above by providing footwear adapted to absorb perspiration from the foot and able to keep the foot within the footwear substantially dry.

This object is achieved by footwear including means for absorbing perspiration from the foot intended to be interposed between the foot and the sole of the footwear, characterised in that the means are constituted by a layer of sponge material with open intercom-

municating cells, which is substantially non elastically deformable under the compressive stress due to the weight of the person wearing the footwear.

The term "substantially non elastically deformable" as used in the present specification with reference to the sponge material is intended to mean that the deformation of said material when subjected to the maximum compressive stress in use, shall be negligible with respect to the thickness which the layer has in the absence of compressive stress or at least that the spring back of said material shall be negligible with respect to the deformation due to the compressive stress.

The compressive stress to which the layer may be subjected in use is typically of the order of from 1 to 10 Kg/cm^2.

Preferably, the layer of sponge material is constituted by a sponge metal having an effective porosity of between 20 and 85%, preferably between 60 and 80%, and pores with dimensions preferably between 100 and 500 microns. The sponge metal may be constituted by a single metal, such as nickel, chromium, copper or aluminium, or by alloys of two or more different metals.

Non-metallic sponge material, for example sponges of a plastics material, such as polypropylene, may also be used as long as these are substantially non elastically deformable as hereinbefore defined.

Materials suitable for forming the layer of sponge are available commercially. For example, the material known commercially as "Felt-metal", made by the

Brunswick Corporation, of Skokie, Illinois, may conveniently be used as a sponge metal. The product known commercially as "Vyon", made by Kopp, of Aachen, German Federal Republic, may be used as a non-metallic sponge material.

These materials are available in the form of sheets of different thickness and porosity. Preferably, sheets of a thickness of between 1 and 4 mm, preferably 3 mm, are used for the layer of the invention.

The layer of sponge of the invention may be shaped or cut and inserted into the footwear in the form of removable arch-supports extending between the toe and the heel of the footwear, or it may be fixed to the footwear by force-fitting or tacking.

Preferably, the layer of sponge material of the invention is covered by a layer of soft, permeable, absorbent material. This second layer may be constituted, for example, by cloth or felt.

The layer os sponge of the invention thus forms an interspace, or, better, an air space, between the aforesaid layer of soft, absorbent material and the sole of the footwear. The footwear having this interspace formed by the sponge allows the foot of the person wearing the footwear to breathe properly. The perspiration is first absorbed by the cloth or felt and then given up to the sponge which, being at a lower temperature than the foot, causes it to condense. Thus, the person wearing this new type of footwear does not have the disadvantage of having his foot in contact with surfaces saturated with sweat from the foot itself for long periods of time.

Owing to the substantial stiffness of the cell walls of the sponge material used according to the present invention even when the sponge layer is subjected to the maximum compressive stress in use, the perspiration liquid within said layer will not be squeezed out of the cells thus avoiding any contact between said liquid and the sole of the foot.

The layers of sponge materials specified above have good bending strength, although sponges of plastics material have a better bending strength than sponge metals. On the other hand, the sponge metal, as stated above, is preferred because of its higher thermal conductivity.

The footwear according to the present invention may be realized in any form but in cases in which the footwear has to be very flexible it is preferable to use a layer of sponge metal formed by two separate sections disposed one in the zone of the heel and the other in the zone of the toe of the footwear. An intermediate section of plastics sponge of the aforementioned type may be interposed between the two sections of sponge metal in the zone of bending of the sole.

In the case of footwear with a rigid sole, for example ski-boots, climbing boots or skating boots, the layer of sponge according to the invention may extend over the entire sole of the foot.

In the case of footwear formed of plastics material, such as ski-boots provided with inner boots which are of impermeable material and thus not suitable for absorbing the moisture resulting from the perspir-

ation of the feet, the sponge layer may be inserted directly on the sole of the inner boot. Alternatively, if the sole of the inner boot is made of cloth or felt, the first layer of sponge may be encapsulated in a container of thin sheet metal or plastics material which is open upwardly and has side walls of a height equal to the thickness of the layer of sponge, before being inserted in a suitable space in the footwear. The container has the function of collecting the condensed sweat.

The latter embodiment of the present invention allows complete cleaning of the footwear since the container for the sponge metal may easily be removed from the footwear to be washed, dried and even scented in order to deodorise it.

A further object of the present invention is to provide ventilation means within the footwear for venting the liquid condensed within the pores of the sponge layer to the exterior in the form of vapour. These ventilation means comprise a duct communicating with the exterior of the footwear and with a surface portion of the layer of sponge. Preferably, the duct is formed in the rear part of the footwear and communicates with the exterior, preferably through a porous filter of sintered metal or plastics material which is permeable to air and vapour.

In the drawings provided purely by way of non-limiting example,

Figure 1 shows in cross-section the rear portion of a boot according to the invention, provided with

ventilation means, and

Figure 2 illustrates in cross-section the rear portion of an athletics shoe according to the invention, provided with a further embodiment of the ventilation means.

Figure 1 shows the body 1 of a boot made from plastics material and a layer 2 of sponge metal material according to the invention. The layer 2 is encapsulated within a container 3 of thin sheet metal which rests on the sole of the body 1. An inner boot 4 of the boot has a sole 5 of cloth or felt. A groove 6 is formed within the thickness of the body 1. The groove 6 communicates with the layer 2 of sponge through an aperture formed in the wall of the container 3 and extends towards the upper part of the boot to communicate with the exterior through a through-hole 7. A sintered metal filter 8 puts the through-hole 7 into communication with the external environment. The sintered filter 8 may be moulded with the body or fixed to the body by a washer of rubber or thermoplastics material, indicated 9 in the drawings. The outer surface of the filter is protected by an openable cover 10.

In Figure 2, an athletics shoe 20 has a layer 21 of sponge according to the invention and an arch-support 22 of felt or cloth located over the layer 21. In this case, the ventilation means are constituted simply by a tube 23 located close to the heel of the shoe 20, which puts a portion of the surface of the layer 21 into communication with the external environment.

During use of the footwear provided with the ven-

tilation means described above, the articulation force exerted by the foot generates heat and at the same time generates a pumping action in the footwear which pumps air through the communication duct to the exterior, through the porous filter when used. The pumping of air thus allows the perspiration to be vented to the exterior and makes the foot feel comfortable.

Naturally, the constructional details and the embodiments may be varied widely with respect to that described and illustrated purely by way of example.

CLAIMS:

1. Footwear including means for absorbing perspiration from the foot intended to be interposed between the foot and the sole of the footwear, characterised in that the means are constituted by a layer of sponge material (2,21) with open intercommunicating cells, which is substantially non elastically deformable under the compressive stress due to the weight of the person wearing the footwear.

2. Footwear according to Claim 1, characterised in that the layer has an effective porosity of between 20 and 85%, preferably between 60 and 80%.

3. Footwear according to Claim 1, characterised in that the layer has pores with a diameter of between 100 and 500 microns.

4. Footwear according to Claim 1, characterised in that the layer of sponge material is constituted by a sponge metal.

5. Footwear according to Claim 1, characterised in that the layer of sponge material is constituted by a plastics sponge.

6. Footwear according to Claims 1 to 5, characterised in that the layer of sponge material is covered by a layer of soft, permeable and absorbent material.

7. Footwear according to any one of Claims 1 to 6, characterised in that the layer of sponge material is in the form of a removable arch-support extending between the heel and the toe of the footwear.

8. Footwear according to any one of Claims 1 to 7, characterised in that the layer of sponge material is

formed from two separate sections, one of which is located in the heel zone and the other in the toe zone of the footwear.

9. Footwear according to Claim 8, characterised in that the separate sections of sponge are constituted by sponge metal, and in that an intermediate section of plastics sponge is interposed between these sections, which is adjacent thereto and disposed in the zone of bending of the sole.

10. Footwear according to Claims 1 to 7 and having a rigid sole, characterised in that the layer of sponge material is disposed within an upwardly open, easily removable, thin-walled container (3).

11. Footwear according to any one of Claims 1 to 10, characterised in that it includes means (6,23) for venting the liquid condensed within the pores of the layer of sponge material to exterior in the form of vapour.

12. Footwear according to Claim 11, characterised in that said means comprise a duct communicating with the exterior of the footwear and with a surface portion of the layer of sponge material.

13. Footwear according to Claim 12, characterised in that the duct communicates with the exterior through a porous filter (8) permeable to air and vapour.

FIG. 1

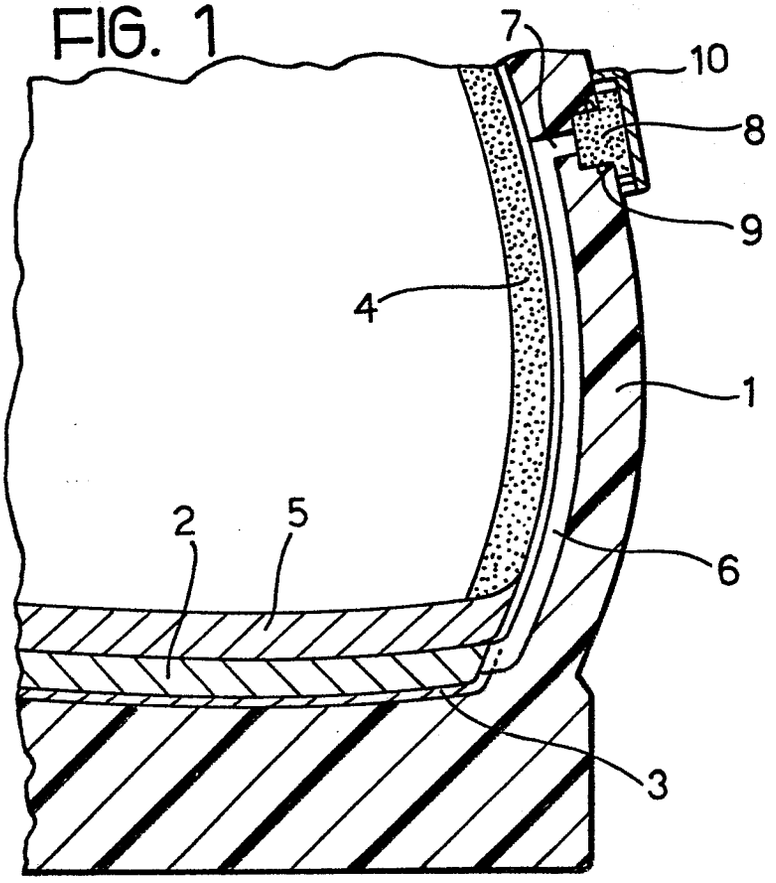
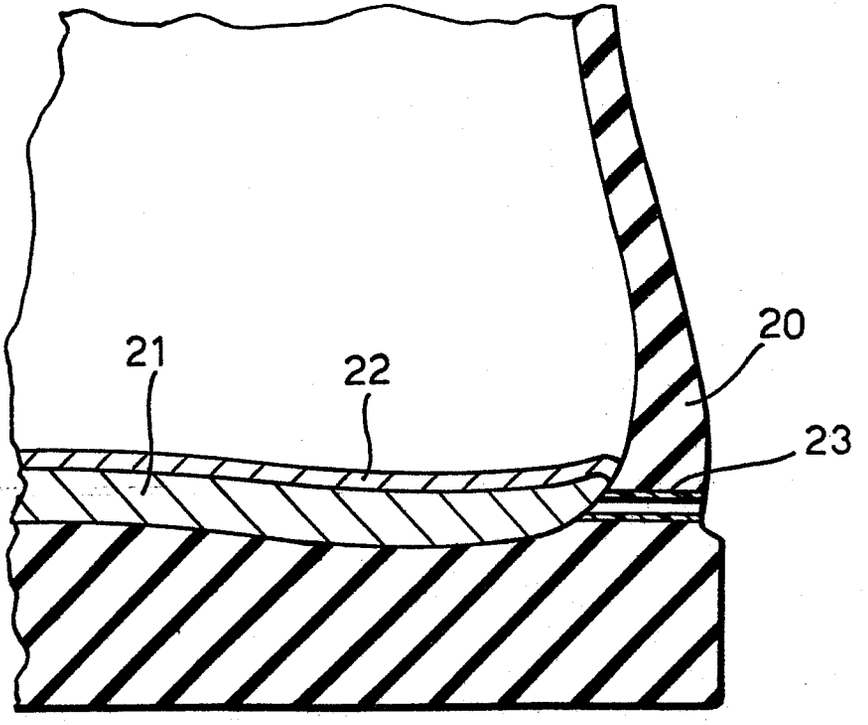


FIG. 2



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EUROPEAN SEARCH REPORT

0127592
Application number

EP 84 83 0154

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)
A	CH-A- 95 990 (B. BÖTTJER) * Whole document *	1	A 43 B 17/14 A 43 B 7/06 A 43 B 17/04
A	DE-A-2 717 752 (FIAT) * Page 3, paragraph 3; claim 1; figures 1,2 *	1	
A	DE-A-2 624 407 (SIEMENS) * Claim 1; figures 1-3 *	1	
A	US-A-3 681 843 (F.G. ARCELLA et al.) * Claims 1,6; figures 1-6 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

A 43 B
C 22 C
F 28 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-07-1984	MALIC K.

CATEGORY OF CITED DOCUMENTS

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