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(11) **EP 1 304 052 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**23.04.2003 Bulletin 2003/17**

(51) Int Cl.7: **A43B 17/08**, A43B 17/14,  
A43B 17/00, A43B 17/02

(21) Application number: **02020137.2**

(22) Date of filing: **09.09.2002**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
IE IT LI LU MC NL PT SE SK TR**  
Designated Extension States:  
**AL LT LV MK RO SI**

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(30) Priority: **22.10.2001 IT PN20010039 U**

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(54) **Ventilated insole for a footwear and footwear provided therewith**

(57) Insole for footwear, comprising an upper layer (1) of soft and porous material; a markedly elastic lower layer made with a thick, close-meshed net-like structure (2), said lower layer being capable of being reduced, when compressed, to a thickness that is by far thinner than the thickness it has under uncompressed conditions; two layers lying on top and at the bottom, respec-

tively, adapted to keep said upper and lower layers in a preestablished position relative to each other. The upper layer is made at least partially of latex, whereas the lower layer with a close-meshed net-like structure is pre-vaillingly made of plastic material. Aeration through-channels are provided orthogonally to said insole layers.

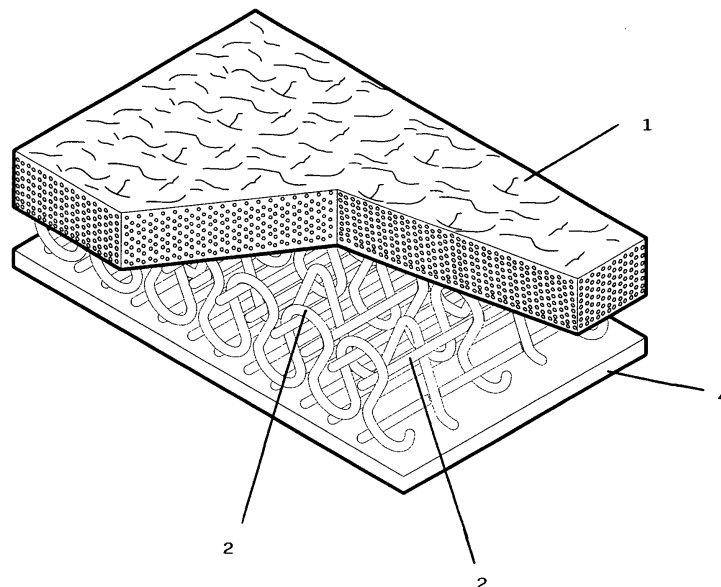


FIG. 3

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## Description

**[0001]** The present invention refers to an improved type of ventilated and cushioning insole for general purpose footwear applications.

**[0002]** Insoles for use in footwear applications are generally known in the art under various denominations and, in particular, also under the name of inner sole, foot pad or the like; the present invention relates to that portion of a footwear which is integrated therewith, and which the foot lies or rests upon, or that accessory item which is inserted in the footwear, normally upon the lower portion of the vamp, and which the foot is caused to rest upon.

**[0003]** In substance, the present invention relates to that portion of a footwear which may be either removable or not, and which may be either an integral part of the footwear or not, on which the foot rests.

**[0004]** For reasons of greater clarity, this portion of the footwear on which the foot rests will be called and referred to by the use of the sole, unified term of "insole" throughout the following description.

**[0005]** Many manufacturers of footwear sole assemblies are currently confronted with the problem of being capable of developing and making an insole which is provided with a capability of ensuring an adequate aeration of lower portion of the foot and, at the same time, providing the same foot with an adequate bio-mechanical stability and a comfortable, although non-yielding support.

**[0006]** However, for a number of reasons, the various solutions that have hitherto been proposed in this connection have practically failed to lead to a favourable conclusion.

**[0007]** So, for example, an important function in sports footwear lies in effectively protecting the foot against running stresses; in those sporting activities, such as for instance tennis, in which the foot is required to continuously or repeatedly spring, hop or bound under stresses that are certainly violent, although generally restrained within generally short periods of time, the need arises for an insole to be provided which is capable, jointly with the rest of the footwear, of ensuring a marked cushioning effect, and a good lateral foot-holding capacity, under a continuous aeration of the foot, in such a manner as to prevent the foot from being subject to excessively violent stresses, as well as to ensure that the foot is cooled continuously and is capable of effectively dissipate its own sweat.

**[0008]** Conversely, in footwear intended for less violent, but more prolonged sports activities, such as for instance walking, running or golfing, or even in footwear intended for general daily use, the most important prerequisite relates to the comfortableness and, therefore, the elasticity of the surface upon which the foot is due to rest, which surface shall however be neither yielding nor inelastic when the pressure exerted by a certain zone of the foot comes to cease.

**[0009]** Furthermore, owing to exactly the fact that the use of such footwear is extended in time, and may also be continuous throughout the day, an aeration capability is anyway required, without this anyway affecting the cushioning, i.e. softness properties of the foot support to any extent.

**[0010]** It therefore would be desirable, and it is actually a main purpose of the present invention to provide a kind of insole which features in a combined form both the capability of ensuring a constant ventilation under the foot and an elastic cushioning effect in association with a foot-contact surface which is soft and comfortable without being particularly yielding or easily deformed in a permanent manner.

**[0011]** In addition, such an insole shall be capable of being provided in the form of an accessory item that can be inserted or removed at will in or from the footwear, or shall also be capable of being applied in a stable a firm manner in the footwear during the manufacturing process thereof.

**[0012]** Finally, said insole shall be capable of being manufactured in a simple, low-cost manner with the use of readily available materials and techniques.

**[0013]** According to the present invention, these aims are reached in a particular kind of insole incorporating the characteristics as defined and recited in the appended claims, which is described below by way of nonlimiting example with reference to the accompanying drawings, in which:

- Figure 1 is a top view of an insole according to the present invention;
- Figure 2 is a side vertical cross-sectional view of a sole according to the present invention;
- Figure 3 is an enlarged, partially cross-sectional view of a portion of a layer of the sole of Figure 2.

**[0014]** An insole according to the present invention comprises, from top to bottom, a first layer 1 of a soft, moderately elastic material, such as preferably latex or the like, provided with properties that allow for a passage of air therethrough.

**[0015]** Under such a first layer there is applied a second layer 2 made of a reticular compound, which is fully permeable to the passage of air and featuring preferably a honeycomb structure.

**[0016]** The most suitable material to this purpose is a braided structure, at least 0.6 mm in thickness, of non-contaminable or non-degradable plastic material, such as for instance polyamide compounds.

**[0017]** The basic feature of this second layer lies in the marked elasticity thereof and, in particular, the capability thereof to act as an "air lung", i.e. an air reservoir; it therefore must be capable of recovering the normal thickness thereof when it is not being compressed, whereas, when it is compressed, its thickness must be

capable of being reduced without any appreciable effort in a significant manner as compared with the initial thickness.

**[0018]** As far as the compression strength, i.e. resistance to deformation thereof is concerned, this must be adequate and properly tuned to the need of ensuring that it is not compressed under just slight pressures, such that, when the foot is normally resting thereon, it becomes compressed only in the zones exposed to greater pressure, and not in the other zones, thereby favouring as uniform a pressure as possible on the foot-sole and, ultimately, a far smaller strain imposed to the same foot which is therefore subject to much less fatigue.

**[0019]** The above-mentioned two layers are contained in a shell acting as a sheath and formed by a top layer 3 that may be of natural leather, plastics or fabrics, whereas the bottom layer 4 is made of a material that must be adequately strong, but does not necessarily feature any special or particularly required property, such as cardboard that may be blended with other reinforcing fibres to a lesser or greater extent, having a thickness of anywhere between approximately 0.9 and 1.0 mm.

**[0020]** As particularly suiting this application may be considered a layer of processed cardboard that is generally known in the art under the tradename TEXON.

**[0021]** These four layers of different materials are then assembled in the above described sequence and order and, possibly, the overall stability of the assembly is aided by the application of respective gluing or adhesive layers, such as moltoprene, therebetween (not shown in the Figures for reasons of greater simplicity).

**[0022]** In view of holding the so obtained assembly firmly and compactly together, it is preferable to provide for the four matingly fitting layers to be sealed together by some suitable sealing means provided all along the outer periphery thereof, preferably with a welding seam or other known means.

**[0023]** Eventually this assembly is perforated with a plurality of through-channels 5 which in particular perforate, i.e. extend through the two outer layers of the assembly.

**[0024]** The way in which this kind of insole according to the present invention actually works will by now be fully apparent to those skilled in the art: in fact, the layer 2 of the elastic net type, when the foot is placed thereupon, yields to the resulting increase in weight on the upper zone, thereby reducing its thickness; this reduction in thickness drives the air present in the space now being squeezed to displace outwardly therearound and, in particular, owing to its being anyway squeezed, it is ejected under pressure outside the insole by passing through said channels 5.

**[0025]** Obviously, also the layer 1, which is formed of a porous material, is squeezed and, as a result, the air contained therein moves away to mix with the air from the layer 2 to be ultimately ejected jointly therewith.

**[0026]** In this phase when the foot is being pressed against the insole, the cushioning effect is ensured mainly by the layer 2, since the layer 1, although being elastic, has above all the function of creating a constantly soft barrier under the foot, so as to isolate it from the hardnesses of the layer 2 therebelow.

**[0027]** When the foot is then raised, the reverse sequence of events obviously takes place; it should be noticed that, while the air is in this case taken in from the outside, it is in any case air differing from the previously ejected one, and in particular a cooler and drier air, thereby preventing sweat from stagnating in the footwear and giving rise to all problems that are normally connected therewith.

**[0028]** Owing to the layer 2 recovering elastically to the original thickness thereof, this air is pumped again into the insole, where it progressively spreads through and into all interstices and, in particular, into and throughout the porous layer 1.

**[0029]** This of course until the next step is made, when the above described processes take place again in a similar manner.

**[0030]** At this point, it can therefore be fully appreciated that, at each step, the air within the insole is caused to circulate and is partially exchanged with the outside air, thereby enabling the above-described beneficial effects to be obtained. At the same time, the layer 2 goes on acting as a "spring", by absorbing all possible strains or excessive loads imposed to the foot owing exactly to the fact that such a spring extends with quite an appreciable thickness all over the bottom surface of the foot; in fact, should there be a particularly localized strain or load, a full compression of the layer 2 in the concerned zone occurs, while all other zones remain uncompressed.

**[0031]** This enables the foot-plant to avoid being strained and, therefore, distorted with respect to any sole whatsoever and, as a result, continuously protects and guards the lower articulation of the foot, which anyway keeps being protected also by the soft and markedly elastic layer 1. In addition, the elastic cushioning effect ensured by this layer produces a beneficial massaging action that is effective in stimulating the blood circulation of the foot.

**[0032]** An advantageous improvement of the present invention derives from the fact that the layer 1, owing to its being porous, may be impregnated with substances, such as for instance activated carbon, which prove valuable in maintaining the hollow space, i.e. gap within the insole in the best possible hygienical conditions in that, by fighting the growth of fungi and bacteria, oppose bacterial fermentation processes and the formation of fungi within the footwear.

**[0033]** The possibility is therefore also given for footwear to be provided, which are since the beginning, i.e. their manufacturing, and in a stable manner equipped with the above-described type of insole, so as to enable the afore illustrated advantages and benefits to be ob-

tained starting from the first time that such footwear are used.

**[0034]** It will be appreciated that it is not possible for downwardly directed ventilation channels to be provided in this kind of footwear. However, this limitation does not appear to be prejudicial if the upwardly directed channels are as large and thick as needed.

**[0035]** It will also be readily appreciated that, when sports footwear or special-purpose footwear is being made, the present invention provides the best conditions and advantages since it will be possible for the nature and the thickness of the various components to be finely tuned to the actual requirements of such uses, so as to maximize the advantages that are to be achieved.

### Claims

1. Insole for footwear, **characterized in that** it comprises:
  - an upper layer (1) of soft and porous material,
  - a markedly elastic lower layer (2) made with a thick net-like structure, said lower layer being capable of being reduced, when compressed, to a thickness that is by far thinner than the thickness it has under uncompressed conditions,
  - two layers (3, 4) lying on top and at the bottom, respectively, adapted to keep said upper and lower layers in a pre-established position relative to each other.
2. Insole according to claim 1, **characterized in that** there are provided a plurality of through-channels (5) extending orthogonally to said insole.
3. Insole according to claim 2, **characterized in that** said upper layer (1) is at least partially made of latex.
4. Insole according to any of the preceding claims, **characterized in that** said lower layer with a thick net-like structure is prevailingly made of plastic material, preferably polyamide compounds.
5. Insole according to any of the preceding claims, **characterized in that** said upper layer (1) is impregnated with hygiene-promoting substances.
6. Insole according to claim 5, **characterized in that** said hygiene-promoting substances comprise activated carbon.
7. Insole according to any of the preceding claims, **characterized in that** said lower layer (2) has a honeycomb-like structure.
8. General-purpose or special-purpose footwear, **characterized in that** it comprises an insole according to any of the preceding claims, which is integral with or firmly joined to the structure of said footwear.

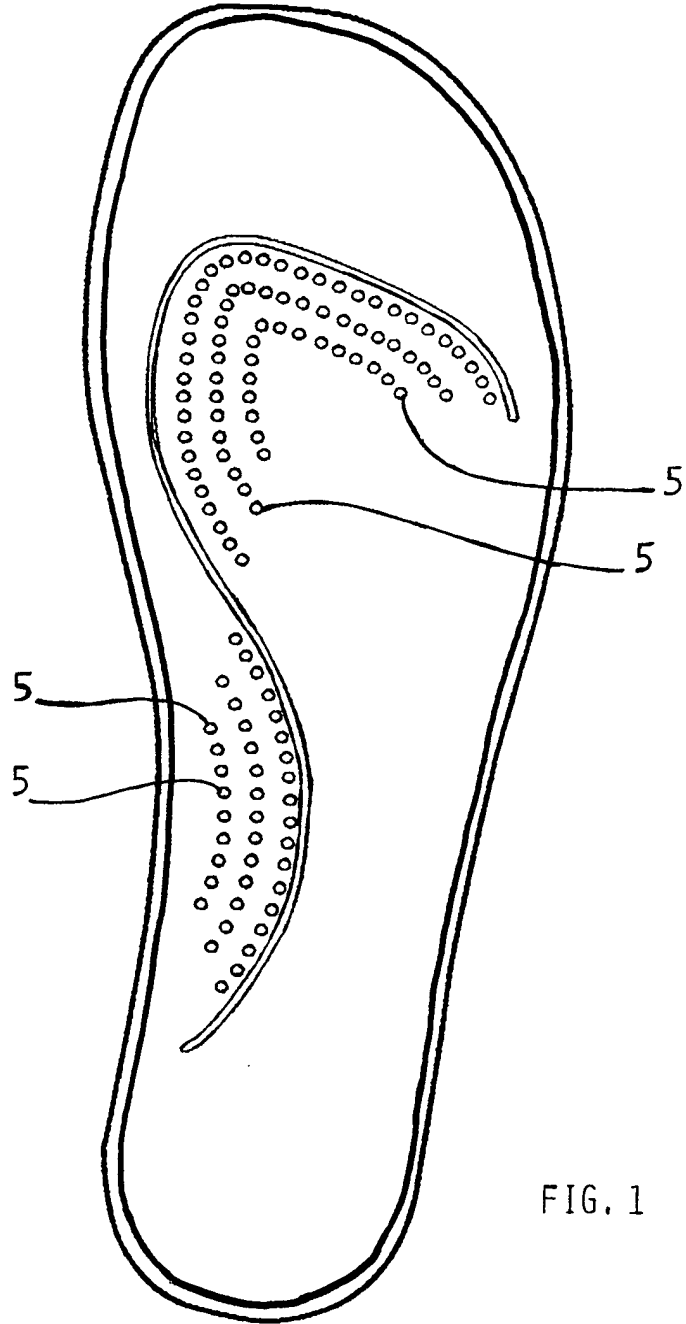


FIG. 1

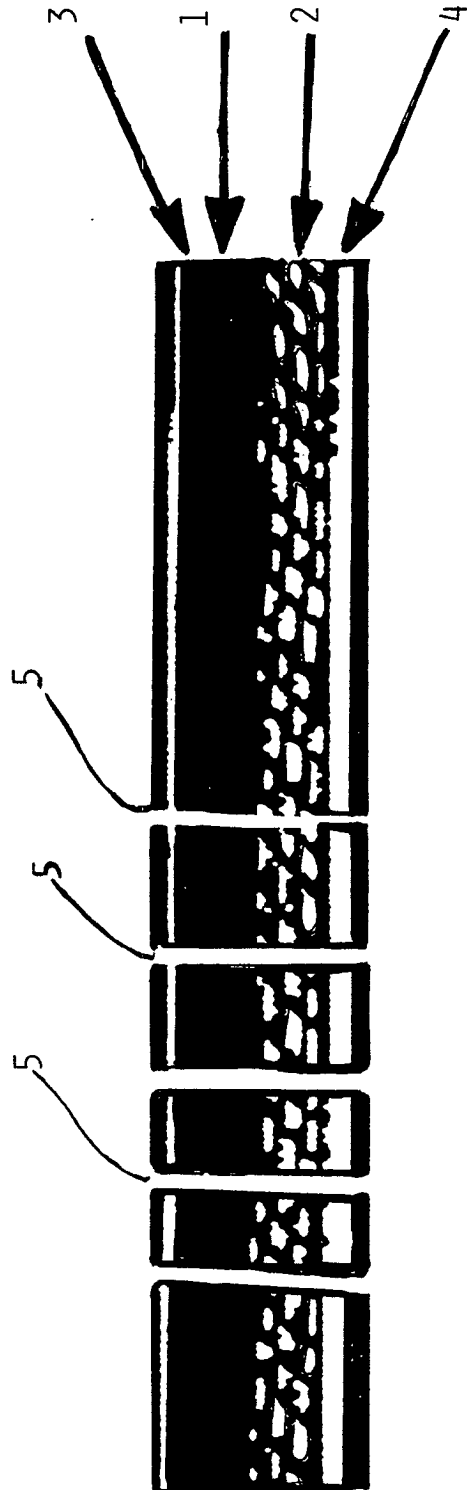


FIG. 2

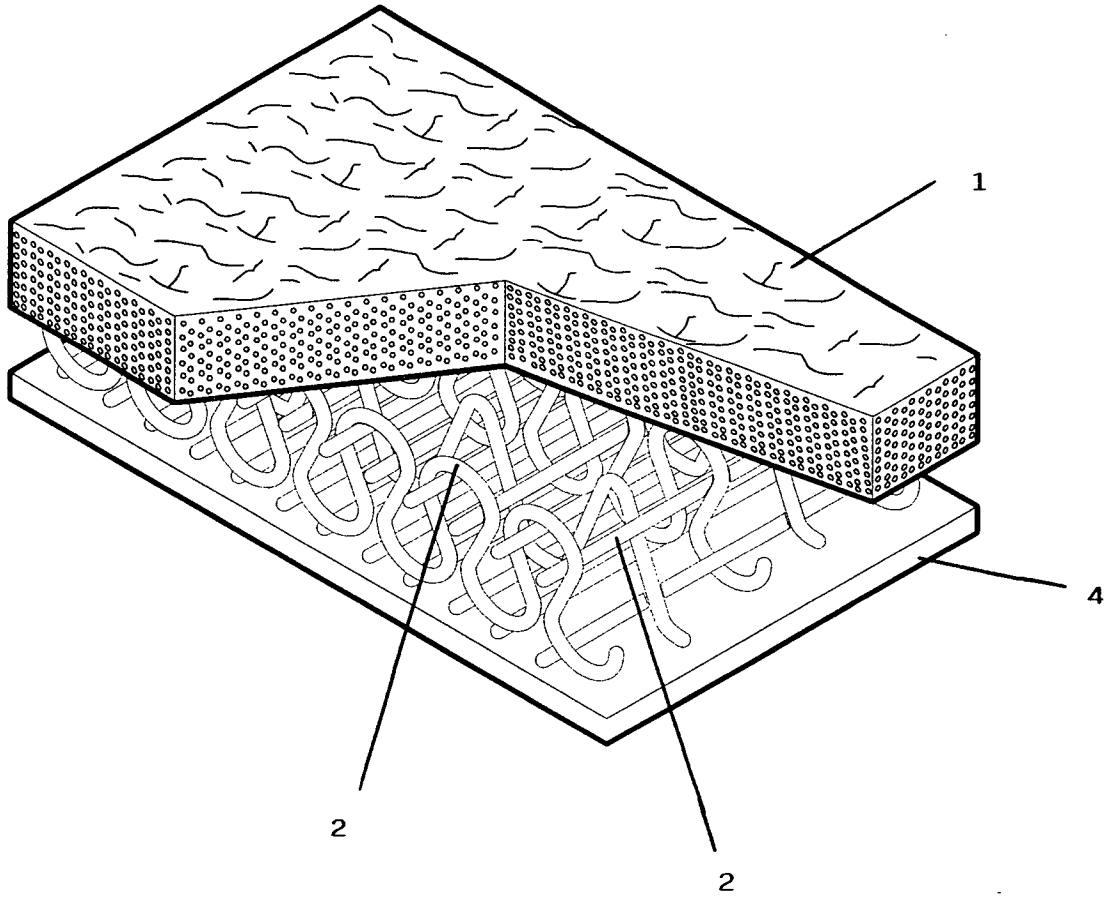


FIG. 3