

DESCRIPTION

MULTILAYER INSOLE TO BE FITTED IN FOOTWEAR AND THE LIKE

The present invention relates to a multilayer insole to be fitted in footwear and the like, of the type specified in the preamble of claim 1.

- 5 It is known that presently footwear items or shoes and the like are commonly formed with a sole, a vamp, an insole and a heel.

The sole is the part of the shoe in contact with the ground and is usually made of leather, rubber or plastic; the vamp constitutes the part surrounding the foot at the upper part thereof from the heel to the toes; the heel represents a raised base
10 portion present under the sole and placed at the foot heel; finally, the insole is an element reproducing the shape of the foot and is placed internally of the shoe and, in particular, upon the sole and adjacent to the inner surface of the vamp.

The shoe, as any other type of garment, performs an action mainly of the containment and support type adapted to implement a protection means for protecting the
15 foot from external agents, such as the cold and the wet, without hindering the foot movements and therefore the normal walking.

Therefore, a shoe must be first of all soft and flexible; it must not be hard and stiff and consequently must not represent too stiff a constraint for the foot, preventing natural movements thereof.

- 20 In addition, people are forced to walk on hard grounds such as asphalt, concrete, marble, tiles. These surfaces are not adapted to absorb either the energy or the vibrations triggered at the moment the shoe is resting on the ground.

Therefore these actions are returned from the shoe to the individual who absorbs almost the entirety thereof.

- 25 This aspect may give rise to serious pathologies such as tendinitis, talalgias, pe-

riostitis, fatigue fractures, pains in the joints, particularly the feet, knees, ankles, back, and up to the cranium base. For instance, a study from the University Charité of Berlin shows that walking on flat surfaces is the primary cause of postural alterations.

- 5 For the above reasons, it is important to have a shoe capable of ensuring not only comfort, but also a high ability to absorb the vibrations and energy arising when an individual is moving, while at the same time offering a proper position of the foot and therefore a correct posture of the whole person.

Consequently, of the greatest importance are the materials of which the shoe is
10 made and the shape of same, and in particular the materials of the sole and insole which are the elements defining the shoe capability of absorbing the aforesaid actions.

One of the solutions hitherto adopted contemplates use of air under pressure. In this solution at least one air-containing sealed bag is disposed inside the sole,
15 which bag by becoming deformed allows said energy to be absorbed.

In another solution, still based on use of air, the sole is provided with a bladder which is connected to the outside by a valve. While people are walking, the bladder is alternately compressed and expanded due to the weight force. This force creates an airflow through said valve and therefore a volume variation enabling
20 said action to be damped.

In another case use of springs is provided, which are suitably disposed in the vicinity of the heel, which springs being subjected to the action of the weight, continuously vary their length and therefore generate an action adapted to limit the efforts exerted by the shoe on the foot.

- 25 In a still further solution, exploitation of multilayer insoles is provided.

In this case manufacture of an insole takes place by overlapping a multiplicity of layers on each other, each of them being designed in such a manner as to provide an appropriate comfort to the shoe user. Each layer is therefore made of a particular thickness and/or material depending on the action to be performed.

5 The known art mentioned above has some important drawbacks.

In fact, it does not offer a system capable of ensuring a sufficient absorption of the vibrations and energy that dangerously fall on the individual.

In addition, the presently described solutions are subject to quick deterioration due to use and therefore the services they offer have a quick decay.

10 These solutions, mainly due to the great thickness, adversely affect the shoes' aesthetic appearance and therefore can be hardly applicable to smart shoes.

In particular, the multilayer insoles currently present on the market are characterised by a low efficiency.

In addition, the materials of which the multilayer insoles are made do not ensure a
15 high comfort sensation, due to an improper transpirable quality of the materials used.

Under this situation, the technical task underlying the present invention is to devise a multilayer insole to be fitted in shoes and the like, capable of substantially obviating the mentioned drawbacks.

20 Within the scope of this technical task, it is an important aim of the invention to ensure the absence of stress on an individual by absorbing the vibrations and energy arising at the moment the shoe comes into contact with the ground.

Another important aim of the invention is to ensure a high comfort under any use condition of the shoe.

25 A further aim of the invention is to make a structure that is efficient, of long dura-

tion and low cost.

A not least aim of the invention is to devise a multilayer insole capable of suiting any type of shoes.

The technical task mentioned and the aims specified are achieved by a multilayer
5 insole to be fitted in shoes and the like as claimed in the appended Claim 1.

Preferred embodiments are highlighted in the sub-claims.

The features and advantages of the invention are hereinafter clarified by the detailed description of a preferred embodiment of the invention, with reference to the accompanying drawings, in which:

10 **Fig. 1** is an exploded view of the insole according to the invention;

Fig. 2 shows a first portion of a shoe substantially defining a vamp, adapted to house the insole according to the invention;

Fig. 3 shows a second portion of a shoe, substantially defining a sole, adapted to house the insole according to the invention;

15 **Fig. 4** shows a mode of use of the insole according to the invention; and

Fig. 5 shows the insole seen in Fig. 1 in a fitted position and ready for use.

With reference to the drawings, the multilayer insole to be fitted in shoes and the like according to the invention is generally denoted at 1.

It allows an element to be created which is able to absorb energies and vibrations
20 triggered when a shoe 2 comes into contact with the ground, preventing them from reaching the foot.

In particular, the insole 1 absorbs the energy and vibrations that reach the user's foot through a sole 3, i.e. the portion of shoe 2 coming into contact with the ground.

25 In the embodiment shown, the sole 3 is formed with different elements and in par-

ticular it preferably comprises a plurality of inner blocks or inserts 4 and a component 5 which is provided with housings adapted to lodge said plurality of inserts 4. Finally, component 5 is internally secured to the lower portion of a vamp 6, i.e. the portion of shoe 2 surrounding the foot.

- 5 Inserts 4 are preferably three in number: the two first 4a and 4b are made of absorbent material such as expanded-cell foams, and the third 4c made is of a polymeric material, such as polyvinylchloride.

The first insert 4a is disposed in the front part of the sole, while the two others 4b-c are located at the rear of the sole 3, i.e. the region adapted to house the heel. In particular, insert 4c is preferably disposed between insert 4b and component 5.

10 In vamp 6 preferably a cloth 6a, a double cloth for example, is provided which is secured to the lower edge of the vamp, i.e. the edge that is adapted to come into contact with sole 3, and allows the inserts 4 to be maintained in the housings present in component 5.

- 15 The multilayer insole 1 is therefore suitable to be disposed inside the shoe 2 and, in particular, it has the lower surface in contact with the double cloth 6a and the side surface in contact with vamp 6.

It extends along a major extension surface 1a and preferably comprises at least three layers, extending in the direction of surface 1a: a damper element 7, an upper layer 8 and a lower layer 9.

The damper element 7 is a layer of a material that advantageously ensures passage of air and a high absorption capability.

- In an original manner, said material constituting the damper element 7 is preferably an open-cell foam of damping microcellular polyurethane material. In particular, this material is poron 62-red marketed by Rogers Corporation or a double layer

comprising the aforesaid poron 62-red.

In particular, it has a high elasticity determining a minimum energy return to the user's foot, during the expansion step immediately following the impact of shoe 2 on the ground. Another important physico-mechanical feature of the material is its
5 damping capability, i.e. it is able to absorb the vibrations arising at the moment of said impact without transferring them to the foot.

Finally, the material used for the damper element 7 advantageously has a resiliency, i.e. the ability to resist impacts, equal to a value of about 4 if measured by an "ASTM D2632-92, Vertical Rebound" test and a 90%-compression recovery
10 time included between 0.3 s and 2.5 s. By 90%-compression recovery time it is intended the time required by the material, elastically deformed by a compression, to take back 90% of the volume lost due to the above action.

A further feature of said material is a good shape memory enabling it to acquire the starting shape again, when the compression and expansion steps have been
15 completed.

Finally, the material is able to offer a good duration under any use condition of the shoe 2, also due to a good resistance to abrasion and wear.

The damper element 7 is placed in the upper part of the multilayer insole 1. In particular, the element 7 is disposed in the vicinity of the insole 1 portion that, when
20 said insole 1 is fitted in shoe 2, is in direct contact with the foot or with an upper layer 8 in contact with the foot.

The damper element 7 substantially extends over the whole insole 1 in the direction of the major extension surface 1a and therefore substantially concerns the whole contact region between the insole 1 and the foot, as shown in Fig. 1.

25 Finally, the element 7 is a layer of greater thickness than the adjacent ones, in-

cluded between 2 mm and 6 mm, preferably of about 3 mm.

In addition, the upper layer 8 is disposed in the contact region between the foot and the insole 1 and is suitable to define the rest surface of the foot in the shoe 2.

This upper layer 8 is made of natural leather or other similar material suitable to
5 define a comfortable rest surface for the foot and to allow passage of air through the insole 1. Finally, said upper layer 8 has a thickness included between 0.5 mm and 1.5 mm, said thickness being substantially of 0.8 mm.

The lower layer 9 is arranged in the lower part of the multilayer insole 1 and is housed under the damper element 7. This lower layer 9 therefore defines the sur-
10 face of the multilayer insole 1 coming into contact with the inner part of the sole 2a of shoe 2 when the insole 1 is fitted inside the shoe.

The lower layer 9 is preferably made of a polymeric material and, in particular, ethylene vinyl-acetate.

In order to ensure an appropriate passage of air through the lower layer 9, at least
15 one cavity 9a is formed in the front portion of said layer 9. Alternatively, instead of cavity 9a, a plurality of holes can be formed on the lower layer 9.

The lower layer 9 contemplates the presence of a flange 10 in the upper surface, which flange 10 is integral with said layer 9 and is disposed on at least part of the perimeter of the multilayer insole 1, preferably on the edge surrounding the insole
20 region designed to get into contact with the foot heel.

Flange 10 is a border of such a height that it can receive the layers of the insole 1 overlying the lower layer 9 and such a thickness that a greater stability can be ensured to the user of a shoe 2 equipped with this insole 1.

Finally, the flange 10 and lower layer 9 are preferably made of one piece construc-
25 tion.

Under said lower layer 9, the multilayer insole 1 can be provided with an airbag 11 adapted to cover at least part of same and in particular that part of the insole 1 that will come into contact with the heel.

The airbag 11 comprises two plates 11a mutually linked in such a manner as to
5 define an air-containing sealed bladder which is preferably divided into two sub-bladders by a third plate 11b.

Finally provided in plate 11b is a series of through holes 11c enabling an airflow to be created between said two sub-bladders and, therefore, the sub-bladder volume to be varied in such a manner as to at least partly absorb the impact of the shoe 2
10 on the ground.

Operation of a multilayer insole 1 to be fitted in shoes and the like, described above as regards structure, is as follows.

As soon as sole 3 comes into contact with the ground, the insole 1 begins to get elastically deformed. In particular, the front portion of the damper element 7 starts
15 becoming deformed and, as it is subjected to compression forces due to the user's weight, begins to compress and therefore to absorb the energy and vibrations resulting from the aforesaid contact.

As contact extends to the rest of sole 3, also the remaining portion of the damper element 7 is elastically deformed by compression and absorbs said energies.

20 This absorption operation is finally promoted by the presence of the airbag 11 that is subjected to deformation and continuously varies the air location inside it, which air can move inside a sub-bladder but also between the two sub-bladders, due to the presence of holes 11c.

Finally, the particular selection of the material of which the damper element 7 is
25 made allows the insole 1 to slowly recover its starting position, thereby minimising

the energy and vibration discharge on the user's foot.

This recovery time of element 7 is at all events sufficient for the insole 1 to have the element 7 fully decompressed at the time of the following step, so that it is ready to absorb energy again.

- 5 In addition, the deformation of the damper element 7 and the airbag 11 allows the insole 1 to absorb any possible unevenness present on the ground.

The invention achieves important advantages.

The insole ensures a high ability to absorb the energy and vibrations arising at the moment the shoe 2 contacts the ground, as well as a high comfort.

- 10 In fact, element 7 is made of a material allowing a 90%-compression recovery time sufficiently high, to such an extent that the return of energy to the foot is minimised, but at the same time to such an extent that the sole is allowed to appear again fully extended at the time of the following step, always ensuring a high damping ability.

- 15 In addition, the materials of which the insole 1 is made ensure a high duration of said insole 1.

Furthermore, the multilayer insole 1 offers a high comfort to the user, due to its capability of absorbing both the contact energy between shoe 2 and the ground and any possible unevenness of the ground.

- 20 The sensation of comfort is further increased due to the capability of transpiration of the insole 1 that allows passage of an airflow adapted to enable optimal temperature and humidity values to be obtained inside shoe 2.

A non negligible advantage of the invention is the fact that insole 1, due to the physico-mechanical features of the material of element 7, is able to suit the pecu-

- 25 liar physiognomy of the user's foot.

Another advantage resides in that insole 1 is on the whole thin and therefore can be accommodated in any type of shoe 2, even in smart shoes.

A further advantage concerns the low manufacturing costs of insole 1.

The invention is susceptible of variations falling within the scope of the inventive
5 idea.

All of the details can be replaced by equivalent elements, and the materials, shapes and sizes can be of any nature and magnitude.

CLAIMS

1. A multilayer insole (1) to be fitted in a footwear or shoe (2), extending along a major-extension surface (1a) and comprising: at least one damper element (7) adapted to damp the impact of said shoe (2) on the ground, substantially extending over the whole of said insole (1) in the direction of said major-extension surface (1a) and being placed in the upper part of said insole (1), characterised in that said damper element (7) is an open-cell foam made of damping microcellular polyurethane material with a 90%-compression recovery time included between 0.3 s and 2.5 s.

2. A multilayer insole (1) as claimed in the preceding claim, wherein said material of said damper element (7) has a resiliency equal to a value of about 4 if measured by an "ASTM D2632-92, Vertical Rebound" test.

3. A multilayer insole (1) as claimed in one or more of the preceding claims, wherein said material of said damper element (7) is adapted to enable passage of an airflow through said damper element (7) in a direction at right angles to said major extension surface (1a).

4. A multilayer insole (1) as claimed in one or more of the preceding claims, wherein said material of said damper element (7) has a thickness included between 2 mm and 6 mm.

5. A multilayer insole (1) as claimed in one or more of the preceding claims, comprising an upper layer (8) made of natural leather and suitable to be placed on top of said damper element (7) and to define the rest surface of a foot in said shoe (2).

6. A footwear or shoe (2) comprising a multilayer insole (1) as claimed in one or more of the preceding claims.