STRUCTURE OF SHOE SOLE

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ABSTRACT

A structure of shoe sole is provided, which is a custom-made shoe sole that is formed according to a user's foot sole so as to improve the effects of support and wrapping of the shoe sole. The shoe sole includes an enclosure and a clay-like thermoplastic material. The enclosure includes upper and lower cover layers that are made of a material showing local stretchability and air permeability. The thermoplastic material is received between the upper and lower cover layers and is a thermoplastic mixture in the form of soft ceramic. With the shoe sole placed in a shoe and the shoe put on a user's foot, the thermoplastic material of the shoe sole may get deformed inside the enclosure according to the contour of the user's foot sole, making the shoe sole shaped to completely match the foot sole of the user.
STRUCTURE OF SHOE SOLE

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention generally relates to the field of shoe sole, and more particularly to a structure of shoe sole that is self-shapeable and heat-setting so that the shape of shoe sole can be automatically set according to three-dimensional contour of a user's foot sole to thereby enhance safety and comfortableness of the user wearing shoes.

DESCRIPTION OF THE PRIOR ART

[0002] A shoe sole is a pad that is positioned inside a shoe for supporting pressures induced on a foot sole and limiting the movement of an ankle thereby providing a cushioning function to reduce the potential risk of damage to the user's foot. The shoe sole is put in direct contact with a foot sole and it is of critical effect on the safety and comfortableness of a user wearing the shoe. A conventional shoe sole is made in the form of a flat pad like article, which only engages front and rear portions of the foot sole and the heel, but provides no support to the arch that is a middle portion of the foot sole. This results in non-uniform distribution of pressure. Further, since the user's foot is not properly constrained, the heel is allowed for movement in a large range. This often results in a twist of the ankle. Apparently, the conventional shoe sole does not completely meet the needs of general consumers.

[0003] To overcome the problem that the conventional shoe sole cannot properly support the arch, a thermoplastic shoe sole is available. The thermoplastic shoe sole is formed by trimming a plate made of foamed plastics or thermoplastic urethane to provide a sole blank, which is heated to the softening point (not the melting point) and then subjected to depressing and shaping by using a foot mold. Afterwards, cooling is made to set the molded blank to form a finished product of shoe sole. In this way, the shoe sole is made an arch pad that can support the arch of a user's foot sole.

[0004] The above mentioned thermoplastic material that is used to form the shoe sole is not a flowable material and must be heated to the softening point, which generates a high temperature condition. This, plus the effect of restoration springing, makes it not possible to mold and shape the shoe sole by directly using a user's foot sole, and the shoe sole can only be properly formed after being repeatedly depressed and molded several times by using the foot mold that is prepared in advance. Further, during the process of molding and shaping, although the shoe sole blank can be deformed in a vertical direction within a three-dimensional space to form an arch pad, yet deformation of the blank in a horizontal lateral direction is not significant enough to provide an effect of wrapping the arch at opposite sides thereof.

[0005] Further, as discussed above, the known technique uses a fixed foot mold, which has a poor capability of shaping, so that it needs several times of repeated molding steps before the final shape can be obtained. Thus, it is not possible for the known technique to provide a custom-made shoe sole, for each individual user has different height of arch, and thus, no effective support to the arch can be realized and the pressure distribution on the foot sole cannot be made uniform. Further, it shows a poor effect of positioning, which negatively influences the comfortableness of user wearing a shoe. Further, since the conventional shoe sole does not closely wrap around the foot sole of a wearer, the foot sole of the wearer is allowed to shift in an undesired lager range inside the shoe, making the positioning of foot sole even worse and eventually resulting in deformation and hurt of foot sole due to twisting. In addition, due to the poor effect of not properly supporting the arch and not wrapping the heel, a wearer of a shoe cannot get the foot relaxed when taking movement while wearing the shoe. This leads to waste of body energy and a long term wear of the shoe incorporating the conventional shoe sole will eventually exhaust the wearer and cause tiredness and incapability of long standing and walking.

[0006] The above discussion clearly shows a potential solution that comfortableness and safety of wearing a shoe can be realized for a wearer by forming a shoe sole in such a way that a shoe wearer's foot sole is used as a mold in molding the shoe sole, whereby the wearer's foot arch can be properly supported and the heel and lateral sides of the wearer's foot sole can be closely wrapped by the shoe sole so made.

SUMMARY OF THE INVENTION

[0007] Thus, the primary object of the present invention is to provide a structure of shoe sole, wherein the shoe sole is custom-made according to the contour of a user's foot sole, so that excellent support and close wrapping around the foot sole can be realized.

[0008] The solution, which the present invention adopts to achieve the above object, is a structure of shoe sole that comprises:

[0009] an enclosure, which comprises a hollow sack having a shape corresponding to an inside contour of a shoe, the enclosure comprising an upper cover layer and a lower cover layer that overlap each other and are joined to each other along a circumference to form the sack;

[0010] a thermoplastic material, which is received between the upper cover layer and the lower cover layer of the enclosure, the thermoplastic material comprising soft ceramic material that is shapeable in room temperature and settable by being heated;

[0011] as such, a top surface of the shoe sole is shapeable to form a three-dimensional configuration exactly corresponding to a wearer's foot sole, the three-dimensional configuration comprising an arch section that corresponds to the arch of the foot sole and a heel wrapping section that corresponds to the heel of the foot sole, whereby the shoe sole is formed to realize full support of and closely wrapping around the foot sole.

[0012] With such a technical solution, the shoe sole made in accordance with the present invention, when positioned in a shoe that is worn by a user, allows the thermoplastic material inside the enclosure of the shoe sole to deform and thus be shaped according to the foot sole of the user. Further, since the thermoplastic material is enclosed and thus constrained by the enclosure, the adhesion of the thermoplastic material is properly isolated and deformation of the shoe sole to a three-dimensional configuration corresponding to the user's foot sole can be properly achieved. Further, after heating and setting, the shoe sole can effectively wrap around the heel of the user's foot sole and properly support the arch, making the pressure of the foot sole uniformly distributed on the foot sole and the moving space of the ankle suitably constrained, so that safety and comfortableness are significantly improved and added value is increased, leading to upgraded capability of competition and increased economic value.

[0013] The foregoing objectives and summary provide only a brief introduction to the present invention. To fully appreciate these and other objects of the present invention as well as
the invention itself, all of which will become apparent to those skilled in the art, the following detailed description of the invention and the claims should be read in conjunction with the accompanying drawings. Throughout the specification and drawings identical reference numerals refer to identical or similar parts.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a foot sole constructed in accordance with the present invention.

FIG. 2 is an exploded view of the shoe sole of the present invention, illustrating spatial relationship among constituent components thereof.

FIG. 3 is a cross-sectional view of the shoe sole of the present invention in a completely assembled form, illustrating inside structure of the shoe sole.

FIG. 4 is a perspective view showing the shoe sole of the present invention after being deformed and thus shaped.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following descriptions are exemplary embodiments only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope of the invention as set forth in the appended claims.

The present invention provides a structure of custom-made shoe sole and an embodiment of the shoe sole is illustrated in the several drawings attached, in which direction related terms, such as front and rear, left and right, top and bottom, upper and lower, and horizontal and vertical that are referred to in the following description are provided only for convenience of description and not to any extent to limit the components of the shoe sole of the present invention to any specific position or orientation in the three-dimensional space. Any specific size shown or mentioned in the drawings and the specification is subject to proper change according to the design and requirement of embodiments of the present invention illustrated, without departing the scope of the present invention as best defined in the appended claims.

The present invention provides a structure of custom-made shoe sole. As shown in FIGS. 1 and 2, the shoe sole of the present invention, generally designated at 1, comprises a sack-like enclosure 10 and a thermoplastic material 20 contained in the enclosure 10.

Details of a preferred embodiment of the present invention are illustrated in FIGS. 1-3, wherein the enclosure 10 has a shape corresponding to an inside contour a shoe and the enclosure 10 is formed of an upper cover layer 11 and a lower cover layer 12 that overlap each other and are joined together along circumferential edges thereof. The upper and lower cover layers 11, 12 are made of a material showing local stretchability and air permeability, such as cloth, non-woven fabric, and plastic film. The circumferential edges of the upper and lower cover layers 11, 12 can be jointed through ultrasonic waves, adhesives, and sewing.

The thermoplastic material 20 is received between the upper and lower cover layers 11, 12 of the enclosure 10 with the circumferential edges of the upper and lower cover layers 11, 12 joined together in a sealed manner. The thermoplastic material 20 is a soft ceramic material that is shapeable in room temperature and is settable by being heated. The thermoplastic material 20 may comprise a major constituent component of thermoplastic resin, reactive resin, and/or air-drying resin. For the thermoplastic resin, of which examples include ethylene vinyl acetate (EVA), thermoplastic elastomer, thermoplastic polyurethane (TPU), and polyvinyl chloride (PVC), a plasticizer (such as a softener, including for example di-isosteryl phthalate (DINP), di-octylphthalate (DOP), and wax) and an excipient/filler (such as calcium carbonate and gaseous silicon dioxide) that are added and mixed together as a clay-like soft ceramic material, which has the characteristics of being shapeable in room temperature and settable by being heated. For reactive resin, of which examples include hot air vulcanization (HAV) silicone rubber, rubber, polyurethane, epoxy resin, a constant temperature crosslinker and an excipient/filler (such as calcium carbonate and gaseous silicon dioxide) are added and mixed to form a clay-like soft ceramic material, which has the characteristics of being shapeable in room temperature and settable by being heated to a reaction temperature. For air-drying resin, of which examples include polyvinyl acetate (PVAC), polyvinyl alcohol (PVA), vinyl acetate-ethylene (VAE), an excipient/filler (such as calcium carbonate and gaseous silicon dioxide) is and is processed by being taken out of a sealed bag and put into a shoe to match a user's foot sole and being then removed from the shoe to get naturally dried and thus shaped and set.

As such, a custom-made shoe sole 1 that is formed according to the foot sole of a user is provided.

As to practical applications of the present invention, reference is now made to FIGS. 1 and 4. The shoe sole 1, which is not shaped and set, is positioned in a shoe and the shoe is then put on a foot of a user. Afterwards, the user may stand and walk in a normal way and then the shoe is taken off and the shoe sole 1 is removed from the shoe. Due to the force applied by the user walking and standing, a user's foot sole is pressed upon the surface of the shoe sole 1 is shaped to form a three-dimensional configuration 30 exactly corresponding to the contour of the user's foot sole. The three-dimensional configuration 30 comprises an arch section 31 that corresponds to the arch of the foot sole and a heel wrapping section 35 that corresponds to the heel of the foot sole. The shoe sole is then subjected to heating or natural drying to get the shape set. When the user wears the shoe, the foot sole of the user completely matches and is in tight and complete engagement with the three-dimensional configuration 30 of the shoe sole 1 so that the foot sole is provided with complete support and wrapping.

The shoe sole 1 of the present invention shows at least the following advantages and values:

1. The shoe sole 1 of the present invention can be kept in a soft ceramic like condition that is shapeable in room temperature and can be set after properly shaped. Thus, a user's foot sole can be used as a mold to shape a custom-made shoe sole 1 that completely matches the contour of the foot sole and thus provides effective support to the foot sole and makes the foot sole pressure uniformly distributed on the
whole shoe sole and is further advantageous in enhanced foot sole positioning capability that improves the comfort-
ableness of wearing the shoe to do activity.

[0028] (2) The shoe sole 1 of the present invention can be shaped to match the three-dimensional configuration 30 of the soles of various users, so as to provide an effect of wrapping that limits the range of movement of the user's ankle inside a shoe and improves the foot sole positioning capability, whereby deformation and hurt of foot caused by twisting can be avoided and safety of wearing shoe to do activity can be improved.

[0029] (3) The shoe sole 1 of the present invention provides sufficient support to the arch of a user's foot sole and wraps around the heel of the foot sole so that a user, when wearing a shoe that incorporates the shoe sole to do activity, can totally relax without causing waste consumption of body energy and this helps improving the problems of tiredness and incapability of properly standing and walking for long term wearing of the shoe.

[0030] It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

[0031] While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

I claim:

1. A shoe sole, comprising:
   an enclosure, which comprises a hollow sack having a shape corresponding to an inside contour of a shoe, the enclosure comprising an upper cover layer and a lower cover layer that overlaps each other and are joined to each other along circumferential edges to form the sack; and
   a thermoplastic material, which is received between the upper cover layer and the lower cover layer of the enclosure, the thermoplastic material comprising soft ceramic material that is shapeable in room temperature and settable by being heated;
   wherein a top surface of the shoe sole is shapeable to form a three-dimensional configuration exactly correspond-
   ing to a wearer's foot sole, the three-dimensional configuration comprising an arch section that corresponds to the arch of the foot sole and a heel wrapping section that corresponds to the heel of the foot sole, whereby the shoe sole is formed to realize full support of and closely wrapping around the foot sole.

2. The structure of shoe sole according to claim 1, wherein the upper and lower cover layers are made of a material showing local stretchability and air permeability.

3. The structure of shoe sole according to claim 2, wherein the material of the upper and lower cover layers is selected from a group consisting of cloth, non-woven fabric, and plastic film.

4. The structure of shoe sole according to claim 1, wherein the circumferential edges of the upper and lower cover layers are jointed by means of ultrasonic waves, adhesives, and sewing.

5. The structure of shoe sole according to claim 2, wherein the circumferential edges of the upper and lower cover layers are jointed by means of ultrasonic waves, adhesives, and sewing.

6. The structure of shoe sole according to claim 3, wherein the circumferential edges of the upper and lower cover layers are jointed by means of ultrasonic waves, adhesives, and sewing.

7. The structure of shoe sole according to claim 1, wherein the thermoplastic material comprises a thermoplastic resin, which is added with a plasticizer and an excipient/filler to form a clay-like soft ceramic material that has the characteristics of being shapeable in room temperature and settable by being heated.

8. The structure of shoe sole according to claim 1, wherein the thermoplastic material comprises a reactive resin, which is added with a constant temperature crosslinker and an excipient/filler to form a clay-like soft ceramic material that has the characteristics of being shapeable in room temperature and settable by being heated to a reaction temperature.

9. The structure of shoe sole according to claim 1, wherein the thermoplastic material comprises an air-drying resin, which is added with an excipient/filler and which, after being taken out of a sealed bag, is put into a shoe to match a user's foot sole and then removed from the shoe to get naturally dried and thus shaped and set.

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