Abstract

Disclosed is a customized shoe sole having a multi-level cushion column, which can improve impact absorption and dispersion while walking. The customized shoe sole comprises at least one multi-level cushion column including a plurality of cushion layers piled vertically, wherein at least one of the cushion layers has an elastic hardness different from those of the other layers, so as to start to be elastically deformed under a specific load condition.
CUSTOMIZED SHOE SOLE HAVING MULTI-LEVEL CUSHION COLUMN

TECHNICAL FIELD

[0001] The present invention relates to a shoe sole, more particularly, relates to a customized shoe sole having multi-level cushion column, which can improve shock absorption and dispersion and contribute weight lightening of a shoe.

BACKGROUND OF THE ART

[0002] In past, a shoe was for protecting a foot, however, as one’s quality of life is getting improved recently, the shoe is needed to have other function or property.

[0003] Specially, contrary to the past trend that a pair of athletic shoes were used for multipurpose, various type of shoes are being developed in these days, such as for walking, running, mountain climbing, soccer, tennis, baseball, golf and the like.

[0004] A shoe comprises an upper part for protecting an instep and joints of the foot and a sole part for protecting the sole of the foot. The sole part of the shoe transfers impact generated when walking and running. Since a walker wearing shoes having hard sole parts may feel fatigue easily, the sole part should have a light structure which can damp and absorb walking impact.

[0005] There have been studies about shoe soles which can reduce impact generated when walking and running and contribute to weight lightening, however they have left much to be desired. Therefore development of a shoe sole for walking is still needed very much.

[0006] The conventional shoes have been manufactured depending only on user’s foot size, not considering his weight, so they cannot absorb impact effectively, when supporting heavy users. For example, since the conventional shoe of 270 mm has only one shock absorbing ability regardless of users’ real weights, for example 60 kg or 100 kg, the conventional shoe cannot provide a proper shock absorbing ability which can be varied according to their weights.

[0007] Also, the conventional shoes have been manufactured to have a general shock absorbing ability, however they cannot absorb shock in various conditions. For example, a person who is running may bear shock 2-3 times larger than a person who is walking.

DETAILED DESCRIPTION OF THE INVENTION

Technical Object

[0008] The present invention provides a shoe sole having multi-level cushion column, which can minimize shock transmitted to the body when walking or running.

[0009] The present invention provides a shoe sole having multi-level cushion column, which has a shock absorbing ability being controllable according to the user’s physical conditions, such as weight.

[0010] The present invention provides a shoe sole having multi-level cushion column, which has a shock absorbing ability to cope actively to the changes of impulse when walking or running.

[0011] The present invention provides a shoe sole having multi-level cushion column, which can maintain a stable body balance when walking or running.

[0012] The present invention provides a shoe sole having multi-level cushion column, which can serve a good wear sensation and let the foot felt fatigued rarely by improving energy efficiency.

Technical Solutions

[0013] According to one exemplary embodiment of this invention, a customized shoe sole having a multi-level cushion column comprises at least one multi-level cushion column including a plurality of cushion layers piled vertically, wherein at least one of the cushion layers has an elastic hardness different from the other layers, so as to start to be elastically deformed under a specific load condition.

[0014] For reference, the meaning of “vertically” in this specification may be understood as a direction of the user’s weight or a direction perpendicular to ground.

[0015] The cushion layers in one cushion column may be elastically deformed under different conditions. For example, the cushion column may include a first cushion layer and a second cushion layer, each of which has a different elastic hardness, such that the first cushion layer may not be deformed even when the second cushion layer is deformed under a specific load condition, and may be elastically deformed under further increased load condition. In this instance, when the first cushion layer is elastically deformed, the second cushion layer may be elastically deformed together.

[0016] The cushion column may be formed in accordance with the whole area of the shoe sole or part of the shoe sole. The size, the shape and the location of the cushion column cannot limit the present invention.

[0017] A plurality of the cushion columns may be provided to be separated to each other, on the whole or partial area of the shoe sole. The number and the interval of the columns may be variously changed or selected according to the needed conditions or design plans.

[0018] The structure of the cushion column may be variously selected according to the condition or design specification. For example, the cushion column may comprise a first cushion layer and a second cushion layer. In this instance, the second cushion layer may be positioned above or below the first cushion layer.

[0019] Otherwise, the hardness of the first and the second cushion layers may be variously selected according to the conditions or design specification. For example, the first cushion layer positioned below may have hardness relatively higher than the second cushion layer. In other cases, the second cushion layer may have hardness relatively higher than the first cushion layer.

[0020] At least one of the cushion columns may further comprise a third cushion layer overlaid above or below the second cushion layer, and the third cushion layer may have elastic hardness different from at least one of the first and the second cushion layers. Otherwise, the cushion columns may comprise four or more cushion layers which are different from each other. The number of the cushion layers cannot limit the present invention.

[0021] The cushion columns may have a structure of the cushion layers which are equal to or different from one another. The cushion columns which have a layer structure equal to each other, for example, may have the first cushion layer and the second cushion layer respectively, in which the first cushion layers have the same elastic hardness and the second cushion layers have the same elastic hardness. In
contrast, the cushion columns which have a layer structure different from each other, for example, may have the first cushion layer and the second cushion layer respectively, in which one of the first and second cushion layers may have an elastic hardness different from neighboring first or second cushion layer.

[0022] The cushion columns may have the same number of the cushion layers, however may have the different number of the cushion layers. For example, a part of the cushion column may have three or more number of the cushion layers, and another part of the cushion columns may have two cushion layers.

[0023] The neighboring cushion layers in the plurality of the cushion columns, which are of the same level, may be mutually connected by connecting ribs. For example, in the several or many cushion columns, the neighboring first cushion layers may be mutually connected by first connecting ribs. Similarly, the second cushion layers may be mutually connected by second connecting ribs, or the third cushion layers may be mutually connected by third connecting ribs. On the contrary, without the connecting ribs, the first, the second and the third cushion layers may be provided separated to one another. The adjacent cushion layers made of the same material, even if they are located in different cushion columns and/or in different levels, may be connected by connecting ribs.

[0024] The neighboring cushion layers in the plurality of the cushion columns, which are of the same level, may have the same or different size, e.g., thickness or area, of cushion layers. For example, each of the first, second and third cushion layers in several cushion columns may have thickness different from one another. The first to third cushion layers of the cushion column may have thickness equal to each other, on the contrary, one of the first to third cushion layers may have thickness different from the others. Each of the cushion layers in the many columns, may have thickness different from the others in a specific region or under a specific condition.

[0025] The shape or the cross section of the cushion layers may be designed or selected various according to the needed conditions or design specification. For example, the first to the third cushion layers may have a circular cross section, in other cases, the cross section of the cushion layers may be oval, triangle, rectangular and pentagon or may be shaped of geometric star or heart. At least one of the first to the third cushion layers may have a cross section different from the others.

[0026] One of a pile of the cushion layers may have a receiving portion partially receiving another cushion layer which is vertically adjacent to itself, and a cushion chamber may be formed in at least one of the cushion layers.

Advantageous Effects

[0027] The shoe sole of the present invention can improve shock absorption and dispersion and contribute weight lightening of a shoe.

[0028] Specially, by using a cushion column in which multi-level cushion layers are piled vertically, the shoe sole of the present invention can effectively absorb and disperse the shock generated when walking or running.

[0029] Each of the cushion layers may be deformed elastically under a different load condition, so as to absorb the shock with various shock absorption abilities according to the user’s physical conditions, such as weight. For example, in the present invention, different cushion layers may perform shock absorption respectively according to the user's weight. To one user having about 270 mm of shoe size and about 60 kg of weight, only one cushion layer located on top may be elastically deformed, while to another user having the same shoe size and about 100 kg of weight, two or more cushion layers may be elastically deformed to support relatively heavy load. Accordingly, the customized shoe sole of the present invention may provide differently optimized shock absorption abilities according to the users’ weights with the same shoe size.

[0030] By actively controlling the shock absorption ability according to the exercise conditions, the shoe sole of the present invention can absorb shock effectively in various conditions. For example, it is known that the shock during running is larger than the shock during walking by about 2-3 times. According to the present invention, one or two of the cushion layers in one cushion column may perform shock absorption when walking, and two or more of the cushion layers may perform shock absorption to support the increased load in order when running. Like this, the customized shoe sole of the present invention may provide differently optimized shock absorption abilities according to exercise conditions, such as walking or running.

[0031] According to the present invention, a plurality of the cushion columns may be distributed in the shoe sole by being horizontally separated to each other, so as to protect the user’s foot from lateral shock. In case that the cushion column is formed integrally in one body, the lateral shock may not be absorbed and be transmitted to the whole of the shoe. But in case that a plurality of cushion columns are distributed and separated to each other, the lateral shock may be absorbed and dispersed effectively due to spaces in the shoe sole.

[0032] Therefore, the customized shoe sole of the present invention can provide an improved wearing feeling, help the user’s easy walking and minimize the tiredness of foot.

[0033] The customized shoe sole of the present invention which has mutually separated cushion columns can provide improved shock absorption abilities, in spite of its light weight.

[0034] The customized shoe sole of the present invention may maintain a stable body balance when walking or running. Since the separated cushion columns may operate independently, several cushion columns, for example located on a jagged stone, may be elastically deformed, such that the shoe sole can maintain a stable body balance. The customized shoe sole may protect the user’s feet from the damage to the joints like ankle, knee and waist.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] FIG. 1 is an exploded side view illustrating a structure of a customized shoe sole according to one exemplary embodiment of the present invention.

[0036] FIG. 2 is a side view illustrating a customized shoe sole according to one exemplary embodiment of the present invention.

[0037] FIG. 3 is a bottom view illustrating a customized shoe sole according to one exemplary embodiment of the present invention.

[0038] FIG. 4 is a cross sectional view of A-A' in FIG. 3.

[0039] FIG. 5 is a cross sectional view of B-B' in FIG. 3.

[0040] FIG. 6 is a cross sectional view of C-C' in FIG. 3.
FIG. 7 is a partial side view illustrating a customized shoe sole having multi-level cushion columns according to another embodiment of the present invention,

FIG. 8 is a cross sectional view illustrating a customized shoe sole having multi-level cushion columns according to another embodiment of the present invention,

FIG. 9 is a cross sectional view illustrating a merit operation of a customized shoe sole having multi-level cushion columns according to still another embodiment of the present invention,

FIG. 10 is a cross sectional view illustrating a customized shoe sole having multi-level cushion columns according to still another embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. It is to be understood that the present invention is not limited by the embodiment only. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. Under this rule, reference may be made referring to examples illustrated in other drawings, and description apparent to those skilled in the art or repeated parts will be omitted.

FIG. 1 is an exploded side view illustrating a structure of a customized shoe sole according to one exemplary embodiment of the present invention, FIG. 2 is a side view illustrating a customized shoe sole according to one exemplary embodiment of the present invention, FIG. 3 is a bottom view illustrating a customized shoe sole according to one exemplary embodiment of the present invention, FIG. 4 is a cross sectional view of A-A' in FIG. 3, FIG. 5 is a cross sectional view of B-B' in FIG. 3, and FIG. 6 is a cross sectional view of C-C' in FIG. 3.

As shown in the above figures, a shoe sole of the present embodiment comprises at least one multi-level cushion column 100 which includes a plurality of cushion layers 110, 210 and 310 vertically piled. At least one of the cushion layers 110, 210 and 310 may have a different elastic hardness from the other layers, to be elastically deformed under different load conditions respectively.

The cushion column 100 may be formed in accordance with the whole area of the shoe sole or part of the shoe sole. The size, the shape and the location of the cushion column 100 cannot limit the present invention.

Hereinafter, the cushion columns 100 may be provided to be separated to each other, on the whole or partial area of the shoe sole. The number and the interval of the cushion columns may be variously changed or selected according to the needed conditions or design plans.

For example, the cushion column 100 may include a first cushion layer 110 and a second cushion layer 210.

The first cushion layer 110 and the second cushion layer 210 may be formed to have different elastic hardness to each other and be vertically piled, so as to be elastically deformed under different load condition respectively.

Referring to the figures, the second cushion layer 210 is located on the first cushion layer 110. In other embodiments, the relatively soft second cushion layer may be located under the relatively hard first cushion layer.

The first cushion layer 110 and the second cushion layer 210 may be formed via foam plastic molding using general rubber or synthetic resin. Occasionally, the first and second cushion layers may be formed with non-foam plastic resin or other materials.

The hardnesses of the first cushion layer 110 and the second cushion layer 210 may be preferably different from each other to be selected variously according to the needed conditions or design plans. For example, the first cushion layer 110 located below the second cushion layer 210 may be relatively harder than the second cushion layer 210.

The cushion columns 100 may be formed to have the same or different structure of cushion layers. The cushion columns 100 may have the same structure of the cushion layers as following.

For reference, the meaning of “the same structure of cushion layer” may be understood that, in the cushion columns 100 including the first cushion layer 110 and the second cushion layer 210, the first cushion columns 110 have the same elastic hardness and the second cushion columns 210 have the same elastic hardness respectively.

The meaning of “different structure of cushion layers” may be understood that, in the cushion columns 100 including the first cushion layer 110 and the second cushion layer 210, the first cushion layer 110 or the second cushion layer 210 of one cushion column has different elastic hardness from a corresponding cushion layer of another cushion column.

On the other hand, at least one of the cushion columns may have a third cushion layer 310 which is provided on or under the second cushion layer 210. The third cushion layer 310 may have elastic hardness different from that of the first cushion layer 110 or the second cushion layer 210, in which the first and the second cushion layers 110 and 210 are vertically piled. Hereinafter, for example, the third cushion layer 310 may have the elastic hardness lower than that of the second cushion layer 210.

The third cushion layer 310 may be formed via foam plastic molding using general rubber or synthetic resin. Occasionally, the third cushion layer may be formed with non-foam plastic resin or other materials.

As mentioned above, a plurality of the cushion columns may have the same number of cushion layers, otherwise they may be provided with a different number of cushion layers. As shown in drawings, some of the cushion columns may provided with a different number of cushion layers, in comparison with other cushion columns. For example, some of the cushion columns 100 are composed with three cushion layers, while other of the cushion columns are composed with two cushion layers. In other embodiments, a plurality of cushion columns may have the same number of cushion layers uniformly.

In the plurality of the cushion columns 100, the neighboring cushion layers located on the same level may be mutually connected by connecting ribs. For one example, the first cushion layers 110 of the cushion columns 100 are mutually connected by first connecting ribs 120. The first connecting ribs 120 connect with the first cushion layers 110 as one body. In the same manner, the second cushion layers 210 may be connected by second connecting ribs 220, and the third cushion layers 310 may be connected by third connecting ribs 320. In other embodiments, the first, second and third cushion
layers are separately provided with no connecting rib to form cushion columns which are physically separated from other columns. Also, the same material of the cushion layers, even if they are of different levels in the cushion columns, may be connected by connecting ribs, as shown in FIG. 7.

[0063] The above mentioned cushion columns are composed of two or three of the cushion layers, however, other cushion columns of other embodiments may be composed of four or more of cushion layers.

[0064] Also, in the above mentioned cushion columns, the upper the cushion layer is located, the harder material it is formed with. However, in other embodiments, the upper the cushion layer is located, the softer material it is formed with.

[0065] Moreover, the cross sections of the first, second and third cushion layers 110, 210 and 310 may be properly changed and selected according to the needed conditions and design plans. For example, in the first to third cushion layers, the lower the cushion layer is located, the larger cross section area it has. On the contrary, the lower the cushion layer is located, the smaller cross section area it has, in other embodiments.

[0066] The shapes of the first, second and third cushion layers 110, 210 and 310 (including their cross section) may be variously changed and selected according to the needed conditions and design plans. For example, the first to third cushion layers 110, 210 and 310 may have circular cross section like cylinders. However, in other embodiments, the cushion layers may have various shapes of cross section, such as oval, triangle, tetragon, pentagon, pentagram, heart or the likes.

[0067] In the above mentioned embodiments, the first to third cushion layers 110, 210 and 310 may have the same or similar shapes of cross sections. Occasionally, at least one of the cushion layers may have another shape of cross section different from the other cushion layers in the cushion columns. For example, the first cushion layer may be of circle, the second cushion layer may be of tetragon, and the third cushion layer may be of pentagon.

[0068] The neighboring cushion layers of the cushion columns may be provided with the same or different size, in view of thickness and area. For one example, the first to third cushion layers 110, 210 and 310 may be provided with different thicknesses respectively. In other embodiments, only one of the first to third cushion layers may have a thickness different from the other second cushion layers, and at least one of the third cushion layers 310 in the cushion columns 100 may have a thickness different from the other third cushion layers.

[0069] Each cushion layer of the cushion columns 100 may have a thickness optimized according to load conditions or its position, such as a front part, a middle part or a rear part of the foot. For one example, as moving from the rear part to the front part, the first cushion layers gets thinner step by step. Likewise, at least one of the second cushion layers 210 in the cushion columns 100 may have a thickness different from the other second cushion layers, and at least one of the third cushion layers 310 in the cushion columns 100 may have a thickness different from the other third cushion layers.

[0070] In this instance, the above mentioned cushion columns 100 may be located between an upper midsole 400 and an outsole 500. The outsole 500 may be a bottom part which directly contacts with ground to prevent skidding and improve safety.

[0071] FIG. 7 is a partial side view illustrating a customized shoe sole having multi-level cushion columns according to another embodiment of the present invention, and FIG. 8 is a cross sectional view illustrating a customized shoe sole having multi-level cushion columns according to another embodiment of the present invention. Some reference numbers may be used as same as the reference numbers of the previous embodiments, and description for the same element may be omitted.

[0072] In the previous embodiments, the first cushion layers 110 of the cushion columns 100 have the same elastic hardness, and the second and the third cushion layers 210 and 310 also have the same elastic hardness respectively. Otherwise, at least one of the cushion layers may have non-identical elastic hardness different from a neighboring cushion layer.

[0073] For example, referring to FIG. 7 and FIG. 8, each of the first to the third cushion layer 110, 210 and 310 in the cushion columns 100 may have non-identical elastic hardness, according to the load conditions and other design plans of the cushion columns. For better understanding, the hardness of the cushion layers 110, 210 and 310 is represented using numbers of 1 to 4, in FIG. 7 and FIG. 8. In here, the number of “1” represents the lowest hardness and the number of “4” represents the highest hardness.

[0074] FIG. 9 is a cross sectional view illustrating a merit operation of a customized shoe sole having multi-level cushion columns according to still another embodiment of the present invention. Some reference numbers may be used as same as the reference numbers of the previous embodiments, and description for the same element may be omitted.

[0075] Referring to FIG. 9, each cushion columns 100 having various types of cushion layers 110, 210 and 310 operate independently, such that parts of the cushion columns 100 which is positioned on a risky element, such as a jagged stone, are partially pressed independently from the other part, during walking or running. Since the partially deformed cushion columns can help the balancing of the shoe, the customized shoe sole can reduce the risk of ankle sprain and the overload to knee or waist.

[0076] FIG. 10 is a cross sectional view illustrating a customized shoe sole having multi-level cushion columns according to still another embodiment of the present invention. Some reference numbers may be used as same as the reference numbers of the previous embodiments, and description for the same element may be omitted.

[0077] Referring to FIG. 10, each cushion columns 100 includes a plurality of cushion layers 1110, 1210 and 1310 which have non-identical elastic hardness and are vertically adjacent to each other. One of a pile of the cushion layers has receiving portions 1114 and 1214 partially receiving another cushion layer which is vertically adjacent to the one.

[0078] For one example, the first receiving portion 1114 may be formed at top of the first cushion layer 1110 to partially receive the bottom of the second cushion layer 1210, and the second receiving portion 1214 may be formed at top of the second cushion layer 1210 to partially receive the bottom of the third cushion layer 1310. Likewise, the vertically piled cushion layers in the first to third cushion layers 1110, 1210 and 1310 may be overlaid using the receiving portions for stable maintaining.

[0079] As shown in FIG. 10, the cushion columns 100 including the vertically piled cushion layers 1110, 1210 and 1310 may form cushion chambers 1112, 1212 and 1312 in the cushion layers. The first to third cushion chambers 1112, 1212 and 1312 can absorb shock given to the cushion column 1100 and can help weight lightening of the shoe.

[0080] The first cushion chamber 1112 may be formed on top of the first cushion layer 1110, the second cushion chamber 1212 may be formed on top of the second cushion layer
1210, and the third cushion chamber 1312 may be formed on top of the third cushion layer 1310.

[0081] In the first to the third cushion chamber 1112, 1212 and 1312, the lower cushion chamber may be formed to take up bigger room than the upper cushion chamber step by step. In other embodiments, the lower cushion chamber may be formed to take up smaller room than the upper cushion chamber on the contrary, otherwise all the cushion chambers may be formed to take up the same room.

[0082] The first to third cushion chambers 1112, 1212 and 1312 may be formed as closed air chamber, otherwise they may be formed as open air chamber spatially connected with outside. The cushion chamber may be formed in all or some of the cushion layers.

[0083] It will be apparent to those skilled in the art that the present invention can be embodied in other specific forms without departing from essential characteristics of the invention. Thus, the above embodiments are to be considered in all respects as illustrative and not restrictive.

1. A customized shoe sole having a multi-level cushion column comprising:
   at least one multi-level cushion column including a plurality of cushion layers piled vertically,
   wherein at least one of the cushion layers has an elastic hardness different from those of the other layers, so as to start to be elastically deformed under a specific load condition.

2. The customized shoe sole of claim 1, wherein one or more of the cushion columns are provided all over or partially to the shoe sole.

3. The customized shoe sole of claim 1, wherein a plurality of the cushion columns are provided all over or partially to the shoe sole and separated mutually.

4. The customized shoe sole of claim 3, wherein the plurality of the cushion columns have a structure of the cushion layers, which is the same to or different from each other.

5. The customized shoe sole of claim 3, wherein the plurality of the cushion columns have a structure of the cushion layers, the number of which is the same to or different from each other.

6. The customized shoe sole of claim 3, wherein the neighboring cushion layers in the plurality of the cushion columns have a size the same to or different from each other.

7. The customized shoe sole of claim 3, wherein the neighboring cushion layers in the plurality of the cushion columns, which are of the same level, are mutually connected by connecting ribs.

8. The customized shoe sole of claim 3, wherein the adjacent cushion layers in the plurality of the cushion columns, which are made of the same material, are mutually connected by connecting ribs.

9. The customized shoe sole of claim 1, wherein at least one of the cushion layers has a cross section of circle, oval, polygon, star or heart.

10. The customized shoe sole of claim 1, wherein the cushion column includes,
   a first cushion layer, and
   a second cushion layer piled on or beneath the first cushion layer,
   wherein the first and the second cushion layers have an elastic hardness different from each other, to start to be elastically deformed under different load conditions respectively.

11. The customized shoe sole of claim 10, wherein the cushion column further includes a third cushion layer piled on or beneath the second cushion layer, which has an elastic hardness different from that of the first or the second cushion layer.

12. The customized shoe sole of claim 1, wherein one of a pile of the cushion layers has a receiving portion partially receiving another cushion layer which is vertically adjacent to the one.

13. The customized shoe sole of claim 1, wherein a cushion chamber is formed in at least one of the cushion layers.