THREE-DIMENSIONAL CROSS-LINKED FOAM FOR UPPERS OF SHOES

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ABSTRACT

The present invention provides a three-dimensional cross-linked foam for uppers of shoes that comprises a cross-linked foam body having a shape corresponding to a last; at least one inner cavity structure formed in the cross-linked foam body; the inner cavity structure defined by an internally formed surface of the cross-linked foam body; and filler injected into the inner cavity structure. The cross-linked foam of the present invention can more effectively protect the feet and increase a fitting feeling and a supporting power without additional components added to the cross-linked foam. The cross-linked foam of the present invention may further have an air ventilation and waterproof function.
THREE-DIMENSIONAL CROSS-LINKED FOAM FOR UPPERS OF SHOES

TECHNICAL FIELD

[0001] The present invention relates to a cross-linked foam, and more specifically a three-dimensional cross-linked foam for uppers of shoes that has a shape corresponding to a last and has at least one inner cavity structure therein.

BACKGROUND ART

[0002] The shoes that we usually wear for protecting the feet from the external circumstance mainly comprise soles and uppers. The uppers of the shoes directly contact the feet and thus increases a feeling of unity. Besides, the uppers play a primary role in protecting the feet from an external impact applied to the feet.

[0003] The uppers are usually formed using a last 10 that has a three-dimensional shape corresponding to completed uppers as shown in FIGS. 13 to 14. Because the last 10 has a three-dimensional shape and the raw material for the uppers are planar, a measurement of each portion of the last 10 must be taken and then converted to a measurement that can be applied to the planar raw material for the uppers such as cloth, leather and various resins, etc. That is, the last 10 has a three-dimensional measurement as shown in the figures in alphabet “a”, “b”, “c”, “d” and “e” and these measurement must be converted to a planar measurement that can be applied to the raw material for the uppers. The raw material is cut according to the converted measurement and then sewed or attached together. The sewed or attached material is put into close contact with the outer surface of the last 10 and then undergoes a heating and an ageing processes to obtain a completed uppers. The completed uppers acquired by the above-mentioned method have following disadvantages.

[0004] Firstly, many components of the completed uppers basically has a thin planar shape and is formed of soft material, a stability of a shape and a dimension is low compared with the soles of the shoes that is formed by a molding die. In addition, once the planar raw materials are transformed into a three-dimensional shape, it is difficult to keep the completed uppers in a three-dimensional shape.

[0005] Accordingly, this phenomenon is likely to happen to the uppers of the shoes when the shoes is repeatedly used for a certain period of time. To overcome this problem, an injection-molded material having a superior forming property and shape-maintenance property has been widely used for a specific component of the shoe at a certain portion of the uppers in the field. According to this method, the forming property and the shape-maintenance property of the uppers are greatly improved but a fitting feeling of the shoes may be lowered owing to the injection-molded material having a higher hardness than the cloth and the leather. Accordingly, the injection-molded material is limitedly used for a certain portion of the uppers or for shoes designed for a special purpose.

[0006] Secondly, because the uppers must primarily protect the feet from the external impact, it should have a supporting property and a good fitting. However, it has been very difficult for the uppers to satisfy those required properties because the uppers of the related art has been usually made of the thin, planar and soft materials. In an alternative to overcome the problem, various shock-absorbing material or protector may be put into the uppers or attached to the uppers during a sewing process. However, an applicable range of this method is very narrow considering that the upper is formed of thin planar material and has a smaller thickness than the soles of the shoe. Moreover, if several shock-absorbing materials having a relatively big volume are inserted or attached to a certain portion of the uppers, the fitting feeling between the uppers and the feet becomes bad and a naturally curved appearance of the shoes also becomes bad even though a shock-absorbing property of the certain portion of the uppers is improved.

[0007] Thirdly, recent customer has a preference to shoes that has a function of an air circulation and a waterproof to take a fresh air into the shoes and discharge sweat out of the shoes. However, it is not easy to give such properties to the uppers of the related art formed of the soft material such as leather. There are two different methods to provide the uppers with the function of air ventilation and waterproof. That is, a film or sheet type material for air ventilation and waterproof may be additionally attached to the uppers or a surface of the uppers may be chemically treated in order to fulfill the function of air ventilation and waterproof.

[0008] In case of the former, the film or the sheet having the function of air ventilation and waterproof is attached to a surface of the uppers or additional built-in uppers formed of the film or the sheet having the function of air ventilation and waterproof are formed in a shape of the sewed uppers and then put into the sewed uppers. However, this method makes the total manufacturing process of the shoes complex and accordingly increases the manufacturing cost.

[0009] In case of the latter, though the total process to treat the surface of the uppers chemically is relatively simple compared with the former, an effect of the air ventilation and waterproof is relatively poor considering that the chemical treatment is done only on the surface of the uppers.

DISCLOSURE OF INVENTION

Technical Problem

[0010] Accordingly, the present invention has been made keeping in mind the above problems occurring in the related art, and an object of the present invention is to provide a three-dimensional cross-linked foam for uppers of shoes that can maintain a dimension and a shape for a long time because the cross-linked foam is formed according to a shape of a last.

[0011] Another object of the present invention is to provide a three-dimensional cross-linked foam for uppers of shoes that can increase fitting feeling and supporting property of the shoes without attaching additional components to the uppers.

[0012] Another object of the present invention is to provide a three-dimensional cross-linked foam for uppers of shoes that can naturally circulate air between the inside and outside of the shoes and have a proper function of waterproof.

[0013] Another object of the present invention is to provide a three-dimensional cross-linked foam for uppers of shoes that can differentiate a hardness and design of each portion of the shoes.
Technical Solution

[0014] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a three-dimensional cross-linked foam for uppers of shoes comprises a cross-linked foam body having a shape corresponding to a last; and at least one inner cavity structure formed in the cross-linked foam body, the inner cavity structure defined by an internally formed surface of the cross-linked foam body.

[0015] In the above, plural inner cavity structures may be formed in the cross-linked foam body.

[0016] In the above, all or some of the plural inner cavity structures may be connected to each other.

[0017] In the above, the plural inner cavity structures may form groups consisting of connected inner cavity structures.

[0018] In the above, cross-linked foam may further comprise an air passage connected to at least one of the plural inner cavity structures.

[0019] In the above, at least one of the plural inner cavity structures may be filled with gas.

[0020] In the above, unevenness may be formed on the cross-linked foam body.

[0021] In another aspect, a three-dimensional cross-linked foam for uppers of shoes comprises a cross-linked foam body having a shape corresponding to a last; at least one inner cavity structure formed in the cross-linked foam body, the inner cavity structure defined by an internally formed surface of the cross-linked foam body; and filler introduced into the inner cavity structure.

[0022] In the above, plural inner cavity structures are formed in the cross-linked foam body and all of the plural inner cavity structures are filled with the filler.

[0023] In the above, plural inner cavity structures may be formed in the cross-linked foam body and at least one of the plural inner cavity structures is filled with the filler.

[0024] In the above, all or some of the plural inner cavity structures may be connected to each other.

[0025] In the above, the plural inner cavity structures may form groups consisting of connected inner cavity structures.

[0026] In the above, cross-linked foam may further comprise an air passage connected to at least one of the plural inner cavity structures.

[0027] In the above, the filler may include at least one material selected from gas, liquid and same material as or different material from the cross-linked foam body.

[0028] In the above, the filler may be introduced into a housing that is put into close contact with the internally formed surface.

[0029] In the above, unevenness may be formed on the cross-linked foam body.

[0030] In another aspect, a three-dimensional cross-linked foam for uppers of shoes comprises a cross-linked foam body having a shape corresponding to a last.

[0031] In the above, at least one air passage may be formed in the cross-linked foam body.

[0032] In the above, unevenness may be formed on the cross-linked foam body.

[0033] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Advantageous Effects

[0034] According to the present invention, because the cross-linked foam for uppers of shoes is formed in a three-dimensional shape according to the shape of the last having a complex curved surface so that dimension and shape stabilities can be provided to the shoes.

[0035] Because the cross-linked foam of the present invention has at least one inner cavity structure therein formed simultaneously with the cross-linked foam and the inner cavity may have gas therein at a certain pressure, fitting feeling and supporting property is greatly improved.

[0036] The cross-linked foam of the present invention can more perfectly protect the feet from an external impact because at least one of the inner cavity structures can be filled with the filler having a required property.

[0037] The cross-linked foam of the present invention can provide air ventilation and waterproof properties to the shoes so that air in the shoes can effectively discharged out of the shoes while moisture can not permeates the shoes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0039] FIG. 1 is illustrating a three-dimensional cross-linked foam for uppers of shoes according to an embodiment of the present invention;

[0040] FIGS. 2 to 3 are cross-sectional views of the three-dimensional cross-linked foam taken along lines A-A' and B-B' of FIG. 1, respectively;

[0041] FIG. 4 is a cross-sectional view of the three-dimensional cross-linked foam when the inner cavity structure of FIG. 2 is filled with filler;

[0042] FIG. 5 is a cross-sectional view of the three-dimensional cross-linked foam when the inner cavity structure of FIG. 3 is filled with filler;

[0043] FIG. 6 is a cross-sectional view of the three-dimensional cross-linked foam when a housing filled with filler is inserted into the inner cavity structure of FIG. 2;

[0044] FIG. 7 is illustrating a three-dimensional cross-linked foam for uppers of shoes according to another embodiment of the present invention;

[0045] FIGS. 8 to 9 are cross-sectional views of the three-dimensional cross-linked foam taken along lines C-C' and D-D' of FIG. 7, respectively;

[0046] FIG. 10 is illustrating a three-dimensional cross-linked foam for uppers of shoes according to another embodiment of the present invention;
FIGS. 11 to 12 are cross-sectional views of the three-dimensional cross-linked foam taken along lines E'-E" and F'-F" of FIG. 10, respectively; and FIGS. 13 and 14 are illustrating a side and a bottom of a last.

MODE FOR THE INVENTION

Reference will now be made in detail to the preferred embodiment of the present invention, which is illustrated in the accompanying drawings. A same name will be used for an element of the present invention that has a same or corresponding function even if it has a different reference number.

FIG. 1 is illustrating a three-dimensional cross-linked foam for uppers of shoes according to an embodiment of the present invention and FIGS. 2 to 3 are cross-sectional views of the three-dimensional cross-linked foam taken along lines A'-A" and B'-B" of FIG. 1, respectively. The cross-linked foam 100 for uppers of shoe mainly comprises a cross-linked foam body 120 and inner cavity structures 142 and 146 formed simultaneously with the cross-linked foam body in a unity. The cross-linked foam body 120 is obtained by various cross-linked foaming methods known in the field and has a shape corresponding to a curved surface of a last 10 of FIGS. 13 to 14. An inner surface 180 of the cross-linked foam body 120 may desirably have a three-dimensional shape corresponding to an outer curved surface of the last 10. Portions of the inner surface 180 corresponding to fore-foot, middle-foot and or rear-foot may desirably have a same shape as the fore-foot "a", middle-foot "b" and "c" or rear-foot "d" of the last 10, respectively.

The inner cavity structures 142 and 146 are defined by an internally formed surface 132 of the cross-linked foam body 120. Though the inner cavity structure 142 and 146 may desirably be formed along a curved surface of the cross-linked foam body 120 as shown in FIGS. 2 and 3, a shape of the inner cavity structure is not confined to a certain shape.

The inner cavity structure 142 and 146 provides stability and supporting property to the cross-linked foam body 120 and improves a fitting feeling of the shoes. Accordingly, the cross-linked foam body 120 itself can effectively protect the feet without additional components attached.

Unexplained elements having reference numbers 122 and 124 are covering portions of the inner cavity structures 142 and 146, respectively. Though the covering portions 122 and 124 are protruded over a surface of the cross-linked foam body 120 in FIGS. 2 and 3, they may be leveled with the surface of the cross-linked foam body 120.

Though two inner cavity structures are formed on a left lateral side of the cross-linked foam body 120 in the figures, the shape, number and position of the inner cavity structure can be controlled under various conditions.

When the cross-linked foam body 120 has a plurality of inner cavity structures, the plural inner cavity structures may not be connected to each other or all or some of them may be connected to each other. Or the plural inner cavity structures may form groups consisting of connected inner cavity structures, that is, the plural inner cavity structures may consist of plural groups in each of which adjacent inner cavity structures among the plural inner cavity structures are connected to each other.

The cross-linked foam body 120 has inner and outer air passages 196 and 192 connected to at least one of inner cavity structures so that air can circulate in and out of the cross-linked foam body 120 as in FIG. 3. The position, number and a selection of the inner cavity structure to be connected to the air passage are not limited and changeable under various conditions. A valve may be connected to the air passages 192 and 196 to control an amount of the air flowing in and out of the cross-linked foam body 120.

Though the inner cavity structure 142 and 146 itself has superior shock-absorbing property and an elasticity, those properties can be more increased by injecting gas selected from various known gases into all or some of the inner cavity structures.

Though it is not shown in figures, unevenness may further be formed on the cross-linked foam body 120 at a position corresponding to an instep of fore-foot to which a repeated bending stress is applied and to a heel portion that should protect the feet from an external impact.

FIG. 4 is a cross-sectional view of the three-dimensional cross-linked foam when the inner cavity structure of FIG. 2 is filled with filler and FIG. 5 is a cross-sectional view of the three-dimensional cross-linked foam when the inner cavity structure of FIG. 3 is filled with filler. Each of the inner cavity structures 142 and 146 are filled with different materials, i.e., fillers 162 and 166, having different physical properties to increase the fitting feeling of the shoes and more effectively protect the feet from the external impact.

A phase and a kind of the filler 162 and 166 is not limited and can be selected from various materials in a phase of gas, liquid or solid. Besides, an injection molded material having a certain shape may be selected as the filler. A same filler may be filled into connected inner cavity structures or a same or different material may be injected into the group consisting of connected inner cavity structures connected to the adjacent inner cavity structures.

The idea on the shapes of the cross-linked foam body, the covering portions of inner cavity structure and the unevenness and a formation of the air passage that is already described with reference to FIGS. 2 to 3 can be applied to this embodiment with a same rule.

FIG. 6 is a cross-sectional view of the three-dimensional cross-linked foam when a housing filled with filler is inserted into the inner cavity structure of FIG. 2. Because an independent housing 172 is filled with the filler 162 and then the housing 172 is inserted into the inner cavity structure 142, the filler 162 can be more safety and perfectly introduced into the inner cavity structure 142 regardless of the shape and phase.

Though a material of the housing 172 is not limited as long as the housing can be properly introduced into the inner cavity structure 142 and make a close contact with the internally formed surface 132 of the cross-linked foam body 120, it may desirably be thermoplastic polyurethane (TPU) that is widely used as a material for various kinds of housings.
FIG. 7 is illustrating a three-dimensional cross-linked foam for uppers of shoes according to another embodiment of the present invention and FIGS. 8 to 9 are cross-sectional views of the three-dimensional cross-linked foam taken along lines C-C' and D-D' of FIG. 7, respectively. As shown in the figures, three groups of inner cavity structures are formed in the cross-linked foam body 220 at different portions of the cross-linked foam body 220. The reference numbers 222, 224 and 226 are covering portions of the three groups of inner cavity structures. Inner cavity structures belonging to groups corresponding to the covering portions 224 and 226 are connected to other inner cavity structures in the same group. Inner and outer air passages 296 and 292 are connected to the inner cavity structure 242 and the inner cavity structure 262 is filled with filler 246. Though it is not shown in the figures, the inner cavity structure formed at a position corresponding to the covering portion 222 of a heel portion of the uppers may be filled with the gaseous material.

In this embodiment, the inner cavity structure is formed at a portion of the uppers requiring a fitting feeling and a supporting property and filled with the filler having a required physical property. Accordingly, the fitting feeling and the supporting property can be greatly improved. Besides, the cross-linked foam body 220 can have a function of ventilation by forming the air passages connected to the inner cavity structure. The cross-linked foam body can have a waterproof function by controlling positions of the air passages 292 and 296 so that the air can freely circulate in and out of the cross-linked foam body while the moisture cannot infiltrate into the cross-linked foam body. For example, as shown in figures, the waterproof function is provided by forming the air passage 296 on upper portion of the inside of the cross-linked foam for uppers and forming the outer air passage 292 on lower portion of the outside of the cross-linked foam for uppers.

FIG. 10 is illustrating a three-dimensional cross-linked foam for uppers of shoes according to another embodiment of the present invention and FIGS. 11 to 12 are cross-sectional views of the three-dimensional cross-linked foam taken along lines E-E' and F-F' of FIG. 10, respectively. The inner surface 380 of the three-dimensional cross-linked foam 300 is naturally shaped after the outer curved surface of the last 10 of FIGS. 13 and 14. Inner and outer air passages 396 and 392 are formed in the cross-linked foam body 320 so that air can freely circulate between the inside and the outside of the cross-linked foam body 320. However, the inner cavity structure is not formed in the cross-linked foam body 320 unlike the previous embodiments. Though fore-mentioned descriptions pertaining to the inner cavity structure cannot be applied to this embodiment, the same idea and technique can be applied to this embodiment except those pertaining to the inner cavity structure.

Unexplained reference numbers 324 and 326 are protrusions over the surface of the cross-linked foam body 320. Though the cross-linked foam bodies 120, 220 and 320 have a shape of an upper in the embodiments of the present invention, the cross-linked foam body may have a shape of a portion of the uppers such as fore-foot, middle-foot, rear-foot.

The cross-linked foam bodies 120, 220 and 320 can be manufactured by foaming various foaming material known in the field by various foaming methods known in the field. The foaming material for the cross-linked foam bodies 120, 220 and 320 may be selected from a synthetic material having a possibility to become a foam using a various cross-linked foaming method, for example, synthetic resins such as an EVA based resin, a polyolefin based resin containing PE or a variety of densities, a polyvinyl based resin, a polyurethane based resin, and LDPE(low density polyethylene)-added EVA, a copolymer thereof, a blend thereof, or a mixture thereof; a natural or synthetic rubber constituted by a mixture of a natural rubber, a styrene butadiene rubber (SBR) based, a poly-butadiene rubber(BR) based, an poly-isoprene rubber(IR) based, a chloroprene rubber(CR) based, an nitrile rubber (NBR) based, an EPDM rubber based, an ethylene-propylene rubber(EP) based, and an acryl rubber (AR) based rubber, and/or an styrene butadiene rubber(SBR) added neoprene rubber(NR); and a composite material including an EPDM rubber added ethylene-vinyl acetate (EVA) and a poly-vinyl chloride (PVC) added nitrile rubber (NBR).

However, it is recommended to adopt EVA (ethylene-vinyl acetate) that can contain a variable percentage of an amount of vinyl acetate (VA %) or the polyethylene (PE) based synthetic resin having various densities as the source material.

It will be apparent to those skilled in the art that various modifications and variations can be made in a manufacturing method of three-dimensional cross-linked foam for uppers for shoes without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

1-24. (canceled)
25. A three-dimensional cross-linked foam for uppers of shoes, comprising:
   a cross-linked foam body having a shape corresponding to a last; and
   at least one inner cavity structure formed in the cross-linked foam body, the inner cavity structure defined by an internally formed surface of the cross-linked foam body.
26. The cross-linked foam according to claim 24, further comprises an air passage connected to the at least one inner cavity structure.
27. The cross-linked foam according to claim 24, wherein the at least one inner cavity structure is filled with gas.
28. The cross-linked foam according to claim 24, wherein unevenness is formed on the cross-linked foam body.
29. The cross-linked foam according to claim 24, wherein plural inner cavity structures are formed in the cross-linked foam body.
30. The cross-linked foam according to claim 29, wherein all or some of the plural inner cavity structures are connected to each other.
31. The cross-linked foam according to claim 30, further comprises an air passage connected to at least one of the plural inner cavity structures.
32. The cross-linked foam according to claim 30, wherein at least one of the plural inner cavity structures is filled with gas.
33. The cross-linked foam according to claim 29, wherein the plural inner cavity structures form groups consisting of connected inner cavity structures.

34. The cross-linked foam according to claim 33, further comprises an air passage connected to at least one of the plural inner cavity structures.

35. The cross-linked foam according to claim 33, wherein at least one of the plural inner cavity structures is filled with gas.

36. A three-dimensional cross-linked foam for uppers of shoes, comprising:
   a cross-linked foam body having a shape corresponding to a last;
   at least one inner cavity structure formed in the cross-linked foam body, the inner cavity structure defined by an internally formed surface of the cross-linked foam body; and
   filler introduced into the inner cavity structure.

37. The cross-linked foam according to claim 36, wherein unevenness is formed on the cross-linked foam body.

38. The cross-linked foam according to claim 36, wherein the filler includes at least one material selected from gas, liquid and same material as or different material from the cross-linked foam body.

39. The cross-linked foam according to claim 38, wherein the filler is introduced into a housing that is put into close contact with the internally formed surface.

40. The cross-linked foam according to claim 36, wherein plural inner cavity structures are formed in the cross-linked foam body and at least one of the plural inner cavity structures is filled with the filler.

41. The cross-linked foam according to claim 40, wherein the filler includes at least one material selected from gas, liquid and same material as or different material from the cross-linked foam body.

42. The cross-linked foam according to claim 41, wherein the filler is introduced into a housing that is put into close contact with the internally formed surface.

43. The cross-linked foam according to claim 40, further comprises an air passage connected to at least one of the plural inner cavity structures.

44. The cross-linked foam according to claim 43, wherein the filler includes at least one material selected from gas, liquid and same material as or different material from the cross-linked foam body.

45. The cross-linked foam according to claim 44, wherein the filler is introduced into a housing that is put into close contact with the internally formed surface.

46. The cross-linked foam according to claim 40, wherein all or some of the inner cavity structures are connected to each other.

47. The cross-linked foam according to claim 46, wherein the filler includes at least one material selected from gas, liquid and same material as or different material from the cross-linked foam body.

48. The cross-linked foam according to claim 47, wherein the filler is introduced into a housing that is put into close contact with the internally formed surface.

49. The cross-linked foam according to claim 46, further comprises an air passage connected to at least one of the plural inner cavity structures.

50. The cross-linked foam according to claim 40, wherein the plural inner cavity structures form groups consisting of connected inner cavity structures.

51. The cross-linked foam according to claim 50, wherein the filler includes at least one material selected from gas, liquid and same material as or different material from the cross-linked foam body.

52. The cross-linked foam according to claim 51, wherein the filler is introduced into a housing that is put into close contact with the internally formed surface.

53. The cross-linked foam according to claim 50, further comprises an air passage connected to at least one of the plural inner cavity structures.

54. A three-dimensional cross-linked foam for uppers of shoes, comprising:
   a cross-linked foam body having a shape corresponding to a last.

55. The cross-linked foam according to claim 54, wherein at least one air passage is formed in the cross-linked foam body.

56. The cross-linked foam according to claim 54, wherein unevenness is formed on the cross-linked foam body.

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