Disclosed is an injection molded Phylon (foam ethylene vinyl acetate) midsole having distinguished advantages, such as increased productivity, improved quality, decreased manufacturing cost, reduced fraction defective, reduced weight or the like, in relation to a conventional injection molded Phylon midsole. The injection molded Phylon midsole is manufactured by an upper molding and a lower molding. The midsole (10) is formed with a vertical through-groove (11), a horizontal through-groove (11), or a cross through-groove (11). When the midsole (10) is bonded to an outsole (2), the midsole (10) of a proper size within an allowable variation or deviating from the allowable variation widens or constrains the through-groove (11), so that the midsole (10) is exactly bonded to the outsole (2) without deforming the midsole.
Fig 14
Fig 17
INJECTION MOLDED PHYLON MIDSOLE

TECHNICAL FIELD

[0001] The present invention relates to an injection molded Phylon (foam ethylene vinyl acetate) midsole having distinguished advantages, such as increased productivity, improved quality, decreased manufacturing cost, reduced fraction defective, reduced weight or the like, in relation to a conventional injection molded Phylon midsole.

BACKGROUND ART

[0002] Recently, as shoes are trend toward a high quality, shoe midsoles are made from Phylon having some physical properties comprising light weight, high elasticity and good shock absorption. A conventional Phylon midsole is manufactured in a sheet shape, and is cut by a press moldinging of the same size as that of a midsole to be made. Then, the cut midsole is ground to conform to a correct shape of the wanted midsole.

[0003] Since the midsole is cut (punched) by the press molding of the same size as the midsole, a required size variation of the midsole is not large. Therefore, the conventional method may reduce a fraction defective related to the variation. Because material loss is excessive (about 40%) after carrying out the press process, and its productivity is poor, mass production is difficult. For the above reasons, a manufacturing cost is increased, and wasted material should be processed. The method is hardly used at present due to the cumbersome and economical loss.

[0004] In order to solve the above problems contained in the conventional method of manufacturing the midsole, a method of manufacturing a Phylon midsole using injection molding has been proposed. Specifically, a volume of a midsole molding consisting of an upper molding and a lower molding is adapted to have 60% size relative to actual size of the midsole. Preheated ethylene vinyl acetate comprising a forming agent is injected into the moldings. After the upper and lower moldings are heated during a predetermined time, when the upper and lower moldings are opened, the midsole expanded in the upper and lower moldings is released from the moldings. The injection molded Phylon midsole is completed by the above process. However, since the midsole is formed in the upper and lower moldings at a high pressure and a high temperature and is expanded at the same time as the open of the upper and lower moldings, a size variation of the completed midsole is serious due to factors such as a compounding ratio of the forming agent, a temperature variation of machines, a temperature variation of worksite, weather, a temperature variation resulted from thermal conductivity of heat transferred from an exterior of the molding to an interior thereof. Therefore, it is impossible to manufacture the midsole of uniform size, and a fraction defective is increased, thereby causing the economical loss and failing a production scheme.

[0005] Meanwhile, because the midsole has to be adhered and fixed between an outsole and a shoe upper, each having the same size as the midsole, in an exactly conforming size, the size variation of the midsole is very important factor. In general, since a shoe is made in unit of 5 mm every size, an allowable size variation of injection molded Phylon midsole used in present is within a range of ±2 to 3 mm relation to a standard size. The midsole deviating from the variation range is not actually allowed due to the defective problem, and is not used. Specifically, the midsole deviating from the variation range of ±2 to 3 mm falls into disuse. The present invention can manufacture all of midsoles without falling into disuse.

[0006] Considering a method of bonding the midsole with an outsole, after an adhesive is applied on a bottom surface of a midsole 1 or an upper surface of an outsole 2, the midsole 1 is bonded to the outsole 2 by carefully bonding edges of them and then forcibly pressing a center portion thereof using a press (referring to FIG. 2). The midsole 1 having a variation of average 2 to 3 mm is forcibly bonded to the outsole 2 to make a shoe, but the completed shoe is almost deformed into a shape shown in FIG. 2. Accordingly, the midsole having a variation of above ±3 mm should fall into disuse.

[0007] Referring to FIG. 2 to prove the reason, since the bond is started from the edge of the midsole 1 having a size which does not coincide with that of the outsole 2, and the center portion of the midsole is bonded to the center portion of the outsole by the press, the midsole 1 tends to return to its original size. Specifically, since the bottom surface of the midsole 1 is bonded to the upper surface of the outsole, the bottom surface of the midsole cannot be deformed. Force tending to return to its original size acts upon the upper surface and side of the midsole 1. Therefore, side protrusions 16 of the midsole 1 are widened left and right (toward an exterior of the shoe), and the center portion of the midsole convexes to form a center bossed portion 1a. Therefore, the center portion of the outsole 2 is deformed with the midsole 1 to form a center bossed portion 2a and thus make a deformed article. Meanwhile, if the outsole is bonded to the midsole of a small size than that of the outsole, a phenomenon contrary to the above description happens. Specifically, the protrusions 16 are moved toward the center thereof, and the center bossed portion 2a are protruded not upwardly but downwardly to a bottom of the midsole 1, i.e., the outsole 2, so that the center portion of the outsole 2 convexes toward the bottom (the ground). These cases must be a defective.

[0008] In the case of bonding the conventional midsole 1 and the outsole 2, although the state deformed after the bond is not distinctly depicted in FIG. 2, it will be understood that it may be deformed as shown in FIG. 2 on the basis of the standard. If the midsole deviating from a variation range of ±2 mm is used, the defective deformed as shown in FIG. 2 necessarily happen. Therefore, the midsole having a variation range of 3 mm must fall into disuse. Since the shoe is made in unit of 5 mm ever size, if the variation of the midsole is close to 45 mm or −5 mm, the interest midsole may be used as a higher size or a lower size.

[0009] Therefore, the shoes made from the conventional midsole have a poor landing feeling and cause inconvenience to wearer’s feet. Since the side protrusions 16 always tend to be outwardly spread or inwardly shrunk, the bonding force of the midsole to the shoe upper becomes weak, thereby dissatisfying a consumer. In addition, since the Phylon midsole is not reusable, it falls into disuse as an industrial waste, thereby causing an economical loss and going against environmental protection.
DISCLOSURE OF THE INVENTION

[0010] Therefore, an object of the present invention is to solve the problems involved in the prior art, and to provide an injection molded Phylon midsole.

[0011] In order to accomplish the above and other objects, there is provided an injection molded Phylon midsole manufactured by an upper molding and a lower molding, wherein the midsole is formed with a vertical through-groove, a horizontal through-groove, or a cross through-groove, and wherein when the midsole is bonded to an outsole, the midsole of a proper size within an allowable variation or deviating from the allowable variation widens or constrains the through-groove, so that the midsole is exactly bonded to the outsole without deforming the midsole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above objects, other features and advantages of the present invention will become more apparent by describing the preferred embodiment thereof with reference to the accompanying drawings, in which:

[0013] FIG. 1 is a cross-sectional view illustrating a state prior to that a conventional Phylon midsole is bonded to an outsole.

[0014] FIG. 2 is a cross-sectional view illustrating a state of bonding a conventional Phylon midsole to an outsole.

[0015] FIG. 3 is a perspective view of an injection molded Phylon midsole according to a preferred embodiment of the present invention.

[0016] FIG. 4 is a cross-sectional view taken along a line 100-100 in FIG. 3.

[0017] FIG. 5 is a cross-sectional view taken along a line 200-200 in FIG. 3.

[0018] FIG. 6 is a cross-sectional view illustrating a state of bonding an injection molded Phylon midsole of the present invention to an outsole.

[0019] FIG. 7 is a plan view of an injection molded Phylon midsole according to one preferred embodiment of the present invention.

[0020] FIGS. 8, 9 and 10 are plan views of an injection molded Phylon midsole according to alternative embodiments of the present invention.

[0021] FIGS. 11, 12 and 13 are plan views of an injection molded Phylon midsole according to alternative embodiments of the present invention.

[0022] FIGS. 14 and 15 are plan views of an injection molded Phylon midsole according to alternative embodiments of the present invention.

[0023] FIG. 16 is a cross-sectional view of an upper molding and a lower molding for manufacturing the midsole according to one preferred embodiment of the present invention.

[0024] FIG. 17 is a cross-sectional view illustrating a process of manufacturing the midsole according to one preferred embodiment of the present invention by use of the moldings.

BEST MODE FOR CARRYING OUT THE INVENTION

[0025] Reference will now be made in detail to preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. A method of manufacturing an injection molded Phylon midsole described and shown herein utilizes a general molding technique, description of which will be omitted.

[0026] Considering one preferred embodiment of the present invention, as shown in FIG. 14, an upper molding 30 is prepared to include a protruded portion 30a of a small size than that of a midsole 10 but formed in the same shape as the midsole at a bottom surface thereof. In addition, a lower molding 40 is prepared to include a molding cavity 40a of a small size than that of the midsole 10 but formed in the same shape as the midsole. The molding cavity 40a is formed therein with a groove shaping protrusion 40b corresponding to a through-groove 11 formed in the midsole. Then, as shown in FIG. 15, the upper molding 30 is coupled to the lower molding 40, and foam ethylene vinyl acetate comprising a forming agent is injected into the moldings. After the upper and lower moldings 30 and 40 are heated during a predetermined time, if the material is heated and aged, the upper and lower moldings 30 and 40 are opened. Accordingly, the midsole 10 shaped as shown in FIGS. 3, 4 and 5 is completed. It will be understood that if only the groove shaping protrusion 40b is changed alternative midsoles 10-1, 10-2, 10-3 and 10-4 with a cross through-groove 11 or a vertical through-groove 11 formed may be manufactured. Of course, a midsole with a horizontal through-groove 11 may be manufactured.

[0027] It will be understood that the midsole 10 manufactured as described above has no any problem due to a size variation.

[0028] Specifically, the midsole 10 must be precisely bonded to the outsole 2 in the state that each size does not coincide with each other, as shown in FIG. 4. The midsole 10 of the present invention is formed with a horizontal, vertical or cross through-groove 11 at a center portion thereof. An edge of the outsole 2 is first bonded to an edge of the midsole 10, while a center portion of the midsole is lightly pressed. At that time, the center portion of the midsole 10 is spread toward the through-groove 11, and thus a width of the through-groove 11 is reduced (contracted). Simultaneously, the midsole is bonded to the outsole 2. Even though the midsole 10 of the present invention is bonded to the outsole 2, the through-groove 11 is not protruded but contacted by a center convex portion of the midsole so as to maintain a flat state, dissimilar from a conventional midsole 1 (referring to FIG. 2) of which a center portion is protruded and deformed to form a center bossed portion 1a and thus form a side protrusion 1b spread outwardly. Therefore, the midsole 10 of the present invention can be exactly and clearly bonded to the outsole 2.

[0029] As described above, when the midsole 10 of the present invention is bonded to the outsole 2, the through-groove 11 is contracted as a contracted groove 11R, as shown in FIG. 6. Width and position of the through-groove 11 or blind groove 11b, 11c and 11d formed at the completed midsole 10 according to the present invention may be freely determined depending upon a variation of the midsole and a design of the shoe.
Referring to FIGS. 11, 12 and 13, a midsole 10 may include a blind groove 11b formed at an upper surface thereof and a middle rib 10a formed at a bottom thereof. A midsole 10 may include a blind groove 11c formed at a bottom thereof and a middle rib 10a formed at an upper surface thereof. Alternatively, a midsole 10 may include a symmetrical blind groove 11d formed at upper and lower portions thereof and a middle rib 10a formed at a boundary region of the blind groove 11d. These types function as the first embodiment of the present invention. Specifically, when the midsole 10 shown in FIG. 11, 12 or 13 is bonded to the outsole 2 as the first embodiment, the middle rib 10a does not matter to the contraction of width and length of the midsole 10, even if the blind groove 11b, 11c or 11d is contracted. The reason is that the middle rib 10a is of about 1 to 2 mm in thickness. If the middle rib 10a obstructs to the bonding work, the middle rib may be simply cut by use of a knife or press molding. Therefore, the midsoles 10 shown in FIGS. 11, 12 and 13 may be usefully employed. The middle rib 10a is adapted to have a thickness of 1 mm to 2 mm. If the thickness is less than 1 mm, it is difficult to manufacture the Phylon midsole due to a characteristic of injection foaming work. If the thickness is more than 2 mm, it obstructs the function of the groove. Therefore, it will be understood that the thickness of the middle rib 10a is preferably in range of 1 mm to 2 mm.

As shown in FIG. 10, a midsole 10 is formed with at least two holes 11a around a seriously deformed portion of the midsole. The hole 11a may be formed in various shapes such as a circular, an oval or a polygon. Preferably, the hole 11a has a diameter of 5 to 10 mm. It will be understood that the modification may be applied, similar to the preferred embodiment and alternative embodiments and does not matter to the bonding work with the outsole.

Meanwhile, since a Teflon midsole is laid on the Phylon midsole, and an innersole is laid on the Teflon midsole, the through-groove 11 or hole 11a or the blind grooves 11b, 11c and 11d formed at the midsole of the present invention does not cause inconvenience to wearer’s feet. When the wearer walks, the midsole is more softly bent, thereby improving the wearing feeling of the shoe and also increasing the shock absorption.

In the application of the present invention, it is important to form the through-groove 11 and hole 11a and the blind grooves 11b, 11c and 11d at the seriously deformed portion of the midsole. It will be understood that the present invention is not limited to the shown and illustrated embodiments, but the grooves may have various designs and shapes.

The embodiments of the present invention describes the case that the outsole is bonded to the midsole having a large variation than that of the outsole, but a midsole having a small size (a few millimeters) than that of the outsole may be bonded to the outsole by pulling the midsole and bonding them from the edge of the outsole.

Also, the present invention employs a method of manufacturing the midsole by cutting (punching) a sheet of Phylon using a press molding, thereby easily manufacturing the Phylon midsole. The through-groove 11 may be formed at the midsole when cutting (punching) the Phylon by use of the press molding. Therefore, the present invention may employ the method of manufacturing the Phylon midsole by use of the press molding or other method, besides the injection molding using an upper molding and a lower molding.

In addition, the present invention may reuse most of midsoles regarded as defective in the conventional process by forming the through-groove 11, the blind grooves 11b, 11c and 11d or the hole 11a, as the above embodiments.

While the present invention has been described and illustrated herein with reference to the preferred embodiments thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the spirit and scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention that come within the scope of the appended claims and their equivalents.

INDUSTRIAL APPLICABILITY

As apparent from the above description, the midsole of the present invention is allowable for a wide range of variation, so that it may be bonded to an outsole, without deforming the midsole. Therefore, bonding durability of the midsole and a shoe upper may be remarkably increased, thereby allowing a user to properly put on a shoe and increasing wearing feeling, landing feeling and shock absorption. In addition, the present invention does not generate the defective due to the size variation, thereby providing a large economical benefit and contributing to the environmental protection. Furthermore, the bonding work of the midsole of the present invention and the outsole is conveniently implemented. Since the defective does not happen, the productivity is significantly increased, and mass production of articles of the best quality is possible, thereby lowering the manufacturing cost. The midsole of the present invention is formed with the groove, so that its weight may be reduced in relation to a conventional midsole. Therefore, a weight of the shoe may be decreased and its flexibility may be increased, thereby improving the productivity thereof. The groove forming protrusion 40b formed integrally with the lower molding rapidly transfers the heat applied from the exterior to the protruded portion 30a of the upper molding 30, and rapidly and uniformly transfers the heat to the material contained in the upper and lower moldings, thereby decreasing a manufacturing time of the midsole and thus improving its productivity and the quality of the midsole.

In addition, the present invention may reuse most of midsoles regarded as defective in the conventional process by forming the through-groove 11, the blind grooves 11b, 11c and 11d or the hole 11a, as the above embodiments. Furthermore, the present invention does not generate the defective due to the size variation, thereby providing a large economical benefit and contributing to the environmental protection.

1. An injection molded Phylon midsole manufactured by an upper molding and a lower molding, wherein the midsole (10) is formed with a vertical through-groove (11), a horizontal through-groove (11), or a cross through-groove (11), and wherein when the midsole (10) is bonded to an outsole 2, the midsole 10 of a proper size within an allowable variation or deviating from the allowable variation widens or
constrains the through-groove (11), so that the midsole (10) is exactly bonded to the outsole (2) without deforming the midsole.

2. An injection molded Phylon midsole manufactured by an upper molding and a lower molding, wherein the midsole (10) is formed with a middle rib (10a) at a bottom surface thereof and a vertical blind groove (11b), a horizontal blind groove (11b), or a cross blind groove (11b) at an upper surface thereof, and wherein when the midsole (10) is bonded to an outsole (2), the midsole (10) of a proper size within an allowable variation or deviating from the allowable variation widens or constrains the through-groove (11b), so that the midsole (10) is exactly bonded to the outsole (2) without deforming the midsole.

3. An injection molded Phylon midsole manufactured by an upper molding and a lower molding, wherein the midsole (10) is formed with a middle rib (10a) at a bottom surface thereof and a vertical blind groove (11c), a horizontal blind groove (11c), or a cross blind groove (11c) at a bottom surface thereof, and wherein when the midsole (10) is bonded to an outsole (2), the midsole (10) of a proper size within an allowable variation or deviating from the allowable variation widens or constrains the through-groove (11c), so that the midsole (10) is exactly bonded to the outsole (2) without deforming the midsole.

4. An injection molded Phylon midsole manufactured by an upper molding and a lower molding, wherein the midsole (10) is formed with a middle rib (10a) at a center portion thereof and a vertical blind groove (11d), a horizontal blind groove (11d), or a cross blind groove (11d) at a bottom surface and bottom surface thereof, respectively, and wherein when the midsole (10) is bonded to an outsole (2), the midsole (10) of a proper size within an allowable variation or deviating from the allowable variation widens or constrains the through-groove (11d), so that the midsole (10) is exactly bonded to the outsole (2) without deforming the midsole.

5. An injection molded Phylon midsole manufactured by an upper molding and a lower molding, wherein the midsole (10) is formed with at least two holes (11a), and wherein when the midsole (10) is bonded to an outsole (2), the midsole (10) of a proper size within an allowable variation or deviating from the allowable variation widens or constrains the holes (11a), so that the midsole (10) is exactly bonded to the outsole (2) without deforming the midsole.

6. The injection molded Phylon midsole as claimed in claim 1, wherein the through-groove (11) and the blind grooves (11b), (11c) and (11d) have a width of 3 mm to 5 mm, respectively.

7. The injection molded Phylon midsole as claimed in claim 5, wherein the holes (11a) are formed in various shapes such as a circular, an oval or a polygon, and the holes (11a) have a diameter of 5 mm to 10 mm.

8. The injection molded Phylon midsole as claimed in claim 1, wherein at least one through-groove (11) or at least one blind groove (11b), (11c) or (11d) is formed vertically, horizontally or vertically and horizontally.

9. The injection molded Phylon midsole as claimed in claim 2, wherein the middle rib (10a) has a thickness of 1 mm to 2 mm.

10. The injection molded Phylon midsole as claimed in claim 2, wherein the through-groove (11) and the blind grooves (11b), (11c) and (11d) have a width of 3 mm to 5 mm, respectively.

11. The injection molded Phylon midsole as claimed in claim 3, wherein the through-groove (11) and the blind grooves (11b), (11c) and (11d) have a width of 3 mm to 5 mm, respectively.

12. The injection molded Phylon midsole as claimed in claim 3, wherein the through-groove (11) and the blind grooves (11b), (11c) and (11d) have a width of 3 mm to 5 mm, respectively.

13. The injection molded Phylon midsole as claimed in claim 4, wherein the through-groove (11) and the blind grooves (11b), (11c) and (11d) have a width of 3 mm to 5 mm, respectively.

14. The injection molded Phylon midsole as claimed in claim 2, wherein at least one through-groove (11) or at least one blind groove (11b), (11c) or (11d) is formed vertically, horizontally or vertically and horizontally.

15. The injection molded Phylon midsole as claimed in claim 3, wherein at least one through-groove (11) or at least one blind groove (11b), (11c) or (11d) is formed vertically, horizontally or vertically and horizontally.

16. The injection molded Phylon midsole as claimed in claim 4, wherein at least one through-groove (11) or at least one blind groove (11b), (11c) or (11d) is formed vertically, horizontally or vertically and horizontally.

17. The injection molded Phylon midsole as claimed in claim 3, wherein the middle rib (10a) has a thickness of 1 mm to 2 mm.

18. The injection molded Phylon midsole as claimed in claim 3, wherein the middle rib (10a) has a thickness of 1 mm to 2 mm.