

Description

The present invention relates to sole and heel structure for a shoe or the like.

U.S. Patent Nos. 4,237,625 on which the pre-characterizing part of claim 1 is based discloses sole-and-heel structures with a cavity in the sole portion and a cavity in the heel portion. The cavity in the sole portion is located immediately behind the foot's metatarsal region. The cavities are covered by a thin material. Pressurized fluid is delivered to these cavities through a suitable valve. The pressurized fluid has a ballooning effect on the thin cavity covers causing them to bulge below the main plane of the sole-and-heel structure. These bulges come into contact with the pavement. At rest, the foot is cushioned comfortably on the pressurized fluid in the bulges. In moving, fluid under pressure, alternates through a passageway between the heel and metatarsal cavities, producing an alternate lifting effect. The bulges facilitate movement by providing forward thrust to the heel and to the metatarsal region.

The sole-and-heel structure must have high wear resistant capabilities so as not to deteriorate rapidly as it contacts the pavement. The bulges in the structures described in these prior art patents are thin in order to balloon out as the result of pressurization. The thinness causes such sole-and-heel structures to have a tendency to wear out more quickly in the areas of the bulges.

A sole-and-heel structure is known from patent document DE-C-1287477 in which cavities are formed within the heel and sole by moulded bulges in the lowermost layer of material. The layout of these bulges shown in this document would, however, lead to a shoe without particularly good comfort, action or stability. It is an object of the present invention to provide a sole-and-heel structure which is more wear resistant than the arrangement of US-A-4237625, while at the same time being comfortable, stable and having a satisfactory action.

According to the present invention, there is provided a sole-and-heel structure for a shoe or the like comprising an elongated resilient outer member including a sole portion and a heel portion, said outer member having interior and exterior surfaces, heel and sole bulges projecting from said exterior surface, said heel and sole bulges respectively defining heel and sole cavities, and a restricted passageway between said heel and sole cavities, characterized by said outer member being a one-piece molded member, said heel and sole cavities and said passageway being molded into said outer member and opening to said interior surface a sealing member having a shape that matches the shape of said outer member, said sealing member being impermeable to air and having a sealing surface, and adhesive means between said sealing surface and said interior surface for hermetically attaching said sealing member to said outer member, whereby air at atmospheric

pressure is permanently located in the space jointly defined by said passageway and said cavities, and in which the volume of each of said cavities is substantially the same.

In the drawings:

Figure 1 is a side elevation of a shoe embodying sole-and-heel structure incorporating the features of the present invention;

Figure 2 is a bottom plan view of the shoe of Figure 1 on an enlarged scale;

Figure 3 is a view in longitudinal section of the sole-and-heel structure alone, taken along the line 3—3 of Figure 2;

Figure 4 is a top plan view taken along the line 4—4 of Figure 3;

Figure 5 is an enlarged sectional view taken along the line 5—5 of Figure 4;

Figure 6 is an enlarged sectional view taken along the line 6—6 of Figure 4;

Figure 7 is an enlarged view of the portion of Figure 3 with the circle labeled "7";

Figure 8 is an enlarged view of the portion of Figure 3 within the circle labeled "8"; and

Figure 9 is a view in longitudinal section like Figure 3, but depicting a second embodiment of the invention.

Turning now to the drawings, and more particularly to Figure 1 thereof there is depicted a shoe 20 having a conventional upper portion or last 21 and a so-called mid sole 22 which is generally of wedge shape, whereby the shoe 20 is referred to as being of the "wedge" type. The sole 22 has a downwardly facing surface 23.

Referring also to Figures 2—8, sole-and-heel structure 25 is affixed to the shoe 20. The structure 25 comprises a generally flat, thin, elongated outer member 30, the member 30 being of one-piece, molded construction, preferably rubber. In an operative embodiment, the member had a thickness of .317 cm (.125 inch). It is essential that the outer member 30 be highly wear resistant since it is subject to constant engagement with the pavement. A preferred composition is made by the Goodyear Tire and Rubber Company under its brand name INDY-500 (R.T.M.).

The outer member 30 has a sole portion 31 located under the sole of one's foot and a heel portion 32 located under the person's heel. The outer member 30 has a substantially planar interior surface 33 and a substantially planar exterior surface 34, which surfaces are generally parallel. It is the exterior surface 34 which contacts the pavement. A metatarsal bulge 35 is molded into the sole portion 31 in the metatarsal region thereof and projects downwardly from the exterior surface 34. Likewise, a heel bulge 36 is molded into the heel portion 32 and projects downwardly from the exterior surface 34. The bulge 36 is U-shaped in plan, having a pair of legs 37 extending substantially parallel to the longitudinal axis of the member 30, and a curved bight 38 disposed away from the sole portion 31, at the rear of the outer member 30. The legs 37 increase the lateral stability of a person wearing the shoe 20.

The metatarsal bulge 35 defines a cavity 40 opening to the interior surface 33. The cavity 40 is elongated having parallel side walls and part-cylindrical end walls. The cavity 40 is canted to the longitudinal axis of the outer member 30 so that it is generally parallel to the metatarsal area of a person's foot. As an example, the cavity 40 may be located such that its transverse axis is about .318 cm (1/8 inch) rearwardly of the transverse center line of the metatarsal ball area of the foot for which the member 30 is sized.

Figure 7 depicts a preferred form of the cavity 40, which has a bottom wall 41 and two side walls 42, all being part-cylindrical, the radius of curvature of the bottom wall 41 being preferably greater than the radius of curvature of the side walls 42. In the embodiment shown, the cavity 40 is undercut at 43 around its entirety for purposes to be described.

The heel bulge 36 defines a heel cavity 50 opening to the interior surface 33. Figure 8 depicts a preferred form of the cavity 50, which has a bottom wall 51 and two side walls 52, all being part-cylindrical, the radius of curvature of the bottom wall 51 being preferably greater than the radius of curvature of the side walls 52. The cavity 50 is undercut at 55 around its entirety for purposes to be described.

Finally, a restricted passageway 60 (Figure 4) is molded into the outer member 30, between the cavities 40 and 50 and opening to the interior surface 33.

Referring to Figure 1, between the interior surface 33 of the outer member 30 and the surface 23 of the mid sole 22 is an adhesive 65. The outer member 30 and the mid sole 22 are thus attached and the cavities 40 and 50 hermetically sealed, whereby air at atmospheric pressure is permanently located in the space jointly defined by the cavities 40 and 50 and the passageway 60.

In use, the bulges 35 and 36 engage the pavement as the wearer of the shoe 20 is standing. The air in the cavities 40 and 50 provides a cushioning effect. In walking and running, the heel bulge 36 first comes in contact with the pavement, causing air in the cavity 50 to be compressed and forced through the passageway 60 into the cavity 40. As the heel portion 32 lifts off the pavement, the air returns to the cavity 50 to give a lifting effect. As the bulge 35 contacts the pavement, the air in the cavity 40 is forced through the passageway 60 into the cavity 50. In walking and running, the air alternates back and forth between the cavities 40 and 50, through the passageway 60 to give an alternate lifting effect and provide thrust both at the metatarsal ball area and in the heel that facilitates walking and running. The weight of the wearer produces energy in placing the cavities 40 and 50 under pressure and transferring air from the heel to the metatarsal region and vice versa.

Although the exterior surface 34 is shown to be smooth, that is not necessary. A tread, such as is used in athletic shoes could be added to such exterior surface. Also, although a wedge type shoe 20 is depicted, a structure in which the

forward part of the heel structure is substantially vertical can be formed, as long as the sole and heel portions are unitary.

The particular shapes of the cavities 40 and 50 depicted in the drawings are not necessary, although they are preferred, having the advantages discussed above. However, other shaped cavities would perform well also.

It is important that the mid sole 22 function as a sealing member, that is, it must be impermeable to air. The cavities 40 and 50 must be hermetically sealed. The adhesive 65, the mid sole 22 and the outer member 30 all must be substantially impermeable to air. Of course, the member 30 and the mid sole 2 must be resilient in order to flex during use of the shoe 20. Rubber is preferred in this regard.

Those skilled in the art of manufacturing rubber products such as the member 30 will readily know how to make the same. Suffice it to say that the tooling and the molding machine will permanently form the bulges 35 and 36 and the corresponding cavities 40 and 50 during the molding operation.

The undercuts 43 and 55 (Figures 7 and 8) improve adhesion of the outer member 30 to the mid sole 22 in the region of the cavities 40 and 50. Stress produced by the air in these cavities at the junction react as shear stresses rather than peel stresses. Of course, the use of atmospheric pressure instead of the higher pressures disclosed in the prior art substantially reduces the stresses in the structure 25.

When the shoe is not worn or at least the wearer is not standing or running, there is no pressure in the cavities, and therefore, no stress that could break the seal over time. Pressure is only developed, as explained above, when the wearer is standing, walking or running.

The thickness of the outer member 30 is sufficient so that it is inherently capable of withstanding the stress to which any sole-and-heel structure is put during walking, running, etc. No metatarsal stiffener is required, as disclosed in the previous patents, to stiffen the sole while enabling it to balloon in the areas desired. Of course, without such a stiffener, the sole itself is more flexible.

Each size shoe preferably would have different size bulges and cavities. A larger shoe would have a longer metatarsal bulge 35 and a larger heel bulge 36.

Referring to Figure 9 an alternative embodiment is depicted which is intended for the replacement market. In the embodiment of Figure 9, the identical outer member 30 is utilized. A plate-like sealing membrane or member 75 has a shape that matches the shape of the outer member 30 and in the embodiment shown is somewhat thinner. Adhesive 65 between the sealing member 75 and the outer member 30 permanently attach the two to provide hermetically sealed cavities 40 and 50 in the same manner as described with respect to the first embodiment. A cobbler would have a supply of the sole-and-heel

structures to repair shoes in the usual way. The exposed surface of such structure would be attached in any number of ways to the existing mid sole of a shoe brought in for repair. The cobbler need not be concerned with insuring a hermetic seal because that is already provided in the product itself.

What has been described therefore, is improved sole-and-heel structure with molded-in bulges defining cavities that are hermetically sealed.

Claims

1. Sole and heel structure for a shoe or the like comprising an elongated resilient outer member (30) including a sole portion (31) and a heel portion (32), said outer member having interior (33) and exterior (34) surfaces, heel (36) and sole (35) bulges projecting from said exterior surface (34), said heel and sole bulges respectively defining heel and sole cavities (50, 40), and a restricted passageway (60) between said heel and sole cavities, characterized by said outer member (30) being a one-piece molded member, said heel and sole cavities (50, 40) and said passageway (60) being molded into said outer member and opening to said interior surface, a sealing member (22, 75) having a shape that matches the shape of said outer member (30), said sealing member being impermeable to air and having a sealing surface, and adhesive means (65) between said sealing surface and said interior surface (33) for hermetically attaching said sealing member (22, 75) to said outer member (30), whereby air at atmospheric pressure is permanently located in the space jointly defined by said passageway (60) and said cavities (40, 50), and in which the volume of each of said cavities (40, 50) is substantially the same.

2. The sole-and-heel structure of claim 1, characterized in that said outer member has no more than one heel bulge (36) and associated heel cavity (50) and no more than one sole bulge (35) and associated sole bulge cavity (40).

3. The sole-and-heel structure of claim 1 or 2, characterized in that said heel bulge and said heel cavity are U-shaped having two side legs (37) for lateral stability and a bight (38) away from said sole portion.

4. The sole-and-heel structure of claim 1, 2 or 3, characterized in that each of said cavities (40, 50) is undercut in the region of said interior surface.

5. The sole-and-heel structure of any of claims 1 to 4, characterized in that said sole bulge and said sole bulge cavity are elongated and located slightly behind the metatarsal area of a foot to be housed in the shoe.

6. The sole-and-heel structure of any of claims 1 to 5, characterized in that said sealing and outer members are composed of rubber.

7. The sole-and-heel structure of any preceding claim, characterized in that the thickness of said outer member (30) is on the order to about .318 cm (.125 inch).

8. The sole-and-heel structure of any of claims 1 to 7, characterized in that said sealing member (75) is platelike.

Patentansprüche

1. Sohle- und Absatz für einen Schuh oder dergl. mit einem langgestreckten elastischen Außenteil (30), der einen Sohlenteil (31) und einen Absatzteil (32) aufweist und eine Innenfläche (33) und eine Außenfläche (34) besitzt, ferner eine Absatzausbauchung (36) und eine Sohlenausbauchung (35), die von der Außenfläche (34) vorspringen und einen Absatzhohlraum (50) und einen Sohlenhohlraum (40) begrenzen, ferner einen verengten Kanal (60) zwischen dem Absatz- und dem Sohlenhohlraum, dadurch gekennzeichnet, daß der Außenteil (30) ein einstückiger Formpreßling ist, daß der Absatz- und der Sohlenhohlraum (50, 40) und der Kanal (60) in den Außenteil eingeformt und an der Innenfläche offen sind, daß ein Dichtteil (22, 75) vorgesehen ist, der in seiner Form der Innenfläche (30) angepaßt ist und der luftundurchlässig ist und eine Dichtfläche besitzt, und daß zwischen der Dichtfläche und der Innenfläche (33) Klebmittel (65) zum hermetischen Anbringen des Dichtteils (22, 75) an dem Außenteil (30) vorgesehen sind, der von dem Kanal (60) und den genannten Hohlräumen (40, 50) gemeinsam gebildete Raum ständig Luft unter atmosphärischem Druck enthält, wobei die beiden Hohlräume (40, 50) im wesentlichen das gleiche Volumen haben.

2. Sohle und Absatz nach Anspruch 1, dadurch gekennzeichnet, daß der Außenteil nicht mehr als eine Absatzausbauchung (36) und einen zugeordneten Absatzhohlraum (50) und nicht mehr als eine Sohlenausbauchung (35) und einen zugeordneten Sohlenhohlraum (40) besitzt.

3. Sohle und Absatz nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Absatzausbauchung und der Absatzhohlraum U-förmig sind und zwei Seitenschenkel (37) zur seitlichen Stabilisierung und einen von dem Sohlenteil entfernten Rug (38) besitzen.

4. Sohle und Absatz nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß jeder der Hohlräume (40, 50) im Bereich der Innenfläche hinterschnitten ist.

5. Sohle und Absatz nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Sohlenausbauchung und der Sohlenhohlraum langgestreckt und etwas hinter dem Mittelfußbereich eines von dem Schuh aufzunehmenden Fußes angeordnet sind.

6. Sohle und Absatz nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Dichtteil und der Außenteil aus Gummi bestehen.

7. Sohle und Absatz nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Außenteil (30) eine Dicke in einer Größenordnung von 0,318 cm hat.

8. Sohle und Absatz nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß der Dichtteil (75) plattenartig ist.

structures to repair shoes in the usual way. The exposed surface of such structure would be attached in any number of ways to the existing mid sole of a shoe brought in for repair. The cobbler need not be concerned with insuring a hermetic seal because that is already provided in the product itself.

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5. Sohle und Absatz nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Sohlenausbauchung und der Sohlenhohlraum langgestreckt und etwas hinter dem Mittelfußbereich eines von dem Schuh aufzunehmenden Fußes angeordnet sind.

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7. Sohle und Absatz nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Außenteil (30) eine Dicke in einer Größenordnung von 0,318 cm hat.

8. Sohle und Absatz nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß der Dichtteil (75) plattenartig ist.



Revendications

1. Structure de semelle et de talon pour une chaussure ou équivalent, comprenant un élément extérieur élastique allongé (30) qui comprend une partie semelle (31) et une partie talon (32), ledit élément extérieur possédant des surfaces intérieure (33) et extérieure (34), des protubérances du talon (36) et de la semelle (35) faisant saillie sur ladite surface extérieure (34), ledites protubérances du talon et de la semelle définissant respectivement des cavités (50, 40) du talon et de la semelle, et un passage étranglé (60) entre lesdites cavités du talon et de la semelle, caractérisée en ce que ledit élément extérieur (30) est un élément moulé en une seule pièce, lesdites cavités (50, 40) du talon et de la semelle et ledit passage (60) sont moulés dans ledit élément extérieur et s'ouvrent sur ladite surface intérieure, un élément de fermeture étanche (22, 75) présente une forme complémentaire de celle dudit élément extérieur (30), ledit élément de fermeture étanche est imperméable à l'air et possède une surface de fermeture étanche, et des moyens adhésifs (65) sont interposés entre ladite surface d'étanchéité et ladite surface intérieure (33) pour fixer ledit élément de fermeture étanche (22, 75) audit élément extérieur (30), de sorte que de l'air à la pression atmosphérique est contenu en permanence dans l'espace défini conjointement par ledit passage (60) et lesdites cavités (40, 50) et dans laquelle les volumes desdites cavités (40, 50) sont sensiblement identiques.

2. Structure de semelle et de talon selon la revendication 1, caractérisée en ce que ledit élément extérieur ne possède pas plus d'une protubérance de talon (36) et d'une cavité de talon (50)

correspondante, et pas plus d'une protubérance de semelle (35) et d'une cavité de semelle correspondante (40).

3. Structure de semelle et de talon selon la revendication 1 ou 2, caractérisée en ce que ladite protubérance de talon et ladite cavité de talon sont en forme de U possédant deux branches latérales (37), pour assurer la stabilité latérale, et une anse (38) qui est éloignée de ladite partie semelle.

4. Structure de semelle et de talon selon la revendication 1, 2 ou 3, caractérisée en ce que chacune desdites cavités (40, 50) est à contre-dépouille dans la région de ladite surface intérieure.

5. Structure de semelle et de talon selon une quelconque des revendications 1 à 4, caractérisée en ce que ladite protubérance de semelle et ladite cavité de protubérance de semelle sont de forme allongée et placées légèrement en arrière de la région du métatarse du pied qui sera logé dans la chaussure.

6. Structure de semelle et de talon selon une quelconque des revendications 1 à 5, caractérisée en ce que ledit élément de fermeture étanche et ledit élément extérieur sont composés de caoutchouc.

7. Structure de semelle et de talon selon une quelconque des revendications précédentes, caractérisée en ce que l'épaisseur dudit élément extérieur (30) et de l'ordre d'environ 0,318 cm (0,125 pouce).

8. Structure de semelle et de talon d'une quelconque des revendications 1 à 7, caractérisée en ce que ledit élément de fermeture étanche (75) est en forme de plaque.

