Aug. 24, 1937. W. S. WILSON 2,090,881

FOOTWEAR

Filed April 20, 1936 2 Sheets-Sheet 1

Fig. 1.

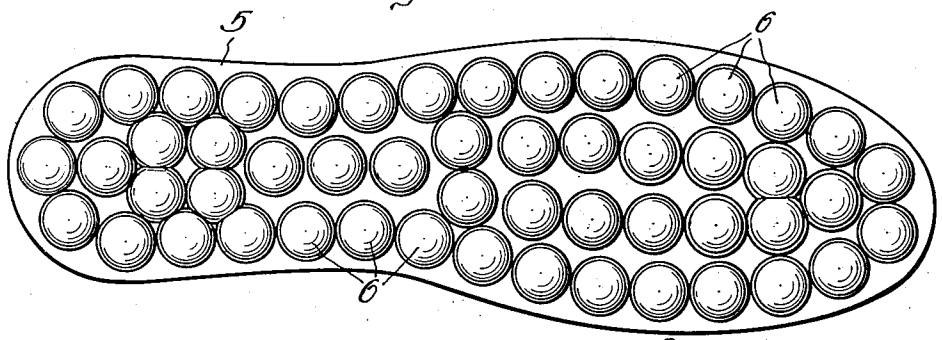


Fig. 2.

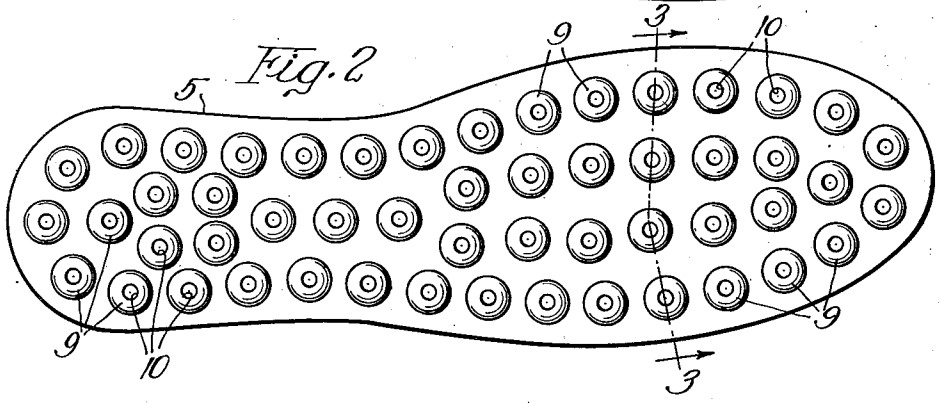


Fig. 3.

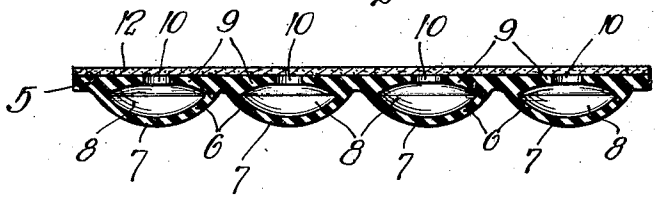
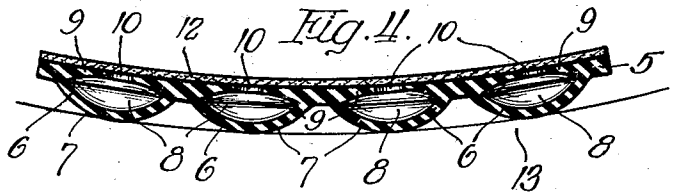


Fig. 4.



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Fig. 5.

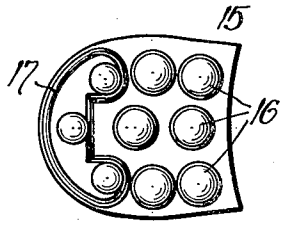


Fig. 6.

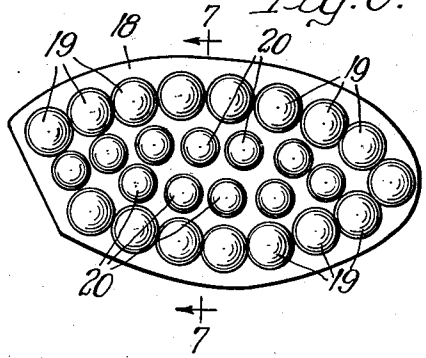


Fig. 7.

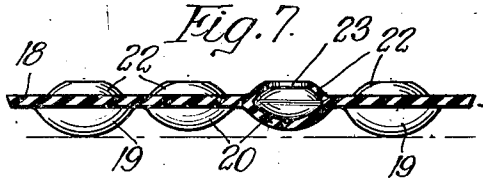


Fig. 8.

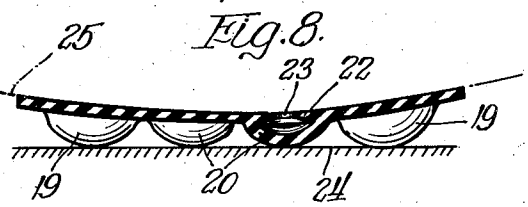


Fig. 9.

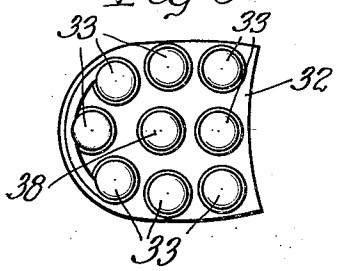


Fig. 10.

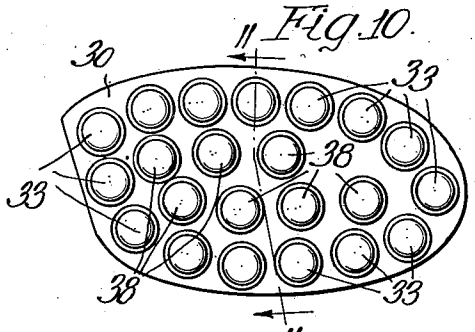


Fig. 12.

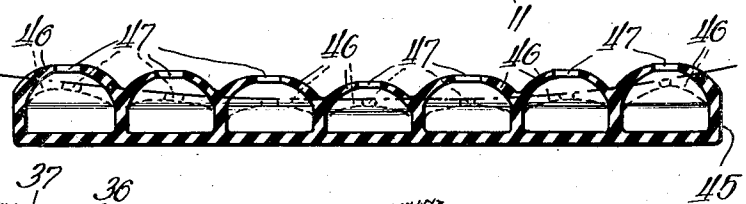
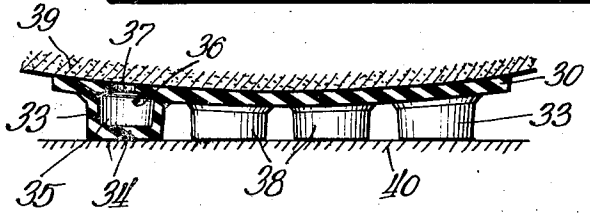


Fig. 11.



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UNITED STATES PATENT OFFICE

2,090,881

FOOTWEAR

Wilmer S. Wilson, Chicago, Ill.

Application April 20, 1936, Serial No. 75,294

6 Claims. (Cl. 36—29)

This invention relates to footwear, and more particularly is directed to footwear for cushioning the impact of the foot against the ground, being adapted for use either as an insole or an outsole.

One of the primary objects of the present invention is the provision of a cushioning member of such construction as to produce a cushioning effect when applied to the wear surface or inside surface of a shoe member, and which is capable of retaining its resiliency and cushioning characteristics throughout the normal life of the member.

In the preferred form of the invention, I provide a cushioning member which is adapted to engage either the insole or outer wear surface of the shoe, and which has a plurality of individual air-filled cells with the air confined therein to provide cushioning columns for easing the impact of the foot against the ground or walking surface.

Another feature of the present invention resides in the provision of a cushioning structure which, when used as an outsole, is cemented to the wear surface of the shoe sole or heel, and the axial extent of the individual air cells is varied in conformance with the curvature of the shoe sole so that a planar walking surface is provided, the outer ends of the cells all engaging the ground or walking surface in the same plane, so that cushioning pressure is provided equally in all the cells. This eliminates wear of individual cells, and also insures that the ball of the foot is equally supported in all directions.

When the cushioning member is used as an insole, the cells are so proportioned that the cushioning member will assume the curvature of the inside foot engaging surface of the shoe when compressed, and equalized distribution of cushioning pressure will be effected.

In my Patent No. 2,033,313, issued March 10, 1936, I have disclosed an air cell for footwear of this type which is provided with thickened flanged ends and an intermediate portion of reduced thickness capable of flexing or bulbing under compression. The present invention, in one of its preferred embodiments, provides an air cell which has a relatively thick wear surface, which may be either flat or spherical in shape, and which has the upper closing flange portion formed as a bulbed flange, to increase the volume of the cell so that the unit increase in pressure applied to the cell will not produce as great a unit increase in air pressure within the cell. In this manner, a greater cushioning effect is produced, since the air within the cells will not be compressed as rapidly as in the cells shown in my aforementioned patent, due to the increased volume. The wall structure is likewise made more flexible in order to increase the cushioning characteristics of the member.

Other objects and advantages of the present invention will appear more fully from the following detailed description, which, taken in connection with the accompanying drawings, will disclose to those skilled in the art the construction and operation of the illustrated embodiments of the invention.

In the drawings:

Figure 1 is a bottom view of the cushioning member employed as an insole;

Figure 2 is a top plan view of the member shown in Figure 1;

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 2, with the cushioning member in position to receive the leather cover sheet;

Figure 4 is a view corresponding to Figure 3, when the cushioning member is sealed closed and actually employed in the cushioning of a foot within a shoe;

Figures 5 and 6 are bottom views of a cushioning member constructed according to the present invention and used for application to the outer wear surface of the sole and heel of a shoe;

Figure 7 is a sectional view taken substantially on line 7—7 of Figure 6, when the member is not applied to the shoe;

Figure 8 is a view showing the application of the cushioning member to the ground or walking surface, and the engagement of the individual cells with such surface;

Figures 9 and 10 are views corresponding to views 5 and 6 showing a modified form of cell construction;

Figure 11 is a sectional view taken substantially on line 11—11 of Figure 10, illustrating the manner in which the sole member of Figure 10 engages the ground or walking surface; and

Figure 12 is a sectional view through a modified form of insole or outsole construction.

Referring now in detail to Figures 1 and 2, I have provided the insole member shown generally at 5, comprising a substantially planar sheet of rubber or other resilient material provided with a plurality of air cells formed therein. These air cells are indicated generally at 6, and are so distributed over the area of the insole 5 as to form the proper support for the ball and heel of a foot. The undersurfaces of the air cells, that

is, the surfaces which engage the inner surfaces of the sole and heel of the shoe, are spherical in section, as illustrated at 7 in Figures 3 and 4, and are of sufficient thickness to insure a normal wear period of considerable length.

The air cells themselves, which may be of the form of an oblate spheroid, indicated at 8 in Figures 3 and 4, are joined together by the resilient sheet 5 approximately along their major axes, although they may be joined at their upper or lower ends, and the upper surfaces thereof may also be in the form of spherical sections 9 which are provided with openings 10 substantially centrally thereof, allowing the entrance of air to the interior of the cells. Of course, other shapes of flanges 9 may be employed for increasing the internal volume of the cells.

The resilient insole member 5, when applied to the inner surface of a shoe, is first provided with a thin leather strip 12, sealed to the defining edge of the member 5, and also sealed or cemented over the openings 10 in the individual cells. As a result, the air within the cells 8 is sealed against escape, and consequently any pressure imposed upon the upper surface of the member 12 will merely compress the air in the cells 8, but no air will be allowed to enter or escape from the cells, due to the seal over the openings 10 provided by the sheet 12. During the sealing of the strip 12 over the tops of the cells, the upper flanges 9 of the cells are forced downwardly, as shown in Figure 4. This increases the sealing area about the openings 10.

The insole member is normally substantially planar in extent, but when pressure is applied thereto, as indicated in Figure 4, as by the foot of the wearer of the shoe, causing the insole member to be pressed against the inner surface of the shoe sole, as indicated at 13, the insole member assumes a curvature corresponding to the curvature of surface 13, and consequently an equal distribution of pressure in all of the cells 8 is produced, since each of the cells is equally compressed between the foot of the wearer and the inner sole surface 13. It will therefore be obvious that a very resilient cushioning of the foot is provided between the bottom surface of the foot and the inner surface of the sole of the shoe. In addition, by reason of the spherical portions 9 forming the upper ends of the cells 6, an increased volume is produced within the cells, such as shown at 8, and this increased volume insures that the pressure within the cell will be increased to a smaller extent per unit application of pressure to the member 12 than would be the case if the portions 9 of the cells extended straight across the upper ends instead of being bulbed upwardly. As shown in Figure 4, these upper portions or flanges 9 of the cells are slightly compressed during the pressure engagement, which produces the increase in pressure within the volumes 8, and consequently resiliently supports the foot of the wearer upon air cushions or columns formed by the compression of the air in the volumes 8. A very comfortable insole member, having improved cushioning characteristics, is therefore provided by this construction.

Referring now to Figures 5 to 8, in Figure 5, I have provided a heel member 15 having a plurality of cells 16 formed therein, which cells correspond to the cells 6 of the embodiment of the invention shown in Figures 1 to 4. In order to prevent too rapid wear of the heel, a reinforcing rib is provided adjacent the rear end of the heel, so that this portion will not wear more rapidly than the forward portion, which is usually the case with rubber heels of the type with which I am familiar. The sole member 18 of Figure 6 corresponds to the sole portion of the insole member 5, and is also provided with a plurality of air cells 19, which cells are spaced in proper position to secure equal distribution of pressure on all of the cells. It will be noted, however, that the cells shown in Figure 6 are of varying size, the inner ring of cells 20 being of smaller volume than the outer peripheral row of cells 19. The purpose of this arrangement will be apparent from an inspection of Figures 7 and 8.

In these latter two figures, it is apparent that the carrying member 18 for the cells 19 and 20 normally extends in a plane, such as shown in Figure 7, and that the inner cell members 20 are of smaller volume than the outer cell members 19, this reduction in volume being provided by a reduction in the length of the minor axes of the oblate spheroids which form each of the cells. This reduction, it will be noted, is provided entirely on one side of the member 18, that is, the upper surfaces 22 of all of the cells are maintained the same, but the lower spherical wear surfaces of the cells 19 extend below the carrier 18 a distance greater than do the corresponding portions of the cells 20. Each of the cells is, of course, provided with the air opening 23, which is sealed when the cells are cemented to the undersurface of the sole of the shoe. When the shoe is engaged with a walking surface such as indicated at 24, and pressure is applied to the sole of the shoe indicated by the dot-and-dash line 25, this results in equal application of the under-surfaces or bottom surfaces of the cells 19 and 20 to the surface 24. It is apparent that the undersurface of the sole of a shoe is curved, having a curvature corresponding to the line 25. Consequently, when the sole member shown in Figures 6 and 7 is cemented to the sole of a shoe, the member 18 takes a curvature corresponding to the curvature of the shoe sole, and consequently the outer ring of cells 19 are curved upwardly with respect to the inner ring of cells 20. As a result, when the wear surface of the member 18 is engaged with the ground or other walking surface, all of the cells are in simultaneous engagement with this surface, and consequently pressure is increased in each of the cells equally, so that a uniform cushioning effect is provided. A corresponding construction can be provided for the heel member 15, although in such case only the inner two cells would be reduced in axial length in order to accomplish this purpose.

It is therefore apparent that when the cushioning member is applied to the outer wear surface of a shoe, the cushioning member assumes the curvature of the shoe surface, and by the provision of the varying axial lengths of cells forming the cushioning member, a straight line contacting engagement of all of the cells simultaneously upon the ground or walking surface is provided. This is of distinct importance in insuring that all portions of the cushioning member will sustain the same amount of wear, and also in insuring that equal pressure distribution of the weight will be transmitted to all of the cells.

Considering the embodiment of the invention shown in Figures 9 to 11, corresponding sole and heel member are provided at 30 and 32. The sole member 30 is provided with a plurality of substantially cylindrical depending cell members 33, which are, as far as their lower portion is concerned, substantially similar to the cells

shown in my aforementioned patent. As shown in section in Figure 11, the cell **33** is provided with a thickened wear surface **34**, joined to the cylindrical wall portion of the cell by the tapered annular portion **35**. However, the upper portions of the cells **33** are provided with the spherically flanged closure portions **36**, provided with the openings **37** for the admission of air thereinto, and the axial length of the cells **33** varies substantially in the manner set forth in connection with the cells **19** and **20** of the embodiment shown in Figure 6. Thus, the inner cells indicated at **38** in Figure 10 are all of less axial extent than the outer ring of cells **33** of this embodiment. Thus, when the member **30** is cemented to the wear surface **39** of the shoe, the member **30** will assume a curvature corresponding to the curvature of this wear surface. As a result, the cells **33** and **38**, because of their difference in axial length, will all have simultaneous equalized contact engagement with the ground or walking surface **40**. As a result, when pressure is applied to the wear surface **39** of the shoe, compression of each of the cells will be simultaneously effected, and each of the cells will be subjected to the same amount of wear. As a result, no one cell or portion of the entire number of cells will be subjected to an unequal amount of wear tending to reduce the life of the entire member. Also, the cushioning effected by the compression of air within the cells will be increased first, by reason of the increased volume provided by the flanged portions **36** of the cells, and secondly, by reason of the fact that the cushioning is equally distributed over the entire surface of the cushioning member. As a result, a cushioning member providing a great degree of comfort for the wearer, and which also has a relatively long life, is provided.

It is apparent that the cushioning structure shown in Figures 5 to 11, inclusive, can be applied to the under or wear surface of any size or style of shoe, and can be employed for athletic shoes, such as basketball and football shoes requiring caulks or other gripping members, since the rubber from which the cushioning members are formed serves as an excellent anti-skidding surface for such types of shoes. The shoes can also be provided with such cushioning surfaces for use as golf shoes, or for ordinary use for individuals who do a great amount of walking, such as milkmen, postmen, and the like.

In Figure 12 is disclosed a construction of individual cells **45** which are joined together along their bases to form an integral group of cells for attachment to the undersurface of a shoe sole or for use as an insole. Each of the cells is provided with a flange **46** which serves to increase the air volume of the cell, and the flanges are provided with openings **47** which are sealed when the group of cells is attached either to the shoe sole or to a leather sheet for use as an insole. Obviously, the cells can be secured together at their upper portions as well, or reversed if used as an insole. The lengths of the cells are varied to conform to the curvature of the supporting surface, as previously described.

It is believed that the present invention therefore provides a cushioning member having a unique sole construction capable of producing increased cushioning characteristics and uniform wear of the entire member, and which can be equally well employed as an insole or an outsole.

I am aware that various changes may be made in details of construction of the present invention, and I therefore do not intend to limit the invention except as defined by the scope and spirit of the appended claims.

I claim:

1. Footwear of the class described, adapted to be supported from the wear surface of a shoe, comprising a resilient member carrying a plurality of air cells projecting from opposite surfaces thereof, each of said cells having on one side of said surface a relatively thin bulbed flange defining an air opening and on the opposite side carrying a projecting relatively thick surface-engaging portion, said member and the flanges being cemented to said wear surface with the air openings sealed against passage of air therethrough.

2. Footwear of the type specified in claim 1, each of said air cells being in the shape of an oblate spheroid having its lateral surface at the major circumference thereof joined to said carrying member.

3. Footwear as specified in claim 1, each of said cells having an oblate semi-spheroidal portion on said one side of said carrying member and a cylindrical projection terminating in said surface engaging portion.

4. An air cell for a cushioning member of the class described, comprising a hollow oblate spheroidal body of resilient material having an air opening about one pole of the minor axis, the wall thickness of the semi-spherical portion from said opening to the major circumference of said cell being relatively thin, the opposite semi-spherical portion having an increased wall thickness providing a wear surface.

5. A cushioning member comprising a web member carrying a plurality of individual air cells, each formed of two semi-spherical portions joined at their meeting edges to said web member, one of said portions having relatively thin walls which are easily flexed and the other of said portions having relatively thick walls.

6. An insole member formed of resilient material and comprising a plurality of individual air cells joined together by an integral webbing, said cells having openings disposed slightly above the surface of said webbing and defined by radially inwardly extending flanges, and a thin sheet member cemented to the upper surface of said cells and webbing and sealing said openings, the sealing engagement between said flanges and sheet member being such that increase of pressure in said cells increases the sealing pressure between said sheet member and said flanges.

WILMER S. WILSON.