A shoe is provided with an adjustable arch support which is constructed to permit ready adjustment of the height and curvature of an arch formed on the insole of the shoe. An adjustment screw means is positioned to be rotated for lifting and lowering at least one arch-forming spring means located under the insole of the shoe. Downward pressure through the adjustment screw means is distributed by a pressure distribution plate positioned above the outsole of the shoe and secured at its rear end to the heel portion of the shoe. The adjustment screw means may be accessible from the bottom, back, or inside of the shoe. A preferred arrangement provides for two arch-forming spring means in a generally side-by-side relationship with separate adjustment screw means for each spring means.

6 Claims, 11 Drawing Figures
ADJUSTABLE ARCH SUPPORT FOR A SHOE

This application is a continuation-in-part of my copending application Ser. No. 877,753, filed Nov. 18, 1969.

BACKGROUND AND BRIEF DESCRIPTION OF INVENTION

It is known in this art to provide for various adjusting screw devices which have the effect of raising and lowering a portion of the insole of a shoe so as to adjust the arch formed in the shoe. Prior art attempts to provide for adjustable arches in shoes have considered the use of screws that are accessible from the bottom, back, or inside of the shoe so that adjustment may be made with a tool. Other arrangements have required a removal or movement of a portion of the shoe to gain access to an adjustment screw device. Representative U.S. Pats. in this art include the following: Nos. 692,539; 961,174; 1,091,696; 1,242,317; 1,558,192; 1,644,762; 1,809,010; 1,885,259; 2,050,973; 2,114,089; and 2,295,364.

For one reason or another, known prior art efforts have failed to provide for a marketable arrangement which can be economically produced and which is comfortable and easy to use. The present invention offers an improved adjustable arch support for a shoe which is readily adaptable to existing methods of shoe construction and which provides for easy adjustment in arch comfort in a shoe. In accordance with the invention, the sole portion of a shoe is provided with a laminate structure made up at least of an insole, an intermediate sole, and an outsole. Working components of the adjustable arch support are positioned within the laminate structure of the shoe sole so as to provide for a comfortable adjustment of the shoe arch while also completely concealing the components and protecting the foot of a wearer from the components. The working components which make up the adjustment device of this invention include a single pressure distribution plate positioned above the outsole of the shoe (and below the intermediate sole) and which is secured at its rear end to the heel portion of the shoe. An arch-forming spring means is positioned above the intermediate sole and below the insole of the shoe, and the arch-forming spring means is secured only at its rear end so as to be unattached and free at its forward end. An adjustment screw means is operatively positioned and secured for rotation between the pressure distribution plate and the arch-forming spring means so that the height and curvature of the spring means can be changed when the adjustment screw means is rotated. Further, the adjustment screw means has an enlarged head portion which prevents a loss of the screw means into the interior of the sole construction and which is readily accessible for adjustment without removal of any portion of the shoe construction.

Preferably, the shoe construction is provided with two arch-forming spring means placed in a generally side-by-side relationship so that separate adjustment can be made for each side of the shoe. Each of the two arch-forming spring means is provided with its own adjustment screw means. It is also preferred that a T-member be fitted to the pressure distribution plate so as to receive the adjustment screw means therethrough in a threaded relationship. The T-member functions to transmit downward pressure from the adjustment screws onto the pressure distribution plate so that there is a good distribution of pressure from the arch area of the shoe.

Other embodiments of the invention include arrangements for adjusting an arch from the bottom, back, or inside of the shoe. These and other features and advantages of the present invention will become apparent in the more detailed discussion which follows. In the detailed discussion, reference will be made to the accompanying drawings as briefly described below.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side elevational view of a shoe, partly in section and partly exploded, showing the basic components and relationships of the adjustable arch support of this invention; FIG. 2 is an elevational view similar to FIG. 1 and showing a preferred embodiment which provides for two separate arch-forming spring means within a shoe construction; FIG. 3 is an elevational view similar to FIG. 1, showing a preferred embodiment which provides for two separate arch-forming spring means within a shoe construction; FIG. 4 is a top plan view, partly in section, of the shoe construction shown in FIG. 3; FIG. 5 is an elevational view similar to FIG. 1, showing a further embodiment of the invention; FIG. 6 is a bottom plan view of a T-member component used in the shoe construction shown in FIG. 2; FIG. 7 is an elevational side view of the T-member of FIG. 6, shown in section, and of an adjustment screw member received into the T-member; FIG. 8 is a plan view of a pressure distribution plate utilized with the shoe constructions shown in FIGS. 1 - 5, with the exception that an additional opening would be provided therethrough for the FIG. 3 construction; FIG. 9 is a top plan view of a typical arch-forming spring means utilized with the shoe constructions of this invention; FIG. 10 is an exploded elevational view showing construction and relationships of a number of components for the adjustable arch support of this invention; and FIG. 11 is a top plan view of two of the components shown in FIG. 10, this view being slightly enlarged from what is shown in FIG. 10.

DETAILED DESCRIPTION OF INVENTION

Although FIG. 1 represents one embodiment of the invention, the component parts illustrated in FIG. 1 are typical of those used in other embodiments of this invention. The shoe construction which is illustrated includes a sole laminate made up of three general layers of leather or rubber, although a different number of layers of leather or other substances may be used if desired. The sole is made up of an outsole 10, an intermediate sole 12 and an insole 14, all of which are placed upon the other as illustrated. The insole 14 is contacted by the bottom of the foot of a wearer, and working components are provided for adjusting the height and curvature of an arch area of the insole so as to provide for a comfort adjustment of the shoe. The working components include a metal, arch-forming spring means 16 positioned just beneath the insole of the shoe with its rear end secured by fastening nails or other devices 18 to a heel portion 20 of the shoe. A forward end 22 of the arch-forming spring means 16 is left free. Also, it can be seen that the arch-forming spring means is interspersed between the insole 14 and the intermediate sole layer 12. A metal pressure distribution plate 24 is interposed between the intermediate sole 12 and the outsole 10, and this plate functions to support and receive pressure from an adjustment screw means 26. The pressure distribution plate is secured by nails or other fastening devices to the heel portion 20 of the shoe at its rear end. The adjustment screw means 26 is operatively positioned between the arch-forming spring means 16 and the pressure distribution plate 24 is such a way that rotation of the adjustment screw adjusts the height and curvature of the arch-forming spring means 16 in accordance with linear travel of the adjustment screw means. An inner end of the adjustment screw means directly contacts and bears against the arch-forming spring means 16. In accordance with the invention, the adjustment screw means 26 is provided with an enlarged head portion 28 which is immediately accessible for turning without removal of any portion or part of the shoe construction. In the FIG. 1 embodiment, the enlarged head portion 28 depends downwardly so as to be accessible from the bottom of the shoe. The enlarged head portion may be provided with a slot or recess for receiving a tool, such as a screw driver or Allen wrench, and its outside surface may be roughened to provide for manual turning of the screw adjustment means. By providing an enlarged head on the adjustment screw, extreme movement of the adjustment screw means into the sole of the shoe is prevented. This overcomes a problem presented.
by some prior art arrangements which place no limit on an adjustment screw in its movement into a shoe sole.

Also, it can be seen from FIG. 1 that the adjustment screw is thread through a member 30 which will be described hereinafter as a T-shaped member. This member functions to secure the adjustment screw means 26 to a portion of the shoe construction so that the screw can be rotated and threaded toward and away from the arch-forming spring means 16. In the FIG. 1 embodiment, the T-shaped member 30 has a depending portion 32 which is fitted through a hole in the pressure distribution plate 24 and through an opening formed in the sole 10 of the shoe. An upper portion 34 of the T-shaped member is secured with nails or by other means to the pressure distribution plate 24. This permits a firm mounting of the adjustment screw means relative to the shoe so that rotation of the adjustment screw means can be made in carefully controlled increments of adjustment. Also, it can be seen that downward forces from the insole of the shoe will be transmitted through the adjustment screw means 26 and onto the pressure distribution plate 24 by the T-shaped member 30. This prevents damage to the shoe sole and maintains all working components of the adjustable arch support in place.

FIG. 2 illustrates a second embodiment of the invention wherein the adjustment screw means is operated from inside of the shoe. The same basic components of a pressure distribution plate 24 and arch-forming spring means 16, and an adjustment screw means 26 are used in this embodiment as in the FIG. 1 embodiment. However, the pressure adjustment screw means bear against a top surface of the pressure distribution plate without passing through the plate, and rotational movements of the adjustment screw means 26 have the effect of lifting and lowering the arch-forming spring means. The adjustment screw means 26 is secured to the arch-forming spring member by the T-shaped member 30. The T-shaped member 30 is fixed to the arch-forming spring means so that it will not rotate relative to the spring means.

FIGS. 3 and 4 represent a preferred embodiment wherein two separate arch-forming spring means 16 are arranged in a generally side-by-side relationship within the shoe sole. As shown in FIG. 3, the arch-forming spring means, the adjustment screw means 26 and the pressure distribution plate are all arranged in an identical manner to that shown in FIG. 1. However, as shown in FIG. 4, two separate T-shaped members are secured through two separate openings formed in a single pressure distribution plate so as to carry two separate adjustment screw means within the sole of the shoe.

FIG. 5 represents a further embodiment wherein adjustment of the arch-forming spring means of a shoe can be made by an adjustment screw means extending outwardly through the rear of a shoe. In the FIG. 5 arrangement, a wedge-shaped block 40 is positioned between the arch-forming spring means and the pressure distribution plate of the shoe. The wedge-shaped block is essentially flat on its bottom and curved on its top so that as it moves backward and forward along the longitudinal axis of the shoe there is an adjustment in height and curvature of the arch area of the shoe. Forward and backward movements of the block 40 are accomplished by rotation of the adjustment screw means 26. As with the previous embodiments, the adjustment screw means includes an enlarged head portion 28 extending outside of the shoe for easy access. The adjusting screw means 26 of the FIG. 5 embodiment is mounted so that it cannot move longitudinally along its central axis. This is accomplished by mounting the adjustment screw means through a mounting bracket 42 having upstanding portions 44 for receiving the adjustment screw head. The mounting bracket 42 is secured to the heel portion of the shoe in a fixed position. An enlarged flange area 46 is provided on the adjustment screw means so that the screw cannot be moved axially through openings formed in the upstanding members 44. Thus, rotation of the adjustment screw means can be made so as to move the wedge block 40, but the screw itself will not be displaced along its axis.

FIG. 6 through 9 illustrate details of construction of typical embodiments of the working components of this invention. FIG. 6 is a bottom plan view of the T-shaped member used to secure the adjustment screw means to either the pressure distribution plate or to the arch-forming spring means. It can be seen that the T-shaped member has a sleeve portion 32 and a relatively flat portion 34. The sleeve portion is provided with a bore therethrough which is threaded to receive the threaded shank of the adjustment screw means.

FIG. 7 shows the relationship of the adjustment screw means 26 to the T-shaped member 30, and also, the relationship of the T-shaped member 30 to the pressure distribution plate 24. It can be seen that the adjustment screw means is received in threaded engagement into a bore through the sleeve portion 32 of the T-shaped member. Further it can be seen that the sleeve portion 32 of the T-shaped member is fitted through an opening (see 50 of FIG. 8) of the pressure distribution plate. It should be understood that different lengths of adjustment screw means can be provided for proper adjustment of high, normal, or low arches, while still providing for a flush mounting of the head of the adjustment screw within the recess area of the sleeve 32 of the T-shaped member.

FIG. 8 is a plan view of a typical pressure distribution plate used in a shoe having a single adjustment screw means and a single arch-forming spring means. An opening 50 is formed through the plate to receive the T-shaped member. A second opening 50 would be provided in the plate for a shoe construction made in accordance with FIG. 3, and the plate would be broader than the one in FIG. 8.

FIG. 9 illustrates a typical arch-forming spring which may be used for shaping the arch of the shoe. Preformed holes are provided at a rear end of the spring so that it can be attached to the heel portion of a shoe, as described above. In addition, the arch-forming spring means may be provided with a concave formation at 52 to receive the free end of an adjustment screw means 26. The concave formation 52 functions to maintain the relatively free end of the spring means in place without lateral movement.

FIGS. 10 and 11 illustrate further examples of structures and relationships which have been discussed above with reference to other drawings. The FIG. 10 view shows the relationships of a number of components which would be placed in a shoe assembly to provide an adjustable arch. As with the previous illustrations and discussions, element 14 represents an insole portion of a shoe construction, and this insole may be only slightly larger in size than the arch-forming spring means 16 which it covers (see FIG. 11). In such a case, an additional insole may be provided on top of the insole 14 to cover the entire bottom of a shoe in which the adjustable arch device is included. The pressure distribution plate 24, of the FIG. 10 embodiment, is formed integrally with the member 30 referred to above as the T-shaped member. The member 30, its downwardly depending sleeve portion 32, and the pressure plate 24 are all formed as a single piece, and this may be accomplished by securing elements together in any known fashion or by molding the entire structure as an integral structure. A boring 51 is formed into the member 30, and threaded, to receive the adjustment screw means 26, as with the embodiments discussed above.

FIG. 11 is a view from the underside of the arch-forming plate 16, as covered by a partial insole 14. Holes 60 and 62 are provided for brads to secure the leather insole 14 to the plate 16, and holes 64 are provided for tacking the heel portion of the plate to the heel of the shoe. The forward end of the plate is allowed to remain free.

Also, it should be understood that the adjustable arch support of this invention can be placed in various positions in a shoe construction. For example, the arch-forming spring 16 can be placed to form an arch (a) immediately forward of the heel, (b) in a normal arch position intermediate the heel and the toe, or (c) at a forward position near the toes or ball of a foot. Likewise, the lateral position of the arch-forming spring
can be varied to provide (1) an extreme outside position, (2) a middle position, or (3) an extreme inside position. The positions (a) – (c) and (1) – (3) can be combined in various ways and shoes can be cored to indicate the position of the arch in each shoe.

Although the invention has been described by reference to particular embodiments, it can be appreciated that substitutions of equivalent structures and functions can be made. For example, the pressure plate 24 and its associated structures, and the arch-forming plate 16, may be formed from synthetic resins or plastic materials, if desired. All substitutions which would be obvious to those skilled in this art or which would be considered equivalent to what has been disclosed are intended to be included in an interpretation of the claims which follow.

What is claimed is
1. An improved adjustable arch support for a shoe comprising in combination
   a shoe having an outsole and a heel portion,
   a pressure distribution plate positioned above the outsole of the shoe and secured only at its rear end to the heel portion of the shoe,
   an intermediate sole positioned above said pressure distribution plate,
   an arch-forming spring means positioned above said intermediate sole and below an insole of the shoe, said arch-forming spring means being free at its forward end and secured to the heel portion of the shoe at its rear end, and said arch-forming spring means having a longitudinal groove formation on its lower face,
   an adjustment screw means operatively positioned and secured for rotation about a vertical axis between said pressure distribution plate and said arch-forming spring means so as to adjust the height and curvature of said arch-forming spring means when it is rotated, said adjustment screw means being formed as an integral part of said pressure distribution plate, and said adjustment screw means having (a) an enlarged head portion positioned at an accessible point relative to the shoe so that adjustment can be made readily without removal of any portion or part of the shoe construction, and (b) a free end portion which is received within said groove formation for preventing lateral displacement of said arch-forming spring means.
2. The improved adjustable arch support of claim 1 wherein said adjustment screw means is threaded through a T-member which passes through an opening in said pressure distribution plate, said T-member being secured to said pressure distribution plate.
3. The improved adjustable arch support of claim 2 wherein said adjustment screw means passes through the outsole of the shoe so that said enlarged head portion is accessible from the bottom of the shoe.
4. The improved adjustable arch support of claim 1 wherein two separate arch-forming spring means are provided in a substantially side-by-side relationship so that separate adjustment of height and curvature can be made for each side of an arch of the shoe, and each of said separate arch-forming spring means being provided with an adjustment screw means.
5. The improved adjustable arch support of claim 4 wherein a single pressure distribution plate receives pressure from each of said adjustment screw means.
6. The improved adjustable arch support of claim 5 wherein each adjustable screw means is threaded through a T-member which is fitted through an opening in said pressure distribution plate, and each of said adjustment screw means passing through said outsole so that the enlarged head portions are accessible for adjustment from the bottom of the shoe.

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