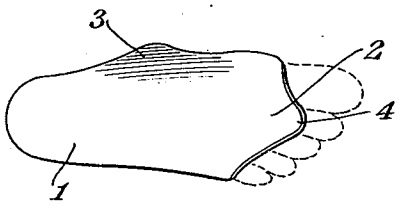
June 14, 1938. A. E. MURRAY 2,120,370

FOOT SUPPORT AND CONSTRUCTION INVOLVING THE SAME

Filed Oct. 5, 1935

Fig. 1.



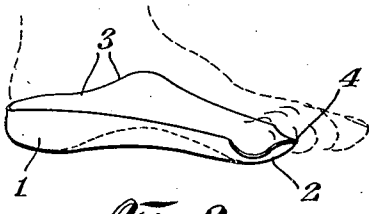


Fig. 2.

Fig. 3.

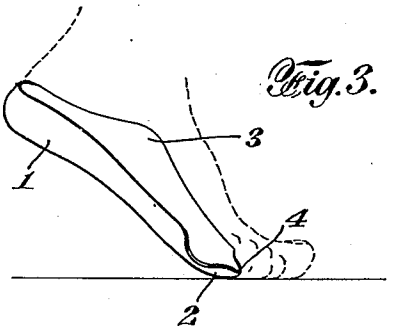
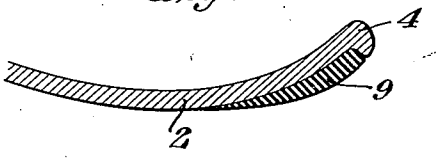


Fig. 4.



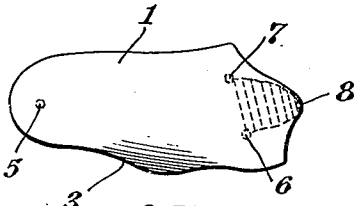


Fig. 5.

Fig. 7.

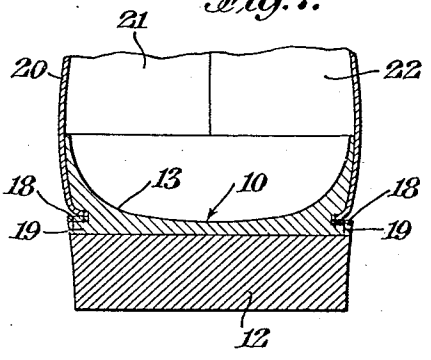
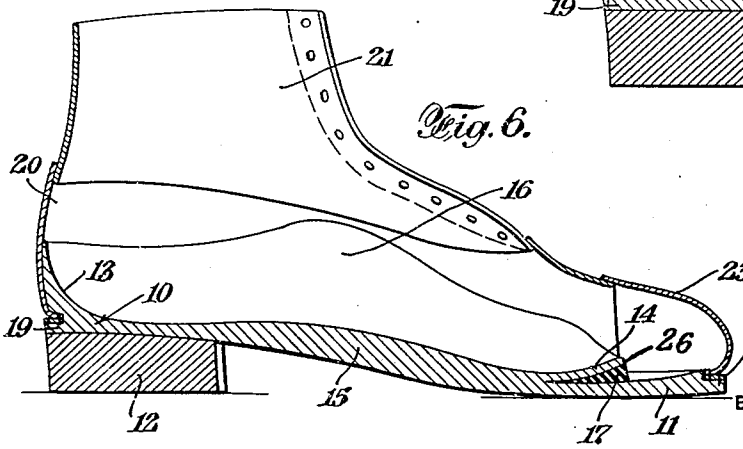


Fig. 6.



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Patented June 14, 1938 2,120,370

UNITED STATES PATENT OFFICE

2,120,370

FOOT SUPPORT AND CONSTRUCTION INVOLVING THE SAME

Alan E. Murray, New York, N. Y.

Application October 5, 1935, Serial No. 43,658

6 Claims. (Cl. 36—8.5)

My invention relates to an improved foot support which may be applied to any and all purposes for supporting the weight of the body.

The object of my invention is particularly to provide a greatly improved form of foot support which may be utilized in any and all constructions and for any and all purposes to which the weight of the body is supported by one or both feet. Hitherto the foot supporting devices such as known, arch supporters, etc., have been very inadequate as previously they did not support the foot in its natural position invariably so that the foot became displaced to a greater or less extent in the use of the foot, as in walking, running, skating, etc., and as a result caused a deformation of the foot, with the resultant formation of callouses at the places where excess pressure was produced. Furthermore, there has been, previously, the problem of adequately supporting the foot at all points while permitting the normal bending of the foot and at the same time maintaining the foot at all times in its natural position notwithstanding the bending thereof. In accordance with my invention, these difficulties and problems have been removed. I have discovered that the foot may be adequately supported without displacement thereof when bending, in the use of the foot, by means of a unitary support as hereinafter referred to in detail. At the same time, this form of support permits the foot to be readily bent in the natural and normal way without the displacement of the foot in the support and without the necessity of relatively moving parts, hinged portions, etc. Further objects of my invention will appear from the detailed description of my invention hereinafter in connection with the accompanying drawing, in which—

Fig. 1 is a plan view of a foot support made in accordance with my invention;

Fig. 2 is a side elevation of the same in horizontal position;

Fig. 3 is a similar view showing the foot support in which the foot is bent, as, for example, in walking, running, etc.;

Fig. 4 is a fragmentary cross-section thereof showing, as a modification, a built-up pyramid at the front or apex of the foot support;

Fig. 5 is an underneath view of the form of the invention shown in Figs. 1 to 3, containing a diagram indicating the weight supporting points of the foot in horizontal position as well as the changing positions thereof in the tilting or bending of the foot;

Fig. 6 is a longitudinal section of a shoe made in accordance with my invention; and

Fig. 7 is a transverse section of the same.

In the drawing, referring first to Figs. 1, 2 and 5, I have shown a unitary integral foot support 1 which may be made of any desired material, but preferably of stainless steel, cobalt tungsten alloys such as vitallium, a sheet of molded leather or leather composition of any desired character. The foot support may be swedged, cast or molded in any desired way from negative and positive dies, which latter may be obtained in any desired way, but preferably such as to conform exactly to the natural or aerial conformation of the foot as obtained in connection with the impression technique described in detail in my co-pending application upon Process of producing physiological shoes and product thereof, Ser. No. 34,888, filed August 6, 1935. Also, in making the dies for the foot support the natural or aerial position to secure the form therefor may be made with the foot in horizontal position or slightly tilted, although not as much as shown in Fig. 3, which latter is provided to illustrate the position of the foot in bending, as in walking, running, etc. In this instance it is to be noted, however, that the impression technique is to be followed in such a manner as to obtain a single positive and a single negative die extending from the rear of the foot to a point at least extending upwardly to a greater or less extent along the curve 2 at the front of the ball of the foot so as to exert a rearward holding force for the foot, to offset or balance the forwardly directed holding force exerted at the rear of the foot support. The material and rear margin 3 of the foot support will preferably correspond to the undercut line of the foot, that is the line formed by the contour of the greatest width of the bottom portion of the foot, that is to say, so that the foot support will cover and conform to what is known as the pad of the foot. In other words, the marginal line will be the line where the top curvature of the foot meets the under-curvature thereof. Preferably, also, the front portion of the foot support will extend upwardly along the curvature 2 so that the front end of the support will conform to and end at the line where the sole of the foot ends and the toes begin. In other words, the front edge thereof will end at the bending line between the toes and the sole of the foot. Preferably, also, the extreme front portion or apex of the foot support will continue so as to have a slight downwardly directed curvature 4 to provide a com-

fortable edge or end portion from the front of the support. It will be noted that the extreme front apex of the foot support, where the curvature 4 ends, falls within a distinct hollow in the foot adjacent to the big toe and generally underlying the next toe, which is the extreme end of the weight-supporting position on the pad of the foot in its final tilting position. This is illustrated graphically in the diagram in Fig. 5, from which it will be seen that in the horizontal position of the foot the weight of the body is supported normally at the three points 5, 6 and 7, whereas at the start of the tilting operation the weight is supported at the points 6 and 7 and is then shifted normally in the successive positions, as shown in the dotted lines, until the support is substantially at the point 8 underlying the curved end 4. Therefore, if desired, as shown in Fig. 4, the front extreme apex 4 may be made into a cone 9 of soft or compressible material, such as soft rubber, or any other more or less soft material, so as to provide a springy support for the foot during the tilting operation, as in walking, running, etc. This soft material will, of course, be united, as, for instance, by vulcanization, to the forward edge of the foot support and in fact the whole forward edge may be provided with an edge of such a material in the form of a beading, if desired, which material, in this instance, might be vulcanite.

In this way a one-piece foot support can be obtained which provides a complete and ample support for the foot, while at the same time permitting all the bending operations to which the foot is usually subjected and without the necessity of any hinged or bendable portion therein. Furthermore, this has the advantage of completely distributing the weight over the entire pad of the foot when in horizontal position, thus decreasing the actual pressure on any one unit of the foot. Accordingly, not only is great comfort obtained thereby, but the condition of the foot can thus be better preserved against pathological conditions, and in fact pathological conditions, when they have occurred from the use of other forms of supports for the feet, as in the case, for example, of the ordinary type of shoes, can be corrected accordingly. Thus, in accordance with my invention, the foot support made as above can be inserted in the ordinary shoe as a filler or inner sole and can, also, instead, be made as the sole portion of the shoe by conforming an inner surface of the ordinary shoe sole to the shape as above described, by using moldable materials of any desired kind, as, for example, a sheet of leather or any known leather composition, etc., for the sole, which may be conformed by the application of heat and pressure with the aid of appropriate dies. Of course, for example, where a leather composition is used the usual sole of a shoe made in the usual way may be provided just like the soles of shoes as now contained therein but in which the upper or inner surface of the sole is given a conformation like the upper surface of the support 1 down to the point 4, after which the sole opposite the toes might have any desired inner surface and which may be even the surface such as is present in the ordinary shoes opposite to the toes therein. The lateral outside portions of such molded shoe sole could be made so as to fit and be built into the ordinary shoe in the usual way and the undersurface of such molded sole could of course be flat or have the slight curvature such as is present in ordinary shoe soles when built into the shoes in the usual way.

In this way, a form for the foot is obtained, from which, what might be called an orthopedic shoe, is built up, it being understood, of course, as shown in Figs. 6 and 7, that where a sole 10, of any known moldable leather composition, of the shoe itself forms the foot support with the conformation above described, a forward end 11 of the sole opposite the toes will be an integral continuation of the foot support 1 but such that the bottom surface of the sole will be substantially flat throughout in the usual way and may have the usual heel 12 applied thereto but the upper surface 13 within the shoe will have the conformation and properties as above described, while the portion 11 thereof, opposite to the toes, will of course be thin to permit the bending of the sole at the toe portion but without any appreciable bending of the support beneath the pad of the foot. As will be seen in Fig. 6, the front part of the pad of the foot is supported by an upwardly curved portion 14 extending forwardly from a thick substantially rigid portion 15 of the sole which is made further rigid by reason of the lateral upwardly directed portions 16 on either side of the shoe and integral with the sole 10. Also, the extreme forward edge of the portion 14 is provided with a rounded or beaded edge 26 and beneath the portion 14 there is a tapered recess in which there may be provided, if desired, a filler 17 of compressible rubber so that in walking the portions 15 and 14 which cover the pad of the foot, will not bend to any appreciable extent whereas the portion 11, opposite the toes, will bend in this way, the portion 14 will have substantially a rolling action over the portion 11 due to the compression of the soft rubber 17. Also, the shoe may be completed in any of the known or desired ways, as, for example, by providing a welt 18 stitched to a surrounding flange 19 on the sole 10, which welt has been previously stitched to the usual side portion 20 of the shoe, said side portion in turn being stitched to the usual uppers 21, 22 in the usual way and the said side piece 20 may also be stitched to a toe piece 23 which is also stitched at its lower portion to the welt 18, which latter is stitched to the flange 19 of the sole as above described. Of course the shoe may have any of the usual types of lining, if desired. However, it will be understood that in any and all of the forms of my invention as above described, the extreme forward portion or apex of the support may be arranged to bend slightly when the foot is in action, even in the embodiments in which the support is made of metal. In fact this will occur to a slight extent due to the narrowness of this portion in the case of the metal supports described above.

The constructions as described above furthermore provide a hold or grip by the big toe and the two adjacent toes on the foot support, so that these toes actually assist in the rolling action which takes place in the bending of the foot, as in walking, running, etc. This action is, in fact, a distinct corrective for the metatarsal as it strengthens the toes and the forward part of the foot. Also, in the bending or rolling action of the foot which is accompanied by the bending of the toes, the forward edge of the foot support will not in any way irritate the toes as this movement is accomplished by the toes being slightly lifted away from the forward edge of the foot support, as will be readily understood from the

normal bending action of the foot. At the same time it will be realized that the foot support adequately supports all of the arches or hollow points in the conformation of the pad of the foot and, therefore, all relative movement between the foot and its support or shoe is thereby completely eliminated. Therefore, also, it will be readily seen that the breaking-in of shoes made in this way is entirely unnecessary.

The foot supports or shoes made in accordance with my invention have a universal applicability for the reasons pointed out above, but are especially advantageous wherever the foot is subjected to undue use and strain, as, for example, in the army and in the case of all organizations where the people need to use their feet to an unusual extent.

While I have described my invention above in detail I wish it to be understood that many changes may be made therein without departing from the spirit of the same.

I claim:

1. A unitary foot support conforming substantially to the under-portion of the foot and extending from the rear of the heel forwardly and having a height up to and following the undercut line of the foot.

2. A unitary foot support conforming to the natural curvature of the under-portion of the foot and extending from the rear of the heel merely to a point adjacent the rear of the toes, the marginal contour thereof around the sides and rear of the support following the undercut line of the foot.

3. A unitary foot support conforming to the natural curvature of the under-portion of the foot and extending from the rear of the heel merely to a point adjacent the rear of the toes where the front of the support comprises a V-shaped line, the marginal contour thereof around the sides and rear of the support following the undercut line of the foot.

4. A unitary foot support conforming to the natural curvature of the underportion of the foot and extending from the rear of the heel merely to a point in the upward curvature at the front of the foot adjacent the rear of the toes where the front of the support comprises a V-shaped line, the marginal contour thereof around the sides and rear of the support following the undercut line of the foot.

5. A unitary foot support conforming to the natural curvature of the underportion of the foot and extending from the rear of the heel merely to a point in the upward curvature at the front of the foot adjacent the rear of the toes where the front of the support comprises a V-shaped line, the marginal contour thereof around the sides and rear of the support following the undercut line of the foot, the extreme forward portion of said upward curvature being yielding as compared with the rest of the support.

6. A shoe having a sole comprised of a unitary foot support conforming to the natural curvature of the underportion of the foot and extending from the rear of the heel to a point on the upward curvature at the front of the underportion of the foot located at the rear of the toes, said sole having a bendable front portion extending forwardly beyond said point and separated by a rearwardly directed recess from the part of the sole which is comparatively rigid located at said point, said recess having a filling of compressible resilient material.

ALAN E. MURRAY.