

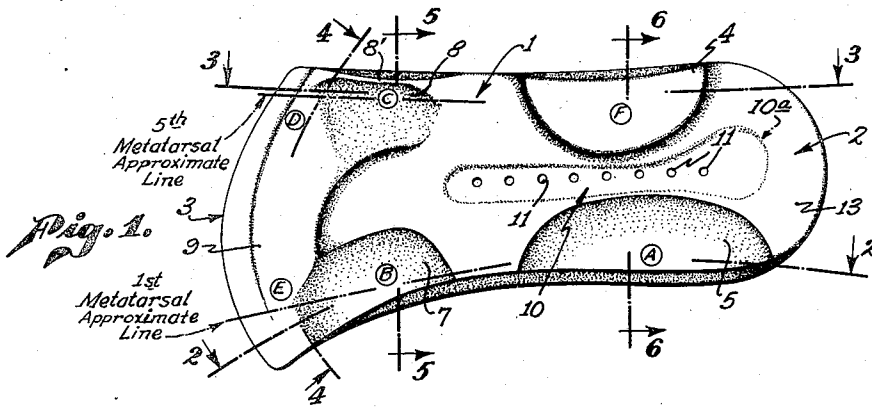
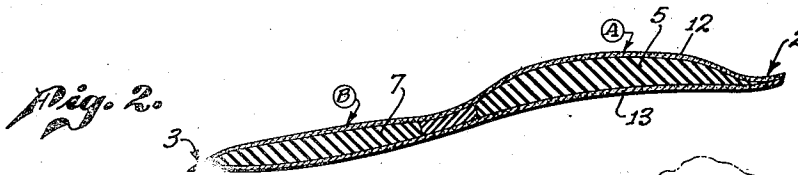
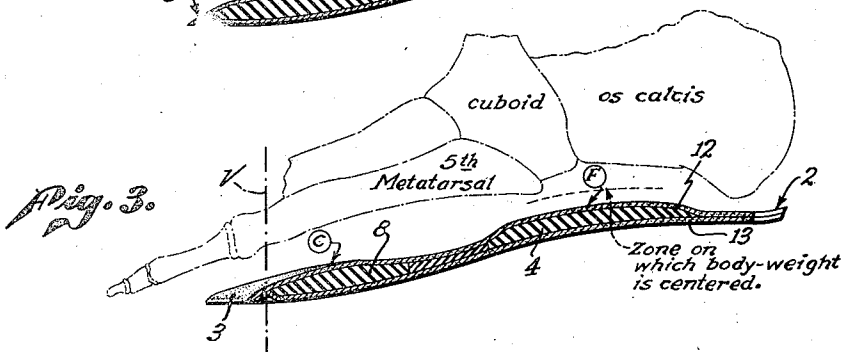
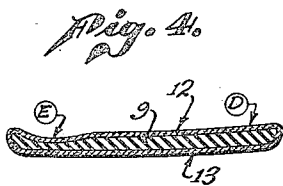
June 23, 1942.

W. C. BURNS

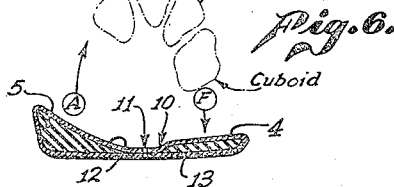
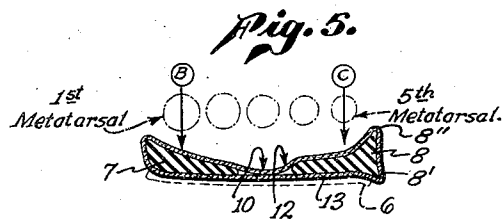
2,287,341

BODY-WEIGHT-DISTRIBUTING CONSTRUCTION FOR SHOES AND THE LIKE

Filed June 2, 1941



Cuneiform Bones
External Middle Internal



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2,287,341

BODY-WEIGHT-DISTRIBUTING CONSTRUCTION FOR SHOES AND THE LIKE

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Application June 2, 1941, Serial No. 396,309

5 Claims. (Cl. 36-71)

This invention relates to a pad or shoe construction adapted to be worn subjacent the weight-bearing portions of a foot for the purpose of securing a desirable distribution of the body weight to the portions of the foot structure which are best adapted to carry such weight without inducing a weakening of the muscular structure of the foot. This invention may be considered as an improvement on the structures described and claimed in my earlier issued Patents No. 1,728,780, dated September 17, 1929, and No. 2,081,474, dated May 25, 1937.

The principal object of this invention is to provide a pad or shoe construction adapted to extend subjacent substantially the full weight-carrying area of the foot and having protuberances or elevations which enforce a desired position of the bones in the foot so that the body weight is caused to be communicated more directly through the os calcis and the astragalus to the tibia, without interference with the spring function of the metatarsal division of the foot.

Prior disclosed supports of the general character with which the subject matter of this invention is concerned have for the most part constituted "arch supports" which have provided a positive support for the longitudinal arch of the foot, and I have heretofore recognized that this portion of the foot was not intended by nature nor structurally adapted to function as a weight-bearing portion, but rather to communicate to the leg the body loads imposed at the so-called "ball" of the foot in walking, and the "arch" is formed to keep the cords, arteries and nerves along the sole of the foot from being compressed when the body weight is supported by the foot, and a large proportion of the body weight is carried directly by the heel bone or os calcis. The pad structures set forth in the above issued patents were developed on a contemplation that particular portions of the foot could be caused to carry a greater proportion of the body weight by providing pad portions of increased height or thickness under the positions at which the greater proportion of the weight should be borne. I have subsequently determined that this contemplation is in error, in that it failed to take into account the involuntary reactions of the wearer which resulted in a substantially uncontrollable tendency for that individual to relieve the pressure resulting from the weight accentuation provided by the thickened pad portion, causing the individual to attempt to shift his weight onto the very portions of the foot at which the lightest load was intended by nature to be borne.

According to the present invention I provide a device of the character described in which a plurality of soft rubber or like pads or shoulder members are disposed underneath a plurality of weight-bearing portions of the foot, such pads varying in height or thickness in such manner that the thinnest pad member is located at the position where the greatest proportion of weight is to be borne, and the other pad portions are made of increased heights or thicknesses, wherefore this involuntary tendency of the user to shift the body weight is utilized to cause such shift to be directed onto the foot portions upon which the principal proportion of the body weight is desirably carried.

The accompanying drawing illustrates a pad structure embodying the present invention, and referring thereto:

Fig. 1 is an inverted plan view of a pad member or "inner-sole" incorporating this invention, and Figs. 2 through 6 are erect sectional views as taken on the corresponding numbered section lines in Fig. 1.

Referring to the drawing, the pad structure is indicated generally at 1, comprising a posterior or heel portion 2 and an anterior portion 3. The length of the pad member will be so established with reference to the length of the foot of the user that the anterior portion 3 lies subjacent and immediately rearward of the metatarsal-phalangeal joints. This is indicated by the vertically extending dot-dash line V in Fig. 3, showing how the pad member underlies the fifth metatarsal joint. The width of the pad member at its anterior portion will be slightly greater than the separation of the first and fifth metatarsal axes, indicated in Fig. 1 by the dotted lines respectively designated as "1st metatarsal approximate line" and "5th metatarsal approximate line," so that the pad portions will be located inwardly and outwardly beyond the respective axes, and preferably at positions substantially conforming to the width of the sole. The width of the posterior section of the pad will comparably conform generally to the transverse dimensions of the foot in this zone.

The construction of this invention will be provided with a plurality of protuberances or elevated members which cooperate to secure the desired weight distribution. The numeral 4 indicates the elevated member upon which the principal proportion of the body weight is to be concentrated, and this member is located along the lateral side of the foot at a position substantially below the cuboid and the forward por-

tion of the os calcis, i. e., below what may be termed the "cuboid arch" of the foot, the preferred relation thereof being indicated particularly in Figs. 3 and 6. Opposite the member 4, on the medial side of the foot, I provide a complementary elevated member 5 which is of materially greater height than the shoulder member 4 and cooperates therewith as shown more particularly in Fig. 6 to cause a shift of the body weight onto the shoulder 4. I have identified the weight concentration points on the above-mentioned elevated shoulder members by encircled reference letters, as at A through F, and with particular reference to Fig. 6, it will be seen that the pressure imposed at the position A will cause a supination of the foot, which will, taken with the natural reaction tendency of the wearer, impose a greater load upon the area F on the shoulder member 4. In general, the height or thickness of the shoulder member 5 may be approximately two to four times that of the shoulder 4.

The result of this shift of body weight to a position under the "cuboid arch" causes the weight to be borne by the rather heavy muscle pad at this position, and serves to elevate the longitudinal arch of the foot and prevent a pronation of the foot which usually results from a weakened longitudinal arch condition. It also improves the foot comfort by relaxing the nerve cord running along the instep.

This construction provides a form of "arch support" in that the body weight is caused to be supported principally at the rearward portion of the longitudinal arch, under the "cuboid arch," but no weight is allowed against the main portion of the arch itself, wherefore no weakening of the longitudinal muscles of the arch will result. Conversely, the fact that the principal proportion of the body weight is carried on the "cuboid arch," and that the nerves, cords and arteries along the inside of the foot are relaxed, the arch muscles are able to strengthen themselves as the result of use, without postural discomfort to the wearer.

I preferably provide additional elevated shoulder members at the anterior portion of the construction to further cooperate with the shoulder member 5 in the distribution of weight toward the area F on the member 4, and the heights of these additional shoulder members bear a preferred relation to the heights of the shoulder members 4 and 5 and to each other. These additional shoulder members may comprise a member 7 located on the medial side of the foot posteriorly of the first metatarsal joint, whose pressure concentration zone is indicated at B, a shoulder member 8 located posteriorly of the fifth metatarsal joint, whose pressure concentration zone is indicated at C, and a laterally elongated anterior shoulder member 9 extending across the full anterior portion 3 of the device, the pressure concentrations upon which are indicated by the transversely separated zones designated at D and E.

The vertical thicknesses or heights of the respective shoulder members will be made of decreasing order from A through F for the optimum realization of the advantages of the invention. The thickness of the shoulder member 5 (A) is thus the greatest and the thickness of the shoulder member 7 (B) will be next. The above relation between the thickness of the shoulder members 5 and 4 is established in a corresponding fashion between the shoulder members 7 and

4, wherefore the shoulder member 7 cooperates to shift a portion of the body weight posteriorly toward the shoulder member 4. The thickness of shoulder member 7 being greater than the thickness of shoulder member 8 causes also a weight distribution towards the shoulder member 8, and owing to the fact that the thickness of shoulder member 8 is greater than that of the shoulder member 4 a proportionate shift of its weight towards shoulder member 4 is also obtained.

The outer or lateral edge of the shoulder member 8, at the lower side thereof, may be thickened sharply downward, as at 8', when the construction is formed as a separate pad member, so as to cause the pad member to "hook" over the lateral edge of the insole shown at 6 and more positively position the pad member within the shoe. This shoulder portion 8' will obviously be omitted if the structure of this invention is formed integrally with the shoe itself.

As a result of the provision of shoulder members in the relation above described, substantially no part of the body weight is carried directly by the longitudinal arch of the foot, and this arch is thereby permitted to act normally as nature intended, to protect the cords, arteries, and nerves at the underside of the arch.

The anterior or metatarsal arch shoulder member 9 is preferably made of decreasing thickness from the lateral to the medial portions thereof, the thickness at the zone D, subjacent the axis of the fifth metatarsal, being preferably less than that at the zone C in the shoulder member 8, and the thickness at the zone E, subjacent the axis of the first metatarsal, being proportionately less than the thickness at the zone D, the thickness at the zone E, however, being still greater than that at the zone F as defined by the shoulder member 4. The shoulder members 7 and 8 will extend transversely beyond the respective axes of the fifth and first metatarsals and will be of slightly greater thickness at the respective laterally and medially spaced portions thereof, so that the resultant upward slant of the shoulder members at each side of the foot will keep the foot from slipping transversely off the shoulder structure.

The thickness of the pad member at the heel portion 2 is established at a minimum so that the wearer's heel is "locked" back of the shoulder members 4 and 5, and I preferably carry this minimal thickness forward along the central portion of the pad as indicated at 10 to avoid compression of the arterial and nerve conduits of the foot, and this zone is preferably provided with perforations as indicated at 11 to facilitate the complete relaxation of the sole of the foot into this zone. Preferably, this central portion is thinned down under the central portion of the heel and between the shoulders 4 and 5, as indicated generally by shading at 10a, to impart the maximum comfort to the wearer and protect such conduits to a maximum.

With more specific reference to the actual shape of the individual shoulder members 4 through 9, it may be said that the interior marginal limits of the shoulder member 4 may be quite abruptly skived toward the thinnest portions of the pad member, as indicated by the shading in Fig. 1, and the superficial area of this shoulder member may be made relatively flat, so that the member is of substantially uniform thickness at all portions. With reference to the shoulder member 5, this member is preferably of

greatest thickness at its longitudinally central position along the lateral edge thereof, tapering forward, inward, and rearward thereof with an accent on the taper inward toward the zone 10, which taper is made rather steep so that the wearer will have little or no tendency to carry his weight on this portion when he walks or stands erect. The shoulder members 7 and 8 are of greatest thickness at the respective medial and lateral edges thereof (it being appreciated that the expressions "medial" and "lateral" are employed in this description in reference to the edges of the pad structure which underlie the respective "medial" and "lateral" edges of the foot) and are tapered inward therefrom. This taper will preferably be slightly concave, so that a hollow will be formed under the respective first and fifth metatarsals to cause a positioning of the foot with respect to such shoulder members. The lateral edge 8' of the shoulder member 8 will preferably be made rather thick to prevent any tendency for the foot to "ride" up along the inclined surface of the shoulder member and over the edge thereof. Furthermore, the shoulder member 8 is caused to taper posteriorly and inward to a more marked degree than its taper anteriorly toward the zone D. The member 9 may be skived off quite abruptly at its anterior and posterior edges with a gradual taper laterally from the zone D to the zone E at which point the minimum thickness is provided, beneath the first metatarsal axis. The forward edge 3 of the pad is caused to fold abruptly over the forward edge of the shoulder member 9 so that the toes and the sole portion subjacent the metatarsal joints will "hook" over the anterior end of the pad member in the production of a modified "grip" upon the shoe, which has been found to contribute materially to the comfort of the pad during walking movements.

With specific reference to the materials with which the pad structure may be formed, I may employ a medium soft rubber or even leather to build up the thickness of the shoulder members, the shoulder members being attached primarily to an upper leather or the like layer 12 corresponding to the conventional "inner-sole," and the lower surface 13 of the pad member may comprise a comparatively thin layer of leather or the like which functions to smooth out the abrupt changes in the pad thicknesses and to enclose the structure. In Fig. 1 the elevations of the various shoulder members are delineated as though the inner-sole layer 12 were disposed substantially in a plane. In Figs. 2 through 6 I have more properly illustrated the shape and disposition of the respective shoulder members with reference to the position adopted thereby within a shoe in response to the pressure imposed thereupon by the wearer. It will be appreciated that the device may be preformed to have the shape ultimately adopted after use, although this is not essential. It will further be appreciated that the respective shoulder members may readily be incorporated in the shoe last itself rather than in a separable inner-sole type of pad member, if desired, without departure from the spirit and scope of this invention. In the subjoined claims, therefore, I have defined the invention in terms of a plurality of shoulder members provided at the inner weight-bearing surface of a shoe structure in contemplation of integral or separable structures cooperating with a shoe structure in the attainment of the desired features of this invention.

I claim:

1. A weight-distributing construction for use in a shoe at the inner weight-bearing surface thereof, which comprises: a plurality of spaced elevated shoulder members adapted to underlie the sole of the foot of the wearer of the shoe, one of said shoulder members being located at a position such as to be subjacent the cuboid arch of the foot, and each of the remainder of said plurality of shoulder members being located in spaced relation to said one shoulder member, and of materially greater vertical thickness than said one shoulder member.

2. A weight-distributing construction for use in a shoe at the inner weight-bearing surface thereof, which comprises: a plurality of spaced elevated shoulder members adapted to underlie the sole of the foot of the wearer of the shoe, one of said shoulder members being located at a position such as to be subjacent the cuboid arch of the foot; a second shoulder member being located in laterally spaced relation to said one shoulder member and of materially greater vertical thickness than said one shoulder member; and a third shoulder member located at a position such as to be subjacent and slightly posterior of the first metatarsal-phalangeal joint of the foot, said third shoulder member being of materially greater vertical thickness than said one shoulder member and of less vertical thickness than said second shoulder member.

3. A weight-distributing construction for use in a shoe at the inner weight-bearing surface thereof, which comprises: a plurality of spaced elevated shoulder members adapted to underlie the sole of the foot of the wearer of the shoe, one of said shoulder members being located at a position such as to be subjacent the cuboid arch of the foot; a second shoulder member being located in laterally spaced relation to said one shoulder member and of materially greater vertical thickness than said one shoulder member; a third shoulder member located at a position such as to be subjacent and slightly posterior of the first metatarsal-phalangeal joint of the foot, and a fourth shoulder member spaced laterally from said third shoulder member and at a position such as to be subjacent and slightly posterior of the fifth metatarsal-phalangeal joint of the foot, said third shoulder means being of a vertical thickness materially greater than that of said one shoulder member and less than that of said second shoulder member, and said fourth shoulder member being of a vertical thickness less than that of said third shoulder member and greater than that of said one shoulder member.

4. A weight-distributing construction for use in a shoe at the inner weight-bearing surface thereof, which comprises: a plurality of spaced elevated shoulder members positioned to underlie the sole of the foot of the wearer of the shoe, one of said shoulder members being located at a position along the medial edge of such sole such as to be subjacent the cuboid arch of the foot, the second of said shoulder members being located in laterally spaced relation to said one shoulder member to underlie the lateral edge of such sole, a third shoulder member located at the medial edge of such sole in such position as to underlie the first metatarsal-phalangeal joint of the foot but slightly posteriorly thereof, a fourth shoulder member spaced laterally from said third shoulder member and at a position such as to be subjacent and slightly posterior

of the fifth metatarsal-phalangeal joint of the foot, and a laterally elongated metatarsal arch shoulder member positioned adjacent said third and fourth shoulder members anteriorly thereof, the vertical thickness of said third shoulder member being less than the vertical thickness of said second shoulder member, the vertical thickness of said fourth shoulder member being less than said third shoulder member, the vertical thickness of said metatarsal shoulder member

being less than that of said fourth shoulder member, and the vertical thickness of said one shoulder member being less than the vertical thickness of said metatarsal shoulder member.

5 5. The construction as set forth in claim 4, the vertical thickness of said metatarsal shoulder member being decreased from adjacent the lateral end thereof toward the medial end thereof.

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