Fig. 1

Fig. 3

Fig. 5

Fig. 6
My invention relates to weight distributing shoe shanks of resilient sheet material, preferably tempered spring steel.

It is a purpose of my invention to provide a shoe shank that is to be built into a shoe by interposition between an outer and an inner sole, that is, of such a character that it controls the bone structure of the foot so as to distribute the weight of the body on the foot structure in the way it would be naturally supported, if the normal foot were in engagement with a supporting surface, such as the ground, without being encased in a shoe. When not harnpered by a shoe, as the normal foot starts into forward motion, the weight is first thrown on the heel bone or os calcis, and after that forwardly on the outer side of the foot, forwardly of the heel or on the outer longitudinal arch, and finally on the ball of the foot or metatarsal arch. In the wearing of shoes, because of having heels thereon, normal weight bearing does not exist and as a result the outer longitudinal arch of the foot is put under a strain, which produces weakness thereof, and mal-alignment of the arch bones, the cuboid, the three cuneiform and scaphoid, and further causes both the inner longitudinal arch of the foot to weaken and the foot to roll inwardly or pronate, throwing the inner edge portion of the foot to a lower than normal position. Due to the whole foot structure being in an abnormal position, the two lower leg bones are thrown in a twisted or unnatural position, which causes the legs to appear to be knock-kneed.

The distinct advantage my invention has over other known shoe shanks and similar devices, is that it will hold the bone structure of the foot and the leg bones in a more normal position, and in cases of foot weakness and mal-alignment of the bones, will help to restore them to normal.

It is a purpose of my improved shoe shank to control and support the bone structure of the foot to produce a normal and natural weight balancing. Since the heel bone or os calcis is the largest bone of the foot, and the key controlling bone thereof, it is necessary that this bone be held in its correct position to avoid its twisting, rotating or pronating. This is accomplished, in my new and improved shoe shank, by providing means for elevating the inner forward portion of the heel of the foot, so as to roll the weight to the outer side of the foot or outer longitudinal arch.

In order to properly support the foot at the outer longitudinal arch, my improved arch supporting shank is provided with a longitudinal arch supporting portion that is located along the outer side of the insole between the forward end of the longitudinal arch supporting portion of the shoe and the forward metatarsal arch supporting or ball portion of my weight distributing shank.

My improved shank further is provided with a transversely elongated forward metatarsal arch supporting portion that extends from the forward end of the longitudinal arch supporting portion under all of the bones of the metatarsal arch structure, and is provided with a domed portion that curves upwardly from adjacent the side edges and the forward and rear edges of the metatarsal arch supporting portion to a central high point substantially midway between said side edges and front and rear edges thereof.

It is the purpose of my invention to provide the basic structure for shoes that will control and support the bone structure of the foot to produce a normal and natural weight bearing. In order to accomplish this purpose it is necessary to provide the above referred to means for elevating the inner forward portion of the heel, the means to support the longitudinal arch and the metatarsal arch supporting means hereinbefore referred to.

It is a further purpose of my invention to provide a flat marginal bearing edge portion along the forward marginal edge and the outer marginal edge of said metatarsal arch supporting portion that bears against the outer sole, or, outside, of the shoe, and projects the upwardly domed portion upwardly therefrom so that the same rises from an elevation of about one-sixteenth of an inch at the marginal portions of said domed portion to an elevation of about three-sixteens of an inch at the center thereof to place the bones of the metatarsal arch in proper position and to distribute the weight properly across said metatarsal arch, thereby avoiding the dropping of the second, third and fourth metatarsal arch bones, the dropping of which causes callouses on the bottom of the foot.

It is a further important advantage of my invention to provide a shank structure, that is of such a character that, while it controls and supports the entire bone structure so as to distribute the weight in the manner that nature intended, does not restrict the muscle functions or the purpose of said inner longitudinal arch, permitting unrestricted motion and elongation of the inner longitudinal arch and allowing it to perform its intended function of acting as a spring or shock absorber for the body.

It is a further purpose of my invention to provide a shank for shoes that has its rear end portion so constructed that it will allow the central heel nail of said shoes to be nailed to the insole and which is so located that it will allow the heel bone of the foot to pocket into the insole of the shoe, thereby giving additional control to the heel bone and hence to the rest of the foot. Said rear portion of my improved shoe shank comprises a pair of laterally spaced attaching ears that flatly engage the insole above the shoe heel, but it includes an upwardly transversely toward the inner side thereof and the forward end thereof to the widest part of said rear portion, to thus provide a raised or higher inner portion forwardly of the rear end of said rear portion of said shank, that reaches its point of highest elevation adjacent the forward edge of the heel of the shoe on the inner side thereof, for throwing the weight at the heel of the foot toward the outside of the foot and toward the outer longitudinal arch.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shwon or described except as defined in the claims.

In the drawings:

Fig. 1 is a bottom plan view of a shoe, showing my improved shoe shank mounted in position therein, in dotted outline.

Fig. 2 is a fragmentary enlarged vertical section view taken on the line 2—2 of Fig. 1, the shoe upper being broken away.

Fig. 3 is an enlarged fragmentary vertical sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 1, the upper of the shoe being broken away.
Fig. 5 is a fragmentary vertical sectional view taken on the line 5-5 of Fig. 1, through the insole, outsode and shank member.

Fig. 6 is a view similar to Fig. 2, taken on the line 6-6 of Fig. 1.

Fig. 7 is a side elevational view of my improved weight distributing shoe shank detached, and

Fig. 8 is a diagrammatic view showing the bones of the foot in dotted outline of the outline of the shoe and my improved weight distributing shank member in full lines in relation to the foot bone structure.

Referring in detail to the drawings, my improved shoe shank comprises a forward metatarsal arch supporting portion 10, an intermediate longitudinal arch supporting portion 11, and a rear heel supporting portion 12. Said rear portion 12 comprises a pair of longitudinally rearwardly extending attaching ears 13 and 14, the ear 13 being longer than the ear 14, and each of said ears tapering slightly toward the rear curved end edges 15 and 16 thereof, respectively. The ear 13 is both longer and extends rearwardly beyond the rear edge of the ear 14 and said ears are spaced from each other so as to provide an opening or cut-out portion 17 lying between said ears to provide for the nailing of a rubber heel to the insole between said ears 13 and 14.

Said longitudinal arch widening from its rear end to its junction with the longitudinal arch supporting portion 11, having an obliquely extending inner edge 18 that terminates at a point 19 adjacent the forward edge of the heel of the shoe, at the junction with the longitudinal arch supporting portion 11. The outer edge 20 of my improved shoe shank extends substantially parallel to the outer edge of the outsole and insole, the outsole being indicated by the numeral 21. Said rear portion 12 inclines upwardly from a point substantially as far forwardly as the inner end 22 of the cut-out portion 17 to the junction 19 with the longitudinal arch supporting portion 11, and the portion thereof forwardly of the ears 13 and 14 also inclines transversely from about the longitudinal center of said portion 12 to the inner edge 18 thereof, the inclined portion being indicated by the numeral 23 in Figs. 2 and 3. Thus the junction 19 of the inner concavely curved edge portion 24 of the longitudinal arch supporting portion 11 with the outer inclined edge 18 of the rear portion 12 is elevated about one-fourth of an inch higher than the outer edge portion 20 of said rear portion 12 of said arch supporting member, and the ears 13 and 14 that engage the outsole 21 and insole 25 flatter.

The longitudinal arch supporting portion 11 of my improved shoe shank has the inner edge 24 thereof concavely curved from the junction 19 of the wider rear portion 12 therewith to the junction of the longitudinal arch supporting portion 11 with the forward portion 10, the concave curvature of the edge 24 being on a longer radius rearwardly of the narrowest portion 26 thereof than forwardly of said narrowest portion. The outer longitudinal edge 20 of my shoe shank extends at a slight curvature from the rear portion 12 outwardly to the junction 27 of the same with the forward convexly curved edge 28 of the forward metatarsal arch supporting portion 10. The major portion of the longitudinal arch supporting portion 11 of said shoe shank, it will be noted, lies on the outer side of the longitudinal center line of the shoe, or along the outer side of the insole and outsole, the only portion thereof that lies inwardly of said center line being the gradually inclined portion that joins it with the rear portion 12 just forwardly of the heel. The heel being indicated generally by the numeral 29. If found desirable, the longitudinal arch supporting portion may be stiffened by providing a rib or corrugation 30 therein, running lengthwise thereof adjacent the outer edge 20. It will be noted that the longitudinal arch supporting portion 10 inclines gradually downwardly from the rear portion to the forward portion thereof.

The forward metatarsal arch supporting portion 10 extends transversely the full width of the metatarsal arch structure of the foot, as will be obvious from Fig. 6, underlyng all of the bones of the metatarsal arch. It is of a generally elliptical character, elongated transversely of the shank and of the shoe, and has a convexly curved inner edge portion 31 that joins the forward convex edge portion 28 with a rear convex edge portion 32, which joins the concavely curved inner edge portion of the longitudinal arch supporting member 11 in a smooth curve, the forward end of said inner concave edge 32 terminating substantially in the middle of the length of the longitudinal arch supporting portion 10. Said forward metatarsal arch supporting portion 10 is provided with a marginal flange portion 33 that flatly engages the outsole 21 so that the various portions of the portion 10 at a desired elevation and to prevent the cutting of the edge of the arch supporting portion 10 into the sole 21. Said flattened narrow flange portion 33 extends along the forward edge 28 and the inner side edge 51 of said metatarsal arch supporting portion 10.

Said metatarsal arch supporting portion 10 is of a concavo-convex character, being domed up or curving upwardly from all the edges thereof toward the center of said portion 10, said domed up portion being indicated generally by the numeral 34. It will be noted upon reference to Figs. 4 and 5 that the upwardly domed portion 34 of the metatarsal arch supporting portion 10 gradually curves upwardly from the inner and outer edges thereof to the middle thereof, as shown in Fig. 4, and from the forward and rear edges thereof to the middle thereof, as shown in Fig. 5. Preferably the domed up portion 34 is raised about one-sixteenth of an inch above the marginal flange 33 adjacent the same and about three-sixteenths of an inch at its highest elevation at the center thereof.

In Fig. 8 the bones of the foot are indicated in dotted outline with relation to the various portions of my improved shoe shank and the outline of the shoe sole is indicated therein. It will be noted that the metatarsal arch supporting portion 10 extends completely under all five bones of the metatarsal arch to support the same, the inner end portion thereof underlying the first metatarsal bone of said arch and the outer end thereof underlying the fifth metatarsal bone. The gradually raised dome-like portion 34 underlies the second, third and fourth metatarsal bones so as to raise these in a gradual transverse curve so that these have their natural position with respect to the first and fifth metatarsal bones. It will also be noted that the heel portion or rear portion 12 of my improved weight distributing shank does not underlie but a small portion of the main heel bone or os calcis, thus permitting it to pocket in the heel of the shoe in a desired manner. In order to accomplish this, the attaching ear 14 is made somewhat shorter than the attaching ear 13 and the opening 17 is provided instead of having a rear end portion on said shank extending from the edge 18 to the edge 20 of the shank. It will also be noted that the upwardly inclined portion 23 of said rear heel portion 12 of my improved shoe shank will throw the weight of the body acting on the foot outwardly toward the outer edge 26 of the shoe and onto the longitudinal arch supporting portion 11 as the weight shifts forwardly in the walking motion, and that the entire inner longitudinal arch structure of the foot is free to move so as to provide the desired cushioning or spring action of said inner longitudinal arch portion concavely curved edge portion 24 being so located that, from slightly forwardly outboard portion of the rear heel portion 12 to the metatarsal arch supporting portion 10 there is no metallic shank structure underlying the inner side of the longitudinal arch structure of the foot, the longitudinal arch supporting structure 11 only underlying the outer longitudinal arch bone structure, which arch structure is designed to bear the weight thereon that is gradually shifted forwardly from the heel portion to the
ball portion of the foot during forward movement of the body in a normal walking action. By providing the upwardly inclined portion 23 to raise the rear heel portion of my improved shoe shank to its maximum height adjacent the forward inner portion of the shoe heel, the weight is thrown toward the outer side of the heel of the shoe and the outer side of the longitudinal arch portion of the foot, and as pointed out above, progressively toward the forward end of said longitudinal arch supporting portion and to the metatarsal arch as a forward walking motion takes place, the raised portion of the rear part 12 of my improved shoe shank, the longitudinal arch supporting portion thereof, and the metatarsal arch supporting portion thereof operating successfully to properly distribute the weight and support the weight that is acting on the foot structure as the forward walking motion takes place.

If desired a wedge shaped filler member 35 can be placed on the insole and secured thereto before placing the shank in position, the filler member being located under the upwardly inclined portion 23 of the shank.

What I claim is:

1. A shoe shank of resilient sheet material adapted to be interposed between an outer and inner sole, comprising a transversely elongated concavo-convex forward metatarsal arch supporting portion, an intermediate portion of less width than said forward portion extending rearwardly from said metatarsal arch supporting portion along the outer side of said shank, and a rear portion wider than said intermediate portion and extending inwardly beyond the inner edge of said intermediate portion, said rear portion having its maximum width adjacent its forward end, being provided with a pair of rearwardly extending transversely spaced ears, said wider rear portion inclining upwardly transversely toward the inner edge thereof and longitudinally toward the forward end thereof of said rear portion being elevated above the outer margin of said rear portion and above said intermediate portion.

2. A shoe shank of resilient sheet material adapted to be interposed between an outer and inner sole, comprising a transversely elongated concavo-convex forward metatarsal arch supporting portion curving upwardly from the peripheral edges to the center thereof and having flat marginal supporting edge portions, an intermediate portion of less width than said forward portion extending rearwardly from said metatarsal arch supporting portion at the outer side of said shank, and a rear portion wider than said intermediate portion and extending inwardly beyond the inner edge of said intermediate portion, said rear portion having its maximum width adjacent its forward end and being provided with a pair of rearwardly extending flat ear portions, said wider rear portion gradually inclining upwardly transversely toward the inner edge thereof and longitudinally toward the forward end thereof of said rear portion and said intermediate portion inclining upwardly rearwardly to the forward inner corner of said rear portion to elevate said rear portion above the outer margin of said rear portion and above said intermediate portion.

3. A shoe shank of resilient sheet material adapted to be interposed between an outer and inner sole, comprising a transversely elongated forward metatarsal arch supporting portion, an intermediate portion of less width than said forward portion extending rearwardly from said metatarsal arch supporting portion along the outer side of said shank, and a rear portion wider than said intermediate portion and extending inwardly beyond the inner edge of said intermediate portion, said rear portion having its maximum width adjacent its forward end and being provided with a pair of rearwardly extending transversely spaced flat ears, said wider rear portion inclining upwardly longitudinally and transversely toward the inner edge thereof forwardly of said ears to the forward inner corner thereof to elevate said corner above all other portions of said wider rear portion, the outer marginal edge of said shank being slightly concavely curved from the forward edge of said forward portion to the rear end of said rear portion.

4. A shoe shank of resilient sheet material adapted to be interposed between an outer and inner sole, comprising a transversely elongated forward metatarsal arch supporting portion, an intermediate portion of less width than said forward portion extending rearwardly from said metatarsal arch supporting portion along the outer side of said shank, and a rear portion wider than said intermediate portion and extending inwardly beyond the inner edge of said intermediate portion, said rear portion having its maximum width adjacent its forward end, tapering in width rearwardly from its forward end, and being provided with rearwardly extending flat ears, said wider rear portion inclining upwardly and transversely forwardly from said ears toward the inner edge thereof and toward its forward end to provide a portion of maximum elevation above said intermediate portion and said ears at the forward inner corner of said wider rear portion.

5. A tempered spring steel shoe shank adapted to be interposed between an outer and inner sole, comprising a transversely elongated concavo-convex forward metatarsal arch supporting portion having convexly curved forward and rear marginal edges, curving upwardly from the peripheral edges to the center thereof and having a flat forward marginal supporting edge portion, an intermediate portion of less width than said forward portion extending rearwardly from said metatarsal arch supporting portion at the outer side of said shank, and a rear portion wider than said intermediate portion and extending inwardly beyond the inner edge of said intermediate portion, said rear portion being provided with a pair of rearwardly extending transversely spaced flat ears, said wider rear portion inclining upwardly forwardly and transversely from said ears toward the inner edge thereof and toward its forward end rearwardly of said ears to provide a portion of maximum elevation above said ears at the forward inner corner of said wider rear portion, the outer marginal edges of said forward, intermediate and rear portions being substantially longitudinally aligned, said intermediate portion having a concave inner edge extending rearwardly from an intermediate portion adjacent the transverse middle of said forward metatarsal arch supporting portion to the forward inner corner of said wider rear portion.

6. A shoe shank of resilient sheet material adapted to be interposed between an outer and inner sole, comprising a transversely elongated forward metatarsal arch supporting portion, an intermediate portion of less width than said forward portion extending rearwardly from said metatarsal arch supporting portion along the outer side of said shank, and a rear portion wider than said intermediate portion and extending inwardly beyond the inner edge of said intermediate portion, said rear portion being elevated above said intermediate portion and all other portions of said rear portion at the forward end of the inner side of said rear portion.

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