This invention relates to arch and heel supports which may be used in combination with an inner sole or as a part of a shoe construction. The principal object of the invention is to provide an arch and heel support so constructed that the arch is properly supported and held in this position by the heel support construction which causes the foot, when weight is placed thereon, to maintain its natural foot form and to prevent the sinking of the os calcis or the heel bone, and the falling of the arch.

A further object is to provide a cushion member for the heel provided with two or more grades of resilient material such as sponge rubber, one layer being made of relatively more resilient material than the other.

A still further object is to provide a proper support for the metatarsals.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, can be made within the scope of what is claimed, without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a side elevation of a shoe with the arch and heel support in place showing the cross section of the arch and heel support.

Figure 2 is a top plan view of the arch and heel support in position upon a shoe sole.

Figure 3 is a cross section taken on line 2—3 of Figure 4.

Figure 4 is a side elevation of the arch and heel support showing the same depressed as it would be with weight placed thereon and showing the manner in which the supports conform to the shape of the foot bones.

Figure 5 is a cross section taken on line 5—5 of Figure 4.

Many people have some type of foot pathology, the most common of which is weak foot. In weak foot, the ligaments and muscles supporting the arched structure of the foot, and principally its inner side, are too weak to carry the load of the body weight. Thus on weight bearing the foot collapses. As soon as a person bears weight on the foot, the anterior part of the os calcis sinks down. The anterior part of the astragalus, its head, has to follow this movement, since this bone rests upon the former. The result is a lengthening and flattening of the foot through the metatarsal joint. This is checked when the anterior part of the os calcais cannot come down any further.

Next the head of the astragalus is displaced inwardly by rotation of this bone on its vertical axis. The structures above, below, and in front of the astragalus are affected by the changed position of this bone.

The astragalus, after having rotated inward on its vertical axis, causes a tilting of the superior surface of the os calcais to the inner side of the foot, because most of the weight of the body now falls on the inner side of the heel bone and not through the center as it normally should. This altered position of the os calcais causes the astragalus to glide downward and inward on it as far as the connecting ligaments will permit, thereby increasing its internal lateral displacement still more.

The head of the astragalus connected to the scaphoid, by its inward rotation changes its relationship to this bone and through it disturbs the relation of the forefoot to the rest of the foot.

Through the inward rotation of the head of the astragalus under weight bearing, there occurs an angulation between fore and rear foot of the metatarsal joint. That brings the forefoot, in its relation to the other two bones, into a position of abstraction and changes the straight and even concave line on the inner side of the foot into a convex line with its most prominent point at the astragalus-scaphoid joint. The malalignment of the skeleton is then such that the supporting structures from below, that is, the ligaments that ordinarily keep the various parts of the foot longitudinally in proper alignment, cannot perform their functions.

It is the intention of this invention to provide an arch and heel support which will prevent the malalignment of the foot bones and which will support the foot in its normal position. Thus lateral displacement of the bones on the inner side of the foot is prevented and the os calcais kept in straight alignment, and downward displacement cannot occur and breaking down of the longitudinal arch is impossible.

Referring now to the drawing it will be seen that a skeleton of the foot is shown in Figures 4 and 5 where numeral 1 represents the os calcais; 2, the astragalus; 3, the scaphoid; 4, the internal cuneiform; 5, a metatarsal; 6, a proximal phalanx; 7, the tibia; and 8, the fibula.

By referring to Figure 1 it will be seen that there is provided a shoe 9 in which is a structure comprising a resilient body portion 10 preferably made of sponge rubber. and a heel support
formed of a relatively more resilient material than the body portion 10. This heel support is also preferably of sponge rubber.

By referring to Figures 2 and 3 it will be seen that this resilient body portion 13 is constructed with a metatarsal support 12 having its front edge 13 shaped so as to conform with the varying lengths of the metatarsal bones 5, and providing a support for the same. The body portion 10 is built up at a point 14 to provide a support for the arch of the foot. It will be seen that there is provided a tab extension 15 at the point 14 in order that the same may be attached to the side wall of the shoe in order to hold it up underneath the arch when the shoe is properly laced, thereby utilizing the side shoe structure and the variations in the lacing.

It will also be seen that the heel support 11 rests in a semi-saucer shaped recess 16 in the body portion 10 and is positioned slightly to the outer side of the heel portion of the body portion 10 in order to conform to the shape of the os calcis. This heel portion 11 is elongated in order to provide a support which fits the lower end portion 17 of the os calcis 1. (See Fig. 4.)

Referring to Figures 4 and 5 it will be seen that the foot skeleton represents the foot under weight so as to show the built up portion 14 of the body portion 10 coming underneath the inner longitudinal arch of the foot and a point 18 of the built up portion 14 fitting directly in front of the lower end portion 17 of the os calcis 1. It will be seen that the heel of the foot would take a position as indicated by a pocket formed by the depression of the relatively more resilient heel portion 11.

It is understood that the shoe sole construction as above described should be worn in every shoe in order to prevent a weakened condition of the foot, and it is especially beneficial in the correction of the malalignment of the foot bones.

It is also desirable that shoes constructed for athletes should give the desired support in order to eliminate the danger of injuring the foot. This invention is adaptable to this particular type of shoe.

It is obvious from the foregoing description that we find that the flattening of the foot under weight bearing is not accomplished by a simple and direct downward displacement of the bones forming the arch of the foot that enter into the formation of the inner side of the longitudinal arch, but their downward displacement must be preceded by an internal lateral displacement of some of the bones so as to escape the resistance offered to their downward displacement by the strong supporting structure directly beneath them.

It is understood that while it is desirable to build the device in every shoe, it may readily be adapted to be used as an insole in a shoe which has been built to conform to the ordinary construction.

What we claim is:

1. In an arch and heel support, a resilient body portion, an elongated semi-saucer shaped recess in the heel of said body portion, a resilient heel support in said recess, said recess formed slightly to the outside of the heel portion of the body portion, an inner longitudinal arch support formed in said body portion, a built up portion on said arch support, a tab extension on said built up portion to be attached to a shoe, a metatarsal support in said body portion having its front edge shaped to conform to the varying lengths of the metatarsal bones.

2. In an arch and heel support, a resilient body portion, an elongated semi-saucer shaped recess in the heel of said body portion, a resilient heel support in said recess, said recess formed slightly to the outside of the heel portion of the body portion, an inner longitudinal arch support formed in said body portion, said arch support being so shaped as to form a support directly in front of the lower end portion of the os calcis or heel bone, a built up portion on said arch support, a tab extension on said built up portion to be attached to a shoe, a metatarsal support in said body portion having its front edge shaped to conform to the varying lengths of the metatarsal bones.

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