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SANDAL

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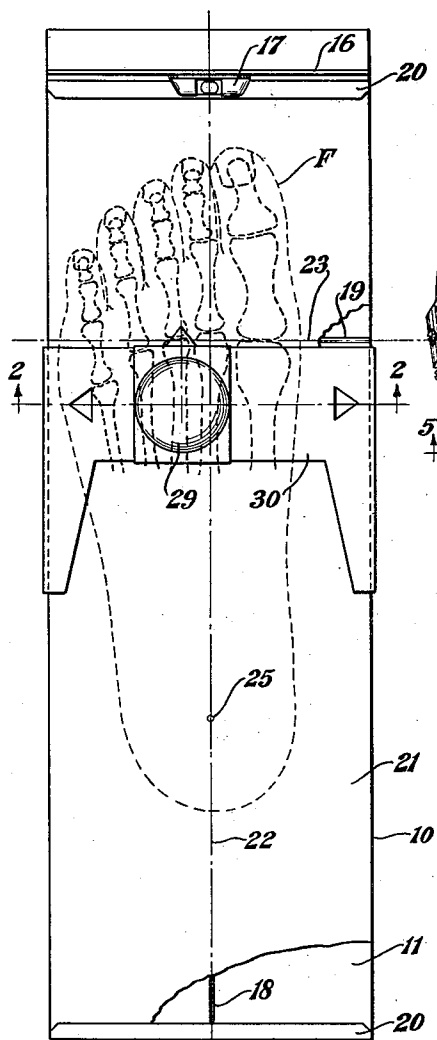


Fig. 1

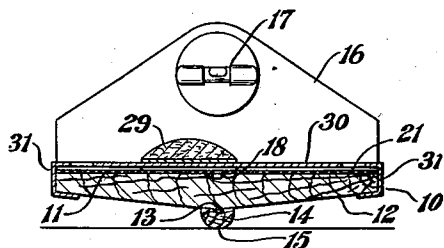


Fig. 2

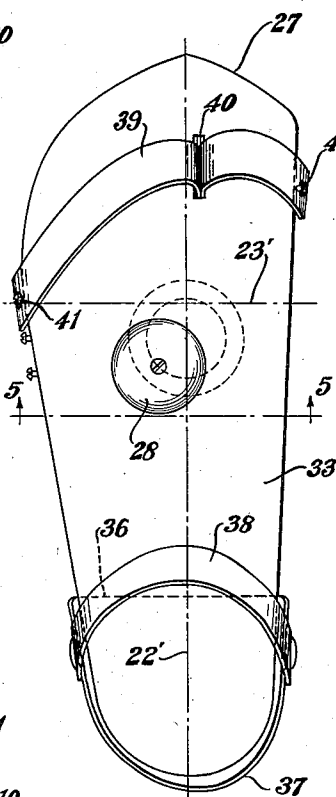


Fig. 3

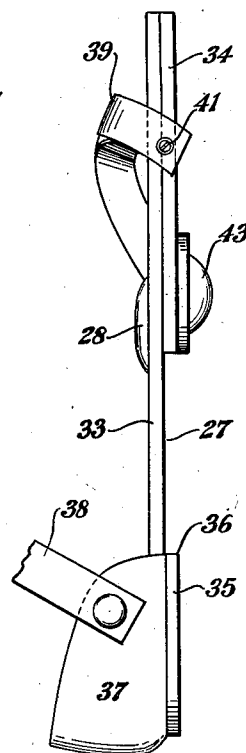


Fig. 4

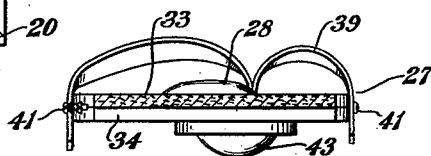


Fig. 5

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SANDAL

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6 Claims. (Cl. 36—8.5)

The invention relates generally to the construction of shoes and the like, and more particularly to a novel method of designing sandals according to a basically new principle, and to novel sandal construction resulting therefrom.

Practically all shoes are now designed and constructed according to the theory that the normal human foot provides a three-point or tripod support for the body, one point being at the heel, another at the second joint of the large toe or ball of the foot on the transverse arch thereof, and the third point at the small toe on the transverse arch.

In designing shoes according to this widely accepted theory, the sole is laid out from a longitudinal divisional line which passes approximately between the position of the second and third toes, and which approximately bisects the transverse arch portion of the sole as well as the heel portion.

Many variations of this method have been proposed and practiced, in some of which the longitudinal division line has been shifted to one side or the other, or laid out as two lines intersecting at an obtuse angle in an attempt to provide shoes properly fitting and supporting the feet during walking.

In all of these prior constructions of which we are aware, the longitudinal divisional line, or line of cleavage of the shoe sole, has been assumed without any real basis except custom or precedent to have a certain lateral position relative to the foot, and is not determined according to the actual longitudinal line of balance of the foot.

As a consequence, practically all standard makes of shoes for normal feet tend to throw the feet to one side or the other during walking, usually to the outside, as is evidenced by the fact that nearly all persons wear their heels, and sometimes their soles off at the side instead of straight to the rear. This is because the shoes do not allow the feet to properly support the body according to the actual lines of balance of the feet, and the effect is to cause severe discomfort and even pain because the bones of the foot are distorted and displaced; and continuous wear quite frequently results in bunions, calluses, corns etc.

When the weight is shunted or thrown toward the outside of the foot during walking, a large proportion of it is taken by the three outer toes. A casual inspection of the anatomical construction of the foot shows that nature never intended the weight to be borne by the three outer

toes because they have relatively small bones, while the bones of the large and second toe are large and strong and logically designed to support the weight of the body.

We have discovered the basic principle that the main support for the body is provided by two points on each foot, those points being at the central portion of the heel and substantially at the third joint of the second toe of the foot; and a line passing through these two points forms the actual longitudinal line of balance of the foot, as distinguished from the anatomical line of cleavage between the second and third toes of the foot.

According to the results of our experiments, the function of the third point of contact at the small toe is solely to provide an auxiliary support for lateral stability. The function of this auxiliary support is closely analogous to that of an outrigger attached to a canoe; the longitudinal axis of the canoe being the line of main support, and the float on the outer end of the outrigger being an auxiliary support solely for giving lateral stability.

The benefits actually derived from the wearing of sandals constructed according to the principle that the foot has two main supports determining the longitudinal line of balance, have conclusively shown that the principle is correct, although somewhat revolutionary.

It is therefore a principal object of the present invention to provide a novel method of designing sandals according to the longitudinal line of actual balance of the foot.

Another object is to provide novel apparatus for determining the actual longitudinal line of balance of any foot.

A further object is to provide a sandal constructed so as to support the foot along the actual line of longitudinal balance of the foot.

Another object is to provide a sandal constructed so as to urge the foot toward its proper position of balance during walking.

A still further object is to provide a novel method of treating foot ailments and novel corrective foot-wear constructed according to the actual line of balance of the foot, for carrying out the treatment of various deformities and ailments of the foot.

These and other objects are accomplished by constructing a sandal for each particular foot according to the line of balance of that foot, by determining the actual line of longitudinal balance of said foot when under substantially the full weight of the body, laying out said outline

and a line corresponding to said line of balance on the sole of a sandal to be worn on that foot, and constructing the sandal with said corresponding line as a basis.

Referring to the drawing forming part hereof—

Figure 1 is a plan view of the novel apparatus for determining the actual longitudinal line of balance of a foot, the balanced position of a foot thereon being indicated in dotted lines;

Fig. 2 is a transverse sectional view of the foot balancing apparatus taken substantially on line 2—2, Fig. 1;

Fig. 3 is a plan view of a sandal constructed according to the line of balance of a foot determined by the apparatus of Figs. 1 and 2;

Fig. 4 is a side elevation of a sandal; and

Fig. 5 is a transverse sectional view thereof taken on the line 5—5, Fig. 3.

Similar numerals refer to similar parts throughout the drawing.

The customary method of laying out a sole in constructing a shoe of standard make is to begin by assuming a longitudinal line of division of the shoe sole, and determining the outline of the sole with the line of division as the basis. It has also been proposed to lay out a longitudinal line on the shoe sole substantially corresponding to the anatomical line of cleavage of a foot for which the shoe is designed, which cleavage line is between the second and third toes of the foot.

In all of these prior methods of which we are aware, the position of the line of division or cleavage of the shoe sole has been assumed without any regard to the actual longitudinal line of balance of the foot with the weight of the body supported thereon, upon which line of balance the weight of the body is naturally balanced and supported during standing and walking.

In designing and constructing our novel sandal, the first and logical step is to determine accurately the longitudinal line of balance of a foot with the weight of the body supported thereon.

The novel apparatus for determining the line of balance of any foot is shown in Figs. 1 and 2, and includes a flat base or balancing board 10 having a flat upper surface 11 and a wedge-shaped bottom surface 12. The base or board 10 is made considerably longer and wider than the average foot, and may be rectangular in shape as shown.

Preferably, the apex 13 of the wedge-shaped bottom surface 12 is located in the center laterally of the base and extends longitudinally throughout its length. A substantially half-round piece 14 may be secured longitudinally on the base at the apex 13 thereof for providing a line contact with a supporting surface or floor, as shown at 15 in Fig. 2.

A vertical flange portion 16 is preferably provided at one end of the base, and has mounted thereon an ordinary spirit level 17 for indicating when the upper surface of the base is level, the longitudinal axis of the leveling tube being parallel with the upper surface of the base.

Preferably, a longitudinal line or groove 18 is provided on the upper surface of the base directly over the apex 13 of its bottom surface and the center line of the contact piece 14, and a transverse line or groove 19 is provided on the upper surface of the base at right angles to the longitudinal line 18 for positioning the second joint of the large toe, when the foot is placed on the apparatus.

After determining the line of balance of a foot with this novel apparatus, it is usually desirable to transfer the line of balance and the outline of the foot relative thereto to a sandal, with said balance line located on the sandal in relation to the outline of the foot as determined through use of this apparatus; and for this purpose a sheet of paper or other markable material is placed on the upper surface of the base and detachably held thereon by means of flanges 20 secured to the ends of the base. A sheet of paper is indicated at 21 and has a longitudinal center line 22 and a transverse line 23 which are adapted to coincide respectively with the longitudinal and transverse grooves 18 and 19 on the upper surface of the base.

In order to determine the actual line of longitudinal balance of any one foot, the balancing board or base 10 is placed on a substantially level surface such as a floor, as indicated in Fig. 2, and the foot is positioned on the upper surface of the board with the anatomical center of the bottom of the heel on the longitudinal line 22 and therefore directly over the line of contact 15 between the base and the floor. The anatomical center of the bottom of the heel of a normal foot is substantially at its geometrical center, and is actually at the point where the os calcis bone bears on the supporting surface. The anatomical center of the heel of the foot F is indicated at 25 in Fig. 1.

By moving the foot longitudinally so as to keep the anatomical center 25 on the line 22, the second joint of the large toe is positioned on the transverse line 23. Obviously, a cup-shaped heel positioning member similar to member 37 of Figs. 3 and 4 closely fitting the heel of the foot may be longitudinally slidably mounted on the balancing board over longitudinal line 22 for aiding in centering the heel over the longitudinal line 22.

After the foot F has been positioned with its heel centered on the line 22 and the second joint of the large toe on the transverse line 23, the full weight of the body is put on the foot by raising the other foot slightly off the ground and balancing the body so as to throw all the weight on foot F, and the forepart of the foot F is swung laterally of the board to either side, using the point 25 as a pivot, until the foot F occupies a position at which the level 17 shows it to be balanced laterally. By then drawing the outline of the foot in this position on the paper 21, the longitudinal line or axis of actual balance of the foot F with the full weight of the body thereon with respect to the marginal outline of the foot is along the line 22.

In constructing foot exercising and correcting devices for treating foot ailments, such as the sandal 27 indicated in Figs. 3, 4 and 5, it is desirable to place a convex pad or protuberance 28 on the upper surface of the sole, for pushing upward at the transverse arch during walking for applying pressure to the muscles and the bones of the foot.

The location of such a pad may be determined by providing a similar pad 29 slidably mounted on the balancing board 10 for movement longitudinally and transversely thereof. The pad 29 may be conveniently mounted for sliding laterally on a sheet metal bracket member 30, which is in turn mounted for longitudinal sliding movement on the base 10 by means of L-shaped flanges 31.

After the foot has been placed in a position

of longitudinal balance on the balancing board 10, in the manner previously described, the pad 29 is moved to a position just back of the transverse arch of the foot, and the pad 28 on the sandal 27 for the foot F is located in the same position relative to the longitudinal and transverse lines 22' and 23' respectively.

We have found by actual test that the longitudinal line of balance of most substantially normal feet, as determined in the foregoing manner, passes substantially through the center of the third joint of the second toe on the transverse arch of the foot, and extends substantially between the ends of the first and second toes.

The novel foot exercising and correcting sandal 27 preferably has a sole 33, which is a substantially flat single piece of leather somewhat larger than the foot on which it is to be worn. The sandal 27 is designed to be worn on the foot F.

The underside of the forepart of the sole 33 may have another layer of leather 34 thereon for stiffening purposes, and the layer 34 may extend from the front end of the sole 33 to a point back of the line 23'. The heel portion of the sandal may have a layer of leather 35 secured to its underside for forming a low heel thereon, and the forward edge of the heel is formed at right angles to the longitudinal line of balance 22' as indicated at 36 in Fig. 3.

The longitudinal line of balance 22' and the transverse line 23', as well as the pad 28, are located on the sandal 27 by transferring the outline of the foot F relative thereto from the paper sheet 21 onto the sandal in a manner previously described.

A heel retaining cup-shaped portion of soft leather or the like 37 may be provided around the heel of the sandal for fitting around the heel of the foot, and a flexible strap 38 is detachably secured to the portion 37 for strapping over the instep to hold the heel in place.

Similarly, a flexible strap 39 may be secured to the sandal at a point between the positions of the first and second toes, as at 40, and is adapted to be detachably secured at its ends to the laterally opposite sides of the sole 33 as indicated at 41, for strapping the toes in place on the sandal. As shown in the drawing, one portion of strap 39 straps the large toe in place and the other portion thereof straps the other toes or other forward parts of the foot.

A preferably hemispherical contact pad 43 of rubber or the like is attached to the underside of the sole at a point on the longitudinal line of balance 22' and under the ball line, as shown, so that in walking the foot may be balanced on a single point for aiding in exercising the foot, particularly the muscles and bones of the toes thereof.

In wearing this novel sandal during walking, the pad 28 acts to push upward at the transverse arch and massage the muscles of the toes, and the pad 43 provides a balance point on the longitudinal line of balance of the foot, so that the foot carries the weight of the body on the balance line as long as no other part of the sole touches the floor. An important advantage of this sandal over other foot exercising devices is that the foot is exercised in balance with the

full weight of the body thereon, which is the natural weight the foot is designed to carry.

By wearing this novel sandal a few minutes each day, the muscles of the foot are strengthened and the bones returned to normal position for properly and naturally supporting the weight of the body, with the result that bunions, corns, calluses, etc., gradually disappear.

We claim:

1. A sandal for fitting a particular foot, including a sole having a line longitudinally thereof corresponding to the longitudinal line of balance of said foot when under substantially all the weight of the body, and means on the underside of said sole and centered laterally of the sole on said longitudinal line for rockably supporting said foot thereon during walking.

2. A sandal for fitting a particular foot, including a sole having a line longitudinally thereof corresponding to the longitudinal line of balance of said foot when under substantially all the weight of the body, and a hemispherical pad secured to the underside of the forepart of said sole centered laterally of the sole on said line for permitting balancing said foot thereon during walking.

3. A sandal for fitting a particular foot, including a sole having a heel portion and a toe portion, and a pad of relatively small area on the underside of said toe portion longitudinally adjacent to the position of the third joint of the second toe, said pad being located so as to be centered laterally of the toe portion on a line corresponding to the longitudinal line of balance of said foot with substantially the full weight of the body thereon.

4. A sandal for fitting a particular foot, including a sole having a heel portion and a toe portion, and a pad on the underside of said toe portion behind the position of the second joint of the large toe and in front of the position of the third joint of the small toe, said pad being located so as to be centered laterally of the toe portion on a line corresponding to the longitudinal line of balance of said foot with substantially the full weight of the body thereon.

5. A sandal for fitting a particular foot, including a sole having a line longitudinally thereof corresponding to the longitudinal line of balance of said foot when under substantially the full weight of the body, means for strapping over the instep of said foot for holding the heel in place on said sole, and means on the underside of said sole and centered laterally of the sole on said longitudinal line for rockably supporting said foot thereon during walking.

6. A sandal for fitting a particular foot, including a sole having a line longitudinally thereof corresponding to the longitudinal line of balance of said foot when under substantially the full weight of the body, means for strapping over the instep of said foot for holding the heel in place on said sole, means for strapping the large toe of said foot on said sole, means for strapping other forward parts of said foot on said sole, and means on the underside of said sole and centered laterally thereof on said longitudinal line for rockably supporting said foot thereon during walking.

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