

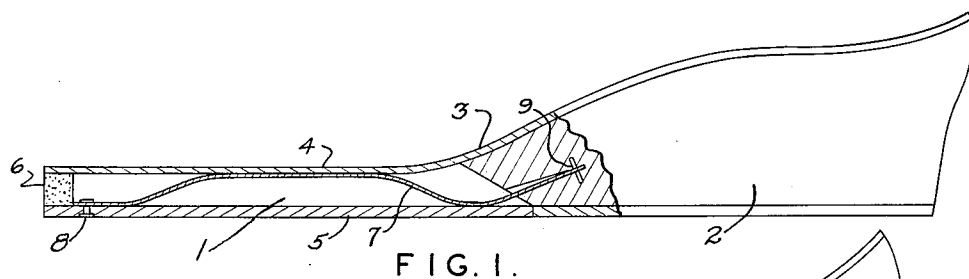
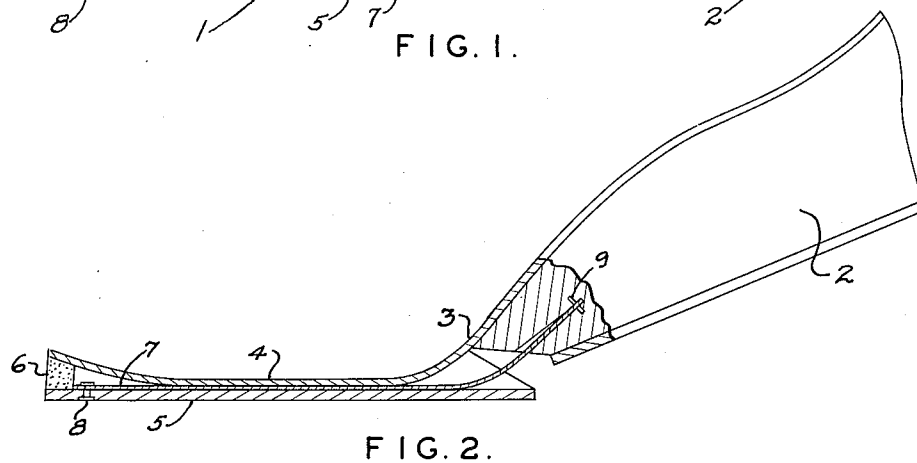
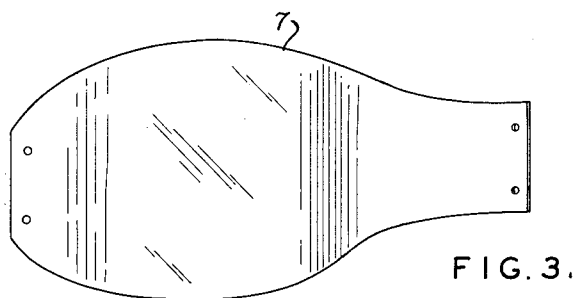
June 19, 1962

H. LINCORS  
SHOE FLEXING DEVICE

3,039,207

Filed Sept. 16, 1955

3 Sheets-Sheet 1



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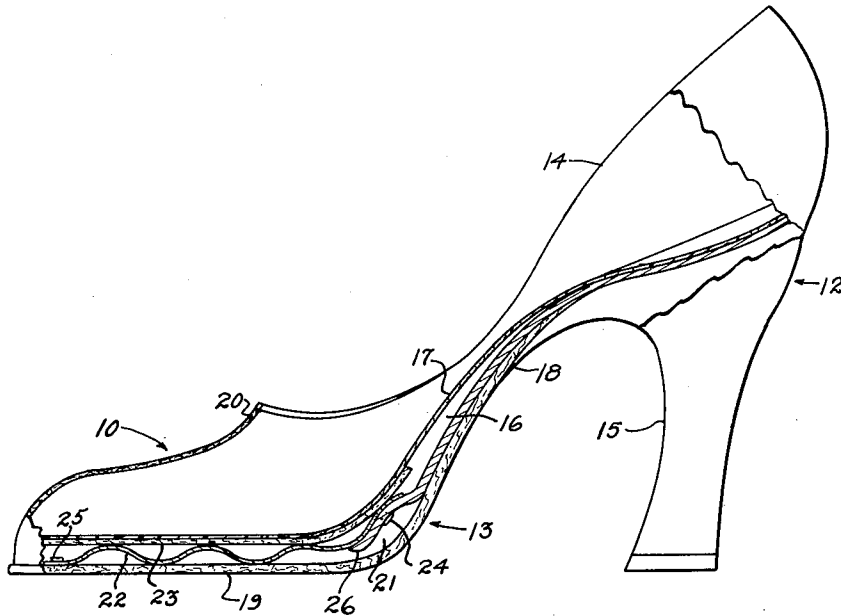


FIG. 4.

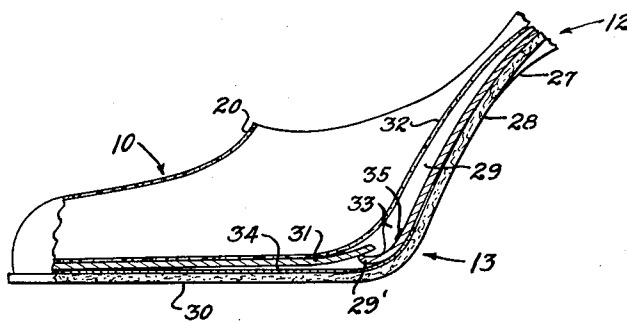


FIG. 6.

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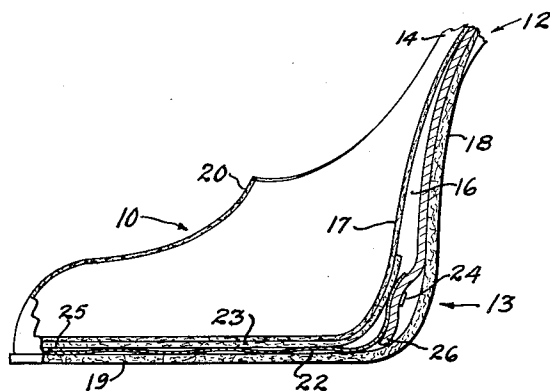


FIG. 5.

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3,039,207  
**SHOE FLEXING DEVICE**  
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11 Claims. (Cl. 36—58.5)

This invention relates to shoes and, more specifically, to a shoe construction in which foot pressures applied in walking are converted into forces which flex the shoe into conformity with the foot throughout each step.

This application is a continuation in part of my prior copending application serial number 423,344 filed April 15, 1954 for Shoe Flexing Device now abandoned.

By way of explanation, this movement of the shoe with respect to the foot is perhaps best illustrated by the action of a scuff. During a step, it will be quite apparent that the foot flexes as the pressure on the heel of the foot is transferred to the ball of the foot. Because in the case of a scuff there is no force tending to flex the sole, the heel of the scuff remains stationary temporarily as the heel of the foot is raised. When the whole foot is raised, however, the foot unflexes, and the heel of the scuff slaps the undersurface of the foot. This repeated slapping action is obviously undesirable from the comfort standpoint and detracts from the scope of customer appeal for certain shoe styles such as sling, halter sling, or strap pumps, sandals, or mules. Obviously, also, there are certain types of feet which cannot be properly fitted in shoes without counters because, as is readily apparent, when the heel of the foot is raised, the resistance of the shoe to flexing is a sufficient force to slip the sling straps from the heel of the foot even if the shoe is quite flexible.

The present invention applies to shoes constructed with a heel portion and a toe portion (including the forward sole portion) which are interconnected by a flexible part, usually adjacent the ball of the foot. According to this invention, the shoe construction incorporates a device connected between the toe portion and the heel portion of the shoe, providing, incidentally, a cushioned support for the foot, and is tensioned by pressure on or near the ball of the foot. This tension is transmitted through an interconnection to the heel portion tending to flex the shoe when pressure exerted on the heel portion of the shoe is removed, so that the tension transmitted to the heel portion of the shoe causes it to raise and follow the heel of the foot. It is contemplated that this device can have many different forms, some of which are shown, but, according to this invention, however, each form is responsive to pressure to place it or part of it under tension so as to exert the desired direction and degree of force on the heel portion of the shoe to lift the heel when the pressure exerted by the heel of the foot is removed.

It is the object of the present invention to eliminate the slapping of the shoe on the heel by modifying present shoe construction to add thereto a device to flex the shoe so as to maintain contact with the heel of the foot at least during that part of the step when the pressure is being applied to the shoe by the ball of the foot.

It is also an object of the invention to provide a device for the above purpose which is wholly concealed within the shoe and requires no alteration to the outward appearance of any particular style of shoe.

It is also an object of this invention to provide a device adaptable to any form of shoe which is responsive to pressure placed thereon to transmit a bending force from toe to heel.

In order to facilitate a clear understanding of the invention, the accompanying drawings illustrate several forms of the said device which will carry out the objects of the present invention. In the drawings:

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FIG. 1 is a side elevation of a shoe partly in section illustrating one form of the invention.

FIG. 2 is a view similar to FIG. 1 illustrating the operation of the shoe.

FIG. 3 is a top plan view of the spring used in FIG. 1 and FIG. 2.

FIG. 4 is a side elevation of a shoe partly in section illustrating a second form of the invention.

FIG. 5 is a view illustrating the operation of the shoe in FIG. 4.

FIG. 6 is a side elevation in section illustrating another form of the same invention.

The drawings are intended to illustrate the invention applied to different styles or patterns of shoes constructed according to one method of manufacture. Certain slight modifications to adapt this invention to products manufactured by the various other methods of shoe construction will be obvious to those skilled in the art in view of the description.

Referring to FIGS. 1-3, the type of shoe illustrated is generally referred to as a wedge sandal. The straps forming the shoe upper have been omitted to simplify the description since they form no part of the instant invention.

The shoe in these figures has a toe portion 1 joined to a heel portion 2 by a flexible part 3. The toe portion 1 is constructed with an inner sole 4 and an outer sole 5 in spaced apart relation. A filler 6 extends around the edge of both soles 4 and 5. Filler 6 is resilient and compressible and may be cemented in place to form a chamber between the inner and outer sole within which is a wave spring 7. Preferably the spring 7 is secured at one end to the toe portion 1 as at 8 and at its opposite end to the heel portion 9. Any suitable fastening may be used.

## Operation

Normally the shoe is as shown in FIG. 1. The wave spring 7 cannot flatten so long as the heel is flat but as soon as the heel of the foot lifts, wave spring 7 begins to compress toward a flattened condition. As it is compressed toward a flattened condition it expands or elongates forcing the shoe to flex at 3 so that the heel of the shoe follows the heel of the foot as it also flexes during each step.

As the weight or pressure is removed from the toe portion as the ball of the foot is raised, the shoe returns to the shape in FIG. 1 but since the foot also relaxes during this part of the step, the shoe shapes to the foot throughout the step.

In this modification the spring 7 is compressed by the weight of the ball of the foot on the inner sole so that the inner sole 4 can be termed a pressure member and the spring 7 an expansible member. It is desirable that the spring 7 be flexible enough to compress to some extent under the weight of the foot to give a cushion support to the inner sole at all times.

In the shoe shown FIGS. 4 and 5, the toe portion generally indicated as 10 is joined to the heel portion generally indicated as 12 by a flexible portion generally indicated as 13. The heel portion 12 comprises a counter 14 to which is attached a heel 15. The heel 15 and counter 14 are reinforced by a shank stiffener 16 which reinforces the shank of the shoe. The exterior of the shank is provided with a sole or cover for the shank 18 to conceal the steel shank 16. Interiorly of the shoe is a covering 17 for the shank stiffener, usually referred to as a sock liner, as shown. The cover 18 joins with the outer sole 19, which extends under the toe of the shoe. Attached to the sole 19 is a vamp 20 extending in this instance to the counter 14. Whether either vamp or counter is present or not, and in what form, depends,

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of course, entirely upon the style of the shoe, which is not a feature of the present invention.

According to this invention, the shank stiffener 16 extends throughout the length of the shank, and where it terminates the sole forms a pocket 21 between the toe portion and heel portion of the shoe at the flexible portion. This pocket will accommodate movement of the shank stiffener with respect to the sole of the shoe when the toe portion 10 of the shoe is flexed with respect to the shank portion and heel portion 12 of the shoe. Disposed above the outer sole of the shoe is a composite device comprising a wave spring 22 upon which is superposed a spring depressor 23 of suitable material which is relatively rigid throughout the sole portion, but is preferable slightly flexible adjacent point 13. The depressor 23 and the wave spring 22 are each securely riveted to the shank stiffener 16 at one end by rivet 24 and the spring is secured to the sole 19 at the opposite end as by rivet 25. A sock liner 17 extends to the toe and conceals the entire flexing device and the shank so as to give a finished appearance to the inside of the shoe. In the present construction, the rivet 24 approximately coincides with the flexible part adjoining the toe portion 10 and the heel portion 12 and acts as a fulcrum in the action of the device during operation.

When weight is applied by the foot to the shoe in FIG. 4, the weight at the toe or at the ball of the foot is cushioned by the wave spring 22 and so long as pressure is applied to the heel very little happens except for the resilient reaction of the spring 22 to the compressive weight of the foot which tends to press the shank of the shoe upwardly so as to lend support to the arch of the foot, thereby adding to the comfort by increasing the bearing area between the shoe and the foot. However, as soon as the pressure at the heel of the shoe is removed, the spring 22 will be compressed or flattened, and, as the heel of the foot lifts during the step, the spring 22 will expand or elongate relative to the spring depressor 23. The expansion of spring 22 will cause bending of the shoe about a fulcrum point adjacent the rivet 24. Due to the fact that the wave spring is disposed on the underside of the spring depressor 23, deflection will cause the shank stiffener 16 to press upwardly on the shank in a manner to cause the heel of the shoe to lift and follow the heel of the foot as the step is taken and at the same time produce a lifting force to hold the full length of the shank of the shoe against the arch of the foot.

In order to augment this force creating the bending action as above described, the shank stiffener has a tip portion 26 which overlaps one end of the wave spring 22 so that when weight is relieved from the heel and the wave spring 22 is permitted to expand, it will lengthen with respect to the spring depressor. During expansion the spring 22 will be caused to buckle at the point where it contacts the tip portion 26 of shank stiffener 16. The buckling action of the spring 22 against the end of the shank stiffener 26 below the fulcrum point determined by the rivet 24 will produce a reaction in the opposite end of the shank stiffener in the opposite direction from the application of the force on the tip portion 26.

The abovementioned reaction to the application of the force from spring 22 to tip portion 26 will also aid in lifting the shank stiffener and heel portion of the shoe 12 when the weight is removed. This action is best illustrated in FIG. 5.

Turning now to FIG. 6, a second modification of the above invention is shown. In this modification the toe portion is again indicated as 10 and the heel portion indicated as 12. These shoe portions are joined by a flexible portion indicated as 13, similar to that above described. Flexing of one portion of the shoe with respect to the other is accommodated by the portion 13. In this modification, the shank 27 is formed by a breasting or cover 28 and reinforced by a shank stiffener 29. The shank

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stiffener 29 differs from that above described in that it is provided with an upturned and offset portion 29'. The sole 30 joins the breasting or cover for the shank stiffener 28 to form the outer surface of the shoe, and the vamp 29 is attached in some usual manner to the sole 30. Spaced slightly above the sole 30 near the flexing point 13 is a depressor plate 31. The depressor plate may be flexible if desired, and is concealed within the inside of the shoe by the sock liner 32. A pocket is formed between the sock liner 32 and the shank stiffener 29, and this pocket may be filled with a resilient material to form a cushion. The shank stiffener 29 has a rib 33 integral therewith for reinforcing purposes, and this rib is notched so as to receive and provide room for the depressor 31. A member 34 riveted at 35 to shank stiffener 29 and attached to 10 holds the parts from slipping.

In this modification, the weight of the foot is borne by the depressor plate 31, which, in turn, will exert a force upon the offset end of the shank stiffener 29 which extends forward of the flexing point in portion 13 of the shoe. This force will produce a reaction tending to move the shank in an upward direction to lift the heel of the shoe. So long as weight is on the heel of the shoe, however, this cannot take place, but immediately after the weight is relieved from the heel of the shoe and transferred exclusively to the ball of the foot, the action will take place lifting the heel of the shoe by the downward force of the depressor plate against the edge or end 29' of the shank stiffener 29. In this form of the invention the offset 29' may be formed in a manner to be slightly resilient so that a spring action is effective to produce the lifting force on the heel. In this form FIG. 6 the members 29 and 31 act somewhat like the spring 22 on the shank end 26 in FIG. 4.

A device which will carry out the objects of the invention has been disclosed, but it is contemplated that other modifications of the invention will occur to those skilled in the art which come within the spirit of the invention as defined in the appended claims.

I claim:

1. A shoe construction adapted to be effective on the application of foot pressure to exert a lifting force on the heel portion of said shoe, comprising a pair of superposed spaced members in said shoe at least one of which is flexible, a shank stiffener forming a rigid extension from said heel and having its forward end secured to both of said members to form a fulcrum point with at least one of said members, and a force-transmitting point of contact with the other of said members in a zone spaced from said fulcrum point.

2. A shoe construction adapted to be effective on the application of foot pressure to exert a lifting force on the heel portion of said shoe, comprising a pair of superposed spaced members in said shoe at least one of which is flexible and expansible, said heel portion having its forward end extending in overlapping relation with adjacent ends of said flexible members at spaced points on said heel portion to form respectively a fulcrum point with at least one of said members and a force-transmitting connection with the other said member whereby pressure on said members causes opposite forces to be imposed by said members at said spaced points on said heel portion to produce the lifting action.

3. A shoe construction adapted to be effective on the application of foot pressure to exert a lifting force on the heel portion of said shoe, comprising a pair of superposed spaced flexible members extending lengthwise of said shoe at least one of which is expansible when pressed toward the other by foot pressure, a rigid extension from said heel having its forward end extending in overlapping relation with adjacent ends of said members and attached thereto, and interconnections between said flexible members whereby pressure on said flexible members tending to force them together causes opposite forces in said mem-

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bers and a resulting force on said extension to produce the lifting action.

4. In a shoe, the combination of a toe portion, a heel portion including an extension rigid with said heel portion and flexibly connected with said toe portion, and superposed spaced apart means connected to said toe portion and to an intermediate point in said extension and disposed in overlapping relation adjacent said intermediate point, said means including a part expansible by the pressure of the foot in said toe portion for transmitting a lifting force to said extension adjacent said intermediate point tending to bend said shoe.

5. In a shoe, a device adapted to be operated by foot pressure to produce a bending force, tending to lift the heel of the shoe comprising a first flexible member extending lengthwise of said shoe, a second flexible member in said shoe longer than said first flexible member and in part coextensive therewith, and means attaching said members to the heel portion of said shoe and to the toe portion thereof with portions of said members in said toe portion in spaced relation whereby pressure forcing said members together in said toe portion causes a force in one direction in one of said flexible members and an opposite force in the other of said flexible members to cause a joint deflection in said flexible members tending to curl up the ends thereof to bend said shoe.

6. In a shoe, having a sole structure including a toe portion, a heel portion, and a flexible part between said toe and said heel portion, the combination of a flexible device within said sole structure connecting said toe portion and heel portion, including a pair of members secured with respect to one another, at least one of which is a wave spring tensioned when said members are pressed together, to exert a force lengthwise of said other member tending to cause said flexible device to bend.

7. A device for a shoe adapted to produce a bending force when compressed, comprising a first flexible member, a second flexible wave spring member in part coextensive with said first member, and means for fixing said members with respect to one another adjacent opposite ends with an intermediate portion thereof in spaced relation whereby pressing said members together causes a force in one direction in one of said flexible members and an opposite force in the other flexible member to cause a joint deflection of said flexible members in the same direction.

8. In a shoe, a pair of superposed flexible members arranged in overlapping relation lengthwise and extending along the sole portion to the heel portion of said shoe, one of said members having substantial resistance to forces tending to produce elongation lengthwise thereof, and the other of said members being constructed

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and arranged to expand lengthwise under foot pressure against the resistance to elongation of said one member to cause bending of both of said members and said shoe.

9. In a shoe, a structure adapted to be effective on the application of foot pressure in the toe portion to exert an upward force on the foot rearwardly of the toe portion, said structure comprising a flexible device extending lengthwise of the shoe in the toe portion and heel portion thereof, means in said flexible device for yieldably maintaining parts of said flexible device in spaced relation in said toe portion, said yieldable means tending to expand in one direction when compressed in another direction by foot pressure in the toe portion of said shoe, and means for directing the force produced by expansion upwardly against the foot.

10. In a shoe having a toe portion and a heel portion, a structure adapted to be effective on the application of foot pressure in said toe portion to exert an upward force in the heel portion, said structure comprising a flexible device extending lengthwise of the shoe including a compressible means in the toe portion of the shoe actuated by foot pressure, said compressible means being expansible in one direction when compressed in another direction by foot pressure in said toe portion, and means in said structure for resisting the expansion of said compressible means to produce the resultant upward force in the heel portion of said shoe.

11. In a shoe having a toe portion and a heel portion, a flexible device in said toe portion acting on said heel portion, said device being effective on the application of foot pressure to exert an upward force on a portion of the foot, said device comprising a flexible structure extending lengthwise of the shoe and including a compressible means being expansible in one direction lengthwise of the shoe when compressed by the foot pressure in another direction, and means in said device for resisting lengthwise expansion of said compressible means to produce the resultant upward force on a portion of the foot.

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