March 9, 1965 B. W. COLMAN 3,172,217

RESILIENT SHOE SOLE AND HEEL CONSTRUCTION

Filed Feb. 21, 1963

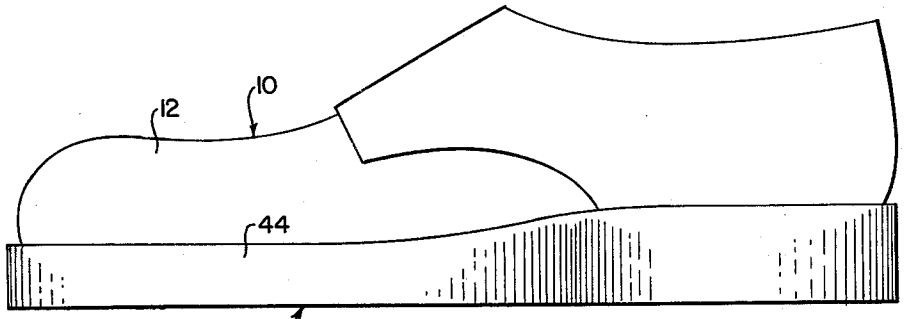

FIG. 1

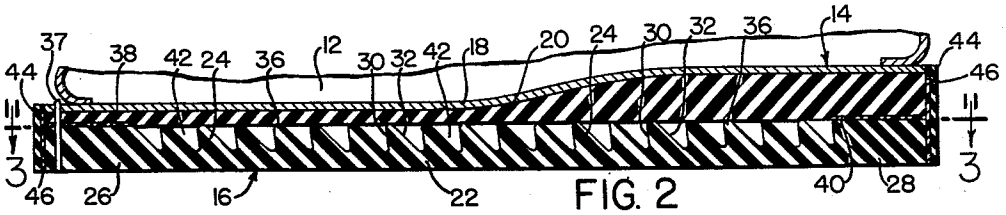

FIG. 2

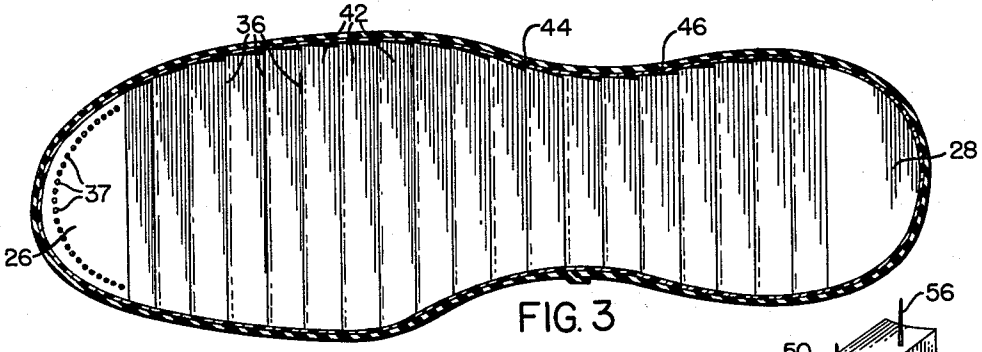

FIG. 3

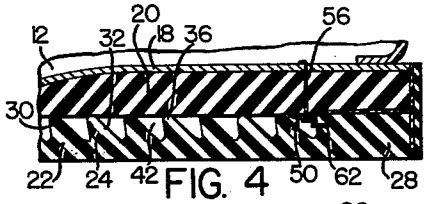

FIG. 4

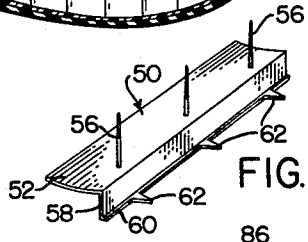

FIG. 5

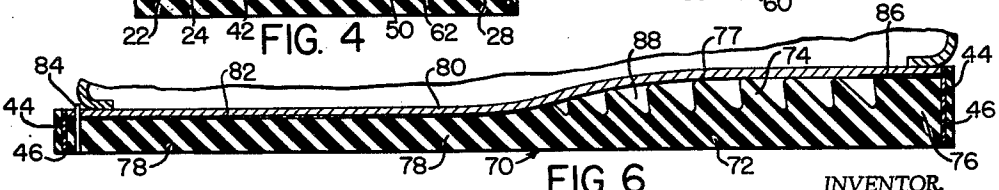

FIG. 6

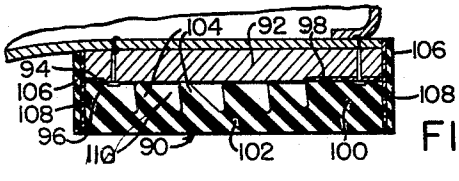

FIG. 7

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RESILIENT SHOE SOLE AND HEEL CONSTRUCTION

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This invention relates to shoe soles and heels made of a resilient material and more particularly to a shoe sole or heel having a body and a series of upwardly projecting, forwardly inclined transverse rib members on its upper surface in shoe or heel base supporting relationship, the rib members being directed upwardly and forwardly so that they will flex in the direction of their inclination and yield forwardly under weight of the wearer.

The invention of this application involves an improved shoe construction wherein an inverted rib resilient shoe sole is secured to and under the shoe base at the toe and heel portions leaving the ribs free for flexing and yielding movement under the shoe base. In the instant invention the toe portion of the sole is secured directly to the shoe base by stitching passed through the sole and the shoe base, or by an adhesive and stitching, and the heel portion is secured by an adhesive applied to the shoe base and the heel block of the sole, or alternatively by an adhesive and a clip secured to the shoe base and engaging the heel block of the sole. The entire sole is preferably enclosed at its peripheral edge by a foxing strip adhesively attached to the peripheral edges of the sole and the shoe base, so as to exclude the admission of matter such as mud, snow, dirt and water. Similarly, an inverted rib heel is secured to a heel base, the inverted ribs being free to flex under such heel base, the front and rear portions of the heel being secured to such heel base by an adhesive or by a clip and adhesive. The peripheral edges of the heel and the heel base are preferably enclosed by a foxing strip adhesively secured to such edges.

The resilient shoe sole or heel of this invention is integrally formed of resilient rubber or similar or equivalent composition material, and comprises a ground plane surface engaging body and integrally formed upwardly projecting forwardly inclined transverse parallel rib members arranged in shoe base or heel base supporting relationship, as the case may be. When a load is applied to the shoe by a wearer, the ground plane surface contacting body of the sole or heel is brought to bear upon such surface and the rib members at the upper surface of the body flex forwardly, i.e., in the direction of their inclination, under and against the shoe base or heel base.

Since the rib members at their upper edges in contact with the shoe base make a frictional engagement with such shoe base, it is desirable to reduce such frictional interference with the flexing of the rib members as may occur. One means for so doing is the insertion of a smooth thin sheet of relatively firm yet flexible plastic material, such as a polyallomer, between the rib member upper edges and the shoe base by securing the plastic sheet material to the shoe base, making it a part thereof for the purposes of this construction. Various other materials may be considered including applying a wax to the shoe base, coating the shoe base with a film or spray coating of a suitable material having a reduced frictional engagement with the rubber composition of the rib member edges, powdering the shoe base with talcum powder or a wax powder, and other similar materials or expedients.

It is an object of the invention to provide a resilient shoe sole having upwardly and forwardly directed rib members secured to and in combination with a shoe base, wherein the rib members in supporting contact with the shoe base are free to move and flex in the direction of their inclination under such shoe base. Another object is to

secure such resilient inverted rib shoe sole to the shoe base at toe and heel portions, leaving the ribs intermediate such portions free to flex under and in contact with the shoe base. A further object is to secure a resilient inverted rib heel to a heel base at forward and rear portions of such heel, leaving the rib members intermediate such portions free to flex under and in contact with the heel base. Another object is to enclose the peripheral edges of such resilient sole or heel whereby to prevent admission of dirt, mud, snow and water into the spaces or openings between the inverted ribs of the sole or heel, and to provide securement of such sole or heel at their peripheral edges to the peripheral edges of the shoe base or the heel base, as the case may be.

These and additional objects of the invention and features of construction will become more apparent from the descritpion given below in which the terms employed are used for purposes of description and not of limitation.

Reference is made to the drawing annexed hereto, forming an integral part of this specification, and in which

FIGURE 1 is a side elevational view of a shoe embodying the inventive construction of this application.

FIGURE 2 is a fragmentary vertical sectional view taken substantially medially and longitudinally of the shoe illustrated in FIGURE 1 through the lower portion thereof.

FIGURE 3 is a horizontal sectional view taken substantially on the line 3—3 of FIGURE 2.

FIGURE 4 is a fragmentary vertical sectional view of the rearward portion of the sole in FIGURE 2, showing the combination with an optional mechanical fastener.

FIGURE 5 is a perspective view of the mechanical fastener.

FIGURE 6 is a vertical sectional view similar to that in FIGURE 2 showing a modified sole construction and its attachment to the shoe base.

FIGURE 7 is a vertical sectional view showing a heel secured to a heel base.

As shown in the several views of the drawing and more particularly in FIGURES 1, 2 and 3, the shoe **10** comprises an upper portion **12**, a shoe base **14**, and an outer sole **16**.

The shoe upper **12** can be of any usual or desired construction, including sandal or strap-type structures. The upper is attached or secured to a shoe base according to conventional practices.

The shoe base **14** shown is merely illustrative of a single type including an inner sole **18** and a wedge layer **20**. It will be understood that such shoe base is merely one of several types that can be utilized in the inventive construction wherein an inverted rib outer sole is secured to a shoe base to provide the benefits and advantages described herein.

The outer sole **16** comprises a body **22**, a longitudinally extending series of transverse parallel rib members **24** intermediate a toe block **26** and a heel block **28**. The body **22** has a bottom surface which is preferably flat and planar, although it may be otherwise fashioned. At its upper surface, the toe and heel blocks and the intermediate series of rib members are integrally formed with the body **22**. The sole **16** can be molded according to conventional practice, or it may be extruded if a suitable composition and die are employed. Although the upper surfaces of the toe block and heel block and the upper edges of the rib members are shown lying in a common plane, it will be understood that such relationship can be varied or modified so long as the rib member edges are arranged in shoe base supporting relationship or contact.

The outer sole **16** is formed of a resilient rubber or similar or equivalent composition suitable as a sole material. The sole is preferably molded of such composition that the toe and heel blocks and the rib members **24** are resilient

and flexible under weight of the shoe wearer in walking, running or standing. The body **22** may be heavy or thin in vertical section, it being understood that such thickness is best adjusted to the size and weight of the shoe wearer as well as desired to wear and resiliency characteristics of such sole body. The rib members **24** preferably have both their front and rear faces, **30** and **32** respectively, inclined upwardly and forwardly from the body **22**, so that the direction of rib inclination is forward. The faces **30** and **32** converge to conjunctive edges **36** at their upper ends.

The toe block **26** comprises a relatively solid pad of sole material which is secured to the shoe base **14** by stitching **37**, and optionally by a layer of suitable adhesive **38**. Similarly, the heel block **28** comprises a relatively solid pad of sole material and is adhered to the shoe base by a layer of adhesive **40**. Stitching may also be used at the heel block if the thickness of the heel block and the nature of the shoe base will permit.

To peripherally enclose the open spaces **42** formed by the rib members **24**, the body **22** and the shoe base **14** against the admisison of mud, dirt, snow and water, a foxing strip **44** is attached to and about the peripheral edges of the sole **16** and the shoe base **14** by an adhesive layer **46**, helping to further secure the sole to the shoe base.

Observations made of the sole **16** when attached to a shoe upper and shoe base as herein described appear to indicate that the rib members **24** flex forwardly as the shoe is brought into contact with a ground plane surface in walking or standing. In order that attachment of the sole **16** to the shoe base **14** may be made more secure if such is required, the use of a mechanical clip **50** (FIGURE 5) can be considered. The clip comprises a body **52**, disposed in contact with the shoe base **14** and secured thereto by nails **56** or other suitable fasteners, having a leg **58** depending from the body and terminating in an edge **60** from which prongs **62** project for penetration into and engagement with the sole **16**. As shown in FIGURE 4, the clip prongs **62** pierce the heel block **28** at its forward edge and the clip **50** tends to resist undue forward movement of the shoe base with respect to the heel block.

A modified resilient sole **70** is shown in vertical section in FIGURE 6 and comprises a sole body **72**, a longitudinally extending series of rib members **74** (similar to the rib members **24**) starting from the shank area of the sole and extending rearwardly to the heel block **76**. The rib members **74**, substantially similar in nature, form and function to the sole rib members **24**, extend upwardly from the body **72** to form and provide a wedge heel section **77** for the sole **70**. The forepart **78** of the sole **70** is relatively solid throughout and is adhered to the shoe base **80** by a layer of adhesive **82** and stitching **84** at the forward or toe end of the sole. The heel block **76** is adhered to the shoe base by a layer of adhesive **86**. If desired or required, a clip **50** can also be used. A foxing strip **44** is preferably attached by adhesive **46** peripherally about the sole and the shoe base to close the open spaces **88** between the rib members, the sole body and the shoe base. The composition of sole **70** is resilient and similar to that above described for the sole **16**.

A resilient inverted rib heel **90** (FIGURE 7) is secured to a heel base **92** by adhesive layers **94**, at the forepart **96** of the heel, and **98** at the heel block **100**, and comprises a heel body **102** and a longitudinally extending series of upwardly projecting and forwardly inclined rib members **104** in supporting relationship under the heel base **92**. The rib members **104** are similar in nature, form and function to the sole rib members **24** above described. A peripheral foxing strip **106** is attached to the peripheral edges of the heel **90** and shoe base **92** by a layer of adhesive **108**, to close the open spaces **110** against admission of mud, dirt, snow and water. The composition of heel **90** is resilient and similar to that above described for the sole **16**.

The rib members **24**, **74** or **104** herein illustrated and described are straight transverse and extend from edge to edge laterally of their soles. However, it will be understood that such rib members may also be curved or arcuate transversely, angled or chevron-shaped transversely, or they may be segments of such straight, curved angled or chevron-shaped rib members. The important features of such rib members include an upwardly projecting and forward inclination, resiliency, flexing and load bearing characteristics.

Foxing strips **44** or **106**, securing the sole or heel peripherally to the shoe base, are preferably made of a resilient and flexible rubber or rubber-like material so as not to unduly impair flexing of the rib members, but other suitable materials can also be used. In some shoe constructions, the foxing strip can be integrally molded with the shoe base and/or upper portions, in which event the sole or heel is secured to the foxing strip and shoe base within the cavity formed by such molded-in foxing strip by an adhesive, or by other suitable means.

A slick, relatively friction-free or reduced-frictional surface in contact with the upper edges of the rib members is preferred. Such a surface can be provided by waxing the underside of the shoe base, coating such surface with talcum or other friction-reducing powder or material, or by inserting a thin sheet of flexible plastic material having a reduced frictional coefficient with respect to the rib member edges. One sheet material that can be considered is a polyallomer produced by Eastman Chemical Products Co. of Kingsport, Tennessee. When the rib members are in load supporting relationship under the shoe base, they will flex more easily and function more satisfactorily if the surface of the shoe base is such as to permit a sliding action or motion of the shoe base against such rib member edges with a minimum of frictional resistance. In this way, a forward yielding motion of the shoe base relative to the rib member edges appears to occur, providing a more resilient and cushioning action or effect in standing or walking and a diminution of the shocks occurring in walking or running.

Application of the clip **50** adjacent the heel block of any of the soles or heels disclosed herein is optional and will depend upon the necessity for providing a mechanical fastener to restrain the heel block or sole or heel from undue forward movement or strain. Moreover, if the clip will not unduly impair the forward flexing action of the rib members, it may also be attached to the sole base at other points along the sole should such prove desirable or necessary to adequately secure the sole to the shoe base.

In operation, the shoe **10** having a sole **16**, or a heel **90**, or a modified sole **70** attached to its shoe base as above described provides a cushioning effect against the shocks of hard ground plane surface contacts by virtue of the forward yielding and flexing of the sole or heel rib members as the sole or heel body engages a ground plane surface. Forward flexing of the rib members, or flexing and yielding in the direction of rib inclination, provides the means for cushioning the shocks of walking on hard ground plane surfaces. When the sole or heel is peripherally enclosed by a foxing strip, pick up of mud, dirt, snow, water or other undesirable matter is avoided since the spaces between the rib members, the sole or heel body and the sole or heel base are closed. Securement at the fore and rear end portions of the sole or heel to the shoe or heel base leaves the intermediate rib members free to flex and yield under load against such base when the sole or heel is engaged upon a ground plane surface.

Having described the invention in its simplest terms, it is to be understood that the various features of construction above described may be changed or varied in greater or lesser degree without departing from the essence of the invention.

I claim:

1. In combination with a shoe having a shoe base,
a resilient sole secured to said shoe under said shoe base,
said sole having
a ground plane surface contacting body,
a longitudinally extending series of transverse parallel rib members projecting upwardly and inclined forwardly from the upper surface of said body,
said rib members having their front and rear faces converging upwardly from said body to conjunctive edges arranged in load supporting relationship under said shoe base,
said sole having a toe block and a heel block secured to said shoe base,
said rib members being free to flex under said shoe base in the direction of their inclination when under weight and said body is engaged upon said ground plane surface,
and in which the surface of said shoe base in contact with said rib member edges is of a reduced-frictional character with respect to said edges so as to permit a sliding motion of said shoe base relative to said rib member edges.

2. The structure defined in claim 1, and including a foxing strip secured to and about the peripheral edges of said sole and said shoe base, whereby the spaces between said rib members are closed to admission of matter thereinto and said sole is peripherally attached to said shoe base.

3. The structure defined in claim 1, and including
a metallic clip having a body secured to said shoe base and prongs projecting from said body penetrating and engaging said sole.

4. The structure defined in claim 3, and in which said clip body is secured to said shoe base in the heel portion thereof and said clip prongs penetrate and engage said heel block.

5. In combination with a shoe having a heel base,
a resilient heel secured to said shoe under said heel base,
said heel having
a ground plane surface contacting body,
a longitudinally extending series of transverse parallel rib members projecting upwardly and inclined forwardly from the upper surface of said body,
said rib members having their front and rear faces converging upwardly from said body to conjunctive edges arranged in load supporting relationship under said heel base,
said heel having portions forward and rearward of said rib members secured to said heel base,
said rib members being free to flex under said heel base in the direction of their inclination when under weight and said body is engaged upon said ground plane surface,
and in which the surface of said shoe base in contact with said rib member edges is of a reduced-

frictional character with respect to said edges so as to permit a sliding motion of said shoe base relative to said rib member edges.

6. The structure defined in claim 5, and including a foxing strip secured to and about the peripheral edges of said heel and said heel base, whereby the spaces between said rib members are closed to admission of matter thereinto and said heel is peripherally attached to said heel base.

7. The structure defined in claim 5, and including
a metallic clip having a body secured to said heel base and prongs projecting from said body penetrating and engaging said heel.

8. In combination with a shoe having a shoe base,
a resilient sole secured to said shoe under said shoe base,
said sole having
a ground plane surface contacting body,
a longitudinally extending series of transverse parallel rib members projecting upwardly and inclined forwardly from the upper surface of said body in the heel portion and extending partially into the shank area of said shoe base thereof,
said rib members having their front and rear faces converging upwardly from said body to conjunctive edges arranged in load supporting relationship under said shoe base,
said sole having portions forward and rearward of said rib members secured to said heel base,
said rib members being free to flex under said shoe base in the direction of their inclination when under weight and said body is engaged upon said ground plane surface,
and in which the surface of said shoe base in contact with said rib member edges is of a reduced-frictional character with respect to said edges so as to permit a sliding motion of said shoe base relative to said rib member edges.

9. The structure defined in claim 8, and including a foxing strip secured to and about the peripheral edges of said sole and said shoe base, whereby the spaces between said rib members are closed to admission of matter thereinto and said sole is peripherally attached to said shoe base.

10. The structure defined in claim 8, and including
a metallic clip having a body secured to said shoe base and prongs projecting from said body penetrating and engaging said heel block.

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