

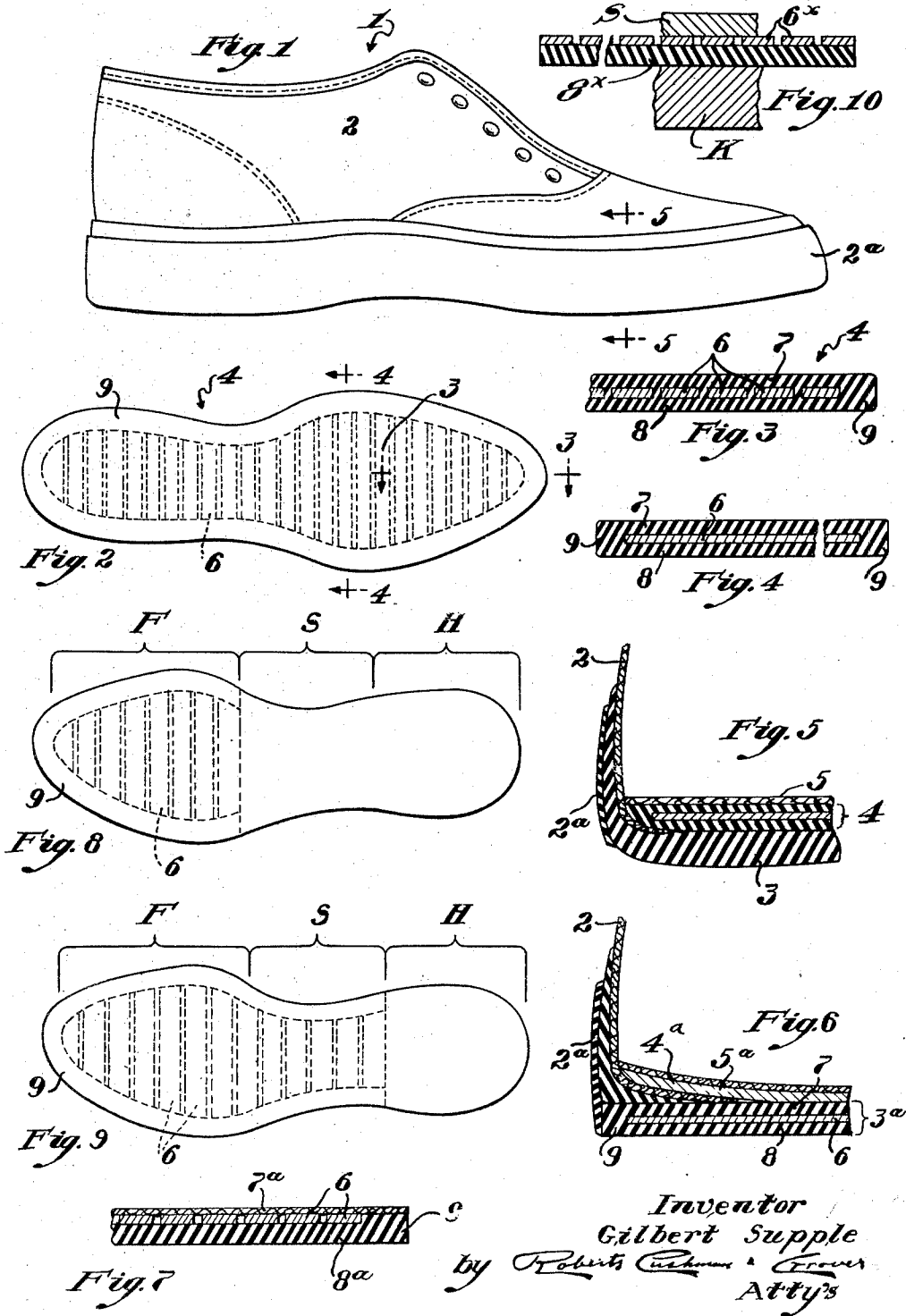
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FLEXIBLE SOLE ELEMENT

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FLEXIBLE SOLE ELEMENT

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9 Claims. (Cl. 36—32)

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This invention pertains to footwear wherein the bottom structure includes a transversely rigid, longitudinally flexible sole element and relates more particularly to a novel sole element for use in the manufacture of such a shoe, the present application being a continuation-in-part of my application for Letters Patent Serial No. 672,346, filed May 27, 1946, since issued as Patent No. 2,461,355, dated February 8, 1949.

In my Patent No. 2,381,937 dated August 14, 1945 I have described a transversely rigid, longitudinally flexible sole element comprising two or more plies of wood and a marginal attaching strip of flexible material such as leather. In the patented construction, each ply of wood consists of a series of ribs, each rib having a slot in its end, and the attaching strip is set into the slots in the several ribs and not only constitutes means for securing the sole element to other parts of the shoe but also provides a flexible or hinge connection between the ribs of the series. Such a sole element, transversely rigid but longitudinally flexible is very desirable in athletic shoes, for example tennis, golf, basketball and bowling shoes, wherein longitudinal flexibility coupled with adequate foot support are desirable.

One object of the present invention is to provide a sole element, constituting a novel and useful modification of that specifically disclosed and claimed in my aforesaid patent. A further object is to provide a sole element having certain of the characteristics of the patented sole element above referred to and which is of full length, that is to say, it extends from heel to toe-tip of the shoe. A further object is to provide a transversely rigid, longitudinally flexible sole element having an attaching member extending all of the way around it, including its toe and heel portions. A further object is to provide, as a modification thereof, a sole element of similar construction but wherein the forepart, or the forepart and shank portions only are of the transversely rigid longitudinally flexible type, the remainder of the sole element being of conventional construction, for example of rubber and fabric or the like. A further and more specific object is to provide a sole element wherein transversely rigid ribs or slats are completely or partially embedded in a mass of water-resistant material, such for example as a rubber compound. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein

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Fig. 1 is a side elevation of a rubber-soled shoe embodying the present invention;

Fig. 2 is a top plan view of a sole element embodying the present invention, as it appears before incorporation in the shoe, and which may, for example, constitute either the inner sole or the outer sole of a shoe such as shown in Fig. 1;

Fig. 3 is a fragmentary longitudinal section, to larger scale, substantially on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary transverse section, to larger scale, substantially on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary transverse section through a shoe such as that of Fig. 1, showing the improved sole element of the present invention arranged to constitute the insole;

Fig. 6 is a view similar to Fig. 5 but showing the sole element of the present invention arranged to constitute the outer sole of the shoe;

Fig. 7 is a view similar to Fig. 3 but illustrating a modified construction;

Fig. 8 is a top plan view of a sole element of modified construction embodying the present invention (as it appears before incorporation in the shoe) said sole element differing from that illustrated in Figs. 2, 3 and 4 only in that the transversely rigid portion is confined to the forepart of the shoe;

Fig. 9 is a view similar to Fig. 8 illustrating a modification in which the transversely rigid portion of the sole element is confined to its forepart and shank portions only; and

Fig. 10 is a fragmentary vertical section through the bottom of a Goodyear welt shoe showing a sole element embodying the present invention employed as a filler piece.

Referring to the drawings the numeral 1 designates an athletic shoe, for example, a tennis shoe, having the upper 2 which is usually of textile fabric. In Fig. 5, which is a more or less diagrammatic fragmentary section through the forepart of the shoe of Fig. 1, the shoe is shown as having a generally conventional rubber outer sole 3, an exterior foxing strip 2^a, an inner sole 4 constructed in accordance with the principles of the present invention, and a sock lining 5 of textile material or the like covering the upper surface of the insole. The rubber shoe, except with respect to the insole 4, may be of conventional construction and its parts may be assembled and united in conventional fashion. In accordance with the present invention, the sole element, which constitutes the inner sole 4 of the shoe of Fig. 5, comprises a longitudinally extending

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series of transversely rigid slats or ribs 6. These transversely extending ribs may be of any suitable material providing the desired rigidity, but as they should be light in weight, as well as transversely rigid, it is recommended that they be made of wood since this possesses these requisite characteristics. For some purposes a multi-layer ply wood may be employed, or plies of textile material united and made substantially rigid by an impregnant binder. However, it is contemplated that a light metal, for example an aluminum or magnesium alloy, or tubing of other metals may be employed in making these ribs as preferred.

As illustrated in Fig. 3, the ribs 6 are disposed in the same plane to form a mid-ply of the sole element, this mid-ply being embedded in a mass of resilient water-impervious material such, for example, as a rubber compound, either natural or synthetic, this water-impervious material forming upper and lower webs 7 and 8 overlying and underlying the rib ply and preferably integrally joined at the margin of the sole element to form the attaching strip 9. Each of the webs 7 and 8, as illustrated in Figs. 3 and 4, is of greater thickness than the mid-ply consisting of the ribs 6. The plies 7 and 8 collectively provide the major portion of the thickness of the sole element which is thus predominantly a rubber sole. This attaching strip may be of any desired and suitable width and may be employed in certain types of shoe for the reception of fastening elements, for example, metal fasteners or thread stitches for uniting the sole element to other parts. Ordinarily in the manufacture of a rubber sole shoe such fasteners are not employed and the attaching strip 9 and one or both of the web members 7 and 8 are adhesively bonded to adjacent parts of the shoe structure by suitable cement. The upper and lower webs 7 and 8, in the process of curing the material of which they are formed, may protrude into the narrow spaces between the ribs 6 and may even integrally merge, as shown in Fig. 3, at these points so that they are firmly united to each other. While the sole element may have a marginal attaching strip 9 of substantial width, it is within the scope of the invention to narrow this attaching strip as much as may be desired, or even omit it entirely, since in a rubber soled shoe it is not usually necessary, as hereinafter noted with specific reference to Figs. 7 and 10, one of the webs 7 or 8 may be omitted. The curing process will usually bond the ribs 6 directly to the material forming the webs 7 and 8. In any event the ribs are bedded upon resilient material forming one or both of the webs 7 and 8 and adhere strongly to one or both of said webs and are thus flexibly united so that the sole element, while rigid transversely, is flexible in a longitudinal direction. In stating that the ribs are "bedded" upon the resilient material, it is not intended thereby to suggest whether the ribs are above, below or completely surrounded by the resilient material.

The ply comprising the ribs 6, may, as illustrated in Fig. 2, extend substantially from toe to heel of the sole element, the attaching strip 9 then extending all of the way around the sole element. On the other hand, as illustrated in Fig. 8, the transversely rigid ribs 6 may be confined to the forepart F of the sole element, the shank and heel portions then being of any suitable material, for example a solid mass of the rubber or other usual material, and forming an

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integral continuation of the webs 7 and 8. Likewise, as illustrated in Fig. 9, the transversely extending ribs may extend throughout the forepart and shank portions F and S, while the heel portion H consists of rubber or other usual material. As a matter of fact, the ribs may extend over as large or as small an area of the sole element as may be desired. It is to be understood that the shoe shown in Fig. 1 may have a sole element such as shown in either of Figs. 2, 8 or 9.

While, as above described and as illustrated in Fig. 5, the sole element 4 forms the inner sole of the rubber soled shoe, the outer sole 3 being of conventional rubber shoe construction, the reverse arrangement may be employed. As shown in Fig. 6, the outer sole 3^a comprises a ply consisting of the transversely rigid ribs 6 interposed between upper and lower webs 7 and 8 of the resilient material. The marginal strip 9 is not necessary as an attaching member, but may be desirable to provide a substantial body of rubber at the edge of the shoe bottom. As illustrated in Fig. 6, the inner sole 4^a is of conventional form and the sock lining 5^a is likewise of usual construction. Although not here specifically illustrated, it is contemplated that both the outer and inner soles in the same shoe may be of the construction herein specifically described, that is to say may have a ply consisting of transversely rigid ribs and a uniting mass of flexible and resilient water-resistant material.

As a further modification and as illustrated in Fig. 7 the sole element may comprise a ply consisting of the transversely rigid ribs 6, as above described, but may have but a single overlying or underlying web 8^a of the resilient material. In this case this web underlies the rib ply and is integral with the attaching strip 9. Portions of the web 8^a may, as shown, extend up between the ribs 6. In this instance the ribs are bedded upon the single rubber ply 8^a and flexibly united by the rubber to form a longitudinally flexible sole element. If desired, a textile or other ply 7^a is arranged to overlie and to conceal the ribs 6. As thus indicated, the rib ply is not necessarily midway between the top and bottom of the sole element. It is to be understood that when reference is made to a "mid-ply" consisting of the transversely rigid independent ribs, it is not thereby intended to limit the position of the rib ply to the exact mid-height of the sole element.

The sole element shown in Fig. 10 comprises a bottom ply 8^x which is flexible both longitudinally and transversely. This ply may be of leather, rubber, rubber substitutes, or compounds of rubber, or of textile or equivalent material which may be waterproofed, or frictioned with rubber. This sole element also comprises a single top ply, coextensive and registering with the ply 8^x, which is flexible longitudinally, but rigid transversely of the sole element, said top ply comprising a series of longitudinally spaced independent ribs or slats 6^x such as above described, the several ribs or slats being bedded upon and adhesively bonded to the ply 8^x which thus constitutes hinge means uniting the several ribs or slats. Such a structure is useful as an internal sole element for example, as a midsole or platform in a platform type shoe, or as suggested in Fig. 10, as a filler piece for a Goodyear welt shoe. As illustrated in Fig. 10, this sole element is devoid of any marginal attaching strip and when used as a filler in a Goodyear welt shoe will be disposed between the insole S and the outer sole

K. As here illustrated, the slats are substantially symmetrical with reference to the longitudinal axis of the sole element so that said axis substantially bisects each slat of the series. When herein the series of slots is referred to as a "ply" such reference is not intended to suggest the character of the individual slat, which may be an integral piece of wood or other stiff material or plied material as preferred.

When herein reference is made to "rubber" it is to be understood that this term is used as broadly descriptive of any substance having the general characteristics of natural rubber such as resiliency and water-impermeability.

While certain desirable embodiments of the invention have herein been illustrated and described by way of example it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claims.

I claim:

1. A sole element for use in rubber soled footwear, said sole element including a mid ply comprising a series of independent transversely extending substantially rigid ribs, and upper and lower plies of flexible water-impervius material to which said ribs are bonded at least one of said plies of flexible water-impervius material being thicker than said mid-ply.

2. A sole element according to claim 1 wherein the upper and lower plies have marginal portions which extend beyond the edges of the mid-ply and are united to form an attaching strip.

3. A sole element according to claim 1 wherein the upper and lower plies are of a rubber compound and have marginal portions which extend beyond the edges of the mid-ply, said marginal portions being integrally joined.

4. A sole element for use in footwear, said sole element comprising upper and lower plies which are flexible both longitudinally and transversely of the sole element, one at least of said plies being of resilient water-impervius material and a third ply intervening between said upper and lower plies, said third ply consisting of a single, longitudinally extending series of independent substantially rigid slats, each slat extending transversely of the sole element, the slats being in substantially the same plane and being spaced apart sufficiently to permit longitudinal flexing of the sole element and being so arranged that the longitudinal axis of the sole element substantially bisects each slat, said flexible plies collectively providing the major portion of the thickness of the sole element.

5. A sole element according to claim 4 wherein the material which constitutes both the upper and lower plies is water-impervius and fills the spaces between adjacent slats, the margins of

the upper and lower plies extending beyond the edges of the third ply and being integrally joined, whereby the slats forming the third ply are embedded and sealed within the material forming the upper and lower plies.

6. A sole element for use in footwear, said sole element comprising at least two registering plies, one of which is of a resilient water-impervius rubber compound which is flexible in all directions, and one of which is flexible longitudinally of the sole element but substantially rigid transversely of the sole element, said latter ply being thinner than the water-impervius ply and consisting of a single series of thin, substantially rigid, spaced, parallel, transversely extending independent wooden slats, all in substantially the same plane and which are adherent to the first first ply, the slats being so arranged that the longitudinal axis of the sole element substantially bisects each slat.

7. A sole element according to claim 6 and wherein the heel end of the sole element is devoid of the transversely extending slats.

8. A sole element according to claim 6 and wherein the said two plies are coextensive, the transversely extending slats of the series being spaced apart, one surface only of each slat contacting the material forming the resilient ply.

9. A sole element according to claim 6 and which comprises three registering plies, one of said plies being of a resilient water-impervius rubber compound which is flexible in all directions, a second ply being flexible longitudinally of the element but substantially rigid transversely of the sole element, and consisting of a single series of thin, substantially rigid, spaced, parallel, transversely extending, independent, wooden slats all in substantially the same plane, said slot ply being thinner than the water-impervius ply, and the third ply being of textile material overlying and concealing the slat ply.

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