Nov. 2, 1943. F. E. RUSSELL 2,333,201

OUTSOLE FOR SHOES

Filed March 30, 1942

Fig1

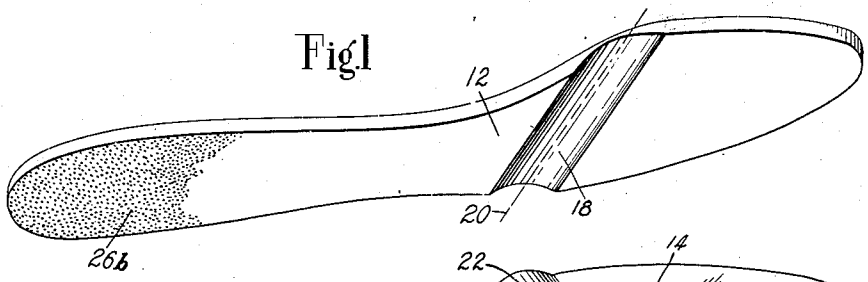


Fig2

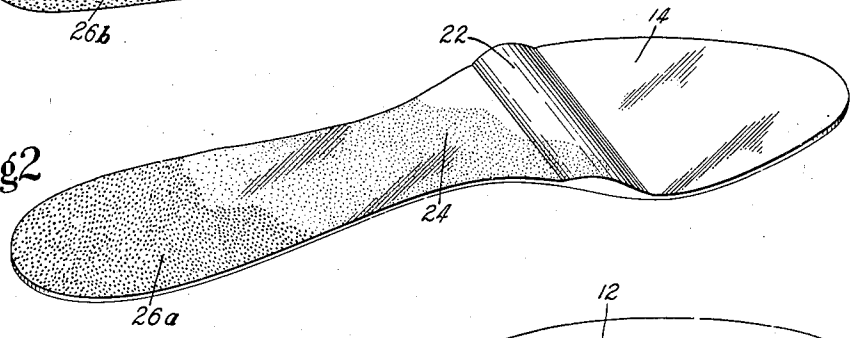


Fig3

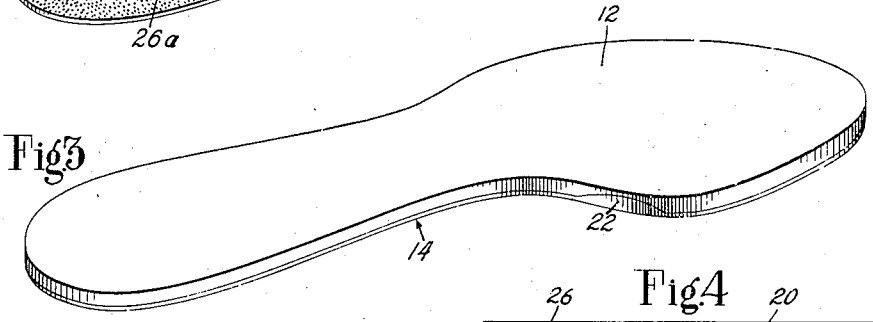


Fig4

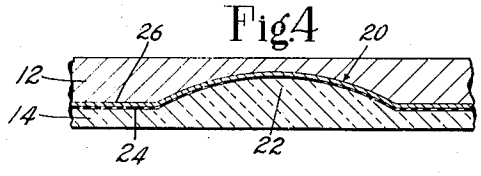


Fig5

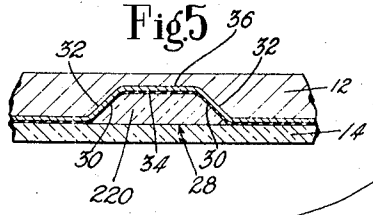


Fig6

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UNITED STATES PATENT OFFICE

2,333,201

OUTSOLE FOR SHOES

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Application March 30, 1942, Serial No. 436,776

10 Claims. (Cl. 36—30)

This invention relates to improvements in outsoles for shoes.

It is desirable that the bottom of a shoe shall be capable of bending freely in the vicinity of the break line between its shank and ball portions to accommodate the flexure of the foot in walking and many attempts have been made to accomplish this result. For example, it is a common practice to slash or groove the insole transversely in the break line area to render that area more flexible. Even if such treatment is effective to facilitate bending of the insole, the stiffness of the outsole renders the shoe bottom as a whole incapable of being bent or flexed as freely as desired. Cutting, scoring and recessing operations have also been performed upon outsoles to increase their flexibility in different localities but such treatment has heretofore had the undesirable result of weakening the outsoles so as to lessen their resistance to wear.

One object of the present invention is to provide the desired degree of flexibility in the zone adjacent to the junction of the shank and ball portions of an outsole without weakening the outsole or impairing its wearing qualities.

With this object in view the present invention provides a composite outsole comprising two laminae permanently secured together, one of said laminae being more flexible and less resistant to bending than the other and having a thickened portion in the break line area of the outsole, i. e., in the vicinity of the junction of the shank and forepart thereof, and the other lamina having portions of reduced thickness in that vicinity. Thus, because there is a preponderance of the more flexible material in the vicinity of the break line of the outsole, the outsole will be capable of bending more freely in that locality than elsewhere and thus will be better adapted to accommodate the flexing movements of the foot, and the shoe in which the outsole is incorporated will be more comfortable to wear than a shoe having a conventional outsole.

As herein illustrated I prefer to make the lower or tread layer of the outsole of the more flexible material since it is this lower layer which is subjected to the greater amount of stretching when the sole is being flexed. I also prefer to make the lower or tread layer of the outsole of sheet vinyl resin, inasmuch as this material is not only more flexible and less resistant to bending than leather or other materials usually employed in the manufacture of outsoles, but it is also more yieldable than leather and thus has an advantageous cushioning effect which is more pronounced in the break line area where the thickened portion of the layer affords an effective yielding support for the metatarsal arch of the foot. It has also been found that vinyl resin has substantially better wearing qualities than the better grades of sole leather. As herein illustrated, I reduce the thickness of the leather or less flexible layer of my laminated outsole by cutting, in the lower side of this layer, a groove of substantial width and depth, the groove extending transversely of the layer in the break line area and preferably extending entirely across the layer, and I provide a thickened portion upon the lower or tread layer by forming upon the upper side of that layer a ridge-like projection substantially complemental to the groove in the upper layer, the projection being adapted to fit within the groove in the upper layer so as substantially to fill the same. This projection may be formed integrally with the substance of the lower layer or it may be formed as a separate piece of the same material as the lower layer and secured to the body of that layer by means of adhesive.

The invention will now be described with reference to the accompanying drawing, in which

Fig. 1 is a perspective view of the upper or body layer of my improved outsole, the view showing the lower side of that layer;

Fig. 2 is a perspective view of the lower or tread layer of the outsole showing the upper side of that layer;

Fig. 3 is a perspective view of a composite outsole embodying my invention and comprising the upper and lower layers as shown in Figs. 1 and 2, respectively;

Fig. 4 is a detailed view, in longitudinal section and on an enlarged scale, of a portion of the outsole in the vicinity of the break line;

Fig. 5 is a view similar to Fig. 4 but illustrating an alternative formation of the complemental interfitting portions of the component layers of the outsole; and

Fig. 6 is a perspective view of an outsole of further modified construction.

As illustrated in Figs. 1 to 4, inclusive, of the drawing, my improved outsole comprises two full length sole-shaped layers, viz., an upper or body layer **12** which may be of sole leather and a lower tread or facing layer **14** which is preferably composed of sheet vinyl resin, such material being substantially more flexible and less resistant to bending than sole leather. The vinyl resin sheet material may comprise polyvinyl acetate, polyvinyl chloride, a copolymer of vinyl acetate and vinyl chloride, polyvinyl acetal or other suitable vinyl resin. The material ordinarily contains a suitable plasticizer, such as dibutyl cellosolve, phthalate, or dibutyl sebacate.

The upper or leather layer **12**, which is shown as being substantially thicker than the tread layer **14**, has a groove **18** of substantial depth and width formed in its lower side, the groove extending across the layer in the vicinity of the junction of the shank and ball portions thereof,

this locality being indicated by the dotted "break line" 20 in Fig. 1. The upper layer 12 is thus reduced in thickness in the break line area by the removal of a substantial amount of material, leaving only a relatively thin portion of the layer connecting the shank and ball portions thereof which will offer no substantial resistance to bending of the layer in the region. A piece of leather having a grain surface at one side will ordinarily be employed as the leather layer 12 and advantageously the groove 18 will be formed in the grain-surfaced side of the layer inasmuch as the material adjacent to this surface is stiffer than that at the flesh side of the layer and the layer will be made even less resistant to bending by the removal of material from its grain side than by the removal of material from its flesh side. The ungrooved portions of the grain surfaces of the layer 12 may be buffed or roughened to prepare them for the reception of adhesive by which the layer 12 is to be secured to the layer 14.

As shown in Fig. 2, the tread or facing layer 14 has a ridge-like projection 22 extending across its upper surface, the projection being substantially complemental to the groove 18 and being so disposed relatively to the outer layer that when the two layers are assembled in face-to-face relation, as shown in Figs. 3 and 4, the projection 22 will interfit within and substantially fill the groove 18.

In order to provide for the secure and permanent adhesive bonding of the vinyl resin layer 14 to the leather layer 12 I prefer to proceed as follows. After buffing or roughing the upper surface of the layer 14 I deposit thereon a film 24 of chlorinated rubber by applying a solution of chlorinated rubber and permitting the solution to dry. Thereafter I apply a liquid dispersion or colloidal solution of polymerized chloroprene to the dried film of chlorinated rubber, as indicated at 26^a in Fig. 2, and to the roughened or buffed lower surface of the leather layer 12, as indicated at 26^b in Fig. 1, and permit the solution partially to dry. The two layers are then pressed together with the polymerized chloroprene surfaces in juxtaposition and put under pressure whereby a firm bond becomes established between them. As indicated in Fig. 4, the bonding means comprises the film 24 of chlorinated rubber which is adhesively secured to the vinyl resin layer 14 and a film 26 of polymerized chloroprene which is adhesively secured to both the chlorinated rubber 24 and the leather layer 12. It is to be understood that Fig. 4 is diagrammatic in so far as the illustration of the films 24 and 26 is concerned and that actually these films are much thinner than indicated in the drawing. A method of securing a layer of vinyl resin to a layer of leather, such as that just described, and an outsole comprising a leather layer and a layer of vinyl resin secured together by the practice of such a method are disclosed in a copending application, Serial No. 435,998, filed March 24, 1942, in the name of F. V. Nugent. Reference may also be had to said application for specific compositions of chlorinated rubber and polymerized chloroprene which may be employed.

In assembling the component outsole layers the projection or ridge 22 of the tread layer is received within the groove 18 of the body layer, as illustrated in Figs. 3 and 4. Thus, while the outsole zone comprising the grooved portion of the leather layer and the ridged portion of the vinyl resin layer is of the same thickness as the rest of the outsole, the leather portion of this zone is relatively thin while the vinyl resin portion of the zone is relatively thick and since the vinyl resin layer is more flexible and less resistant to bending than the other layer, the outsole will be capable of bending freely in this zone which, as already pointed out, is located in the vicinity of the junction of the shank and ball of the outsole where the greatest amount of bending is to take place in the wearing of the shoe in which the outsole is incorporated. If, as preferred, the portion of the leather layer which overlies the projection or ridge 22 is composed largely of the flesh fibers of the leather which are more flexible than the grain fibers, this condition will contribute further to the desired capacity of the outsole to bend freely in the vicinity of the break line.

Instead of forming the ridge or projeciton 22 as an integral part of the vinyl resin layer, it may consist of a separate piece 220 and be adhesively secured to the body of the layer at 28, as indicated in Fig. 5. Moreover, the surface of the ridge and the complemental surface defining the groove in the leather layer, instead of being shaped as shown in Fig. 4, may be shaped as indicated in Fig. 5, the ridged surface and the grooved surface having inclined or beveled marginal portions 30 and 32, respectively, and flat portions 34 and 36, respectively, between the beveled portions, the contour of the groove being shaped so as to be complemental to that of the ridge.

As illustrated in Fig. 6, the upper or leather lamina of the outsole may comprise separate sections 38 and 40, the section 38 overlying and being adhesively secured to the heel and shank portion of the tread layer 140 and the section 40 overlying and being adhesively secured to the forepart of the tread layer. The forward extremity of the rear section 38 of the upper lamina and the rear extremity of the section 40 are undercut or beveled as indicated at 42, 42, the beveled surfaces being adhesively secured to the correspondingly beveled lateral margins of a ridge or projection 222 which extends across the upper side of the tread layer in the break line area of the outside. The maximum height of the ridge 222 is equal to the thickness of the upper lamina sections 38 and 40 and the arrangement of the parts is such that the upper surface portion 44 of the ridge is flush with the upper surfaces of the sections 38 and 40. Thus, in this form a portion of the outsole is composed of vinyl resin throughout its entire thickness in the break line area thereof so that the outsole will be even more flexible in this area than in the other forms. The ridge on the lower layer may be shaped so that the surface portion 44 will be either wider or narrower than shown in Fig. 6 or so that the beveled lateral margins of the ridge meet to form a ridge which is V-shaped in cross-section, and is substantially covered by the beveled edges 42, 42 of the upper layer sections 38 and 40.

In the several forms herein shown and described, the cushioning effect of the lower layer is more pronounced in the vicinity of the break line than elsewhere inasmuch as the yieldable material of which the lower layer is composed is of increased thickness in this locality. Thus the thickened portion of the lower layer provides a yielding support for the metatarsal region of the foot where such a support is most effective to shield the foot from the shocks incident to walking.

Preferably, the sheet vinyl resin or other flexi-

ble plastic material constituting the thickened portion of the tread layer will contain more plasticizer than the rest of the layer whereby the capacity of the outsole to bend or flex freely in the break line area is still further enhanced and even more effective cushioning of the metatarsal area of the foot is provided for.

While in Figs. 1 and 2 I have shown the upper and lower layers as having been cut to outsole shape before being secured together, the layers may be supplied in block sole form, one of the layers being grooved and the other ridged, and the layers being secured together with the groove and the ridge interfitting before being cut to sole shape. Moreover, a laminated sheet from which a plurality of outsoles can be cut may be formed by securing together two layers, one having a series of grooves and the other a series of ridges interfitting within the grooves and the sheet may be cut by dies or otherwise to yield a plurality of laminated outsoles each having a complemental groove and ridge formation in its break line area.

Having described my inevntion, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A composite outsole comprising two laminae of full outsole length permanently secured together, each of said laminae being composed of flexible material thereby rendering the outsole capable of bending in any locality, one of said laminae being less resistant to bending than the other and having a thickened portion in the vicinity of the junction of the shank and forepart of the outsole, and the other lamina having portions of reduced thickness in said vicinity.

2. A composite outsole comprising upper and lower laminae adhesively secured together, the upper lamina being flexible and having portions of reduced thickness in the vicinity of the break line between the shank and ball portions of the outsole, and the lower lamina being more flexible than the upper lamina and having a thickened portion in said vicinity.

3. A composite outsole comprising upper and lower laminae adhesively secured together, the upper lamina having portions of reduced thickness in the vicinity of the break line between the shank and forepart of the outsole, and the lower lamina being more flexible than the upper lamina and having in said vicinity a thickened portion which is more flexible than the rest of said lamina.

4. A composite outsole comprising upper and lower laminae adhesively secured together, the upper lamina having portions of reduced thickness in the vicinity of the break line between the shank and forepart of the outsole, and the lower lamina being more yielding than the upper lamina and having in said vicinity a thickened portion which is more yielding than the rest of said lamina.

5. A composite outsole comprising flexible sole-shaped upper and lower layers each of full outsole length, said layers being secured together in face-to-face relation, said upper layer having a continuous upper face and having in its lower side a transversely extending groove located in the vicinity of the junction of the shank and forepart of the outsole and said lower layer being substantially less resistant to bending than said upper layer and having a transversely extending ridge fitting within said groove.

6. A composite outsole comprising an upper layer of flexible leather of full outsole length, said layer having a continuous upper face and having a groove extending across its lower side between its shank and ball portions and a sole-shaped lower or tread layer of vinyl resin having a ridge-like projection complemental to said groove extending across its upper side between its shank and ball portions, said layers being adhesively secured together in face-to-face relation with said ridge interfitted within said groove.

7. A composite outsole comprising flexible sole-shaped upper and lower layers adhesively secured together in face-to-face relation, said upper layer having in its lower side a groove of substantial width extending transversely of the outsole in the vicinity of the junction of its shank and forepart, and said lower layer being substantially less resistant to bending than said upper layer and having on its upper side a raised portion substantially complemental to and fitting within said groove.

8. A laminated outsole comprising a relatively thin sole-shaped lower or tread layer of sheet vinyl resin having a ridge-like projection of substantial width extending across its upper side in the vicinity of the break line between the shank and forepart of the outsole, said projection having beveled lateral margins and said layer being of uniform thickness forwardly and rearwardly of said projection, and a relatively thick sole-shaped upper layer of flexible leather, said upper layer being of full outsole length and being secured to said lower layer by means of adhesive and said layer having a continuous upper face and having in its lower side a recess substantially complemental to said projection within which the latter is received.

9. A composite outsole comprising an upper or body layer of leather having in its lower side a wide channel-like recess extending transversely of the outsole in the vicinity of the junction of its shank and forepart, a sole-shaped lower or tread layer of sheet vinyl resin having on its upper side a raised portion complemental to said recess and fitting within the latter, a film of chlorinated rubber adhesively secured to the upper side of said tread layer, and a film of polymerized chloroprene adhesively secured to said film of chlorinated rubber and to the lower side of said upper layer.

10. A laminated outsole comprising a sole-shaped lower or tread layer composed of vinyl resin having a ridge-like projection extending across its upper side in the vicinity of the break line between the shank and ball portions of the outsole, said projection having beveled lateral margins and said layer being of uniform thickness forwardly and rearwardly of said projection, an upper flexible layer of leather more resistant to bending than said lower layer secured to the heel and shank portion of said lower layer and having a beveled forward margin secured to one beveled rear margin of said projection, and an upper flexible layer of leather secured to the forepart of said lower layer and having a beveled rear margin secured to the beveled forward margin of said projection.

FRED E. RUSSELL.

CERTIFICATE OF CORRECTION.

Patent No. 2,333,201. November 2, 1943.

FRED E. RUSSELL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 8, for "the" second occurrence, read --this--; and second column, line 47, for "outside" read --outsole--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of January, A. D. 1944.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)