July 7, 1953 J. A. CIAIO 2,644,250

LAMINATED SHOE SOLE

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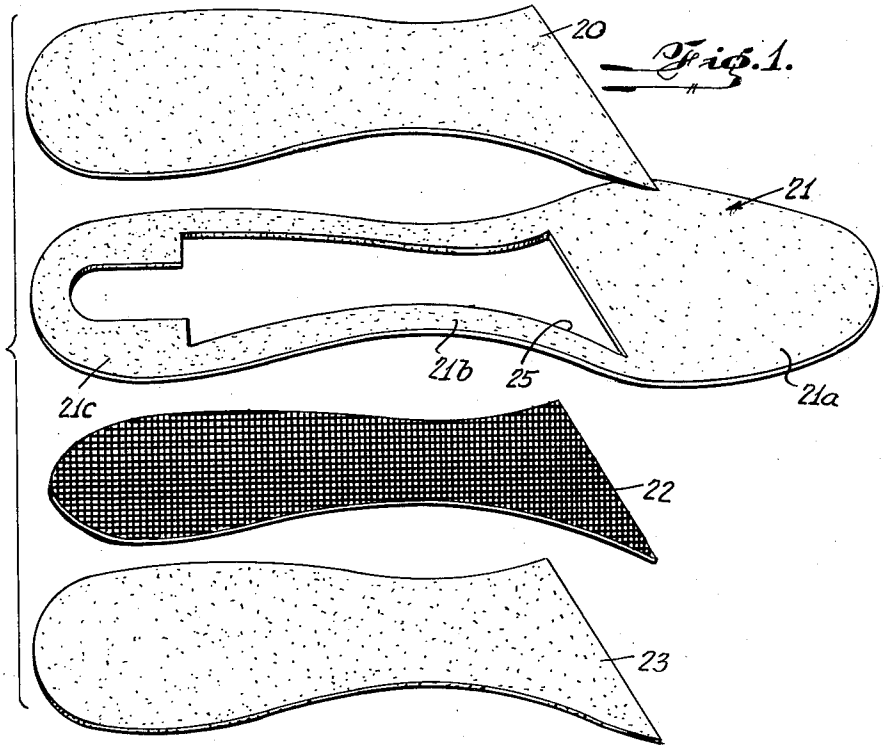

Fig. 1.

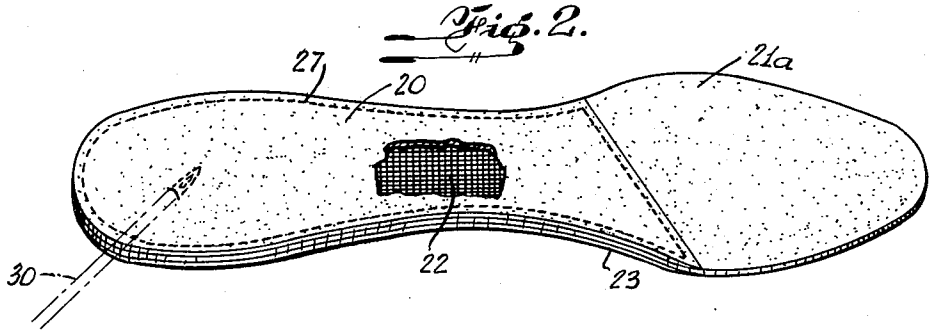

Fig. 2.

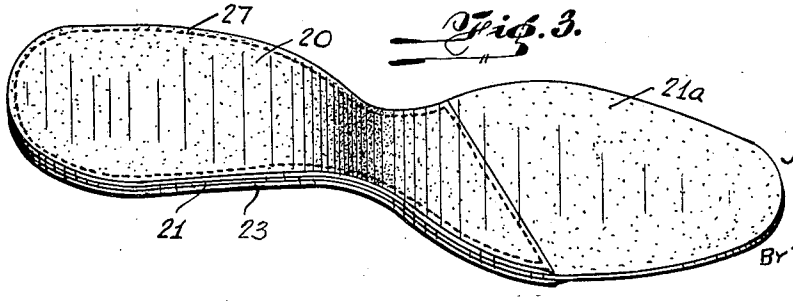

Fig. 3.

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Fig. 4.

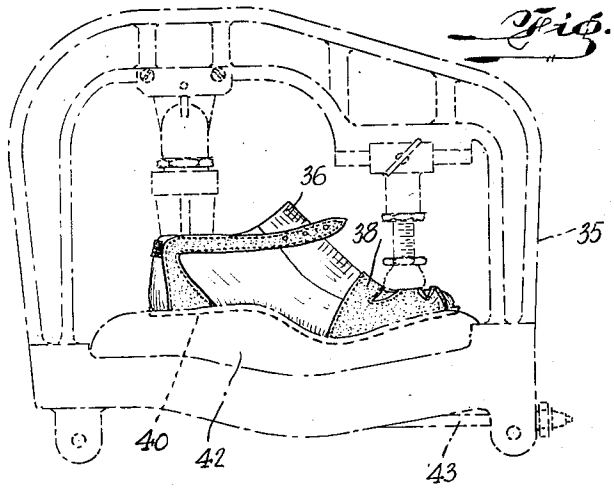


Fig. 5.

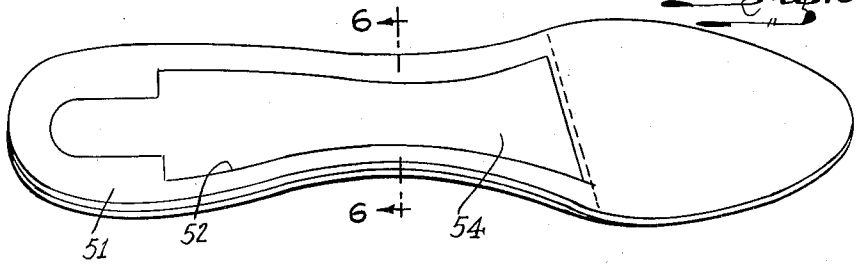


Fig. 7.

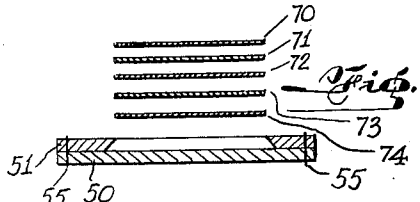
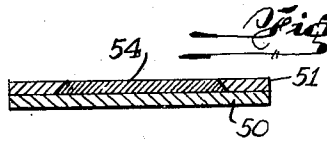


Fig. 6.



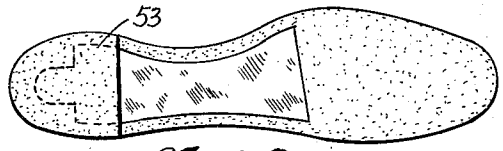


Fig. 9.

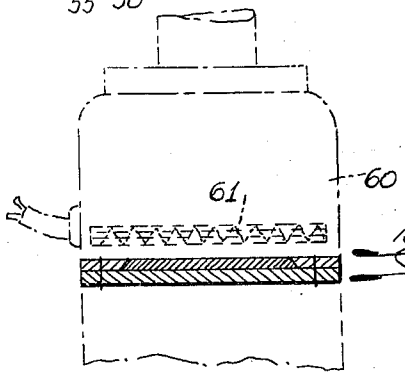


Fig. 8.

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LAMINATED SHOE SOLE

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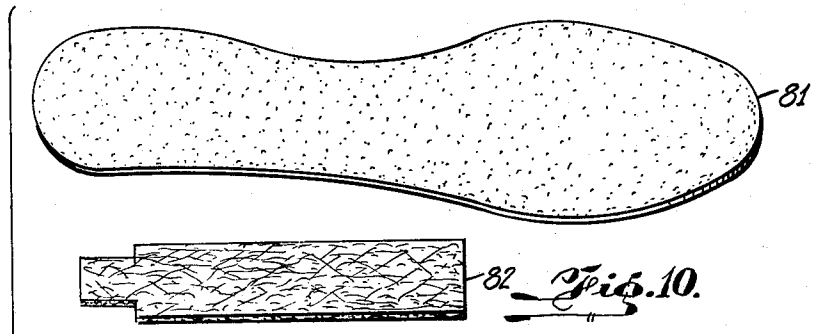
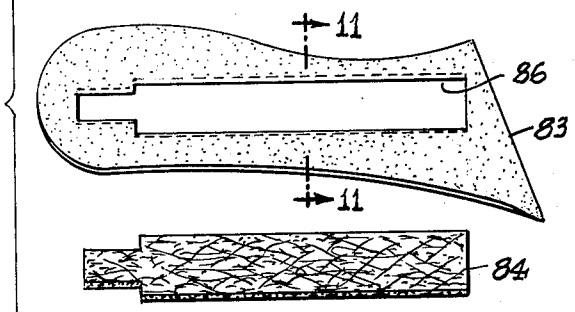


Fig. 10.



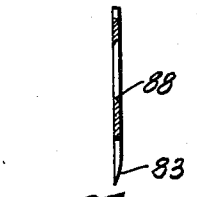


Fig. 11.

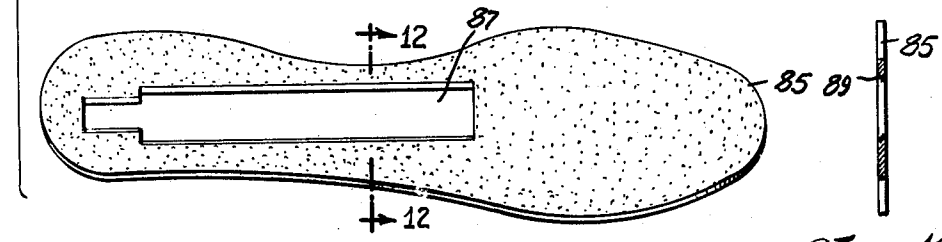


Fig. 12.

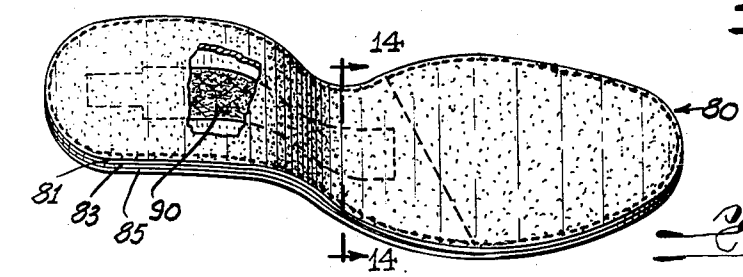


Fig. 13.

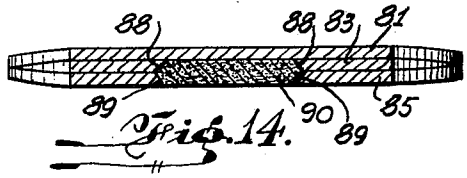


Fig. 14.

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UNITED STATES PATENT OFFICE

2,644,250

LAMINATED SHOE SOLE

Joseph A. Ciaio, Corona, N. Y.

Application November 23, 1951, Serial No. 257,682

3 Claims. (Cl. 36—76)

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This invention relates to an insole construction for shoes and other articles of footwear, and it also relates to a method of constructing an improved type of insole assembly.

The present application is a continuation in part of my co-pending patent application, Serial No. 86,686, filed April 11, 1949, now abandoned.

The insole assembly to which reference is herein made includes the insole proper, the shank portion and that part of the heel seat to which the upper or counter is secured. This insole assembly is preferably made principally of leather and its outward appearance is conventional in virtually every respect. It makes use, however, of a stiffening agent made of plastics, extending from the heel seat to the ball area of the insole, and several advantages are thereby provided. In the first place, an insole assembly of this general character is very easily and inexpensively fabricated and formed. In the second place, the product itself has considerable merit in that the form and contours of the shank area may be provided to exacting perfection and in that, once provided, such form and contours remain a permanent feature of the shoe for the full lifetime thereof.

Plastics used as a forming and stiffening agent for the shank area permits of improved shoe building methods. Plastics is readily fashioned to predetermined shape and form. This may be done prior to its inclusion in the shoe proper or it may be done following its inclusion therein. When the plastics is prefabricated to appropriate shape and form, all that need be done is to fasten it to the shoe proper. Plastics that is not preformed must be incorporated into the shoe proper and forming and setting must thereafter take place as an integral part of the shoe and of the shoe building procedure. In the one case, the preformed plastics becomes part of the shoe proper only to the extent that it is fastened in place in the shoe. It is in reality an insert which is incorporated into the shoe by simply holding it in place between a pair of layers of the insole assembly. In the second case, the plastics becomes an integral part of the insole assembly and it actually penetrates the pores of the leather of said insole assembly to effect an intimate, integral bond therewith.

It is accordingly the principal object of this invention to provide an improved footwear construction in which the shank area has a plastics forming and stiffening agent for adequate and comfortable arch support.

Another object of this invention is the provision of a method of making such improved footwear construction.

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Preferred forms of this invention, including preferred forms of construction and preferred methods of fabrication are illustrated in the accompanying drawing, in which:

Fig. 1 is an exploded view of one form of insole construction, showing the four layers thereof in perspective view and separated from each other.

Fig. 2 is a perspective view showing said four layers fastened together and also showing how plastics is introduced into the space which is provided between the top and bottom layers of said construction.

Fig. 3 is a view similar to that of Fig. 2, but showing the finished insole assembly, after the plies or layers have been assembled, fastened together and shaped.

Fig. 4 shows an article of footwear which incorporates an insole assembly such as is shown in Figs. 1, 2 and 3, said article of footwear being shown in a forming press and on a last where an appropriate shape may be imparted to the insole assembly.

Fig. 5 is a view similar to that of Fig. 2 of a second form of insole construction, showing a prefabricated plastic insert which serves as a shank stiffener.

Fig. 6 is a transverse section therethrough on the line 6—6 of Fig. 5.

Fig. 7 is another transverse sectional exploded view, through another form of shoe insole construction, wherein the stiffening insert for the shank area comprises a plurality of layers of plastics and other material.

Fig. 8 is a transverse section through an insole construction of the type shown in Fig. 7, showing said insole construction in a heated press for the purpose of forming a bond among the several layers of the shank area insert and for the further purpose of shaping the entire insole assembly to proper and appropriate form.

Fig. 9 is a plan view of an insole assembly made in accordance with the present invention.

Fig. 10 is an exploded view in perspective of another form of insole construction made in accordance with the present invention.

Fig. 11 is a sectional view on the line 11—11 of Fig. 10.

Fig. 12 is a sectional view on the line 12—12 of Fig. 10.

Fig. 13 is a perspective view of the completed insole, said view being partly broken away to expose the plastics stiffening member.

Fig. 14 is an enlarged sectional view on the line 14—14 of Fig. 13.

Referring now to the first four figures of the drawing, it will be noted that the shoe construction forming the first embodiment of this invention comprises as its insole assembly an upper ply or layer 20, an intermediate ply 21, a layer of mesh material 22 and a bottom ply or layer 23. Plies 20, 21 and 23 may be made of leather of the kind generally used in sole construction. Ply 22 may be made of nylon or similar plastics mesh. "Nylon" is a generic term for a group of synthetic linear superpolymers known as polyamides.

It will be seen that intermediate ply 21 has sole, shank and heel portions. The sole portion is designated in the drawing by means of the reference character 21*a*, the shank area is identified by means of reference character 21*b* and the heel portion by means of reference character 21*c*. There is a cut-out 25 formed in the intermediate ply and it will be seen that said cut-out extends the full length of the shank area as well as virtually the full length of the heel portion. All that is left of the shank portion in intermediate ply 21 is a pair of narrow strips which bound and define said cut-out. Virtually the same situation is true of the heel portion since its center portion is cut out in the manner and to the extent shown in Fig. 1.

Top ply 20 is imperforate and it extends the full length of the heel portion and shank area, stopping at the ball line of the sole portion proper. Piles 22 and 23 also cover the heel and shank areas but not the sole portion. Like top ply 20, bottom ply 23 is imperforate but ply 22 is foraminous, replete with perforations or openings.

Thus it is seen that the insole is composed of four parts, the intermediate ply which has a cavity which has been die-cut on a clicker machine, said ply being sandwiched between two layers of split soles, and the plastics mesh layer 22.

When the four plies are put together in the order shown in Fig. 1, the respective heel and shank region edges of plies 20, 21*a* and 23 coincide with each other. Stitching 27 may be applied to said four overlying plies for the purpose of securing them together in the manner shown in Fig. 2. A cavity is thereby formed in the assembled insole construction which corresponds in extent and shape to the extent and shape of cut-out 25, and which corresponds in depth or height to the thickness of intermediate ply 21. Immediately below this space is the nylon mesh 22 and immediately above it is upper ply 20.

A thermosetting synthetic resin composition in any suitable fluid state may be introduced into said space by means of a gun 30. The synthetic resin which I have found suitable is 4116 Laminac resin of the American Cyanamid Company. This is a polyglycol ester of fumaric and phthalic acids in styrene; it is generally referred to as a low reactivity styrenated polyester resin. I add one part of a catalyst to four parts of the above resin in order to prepare the material for introduction into the aforementioned space. A suitable catalyst is Lupersol DDM of the Lucidol Division of the Novadel-Agene Corporation. This is a non-volatile solution of methyl ethyl ketone peroxide in dimethyl phthalate and it serves as a convenient catalyst for the polymerization of vinyl and polyester type resins. Broadly speaking, virtually all thermosetting plastics are suitable for the purposes of this invention, particularly a copolymer resin prepared from melamine, urea and formaldehyde, with fiber glass added as a filler and for fibrous strength.

The nozzle of gun 30 is needle-shaped to enable it to penetrate the ply construction above described in the manner shown in Fig. 2. Once this is done, it is a simple matter to shoot the said synthetic resin into space 25, where it not only fills the space but also the openings in nylon mesh 22. Furthermore, it penetrates the pores of upper and lower plies 20 and 23, respectively, so that a strong plastics bond holding all of the plies together is thereby provided.

Where the insole assembly is to be used in shoes intended for use where high heats are encountered of say, between 250° F. to 500° F., then the materials would have to be changed, the intermediate ply for such use being constructed of a laminated asbestos fibre board.

The insole assembly is now complete, to the extent that it is covered by the present invention. It requires additional layers of material for full completion of a shoe, such as the sole tread and the heel and sock linings. The present invention, however, is not concerned with the sole tread or with the sock lining or heel.

The insole construction hereinabove described should now be shaped to take the form shown in Fig. 3. The forming operation may be conventional in every respect. One way of forming the sole construction of the present invention is shown in Fig 4.

A shoe press 35 is shown in Fig. 4 and a last 36 is shown mounted thereon. On the last is an upper 38 and an insole construction 40 such as has been described. The insole construction is attached to the upper by conventional means, and it is shown to rest upon a resilient cushion or bag 42 which receives fluid, whether compressed air or oil or water under pressure, through conduit 43. Upward pressure is thereby applied against the insole construction which had previously been subjected to heat to render the synthetic resin relatively fluid and in a moldable state. The shoe construction is thereby compelled to assume the shape of the last and when the synthetic resin sets, that shape remains fixed and permanent.

Turning now to Figs. 5 and 6, it will be seen that the second embodiment of this invention includes a bottom ply 50 and an upper ply 51. The upper ply has a cut-out or cavity 52 formed therein which corresponds to cut-out 25 of the first embodiment of this invention, and which extends from the heel seat to the ball of the foot, with the edges of the cavity tapering inwardly and downwardly. The two plies may be fastened to each other by means of cement or by any other conventional means. A moldable plastics insert 54, corresponding in size and shape to cavity 52 may be introduced into said cut-out and fastened therein by means of cement or other suitable means. This plastics insert may be preformed, that is, it may be given the shape of a shank, before it is inserted into cavity 52 and therein fastened. It may be found more desirable, however, to provide the insert with its required shape after it has been secured in the cavity. This latter procedure requires the use of a thermoplastic material which softens in the presence of heat and then sets in the relative absence of heat.

The cavity 52, being left open, the plastics shank insert 54 is preheated in a Thermex high frequency dielectric oven for preforming and at the end of the heating cycle the now preformed

insert is removed from the oven and introduced into the cavity 52 and the insole is ready for the press for molding. The insole is then placed upon a last into a sole laying jack (Fig. 4) whereupon the insole is molded to the last. Within sixty seconds, the plastics sets and the insole is then ready for lasting.

A heating oven 60, having an electric heating element 61, is shown in Fig. 8. This oven is adapted to receive an insole construction such as is shown in Figs. 5 and 6, when the shank insert is not preformed, and applies heat to the insole, after which the insole is attached to a last, and then the last and insole are inserted in a press, as for instance, that shown in Fig. 4, to impart a shape to it. This shape and form is retained when the plastics sets, and it remains fixed and permanent for the life of the article of footwear into which the sole construction is incorporated.

When the plastics insert becomes relatively fluid in the presence of heat, the pressure which the press applies thereto compels it to flow into the pores of lower ply 50 and a plastics bond is thereby provided between the plastics insert and said lower ply.

It is important to note that a plastics insert of the character described may, if provided with a smooth top surface, by the use of a last having a chrome-plated steel bottom shank area, eliminate the need of a sock lining which is normally required in conventional shoe construction. It is also important to note that the use of only two plies, that is a lower ply 50 and an upper ply 51, merely illustrates this form of the invention. If desired, ply 51 may be considered to be a mid-ply and a top ply similar to ply 20 as shown in Fig. 1 may be fastened to the top of said mid-ply, thereby encasing and enclosing said plastics insert on the top as well as on the bottom.

Where the plastics shank insert 54 is utilized, a relatively small top ply 53 may be used in the completed shoe, as Fig. 9 shows. This small top ply just about covers the heel, and it is used in place of a sock lining. This heel ply is necessary to cover the clinched ends of the nails which fasten the heel proper to the construction under discussion.

A variant of the embodiment of this invention last above discussed is shown in Fig. 7. Here a plurality of plies 70, 71, 72, 73 and 74, respectively, take the place of plastics insert 54. These plies have the overall shape and size of cut-out 52 and they may be inserted therein in the same manner that has above been described with respect to plastics insert 54. These plies 70 to 74, inclusive, may comprise layers of laminated fibre glass alternated with either nylon or rayon tire cord fibres, and they may be heat-treated or cemented to bind them together. In this form of the invention, plies 50 and 51 are shown to be fastened to each other by means of stitching 55, but it will be understood that cement and other fastening means may be used for the same purpose.

It will be seen from the above that the invention obviates the use of the steel shank in shoes; it facilitates the production of precision molded structural unit formed to fit the last; it provides the shoe with strength and grace; it obviates the use of filling compounds in the shank area and heel seat area. It is specially useful to manufacturers of cement process shoes, Littleway's construction, and McKay process

shoes, and such manufacturers will well appreciate the snug fit in the heel seat waist area and ball area. The invention helps the shoe to retain its shape and to hold its proper tread, and provide proper support for the foot, and make possible superior heel anchorage. The operation of attaching the sole is simplified because a wider proportional lasting margin may be retained through the shank area.

Another modification of this invention is shown in Figs. 10 to 14 inclusive. It will there be seen that sole assembly 80 comprises the following elements: an upper ply 81, a fiberglass mat or batting 82, an intermediate ply 83, a second fiberglass mat or batting 84, and a lower ply 85. The upper ply 81 may be considered as constituting the insole and the lower ply 85 may be considered as constituting an outer sole member. It will be noted that openings 86 and 87 are formed, respectively, in the intermediate and lower plies 83 and 85. These openings may be die cut with the same die so that both openings will be identical in size and shape, but this is not essential. An important feature, however, is the beveling along the edges of said openings. It will be noted in Fig. 14 that when the intermediate and lower plies are placed face to face, the beveled edges 88 on the intermediate ply face in the direction of beveled edges 89 of the lower ply, thereby forming a V-shaped space or groove between the respective edges of said intermediate and lower plies. By the same token, mats 82 and 84 may also be die cut with the same die which forms openings 86 and 87, so that said mats will fit snugly into said openings.

An interesting feature of the method herein claimed is that openings 86 and 87 are not formed at the precise moment of the die cutting operation. Instead, the portions which are cut out of plies 83 and 85 to form said openings 86 and 87 remain attached to said plies by means of small connections thereto which the die leaves. These cut-out portions remain, therefore, part of plies 83 and 85 until such time as it is desired to remove them by severing said small connections. Plies 83 and 85 may therefore be handled and treated as though they were imperforate until such time as the shoe structure is substantially complete, that is, except for the attachment of the heel. In other words, the shoe is completely lasted, and if a turned shoe is to be made, it is also turned, before the cut-out portions are removed from plies 83 and 85.

In making the shoe, the three plies 81, 83 and 85 are secured to each other in the manner above described with respect to the plies of the first form of this invention. It will, of course, be understood that these three plies may be made of any suitable material such as leather. The press shown in Fig. 4 must be used the same as before but it is used in attaching the outsole of the shoe so that the shoe is molded to the bottom contour of the last, all ready for attaching the heel. There is no necessity for using heat and pressure for thermosetting the plastics as in the first form of the invention. When the finished shoe is ready for the plastics shank, the cut-out portions are removed from plies 83 and 85 and glass fiber bats 82 and 84 are inserted in openings 86 and 87 to take the place of said removed cut-out portions. Openings 86 and 87 and the interstices of the fiberglass mats are then filled with a low activity styrenated polyester resin 90 which has been treated with the catalyst. The shoes are then placed in an oven which is maintained at

a temperature of about 125° F. to 150° F. and they are kept there for approximately five minutes. The time and the temperature are not critical since the heat is used only for the purpose of speeding up the reaction and curing the plastics. If sufficient time is allowed, the material will cure at room temperature.

The shoe then goes to the smoothing operation at which station any excess plastics is sanded or otherwise ground off and the sole is prepared for the finishing operation. The bottom of the sole may be buffed and colored or otherwise finished in any way desired. If contrasting or harmonious colors are desired for the purpose of design or for trade mark purposes, it is possible to color the polyester resin in the mix with a suitable dye so that the resin will cure and be finished in a color different from the final coloring of the leather sole. The heel may then be attached to the shoe and the shoe then proceeds to the finisher for final operations.

It will be appreciated that the foregoing is descriptive of preferred forms of this invention, and it will, therefore, be understood that other forms and variants of these forms may be had within the broad scope and coverage of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A shoe sole comprising a plurality of plies flat against each other and fastened to each other, a longitudinally extending cavity formed in said plies, fiberglass batting in said cavity, and a synthetic thermosetting resin filling said cavity and the interstices of said fiberglass batting to form a stiffening member for the shank of said sole.

2. A shoe sole in accordance with claim 1, wherein there are three plies, an upper ply constituting the insole portion, an intermediate ply, and a lower ply constituting the outer sole portion, said cavity being formed in the intermediate and lower plies.

3. A shoe sole in accordance with claim 1, wherein the cavity is provided with V-shaped edges to receive the synthetic resin, whereby the resin is securely anchored to the plies of said sole.

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