

Jan. 19, 1971

P. R. COOPER

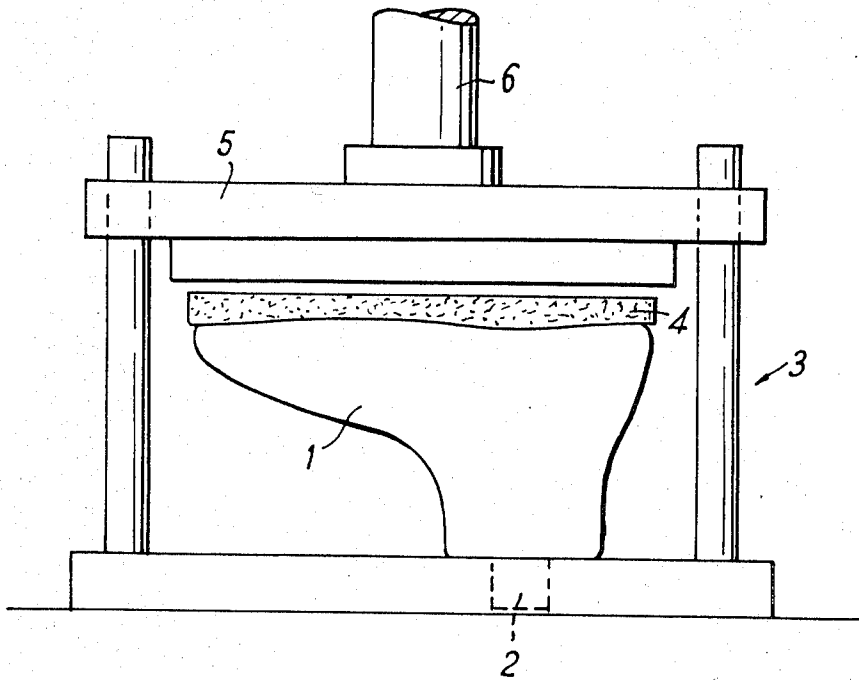
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MANUFACTURE OF INDIVIDUAL FOOTWEAR

Filed June 16, 1969

2 Sheets-Sheet 1

FIG. 1



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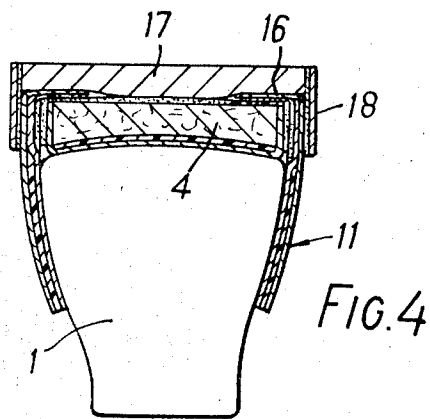
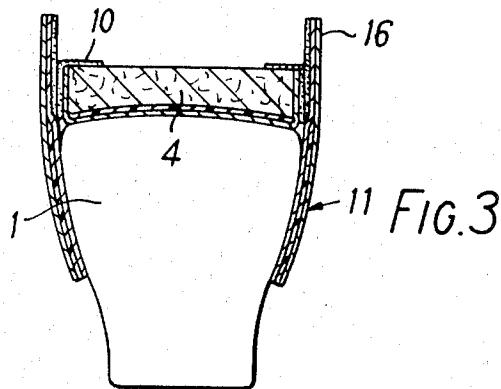
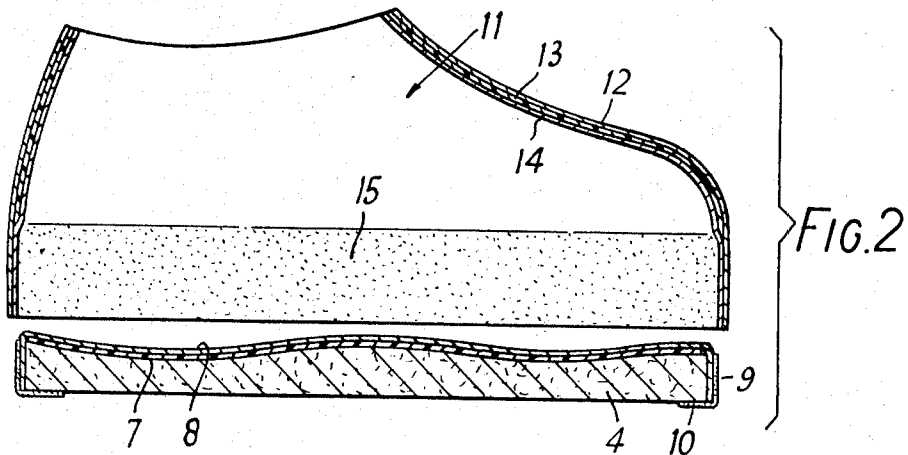
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MANUFACTURE OF INDIVIDUAL FOOTWEAR
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 Seak Limited, London, England, a British company
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 60,306

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U.S. Cl. 12—142

4 Claims

ABSTRACT OF THE DISCLOSURE

Footwear conforming intimately to the foot of the wearer are made by shaping upper and bottom components, and subsequently assembling and bonding them together, on a last which is a casting of the wearer's foot.

This invention is concerned with the production of footwear and in particular is aimed at providing for the inexpensive manufacture of what may be called "individual" footwear, meaning footwear which is built to conform intimately to the foot of the intended wearer. The footwear in question may be a shoe, a boot, or a bootee, but for convenience these will all be referred to below generically as "a shoe."

In pursuance of the invention a cast is made from the foot of the patient or subject and the shoe (see above definition) is built on this cast from a bottom, which is moulded intimately to the underside of the cast, and from an upper structure which is conformed to the upper surface of the cast and is bonded to the aforesaid bottom.

This gives a shoe which is, in effect, moulded to the wearer's foot, is comfortable, and yet supports the foot overall with beneficial chiropodial effects. Because of the intimate fit of the shoe there is no rubbing or blistering of the foot, particularly in the cases of such subjects as diabetics whose feet are often insensitive to the effects of a rubbing shoe so that damage is often done to the foot in the absence of any discomfort to the wearer.

The "bottom" referred to may be the wear sole of the finished product, but preferably is a form of insole to which an outer sole is subsequently attached. This insole may advantageously be of a heat-softenable material, for example a thermoplastic such as polyethylene, which is heated and applied under pressure to the underside of the cast to mould it to the surface form of the latter. It will then take the surface contours of the underside of the foot of the intended wearer and, when applied against the foot in the finished shoe will not chafe it.

To implement the accurate conformity of the upper structure to the foot, this structure is advantageously shaped on the cast, is removed from the latter and closed away from it. It may be made from a piece, or separate pieces, of upper material, for example of thin leather, sheet material of a suitable organic thermoplastic, and so on—depending on the circumstances under which the shoe is likely to be worn or on the particular problem of the patient. This piece or pieces may be cut to final shape on the cast (last) so that the edges to be joined are snugly juxtaposed and can subsequently be butt-welded or bonded to produce a seamfree construction.

The completed upper structure can then be cemented and returned to the cast for bonding to the insole when the latter is reapplied against the underside of this cast.

To enhance the comfort of the finished article, a cushioning lining may be adhered to the inside surfaces of the insole and the upper structure prior to the bonded assembly of these two components of the article.

If some form of opening is required in the finished article, as in the case of a boot, this opening is preferably made after the assembly of the upper, whereby the fidelity of the upper to the foot will not be affected by the provision of the opening. The latter can be cut in the upper structure at any required place appropriate to the particular wearer, and the requisite fastenings, for example a sliding clasp fastener, buttons, lacing, and so on, then applied.

A method of shoe construction conforming with this invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic side view of a piece of equipment used in a stage of the process,

FIG. 2 is a cross section illustrating an upper component and an insole component at an intermediate stage in the production of a shoe, and

FIGS. 3 and 4 are cross sectional illustrations of further stages in the formation of the shoe.

As a preliminary to the method to be described, a plaster cast 1 is made of the foot of the patient or intended wearer by a conventional method. This cast will subsequently form a last in the shoe production, and it is provided with a peg 2. It is mounted in a jig, generally designated 3 in FIG. 1 through the medium of its peg.

A blank of expanded polyethylene generally conforming to the outside shape of the underside of cast 1 is then cut and heated in an oven to 50° C. to soften it. Whilst still in its warm condition it is placed on the bottom face of the cast 1, as shown at 4 in FIG. 1, and is pressed against this underface by a platen 5 urged by a ram 6. After a lapse of about thirty minutes the blank 4, which is to constitute the insole of the shoe, is separated from the cast (last) 1 and its upper surface is found to have taken the impression of the underside of the last 1, i.e. to conform faithfully to the surface relief of the bottom of the patient's foot.

The contoured upper surface of the embryo insole 4 is then coated with an adhesive and covered with a correspondingly shaped cushioning liner made up of 2 mm. thickness of polyurethane foam 7 and a covering of nylon fabric 8. This liner is pressed down on to the insole blank 4 so that it conforms intimately to the upper surface of the latter. The resultant structure is illustrated by the lower element in FIG. 2 of the accompanying drawings.

Upper material, consisting for example of sheet silicone rubber with a polyurethane liner such as that described above is next applied in convenient pieces to the last 1. These pieces may be precut as say quarters, vamps, and so on, or as a one-piece blank which is cut to the individual last as performed by a normal shoe designer. The precut piece or pieces are then cut to final shape on the last 1 so that the edges of the subsequent joints are applied neatly together, and the joints are butt welded or bonded, off the last, to ensure a seamless construction. The next stage is to cement the insole-liner assembly around its lateral edge, as at 9 in FIG. 2, and around the margin 10 of the underside of this insole. The now assembled upper is also similarly cemented. Reference is made to the upper half of FIG. 2 where this assembled upper is depicted at 11 and it will be observed that it now comprises an annularly closed shell 12 of basic upper material, with a lining 13 of polyurethane foam and cover layer of nylon fabric 14. It will also be observed from this figure that the cement coating 15 is provided around the lower margin of the upper in a band of a width greater than the depth of insole 4.

The so-cemented upper is then mounted on the last 1 as shown in FIG. 3, and the insole 4 is applied to the bottom face of the last. It will be observed from FIG. 3

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that, at this stage, the bottom margin of upper 11 stands proud of insole 4. This upstanding marginal part 16 of the upper is now turned over inwards against the exposed surface of the insole 4 so that the cemented face of marginal part 16 is bonded to the annular cementing 10 on the insole 4. Lateral pressure is also applied to bond together the pre-cemented areas 9 and 15.

This is followed by the application of an outer sole to the upper-insole assembly. This outer sole which is pre-cut to shape and size, may be of any material appropriate to the intended function of the shoe, for example be of leather, of a thermoplastic material, or of rubber. It is pre-cemented and applied to the bottom of the insole and the turned-in marginal part 16 of the uppers, as shown in FIG. 4.

This outer sole 17 may incorporate an integral heel-piece or a separate heel piece may be added after attachment of the outer sole to the remainder of the shoe. The latter arrangement is preferred where different heights of heel to suit different chiropodial or surgical conditions are appropriate.

A guard strip 18 is now cemented and applied around the bottom bounding edge of the upper-insole-outer sole assembly.

The last stage in the preparation of the shoe is, where this is required, the forming of an access opening for the foot of the wearer. As indicated above, there may be at least one opening and this may be applied at any appropriate position(s) around the upper. It can be simply cut into the material of the upper and the slit so made may, if necessary, be bonded to prevent ravelling. Fastening means may then be applied to the slit, for example a sliding clasp fastener, eyeletted lacing holes, or equivalent, and an external strip covering may be provided over these fastening means.

I claim:

1. In the method of shoe making in which a bottom is secured to an upper on a last, the improvement wherein a cast is made of the foot of the intended wearer of the finished shoe, a bottom is moulded to the underside of this cast, and an upper structure is conformed to the upper

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surface of said cast and is bonded to said-moulded bottom, said bottom comprising an insole of a heat-softenable material which is heated and applied under pressure to the underside of said cast to mould it to the surface form of the latter and is removed from said cast, and wherein said upper structure is shaped on the cast, is removed from said cast and seamed away from the latter by butt jointing, and the inside of its lower margin is cemented prior to its return to the cast for bonding to said insole.

2. A method according to claim 1, in which the insole is cemented around its periphery, and said pre-cemented insole and the pre-cemented upper structure are assembled on the cast and their cemented areas pressed together to bond them.

3. A method according to claim 2, in which the upper structure is formed to provide a skirt which extends beyond said insole when these are assembled together, this skirt then being turned in over the insole, an outer sole being secured to the outer face of said insole and over said inturned skirt of upper material, and a guard strip being cemented around the lower periphery of the assembly.

4. In the method of shoe making in which a bottom is secured to an upper on a last, the improvement wherein a cast is made of the foot of the intended wearer of the finished shoe, a bottom is moulded to the underside of this cast, and an upper structure is conformed to the upper surface of said cast and is bonded to said moulded bottom, and wherein a cushioning lining is adhered to the inside surfaces of said insole and of said upper structure prior to the bonded assembly of these two components of the shoe.

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