Sept. 22, 1964 F. R. GREENE 3,149,355

METHOD OF MANUFACTURING A SHOE USING A HEAT-SEALING DIE

Filed Sept. 20, 1960 2 Sheets-Sheet 1

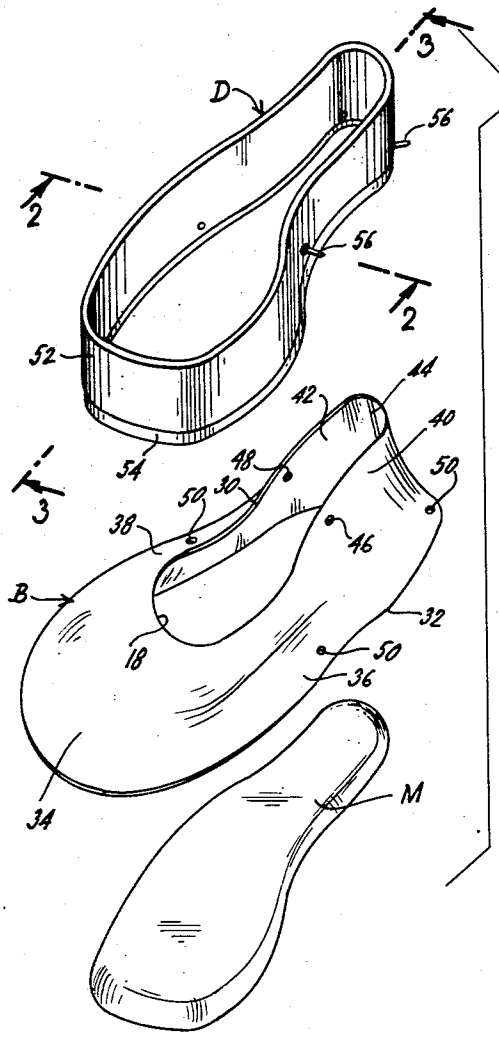

FIG. 1.

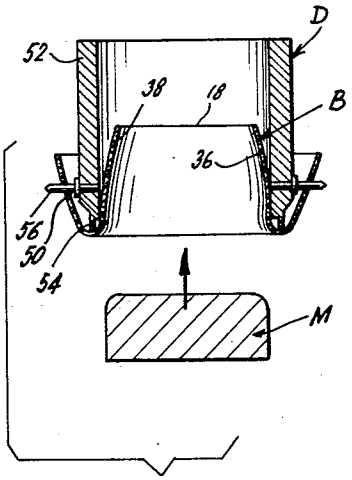

FIG. 2.

FIG. 3.

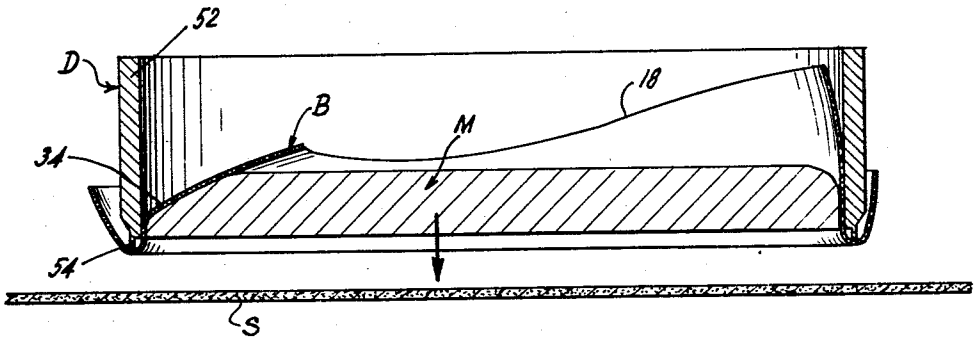

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FIG. 4.

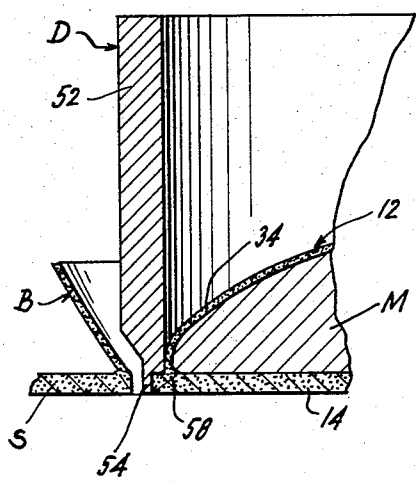
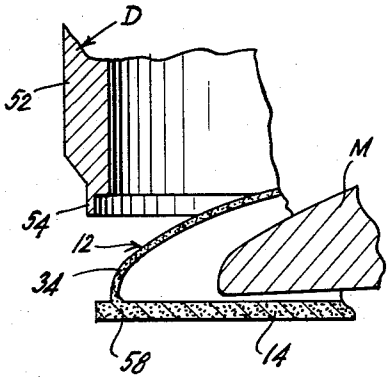


FIG. 5.



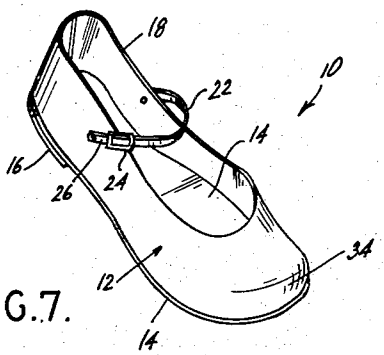
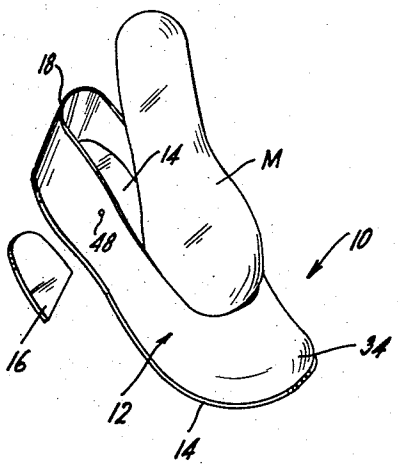


FIG. 7.

FIG. 6.



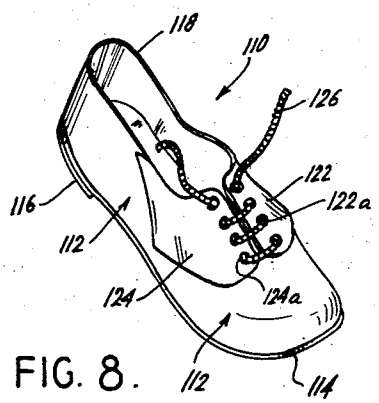


FIG. 8.

INVENTOR.
FRANKLIN GREENE
BY
Amster & Levy
ATTORNEYS

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METHOD OF MANUFACTURING A SHOE USING A HEAT-SEALING DIE

Franklin R. Greene, Flushing, N.Y., assignor to Ideal Toy Corporation, Hollis, N.Y., a corporation of New York

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5 Claims. (Cl. 12—142)

This invention relates generally to the manufacture of shoes, and in particular to an improved method of manufacturing shoes from sheets of flexible plastic material, and to such shoes as improved articles of manufacture particularly adapted for use as doll shoes and the like.

In the clothing of dolls, it has been the practice to dress the dolls by scale-down wearing apparel manufactured in accordance with the accepted technique used for the construction of the full-size counterparts. In accordance with this practice, shoes are provided for the doll which are manufactured in the manner usually followed in the shoe industry. Except for savings in material costs, which may be realized by substitution of plastics and like materials, and the overall reduction in the amount of material required, the manufacturing operations required are substantially identical to those needed to make full-size shoes. This contributes materially to a relatively high cost to dress the doll, particularly when it is recalled that the shoes are but one item of the required dress. There exists the need for an improved method for the manufacture of shoes of the type required in the doll industry which facilitates the simulate of actual shoes, yet enable low cost, mass production. The resultant shoes, should in all substantial respects be like the shoes worn by a child or an adult such as to enhance the life-like characteristics of the doll and its play value.

Broadly, it is an object of the present invention to provide a method of manufacturing shoes and an improved shoe construction which realizes one or more of the aforesaid objectives. Specifically, it is within the contemplation of the present invention to provide an improved process of manufacturing shoes from sheets of flexible heat-sealable material, such as vinyl plastic, by which process there is produced shoes suitable for use on dolls, mannequins and the like which simulate actual shoes manufactured by conventional techniques.

In accordance with an illustrative embodiment demonstrating article aspects of the present invention, a shoe is fabricated of a flexible heat-sealable material which comprises a sole and a U-shaped blank adapted to form an upper for the shoe which has an inner margin defining a foot-receiving opening and an outer margin adapted to be joined to the sole. The blank includes a vamp section and elongated opposite side sections each integral with the vamp section at one end thereof and terminating at the other end thereof in a heel-forming portion. Means, preferably in the form of a heat seal, join the heel-forming portions together along a line between the inner and outer margins of the blank to form the blank into the general configuration and shape for the upper of a shoe. Further means, preferably in the form of a marginal heat seal, join the outer margin of the upper to the outer margin of the sole to complete the shoe. The basic shoe may be appropriately ornamented and implemented to simulate shoes actually worn by children, such as by the provision of one or more straps to simulate pumps for girls, or by the provision of blucher flaps having lace-receiving openings to simulate shoes for boys.

In accordance with the method aspects of the present invention there is provided an improved method of manufacturing a shoe from an upper including an upper or inner margin defining a foot-receiving and opening and a lower or outer margin adapted to be secured to the shoe sole. The upper has a vamp section, a heel section and opposed side sections joining the vamp section to the heel section. Such upper is placed within a hollow sealing die having a sealing and cutting edge in the outline of the shoe sole. The lower margin is turned about the sealing and cutting edge and temporarily secured to the die at its outer surfaces contiguous to and spaced above the sealing and cutting edge. The die is then placed against a sole-forming sheet, with the turned lower margin of the upper in contact therewith, and the turned lower margin is heat-sealed to the sole-forming sheet to form a heat-sealed assembly of the upper and the sole-forming sheet. Simultaneously the sole-forming sheet is cut in the outline of the shoe sole and the turned margin of the upper, outwardly of the location of the heat seal, is trimmed off. Thereupon, the assembly is removed from the heat sealing die and completed by the attachment thereto of straps, blucher flaps and like ornamentation to complete a particular style shoe.

As a feature of the invention, an upper-forming mandrel is inserted into the die preliminary to the placing of the die against the sole-forming sheet such that the upper is sandwiched between the sealing die and the upper-forming mandrel to impart a rise or curved shape to the upper in the vamp section. The upper-forming mandrel remains in the shoe during the heat-sealing operation to shape at least the vamp section and subsequently is removed from within the shoe by withdrawing the same through the foot-receiving opening.

The above brief description, as well as further objects, features and advantages of the present invention will be more fully appreciated by reference to the following detailed description of an illustrative process in accordance with the present invention and several presently preferred, but nonetheless illustrative shoes manufactured in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is an exploded perspective view showing, from top to bottom a hollow heat-sealing die, and a blank formed into the general shape and configuration of the shoe upper, and an upper-forming mandrel used during processing in accordance with the present invention;

FIG. 2 is a sectional view taken substantially along the line 2—2 of FIG. 1, with the upper placed within the heat-sealing die and having its lower margin turned about the sealing and cutting edge of the die and temporarily secured to the outer surface of the die, and with the upper-forming mandrel being shown in its position for insertion within the upper to sandwich the same between the mandrel and the inner surfaces of the die such as to impart a particular shape to the upper in the vamp section;

FIG. 3 is a sectional view taken substantially along the line 3—3 of FIG. 1, but showing the assembly of the heat-sealing die, the upper and the upper-forming mandrel preparatory to contact with the sole-forming sheet;

FIG. 4 is a fragmentary sectional view taken in the toe region of FIG. 3, and on an enlarged scale, showing the heat-sealing die in contact with the sole-forming sheet during the sealing operation, with the trimmed off marginal portions of the upper and adjaecnt portions of the sole-forming sheet spaced from the sealing die and the completed shoe for the purpose of illustration;

FIG. 5 is a view similar to FIG. 4, but showing the toe portion of the shoe as removed from the sealing die and showing the upper-forming mandrel partially withdrawn through the foot-receiving opening of the shoe;

FIG. 6 is a perspective view showing the shoe as withdrawn from the sealing die, with the upper-forming mandrel removed and with a heel and inner sole in position for assembly thereto;

FIG. 7 is a perspective view of a typical girl's pump constructed in accordance with the present invention; and,

FIG. 8 is a perspective view of a typical boy's shoe constructed in accordance with the present invention.

Referring now specifically to the drawings, there is shown in FIGS. 6 and 7 a typical girl's pump, generally designated by the reference numeral 10, which may be fabricated in accordance with method and article aspects of the present invention. A partially completed shoe is shown in FIG. 6 and the completed pump 10 is shown in FIG. 7. The pump 10 includes an upper 12 heat-sealed to a sole 14 and having a lift or heel 16 heat-sealed or otherwise joined to the sole 14 in the heel region thereof. The upper or inner margin of the upper 12, may be appropriately finished by decorative piping or trimming, and forms a foot-receiving opening 18 through which an insole may be inserted during manufacturing. The pump 10 is completed by the addition of an ankle strap 22 which is secured at one end thereof to the shoe upper, as by heat-sealing or riveting. The other end of the ankle strap 22 is inserted through a buckle 24 mounted at the opposite side of the upper 12 on an appropriate tab or strap 26 secured to the upper, as by heat-sealing or riveting.

In lieu of the addition of the ankle strap 22 and the buckle 24 as shown in FIG. 7, the same basic shoe body illustrated in FIG. 6 may be completed in a somewhat different fashion to simulate a boy's shoe, as shown in FIG. 8, and generally designated by the reference character 110. In this illustrative embodiment, the same basic body is provided which includes a shoe upper 112, a sole 114 and a heel 116. The upper 112 has an appropriately trimmed foot-receiving opening 118. In this embodiment, the shoe may be completed by the securement thereto of blucher flaps 122, 124 having one pair of ends meeting and provided with lace-receiving holes or apertures 122*a*, 124*a* which receives a shoe lace 126 and with the other pair of ends thereof appropriately joined, as by heat-sealing, to the shoe upper 112. It will be appreciated that the boys' and girls' shoes illustrated respectively in FIGS. 7 and 8 are typical but nonetheless illustrative of the various types of shoes which may be constructed in accordance with the present invention and its method aspects as will now be detailed by reference to FIGS. 1 to 5 inclusive of the drawings.

As seen in FIG. 1, a generally U-shaped or horse shoe blank, designated by the letter B, may be formed from any appropriate flexible heat-sealable material, such as vinyl sheeting or other heat-sealable plastics. The blank which ultimately forms the upper 12 for the shoe 10 has an inner or upper margin 30 to which may be secured as by stitching, in a preliminary operation, an appropriate ornamental trim or piping. The inner margin defines the foot-receiving opening 18 and the lower or outer margin 32 of the blank B is adapted to be joined to the sole 14 of the shoe 10. U-shaped blank B includes a vamp section 34 in the region of the toe of the shoe and elongated opposed side sections 36, 38 which are integral with the vamp section 34 at one end thereof and terminate at their opposite ends in heel-forming portions 40, 42. The free ends of the U-shaped blank B intermediate the inner and outer margins 30, 32 are joined together at the rearward portion of the shoe, as by a substantially vertical seal 44 extending from the inner margin 30 to the outer margin 32, to form the blank B into the general configuration and shape for the upper 12 of the shoe 10. As seen in FIG. 1, this general configuration includes an upward slope of the vamp section 34 from the toe of the shoe to the adjacent forward portion of the foot-receiving opening 18; an upstanding heel or counter defined by the heel portions 40, 42 extending in opposite directions from the vertical heat seal 44; and side sections 36, 38 which gradually merge from the sloped vamp section into the upstanding heel section 40, 42. In this illustrative embodiment, the side sections 36, 38 contiguous to and spaced below the inner or upper margin 30 are performed with openings 46, 48 through which appropriate eyelets or rivets are assembled for the attachment to the shoe upper 12 of the straps 22, 26 (see FIG. 7). Further, the blank B for the upper contiguous to the lower or outer margin 32 is formed with a number of pin-receiving openings, such as generally designated by the reference numeral 50, which openings receive pins during the manufacturing operation, as will be described. It should be noted that the portions of the blank B contiguous to the outer margin are cut away in the final heat-sealing and cut-off operation such that the portions of the blanks having the pin-receiving openings 50 are not incorporated in the final product. The blank B for the upper 12 is sealed to a sheet of sole-forming material, generally designated by the letter S and shown in FIGS. 3 to 5 inclusive, which sheet S may be fabricated of a somewhat more rigid vinyl material to impart the desired stiffness to the sole 14 of the shoe 10, as compared to the upper 12 thereof.

The heat sealing is accomplished by the employment of a sealing die D and an upper-forming mandrel M, both being used in conjunction with the conventional heat-sealing equipment. The heat-sealing die D is constructed of an appropriate metallic material in accordance with generally understood manufacturing techniques and includes an upstanding die wall 52 in the general outline and configuration of the shoe sole 14 and is adapted to receive the blank B for the upper 12 therein. At its lower end, the upstanding die wall 52 terminates in a depending sealing and cutting edge 54 about which the blank B is turned in a preliminary operation. At spaced locations about its outer periphery, the upstanding wall 52 carriers a plurality of pins 56 which are inserted through the appropriately spaced pin-receiving openings 50 in the outer margins of the blank B for the purpose of temporarily securing the blank B to the heat-sealing die D. The upper-forming mandrel M is likewise in the general outline of the shoe and is adapted to snugly fit within the hollow interior of the die D, as shown in FIG. 3, and is vertically contoured to impart the desired rise to the vamp section 34 during the heat-sealing operation, as seen in FIG. 3 of the drawings. The upper-forming mandrel M due to its dimensioning with respect to the die D is effective to snugly pull the major portions of the blank B into the die D and into the desired final configuration for the body of the shoe, with the blank being turned about the sealing and cutting edge 54 and with the outer margins of the blank projecting externally of the die and being temporarily secured thereto. The blank B, which may have its outer surface appropriately finished, as by having a high polish or leather-simulating surface imparted thereto, is inserted into the lower end of the die D, as seen in FIGS. 2 and 3. The outer marginal portion of the blank B is turned about the cutting and sealing edge 54 of the die D and the spaced openings 50 are engaged on the pins 56 which are provided contiguous to the sealing and cutting edge 54 as seen in FIG. 1. When the outer margin is so engaged over the pins 56, the remainder of the blank B is urged into the interior of the die and into the final configuration of the shoe 10, care being taken to draw the blank taut such that the same fits tightly about the cutting and sealing edge 54. When thus drawn taut, the upper-forming mandrel M is inserted within the blank B, as may be appreciated by inspecting the showing in FIG. 2 and noting the direction of the arrow, such that the blank B is sandwiched between the upstanding walls 52 of the die D and the complementary mandrel M, with the under surface of the mandrel M substantially coplanar with the upper end of the sealing and cutting edge or projection 54 of the die D. The vertical extent of the sealing or cutting edge 54 is equal approximately to the thickness of the

sole-forming material S, as seen in FIG. 3. When the assembly of the blank B within the die D and the mandrel M within the blank B is completed, as shown in FIG. 3, such assembly is placed over the sole-forming material S and subjected to heat and pressure as is attained with conventional heat-sealing equipment requiring no detailed description herein. Incident to such heat-sealing operation, the blank B is joined to the sole-forming sheet S and a marginal heat seal, generally designated by the reference numeral 58, is formed. Concurrently, the sole-forming sheet S is blanked out in the desired shape to complete the sole 14 for the shoe being manufactured. The die D in the region of the cutting and sealing edge 54 may be appropriately formed to impart any desired characteristic to the regions contiguous to the outer periphery of the sole, as for example lines simulating stitching or the like. The cutting and sealing operation frees the sole 14 from the sole-forming sheet S and also frees the portion of the blank B which forms the upper 12 and is disposed within the die D from the outer margins which are secured to the die by the pins 56 which are received within the openings 59 contiguous to the outer margin 32 of the blank B. Upon removal of the assembly of the sole 14 and the upper 12 from within the die D, and the removal of the upper-forming mandrel M through the foot-receiving opening 18, the basic body for the shoe as shown in FIG. 6 is completed. Thereupon, the final assembly operations of joining the heel 16, the insole and supplemental parts, such as the strap and/or blucher flaps may be achieved, as is generally understood.

From the foregoing, it will be appreciated that there is provided in accordance with the present invention, a relatively simple method for the manufacture of shoes which is adaptable to achieving mass production manufacture at relatively low unit cost. The resultant product may be made to simulate a shoe constructed by conventional techniques. The appearance of the completed shoe may be enhanced by initially selecting appropriately patterned or polished plastics and/or the addition to the basic shoe body of further parts and/or ornamentation. The resultant product is structurally strong and is durable such that it will have an acceptable appearance over prolonged periods of use, as may be anticipated when used by a child as a plaything.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly it is approprate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What I claim is:

1. A method of manufacturing a shoe including the steps of forming an upper including an upper margin defining a foot-receiving opening and a lower margin and having a vamp section, a heel section and opposed side sections joining said vamp section to said heel section, placing said upper within a hollow heat-sealing die having a sealing edge in the outline of a shoe sole, turning the lower margin about said sealing edge, placing said die against a sole-forming sheet with the turned lower margin of said upper in contact therewith, and heat-sealing said turned lower margin to said sole-forming sheet to form a heat-sealed assembly of said upper and said sole-forming sheet.

2. A method of manufacturing a shoe including the steps of forming an upper including an upper margin defining a foot-receiving opening and a lower margin and having a vamp section, a heel section and opposed side sections joining said vamp section to said heel section, placing said upper within a hollow heat-sealing die having a sealing and cutting edge in the outline of a shoe sole, turning the lower margin about said sealing and cutting edge, temporarily securing said lower margin of said upper to said die with said lower margin turned about said sealing and cutting edge, placing said die against a sole-forming sheet with the turned lower margin of said upper in contact therewith, and heat sealing said turned lower margin to said sole-forming sheet to form a heat-sealed assembly of said upper and said sole-forming sheet and simultaneously cutting said sole-forming sheet in said outline of said shoe sole.

3. A method of manufacturing a shoe including the steps of forming an upper including an upper margin defining a foot-receiving opening and a lower margin and having a vamp section, a heel section and opposed side sections joining said vamp section to said heel section, placing said upper within a hollow heat-sealing die having a sealing and cutting edge in the outline of a shoe sole, turning the lower margin about said sealing and cutting edge, inserting an upper-forming mandrel into said die to sandwich said upper therebetween and to impart a rise to said upper in said vamp section, placing said die against a sole-forming sheet with the turned lower margin of said upper in contact therewith, and heat sealing said turned lower margin to said sole-forming sheet to form a heat-sealed assembly of said upper and said sole-forming sheet and simultaneously cutting said sole-forming sheet in said outline of said shoe sole.

4. A method of manufacturing a shoe including the steps of forming an upper including an upper margin defining a foot-receiving opening and a lower margin and having a vamp section, a heel section and opposed side sections joining said vamp section to said heel section, placing said upper within a hollow heat-sealing die having a sealing edge in the outline of a shoe sole, turning the lower margin about said sealing edge, inserting an upper-forming mandrel into said die to sandwich said upper therebetween and to impart a rise to said upper in said vamp section, placing said die against a sole-forming sheet with the turned lower margin of said upper in contact therewith, heat sealing said turned lower margin to said sole-forming sheet to form a heat-sealed assembly of said upper and said sole-forming sheet, and removing said upper-forming mandrel from within said assembly by withdrawing the same through said foot-receiving opening.

5. A method of manufacturing a shoe including the steps of forming an upper including an upper margin defining a foot-receiving opening and a lower margin and having a vamp section, a heel section and opposed side sections joining said vamp section to said heel section, placing said upper within a hollow heat-sealing die having a sealing and cutting edge in the outline of a shoe sole, turning the lower margin about said sealing and cutting edge, temporarily securing said lower margin of said upper to said die with said lower margin turned about said sealing and cutting edge, inserting an upper-forming mandrel into said die to sandwich said upper therebetween and to impart a rise to said upper in said vamp section, placing said die against a sole-forming sheet with the turned lower margin of said upper in contact therewith, heat sealing said turned lower margin to said sole-forming sheet to form a heat-sealed assembly of said upper and said sole-forming sheet and simultaneously cutting said sole-forming sheet in said outline of said shoe sole, removing said assembly from said die, and removing said upper-forming mandrel from within said assembly by withdrawing the same through said foot-receiving opening.

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