May 20, 1969 B. B. DUBNER 3,444,586

MEANS FOR MOLDING SHOE SOLES

Filed Dec. 21, 1966 Sheet 1 of 3

Fig. 1

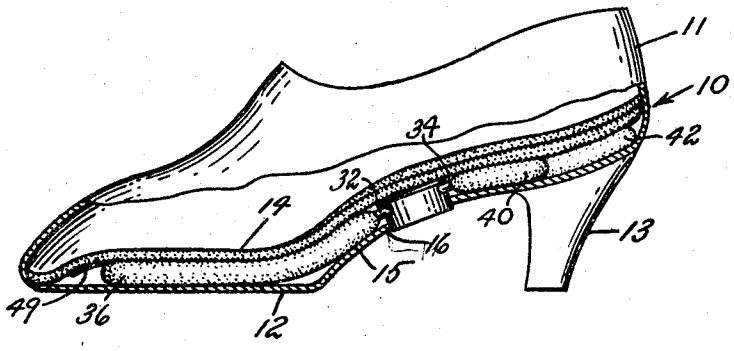
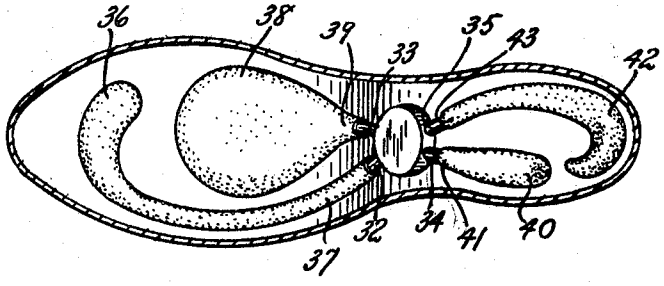


Fig. 2



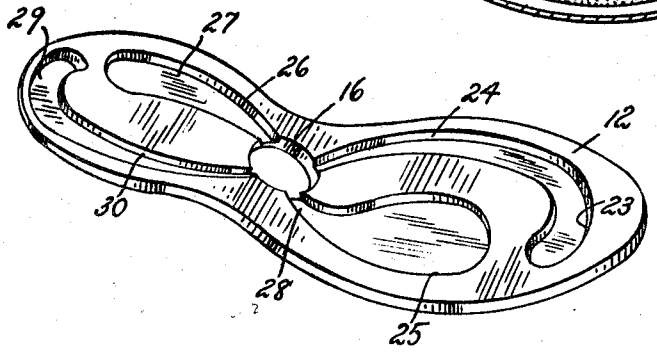
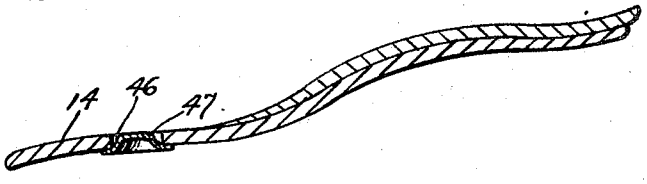


Fig. 3

Fig. 4



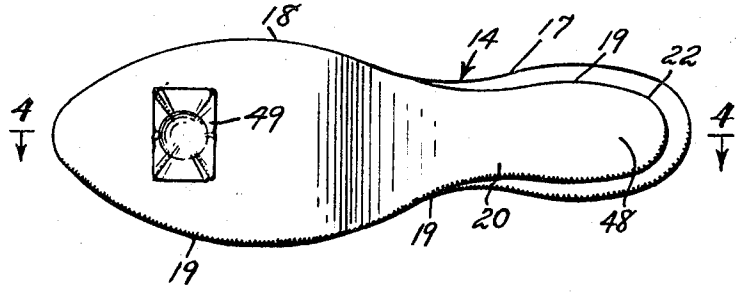


Fig. 5

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MEANS FOR MOLDING SHOE SOLES

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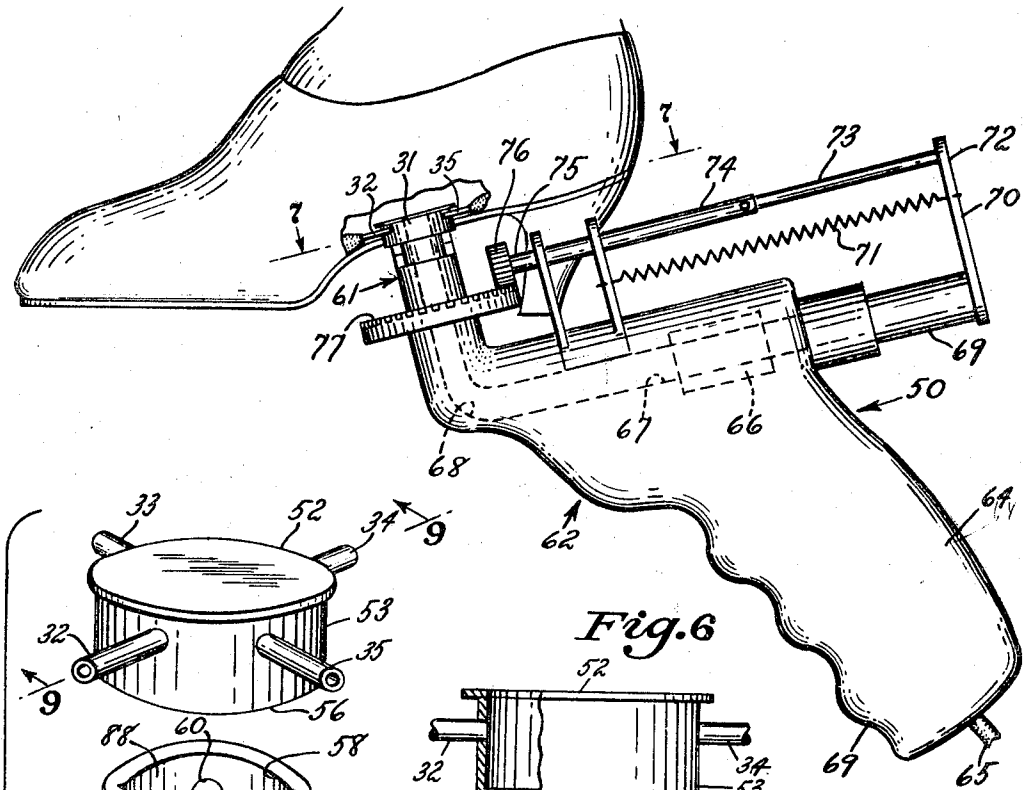


Fig.6

Fig.9

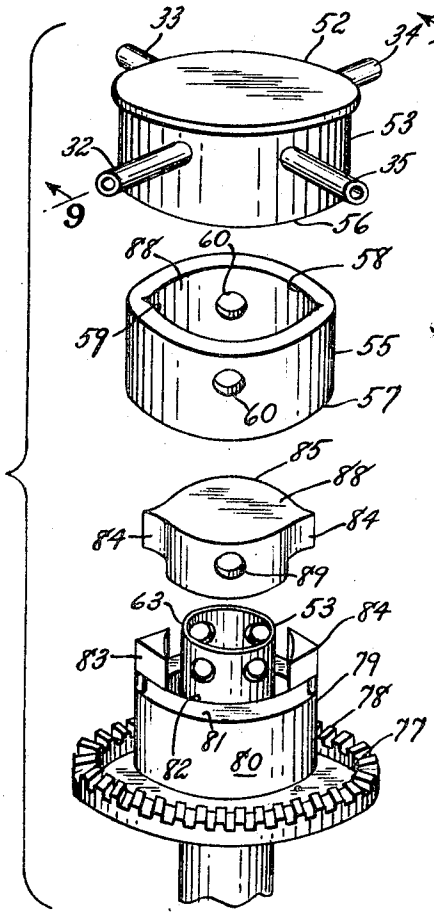


Fig.8

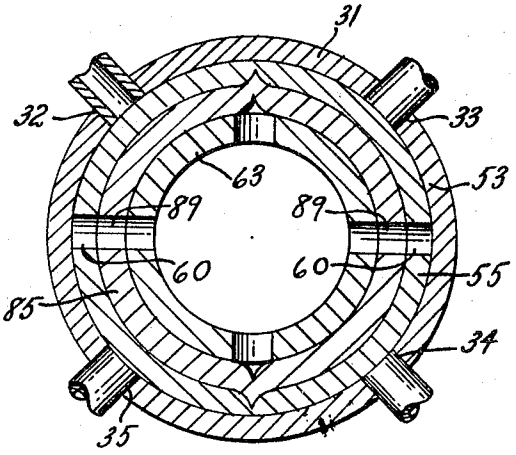
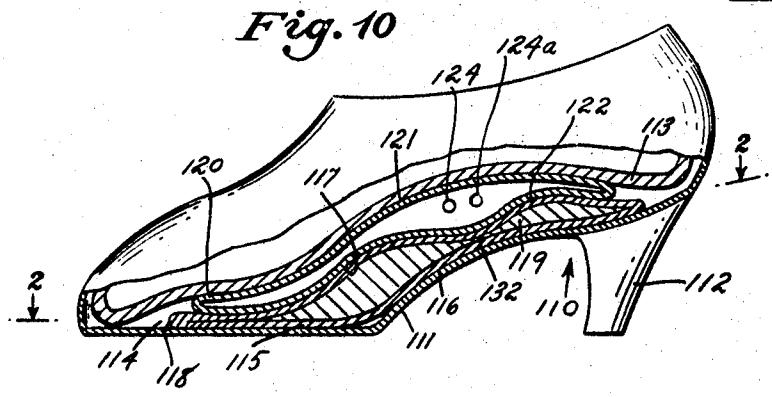


Fig.7

Fig. 10



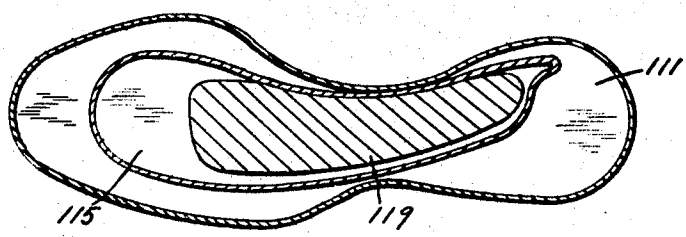


Fig. 11

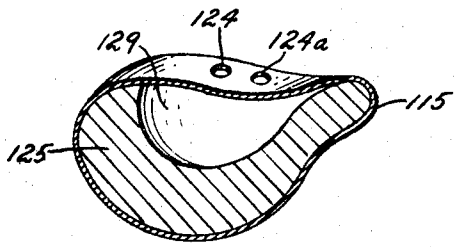


Fig. 12

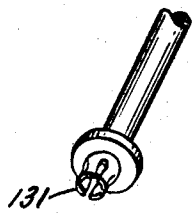


Fig. 14

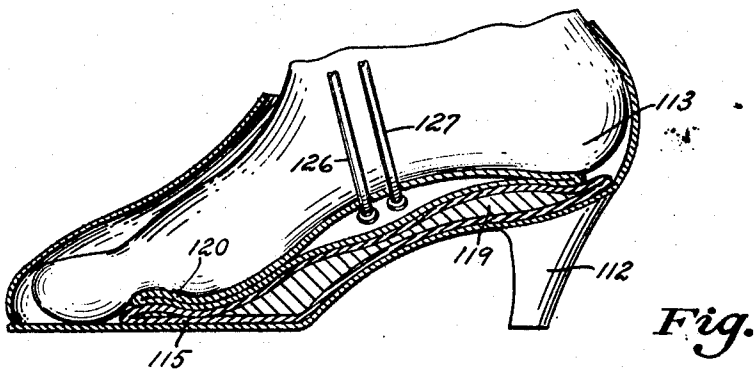


Fig. 13

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3,444,586

MEANS FOR MOLDING SHOE SOLES

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Int. Cl. B29d *31/00*
U.S. Cl. 18—5.1 3 Claims

This invention relates generally to the field of custom fitted shoes, and more particularly to an improved means for accomplishing same.

Modern living demands unnatural walking on hard flat surfaces in shoes manufactured upon lasts normally contoured to an average foot, the lasts being distorted by considerations of style. Experience has shown that foot comfort can be achieved only when a foot is disposed in a shoe which properly fits and supports it.

Because of the many variables in feet, as well as shoe shapes of the same size, it has been estimated that approximately 70% of shoes users are fitted so poorly that the entire body weight is supported on two small areas of the foot causing discomfort, tired feet, pain and deformity.

It is known in the art to adjust the shoe to the individual foot on a mass scale, but previous efforts have been invariably unscientific in approach, relatively expensive, and time consuming to make. More seriously, they have been ineffective.

Among the prior art devices, the most well known is the "arch support" based in concept on the erroneous popular belief that comfort may be achieved by supporting the long arch of the foot. Actually, the long internal arch of the foot is not meant to come into contact with the ground to support weight directly. Actually, the Tarsal bones are squarish in configuration, and very rough for ligamentous attachments. Any substantial pressure here is usually uncomfortable and/or painful. Most so called "supports" do not reach this area, and are therefore wearable. In those cases where they do reach the area, they can be comfortably worn only after the "support" is broken in, that is to say actually broken down. Very often the shank of the shoe is also damaged in this process.

Any beneficial effect that may be achieved is due to the incidental support at the front and back areas of the "arched support" where the area just behind the heads of the Metatarsal bones, and the area just anterior to the dependant part of the heel bone are smooth enough to accept pressure, and thus distribute the weight of the body over a large area. These areas are usually over parts of the shoe in direct contact with the ground, and therefore do not break down the shoe and lose its supported action.

Recognizing the above facts, "Metatarsal pads" have been used for a long time to fill in the area just behind the Metatarsal heads. Practice, unfortunately, is very far from theory, since it is extremely difficult to apply the pads in the proper place. A difference of ⅛th inch forward or behind the proper place makes them either painful or ineffective. The only way to properly place a pad is to take a mark from the bare foot onto the shoe, and even where this is done, there are many other variables to contend with, such as flat feet, thin feet, variable shape and density of the pad, etc.

Mechanical Metatarsal pads so far have only attempted to fill in the area between the shank of the shoe and the foot, but, as they do not attempt to place the entire appliance in its proper position behind the Metatarsal heads, the position of which may vary as much as an inch from one foot to another with the same shoe

size, the use of such pads is even less effective than the procedure described hereinabove.

Other prior art attempts, include the use of the "Levy Mould" which is designed to fill in all the concavities on the bottom of the foot. The device is made over a plaster cast of the foot, a fact which causes the process to lose a positive pressure necessary to compensate for tissue compressability, and corrective action in the useful areas. The process also requires a wider shoe limited in style, in order to be able to accept such a mold, come of the good features of which are often ground away in the process of fitting the mold to the shoe. The desirable features of such a mold, mainly the crest which rises under the middle three toes to help distribute a body weight on the foot, very often are too high to be walked upon comfortably, as is the rise around the periphery of the heel.

To compensate for this, attempts have been made to form the molds within the shoe, placing the molding material suitably encapsulated in a large envelope, after which the foot is put into the shoe, during which process much of the material is pushed into the front of the shoe, after which the patient or customer walks about for approximately half an hour until the mold has set sufficiently to retain its imparted shape. The mold is then removed to cure for a week, after which it may be covered, ready for insertion within the shoe. Although this type of mold is constructed to be moved from one shoe to another, it really never fits another shoe as well as it does the one in which it was formed.

It is therefore among the principal assets of the present invention to provide an improved means for molding shoes for the foot, in which the above mentioned disadvantages and difficulties have been substantially eliminated.

Another object of the invention lies in the provision of an improved means for molding a shoe to the foot in critical areas, namely, the above mentioned crest area, the Metatarsal area, the heel area immediately forward of the heel, and the periphery of the heel.

Another object of the inveniton lies in the provision of means for molding a shoe to a foot both statically and dynamically within a few minutes, the means being such that it can be used by the average shoe clerk at the time of the sale of the shoe, in a neat, clean, and inexpensive manner.

Yet another object of the invention lies in the provision of a shoe construction incorporating a quick setting material injected through a unique opening and closing device fitted in the shank of a shoe, which allows the material to flow into the above mentioned four separate areas that are prepared to receive it in selected sequence.

Still another object of the invention lies in the provision of a novel opening and closing device used in conjunction with a material-injecting gun tip which may be used with a variety of injecting devices already known in the art.

A feature of the invention lies in the fact that the inventive means may be employed in conjunction with a wide variety of types of shoes without substantial modification.

These objects and features, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claims.

In the drawing, to which reference will be made in the specification, similar reference characters have been employed to designate corresponding parts throughout the several views.

FIGURE 1 is a longitudinal central section view of an embodiment of the invention.

FIGURE 2 is a plan view of the embodiment with the upper portion removed for purposes of clarity.

FIGURE 3 is a view in perspective corresponding to that seen in FIGURE 2.

FIGURE 4 is a longitudinal central sectional view as seen from the plane 4—4 in FIGURE 5.

FIGURE 5 is a planned view corresponding to that in FIGURE 2 but showing the sock lining elements thereof in position.

FIGURE 6 is a side elevational view somewhat schematic in nature of a means for injecting moldable material into a shoe.

FIGURE 7 is an enlarged fragmentary sectional view seen from the plane 7—7 in FIGURE 6.

FIGURE 8 is an exploded view in perspective corresponding to the structure as seen in FIGURE 7.

FIGURE 9 is a fragmentary sectional view as seen from the plane 9—9 in FIGURE 8.

FIGURE 10 is a schematic sectional view showing a second embodiment of the invention.

FIGURE 11 is a schematic plan view as seen from the upper portion of FIGURE 10.

FIGURE 12 is a fragmentary view in perspective corresponding to the upper central portion of FIGURE 11.

FIGURE 13 is a phantom schematic view showing the interconnection of air hoses for the melting of moldable material.

FIGURE 14 is a view in perspective showing one end of an air hose used in conjunction with the second embodiment.

In accordance with the invention, there is illustrated in FIGURE 1 in the drawing a shoe, generally indicated by reference character **10** of conventional construction, including an uppper flexible portion **11**, a sole **12**, which may be laminated, and a heel **13**, a sock lining **14**, which may be laminated of several layers of thickness, and covered by textile material is disposed above the sole **12**, and interconnected at the peripheral edges thereof as will more fully appear hereinafter. The shank **15** may be of conventional construction, but is provided with an opening **16** for the injection of a molding material.

In FIGURE 5 in the drawing, the sock lining **14** is bounded by a peripheral edge **17**, a forward portion **18** which is interconnected adjacent to the peripheral edge **19** of an insole **20**. The rearward portion **21** thereof is interconnected above the rear portion **22** of the edge **19** of the insole **20**, to provide a heat barrier protecting the wearer.

Referring to FIGURE 3, the sole **12** is inlet to form a forward recess **23** (to form a toe crust support), the recess being interconnected by a channel **24** to the opening **16**. Disposed adjacently recess **23** is a Metatarsal recess **25** of somewhat larger dimensions, interconnected by a short channel **26** to the opening **16**. A forward heel recess **27** is disposed, inwardly of the center line of the shoe, and interconnected by a feed channel **28** in a similar manner. A peripheral heel recess **29** is of generally elongated configuration, and interconnected by a channel **30**. It will be obsreved from FIGURE 2 in the drawing at spaced intervals, the channels **24** and **30** are positioned 180 degrees from each other, and the channels **26** and **28** are also coaxially arranged. Positioned within the opening **16**, and axially aligned therewith is an outer ring member **31** having opening **16**, and axially aligned therewith is an outer ring member **31** having openings **32**, **33**, **34** and **35**.

Referring to FIGURES 2 and 3, the recess **23** accommodates a molding material retaining bag **36** interconnected by a flat tube **37** in the channel **24** to the opening **32**. In a similar manner, the recess **25** accommodates a bag **38** communicating with a tube **39** connected to the opening **33**. Opening **34** communicates fluid into a bag **40**, positioned within the recess **27** through a tube **41**, and a bag **42**, positioned within the recess **29** is fed by a flat tube **43** from the opening **35**.

Referring to FIGURE 4, the sock lining **14** is provided with an opening **46** in the area of the recess **23** which is filled by a leather insert **47**, to allow adequate accumulation of molding material at that point. The lining **14** is otherwise interconnected by glue means (not shown) at the center **48** of the heel, and a forward point **49** disposed between the recesses **23** and **25**.

The shoe **10** is provided with injection means **50**, including the above mentioned ring member **31** maintained in position by upper flange **52** extending outwardly from a cylindrical portion **53** having the above mentioned openings **32–35** inclusive. A locking flange **53***a* cooperates with a notch surface **81** as will more fully appear to maintain the means **50** in engagement with the shoe during injection. Arranged for coaxial relative rotation is a second ring **55** held in position by a flange **56**, and including a cylindrical sleeve **57**. The sleeve **57** is provided with a noncircular bore **58** including radially extending recesses **59**, the bore **58** communicating with a pair of aligned bores **60** selectively positionable to feed the tubes **37** and **43**, alternately with the tubes **39** and **41**.

Engageable within the second ring **55** is an injection means **61**, best seen in FIGURE 6 in the drawing, the means **61** including an injection gun **62** having an interconnecting nozzle or tip **63**. A pistol grip handle element **64** conducts a power cord **65** from a source of electrical energy (not shown) to a heating element **66** surrounding a recess **67** containing a moldable fluid (not shown). The recess **67** communicates through a connecting channel **68** to the nozzle or tip **63**. A plunger **69** is actuated by a reciprocating member **70**, in turn resiliently urged by a spring **71** to urge fluid from the recess **67** to the tip **63**. The reciprocating member **70** includes a manually engageable member **72** mounted on a first shaft **73** splined to a second shaft **74**, to the opposite end **75** of which mounts a toothed segment **76** meshing with a segment ring gear **77** on a rotatable member **78**. The member **78** surrounds the tip **63**, and includes a tubular portion **79** bounded by an outer cylindrical surface **80** and a notched surface **81**. Disposed radially of the centrally positioned bore **82** are projections **83** aligned with corresponding projections **84** on a ring-like member **85**, both the projections **83** and **84** mating with the recesses **59** in the sleeve **57**. A wall **88** prevents the escape of most of the material other than through the radially arranged openings **89** aligned with the tip **63**.

At the time of use, the gun **62** is supplied with power through the cord **65** whereby the heating element **66** will warm the molding material (not shown) disposed therein to a flowable state. The gun **62** incldung the tip **63** and members **85** and **78** is engaged with the sleeve **57**, so that motion imparted to rotatable member **78** is transmitted to the sleeve **57**, and thence to the member **85**. Rotational motion first establishes communication between the tip **63** and the bags **38** and **40**, while the wearer is wearing the shoe, and in seated position. When these areas are filled, the above-mentioned members are rotated to a position wherein all of the openings are closed, and the injected liquid is given an opportunity to cool and set. The members are again further turned to establish communication with the bags **36** and **42** and the molding material is then flowed to fill the same, following which the sleeve **57** is positioned to close the openings **32** and **35**, and the gun **62** is disconnected from the shoe.

The material in the bags **36** and **42** is then molded by the wearer walking about in the shoe as the material solidifies.

Thus, the Metatarsal and anterior heel areas are molded in a static condition while the wearer is in a seated condition, and the more critical crest and peripheral heel areas are molded dynamically as the wearer walks in the shoe. It may be noted that there is no filling under the Tarsus and center of arch areas for the reason that the bags and tubes specifically do not enter into these areas. By following this procedure, there is no area that needs to be "broken down" when the wearer commences wear-

ing the shoe, and the shoe will have comfortable support from the time of the first wearing thereof.

Turning now to the second embodiment of the invention, as illustrated in FIGURES 10 through 14, inclusive, the construction illustrated is suitable where a less costly construction is desired and it is preferable to eliminate the building into the shoe outsole the means for injecting the molding material. In the case of the second embodiment, the molding material is positioned within an envelope, the envelope in turn being positioned above the sole, and heating means softens the molding material in situ.

Thus, the shoe, generally indicated by reference character **110** may include an outer sole **111**, a heel element **112**, as well as an inner sole or sock lining **113**. In the interstice **114** between the outer sole **111** and the sock lining **113**, generally indicated by reference character **114**, there is disposed a first bag element **115** including a lower lamina **116** and an upper lamina **117**. The laminae **116–117** are heat-sealed at the peripheral edge **118** thereof and encloses a shaped paraffin block **119**.

A second bag element **120** overlies the first bag element **115** and includes upper and lower laminae **121** and **122** similarly sealed at the peripheral edges. As best seen in FIGURES 10 and 11, the second bag element **120** may be slightly smaller than the first bag element, and is self-adhered in the area indicated by reference character **125** to prevent ballooning. Orifices **124** and **124***a* are adapted to be interconnected with an inlet tube **126** and an outlet tube **127**, whereby heated and cooled air may be continuously circulated through the second bag element, as seen in FIGURE 13.

During use, the center portion **129** will swell with the injection of air blown into the second bag element, causing it to balloon out until it comes against the foot **130** of the user and the upper surface of the first bag element **115**. The hot air will heat and soften the paraffin block **119**, and the ballooning action will force the partffin forward and backward into the empty parts of the first bag element to fill any empty spaces between the foot and the shoe. The partially adhered area **125** will maintain the heat to keep the paraffin liquid as long as necessary, following which cool air is blown into the bag to hasten the setting of the paraffin.

Once the desired configuration has been obtained, the second bag element **120** may remain in place, or be removed. In the case where the same is to remain in place, it will be provided with grommetted openings at **124** and **124***a* to receive expanding tipped nozzles **131** (see FIGURE 14) which will expand under pressure to prevent premature disconnection. The space occupied by the nozzles is accommodated by the depressed area **132** in the paraffin block **119**, as best seen in FIGURE 10.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

1. An apparatus for molding a shoe sole comprising a sole element having a plurality of recesses corresponding in location with respect to the foot of a wearer to the toe crest immediately forward of the Metatarsal heads, the Metatarsal area, the area forward of the heel, and the periphery of the heel; means for maintaining a molding material in each of said recesses, and means for injecting a molding material in selective manner into each of said recess.

2. Structure in accordance with claim **1** in which the last mentioned means includes an opening penetrating said sole element, valving means disposed in said opening, and means for establishing communication between the said opening and said recesses.

3. Structure in accordance with claim **2** wherein said means for injecting a molding material is selectively engageable with said sole element.

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J. HOWARD FLINT, JR., *Primary Examiner.*

U.S. Cl. X.R.

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