Oct. 2, 1956 J. W. ASHLEY ET AL 2,764,768

SHOE LASTS

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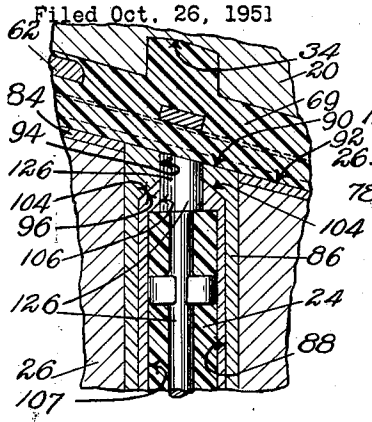


Fig. 5.a

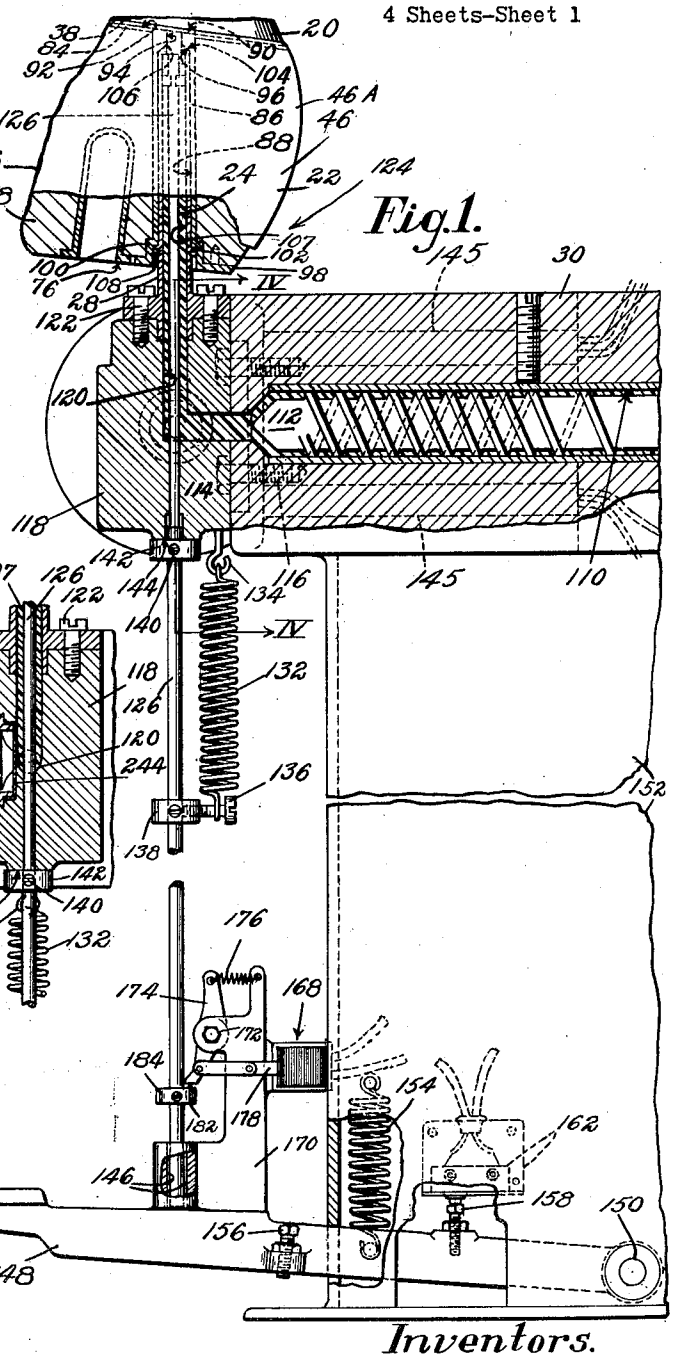


Fig. 1.

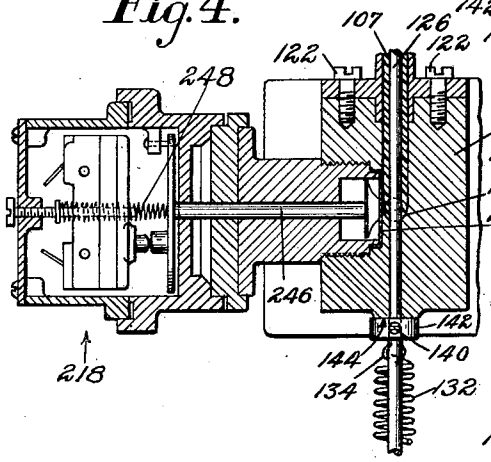


Fig. 4.

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Fig. 2.

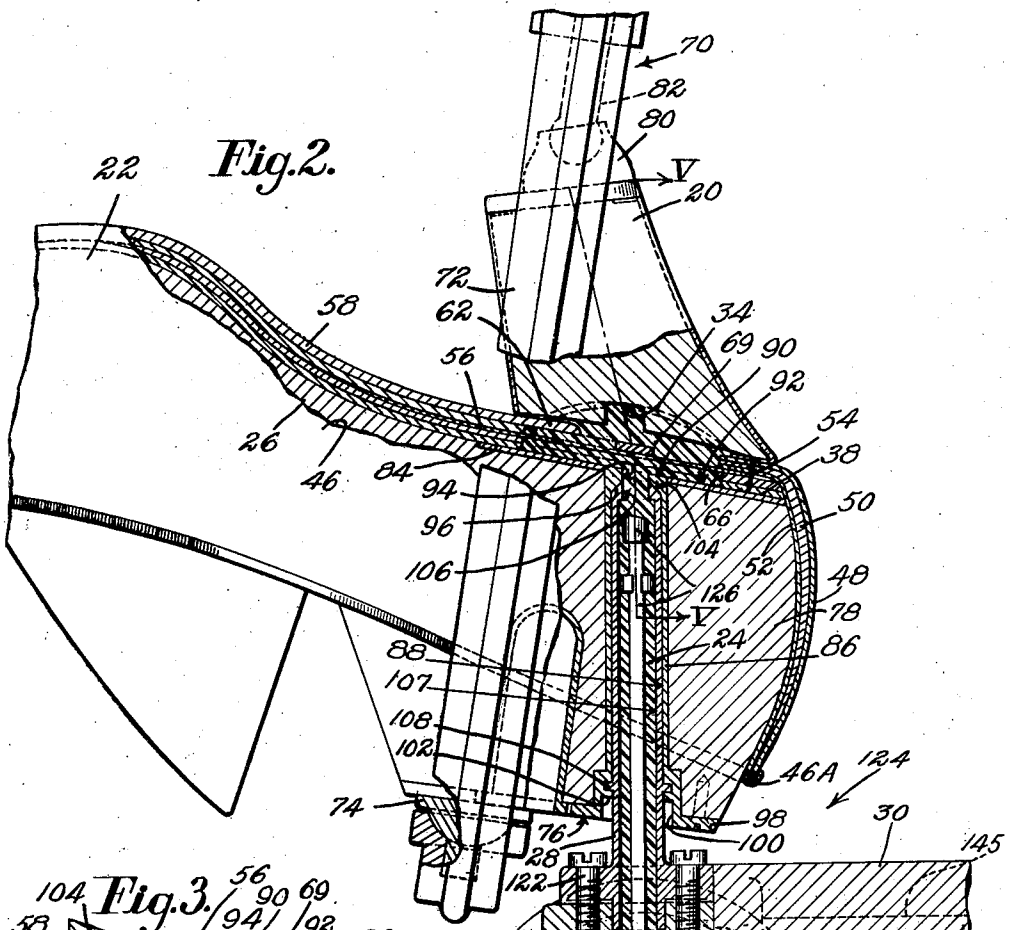
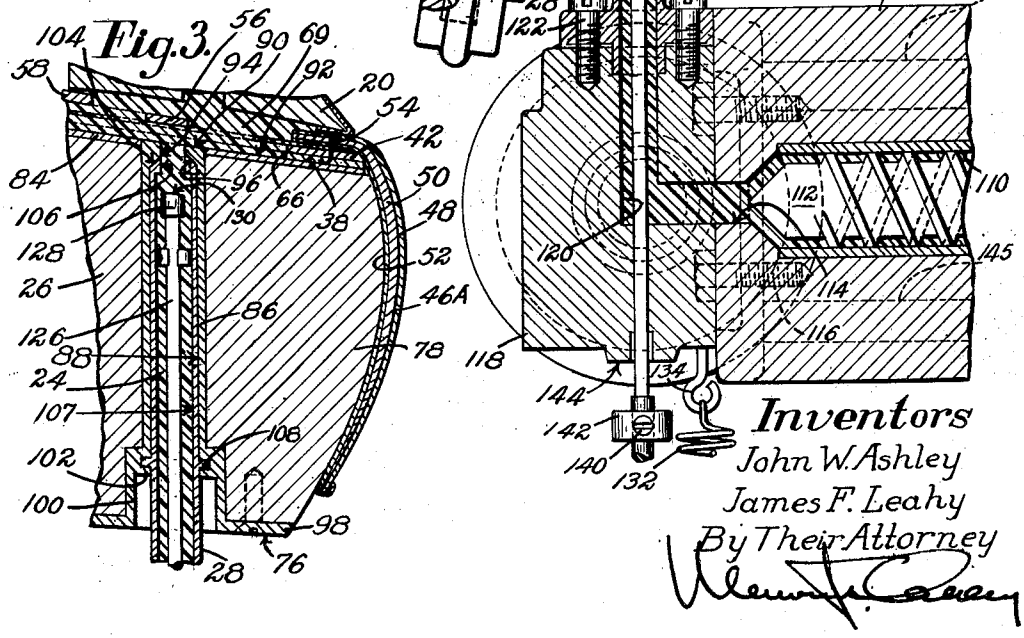


Fig. 3.



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Fig. 9.

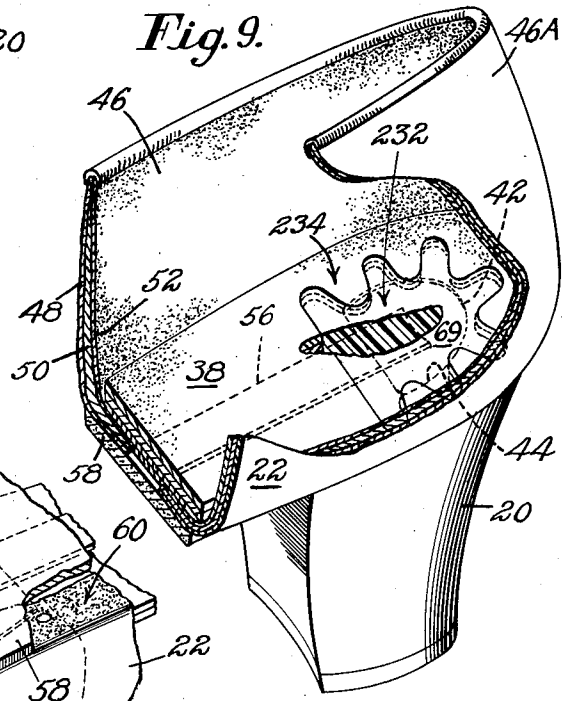


Fig. 7.

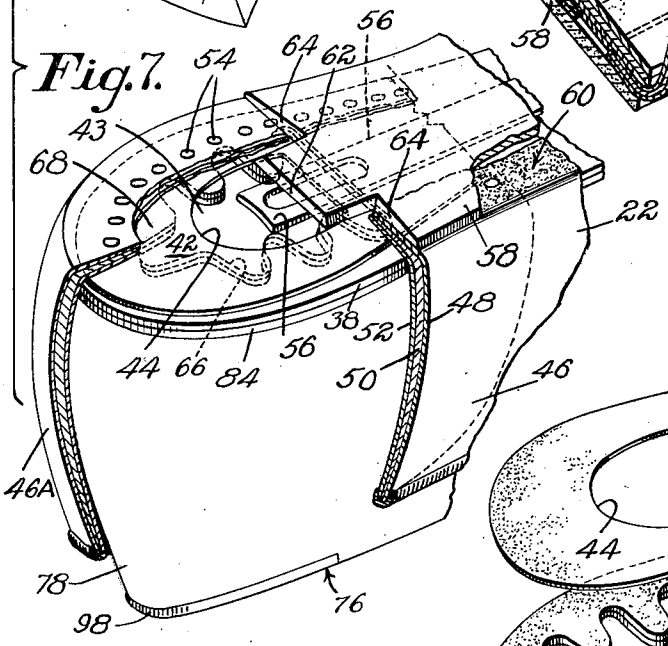


Fig. 8.

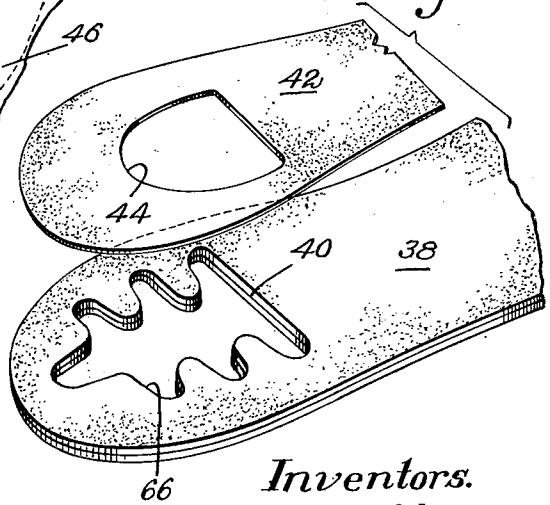
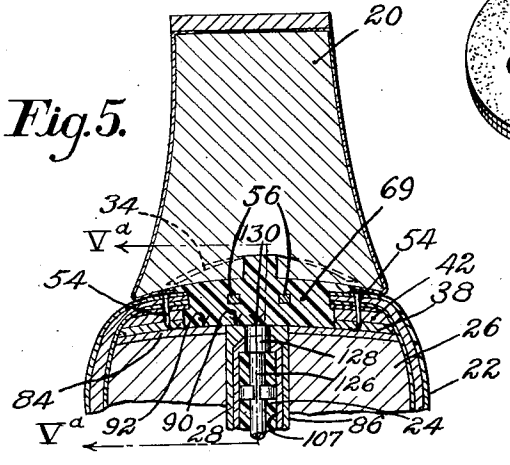


Fig. 5.



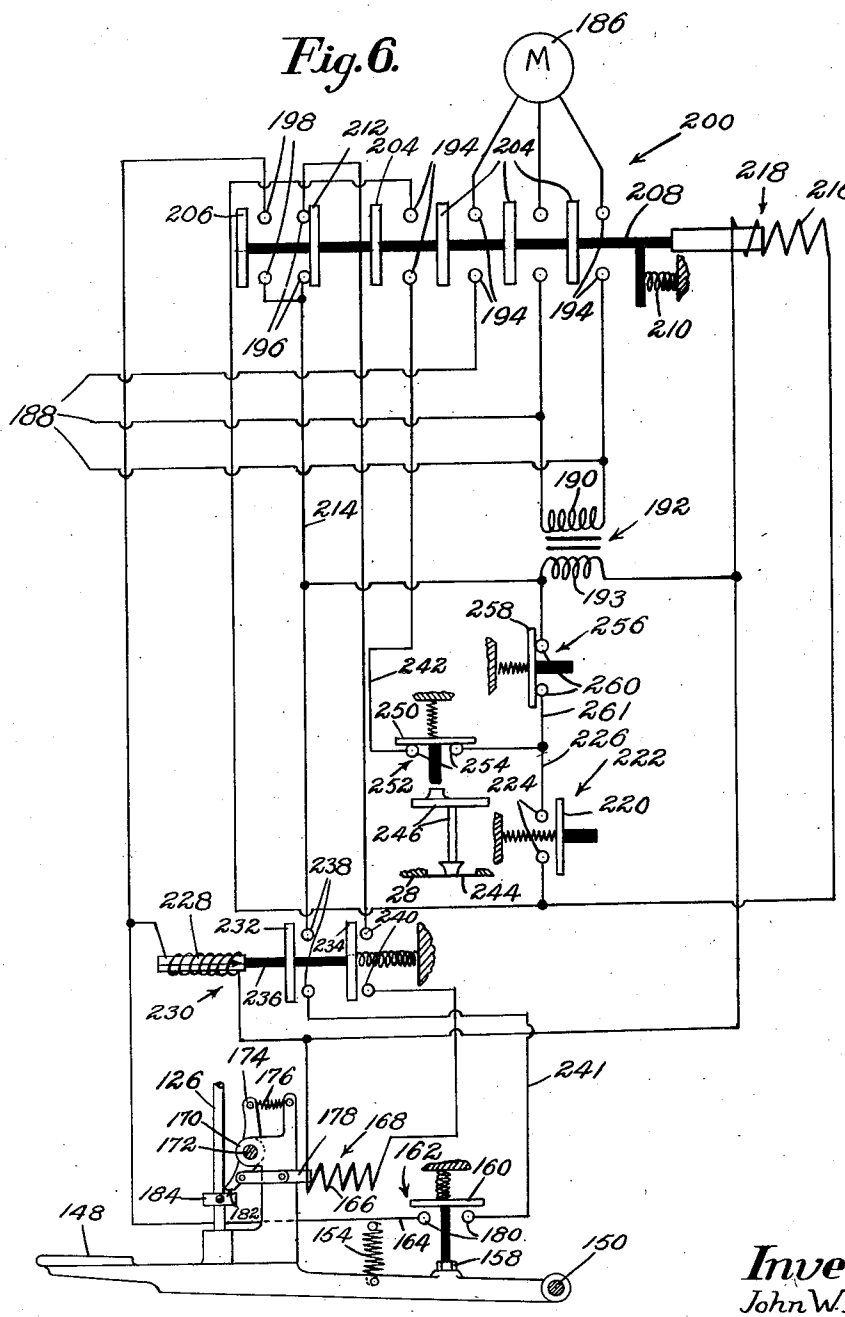
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Fig. 6.



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SHOE LASTS

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Application October 26, 1951, Serial No. 253,308

3 Claims. (Cl. 12—133)

This invention relates to lasts adapted for use with hereinafter disclosed resin injecting apparatus in the attachment of heels to shoes, said apparatus being the subject-matter of a divisional application Serial No. 555,121 filed December 23, 1955 in our names.

As explained in United States Letters Patent No. 2,600,507, granted June 17, 1952 on an application filed in our names, it has been proposed to attach a heel to a shoe by the use of thermoplastic resin which in its viscous form is injected into and fills undercut or anchoring cavities formed in the heel seat of the shoe and the attaching face of the heel as well as all voids existing between said attaching face and heel seat, said resin after it has set serving as a rivet for permanently securing the heel to the shoe.

Resin may be introduced into the anchoring cavities in the attaching face of the heel and in the heel seat of the shoe through a passage extending heightwise through the heel, as disclosed in Patent No. 2,600,507, or through a passage terminating in the breast of the heel, as disclosed in United States Letters Patent No. 2,641,852, granted on June 16, 1953 in the names of James F. Leahy and George F. C. Burke. It has also been proposed permanently to attach heels to shoes by injecting the thermoplastic resin into the above-mentioned cavities and voids through the heel seat of the shoe and it is an object of the present invention to provide a last which is adapted to cooperate with the above-mentioned resin injecting apparatus for this purpose.

The present invention consists in the novel features hereinafter described, reference being had to the accompanying drawings illustrating one embodiment of the invention selected for purposes of illustration, the invention being fully disclosed in the following description and claims.

In the accompanying drawings,

Fig. 1 is a side elevation, partly broken away and partly in section, of the illustrative last and the above-mentioned resin injecting apparatus ready to be used in the attachment of a heel to a shoe;

Fig. 2 is a view similar to the upper part of Fig. 1 but on a larger scale showing a valve head of the resin-injecting apparatus depressed to a cocked position in which resin under pressure is admitted to undercut cavities formed in the heel seat of the shoe and in the attaching face of a heel to be attached to the shoe;

Fig. 3 is a longitudinal central section through the heel seat of a last and a shoe to which a heel has been attached and which is mounted on the last and is considerably larger than the shoe illustrated in Figs. 1 and 2;

Fig. 4 is a section on line IV—IV of Fig. 1;

Fig. 5 is a section on line V—V of Fig. 2 after the valve head has been raised from its cocked position shown in Fig. 2 to insure that resin injected into the work shall be flush with the insole of the shoe;

Fig. 5^a is an enlarged view on line V^a—V^a of Fig. 5;

Fig. 6 is a wiring diagram of the apparatus;

Fig. 7 is an exploded view showing in perspective the heel end of the shoe and the heel which is to be attached to the shoe;

Fig. 8 is an exploded view showing in perspective the heel ends of parts forming a composite insole of the shoe; and

Fig. 9 is a perspective view, partly broken away, of the rear end of the shoe, the heel of which has been attached by the use of the illustrative apparatus.

The illustrative apparatus is described with reference to attaching heels **20** to shoes **22** by the use of thermoplastic resin **24** in accordance with the method disclosed in said Patent No. 2,600,507. Instead, however, of injecting viscous resin through a passage extending heightwise through the heel as disclosed in said application, the resin is injected through the heel seat portion of the shoe, a special form, support or last **26**, which is hereinafter described and constitutes part of said apparatus, being provided for this purpose. The apparatus comprises the last **26** upon which the shoe **22** to which the heel **20** to be attached is clamped, a resin receiving spindle-nozzle **28** upon which the last is mounted and to which the last is coupled, and an extruder **30** (Figs. 1 and 2) in which the resin is plasticized and which forces the resin into and through the spindle-nozzle. The heel **20** has formed in its attaching face **32** (Fig. 7), a pair of cross slots **34** which are inclined to the plane of the rim **36** of the attaching face of the heel and may be collectively referred to as an undercut or anchoring cavity.

The shoe **22** comprises an insole **38** in the heel seat portion of which is formed a relatively large undulatory or crenate opening **40**, a fibre tuck **42** which is cemented or otherwise secured to the lower face of the heel seat portion of the insole and has formed in it a relatively small opening **44**, an upper **46**, a counter portion **46A** of which consists of an outer layer of leather **48**, a fiber counter **50** and a lining **52** all suitably sewed or otherwise secured together, heel seat lasted and secured to the heel seat portion of the insole and its tuck by tacks **54**, a metal stiffener **56** which is secured at its forward end to the insole by staples (not shown), and an outsole **58** which is adhesively secured to a roughened overlasted margin **60** (Fig. 7) of the shoe upper and has its heel seat reduced or "fitted" to provide a heel seat tab **62** and heel breast receiving shoulders **64**.

The insole **38** and the tuck **42** may be referred to as a composite insole which provides the heel seat of the shoe with a cavity **43**, said cavity being described as undercut by reason of the fact that the opening **44** in the tuck is considerably smaller than the opening **40** in the insole **38** so that marginal lobes **66** of the opening underlie the tuck as viewed in Fig. 7. The rear end of the shank stiffener **56** extends into a void or space formed between the undercut cavities **34**, **43** formed respectively in the attaching face **32** of the heel **20** and the heel seat of the shoe and viscous resin injected into the cavity **43**, by the use of apparatus hereinafter described, fills said cavities and voids and has secured in it the rear end of the shank stiffener, thus providing a shoe having a rigid heel seat portion to which the heel is effectively secured permanently by a resin rivet **69**.

The heel **20** may be held in the proper position upon the fitted heel seat of the shoe by a clamp **70** (Fig. 2) comprising a C-shaped bracket **72** carrying a universally tiltable ledge **74** which engages the upper surface **76** of a back cone **78** of the last upon which the shoe is mounted and a presser foot **80** which is universally connected to a screw **82** threaded into said bracket and is forced, upon rotation of the screw, against the tread end of the heel **20** to be attached to the shoe. The clamps **70** are commonly referred to as C-clamps. By the use of the clamps **70** heels are temporarily secured in their proper positions upon the fitted heel seats of the shoes

preparatory to being permanently attached to the shoes.

The last **26** is provided with a highly polished heel plate **84** and has passing through its back cone **78** a bushing or sleeve **86** (Figs. 1, 2, 3, 5 and 5ª) having a cylindrical spindle-nozzle receiving bore or passage **88**. The bushing **86** has a heel seat face **90** which is flush with an adjacent portion of the outer or heel seat face **92** of the last plate **84** and has a cylindrical port, passage or bore **94** which extends from said heel seat face into the bore **88**, a frusto conical sealing or spindle-nozzle engaging shoulder **96** extending from the wall of the cylindrical port **94** to the wall of said bore **88**. The heel seat face **92** of the last plate may be referred to as a shoe sustaining face or the heel seat of the last.

The bushing **86** has formed integral with it a flange **98** which overlies a wood portion of the back cone **78** of the last **26** and forms the upper surface of the back cone, a well portion **100** of the bushing **86** having an internal thread **102**, the distance between said thread and the shoulder **96** being constant irrespective of the height of the last. Accordingly, it will be noted that the depths of the well portions **100** of the bushings **86** of the lasts will vary, the well portions of the bushings of low lasts being shallow as shown in Fig. 2, and the well portions of high lasts being relatively deep as shown in Fig. 3.

The spindle-nozzle **28** is generally cylindrical and is vertically disposed, the bushing **86** fitting slidingly down over the spindle-nozzle until the shoulder **96** of the bushing engages a complemental frusto-conical face **104** of the spindle-nozzle **28** which has a cylindrical passage or port **106** which when the shoe is positioned on the spindle-nozzle registers and is substantially continuous with the port **94** of the bushing **86** and has communicating with it a cylindrical resin receiving bore or passage **107**. The spindle-nozzle **28** has a thread **108** which meshes or interlocks with the thread **102** of the spindle-nozzle, the pitch of the threads being such that when the last has been turned approximately 90° from an initial rest position in which the thread **102** rests upon the thread **108**, the frusto-conical shoulder **96** of the bushing **86** of the last **26** will be forced sealingly against the frusto-conical face **104** of the spindle-nozzle. The threads **102**, **108** of the bushing **86** and the spindle-nozzle, respectively, may be described as coupling, interlocking or threaded parts.

The extruder **30** is of the general type disclosed in United States Letters Patent No. 2,589,323, granted March 18, 1952, on application filed in our names and comprises a plasticizing chamber **110** (Figs. 1 and 2) into which powdered resin is fed, and a screw conveyor **112** for feeding the resin into the chamber and through an exit passage **114** of the extruder. Secured to the extruder **30** by screws **116** is an extruder head **118** having an L-shaped passage **120** which registers with and may be considered part of the passage **114** of the extruder and secured by screws **122** to the extruder head **118** is the spindle-nozzle **28** the bore **107** of which registers with the passage **120**. The extruder **30** together with the spindle-nozzle **28** serves as an injector for the resin and collectively with said spindle-nozzle may be referred to as an injector **124**.

Slidingly mounted in the bore **107** of the spindle-nozzle **28** is a slide or plunger **126** having a valve or valve head **128** (Figs. 3 and 5) which is complemental in cross section to the port **94** and which has an upper end or face **130** which when said head is in a closed or rest position in the port is flush or in alinement with the heel seat face **90** of the bushing **86**. The slide **126** is constantly urged upward to its closed position by a heavy spring **132** (Figs. 1, 2, and 4) opposed ends of which are attached to a hook **134** carried by the extruder head **30** and a screw **136** in a collar **138** secured to the slide. Secured by a screw **140** to the slide **126** is a collar **142** which limits upward movement of the slide and accordingly establishes the upper or closed position of the valve head **128**, the arrangement, as above explained, being such that the upper end **130** of the valve head is flush with the heel seat face **90** of the bushing **86** which in turn is flush with the face **92** of the heel plate **84** of the last **26** when the collar **142** is in engagement with a stop face **144** of the extruder head **118**.

It will be understood that the resin in the extruder head **118** and the spindle-nozzle **28** shall be brought up to the proper temperature before operating the apparatus and that such temperature shall be maintained during the operation of said apparatus. Accordingly the extruder head **118** has housed in it electrical heaters (not shown) similar to the electrical heaters **145** of the extruder **30**. Moreover, when there is no work in the apparatus the spindle-nozzle **28**, which may be described as a spindle having at an end portion thereof a nozzle, may be heated by a suitable shroud (not shown).

The lower portion of the slide **126** fits loosely in a bore **146** (Fig. 1) formed in a treadle **148** (Figs. 1 and 6) the rear end of which is fulcrumed upon a pin **150** secured to a main frame **152** upon the upper end of which the extruder is mounted. The treadle **148** is constantly urged clockwise as viewed in Fig. 1 about the pin **150** by a spring **154**, upward movement of the treadle being limited by the engagement of the treadle with the main frame and downward movement of the treadle being limited by the engagement of a screw **156**, which is adjustably carried by the treadle, with the main frame. The treadle **148** also has adjustably mounted on it a screw **158** which, as will be hereinafter explained, operates a cross bar **160** (Fig. 6) of a self-closing switch **162** in a circuit **164**. Formed integral with the treadle **148** is an upstanding bracket **170** upon which is pivotally mounted a fulcrum pin **172** secured to a latch **174** which is constantly urged clockwise as viewed in Fig. 1 by a spring **176** and has its lower end operatively connected to a slidable core **178** of a latch controlling solenoid **168** which comprises a coil **166**.

When the treadle **148** is in its raised position the cross bar **160** of the switch **162** has been moved by the screw **158** out of contact with terminals **180** of the switch **162** and the coil **166** of the solenoid **168** is deenergized, the spring **176** holding an abutment face **182** of the latch in a position adjacent to the slide **126** and over a collar **184** secured to the slide.

In the attachment of heels **20** to shoes **22** by the use of the above apparatus the operator places the shoe mounted on the last **26** upon the spindle-nozzle **28** with the thread **102** of the bushing **86** of the last resting on the thread **108** of the spindle-nozzle and then rotates the shoe approximately 90° upon the spindle-nozzle, forcing the frusto conical surface **96** of the bushing against the frusto conical surface **104** of the spindle-nozzle **28** and locking the last against heightwise displacement upon the spindle-nozzle.

The treadle **148** is then depressed permitting the cross bar **160** of the self-closing switch **162** to bridge the terminals **180** of the switch and causing, through the latch **174**, the plunger **126** to be depressed from its raised or closed position, in which it closes the passages **94**, **106** of the last bushing **86** and the spindle-nozzle **28** respectively, to its lowered or open position thereby releasing any pressure remaining in the resin in the passage **120** at the end portion of the preceding operation.

Power for operating a motor **186**, to which the screw conveyor **112** is operatively connected, is supplied by a 3-phase circuit **188** to two wires of which is also connected the primary coil **190** of a transformer **192** the secondary coil **193** of which supplies current for a relay **200**.

When the apparatus is at rest and the treadle **148** has been depressed to open the passages **94**, **106** as above stated, bars **204**, **206** of a slide **208** which forms part of the relay **200** and is constantly urged to the left, as viewed in Fig. 6, by a spring **210**, are in their open positions spaced from their associated terminals **194**, **198** and a

bar 212 of the slide bridges the terminals 196 one of which is in a line 214, a coil 216 of a solenoid 218 of said relay 200 at this time being deenergized.

In order to start the motor 186 the operator presses a bar 220 of a switch 222 across terminals 224 of a line 226 thereby energizing the coil 216 of the solenoid 218 and accordingly moving the bars 204, 206, of the slide 208 across the terminals 194, 198 respectively and the bar 212 of the slide, away from the terminals 196. When this occurs a coil 228 of a relay 230 becomes energized causing bars 232, 234 of a slide 236 of the relay to bridge terminals 238, 240, respectively, and a holding circuit 241 to be established. During this time the coil 166 of the solenoid 168 remains deenergized since the terminals 196 are not bridged by the bar 212 and accordingly the latch 174 continues to bear against the collar 184 of the plunger 126 to hold said plunger depressed. As soon as the bar 220 of the normally open switch 222 has been moved to its bridging position across the terminals 224 a line 242 becomes a holding line for maintaining the coil 216 of the solenoid 218 energized and the motor in operation and the bar 220 may be released.

When resin in the passage 120 of the spindle-nozzle 28 has filled the undercut cavities 34, 43 in the heel 20 and the heel seat of the shoe 22 as well as any voids existing between the heel and said heel seat, resin pressure in the passage 120 increases to a point at which it deflects outwardly a diaphragm 244 thus forcing a slide 246 to the left as viewed in Fig. 4 against the action of a spring 248 and accordingly moving a bar 250 (Fig. 6) of a normally closed switch 252 away from terminals 254 in the holding line 242. When the holding line 242 is opened upon opening the normally closed switch 252 the coil 216 of the solenoid 218 becomes deenergized and the slide 208 moves under the action of the spring 210 to its position shown in Fig. 6, the bars 204, 206 being moved away from their associated terminals 194, 198 and the bar 212 again being moved across the terminals 196. When the bar 212 bridges the terminals 196, the coil 166 of the solenoid 168 becomes energized causing the latch 174 to be withdrawn from engagement with the collar 184 of the plunger 126 thereby permitting said plunger acted on by the spring 132 to be moved to its raised position.

The operator thereafter releases the treadle 148 thereby breaking the holding line 241 and deenergizing the coil 228 of the relay 230 thus permitting bars 232, 234 of the slide 236 to be moved away from their associated terminals 238, 240 and accordingly deenergizing the coil 166 of the solenoid 168. As the treadle 148 is raised the latch 174 is retracted against the action of the spring 176 as it engages the collar 184 of the then raised plunger 126 and thereafter swings back to its starting position shown in Fig. 6 over the collar 184. After a short dwell the shoe 22 and the last 26 upon which the shoe is mounted are then rotated upon and raised with relation to the spindle-nozzle 28 to remove the shoe 22 to which the heel 20 has been attached from the machine.

At any time during the operation of the machine the operator may stop the motor 186 and accordingly the screw conveyor 112 and simultaneously therewith cause the plunger 126 to be moved to its raised position by actuating a normally closed switch 256 causing a bar 258 thereof to be moved away from terminals 260 in a line 261. After stopping the machine as above described it is necessary again to close the normally open switch 220 before the motor 186 can again be started.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A last which is adapted for use in the attachment of a heel to a shoe by the injection through the last of plastic material into anchoring cavities formed in the heel and a heel seat of the shoe, comprising a bushing which extends heightwise through a back cone of the last from a heel seat thereof and which has a bore through which the plastic material is introduced into said anchoring cavities, said bushing having at a heel seat portion thereof a flange extending partially across said bore and the upper end portion of said bushing having interlocking fastener means whereby the last may be positioned in sealing interlocking relation with a spindle-nozzle through which is supplied the plastic material introduced into said anchoring cavities.

2. A shoe support for use with a spindle-nozzle which has a coupling part and a passage for transmitting plastic resin, said shoe support comprising a heel seat portion, a bushing which is provided with a passage having one end opening into said heel seat portion and which has a coupling part and a shoulder extending partially across its passage and arranged in close proximity to said heel seat portion, said coupling part of the bushing being adapted to cooperate with the coupling part of the spindle-nozzle to force said shoulder into sealing engagement with the spindle-nozzle and to lock the support against movement lengthwise of said spindle-nozzle.

3. A last for use with a spindle which has at an end portion thereof a nozzle and has a passage for transmitting resin to the nozzle and which has an interlocking part, said last comprising a back cone having a heel seat face, and a bored bushing which extends heightwise through said back cone and has a port opening into said heel seat face and which has an interlocking part adapted to interlock with the interlocking part of the spindle for securing the last to the spindle with said port in sealing engagement with the nozzle of the spindle.

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