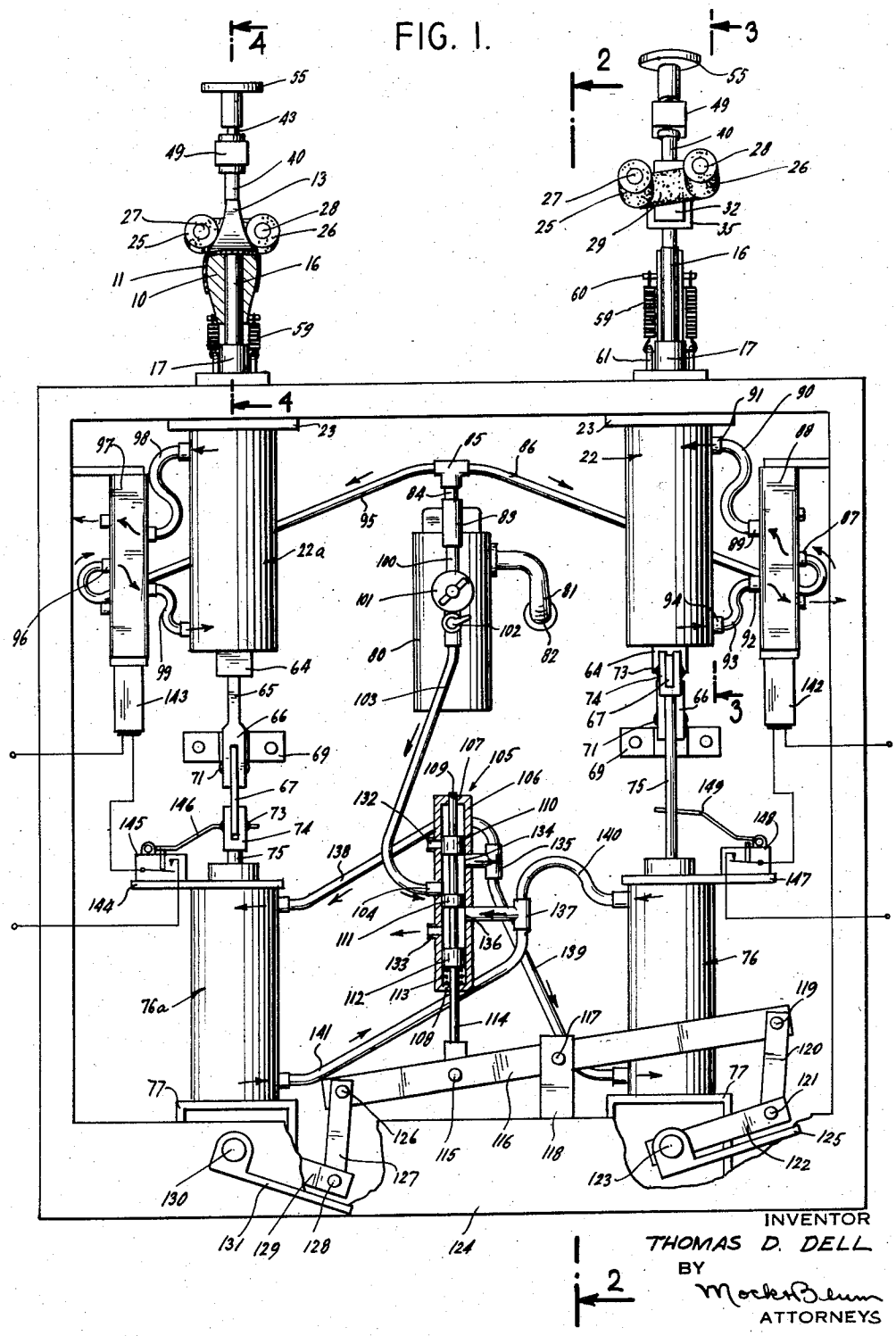
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SHOE HEEL APPLYING APPARATUS

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FIG. 1.



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SHOE HEEL APPLYING APPARATUS

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FIG. 3.

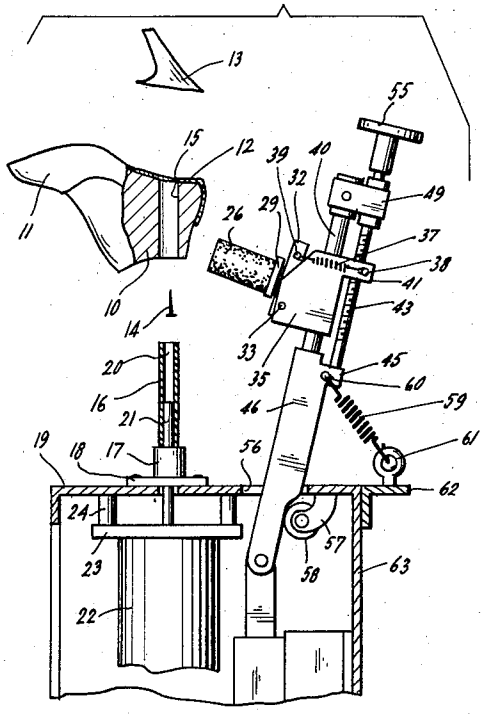


FIG. 2.

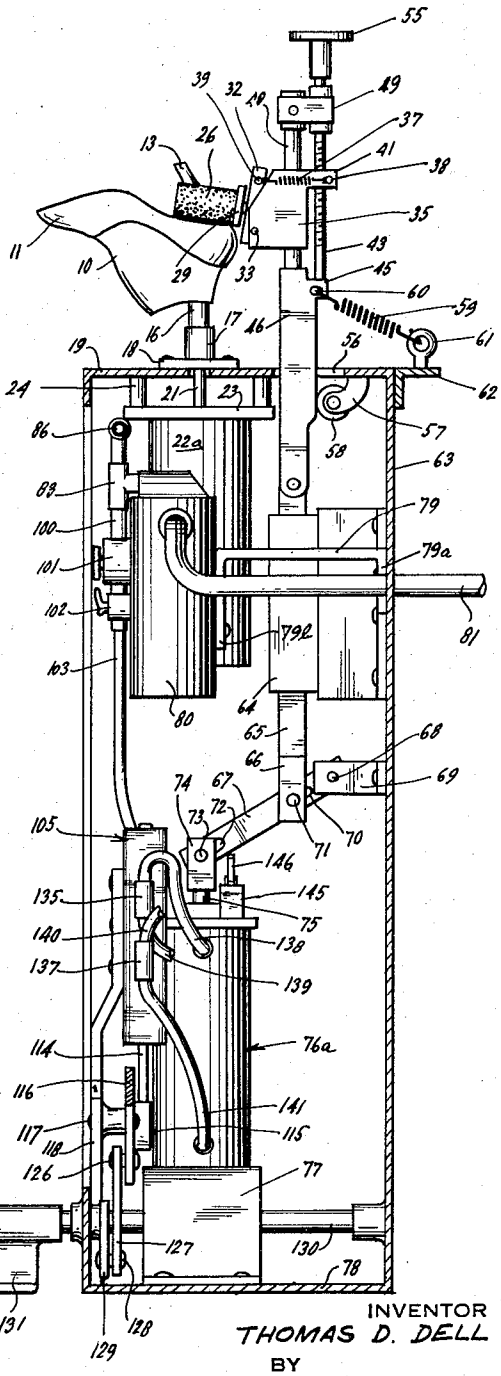
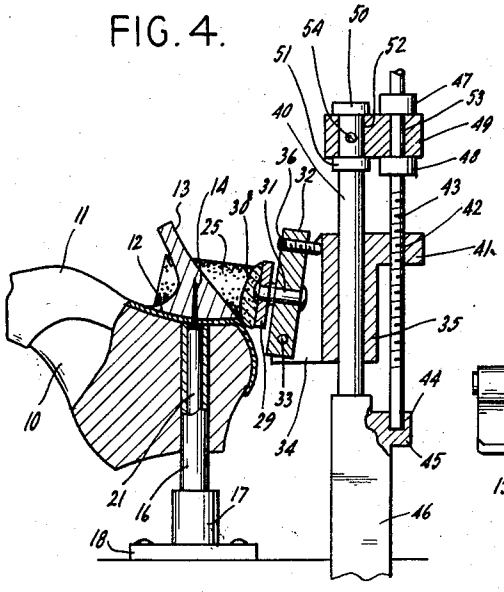


FIG. 4.



INVENTOR
THOMAS D. DELL
BY
Mocker Blum
ATTORNEYS

United States Patent Office

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# SHOE HEEL APPLYING APPARATUS

Thomas D. Dell, New York, N.Y., assignor of fifty per cent to Palizzio, Inc., New York, N.Y., a corporation of New York

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11 Claims. (Cl. 1—32)

The present invention relates to a machine for applying or nailing heels on shoes and is concerned primarily with the provision of such a machine that is largely automatic and simplifies to the utmost degree the work of the operator of such a machine.

It is now common practice in the affixing of a heel in position on a shoe to first secure the heel in position by an adhesive, whereupon a nail is driven through the sole of the shoe into the heel. The present invention is concerned with the driving of such a nail.

If a nail is to be driven, it is evident that a machine of this character must include as a characteristic and essential element a nail driver. Moreover, it is highly important that the heel be securely held in position as the nail is driven. Thus, a highly important object of this invention is to provide new and improved means for securely holding the heel in position as the nail is driven.

More in detail, the invention has as an object the provision, in a heel-nailing or applying machine of the character noted, heel-holding means comprising two spaced holding elements which are designed to receive the heel therebetween. These members are floatingly mounted on a movable carrier or reciprocating rod. When this rod is moved or pulled downwardly by mechanism to be hereinafter described in detail, the heel is securely gripped between the holding elements; and, due to the floating mounting which carries these members, the heel is securely held in position.

Another important object is to provide, in a heel-nailing machine of the type indicated, new and improved mechanism for effecting movement of the heel-gripping elements aforesaid.

Another important object of this invention is to provide control mechanism whereby the operation of the nail driver is synchronized with that of the heel gripper. Thus, just as the heel gripper is moved into its final heel-holding position, the nail driver is automatically started into operation to drive the nail. This end is achieved by utilizing actuating means that is affected by the final portion of the stroke of the mechanism carrying the heel-gripping elements so that, just as this carrying mechanism completes its stroke, the actuating means is affected to operate fluid pressure means for driving the nail driver.

In order to provide for maximum productivity on the part of a workman, the heel-nailing machine of this invention may include two complete nail-driving mechanisms which are so interrelated that an operator may first place a last with a shoe and heel thereon in position on one nail driver and start it into operation, at which time the companion nail driver is affected by the control mechanism to retract the heel-gripping elements and permit the removal of a shoe with the heel nailed thereon therefrom and the positioning of a new shoe. The second nail driver is then started into operation, at which time the first nail driver is then conditioned for the removal of the shoe with the heel nailed thereon therefrom.

An important object of the present invention is to provide a pair of heel-nailing machines of the character aforesaid with appropriate control mechanism for automatically interrelating the operations of the two heel-nailing units in the manner aforesaid.



A somewhat more detailed object of the invention is to provide, in a heel-nailing machine of the character aforesaid, nail drivers which are actuated by a fluid medium such as compressed air. A further object is to provide, in such a machine, actuating elements for heel-gripping means which are also actuated by a fluid medium such as compressed air. The use of a fluid medium as the actuating force particularly lends itself to the automatic control aforesaid.

A further and more detailed object in view is to provide, in a heel-nailing machine of the character indicated, and which includes a pair of complete heel-nailing units, a pair of control valves for the nail-driving elements and a similar valve that is common to the actuating devices for the heel-gripping means. These valves are properly co-related with a source of supply of fluid medium under pressure, microswitches, and foot treadles to achieve the semiautomatic operation above described.

Various other more detailed objects and advantages of the invention, such as arise in connection with carrying out the above-noted ideas in a practical embodiment, will in part become apparent and in part be hereinafter stated as the description of the invention proceeds.

The invention therefore comprises a heel-nailing machine which may include two complete heel-nailing units each including a nail driver, heel-gripping means, fluid means for actuating the nail drivers and the heel-grippers, and control mechanism automatically co-relating the co-operation of the two units.

For a full and more complete understanding of the invention, reference may be had to the following description and accompanying drawings, wherein

Figure 1 is a view in front elevation, with parts broken away, of a heel-nailing machine designed in accordance with the precepts of this invention.

Figure 2 is a side view with the casing shown in section, being taken about on the plane represented by the line 2—2 of Figure 1 and with the other mechanism in elevation;

Figure 3 is a detail taken from the side about on the plane represented by the line 3—3 of Figure 1 showing a last with a shoe thereon, heel and nail, in exploded relation with respect to the part of the machine with which it is immediately associated; and

Figure 4 is a view similar to Figure 3 depicting the heel as gripped and the nail as driven.

Referring now to the drawings, wherein like reference characters denote corresponding parts, and first more particularly to Figure 3, a last which is intended to carry a shoe on which a heel is to be nailed is represented at **10**. The shoe is designated **11** and has a sole **12** onto which a heel **13** is to be affixed. As mentioned above, the heel **13** is first secured in position on the sole **12** by using an adhesive. The joinder is intended to be finally completed by driving a nail, such as shown at **14**, through the sole **12** and into the heel **13**.

The last **10** is formed with a vertical cylindrical passage **15** which snugly receives an upstanding tubular member or support **16** carried by tubular pedestal **17** that is secured by a bracket **18** to an upper frame plate **19**. The tubular member **16** has an upwardly opening passageway or bore **20** in which reciprocates a nail driver or plunger **21**. This nail driver takes the form of the rod illustrated that is carried by a piston which is located within a cylinder **22**. The latter is supported from the top frame part **19** by a hanger plate **23** that is in turn carried by legs **24**.

It is evident that, after the last **10** has been placed

over the tubular support member 16, the heel 13 must be securely gripped and held in position as the nail 14 is driven. For this purpose, a pair of generally parallel spaced cylindrical holding members 25 and 26 (Figure 1) are provided. These members 25 and 26 are rotatably mounted on stud shafts 27 and 28; and the latter are in turn carried by a cross arm 29. The members 25 and 26 are of a soft resiliently compressible or yield material such as rubber, sponge rubber, or the like; and the front face of the connecting arm 29, in which confronts the heel 13, is also covered with this same material as shown at 30 in Figure 1.

The arm 29 is swingably or rockably mounted on a pivot pin 31 (Figure 4) which is in turn carried by a plate 32 that is pivotally mounted adjacent its lower edge, as indicated at 33, between ears 34 that project from a carrier 35. A setscrew, shown at 36, is mounted in a threaded opening at the upper edge of the plate 32 and has a free edge which abuts the carrier 35. A tension coil spring 37 (Figure 2) has one end anchored to the carrier 35 as shown at 38 and its other end to the upper portion of the plate 32, as indicated at 39. There is one of these coil springs at each side of the carrier 35 and plate 32; and the tendency of these springs is to pull the upper edge of the plate 32 inwardly to the point where the free end of the setscrew 36 engages the carrier 35. Thus it is evident that the angular position of the plate 32 may be adjusted through the medium of the setscrew 36.

Referring now again to Figure 4, it will be noted that the carrier 35 is slidably mounted on a rod 40 and has a rearwardly projecting horizontal ear 41 formed with a threaded opening 42 which receives a rotary threaded adjusting stem 43. The lower end of the latter is received in a socket 44 formed in a protuberance 45 on a link 46 that carries the rod 40. The upper end of the screw stem 43 is formed with a pair of spaced annular shoulders 47 and 48 between which are received a block 49 that is carried by the upper end of the rod 40 between another pair of shoulders 50 and 51. The block 49 is formed with a vertical passage 52 which receives the rod 40 and another vertical passage 53 which receives the screw stem 43. A locking screw is shown at 54 for locking the block 49 in position on the rod 40.

The screw stem 43 is continued up above the shoulder ring 47 and at its upper free end carries a handwheel 55 which is non-rotatably mounted thereon and which may be availed of to rotate this screw stem 43 and thus adjust the position of the carrier on the rod 40.

Referring now more particularly to Figure 2, the top frame plate 19 is shown as formed with a slot 56 through which the link 46 passes and which slot is somewhat larger than the link 46. Depending from the lower face of the frame plate 19 adjacent to the rear edge of the slot 56 is a bracket 57 which carries a roller 58 that engages the rear edge of the link 46. A tension coil spring 59 has one end secured to the link 46 as shown at 60 and its other end to an eye 61 carried by an angleiron 62 that is mounted at the rear edge of the top frame plate 19. This spring 59 normally exerts a tendency pulling the rear edge of the link 46 against the roller 58.

Still referring to Figure 2, the frame of the machine includes a rear plate 63 on the inner face of which is mounted a guide 64. Passing through this guide 64 is another link 65 the upper end of which is pivotally connected as indicated at 66 to the link 46 . The lower end of the link 65 is bifurcated as indicated at 66; and received in this bifurcated end 66 is a swinging arm 67. The rear end of the arm 67 is pivotally mounted, as indicated at 68, on a bracket 69 mounted on the inner face of the rear frame wall 63. The arm 67 is formed with a slot 70 through which passes a pin 71 carried by the bifurcated end 66. The end of the arm 67 remote from its pivotal mounting 68 is formed with another slot 72 which receives a pin 73 carried by the bifurcated end 74 of a piston rod 75. This rod 75 is operatively connected to a piston (not illustrated) that is operatively mounted within a hydraulic cylinder 76*a*. This cylinder 76*a* is carried by a bracket 77 that is secured to the upper face of a bottom frame plate 78.

Briefly summing up at this point, it is noted that, as the piston rod 75 is actuated by the fluid medium within the cylinder 76*a*, it is moved either upwardly or downwardly, as the case may be, and the motion transmitted through the arm 67 to the link 65, and from the latter to the link 46. The link 46 will also be moved upwardly and downwardly; but its movement is compounded by the spring 59 and roller 58 so that the cylindrical elements 27 and 28 are moved into or out of gripping engagement with the heel 13.

The mechanism so far described is that of one heel-nailing unit at one side of the mechanism disclosed in Figure 1; namely, the right side. It is to be understood that this mechanism is duplicated at the left-hand side of Figure 1; and it is believed unnecessary to unduly lengthen the specification by here repeating a detailed description of these parts for the left-hand side of Figure 1. However, for the purposes of describing the control mechanism and the automatic operation, the hydraulic cylinder for the nail driver at the left-hand side of Figure 1 will be identified as 22A and the hydraulic cylinder for the heel grippers at the left-hand side of Figure 1 as 76A

As shown in Figure 2, a supporting bracket 79 has a foot 79*a* that is anchored to the inner face of the rear frame wall 63. This bracket 79 extends forwardly and has another depending foot 79*b* to which is secured a pressure regulator or control 80. A conduit 81 leads into the upper end of the pressure regulator 80 and extends through an opening 82 in the rear frame wall 63 to an appropriate source of supply of a fluid medium under pressure, such as compressed air.

Connected to the upper end of the pressure-regulator cylinder 80 is a horizontally arranged T fitting 83. Extending upwardly from this fitting 83 is a conduit 84 that is connected to a vertically arranged T fitting 85. From one side of this T fitting 85 a conduit 86 extends to an inlet, shown at 87, of a control valve 88. This control valve 88 has an upper end, shown at 89, that is connected by a conduit 90 with a port 91 at the top of the cylinder 22. Control valve 88 also has a lower port 92 connected by conduits 93 to a port 94 at the lower end of the cylinder 22.

Likewise, a conduit 95 extends from the left-hand side (speaking with reference to the showing of Figure 1) of the T fitting 85 to an inlet port 96 of another control valve 97. This control valve 97 is operatively associated with the cylinder 22A through the medium of conduits 98 and 99, which are connected to the upper ends and lower ends of cylinder 22A, respectively.

Extending downwardly from the T fitting 83 is another conduit 100 which carries an operating member for pressure regulation as shown at 101 and a main control or cutoff valve 102. From the lower end of this conduit 100 another conduit 103 extends to an inlet port 104 of a control valve 105. This control valve 105 is substantially the same in construction as the control valves 88 and 97, although it is common to the actuating cylinders 76 and 76A. As shown in Figure 1, the control valve 105 has a cylindrical wall 106, a top head 107, and a bottom end 108. Mounted for reciprocation within the valve 105 is a reciprocating valve rod 109 carrying three valve members 110, 111, and 112 which slidably engage the cylindrical wall 106. The upper end of the rod 109 is slidably received in an opening formed in the top head 107; while the lower end is slidably received in an opening formed in the bottom end 108. An expansion coil spring 113 is interposed between the bottom end 108 and the valve

member 112 and normally exerts a tendency urging the valve rod 109 upwardly.

The valve rod 109 is continued down beyond the bottom end 108, as indicated at 114, and at its lower free end is pivotally connected as indicated at 115 to an actuating arm 116. This arm 116 is pivotally mounted as indicated at 117 on a bracket 118 that upstands from the bottom frame wall 78. One end of the arm 116 is pivotally connected, as indicated at 119, to a link 120 the lower end of which is pivotally connected as indicated at 121 to an arm 122, the other end of which is drivably connected to a shaft 123 that is pivotally mounted on the front frame wall 124 as shown in Figure 2. In front of this front frame wall 124 the shaft 123 carries a foot pedal 125.

The other end of the arm 116 is pivotally connected as indicated at 126 to a link 127, the lower end of which is pivotally connected, as indicated at 128, to an arm 129 that is drivably mounted on a shaft 130 that is drivably mounted in the front wall 124 and which carries a second foot pedal 131.

The cylindrical wall 106 of the control valve 105 is formed with a pair of exhaust ports 132 and 133. It is also formed with a port at 134 which carries a T fitting 135 and a second port at 136 which carries another T fitting 137. From one end of the T fitting 135 a conduit 138 extends to the upper end of the cylinder 76A. From the other side of this T fitting 135 another conduit 139 extends to the lower end of the cylinder 76. From one side of the fitting 137 a conduit 140 extends to the upper end of the cylinder 76; while from the other side of the fitting 137 a conduit 141 extends to the lower end of the cylinder 76A.

Each of the control valves 88 and 97 has exhaust ports comparable to the exhaust ports 132 and 133 and, at the other side, ports comparable to the ports 134 and 136. Moreover, each of the control valves 88 and 97 includes piston rods that are biased upwardly by springs corresponding to the spring 108; and these valves 88 and 97 are provided with solenoids 142 and 143, respectively, which when energized pull the piston rod downwardly against the influence of the spring therein.

Extending outwardly from one side of the cylinder 76A at the top is a supporting plate 144 which carries a normally closed microswitch 145 having an actuating arm 146 that is located beneath the arm 67 so as to be actuated thereby as the latter reaches a lower limit of movement. Likewise, a supporting plate 147 is carried by the cylinder 76 at the top and in turn supports another normally closed microswitch 148 having an actuating arm 149 that is located beneath the arm 67 of that unit to be actuated thereby as it reaches its lower limit of movement.

The microswitch 145 is operatively connected by suitable wiring to the solenoid 143 of the control valve 97; while the microswitch 148 is similarly connected to the solenoid 142 of the control valve 88.

*Operation*

While the manner in which the heel-nailing machine of this invention operates is believed to be obvious from the illustration of the drawings and description of parts given it may be briefly described as follows:

With the apparatus in the condition depicted in Figure 1, the operator is working on the right-hand mechanism and will have removed a shoe, on which a heel has been nailed by a previous operation, from the tubular supporting member 16 and then places another nail in the bore 20 of the tubular support 16, and last 10 with a shoe 11 and heel 13 adhesively secured thereto on the tubular support 16. The treadle 125 is now depressed to move the piston rod 109 within the control valve 105 upwardly. As this action takes place, the exhaust port 133 is closed and the valve member 111 moved above the port 104 leaving the port 136 open to receive air under pressure from the conduit 103. This air under pressure is now conducted by conduit 141 to the lower end of the cylinder 76A. Thus the heel grippers at the left-hand side of Figure 1 are moved upwardly into the position releasing the heel; while the piston in the cylinder 76 is urged downwardly to position the heel grippers 25 and 26 in the right-hand unit downwardly into gripping engagement with the heel. As this action is completed, the arm 67 in the last part of its downward movement or stroke engages the actuating arm 149 of the microswitch 148 to energize the solenoid 142 and thus pull the valve rod therein downwardly against the influence of the spring therein. As this action takes place, the lowermost exhaust port is closed and the port 42 is opened to receive air under pressure from the port 87 and conduct it through conduit 93 to the lower end of the cylinder 22 and thus urge the piston carrying the nail-driving rod 21 upwardly to drive the nail.

The shoe with the heel nailed thereon is then removed from the unit at the left-hand side of Figure 1 and replaced with a new lasted shoe 11 having a heel 13 to be nailed and the treadle 131 depressed.

Referring further to the condition of Fig. 1, compressed air under pressure passes from the cylinder 80 through T fitting 83, conduit 84, fitting 85, and conduit 95 to the inlet shown at 96 of the control valve 97. Moreover, the solenoid 143 is de-energized to allow upward movement of the piston rod within the valve 97 by its spring to close the lowermost exhaust port and admit air under pressure through the conduit 99 and beneath the piston of the cylinder 22*a* and thus actuate the nail driven 21. At the same time, the control valve 105 is in the position depicted in Fig. 1 in which the upper exhaust port 132 is closed by the valve member 110; while the port 134 is opened so that air under pressure coming from the conduit 103 passes into the control valve 105 through the port 104 and out to the fitting 135. From the latter the air under pressure is conducted by the conduit 138 in the upper part of the cylinder 76*a* above the piston therein to move this piston downwardly which, through the linkage 67, 65 and 46, pulls the heel grippers 25 and 26 downwardly. At the same time, air under pressure is conducted from the T fitting 135 through the conduit 139 to the lower end of the cylinder 76 beneath the piston therein to move the heel lifter 25 and 26 upwardly. Moreover, as the solenoid 142 is energized in this position, the piston within the control valve 88 is moved downward against its spring to close the uppermost exhaust port and admit air under pressure through the conduit 90 to the upper end of the cylinder 22 and thus urge the piston which carries the nail driving rod 21 downwardly.

While a preferred specific embodiment of the invention is hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact constructions, mechanisms, and devices illustrated and described, because various modifications of these details may be provided in putting the invention into practice within the purview of the appended claims.

What is claimed is:

1. In heel-applying apparatus, the combination comprising: support means for a shoe having a heel positioned thereon, fastener-driving means in said support means for driving a fastener into said shoe and heel, a pair of spaced yieldable elements mounted for free rocking movement relative to each other about an axis extending between said elements and moveable together into and out of holding engagement with said positioned heel to retain said heel in position on said supported shoe, and cooperating operating mechanisms respectively associated with said fastener-driving and heel-holding means for driving a fastener into said shoe and heel in the proper timed relation when the heel is held firm by said heel-holding means.

2. Heel-applying apparatus according to claim 1, said

operating mechanisms comprising first fluid means connected to said elements for effecting their movement toward and away from said positioned heel, second fluid means connected to said fastener-driving means for actuating the latter, and means connected between said first and second fluid means to operate the latter in said timed relation with respect to each other.

3. Heel applying apparatus according to claim 1, said yieldable elements comprising a pair of generally parallel cylindrical members each mounted for independent axial rotation.

4. In a heel applying apparatus having means for supporting a shoe and positioned heel, the improvement comprising a pair of spaced elements mounted for free rocking movement relative to each other about an axis extending between said elements and for movement into and out of firm engagement with opposite sides of a positioned heel.

5. Heel applying apparatus according to claim 4, said spaced elements comprising a pair of generally parallel cylindrical members having yieldable external surfaces, and said axis of rocking movement extending generally parallel to said members.

6. Heel applying apparatus according to claim 4, said cylindrical members each being mounted for independent axial rotation.

7. In heel-applying apparatus, the combination comprising: a pair of support means each adapted to support a shoe having a heel positioned thereon, fastener-driving means in each of said support means for driving a fastener into the adjacent supported shoe and heel, a pair of heel-holding means mounted for rocking movement relative to each other about an axis extending between said heel-holding means and for movement together into and out of holding engagement with a respective positioned heel to retain its respective heel in position on the adjacent shoe, operating means connected to each associated fastener-driving and heel-holding means for driving a fastener into the adjacent shoe and heel when the latter is held firm by the respective heel-holding means, and means interconnecting said operating means to maintain operation of the latter in an out-of-phase timed relation with respect to each other, to thereby enable an operator to place a shoe and heel on one of said support means while a heel is being fastened on the other of said support means.

8. In heel-applying apparatus, the combination comprising: support means for a shoe having a heel positioned thereon, fastener-driving means in said support means for driving a fastener into said shoe and heel, carrier means mounted for movement toward and away from said positioned heel, a pair of spaced yieldable elements carried by said carrier means for rocking movement relative to each other about an axis extending between said elements and for movement into and out of firm engagement with opposite sides of said positioned heel to retain the latter in position, and cooperating operating mechanisms respectively connected to said fastener-driving and carrier means for driving a fastener into said shoe and heel when the latter is held firm by said spaced elements.

9. Heel-applying apparatus according to claim 8, said spaced elements comprising a pair of generally parallel, cylindrical members having yieldable external surfaces.

10. Heel-applying apparatus according to claim 9, said operating mechanisms comprising first fluid means connected to said carrier means for effecting its movement toward and away from said positioned heel, second fluid means connected to said fastener-driving means for actuating the latter, and means connected between said first and second fluid means to operate the latter in said timed relation with respect to each other.

11. Heel-applying apparatus according to claim 9, said support means comprising a fixed upstanding element adapted to be received in a last carrying a shoe and positioned heel to support the same, said upstanding element being formed with an internal upwardly opening passageway for receiving a fastener, and a driver mounted in said passageway and operatively connected to said second fluid means of said operating mechanisms for driving said received fastener into said shoe and heel.

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