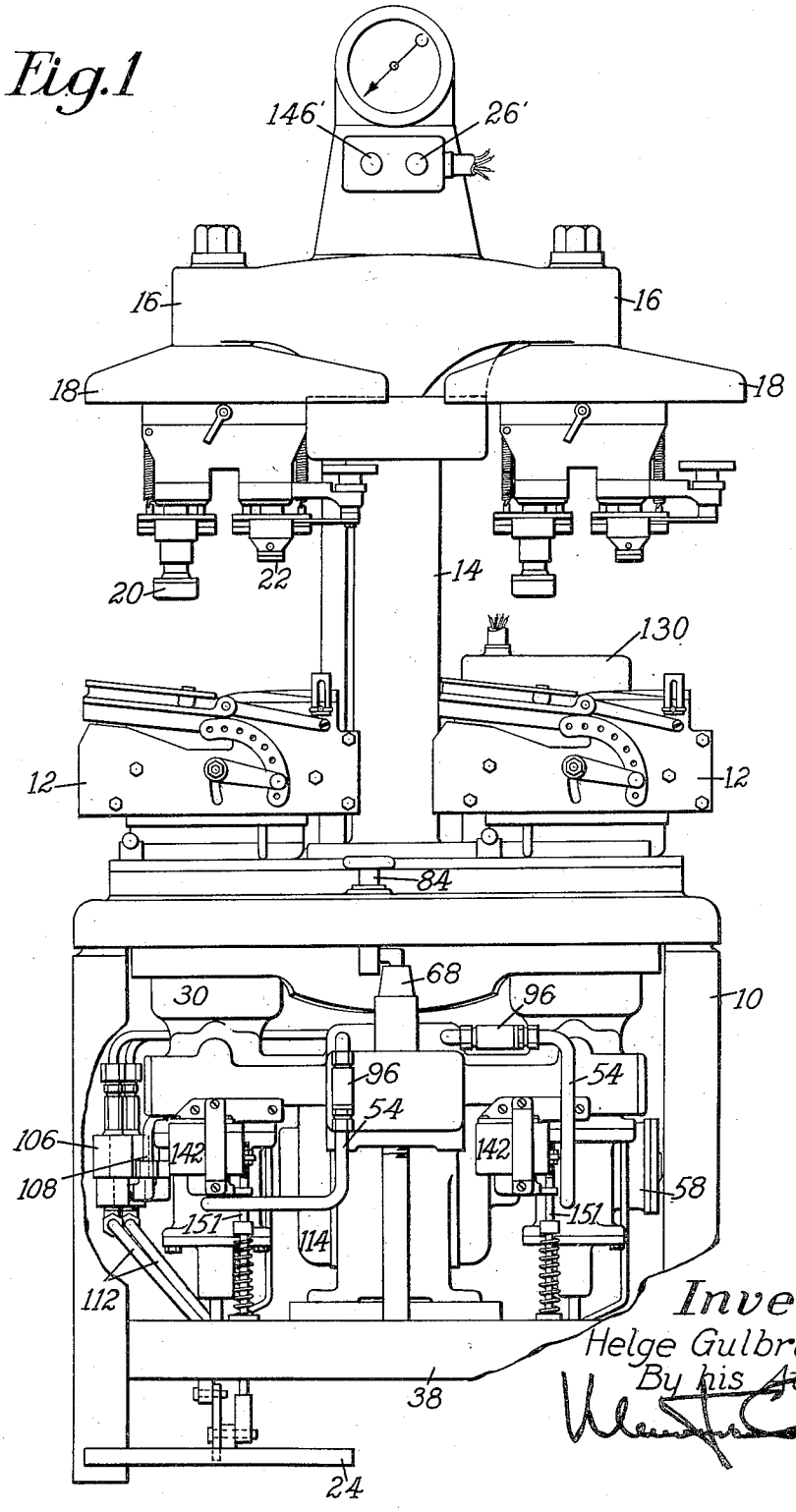
Sept. 6, 1955 H. GULBRANDSEN 2,716,766

MACHINES FOR APPLYING PRESSURE TO SHOE BOTTOMS

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Fig. 1



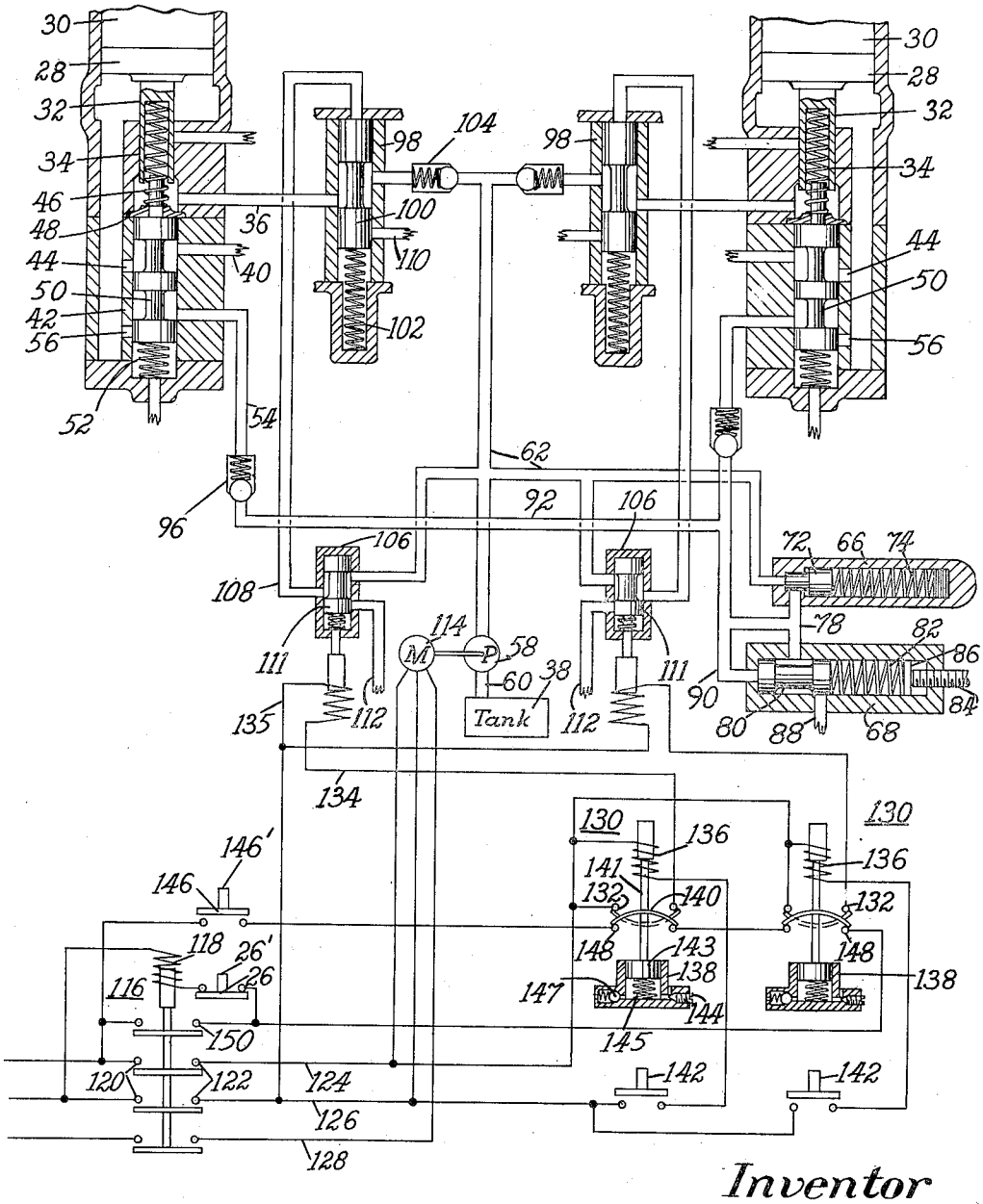
Inventor
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By his Attorney

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Fig. 2



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2,716,766

MACHINES FOR APPLYING PRESSURE TO SHOE BOTTOMS

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9 Claims. (Cl. 12—36)

This invention relates to machines for operating on shoes, and in particular to machines for applying pressure to shoe bottoms. The invention is illustrated as embodied in a two-station sole attaching machine operated by fluid pressure mechanism, although it will be understood that the invention is not thus limited in its application.

An object of the invention is to provide, in a machine of the type referred to above, improved and simplified control mechanisms by which a shoe in each station of the machine will remain under pressure for a predetermined length of time and by which the pressure may quickly be relieved if desired. As illustrated herein each station of the machine includes a fluid pressure operated motor having small and large interconnected pistons, the arrangement being such that upon depression of a treadle at either station of the machine fluid pressure is conducted to a cylinder housing the small piston at the corresponding station of the machine, whereupon rapid upward movement of a pad box carried by the pistons is effected. After the pad box has moved upwardly to clamp the work against heel and toe abutments, fluid under high pressure is admitted into the large cylinder to apply pressure to the work.

In accordance with a feature of the invention an improved and simplified control mechanism for the machine is provided comprising an electrically operated valve controlling the flow of pressure fluid to the fluid pressure motor, and a timer having contacts for controlling the valve, the timer including operating mechanism initiated by actuation of a treadle for holding the contacts closed for a predetermined length of time.

In accordance with another feature of the invention, actuation of the treadle serves to apply fluid pressure to the motor, while the timing period does not commence until the treadle is released, so that the operator may conveniently prolong the pressure period by holding down the treadle if, for example, one of a number of work pieces requires extra time.

In accordance with yet another feature of the invention, a stop switch is provided operative to deenergize the electrically operated valve for relieving pressure in the fluid motor if desired at any time prior to the termination of the timing cycle.

In accordance with a still further feature of the invention, the stop switch is also effective for simultaneously interrupting the supply of energy to an electric motor driving a pump supplying the fluid pressure. A stop switch is normally provided for the motor in any event, and it will be seen that by this feature of the invention, whereby the switch performs the two functions of relieving fluid pressure and stopping the motor, convenience and safety of operation are economically enhanced.

Since the operating mechanism of the timer of the illustrative machine continues to operate and hold closed the valve-controlling contacts of the timer for the predetermined cycle even after interruption of the supply of electric energy to the timer, valve and electric motor, it is desirable, to prevent damage to the work by premature raising of the pad box, to prevent reapplication of fluid pressure to the fluid pressure motor by restarting the pump motor and energizing the valve while the timer operating mechanism is still running through its previously initiated cycle. To this end, and in accordance with another feature of the invention, the timer is provided with means for preventing reapplication of fluid pressure to the fluid pressure motor before the timer has run through its cycle. In the illustrative machine, contacts operatively associated with the timer perform this desirable function.

The above and other features of the invention including various novel combinations of parts and details of construction will now be described by reference to the drawings and pointed out in the claims.

In the drawings,

Fig. 1 is a front elevation of one form of machine in which the invention may be embodied; and

Fig. 2 is a schematic diagram of the electrical and fluid pressure mechanisms embodied in the machine.

The invention is illustrated as embodied in a machine having a base **10** in which are supported for vertical movement pad boxes **12, 12**. Rising vertically from the base **10** is a post **14** to the upper end of which are secured forwardly and outwardly extending arms **16**. Each arm carries at its forward end a crosshead **18** in which are adjustably supported toe and heel abutments **20, 22**. Each pad box is adapted to support an assembled outsole and lasted shoe which is moved upwardly with the pad box, by mechanism to be described, into engagement with the toe and heel abutments to apply sole-attaching pressure to the shoe bottom.

For controlling the movements of the pad boxes there is provided at each side of the machine a treadle **24**, only that treadle at the left side of the machine being illustrated in Fig. 1. Upon depression of one of the treadles, the pad box at the corresponding side of the machine is moved upwardly by fluid pressure until the lasted shoe moves into engagement with the toe and heel abutments.

Located above the arms **16** and carried by the post **14** is a stop switch **26** (Fig. 2) controlled by a button **26'**, the switch serving to permit immediate descent of any pad box which is in its upward position. Under normal conditions the pad box remains in its upper position for a predetermined period following depression of the treadle **24** so that the assembled shoe and outsole remain under pressure for a time sufficient to insure a good bond between the outsole and shoe bottom. In the event however that the assembled shoe and outsole are not properly located on the pad box at the time the pad box reaches its upper position, or for any other reason, the operator may immediately relieve the fluid pressure in the entire system by pressing the button **26'**.

The electrical and fluid pressure mechanism for operating the machine will now be described with particular reference to Fig. 2. Many elements of this mechanism are duplicated in the two stations of the machine, and for convenience are identified by like reference characters. The parts are illustrated in the positions they assume with the machine at rest prior to starting the pump so that no fluid pressure is exerted against any of the fluid presure operated members of the machine. Except for those elements which are common to the two stations of the machine, the following description will refer in particular to the station at the left side of the machine, it being understood that the mode of operation of the other station of the machine is substantially identical therewith.

The pad box is carried for upward movement, to apply pressure to the shoe bottom, by a large piston **28** movable in a cylinder **30**. Depending from and movable

with the large piston 28 is a small piston 32 movable in a cylinder 34, the arrangement being such that first pressure fluid is admitted into the small cylinder 34 to act on the piston 32, moving the pad box upwardly at a high rate of speed, after which pressure fluid is forced into the cylinder 30 to act on the large piston 28 to apply heavy pressure to the work. During the initial upward movement of the pistons 28, 32, pressure fluid flows through a pipe 36 into the small cylinder 34, the upward movement of the piston 28 drawing fluid from a fluid reservoir 38 (Fig. 1) through a pipe 40, a valve 42 and a port 44 so that the large cylinder 30 is constantly maintained filled with pressure fluid. The small piston 32 is hollowed out to receive a light compression spring 46 which acts between the piston and a fixed plate 48 to assist in overcoming the inertia of the pistons and the pad box carried thereby. A pressure controlled valve member 50 is movable in the chamber of valve 42 and has a stem projecting upwardly through the plate 48. This valve is arranged to be forced downwardly against the action of a spring 52 when the pressure of fluid in the cylinder 34 acting on the upwardly projecting valve stem reaches a predetermined value thereby to connect a regulated pressure supply line 54 by way of a port 56 with the cylinder 30 and at the same time cut off communication between the cylinder 30 and the fluid reservoir 38 by way of pipe 40.

The cylinders 30, 34 are supplied with pressure fluid by a pump 58 having an intake pipe 60 connected with the fluid reservoir 38 and having an output supply pipe 62. Connected with the supply pipe 62 are two valves common to both stations of the machine. These valves include a pressure regulating valve 66 and a relief valve 68. The pressure regulating valve 66 includes a valve member 72 urged toward the left by a spring 74 to prevent flow of pressure fluid from the supply pipe 62 into a pipe 78 until the pressure of the fluid in the supply pipe 62 attains a predetermined value such as 200 lbs. per square inch. This valve controls the maximum pressure of the fluid admitted into the cylinder 34 following the depression of the treadle 24. It will be understood that although this pressure is sufficient firmly to grip the work between the pad box and the heel and toe abutments it is insufficient for the final pressure to be exerted upon the shoe bottom because of the small area of the piston 32. The relief valve 68 includes a valve element 80 urged to the left by a spring 82, the action of which may be adjusted by turning a screw 84 carrying an abutment 86. This valve member normally occupies the position shown in which flow of pressure fluid from the pipe 78 and from valve 66 to a discharge pipe 88 leading to the reservoir 38 is prevented. When the pressure in the supply pipe 62 from the pump reaches a sufficiently high value to move the valve member 72 of valve 66 to the right, the pressure fluid flows through a pipe 90 to act upon the left end of the valve element 80 whereupon this valve element will move to the right permitting flow of some of the fluid back into the reservoir 38 by way of pipe 88 and preventing the pressure of the fluid in a pipe 92 connected to the pipe 78 from exceeding a predetermined value which may be somewhere between 50 and 200 lbs. per square inch, for example, depending upon the position of the abutment 86. The pipe 92 is connected by way of a check valve 96 and the pipe 54 with the chamber of valve 42 so that when the valve member 50 is forced downwardly, pressure fluid under control of the relief valve 68 flows into the large cylinder 30 to exert the final high pressure on the work. It will be understood that even though the relief valve 68 maintains a lower pressure per square inch in the pipes 92, 54 which supply the cylinder 30 than is maintained by the pressure regulating valve 66 in the pipe 62 which supplies the cylinder 34, the final pressure on the work will be greater than the pressure provided by the piston 32 because of the larger area of the piston 28.

For each station, the fluid pressure to the cylinder 34 from the supply pipe 62 is controlled by a cylinder control valve 98. This valve includes a valve member 100 urged upwardly by a spring 102 to connect the supply pipe 62 to the pipe 36 through a check valve 104. Normally, however, the valve member 100 is held downward by fluid pressure supplied from the supply pipe 62 through a solenoid valve 106 and a pipe 108. The solenoid valve 106 is a commercial three-way unit having a valve element 111 yieldingly urged into one of two positions. As arranged as shown in Fig. 2, the valve is connected so that when deenergized, the pipe 108 is connected to the supply pipe 62, thus depressing valve member 100 to discharge fluid pressure from cylinder 34 via the pipes 36 and 110, and from the cylinder 30 via pipe 40, back to the reservoir 38. The solenoid valve 106 is arranged to be energized with electric current to disconnect the pipe 108 from the supply pipe 62 and to connect the pipe 108 instead to a pipe 112 leading to the fluid reservoir 38. Accordingly it will be seen that upon energization of the solenoid valve the valve element 100 is permitted to move upwardly for supplying fluid pressure from the supply pipe 62 to the small cylinder 34 through the valve 98.

The pump 58 is driven by an electric motor 114 controlled by a relay 116. This relay includes a coil 118 which when energized connects line side terminals 120 to load side terminals 122 thus supplying power to the motor 114 through wires 124, 126, 128.

For energizing the relay coil 118 to initiate operation of the pump motor 114, a start switch 146 controlled by a button 146' is mounted adjacent to the stop switch 26. This start switch is arranged to be momentarily closed by the operator and completes a circuit through the relay coil 118 through normally closed contacts 148 of a pair of electrically operated timers 130, the circuit also including the normally closed stop switch 26. Accordingly, assuming that the contacts 148 of both timers 130 are closed, momentary closure of the start switch 146 will complete a circuit through the relay coil 118 thus energizing the motor 114. The relay coil 118 remains energized upon opening of the start switch 146 by reason of a holding circuit including the normally closed stop switch 26 and contacts 150 of the relay 116. Thus it will be seen that unless the stop switch 26 is opened, the relay will remain energized and the motor 114 will continue in operation.

The timers 130 each include a pair of contacts 148 aforementioned which are normally connected by a snap acting switch arm 140 carried by a rod 141 having at its upper end an armature arranged to be moved downwardly upon energization of an operating coil 136 whereupon the snap acting switch arm 140 moves into the broken line position shown, connecting contacts 132 of the timer. The timers also each include a dashpot 138 in which is movable a piston 143 carried by the lower end of the rod 141 and normally urged upward by a spring 145. When the coil 136 is energized, fluid below the piston 143 is forced outwardly through a check valve 147 but upon deenergization of the coil 136 and upward movement of the piston by the spring 145, admission of fluid into the dashpot is controlled by a needle valve 144 which is adjustable to vary the length of time required for the piston to move upwardly into the position illustrated in which the switch arm 140 is moved back into its full line position.

As explained heretofore, energization of the solenoid valve 106 permits the pressure fluid in the upper part of the cylinder control valve 98 to exhaust to the tank 38 whereupon the valve member 100 is moved upwardly to admit pressure fluid into the small cylinder 34. The solenoid valve 106 is energized upon closure of contacts 132 of the timer 130, the circuit to the valve including the lead 124, contacts 132, lead 134 and lead 135 to lead 126. Thus it will be seen that as long as contacts

132 of the timer 130 are connected by the switch arm 140, the solenoid valve 106 remains energized (unless the relay 116 is deenergized) thereby to apply pressure to the shoe bottom and maintain the pressure for the period determined by the setting of the needle valve 144 of the timer.

For energizing the operating coil 136 of the timer, a station switch 142 controlled by the treadle 24 is provided. A rod 151 (Fig. 1) connects the treadle to the arm of the switch. Closure of this switch completes a circuit through the operating coil 136 which circuit includes leads 124, 126 from the relay 116. Normally the switch 142 will be closed only momentarily, in response to which the switch arm 140 of the timer closes contacts 132 which remain closed a predetermined time after the circuit through the operating coil 136 is interrupted by release of the treadle 24 and opening of the station switch 142.

The operator may find, after the start of a pressure applying operation, that the work has been incorrectly placed on the pad box or for some other reason he may desire to release the pressure before this is automatically done by completion of the timing cycle and opening of contacts 132 of the timer. For this purpose, it is necessary only to interrupt the holding circuit through the relay coil 118 by depressing the button 26' which opens the stop switch 26. The circuits through the relay 116 are immediately interrupted and consequently the solenoid valve 106 is deenergized and the motor 114 driving the pump 58 stops. This causes an immediate drop in pressure in the large and small cylinders 30 and 34 whereupon the pad box descends. Because the contacts 148 of the timer 130 are open, it is impossible to energize the relay coil 118 by closure of the start switch 146 prior to the conclusion of the timing cycle. Were this not the case, the solenoid valve 106 would immediately be reenergized by closure of the start switch 146 as long as the contacts 132 of the timer remain closed or at any time prior to the expiration of the timing cycle. Likewise it is impossible, by again treadling the machine once the machine has stopped during a timing cycle to place the work under pressure. Thus after relieving the pressure on the work by depression of the stop button 26', the operator cannot inadvertently operate the machine in a way which would result in the work being held under pressure for a period less than a full timing cycle as determined by the adjustment of the needle valve 144 of the timer.

In the operation of the machine it is assumed that the machine is idle and all the parts are in the positions illustrated. To start the machine the operator first closes the start switch 146 thus completing a circuit through coil 118 of the relay 116 which circuit includes the closed contacts 148 of the two timers 130. Pressure fluid now flows from the pump through pipe 62, solenoid valve 106, and pipe 108 into the upper end of valve 98 whereupon the valve member 100 is moved downwardly against the action of the spring 102 so that the small cylinder 34 is connected through the pipes 36 and 110 to the reservoir 38. After a shoe and sole have been placed on one of the pad boxes, the treadle at the corresponding side of the machine will be depressed thus closing the associated switch 142 to energize the coil 136 of the corresponding timer 130, moving the switch arm 140 into the broken line position in which the contacts 148 are disconnected and the contacts 132 are connected. This causes energization of the solenoid valve 106, thus exhausting pressure fluid from the upper end of the valve 98 whereupon the valve member 100 moves back into the position illustrated and pressure fluid then flows from the pump 58 through the valve 98 and pipe 36 into the small cylinder 34, causing rapid upward movement of the pad box. As soon as the work moves into engagement with the heel and toe abutments the pressure builds up in the small cylinder moving the valve member 50 downwardly and connecting the large cylinder 30 to the pump, under the control of the pressure regulating valve 68. The work now remains under pressure until the switch arm 140 of the timer 130 snaps back into the full line position illustrated, interrupting the circuit through the solenoid valve 106 which normally will take place at the conclusion of a predetermined period dependent upon the setting of the needle valve 144. However, the operator may terminate the pressure applying operation prematurely if he desires to for any reason by depressing the button 26' of the stop switch 26, opening the circuit through the relay coil 118 which will immediately deenergize the solenoid valve 106 and the pump motor 114. It will be impossible to start operation of the machine again until the end of the normal timing cycle and closure of the contacts 148 of the timer 130 by the armature 140.

Thus there is no danger of the machine being prematurely started again with upward movement of the pad box by mere operation of the start switch 146 prior to the completion of the timing cycle, or by operation of the treadle 124 and closure of the switch 142, thereby minimizing danger of injury to the operator or unintentionally initiating a shortened pressure applying cycle.

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

1. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected to said pressure applying member for moving it to pressure applying position, a pump connected for supplying pressure fluid to said motor, an electric motor arranged for driving said pump, a valve controlling the supply of pressure fluid to said fluid pressure operated motor, said valve being yieldingly urged toward a position providing for discharge of fluid from the motor, electrically operated means for moving said valve to a position causing flow of fluid from said pump to said fluid pressure operated motor, a main relay switch having line side and load side terminals and having an operating coil energizable to connect said terminals of said switch, means for connecting said electric motor to the load side of said relay switch for energization of said motor when said operating coil is energized, a timer having normally-open contacts in the circuit to said valve moving means and having an operating mechanism responsive to electrical energization to close said normally-open contacts and maintain them closed to connect the valve moving means to the load side of the relay switch for a predetermined period, a normally open station switch in the circuit to the operating mechanism of the timer and arranged, when said main relay is energized, to close the circuit to the timer upon closure of said station switch to energize said electrically operated means for said predetermined period, a normally-open manually closable start switch operable to connect the operating coil of said main relay switch to the line side of the relay switch, a holding circuit for said relay switch including a normally-closed stop switch manually operable to interrupt the energization of said operating coil, the starting circuit for the relay including contacts normally closed by said timer but which are open while the valve-controlling contacts of the timer are closed.

2. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to said motor, an electric motor arranged for driving said pump, an electrically operated valve controlling the supply of pressure fluid to said fluid pressure operated motor, said valve being arranged when deenergized to cause the pressure fluid to discharge from the fluid pressure motor and when energized to cause pressure fluid to flow thereto from the pump, a timer having normally-open contacts con-

nected to control the electrically operated valve and having an operating mechanism electrically energizable to close said contacts and maintain them closed for a predetermined period, a manually-operated station switch connected to said mechanism for initiating the operation of the timer, a stop switch, a relay switch deenergizable by operation of said stop switch simultaneously to interrupt the supply circuits to the electric motor, to the valve and to the timer operating mechanism, and contacts normally closed by said timer but which are open to prevent energization of said relay switch while the valve-controlling contacts of the timer are closed.

3. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to said motor, an electric motor arranged for driving said pump, an electrically operated valve controlling the supply of pressure fluid to said fluid pressure operated motor, said valve being arranged when deenergized to cause the pressure fluid to discharge from the fluid motor and when energized to cause pressure fluid to flow thereto from the pump, a timer having normally-open contacts connected to control the electrically operated valve and having an operating mechanism operable to close said contacts and maintain them closed for a predetermined period, manually-operated means for initiating the operation of said timer, a stop switch, and a relay switch deenergizable by operation of said stop switch simultaneously to interrupt the supply of electric energy to the electric motor and to the valve for quickly turning off the electric motor and for relieving fluid pressure in the fluid pressure motor.

4. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to said motor, an electric motor arranged for driving said pump, an electrically operated valve controlling the supply of pressure fluid to said fluid pressure operated motor, said valve being arranged when deenergized to cause fluid to be discharged from the fluid pressure motor and when energized to cause pressure fluid to flow thereto from the pump, a timer having normally-open contacts connected to control the electrically operated valve and having an operating mechanism electrically energizable to close said contacts and maintain them closed for a predetermined period, a manually operated station switch connected to said mechanism for initiating the operation of the timer, a stop switch, a relay switch deenergizable by operation of said stop switch simultaneously to interrupt the supply circuits to the electric motor, to the valve and to the timer operating mechanism, and contacts normally closed by said timer but which are open to prevent energization of said relay switch while the valve-controlling contacts of the timer are closed.

5. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to said motor, an electrically-operated valve energizable to cause flow of pressure fluid to said motor from said pump and effective upon deenergization to cause discharge of fluid pressure from said motor, a timer having contacts controlling said valve and having an operating mechanism initiatable for operating said contacts to energize said valve in a timing cycle, a manually operated switch operable to deenergize said valve during said timing cycle, and contacts which when open prevent reenergization of said valve, said contacts being held open by said timer while the valve-controlling contacts of said timer are closed.

6. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to said fluid pressure operated motor, an electric motor arranged to drive said pump, a valve controlling the flow of pressure fluid to said fluid pressure operated motor, operator controlled means for moving said valve to one position in which pressure fluid flows from said pump to said fluid pressure operated motor, means operative upon movement of said valve into said one position for holding the valve in said one position for a predetermined period of time and for then causing movement of said valve into a second position in which pressure fluid is exhausted from said fluid pressure motor, operator controlled means for moving said valve into said second position before the expiration of said predetermined period of time and for interrupting operation of said pump motor, and means for then preventing operation of said pump motor and movement of said valve to said one position prior to the expiration of said predetermined period of time.

7. A machine for applying pressure to shoe bottoms comprising a pair of operating stations, each station having a pressure applying member and a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to each of the fluid pressure operated motors, a control valve associated with each of said fluid pressure operated motors and arranged to control the flow of pressure fluid from said pump to said motors, operator controlled means for individually moving each of said valves to a first position to direct pressure fluid to the associated motor, means for automatically moving each valve to a second position after a predetermined period following its movement into the first position, in which second position pressure fluid is exhausted from the associated motor, operator controlled means for causing movements of said valves into said second positions prior to the expirations of said predetermined periods, and means for thereafter preventing movement of either valve into the first position until the expirations of said predetermined periods.

8. A machine for applying pressure to shoe bottoms comprising a pair of operating stations, each station having a pressure applying member and a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, a pump connected for supplying pressure fluid to each of the fluid pressure operated motors, an electric motor arranged to drive said pump, a control valve associated with each of said fluid pressure operated motors and arranged to control the flow of pressure fluid from said pump to said motors, operator controlled means for individually moving each of said valves to a first position to direct pressure fluid to the associated motor, means for automatically moving each valve to a second position after a predetermined period following its movement into the first position, in which second position pressure fluid is exhausted from the associated motor, operator controlled means for deenergizing said electric motor and for causing movements of said valves into said second positions prior to the expirations of said predetermined periods, and means for thereafter preventing energization of said electric motor and preventing movement of either valve into the first position until the expirations of said predetermined periods.

9. In a machine for applying pressure to shoe bottoms, a pressure applying member, a fluid pressure operated motor connected for moving said pressure applying member to pressure applying position, means for providing fluid under pressure, an electrically operated valve controlling the supply of pressure fluid to said fluid pressure operated motor, an electrically operated timer having contacts connected to control said valve, said timer being arranged, upon energization to operate said contacts to

open said valve and upon deenergization to initiate a timing cycle for operating said contacts to close said valve a predetermined time after such deenergization, and a manually operated switch connected to control the energization of said timer.

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