

July 22, 1958

E. HAAS

2,843,864

SHOE SOLE ATTACHING MACHINE

Filed May 6, 1955

4 Sheets-Sheet 1

FIG. 1

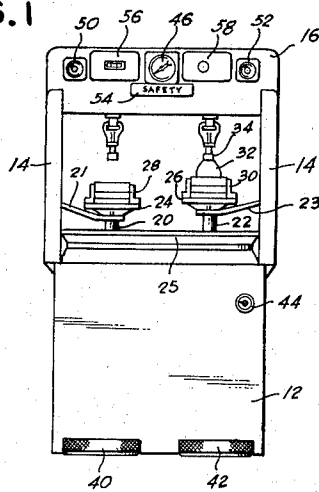


FIG. 3

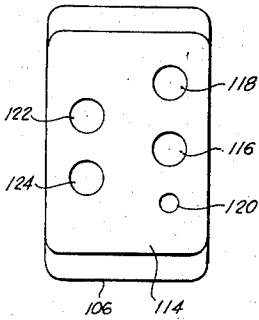
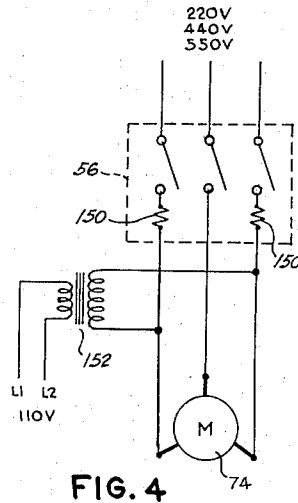
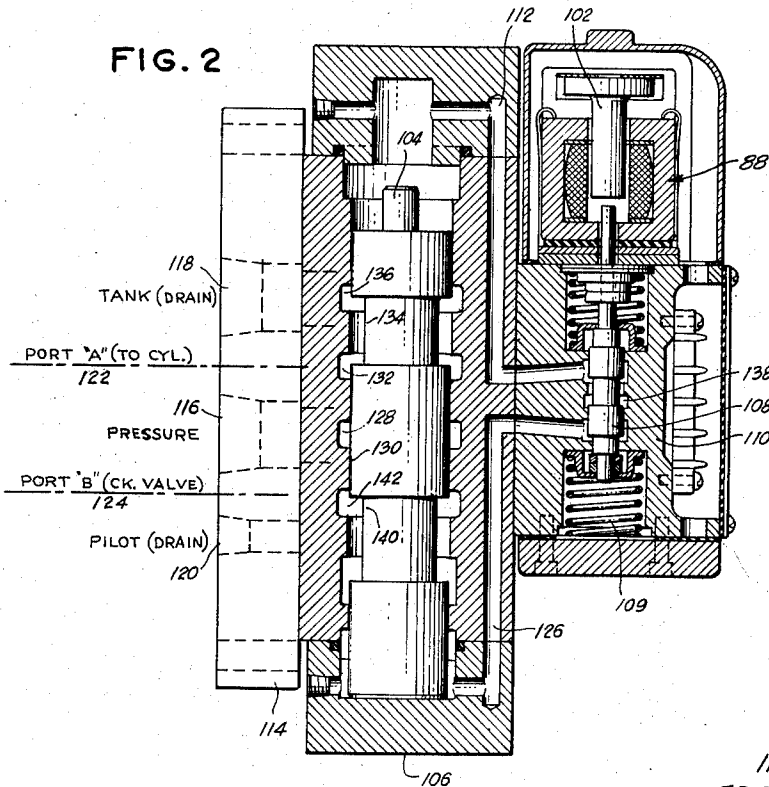


FIG. 4

FIG. 2



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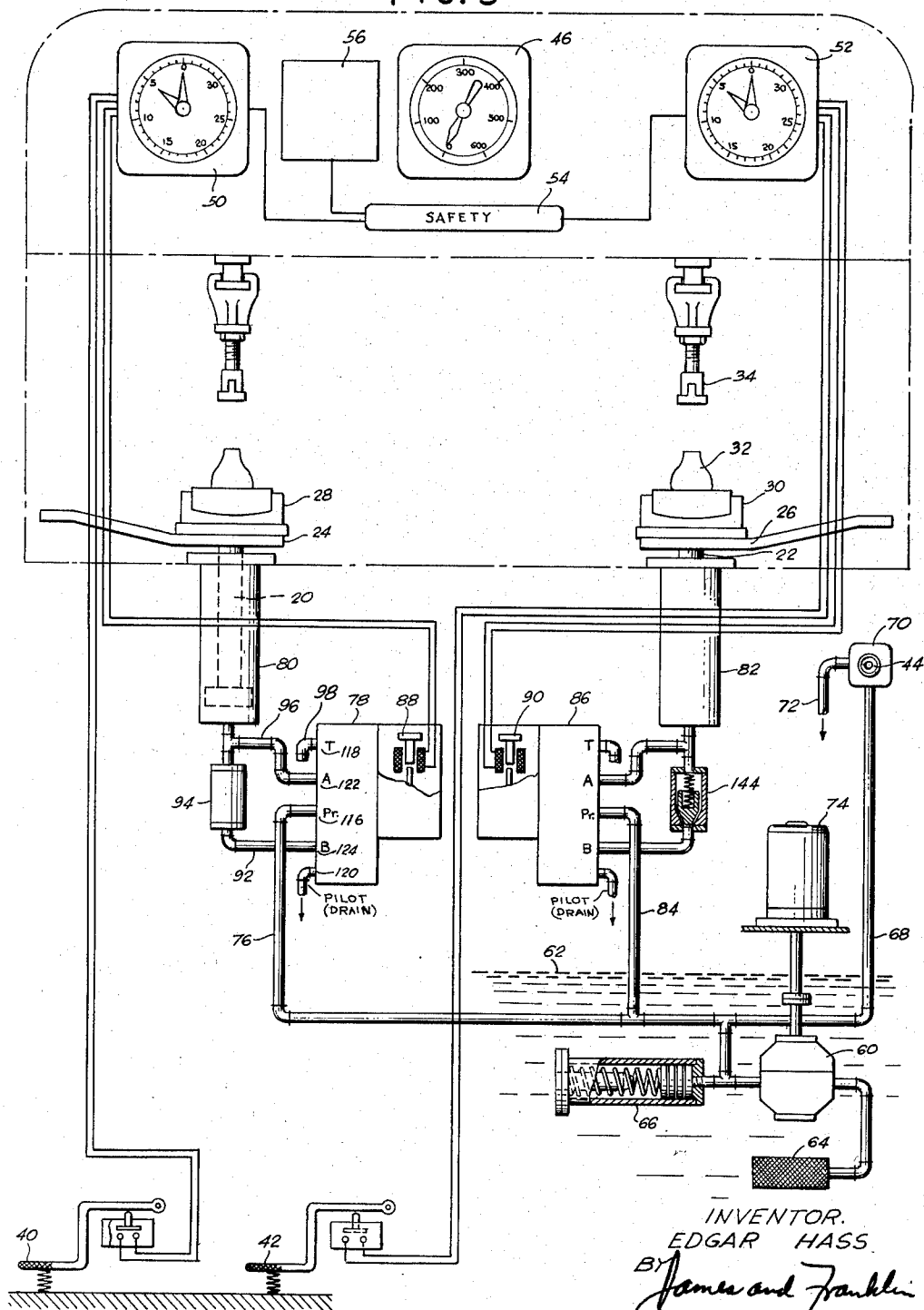
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FIG. 5



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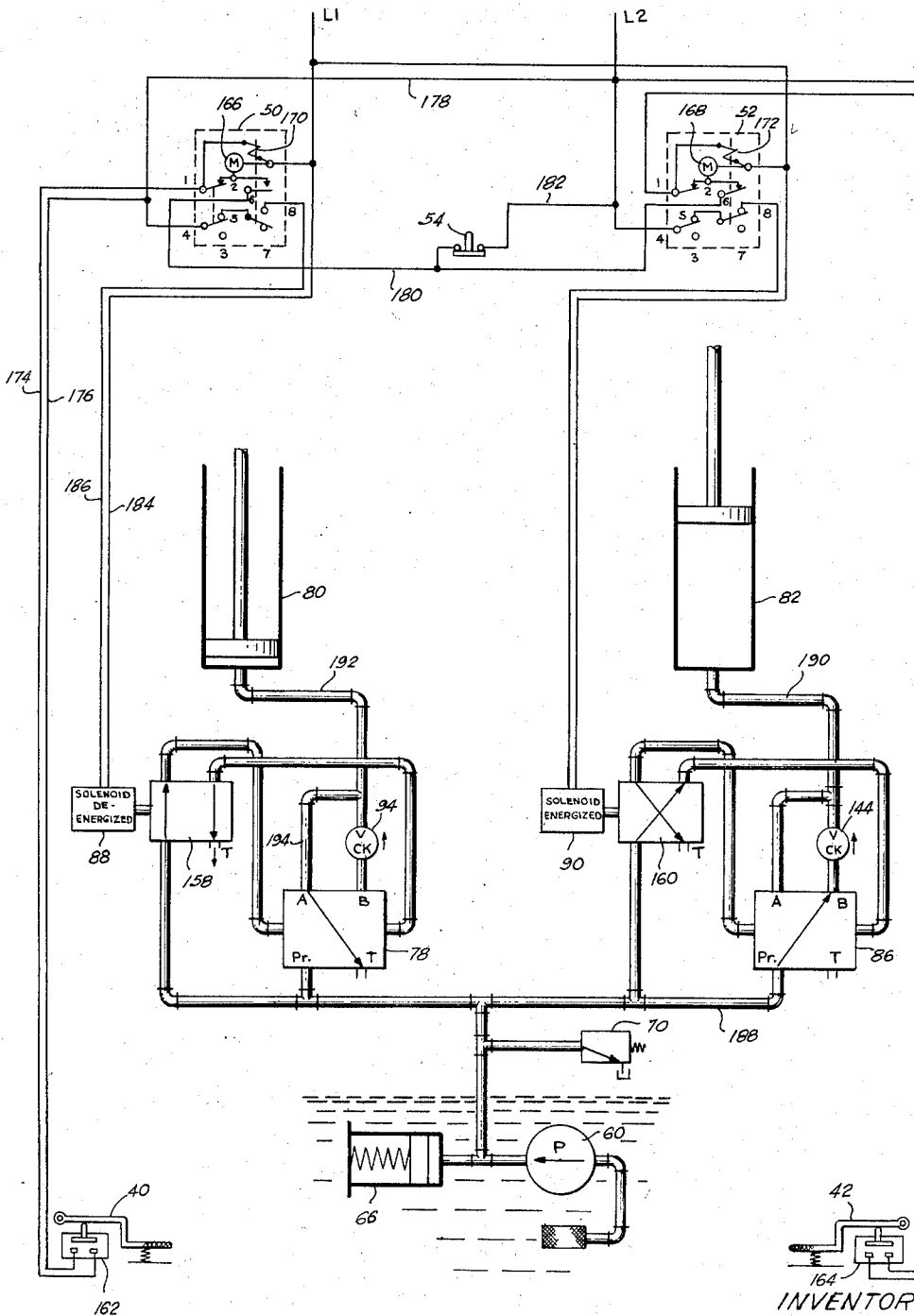


FIG. 6

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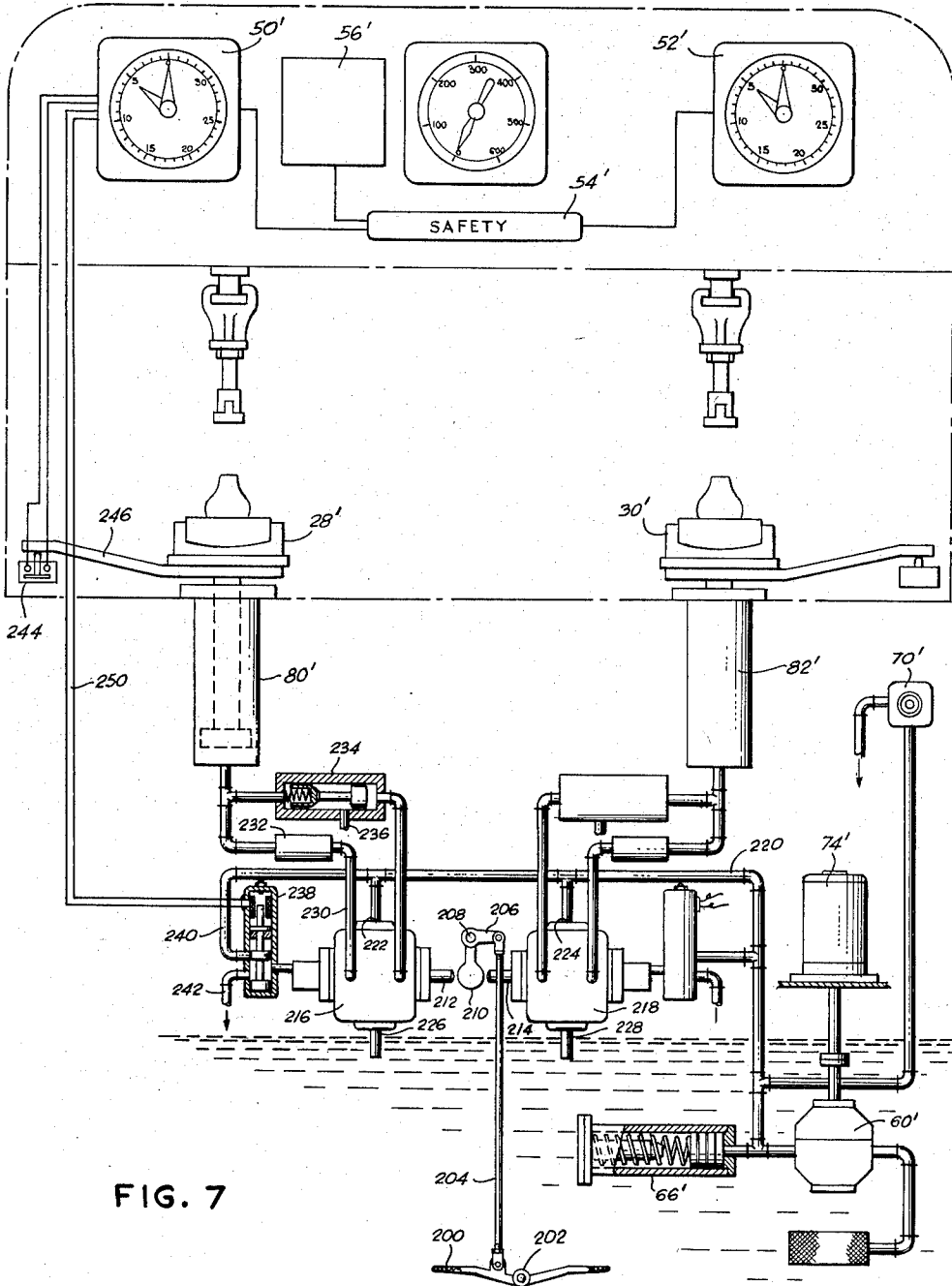


FIG. 7

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2,843,864

SHOE SOLE ATTACHING MACHINE

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Application May 6, 1955, Serial No. 506,443

9 Claims. (Cl. 12—36)

This invention relates to shoe machines, and more particularly to hydraulic sole attaching machines.

Machines for attaching shoe soles by means of adhesive are already known. There are usually a plurality of work stations, most commonly two stations, handled in alternation by a single operator. The adhesive used sets upon the application of sufficient pressure over a specified time. Modern adhesives are fast and sensitive, and the manufacturers usually specify not only an optimum pressure but also an optimum time, which may range from, say, five to fifteen seconds, depending on the particular adhesive. Stations interconnected to work automatically in alternation, with a timing depending wholly on the speed or judgment of the operator, fail to make best use of the up-to-date improvements in adhesives.

The primary object of the present invention is to generally improve hydraulic sole attaching machines. A more specific object is to provide a machine with a plurality of stations, say two, the operation and the timing or dwell of each of which is independent of the operation of the other. A further object is to provide for accurate timing of the dwell, independently of the judgment of the operator. For this purpose a readily and accurately adjustable timer is employed, and I prefer to use a timer of the clock type having a range of from, say, zero to thirty seconds, and a scale which is accurate to a fraction of a second. An ancillary object is to provide a solenoid controlled valve arrangement which will not require the switching mechanism of the timer to handle more than a small current.

Still another object is to provide for safety release of the clamping stations.

Although the operation of one station is independent of another, they will ordinarily be operated in displaced time relation, because a single operator is attending the different stations. Preferably a single or common tank, pump, pressure relief valve, and spring operated accumulator are all used in common for the different stations. A further object of the invention is to prevent the pressure on a first clamped shoe from being relieved or lessened upon initiation of the clamping operation on a second shoe.

To accomplish the foregoing objects, and others which will hereinafter appear, my invention resides in the shoe sole attaching machine elements, and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings, in which:

Fig. 1 is a front elevation of a machine embodying features of my invention;

Fig. 2 is a section through a solenoid-controlled, pilot-operated, four-way valve used in the machine, drawn to enlarged scale;

Fig. 3 is a view of the sub-plate of the valve shown in Fig. 2, drawn to smaller scale than in Fig. 2;

Fig. 4 is a wiring diagram explanatory of a detail of the invention;

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Fig. 5 is a partially schematic view explanatory of the invention;

Fig. 6 is a wiring and pipe diagram explanatory of the invention; and

Fig. 7 is a schematic view generally like Fig. 5, but showing a modified form of the invention.

Referring to the drawing, and more particularly to Fig. 1, the machine there shown comprises a base 12 which acts also as a tank for hydraulic fluid. This is surmounted by a frame comprising uprights 14 and a top beam 16. The latter carries adjustable heel and toe posts for each of a plurality of stations. I prefer to employ two stations, as here shown.

One station is actuated by an hydraulic piston or plunger 20 which is shown down, and the other by piston or plunger 22 which is shown raised. The plungers have platens 24 and 26, which in turn carry pad boxes 28 and 30. These usually contain rubber molded to the shape of the bottom of the shoe. The shoe upper is on a last, and the sole and the lasted upper are vertically compressed between the pad box at the bottom, and heel and toe posts at the top carried by the beam 16, as is indicated by the shoe 32. The heel post 34 bears on the back cone of the last. The toe post is not shown in Fig. 1, but bears on the top of the toe portion of the lasted upper.

If desired the piston 20 and platen 24 may be provided with an arm 21 which rides in a mating guide groove or track in upright 14, thereby holding the platen in desired alignment relative to the heel and toe posts. Similarly the piston 22 and platen 26 may have a guide arm 23. A shelf 25 may be provided for the convenience of the operator.

In the present machine the stations are independently movable under control of separate foot treadles 40 and 42. Depression of a foot treadle causes its station to move from lowered or release position to upper or clamping position. The tank 12 is common to both stations, and houses a common pump, and a common pressure relief valve, which may be adjusted by means of a handle 44. The resulting pressure may be read on a suitable pressure gauge 46. In a typical case the pump is capable of building up a pressure of say 1,000 lbs. per square inch, but the pressure relief valve may be set at a lower figure, say 300 or 400 pounds per square inch, depending on the recommendations of the manufacturer of the adhesive, and the experience of the shoe manufacturer.

The time during which each station remains clamped is independently determined by timing devices, and in the present case I provide accurately adjustable electrical timing clocks 50 and 52. These have a suitable range, which in the present case is from zero to thirty seconds, and the scale is large and easily read so that the timers may be set to a fraction of a second.

The head or beam 16 additionally carries a safety switch controlled by a conspicuous safety bar 54. If this bar is touched, pressed or hit the stations are simultaneously released.

The head 16 further carries the main motor starter for the motor which drives the hydraulic pump. This is shown at 56, and ordinarily is of the three-phase type, and includes means for overload protection. The part 58 is a shut-off valve for the pressure gauge 46.

Considering the machine in greater detail, and referring now to Fig. 5 of the drawing, the single pump is shown at 60, and is preferably immersed in the tank of fluid as indicated at 62. The inlet is taken through a sieve 64, and is delivered to a spring accumulator 66, which may also be immersed in the fluid. The purpose and design of this accumulator are described in greater detail in my co-pending application entitled "Hydraulic Sole Attaching Machine," Serial No. 419,989, filed March 31, 1954, now Patent No. 2,783,486 issued March 5,

1957. The pump output is also connected through pipe 68 to a pressure relief valve 70, the control handle 44 of which is located in front of the machine for ready adjustment. Overflow from the relief valve is returned to the main body of fluid 62 through a return pipe 72. The pump 60 is driven by an electric motor 74.

The pressure fluid is connected through pipe 76 to a first valve 78 for cylinder 80 at one station, and to cylinder 82 for the other station through a pipe 84 and valve 86. These valves are preferably solenoid actuated, as is indicated by the solenoids 88 and 90. In one position of the valve 78 the pressure fluid is connected through pipe 92 and check valve 94 to cylinder 80. In the opposite position of the valve 78 the cylinder 80 is relieved through pipe 96, valve 78, and drain pipe 98, and it should be noted that this circuit bypasses the check valve 94.

The valve 78 may be described in greater detail with reference to Fig. 2 of the drawing. It will be seen there that the valve is a solenoid-controlled and pilot-operated, four-way valve. The solenoid is shown at 88 and controls a plunger 102. Inasmuch as the solenoid current is handled by the timer clock, and inasmuch as the main valve is sizable, it is preferred to boost the effect of the current handled by the timer. This could be done electrically by using relays controlling a large solenoid for moving the main spool 104 in the main valve housing 106, but in the present case the magnification is obtained hydraulically, and for this purpose the solenoid may be small but controls a small pilot spool 108 in a pilot valve housing 110. This in turn supplies some of the pressure fluid to one end or the other of the main spool 104, thus actuating the latter to one end position or the other. In the position shown in Fig. 2 the solenoid is de-energized; its plunger is raised; and pilot spool 108 is raised by spring 109.

Connections to the valve housing 106 are made through a sub-plate 114. A bottom or face view of this subplate is shown in Fig. 3, referring to which it may be explained that pressure fluid is supplied through a pressure port 116. A drainage or tank connection is made at 118. There is a separate drainage or tank connection for the pilot valve shown at 120. There are two ports for connection to the hydraulic cylinder. The port 122 goes directly to the cylinder, while port 124 is connected through a check valve to the cylinder. Reverting now to Fig. 2, the ports 116, 118 and 120 are indicated in dotted lines, while the ports 122 and 124, also marked "A" and "B," which are located in staggered relation behind the other ports, are indicated merely by center lines.

The valve body includes a passage (not shown) for high pressure fluid from the port 116 to the middle region of pilot spool 108. Sometimes a separate pressure port is provided, but in the present machine in which the pressure never drops below a value far in excess of what is needed to operate the pilot valve, the regular pressure port may be used for both spools. The pressure fluid flows upward through passage 112, and thus holds the main spool 104 downward. The region below the main spool is emptied through passage 126 and thence downward at the lower end of pilot spool 108, and from there through a passage in the valve body (not shown), to the pilot drain port 120. With the main spool 104 in the down position shown, the hydraulic fluid admitted at 128 is blocked by the middle part 130 of spool 104. The cylinder is drained through the "A" port 122 leading to port 132 and communicating through the small diameter part 134 of the spool to port 136 and thence to the drain port or tank connection 118.

When the solenoid 88 is energized its core 102 is pulled down and moves the pilot spool 108 to a down position, at which time pressure fluid flows from the center port 138 through the passage 126 to the lower end of main spool 104, which then is raised. At the same

time the passage 112 is connected to the region above the upper end of spool 108, thus permitting discharge of fluid through a passage in the valve body, not shown, to the pilot drain port 120.

When the main spool 104 has been moved to its up position the pressure fluid flows from port 128 through the reduced diameter part 140 of the spool to the port 142, which communicates with the port "B" indicated by center line 124. Thus high pressure fluid flows through the check valve 94 (Fig. 5) to the cylinder 80, until the shoe is raised and clamped. Meanwhile the port 132 (Fig. 2) communicating with port "A" is closed by the large diameter part 130 of the spool 104.

Reverting now to Fig. 5, the valves 78 and 86 are like that shown in Fig. 2 of the drawing. The valve and pipe arrangement for the cylinder 82 is symmetrical or corresponds to that for cylinder 80, and no further description is believed required. It will also be understood that the check valve 94 prevents any lessening of pressure in clamp cylinder 80 when pressure is first applied to clamp cylinder 82, and conversely the check valve 144 of clamp cylinder 82 prevents lessening of pressure in the latter when clamp cylinder 80 is first actuated.

Because of the check valves it is not possible to drain the cylinders through the "B" ports, and it is for this reason that separate "A" ports are provided, with connections which bypass the check valves, thus draining the cylinder.

The system may be additionally described with reference to Figs. 4 and 6 of the drawing. Referring first to Fig. 4, the motor 74 which drives the pump is preferably a three-phase motor operating at 220, 440 or 550 volts, depending on the preference or requirements of the shoe manufacturer using the machine. The motor control 56 may be conventional, and preferably includes overload protection means indicated at 150. One phase of the three-phase supply is tapped for the control mechanism of the machine. The parts of this mechanism are preferably standardized to operate at 110 volts, and I therefore provide a step-down transformer indicated at 152. This has suitable taps to supply 110 volt output at L1, L2, whether the three-phase input is at 220, 440, or 550 volts.

Referring now to Fig. 6, the transformer output is indicated at L1, L2. The timing clocks are shown at 50 and 52, the safety switch at 54, and the solenoids at 88 and 90. These control the pilot valves symbolized at 158 and 160, which in turn control the main valves 78 and 86. The pump 60, accumulator 66, pressure relief valve 70, check valves 94 and 144, cylinders 80 and 82, and treadles 40 and 42 all correspond to the similarly numbered parts previously described. Treadle 40 controls a switch 162, while treadle 42 controls a switch 164.

The timers 50 and 52 are operated by clock motors 166 and 168. They also include a number of contacts or switches and a solenoid 170 (and 172) for shifting the contacts. The particular timer here shown has four movable contacts, but only two are required and used for the present circuit. The particular clock shown is the HP-2 series made by Eagle Signal Corporation of Moline, Illinois, under the name "Cyci-Flex." These come in different ranges of time from thirty seconds to a number of hours, and in the present case the thirty second timer is used, with scale markings of one-half second.

There are eight terminals on the timer, as marked. The timer may be arranged for maintained contact or for momentary contact, and in the present case is wired for momentary contact, so that the treadle need only be touched but not held down. Solenoid 170 raises the right hand switches shown below the solenoid. The left hand switches are mechanically operated by the clock motor.

Stepping on treadle 40 energizes solenoid 170, thus

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raising its lower switch to contact 8, which energizes the valve solenoid 88, and so starts the clamping operation. It also closes its upper switch at clock terminal 6, and so starts the clock motor 166, and closes a holding circuit for the solenoid.

More specifically, when treadle 40 is depressed current flows from L1 through solenoid coil 170 and conductor 174, switch 162, conductor 176, conductor 178 to L2. This closes the contact at clock terminal 6, thus starting the clock motor 166, the circuit being from L1 through the clock motor, the closed contact at 6, conductor 180, switch 54, conductor 182, back to L2. Solenoid 170 also closes the switch to terminal 8, thereby energizing the valve control solenoid 88. The circuit for this is from L1 through conductor 184 to solenoid 88 and back through conductor 186 to clock terminal 8 through the closed switch to terminal 5 and terminal 4 and thence through conductor 178 to L2. The energization of solenoid 88 changes the valves from release to clamping position, and this is shown in the righthand part of the drawing for cylinder 82. More specifically, the pilot valve 158 is changed to the condition shown at 160, and this changes the main valve 78 to the position shown at 86, at which time high pressure fluid flows from the pump 60 and accumulator 66 through pipe 188, valve 86, check valve 144, and pipe 190 to the clamp cylinder.

Closing of the switch at terminal 6 also provides a holding circuit to keep the solenoid 170 energized even though the treadle 40 is released immediately after it has been depressed. Specifically, current flows from L1 through solenoid coil 170 through the switch at terminal 1 to terminal 2 and thence through the switch at terminal 6 to conductor 180, switch 54, conductor 182, and back to L2.

The position of the switches in the clock during the clamping operation is shown in the righthand clock. When the time for which the clock is adjusted has run out the clock mechanism opens the switch at clock terminal 1 momentarily, thereby opening the holding circuit through solenoid 170 and thus opening the switches at terminals 6 and 8. This also stops the clock motor. The parts are all reset to the condition shown in the lefthand clock.

From inspection of the diagram it will be seen that depression of the safety switch 54 opens the return circuit from the clock solenoids to the line L2, and this corresponds to running out of the time on the clocks, which causes de-energization of the solenoids 88 and 90, and immediate release of the clamping pressure at both stations.

When the solenoid 90 is de-energized the pilot valve 160 changes to the condition shown at pilot valve 158, which changes the main valve 86 to the condition shown in main valve 78, at which time clamp cylinder 80 is free to discharge through pipes 192 and 194 and thence through main valve 78 to discharge port T emptying into the tank.

The foregoing system may be described as being electro-hydraulic. However, it is also possible to employ features of the invention while using a system which is partially mechanical, and in Fig. 7 of the drawing I show such a system, which system may be described as being electro-mechanical-hydraulic. In Fig. 7 many parts correspond to those shown in Fig. 5, and have been similarly numbered with primed numerals. This applies to the clamp cylinders 80' and 82' moving pad boxes 28' and 30' with latched shoes upward against heel and toe posts. Similarly there are accurate timer clocks 50' and 52', and a safety release bar 54', as well as a motor starting box 56'. The submerged pump 60', spring accumulator 66', pressure relief valve 70', and pump motor 74' all correspond to those previously described. In the present case, however, instead of two separate treadles working electrical switches, there is a relatively large

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double treadle 200, pivoted in front of the machine at 202, and connected by a link 204 to a lever 206 pivoted on a shaft 208. The shaft passes into the base or tank, and carries a lever 210 which is disposed between projections 212 and 214 of the spools of main valves 216 and 218. Depression of the left part of treadle 200 moves spool 212 to the left without, however, shifting spool 214. This causes valve 216 to supply high pressure fluid to clamp cylinder 80'. Similarly, depression of the righthand side of the treadle moves spool 214 to the right without affecting spool 212, and thus causes main valve 218 to feed high pressure fluid to the clamp cylinder 82'.

Considering the arrangement in greater detail, high pressure fluid is connected to the main valves through pipe 220 at ports 222 and 224. Discharge to the tank is through ports 226 and 228. Valve 216 is connected to cylinder 80' through pipe 230 and check valve 232. The check valve is bypassed by means of a pilot operated check valve 234 having a discharge port 236 leading to the tank. The system further comprises a solenoid operated pilot valve 238 to which high pressure fluid is connected by pipe 240. There is a discharge port 242 leading back to the tank.

The system further comprises a micro switch 244 which is opened by the guide arm 246 when the clamp cylinder is released, but which closes and remains closed when the clamp cylinder is above its lowermost position. It will be understood that the righthand side of the system is symmetrical with the lefthand side, and has corresponding parts. Some of the wiring (at 244 and 250) has been omitted at the righthand side to simplify the drawing.

The operation is as follows: When the spool 212 of main valve 216 is moved to the left, high pressure fluid flows from pipe 220 through port 222 and thence through pipe 230 and check valve 232 to the clamp cylinder 80'. At this time the valves 234 and 238 are both closed. As the clamping operation begins the switch 244 is closed, thereby starting the timer 50'.

When the time runs out a circuit through conductors 250 is energized, thus actuating the solenoid of pilot valve 238, which admits high pressure fluid to the left end of spool 212, thus shifting the spool to the right. This cuts off the feed of high pressure fluid to the clamp cylinder, and supplies it instead to the pilot check valve 234, which thereupon is shifted from closed to open position, thus permitting fluid to drain from cylinder 80' to the discharge port 236, and so back to the tank. When the platen has descended the switch 244 is opened, thereby de-energizing the timer 50' until the next clamping operation begins.

The switch connections inside the timer may be modified slightly from what is shown in Fig. 6, this being done because switch 244 remains closed, thus corresponding to continued depression of the treadle in Fig. 6, and this eliminates the need for a holding circuit. I have not shown the internal wiring for the clock 50', it being understood that this is supplied with the clock as manufactured. The clock is made to be useable with either a momentary contact trip, as in Fig. 6, or a maintained contact, as in Fig. 7.

It is believed that the construction and operation of my improved hydraulic sole attaching machine, as well as the advantages thereof, will be apparent from the foregoing detailed description. The operation, and the timing or dwell, of each station is independent of the operation of the other. The timing of the dwell or clamp period is accurately controlled to even a fraction of a second. Simultaneous release of all stations is provided, for safety. A spring accumulator affords rapid rise of the shoe to clamping position, thus freeing the hands of the operator. However, the initiation of a clamping oper-

ation at one station does not relieve or lessen the pressure on a shoe already clamped in another station.

It will also be apparent that while I have shown and described my invention in several preferred forms, changes may be made in the structures shown without departing from the scope of the invention, as sought to be defined in the following claims.

I claim:

1. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder.

2. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a common spring operated accumulator connected to the pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder.

3. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, and a single safety switch in said circuitry for simultaneously terminating the clamping operation of all of said cylinders at any time.

4. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons thereon each independently movable between a release position for loading or removal of a shoe and a clamping position

for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a common spring operated accumulator connected to the pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, and a single safety switch in said circuitry for simultaneously terminating the clamping operation of all of said cylinders at any time.

5. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, said check valves assuring that the pressure on a clamped shoe will not be relieved upon initiation of a clamping operation on another shoe, said four-way valve being so designed as to bypass the check valve on termination of a clamping operation.

6. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a common spring operated accumulator connected to the pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, said check valves assuring that the pressure on a clamped shoe will not be relieved upon initiation of a clamping operation on another shoe, said four-way valve being so designed as to bypass the check valve on termination of a clamping operation.

7. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but

a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, said check valves assuring that the pressure on a clamped shoe will not be relieved upon initiation of a clamping operation on another shoe, said four-way valve being so designed as to bypass the check valve on termination of a clamping operation, and a single safety switch in said circuitry for simultaneously terminating the clamping operation of all of said cylinders at any time.

8. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a common spring operated accumulator connected to the pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of switches, each switch being associated with a timer and a four-way valve and a clamp cylinder, each switch serving to start its associated timer and solenoid and clamp cylinder, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, said check valves assuring that the pressure on a clamped shoe will not be relieved upon initiation of a clamping operation on another shoe, said four-way valve being so designed as to bypass the check valve on termination of a clamping operation, and a single safety switch in said

circuitry for simultaneously terminating the clamping operation of all of said cylinders at any time.

9. A shoe sole attaching machine comprising a plurality of clamp cylinders and clamp pistons therein each independently movable between a release position for loading or removal of a shoe and a clamping position for securing a sole to a shoe, a common tank for hydraulic fluid, a common pump, a common adjustable pressure relief valve, a common spring operated accumulator connected to the pump, a plurality of solenoid controlled valves each having the housing of a four-way valve but having a special spool for controlling the flow of fluid to the cylinders, each four-way valve having both its cylinder ports connected by separate pipes to one end of its associated clamp cylinder, and each having a check valve in one of said pipes, a plurality of electrical timers each having a scale for adjustment in seconds, a plurality of foot pedal controlled switches, each switch being associated with one of said timers and solenoids and clamp cylinders, circuitry whereby running out of any one of said timers shifts its associated solenoid and terminates the clamping operation of its associated valve and cylinder, said check valves being disposed between each four-way valve and its clamp cylinder whereby the pressure on a clamped shoe will not be relieved upon initiation of a clamping operation on another shoe, the spool of said four-way valve being so designed and related to its housing as to bypass its check valve on termination of a clamping operation, and to then block the pump in order to apply pressure to another clamp cylinder or/and to said accumulator, and a single safety switch in said circuitry for simultaneously terminating the clamping operation of all of said cylinders at any time.

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2,639,585	Camerota	May 26, 1953
2,698,632	Margrave et al.	Jan. 4, 1955
2,716,766	Gulbrandsen	Sept. 6, 1955