

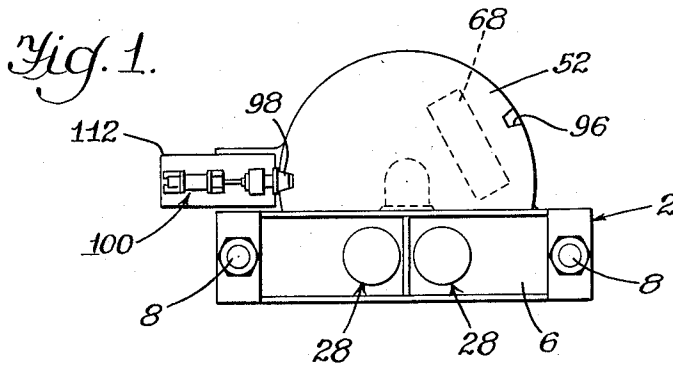
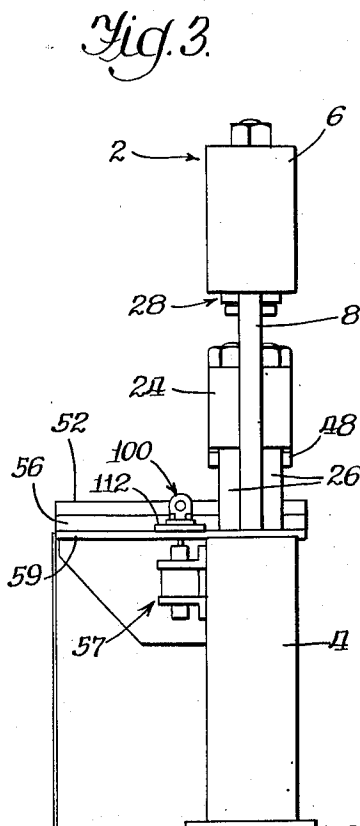
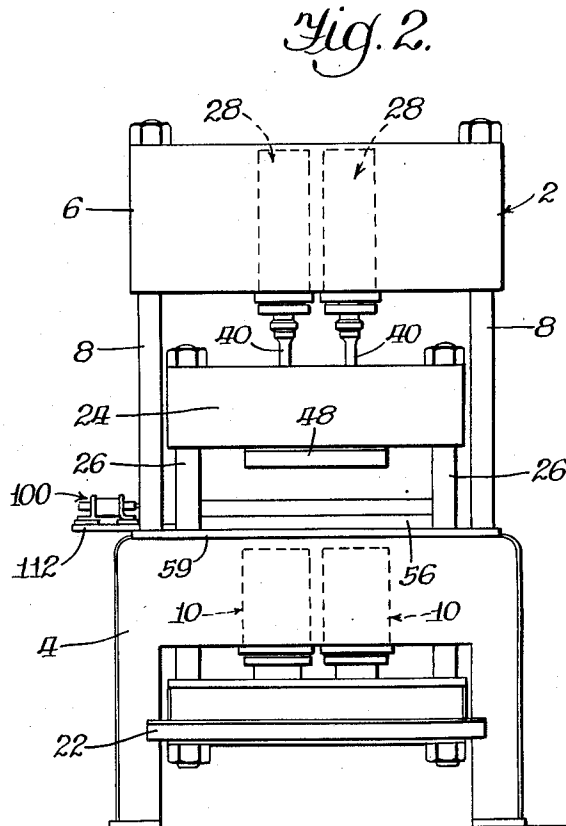
May 7, 1957

J. N. HEATER
HYDRAULIC PRESS

2,790,995

Filed Aug. 7, 1951

6 Sheets-Sheet 1



INVENTOR,
John N. Heater
BY *[Signature]*
Att'y.

J. N. HEATER
HYDRAULIC PRESS.

Filed Aug. 7, 1951

6 Sheets-Sheet 2

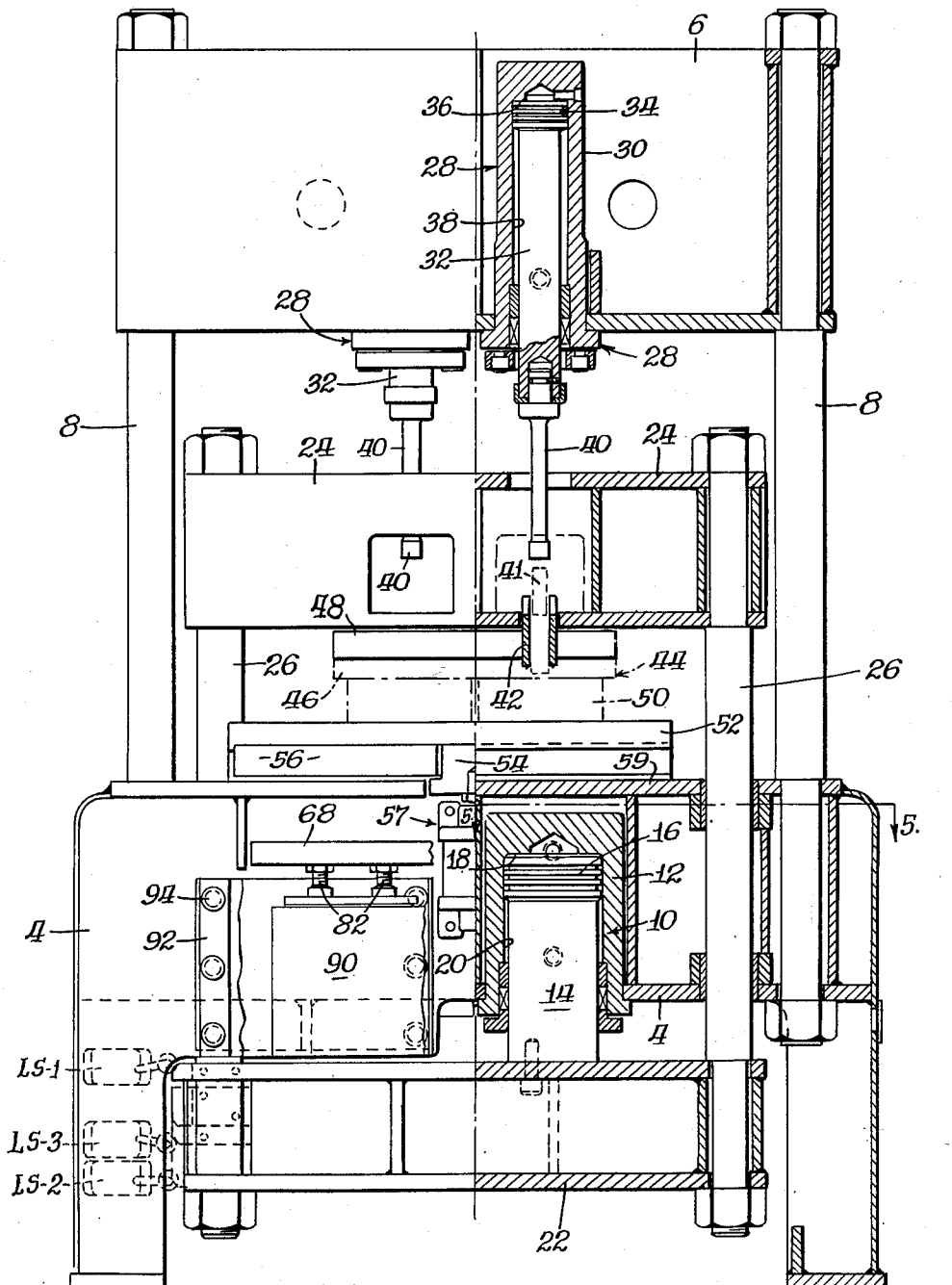


Fig. 4.

INVENTOR.
John N. Heater
BY  O. B. Palmer
Att'y.

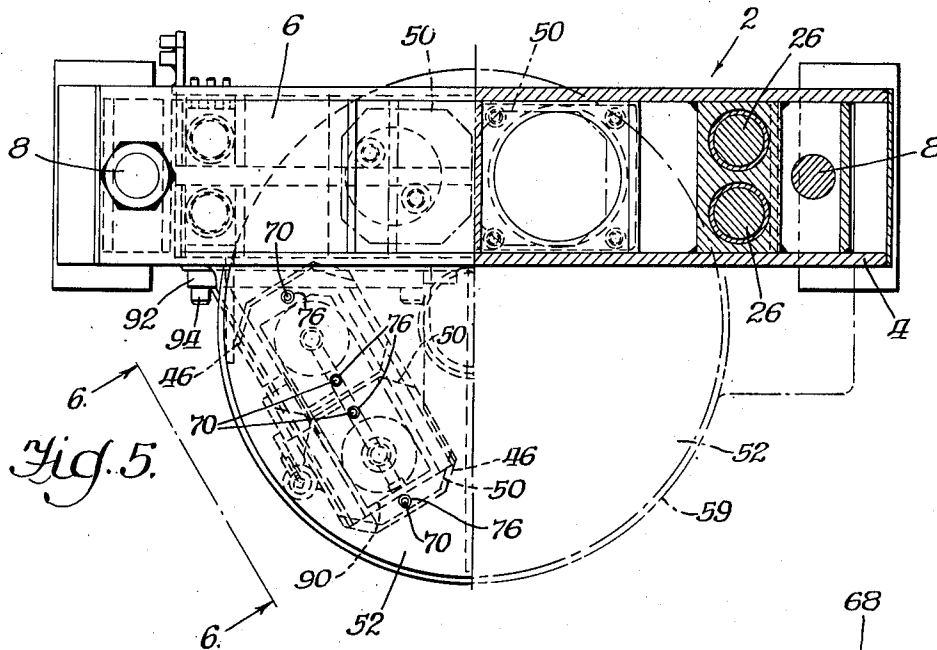
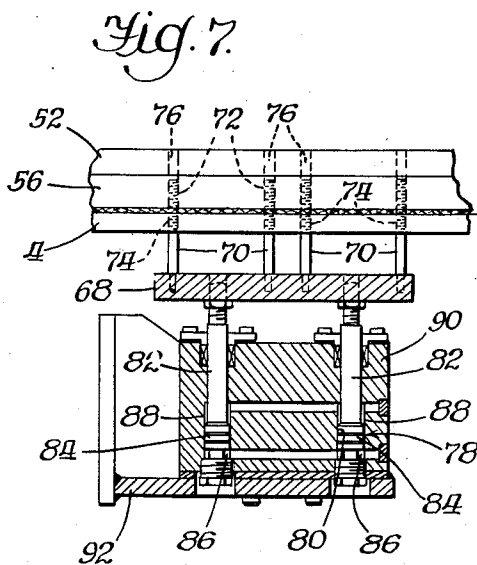
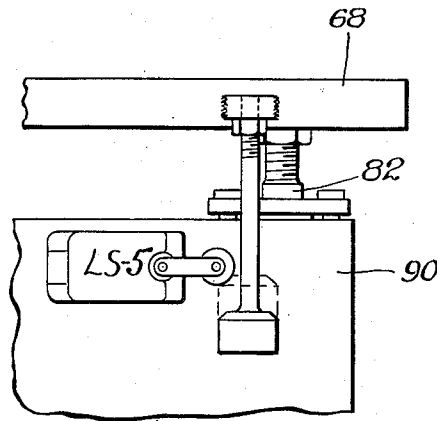
May 7, 1957

J. N. HEATER
HYDRAULIC PRESS

2,790,995

Filed Aug. 7, 1951

6 Sheets-Sheet 3



INVENTOR.
John N. Heater
BY *Wm. B. Ginner*
Att'y.

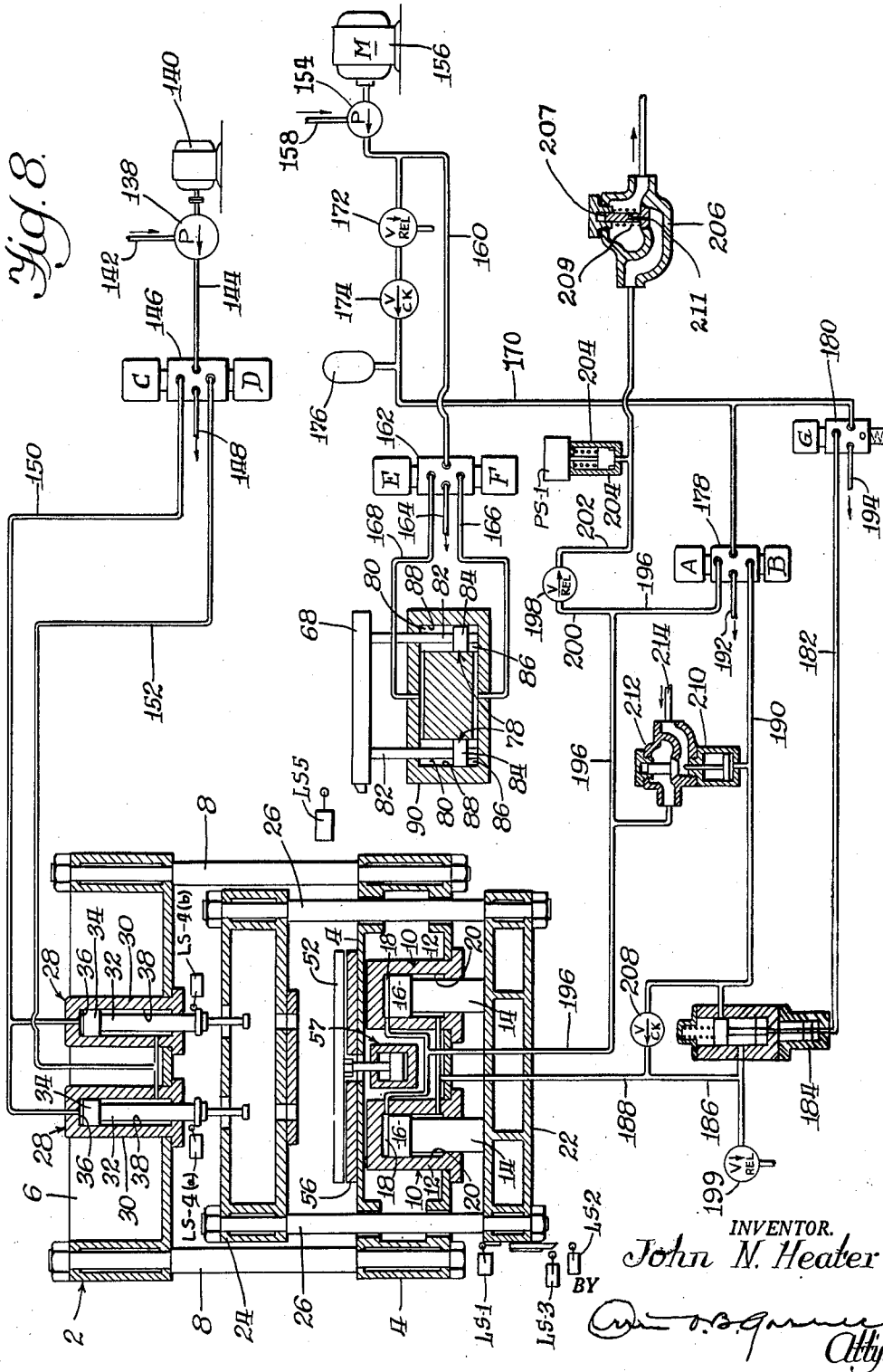
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HYDRAULIC PRESS

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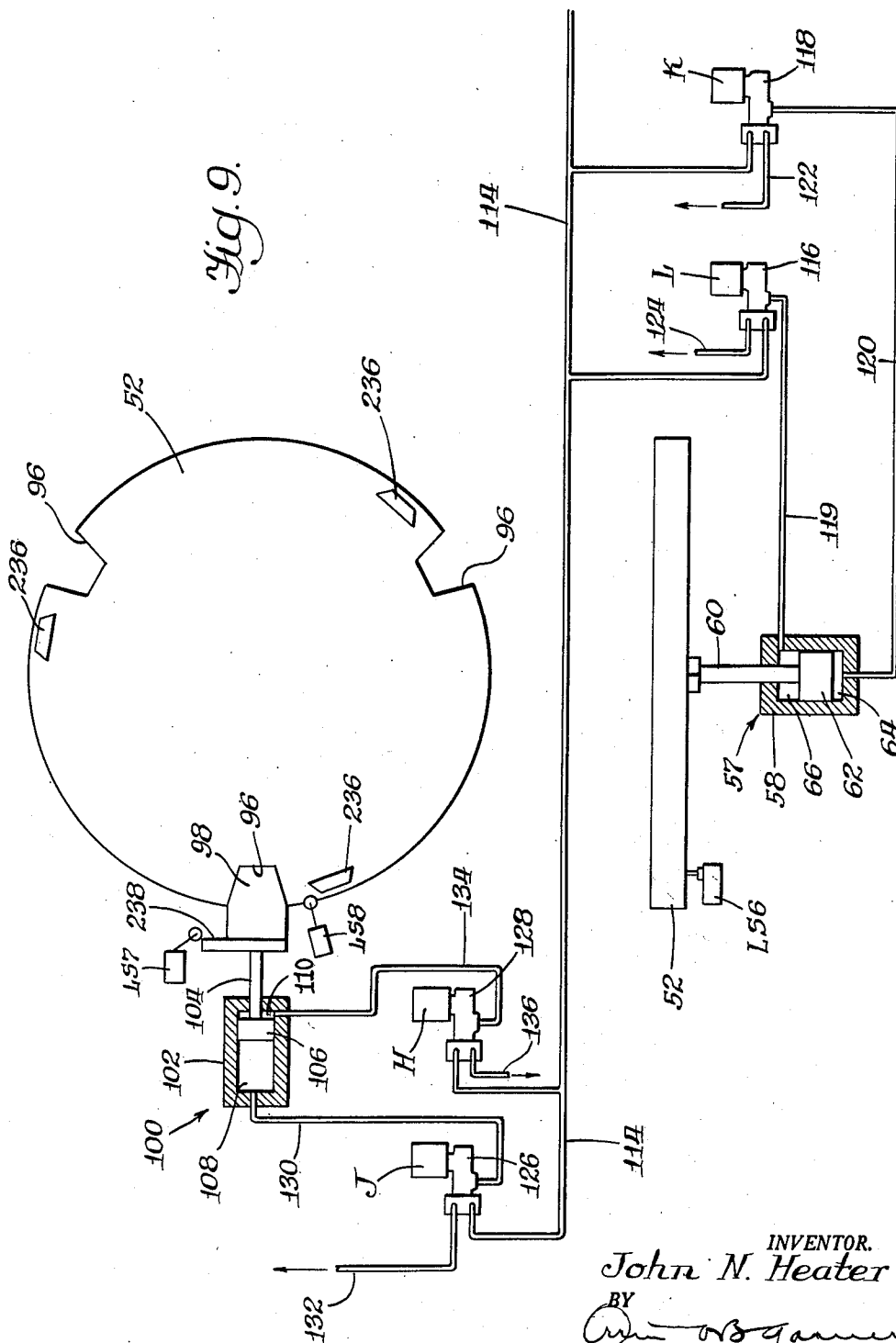
May 7, 1957

J. N. HEATER
HYDRAULIC PRESS

2,790,995

Filed Aug. 7, 1951.

6 Sheets-Sheet 5



INVENTOR.
John N. Heater

BY *Am. B. G.anner*
Atty.

May 7, 1957

J. N. HEATER
HYDRAULIC PRESS

2,790,995

Filed Aug. 7, 1951

6 Sheets-Sheet 6

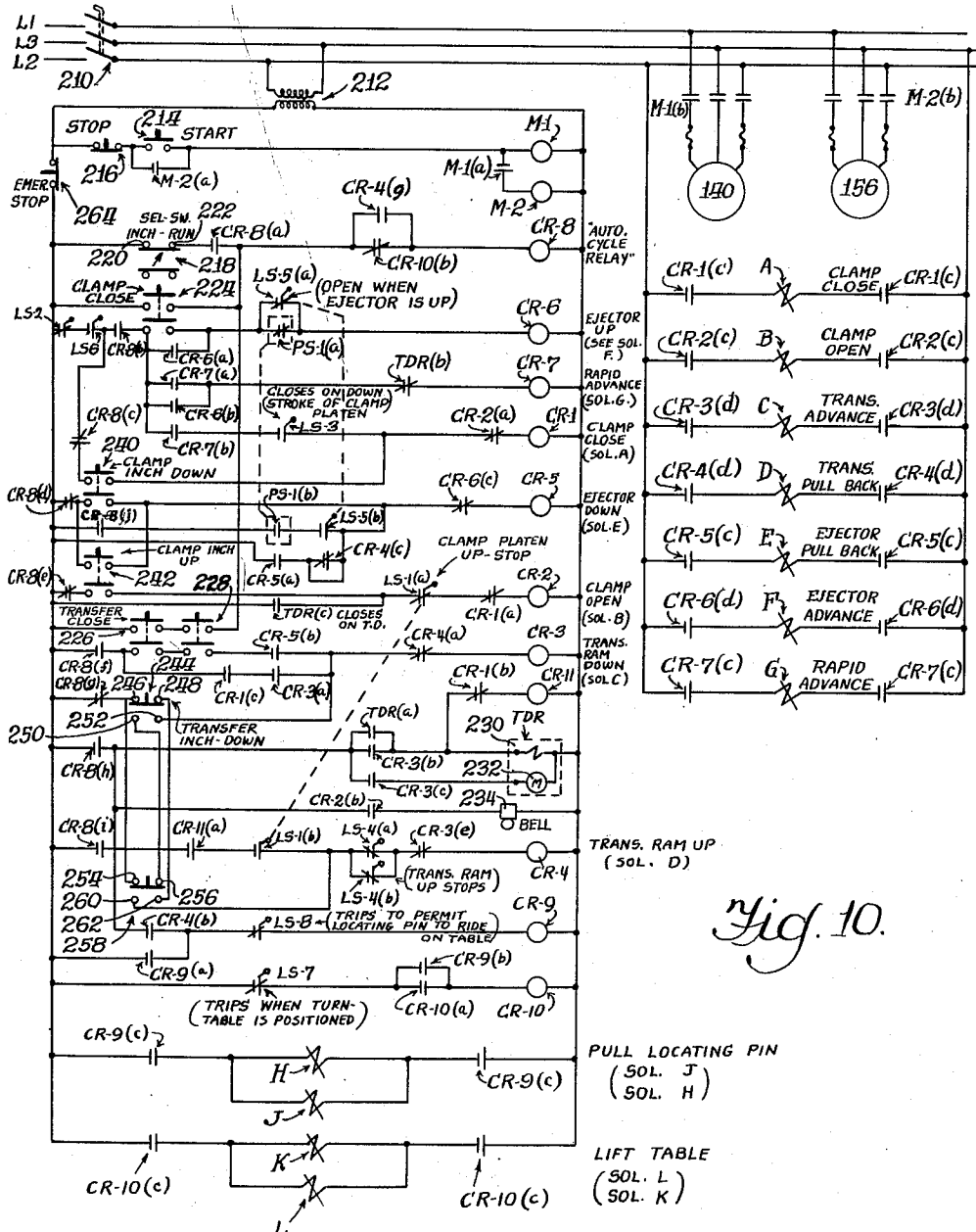


Fig. 10.

INVENTOR.
John N. Heater
BY
C. B. Garner
Atty.

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2,790,995

HYDRAULIC PRESS

John N. Heater, Cincinnati, Ohio, assignor to American Steel Foundries, Chicago, Ill., a corporation of New Jersey

Application August 7, 1951, Serial No. 240,625

16 Claims. (Cl. 18—17)

This invention relates to hydraulic presses and more particularly to a novel press particularly adapted for the transfer molding of materials such as rubber or plastic.

A primary object of the invention is to devise a press of the above described type which is simple and relatively economical in construction and which is compact to occupy a minimum amount of floor space.

Another object of the invention is to devise an hydraulic press having a rotatable work supporting table adapted to selectively register the work with the hydraulic motors of the press.

A still further object of the invention is to provide means to positively latch the table against rotation during operation of the press motors.

Still another object of the invention is to automatically unlatch the table upon termination of the press operation.

A different object of the invention is to facilitate rotation of the table by providing means for lifting the table to decrease frictional resistance to its rotation.

A different object of the invention is to devise novel ejector means for ejecting the molded material from the die set at one station of the table while the die set at another station of the table is being clamped and loaded with material to be molded.

Still another object of the invention is to devise a press such as above described, wherein actuation of various press mechanisms are automatically responsive to actuation of other press mechanisms to eliminate the necessity for highly skilled operators and to decrease the time necessary for a cycle of press operation.

The foregoing and other objects and advantages of the invention will become apparent from a consideration of the following specification and the accompanying drawings, wherein:

Figure 1 is a top plan view of a transfer molding press embodying a preferred form of the invention;

Figure 2 is a rear elevational view of the press shown in Figure 1;

Figure 3 is a side elevational view taken from the left of Figure 2;

Figure 4 is a front elevational view of the press with portions broken away and other portions shown in vertical section to clarify the construction;

Figure 5 is an enlarged top plan view, partly in section, on the line 5—5 of Figure 4;

Figure 6 is a fragmentary side elevational view taken on the line 6—6 of Figure 5;

Figure 7 is a vertical sectional view through the ejector cylinders and associated parts;

Figure 8 is a piping diagram of an hydraulic actuating circuit for the hydraulic press motors;

Figure 9 is a piping diagram of a pneumatic operating circuit for the turn table and associated latch means; and

Figure 10 is a wiring diagram of an electrical actuating system for the press.

Describing the invention in detail and referring first to Figures 1 to 5, the press frame, generally indicated

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2, comprises a bed 4 and an upper portion 6 interconnected by tension rods 8. The bed 4 carries one or more hydraulic motors 10 preferably housed within the bed and each comprising a cylinder member 12 containing a ram member 14 having a head 16 defining an advance chamber 18 and a return or pullback chamber 20 within the cylinder member 12. One of the members 12 and 14, preferably the cylinder member 12, as best seen in Figure 4, is attached to the bed 4; and the other of said members is connected to a cross piece 22 which is connected to a clamping platen 24 by tension rods 26 slidably fitted within complementary bushed openings of the bed 4, whereby the rods 26 afford guide means and actuating means for the platen 24.

The upper frame portion 6 also supports one or more hydraulic motors 28, preferably housed therein, and each comprising a cylinder member 30 containing a ram member 32 having a head 34 defining an advance chamber 36 and a return or pullback chamber 38 within the cylinder member 30. One of said members, preferably the cylinder member 30, as illustrated in Figure 4, being attached to the frame portion 6 and the other of said members being operatively connected to a transfer plunger 40 which is reciprocal through openings of the clamping platen 24 to transfer material such as, for example, a rubber slug 41 through a loading cylinder 42 into a mold or die set generally indicated 44.

The die set 44 may be of any conventional form and in the diagrammatically illustrated embodiment thereof comprises an upper die segment or cover 46 preferably attached to a hot plate 48 carried by the clamping platen 24. The die set 44 also comprises a lower segment 50 supported by a rotatable turn table 52 having a trunnion 54 (Figure 4) journaled within a complementary opening of a bottom hot plate 56 which is secured in any convenient manner to a complementary plate 59 of the bed 4.

It will be noted that the hot plates 48 and 56 may be of any conventional form and are provided with any suitable heating means such as electric or steam heaters (not shown).

The turn table 52 (as best seen in Figures 3 and 4) is adapted in its lower or retracted position to bear against the bottom hot plate 56, whereby the die set 44 is heated by both hot plates during the molding operation; however, as hereinafter described in connection with an operating cycle of the press, the turn table 52 is preferably provided with means for elevating it from the bottom hot plate 56 to reduce frictional resistance to rotation of the table 52, and said means are preferably in the form of a pneumatic motor 57 operatively associated with trunnion 54 of the turn table. The motor 57, as diagrammatically illustrated in Figure 9, comprises a cylinder member 58 containing a piston rod member 60 having a piston 62 defining an advance chamber 64 and a retraction or pullback chamber 66 within the cylinder member 58. One of the members 58 and 60, and preferably the piston rod member 60, as shown in Figure 9, is connected in any convenient manner to the turn table 52 at its center or axis of rotation; and the other member of motor 57 is secured to the bed 4.

Referring again to Figures 1 to 3, it will be noted that the turn table 52 is preferably provided with a plurality of stations, three such stations being illustrated in the drawings, whereby as the die set at one station is being clamped by the platen 24 and loaded by the injection plunger 40, the die set at the next station is in position to have the molded material stripped therefrom by an ejector device comprising an ejector platen 68 having a plurality of ejector pins or plungers 70 (Figures 5 and 7) secured thereto and reciprocal within complementary openings 72 and 74 of the hot plate 56 and bed plate

59, respectively, whereby upon upward or advance movement of the ejector platen 68 the plungers 70 are urged through registered openings 76 of the turn table 52 to eject the molded material from within the die set at the station of the table which is then above the ejector platen 68.

The ejector platen 68 is actuated by one or more hydraulic motors, generally indicated 78, and each comprising a cylinder 80 containing a ram member 82 having a head 84 defining an advance chamber 86 and a retraction or pullback chamber 88 within the cylinder 80 which is preferably formed in a cylinder block member 90. One of the members 82 and 90 is operatively associated with the platen 68. The other member is carried by the press frame 2, and in the illustrated embodiment the cylinder block member 90 is carried by a bracket 92 which is preferably detachably secured in any desired manner, as for example, by screws 94 to the bed 4 of the press. In the illustrated embodiment, two motors 78 are provided, the advance chambers 86 being connected to a common line 166, and the pullback chambers 88 being connected to a common line 168, as hereinafter described in detail.

The table 52 is provided with one or more tapered notches 96 in the outer peripheral edge thereof at respective work stations thereof. A correspondingly tapered latch pin 98 is adapted to engage the notch 96 at one station of the table to releasably hold the table against rotation. Under these conditions, the other two stations of the table are properly aligned with the ejector platen 68 and the clamping platen 24, respectively. The latch pin 98 is actuated by a fluid pressure device 100 which, as best seen in the diagrammatical view of Figure 9, comprises a cylinder member 102 containing a piston rod member 104 having a piston 106 defining an advance chamber 108 and a pullback or retraction chamber 110 within the cylinder member 102. The device 100, as best seen in Figures 1 to 3, is supported by a bracket 112 carried by the press frame 2, one of the members 102 and 104 being anchored to the bracket and the other being connected to latch pin 98.

It will be noted at this point that all of the hydraulic and pneumatic motors above described are of conventional form in which a head of the ram, or a piston of the piston rod, defines advance and return chambers within an associated cylinder; however, it will be readily understood by those skilled in the art that these motors may be of any conventional form with the advance and return chambers in the same or separate cylinders.

Referring again to Figure 9 which shows a pneumatic piping diagram for the pneumatic motors 57 and 100 associated with the turn table 52, it will be seen that a conventional shop air line 114 is connected to a pair of valves 116 and 118, associated with the motor 57 and actuated by solenoids L and K, respectively. The valve 116 in normal position, with the solenoid L de-energized, admits air pressure from the line 114 to a pullback or retraction line 119 connected to the pullback chamber 66; and the valve 118 in normal position thereof with the solenoid K de-energized blocks pneumatic pressure fluid from line 114 and connects pull-back chamber 64 to exhaust through lines 120 and 122. When the solenoids L and K are energized, the valve 116 connects line 119 to an exhaust line 124 and blocks pressure fluid from the line 114; and the valve 118 admits pressure fluid from the line 114 to the line 120 while blocking flow of pressure fluid to the exhaust line 122. Thus, when solenoids L and K are de-energized, the turn table 52 is held in its lower or retracted position, and when these solenoids are energized, the table 52 is actuated to its elevated or advance position.

The line 114 is also connected to a pair of valves 126 and 128 associated with the pneumatic motor 100, said valves being operated by solenoids J and H, respectively. When the solenoids J and H are de-energized, pressure fluid from the line 114 is delivered by valve 126 to a line 130 connected to the advance chamber 108 of the motor

100, and an exhaust line 132 of the valve 126 is blocked. Under these conditions, the valve 128 connects chamber 110 of the motor 100 to exhaust through lines 134 and 136 and blocks pressure fluid from line 114. When the solenoids J and H are energized, the valve 126 connects line 130 to exhaust line 132 and blocks pressure fluid from line 114; and the valve 128 delivers pressure fluid from line 114 to line 134 and blocks flow of fluid to line 136. Thus, when the solenoids J and H are de-energized so that valves 126 and 128 are in normal position thereof, the latch 98 is urged on advance stroke toward the table 52, and when the solenoids J and H are energized, the latch 98 is retracted or pulled back from engagement with the table 52.

Referring now to Figure 8 which illustrates an hydraulic piping diagram for the press, hydraulic pressure fluid to actuate the hydraulic transfer motors 28 is provided by a pump 138 actuated by a motor 140, said pump having its suction side connected by a line 142 to an associated source (not shown) of hydraulic fluid such as oil or water. The discharge side of the pump 138 is connected by a supply line 144 to a conventional operating valve 146 which is actuated by solenoids C and D.

In neutral or normal position of the valve 146, with both solenoids C and D de-energized, hydraulic pressure fluid from the supply line 144 is delivered to an exhaust or discharge line 148 which may be connected, for example, to a tank or reservoir (not shown) of hydraulic fluid which supplies the suction line 142 of the pump 138.

In advance position of the valve 146 with solenoid D de-energized and solenoid C energized, pressure fluid is delivered from supply line 144 to an advance line 150 connected to advance chambers 36 of the hydraulic motors 28; and, under these conditions, the valve 146 connects the exhaust line 148 to a return or pull-back line 152 which is connected to the return or pullback chambers 38 of the motors 28, accommodating movement of transfer rams 32 downwardly on their advance stroke.

The valve 146 in return or pullback position thereof, with the solenoid D energized and the solenoid C de-energized, delivers pressure fluid from the supply line 144 to the pullback line 152 and exhaust fluid from the advance line 150 to the discharge line 148, thereby actuating the rams 32 on upward or pullback stroke thereof.

Hydraulic fluid is supplied to the hydraulic motors 10 and 78 by another pump 154 operated by a motor 156 and having its suction side connected to a line 158, to which hydraulic fluid such as oil or water may be supplied as, for example, by the same reservoir (not shown) which supplies the line 142. The discharge side of pump 154 is connected to a supply line 160 which is connected to a conventional operating valve 162 actuated by solenoids E and F.

In neutral or normal position of valve 162, with both solenoids E and F de-energized, pressure fluid from the supply line 160 is delivered by the valve 162 to an exhaust or discharge line 164. In advance position of valve 162, with solenoid F energized and solenoid E de-energized, the valve 162 delivers pressure fluid from supply line 160 to an advance line 166 connected with the advance chambers 86 of the hydraulic motors 78; and, under these conditions, the valve 162 connects the exhaust line 164 to a return or pullback line 168 which is connected to the retraction or pullback chambers 88 of the hydraulic motor 78, whereupon the ejector platen 68 is actuated upwardly on advance stroke by rams 82 of the motors 78.

When the valve 162 is in return or pullback position thereof, with the solenoid E energized and the solenoid F de-energized, pressure fluid is delivered by the line 160 to the pullback or retraction line 168, and fluid in the advance line 166 is delivered to the exhaust line 164, whereupon the ejector platen 68 is actuated on pullback or retraction stroke thereof by the rams 82.

The supply line 160 comprises a branch line 170 having a safety relief valve 172 and a check valve 174 upstream

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of a conventional hydraulic accumulator or tank 176 which may be either of the spring weighted or air ballasted types, well known in the art. Downstream of the accumulator 176, the line 170 is connected to a conventional operating valve 178 and is also connected to a conventional control valve 180.

The operating valve 178 is actuated by solenoids A and B; and in neutral or normal position of the valve 178, with both solenoids A and B de-energized, pressure fluid in the branch line 170 is blocked. The valve 180 is actuated by a solenoid G; and this valve when in closed or normal position thereof, with the solenoid G de-energized, also blocks flow of pressure fluid from the line 170, whereby with both valves 178 and 180 closed, hydraulic pressure fluid is stored in the accumulator 176.

In rapid advance position of the valve 180, with the solenoid G energized, pressure fluid is delivered from the line 170 through a line 182 to a piston and cylinder pilot device 184, which opens a normally closed valve 186 accommodating flow of hydraulic fluid from the pullback chambers 20 of hydraulic motors 10 through a pullback line 188 and thence through the valve 186 and through a line 190 to the valve 178. The valve 178, under these conditions, is in neutral or normal position thereof, with the solenoids A and B de-energized, and thus connects line 190 to a discharge or exhaust line 192, whereupon the clamping platen 24 falls by force of gravity on its rapid advance stroke toward the rotatable work table 52. Under these conditions, flow of low pressure fluid from a reservoir (not shown) to the advance chambers 18 of motors 10 is accommodated by a one-way check valve 212 connected to the reservoir by a low pressure or exhaust line 214.

The operating valve 178 in advance position thereof, with solenoid A energized and solenoid B de-energized, maintains the connection between line 190 and exhaust line 192 and at the same time delivers pressure fluid from branch line 170 to an advance line 196 which is connected to the advance chambers 18 of the hydraulic motors 10 to urge the clamping platen 24 under full clamping tonnage against the die set which is not shown in Figure 8. This clamping tonnage is applied after the chambers 18 have prefilled during gravity advance of the rams 14 to a pre-selected, near closed position, and the clamping tonnage is controlled by a conventional adjustable relief valve 198 connected to a branch line 200 of the advance line 196. The valve 198 may be adjusted to regulate the pressure in line 196 to any desired value by exhausting fluid from line 200 to a relief or exhaust line 202, which is connected downstream of the valve 198 to a conventional piston and cylinder device 204 for actuation of an electrical switch unit PS-1, serving a purpose hereinafter described. The line 202 is also provided with a one-way, spring pressed check valve 206 accommodating flow of fluid from the line 202 to exhaust, but providing sufficient back pressure to actuate the device 204, when valve 198 opens at maximum predetermined pressure in advance line 196.

It may be noted that the valve 206 comprises a stem 207 yieldingly biased to closed position by a spring 209 which loads the stem 207 by an adjustable pressure value of, for example, the order of ten to fifty pounds. This spring provides the back pressure which actuates PS-1 upon opening of valve 198. Upon closing of valve 198 when pressure drops in line 196, a bleeder port 211 in stem 207 exhausts device 204 and permits PS-1 to reset.

The valve 178 in pullback position thereof, with solenoid B energized and solenoid A de-energized, connects the advance line 196 to the exhaust line 192 and connects the line 190 to the supply branch line 170, whereupon pressure fluid is delivered by the line 190 through a one-way check valve 208 to the pullback line 188. Under these conditions, solenoid G is de-energized, so that valve 180 is closed to cut off flow of fluid from branch line 170 and line 182 is connected to exhaust line 194, whereby valve 186 is in normal position cutting off flow of fluid

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between lines 188 and 190. Pressure in line 190 actuates a conventional piston and cylinder device 210, which opens the normally closed, one-way check valve 212 accommodating flow of fluid from advance line 196 to the exhaust line 214 whereupon the clamping platen 24 is actuated on its upward or pullback stroke by the rams 14.

It may be noted at this point that when the valve 178 is in neutral position with both its solenoids A and B de-energized and when the rapid advance solenoid G is de-energized to close valve 186, hydraulic fluid is trapped in pullback chambers 20 of motors 10 by valves 186 and 208, whereby the clamping platen 24 is held in pullback position, until valve 180 is opened by energization of solenoid G to initiate advance movement of platen 24.

Referring now to Figure 10, the various limit and pressure switches of the press will be described in connection with an operating cycle thereof.

In Figure 10, a conventional source (not shown) of three phase alternating electric current is connected through a main cut-off switch 210 to three main lines L-1, L-2, and L-3, which are connected to corresponding leads of the motors 140 and 156 through normally open relay switches M-1(b) and M-2(b).

Current from lines L-2 and L-3 is supplied through a transformer 212 to various control relay solenoids, hereinafter described in connection with an operating cycle of the press.

The cycle is initiated by momentarily closing a normally open, motor starter push button switch 214, thereby energizing relay solenoid M-1 and M-2 which close their normally open switches M-1(a) and M-2(a) establishing holding circuits through solenoid M-1 and M-2 and through a normally closed motor stop, push button switch 216. Energization of solenoids M-1 and M-2 also closes their normally open motor starter switches M-1(b) and M-2(b), thereby energizing motors 140 and 156.

Next, an automatic cycle switch 218 is actuated to closed position shown in the drawings to close contacts 220 and 222 thus accommodating energization of automatic cycle relay solenoid CR-8 as hereinafter described.

Then the operator momentarily depresses a normally open push button switch 224 which establishes a circuit through control relay solenoid CR-8. This solenoid immediately closes its normally open switch CR-8(a) thereby establishing a holding circuit through CR-8 which also closes its normally open switches CR-8(b), CR-8(f), CR-8(h), CR-8(i), and CR-8(j). CR-8 also opens its normally closed switches CR-8(c), CR-8(d), CR-8(e) and CR-8(g), all of which, when open, cut out switches used only in inching operations, as hereinafter described.

The push button switch 224 also energizes control relay solenoid CR-6 through switch CR-8(b) upon closing thereof as above described, inasmuch as a normally open switch LS-6 is closed under these conditions by the table 52 in its lowermost position. Solenoid CR-6 closes a holding circuit therethrough by closing its normally open switch CR-6(a). CR-6 also energizes ejector advance solenoid F by closing normally open switches CR-6(d), and as the ejector platen 68 moves up on its advance stroke, it trips a switch unit LS-5 (Figure 6), thereby opening a normally closed switch LS-5(a) and closing a normally open switch LS-5(b). CR-6 also opens its normally closed switch CR-6(c) and closes its normally open switch CR-6(b), whereupon control relay solenoid CR-7 is energized through a normally closed time delay switch TDR(b).

CR-7, upon energization thereof, establishes a holding circuit therethrough by closing its normally open switch CR-7(a) and also energizes rapid advance solenoid G by closing normally open switches CR-7(c) and closes normally open switch CR-7(b) whereby as the clamp rams drop by gravity to close a normally open limit switch LS-3, a circuit is established through control relay CR-1 which energizes the clamp close solenoid A by closing nor-

mally open switches CR-1(c) (admitting clamping pressure to advance areas of clamp rams) and opens normally closed switches CR-1(a) and CR-1(b). Overtravel of clamp rams 14 is prevented by a normally closed limit switch LS-2 which is opened by the crosspiece 22, in the event of such overtravel, to de-energize solenoids CR-6, CR-7 and CR-1.

At this point in the cycle, the device 204 is actuated by pressure in line 202 downstream of valve 198 whenever pressure against the clamp rams 14 in their advance chambers 18 has built up to a predetermined value controlled by the setting of valve 198. Actuation of device 204 opens normally closed switch PS-1(a) and closes normally open switch PS-1(b). Opening of PS-1(a) de-energizes solenoid CR-6 which in turn de-energizes ejector advance solenoid F and accommodates return of switches CR-6(a), CR-6(b), CR-6(c), and CR-6(d) to normal position. Thus closing of switch PS-1(b) energizes control relay solenoid CR-5 through limit switch LS-5(b) and normally closed relay switch CR-6(c).

Solenoid CR-5 establishes a holding circuit there-through by closing its normally open switch CR-5(a). Solenoid CR-5 also energizes ejector pullback solenoid E by closing normally open switches CR-5(c), and as the ejector platen 68 moves down on pullback stroke, the normally closed switch LS-5(a) closes as the normally open switch LS-5(b) opens; however, opening of switch LS-5(b) does not de-energize CR-5 which is locked in, as above described, through its switch CR-5(a).

With the die set clamped by rams 14 against the table 52, the operator inserts the material to be molded such as slugs of rubber 41 within the loading cylinders 42 of the die set.

Then the normally open transfer push button switches 226 and 228 are momentarily actuated. These buttons are preferably in series and are spaced on the instrument panel, so that one button must be depressed with each hand, to prevent actuation of transfer rams before both of the operator's hands are free. As the push button switches 226 and 228 are closed, they energize control relay solenoid CR-3 through CR-5(b) which, although normally open, has closed due to energization of solenoid CR-5, as above described.

Solenoid CR-3 establishes a holding circuit there-through by closing its normally open switch CR-3(a), and solenoid CR-3 also energizes transfer advance solenoid C by closing normally open switches CR-3(d), whereupon the transfer rams are actuated on their advance stroke releasing normally closed switches LS-4(a) and LS-4(b) which thus close.

Energization of solenoid CR-3 also opens its normally closed switch CR-3(e) and closes its normally open switches CR-3(b) and CR-3(c), the latter switches energizing a clutch 230 and a motor 232 respectively of a conventional time delay relay TDR which immediately closes its normally open switch TDR(a) establishing a holding circuit through the clutch 230.

After a predetermined period of time, depending upon the setting of TDR, to provide the desired curing time for the material compressed in the die set 44 by transfer rams 32, relay TDR closes its normally open switch TDR(c) and simultaneously opens normally closed switch TDR(b) which thus de-energizes CR-7, returning its switches to normal and de-energizing rapid advance solenoid G. As switch CR-7(b) returns to normal open position, solenoid CR-1 is de-energized thereby opening CR-1(c) to de-energize the clamp close solenoid A and accommodating return of switches CR-1(a) and CR-1(b) to normal closed position.

Closing of CR-1(a) energizes control relay solenoid CR-2 which opens its normally closed switch CR-2(a) and also closes its normally open switch CR-2(b) which energizes a signal 234 such as a bell or light. Energization of CR-2 also energizes clamp open solenoid B by closing normally open switches CR-2(c) and thus the

clamp rams move on their return or pullback stroke stripping the upper die section 46 from the cured material which is held by the transfer rams 32 in the lower die section 50. As pressure in line 196 drops, valve 198 closes so that device 204 is released and normally closed switch PS-1(a) now closes and normally open switch PS-1(b) opens. Switch LS-3 assumes its normal open position as the clamp rams move on their pullback stroke, and at the end of that stroke, switch unit LS-1 is contacted by crosspiece 22 to open normally closed switch LS-1(a) and to close normally open switch LS-1(b). Opening of LS-1(a) de-energizes CR-2, returning its switches to normal and thereby de-energizing clamp open relay B.

Closing of normally closed switch CR-1(b) upon de-energization of relay CR-1 before platen return, as above described, energizes a control relay solenoid CR-11 which closes its normally open switch CR-11(a) and since normally closed switch CR-3(e) has closed upon de-energization of CR-3 due to opening of CR-1(c) in response to de-energization of relay solenoid CR-1, the relay CR-4 will be energized at the moment the clamping platen returns to close LS-1(b).

It may be noted at this point that although normally open switches CR-3(b) and CR-3(c) have opened upon de-energization of solenoid CR-3, so that motor 232 of relay TDR has been de-energized, its clutch 230 remains energized through holding switch TDR(a) to prevent return of TDR(b) and TDR(c) to normal condition until CR-8(h) opens at a later point in the cycle.

Energization of relay solenoid CR-4 closes its normally open switches CR-4(b) and CR-4(g) and opens its normally closed switches CR-4(a) and CR-4(c). Relay solenoid CR-4 also closes its normally open switches CR-4(d) to energize transfer pullback solenoid D, whereupon the transfer rams move up until LS-4(a) and LS-4(b) open, de-energizing CR-4, returning its switches to normal, and consequently de-energizing solenoid D.

Closing of normally open switch CR-4(b) energizes a control relay solenoid CR-9 which closes a holding circuit therethrough by closing its normally open switch CR-9(a) and also closes normally open switches CR-9(c) energizing solenoids H and J, whereupon latch pin 98 is pulled to retracted position accommodating rotation of the table 52.

Solenoid CR-9 also closes its normally open switch CR-9(b) energizing a control relay solenoid CR-10 which closes a holding circuit therethrough by closing its normally open switch CR-10(a), and solenoid CR-10 also closes normally open switches CR-10(c) energizing solenoids K and L whereupon the table is lifted, permitting normally open switch LS-6 to open. CR-10 also opens its normally closed switch CR-10(b), but inasmuch as CR-4(g) is closed solenoid CR-8 is not de-energized until the transfer ram returns and opens LS-4(a) and LS-4(b) de-energizing CR-4 and opening CR-4 and opening CR-4(g), whereupon solenoid CR-8 is de-energized, and its normally open switches CR-8(a), CR-8(b), CR-8(f), CR-8(h), CR-8(i) and CR-8(j) open.

With the pin 98 in retracted position, the table 52 may be rotated manually or otherwise until a normally closed switch LS-8 is opened by trip 236 (Figure 9) on the pin, thereby de-energizing solenoid CR-10 and consequently de-energizing solenoids K and L, whereupon the table drops to bear against hot plate 56 closing

When the pin 98 snaps into the next notch 96, a normally closed switch LS-7 is opened by trip 238 (Figure 9) on the pin, thereby de-energizing solenoid CR-10 and consequently de-energizing solenoids K and L, whereupon the table drops to bear against hot plate 56 closing

ing the normally open switch LS-6 preparatory to initiation of a new cycle.

It will be understood that during adjustment of the press, various movements of the parts may be desired without initiating an automatic cycle such as above described, and this is accomplished by opening inch run selector switch 218 to disconnect its contacts 220 and 222, whereupon closing of a normally open push button switch 240 causes advance inching movement of the clamping platen and closing of a normally open push button switch 242 causes pullback inching movement of the clamping platen. Downward inching of the clamping platen is accommodated by a conventional relief valve 199 (Figure 8) connected to the line 188 and adapted to open at a value higher than normal operating pressure in said line. Inasmuch as solenoid G is not energized under these conditions, fluid trapped in line 188 is forced to exhaust through valve 199 accommodating precise adjustment of the platen 24.

Downward or advance inching of the transfer rams is effected by actuation of a push button switch 244 from its normal position shown in Figure 10 whereat contacts 246 and 248 are closed to a position whereat contacts 250 and 252 are closed to establish a circuit through relay solenoid CR-3 and through normally closed contacts 254 and 256 of a push button switch 258. Thus CR-3 causes advance movement of the transfer rams 32 by closing its switches CR-3(d) to energize the transfer advance solenoid C. Upon release of push button switch 244, it resumes normal position, disconnecting contacts 250 and 252, to de-energize CR-3 stopping advance movement of transfer rams.

Upward or pullback inching of the transfer rams is effected by actuation of the push button switch 258 from its normal position to a position whereat contacts 260 and 262 are connected to close a circuit through the relay solenoid CR-4 and through the normally closed contacts 246 and 248 of push button switch 244, whereupon normally open switches CR-4(d) close and pullback movement of the transfer rams is caused by energization of solenoid D until the push button 258 is released to resume its normal position whereat solenoid CR-4 is de-energized.

An emergency stop push button switch 264 is provided for de-energizing all control relays, and the before mentioned stop push button switch 216 is provided for de-energizing the motors 140 and 156.

I claim:

1. A transfer molding press comprising a press frame including spaced supports, an hydraulic motor carried by one support and including cylinder means with advance and pullback chambers, a table on said one support to engage a mold, ram means reciprocal in respective chambers, a cross piece rigidly connected to said motor, tension rods connected to said cross piece and extending through openings in said one support, a clamping platen connected to said rods for clamping the mold between said table and said platen, another hydraulic motor carried by the other support and including cylinder means with advance and pullback chambers and ram means reciprocal therein, and a transfer plunger connected to said other motor for actuation thereby, said plunger being reciprocal through an opening in said clamping platen to urge material to be molded into said mold when in an advance position, whereby to enable retraction of the clamping platen while holding the transfer ram in advance position.

2. An hydraulic transfer molding press comprising a frame with a bed, a rotatable turn table carried by the bed, a platen mounted for vertical reciprocative movement on the frame for clamping an associated mold against the table in response to downward movement of the platen, injector means carried by the frame above the platen for injecting material to be molded downwardly through the platen into said mold, a plurality

of notches in the periphery of said table, a latch, said notches being selectively engageable with said latch to prevent rotation of the table, power means for urging said latch toward and away from the table, control means automatically responsive to retraction of said injector means and platen from the table for automatically actuating said power means on retraction stroke thereof whereat said latch is released from the table, and means responsive to rotation of the table to a position whereat said notches are misaligned with respect to the latch for actuating said power means on advance stroke thereof to engage said latch with the table, whereby as the table is rotated to a position where said latch is registered with a notch, said latch enters the same to prevent further rotation of the table.

3. A press, according to claim 2, wherein operating means are provided for raising the table from the bed and for lowering the table thereagainst, and control means responsive to entrance of the latch into a notch are provided for automatically actuating said operating means for lowering the table against the bed, said latch and notches being formed and arranged to accommodate downward movement of the table when the latch has entered one of the notches.

4. A transfer molding press comprising a frame including a bed, a platen for clamping a mold against the bed, hydraulic motor means for actuating said platen, means including a plunger and a transfer passage in said platen for transferring material to be molded into said mold, hydraulic motor means carried by said frame above said platen for actuating said plunger, and control means for said hydraulic motor means comprising means for automatically retracting said plunger from the mold in response to and following retraction of said platen from the bed.

5. A transfer molding press comprising a frame including a bed, a platen for clamping a mold against the bed, said platen having a transfer passage, an hydraulic motor for advancing the platen toward the bed and for retracting the platen therefrom, another hydraulic motor carried by the frame above the platen, a plunger connected to said other hydraulic motor for actuation thereby, said other hydraulic motor being adapted to advance the plunger through said passage to transfer into the mold material to be molded therein and being adapted to retract the plunger from said passage, and control means for said other hydraulic motor comprising means for automatically actuating said other hydraulic motor on retraction stroke thereof to retract the plunger from the bed in response to and following retraction movement of the platen a predetermined distance from the bed.

6. A transfer molding press comprising a frame, a work table rotatably supported thereby and having a plurality of stations adapted to carry associated molds, a clamping platen extending across one side portion of the table and having a transfer passage parallel to the axis of rotation of the table, power means carried by the frame responsive to the gravity advance of said platen for clamping said platen against a mold at one station, means including a transfer plunger for transferring material through said passage to said mold, means carried by the frame and displaced circumferentially of the table from said platen for ejecting molded material from a mold at another station, releasable means for latching said table in one of a plurality of rotational positions, said table, platen and ejector means being so arranged that when the table is latched at one of said positions, the platen is aligned with a mold at one station to clamp said last mentioned mold against the table, and the ejector means is aligned with a mold at another station to eject molded material from the last mentioned mold.

7. A transfer molding press comprising a frame, a work table rotatably supported thereby and having a plurality of stations, a clamping platen, hydraulic power means carried by the frame for clamping said platen

against associated molds supported by said table at certain of its respective stations, means including a hydraulic power unit operable for transferring material to the clamped mold, means carried by the frame and displaced circumferentially of the table from said platen for ejecting molded material from said molds, said ejector means being movable through openings of the table, releasable means for latching said table in one of a plurality of rotational positions, said table, platen and ejector means being so arranged that when the table is latched at one of said positions and the platen is aligned with a mold to clamp the same at one station, the ejector means is aligned with the opening of another station to eject molded material from the mold at said last mentioned station.

8. A press, according to claim 7, wherein control means are provided for automatically retracting the ejector means from the aligned opening in response to predetermined clamping pressure by the platen against the clamped mold.

9. A transfer molding press comprising a frame, a work table rotatably supported thereby and having a plurality of stations, a reciprocable clamping platen, hydraulic power means carried by the frame for clamping said platen against molds supported by the table at its respective stations, means including a hydraulic power unit operable for transferring material through an opening in said platen to a mold clamped by said platen, ejector means carried by the frame beneath the table and movable through openings thereof at the respective stations to eject molded material from a mold at a station at one side of said platen, releasable means for latching said table in one of a plurality of positions, said table, platen and ejector means being so arranged that when the table is latched at one of its positions, the platen is aligned with one station and the ejector means is aligned with another station, and a device supported by the frame and connected to the table at its rotational axis to lift the table from the bed upon release of the clamping platen.

10. A press, according to claim 9, wherein control means are provided automatically actuating said device to lift the table upon retraction of the clamping platen and transfer means.

11. A press, according to claim 9, wherein control means are provided for automatically releasing the latching means in response to retraction of the platen and transfer means, and other control means are provided for automatically actuating the device to lift the table in response to release of said latching means.

12. A press, according to claim 11, wherein the table and latching means are formed and arranged to accommodate lowering of the table to engage the frame when the table is latched, and means are provided for automatically lowering the table into engagement with the frame in response to latching of the table against rotation by said latching means.

13. A transfer molding press comprising a frame, a vertically reciprocable clamping platen, and hydraulic motor carried by the frame and operatively connected to the platen for actuating and releasing the latter, a transfer plunger, another hydraulic motor carried by the frame

operatively responsive to action of said platen for advancing the plunger through an opening in the platen toward a mold clamped by the platen to the frame and for retracting the plunger from said mold, means for ejecting molded material from the mold upon release of the clamping platen and retraction of the plunger, and control means operable during each molding cycle to automatically actuate said ejecting means.

14. In a transfer molding press, a frame having a table, a mold portion carried by the table, a movable platen carrying another mold portion registrable with said first mentioned mold portion, a hydraulic motor carried by the frame and connected to said platen for clamping said platen and carried mold portion against the table and carried mold portion, at least one transfer ram operable through an opening in said movable platen, hydraulic means to operate said transfer ram whereby material to be molded is forced into said mold, and control means operable automatically responsive to fluid pressure supplied to said motor to actuate said hydraulic means.

15. In a hydraulic transfer molding press comprising a frame with a bed, an indexable table carried by the bed, said table having a plurality of molds thereon, a movable clamping platen, hydraulic motor means operatively connected to the platen and responsive to each indexine of said table and a partial gravity advance of said platen to advance said platen into consecutive sequential pressured engagement with the molds carried by said table, a transfer plunger operable through an opening in said movable platen, and hydraulic motor means to sequentially and consecutively advance said plunger toward said molds, and control means operable automatically responsive to fluid pressure supplied to said motor to actuate said hydraulic means.

16. In a hydraulic transfer molding press comprising a frame, a work table indexably supported by the frame and having a plurality of stations, each of said stations being adapted to carry an associated mold, a movable clamping platen having a mold section thereon, hydraulic power means responsive to the indexing of said table for clamping said platen and mold section against a mold at one station, a transfer ram for transferring material to said mold, ram actuating means, control means operable responsive to the return of said platen to return said ram, and indexing means operative to rotate said table and bring each of said stations successively into position under said platen.

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