Nov. 26, 1940. E. M. WINEGAR 2,222,732

PRESS

Filed Sept. 21, 1937 2 Sheets-Sheet 1

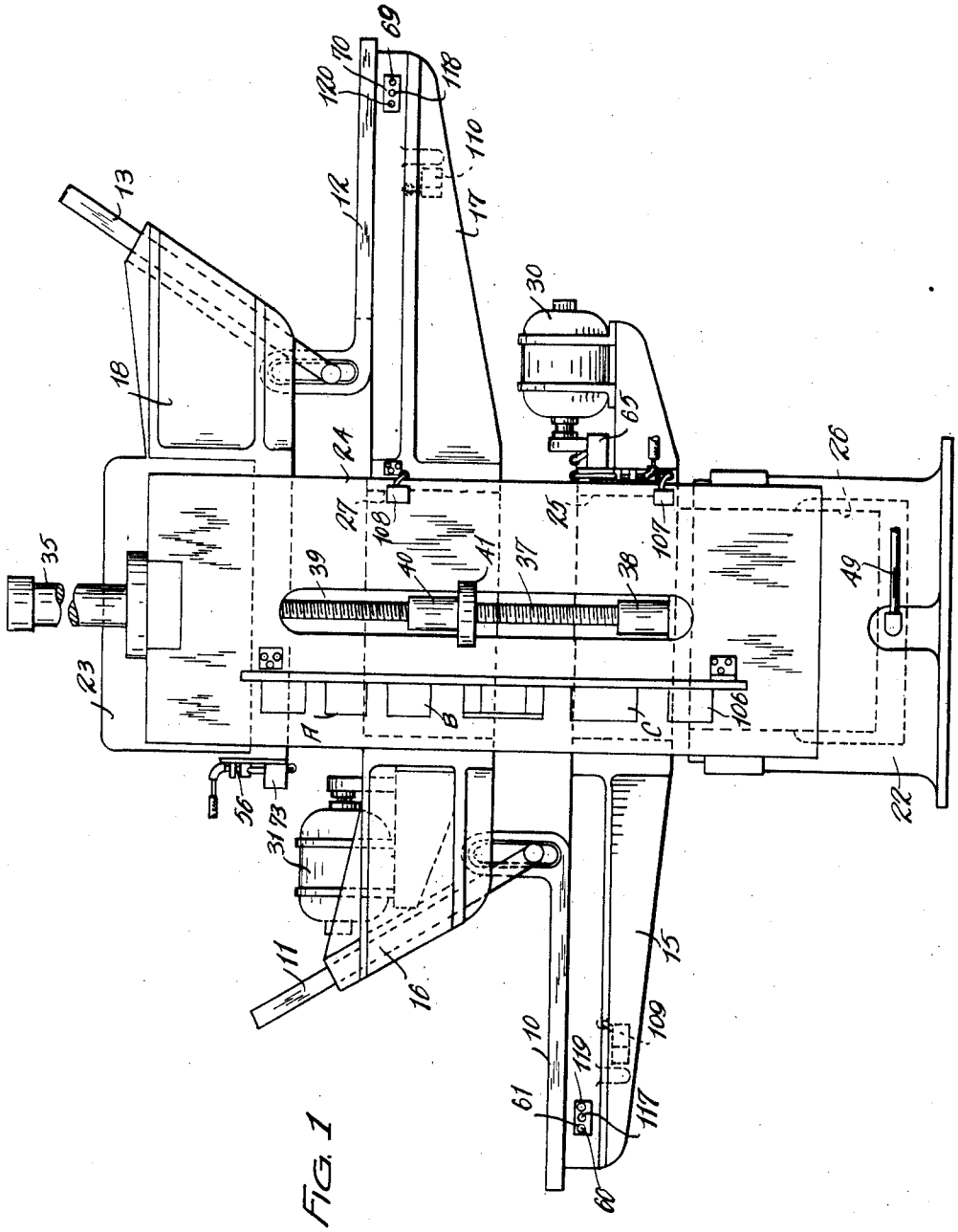

FIG. 1

INVENTOR.
EDMUND M. WINEGAR

BY Kuis Hudson & Kent
ATTORNEYS

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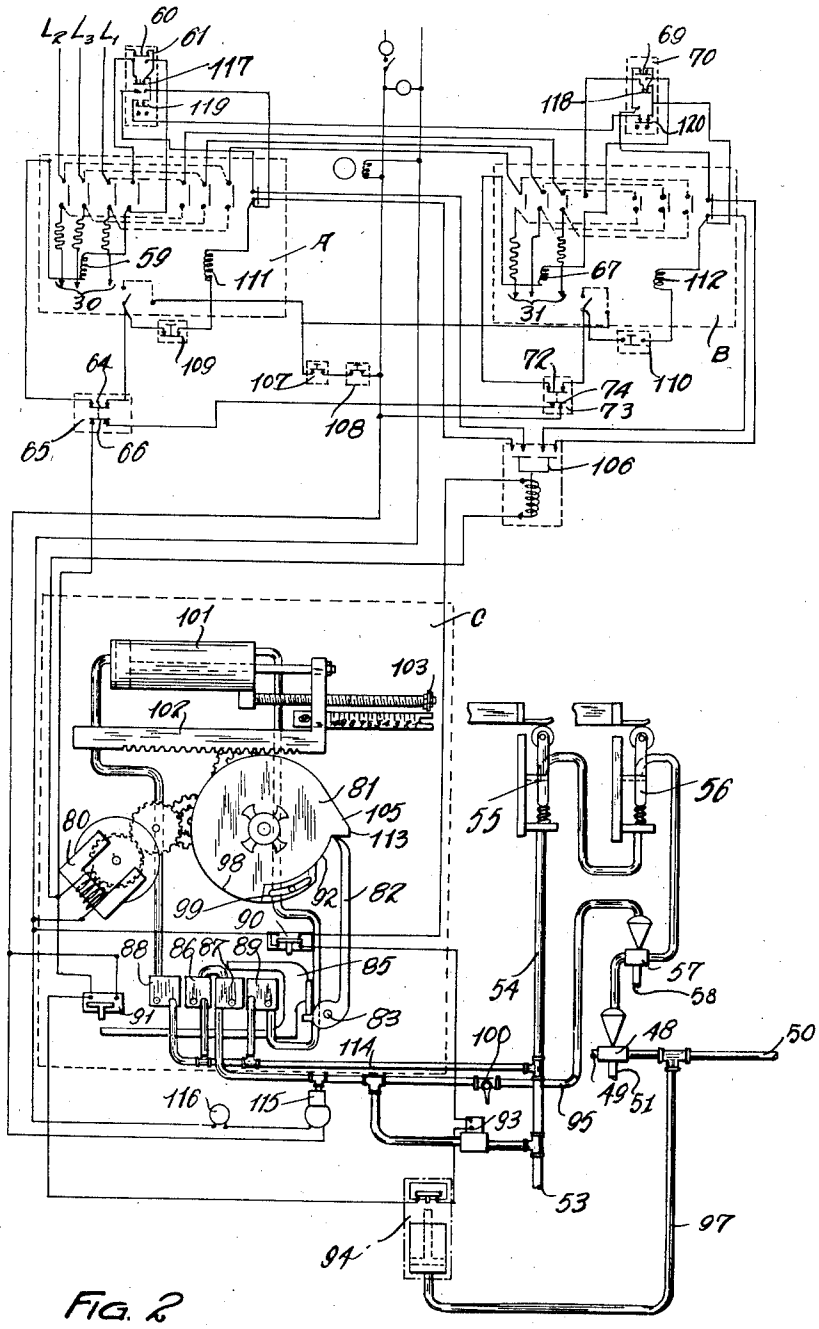

FIG. 2

INVENTOR.
EDMUND M. WINEGAR

BY Kuis Hudson & Kent
ATTORNEYS

Patented Nov. 26, 1940

2,222,732

UNITED STATES PATENT OFFICE

2,222,732

PRESS

Edmund M. Winegar, Willoughby, Ohio, assignor to The Ohio Rubber Company, Willoughby, Ohio, a corporation of Ohio

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5 Claims. (Cl. 18—17)

The present invention relates to presses, especially vulcanizing presses, and to improved means for controlling the operation thereof.

In the operation of the presses, especially those employed for molding plastics, vulcanizing, and the like, it is customary to release the pressure on the molds or open the same slightly for a short interval of time after the closing thereof, either once or a plurality of times, the purpose of which is to allow any air which might be trapped in the molds to escape, or to permit a rearrangement of the stock in the molds, etc. This operation is commonly referred to as "bumping" and in fluid pressure actuated presses is ordinarily performed by a manually controlled valve located at some convenient place on the press. Devices have been devised to perform this "bumping" operation automatically but these devices have proved unsatisfactory for various reasons, such as inability to maintain the required control over the amount that the press or molds open upon each "bumping" operation.

An object of the present invention is the provision of a novel means for "bumping" a fluid pressure actuated press, especially a vulcanizing press, in which the required control over the press is maintained at all times.

Another object of the present invention is the provision of a novel control for a fluid pressure actuated press, especially a vulcanizing press, which control includes means for automatically "bumping" the press while maintaining the required control over the press.

Another object of the present invention is the provision of a novel automatic fluid pressure actuated press, especially a vulcanizing press, over which the desired control is maintained at all times and which includes means for automatically "bumping" the same.

Further objects and advantages of the present invention will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment thereof described with reference to the accompanying drawings forming a part of this specification in which similar reference characters designate corresponding parts, and in which

Fig. 1 is a side elevation of a vulcanizing press embodying the present invention; and

Fig. 2 is a schematic diagram of the control system therefor.

While the invention is susceptible of various modifications and alternative constructions, it is herein illustrated and described as embodied in a double deck vulcanizing press. Generally speaking, the press comprises two pairs of platens 10 and 11, and 12 and 13 adapted to carry mold members on the adjacent faces thereof. The platens are movably supported on two sets of runway brackets 15 and 16, and 17 and 18, in such a manner that they can be moved into the press proper for performing the molding and vulcanizing operation and out of the press proper for facilitating the loading and unloading of the molds. The runway brackets 15 and 16 and 17 and 18 are vertically offset and project from the opposite side of the press so that the molds can be simultaneously loaded and unloaded by operators at opposite sides thereof, thereby reducing the time required to perform the loading operation.

The press proper consists of a base 22 and a stationary abutment member or upper head 23 held in predetermined spaced relation above the base by side plates or strain members 24. The runway brackets 15 are carried by a lower head 25 positioned underneath the head 23 and connected to the upper end of a piston or ram 26 slidably supported in a cylinder formed in the base 22. The runway brackets 16 and 17 are carried by a vertically movable floating member or head 27 positioned midway between the stationary upper head 23 and the movable lower head 25. The pair of platens 10 and 11 which constitute the lower deck of the press are hinged together through a lost motion connection and are adapted to be moved into and out of the press by an electric motor 30 through the medium of a lead screw (not shown) having threaded engagement with a nut secured to the underside of the bottom platen 10. When the platens 10 and 11 are within the press proper, they are located above the movable head 25 and underneath the floating or vertically movable head 27. The platens 12 and 13 which constitute the upper deck of the press are likewise hinged together through a lost motion connection and are adapted to be moved into and out of a position intermediate the stationary upper head 23 and the floating member or head 27, by an electric motor 31 operatively connected to the platen 12 in a manner similar to that in which the motor 30 is connected to the platen 10. The electric motors 30 and 31 are supported on the brackets fixed to the rear sides of the heads 25 and 27 respectively. As previously stated, the lower runway brackets 15 of the lower deck are attached to the lower head 25 and move therewith. The upper run-

way brackets 16 of the lower deck and the lower runway brackets 17 of the upper deck are carried by the floating head 27 and move therewith. The upper runway brackets 18 of the upper deck are fixed to the stationary head 23.

Positive means for opening the press is provided in the form of fluid pressure actuated motors 35 supported on the side members or plates 24 above the upper head 23. The motors 35 are operatively connected to the lower head 25 by rods 37, the lower ends of which are secured in bosses 38 projecting into cutout portions or apertures 39 in the side members 24. The floating head 27 is guided in its vertical movement by the rods 37 which extend through bosses 40 on either side of the floating head and the downward movement or lower position thereof is limited or determined by stop members 41 fixed to the side members or plates 24.

Fluid, preferably water, under high pressure is adapted to be supplied from a conduit 49 to the cylinder in the base 22 for effecting the closing of the press under the control of a fluid pressure actuated three-way diaphragm valve 48. The valve 48 is connected to the cylinder of the pressure fluid motor by conduit 50 and to a drain by conduit 51. Fluid, preferably air, under relatively low pressure from a supply line 53 is employed for operating the valve 48 through the medium of a branch line 54. The construction of the valve 48 is such that when pressure fluid is applied thereto through the line 54, the pressure fluid motor for closing the press is connected with the supply line 49, and at all other times the motor is connected to an exhaust or a drain by the conduit 51. The flow of air through line 54 is controlled by two normally closed safety valves 55 and 56 connected in series with a normally closed three-way diaphragm valve 57, the purpose of which will be hereinafter apparent. The normally closed safety valve 55 is fixed to the press in such a manner that it is opened by the platens 10 and 11 of the lower deck as they reach their "in" position, that is, their position within the press, and the valve 56 is fixed to the press in such a manner that it is opened by the platens 12 and 13 of the upper deck as they reach their "in" position. The construction is such that the diaphragm valve 57 which controls the supply of air for actuating the valve 48 is not connected to the supply line until both pairs of platens or decks are properly positioned within the press. When the diaphragm valve 57 is in its normally closed position the load side thereof is open to atmosphere through the conduit 58.

The electric motors 30 and 31 are adapted to be connected to the supply lines L^1, L^2, and L^3 through solenoid operated reversing switches A and B, respectively, of the self-holding type. Preferably, the motors are of the three-phase alternating current type and are provided with magnetic brakes. The "in" solenoid 59 of the switch A, that is, the solenoid which closes the circuit to rotate the motor 30 in a direction to circuit the lower pair of platens 10 and 11 into the press proper, is in series with a manually controlled push button switch 60 in a switch box 61 fixed to the outside of one of the runway brackets 15. When the push button 60 is released after being initially closed, the circuit to the solenoid 59 is maintained energized through the holding circuit of the switch A. When the platens reach their "in" position, the holding circuit to the solenoid is broken by the opening of a normally closed limit switch 64 in a switch box 65 secured to the press in such a manner as to be actuated by the platens as they reach their "in" position. Simultaneously with the opening of the limit switch 64 the movement of the platens 10 and 11 closes a normally open switch 66 also located within the switch box 65. A single actuating lever operates both of these switches and the purpose of the switch 66 will be hereinafter apparent.

The "in" solenoid 67 of the switch B is in series with a push button switch 69 in a switch box 70 fixed to the outside of one of the runway brackets 17. After the push button switch has been operated to close the "in" solenoid of the switch B the circuit thereto is maintained energized by the holding circuit of switch B. As the platens 12 and 13 of the upper deck reach their "in" position, the holding circuit for the solenoid 67 is opened by a normally closed limit switch 72 in a switch box 73, the actuating lever of which is adapted to be moved by the upper platen 13. Simultaneously with the opening of the limit switch 72 a normally open switch 74 also located in the switch box 73 is closed by the movement of the platens. The latter switch 74 is in series with the switch 66, and when both of these switches are closed, a circuit is completed which energizes the motor 80 of a time cycle device of commercial construction, designated generally by the reference character C, the operating mechanism of which includes a cam 81 and a cam follower 82. The cam follower 82 is supported on a pivot 83 and oscillation thereof about the pivot under the control of the cam 81, as will be hereinafter referred to, produces a vertical reciprocation of a bracket or frame 85 which, in turn, controls a plurality of three-way block air valves 86, 87, 88, and 89 and two micro switches 90 and 91, the former of which is of the double throw type. The construction of the air valves 86, 87, 88, and 89 is such that when the valves are in their closed positions the load sides thereof are open to atmosphere through small apertures therein.

The "bumping" of the press is effected in the following manner during the initial rotation of the cam 81, that is, while the cam follower 82 is traveling along the portion 92 of uniform rise, simultaneously with the closing of the circuit to the motor 80 of the time cycle device, a series circuit is closed to the automatic bumping solenoid-operated valve 93 through a normally closed hydraulic switch 94 and the normally closed lower contacts of the micro switch 90. When the solenoid valve 93 is energized, it by-passes air from the supply line 53 to an air line 95 leading to the valve 57 which in turn operates the diaphragm valve 48 causing high pressure fluid to be admitted to the line 50 leading to the press, thus causing the press to close. As soon as the pressure in the line 50 leading from the diaphragm valve 48 to the press cylinder and in a branch line 97 leading to the hydraulic switch 94 reaches a predetermined amount, the hydraulic switch opens, thus breaking the circuit to the solenoid valve 93 allowing the same to return to its initial position and shutting off the supply of air to the valve 57, causing the valve 48 to shut off the supply of hydraulic fluid to the press cylinder with the result that the press begins to open and the pressure in the molds is relieved. As soon as the pressure in the line 50 falls to a certain point, the hydraulic switch 94 closes, again causing pressure to be

applied to the press. The hydraulic switch 94 is so set or adjusted that the press is subjected to substantially full pressure before it actuates to open the circuit to the solenoid valve 93, and again actuates to close the circuit when the pressure has fallen a predetermined amount. During the interval that pressure is building up in the pneumatic control system to again actuate the valve 48 the pressure is relieved from the molds. Preferably this interval is of sufficient length for the press to open slightly.

The pressure is relieved and then applied a number of times, that is, until the cam follower 82 rides up onto the raised portion 98 of the cam 81. The duration of the "bumping" operation, that is the number of the times the press is "bumped," can be varied by an adjustable sector 99 on the cam 81. Movement of the cam follower raises the frame 85 a short distance to open the normally closed air valve 86 and supply air through the normally open valve 87, which is in series therewith, to the diaphragm valve 57 which, in turn, admits air to the second diaphragm valve 48, thereby either closing the press or continuing the same closed as the case might be. Thereafter the circuit to the solenoid valve 93 is maintained open by the continued high pressure applied to the hydraulic switch 94. The initial upward movement of the frame 85 opens the normally closed air valve 88, simultaneously with the actuation of the valve 86 previously referred to, admitting air to the left hand end of a cylinder 101, thereby reciprocating or moving a rack 102 to the right as viewed in Fig. 2. This movement of the rack 102 advances or rotates the cam 81 an adjustable amount depending upon the location of a stop 103 through a pawl and ratchet mechanism not shown. A friction clutch interposed between the cam 81 and the motor 80 allows the cam 81 to be advanced without affecting the motor drive. After the cam has been advanced by the rack 102 a predetermined amount, depending upon the length of cure desired, it continues to rotate at a comparatively slow constant speed under the control of the synchronous motor 80.

After the expiration of the allotted time the cam follower 82 travels up the inclined portion or surface 105 of the cam 81 leading to the highest portion or surface 113. Movement of the frame 85 produced thereby actuates the micro switch 90 to open the normally closed contacts thereof and close the normally open contacts, which, in turn, closes the circuit to a relay 106 the contacts of which are in series with normally open "down" limit switches 107 and 108 which remain open until the lower head 25 and floating head 27, respectively, are in their down position. As the cam follower 82 continues up the inclined portion or surface 105 the frame 85 closes the normally open air valve 87 which in turn actuates the diaphragm valve 57 to reverse the diaphragm valve 48 to open the press. The high surface 113 of the cam 81 is of sufficient length to maintain the normally open contacts of the micro switch 90 closed long enough for the press to open. When the "down" limit switches 107 and 108 close, both pairs of platens automatically move to their "out" position, that is, the position shown in Fig. 1, at which time the circuits to the motors 30 and 31 are opened by "out" limit switches 109 and 110, respectively. The "down" limit switches 107 and 108 are actuated by the movement of the lower head 25 and the floating head 27, respectively, and the "out" limit switches, which are in series with the "out" solenoids 111 and 112 of the switches A and B, respectively, are actuated by the platens 10 and 12, respectively.

Subsequent to the actuation of the micro switch 90 the micro switch 91 is closed by the continued movement of the cam follower 82 along the inclined surface 105. This closes a circuit to the clock motor 80 which circuit is in parallel with the circuit to the clock motor 80 in which the contacts 66 and 74 of the limit switches 65 and 73 are located. The purpose of this circuit is to maintain the clock motor 80 energized after the contacts 66 and 74 of the limit switches 65 and 73 are opened upon the platens moving to their "out" position, thus continuing the rotation of the cam 81 until the follower 82 drops off of the high portion or surface 113. When the cam follower 82 drops off the high level 113 the frame 85 returns to its original position, opening the micro switches 91, thus breaking the circuit to the motor 80 stopping the clock, and the normally open air valve 89, which closed upon the initial movement of the frame 85, thus admitting air to the opposite end of the cylinder 101 to reset the rack 102. Return of the frame 85 to its original or down position also opens the normally open contacts of the micro switch 90 breaking the circuit to the relay 106, and closes the normally closed contacts of the micro switch 90 in series with the solenoid valve 93.

A three-way valve 100 is provided for manually "bumping" the press if such is desired. While in the preferred embodiment shown the "bumping" operation takes place upon the initial closing of the press, it will be apparent that any desired arrangement of the "bumping" operation may be obtained by constructing the cam 81 in the necessary manner. In the embodiment shown the necessary lag required in the "bumping" operation is obtained in the pneumatic control system, but it is to be understood that this lag can be otherwise obtained, as by means of a time delay device. Air is supplied to the air valves 86, 87, 88 and 89 from the line 53 by a branch line 114. A pneumatic switch 115 connected to the air line which connects the valve 87 and the pneumatic valve 57 causes a signal lamp 116 to burn while the press is closed. This gives a visual indication of the condition of the press, and it will be understood that other signals may be employed as desired or the same may be omitted altogether. Manually controlled push button switches 117 and 118 in the switch boxes 61 and 70, respectively, permit either pair of platens to be moved out at will while the press is open. Similarly controlled push button switches 119 and 120 also in the switch boxes 61 and 70, respectively, are provided for emergency use and permit the operation of the platens to be stopped at any time.

From the foregoing description of the preferred embodiment of the invention it will be apparent that the objects of the invention heretofore enumerated and others have been accomplished and that a novel control means has been provided for automatically "bumping" a fluid pressure actuated press. Although the invention has been herein illustrated and described as embodied in a vulcanizing press of particular construction, the invention is not limited to vulcanizing presses or to the embodiment shown herein but is equally applicable to other fluid pressure actuated presses where it is desired to "bump" the press. As previously stated the invention is not limited to the particular construction shown and it is the intention to cover hereby

all adaptations, modifications and variations thereof which come within the practice of those skilled in the art to which the present invention relates and within the spirit and scope of the appended claims.

Having thus described my invention, I claim:

1. In a press, the combination of a pair of opposed press heads relatively movable toward and away from each other, a pressure fluid actuated motor for producing relative movement between said press heads, means for supplying to and exhausting pressure fluid from said motor including a valve, said valve when in one position serving to permit pressure fluid to exhaust from said motor to open the press, means operatively connected to said motor and controlled by the pressure of fluid therein for actuating said valve to move to said position for exhaust when the pressure in said motor rises to a predetermined value thereby causing the press to open and for moving said valve away from said position for exhaust when the pressure in said motor drops to a predetermined value thereby causing the press to close upon supply of pressure fluid to said motor, and means for rendering said last named means inoperative and thus maintain the press closed.

2. In a press, the combination of a pair of opposed press heads relatively movable toward and away from each other, a pressure fluid actuated motor for producing relative movement between said press heads, means for supplying to and exhausting pressure fluid from said motor including a pressure fluid actuated valve, said valve when in one position serving to permit pressure fluid to exhaust from said motor to open the press, means operatively connected to said motor and controlled by the pressure of fluid therein for actuating said valve to move to said position for exhaust when the pressure in said motor rises to a predetermined value thereby causing the press to open and for moving said valve away from said position for exhaust when the pressure in said motor drops to a predetermined value thereby causing the press to close upon supply of pressure fluid to said motor, and means for rendering said last named means inoperative and thus maintain the press closed.

3. In a press, the combination of a pair of opposed press heads relatively movable toward and away from each other, a pressure fluid actuated motor for producing relative movement between said press heads, means for supplying to and exhausting pressure fluid from said motor including a pressure fluid actuated valve, said valve when in one position serving to permit pressure fluid to exhaust from said motor to open the press, means including a pressure fluid actuated electric switch operatively connected to said motor and controlled by the pressure of fluid therein and operatively connected to an electric solenoid operated valve for actuating said pressure fluid actuated valve to move to said position for exhaust when the pressure in said motor rises to a predetermined value thereby causing the press to open and for moving said valve away from said position for exhaust when the pressure in said motor drops to a predetermined value thereby causing the press to close upon supply of pressure fluid to said motor, and means for rendering said last named means inoperative and thus maintain the press closed.

4. In a press, the combination of a pair of opposed press heads relatively movable toward and away from each other, a pressure fluid actuated motor for producing relative movement between said press heads, means for supplying to and exhausting pressure fluid from said motor including a valve, said valve when in one position serving to permit pressure fluid to exhaust from said motor to open the press, means operatively connected to said motor and controlled by the pressure of fluid therein for actuating said valve to move to said position for exhaust when the pressure in said motor rises to a predetermined value thereby causing the press to open and for moving said valve away from said position for exhaust when the pressure in said motor drops to a predetermined value thereby causing the press to close upon supply of pressure fluid to said motor, means for subsequently rendering the last mentioned means inoperative and thus maintain the press closed, and means for subsequently automatically opening the press after a predetermined time.

5. In a press, the combination of a pair of opposed press heads relatively movable toward and away from each other, a pressure fluid actuated motor for producing relative movement between said press heads, means including a power actuated valve serving when in one position to operatively connect said motor to a source of fluid pressure to close the press and serving when in another position to permit pressure fluid to exhaust from said motor to open the press, means for moving said valve to the first mentioned position, and means operatively connected to said motor and controlled by the pressure of fluid therein for moving said valve into the second mentioned position when the pressure in said motor rises to a predetermined value thereby causing the press to open and for again moving said valve into the first mentioned position when the pressure in said motor drops to a predetermined value thereby causing the press to close, and means for rendering said last named means inoperative and thus maintain the press closed.

EDMUND M. WINEGAR.