

Sept. 23, 1941.

G. L. YEAKEL

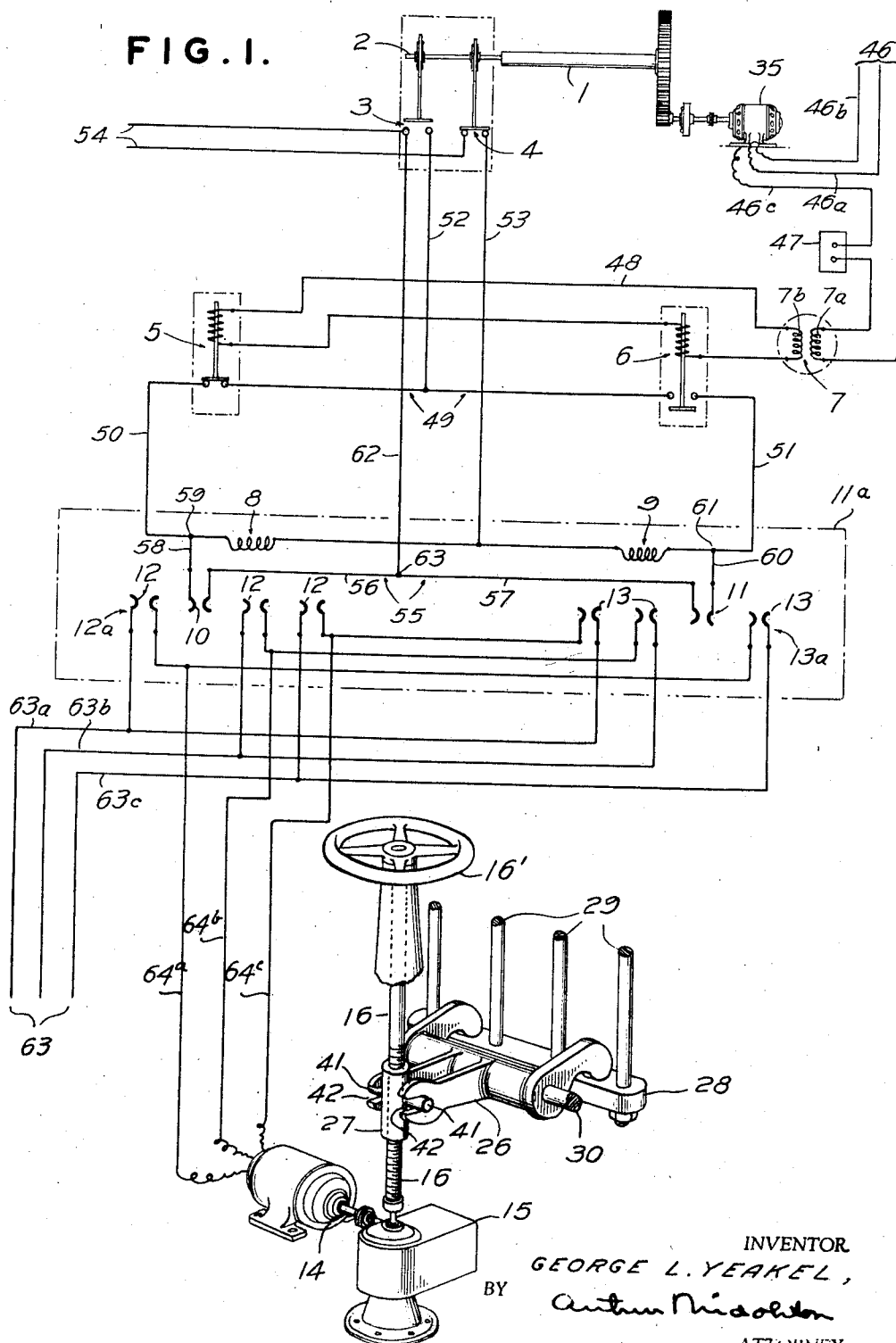
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CONTROL APPARATUS FOR MOLDING PRESSES

Filed Jan. 18, 1940

3 Sheets-Sheet 1

FIG. 1.



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3 Sheets-Sheet 2

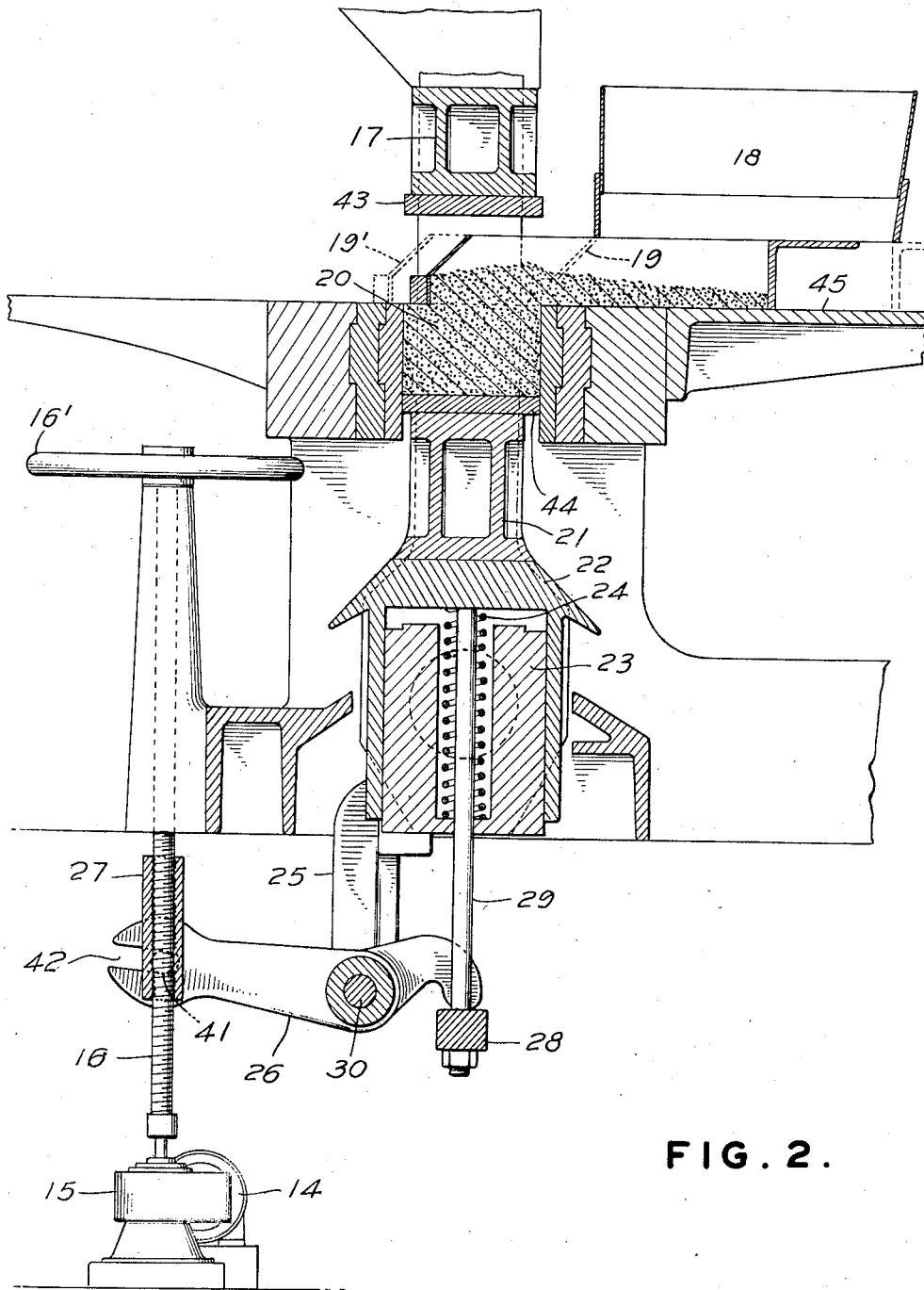


FIG. 2.

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FIG. 3

2, 1, 35, 54, 76, 75, 66, 69, 67, 70, 65, 68, 71, 62, 53, 77, 7b, 7a, 7, 59, 8, 9, 61, 60, 12, 10, 56, 57, 13, 11, 13, 73, 11a, 63a, 63b, 63c, 63, 74

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CONTROL APPARATUS FOR MOLDING
PRESSES

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Application January 18, 1940, Serial No. 314,501

11 Claims. (Cl. 25—45)

This invention relates to a control or regulator apparatus, and method of using the same, for molding presses which make a cyclic power demand on the prime movers which drive them. More particularly it relates to an apparatus for, and means of, controlling the volume of the material fed into the molds of a molding press such as a brick press during the feeding portion of the brick forming cycle.

In a modern brick press, especially of the type known as the Boyd press, there is provided a mold with which plungers cooperate to form the top and bottom of the mold. Means are provided for supplying material to the mold, and motor driven means are provided for moving the plungers toward each other for thus pressing the material in the mold into the shape of a brick. In a press of this general type, the position of the bottom plunger at the time the mold is filled determines the volume of the brick forming mix which enters the mold, and therefore, determines the forming pressure, the weight of the brick, the thickness of the brick, and influences to a large degree the porosity and density of the brick.

The manufacturer of bricks, especially refractory bricks, strives for uniformity in the thickness, weight, and qualities of his product. The density and porosity of refractory bricks greatly influence several refractory qualities in which uniformity is an essential factor such as slag absorption, chemical reactivity to furnace slags and furnace atmospheres, and resistance to thermal shock. Absolute uniformity of the bricks in the pressing operation is dependent upon three factors, the time of each pressing cycle being constant: (1) uniformity of the volume and the apparent density of the brick forming mixture entering the mold during each cycle (2) the same position of the bottom plunger relative to the top of the mold during each mold-filling operation and (3) the application of the same amount of pressure during each cycle. Since the commonly used method of feeding the mold does not provide for absolute uniformity in the density of the brick-forming mixture entering the mold on each cycle, it is necessary that means be provided for making volume adjustments by controlling the position of the bottom plunger to compensate for variations in the density of the brick-forming mixture. In the normal press operation the adjustment is made manually from time to time, sometimes every few minutes, by the operator who judges from the weight and thickness of the brick whether

the proper amount of material has been used, or from the sound of the press (as learned from his experience) whether excessive pressures are being used in brick forming.

5 The adjustment of the volume of the mold to provide for variations in the density of the brick-forming mixture also results in greater uniformity of the pressure exerted by the press on the brick forming mixture from cycle to cycle. 10 Therefore, I have found that the peak pressure exerted by the press during the brick forming cycle is usable as a measure by which the volume of the material entering the mold can be controlled, and this fact forms the basis of the 15 present invention.

The work done by a mechanical molding press can be measured by the electrical demand of the motor which drives the press. If a recording ammeter (or a recording wattmeter) is placed in the 20 lines to the motor driving a press of the type described, the curve will show that the operation of the press makes a cyclic demand for power, that the amperage increases rapidly in accordance with a serrated curve from a minimum at approximately the time the top plunger enters 25 the mold to a maximum that reaches a peak at approximately the time of maximum brick-forming pressure, and then quickly drops back. The positions of the plungers at the maximum 30 and minimum points on the ammeter curve may not occur precisely as described above, due to the leverage action of the press toggle mechanism and to the lag of the electrical equipment in recording the effects of the mechanical actions 35 of the press, but for the purposes of this description, the statement can be considered as accurate.

40 When the position of the bottom plunger during the mold filling portion of the cycle is properly adjusted, that is to say, when variations in the apparent density of the brick-forming mixture are compensated for by controlling the volume of the mold, the values indicated by the peak 45 of the ammeter curve are substantially uniform. Measurements on hundreds of brick made under conditions in which the ammeter peak readings reached a uniform height show that under those conditions the brick are more nearly uniform in 50 thickness, weight and density. By the present invention there is provided a control or regulator apparatus in which variations from a chosen value for the peak readings of the ammeter automatically actuate means which increase or decrease the volume of the material fed to the 55

mold to correct the condition which caused the variation.

Objects of this invention, therefore, are to provide a control apparatus for molding presses which make a cyclic demand upon the motors which drive them; to provide for automatic compensation of the volume of the material entering the mold to compensate for variations in the apparent density of the brick-forming material; and to provide for adjustment of the weight of the material entering the mold of the press during the mold filling portion of the cycle, in order to maintain substantially uniform pressure peaks from cycle to cycle by using the peak pressure of a preceding cycle to regulate the peak pressure reached in the succeeding cycle. Other objects and features of advantage flowing from the invention will appear hereinafter.

To these ends, this invention may be practiced in a brick or other molding press having a mold, means for feeding material to the mold, a top and a bottom plunger cooperating with the mold and forming a top and a bottom respectively for it, and motor driven means for at least one of the plungers, by providing means for controlling the quantity of material fed to the mold based upon the peak current consumption of the motor means during a preceding pressing cycle of the press. A manner of so doing is to make use of means for adjusting the initial position of at least one of the plungers with respect to the mold during mold filling phase that includes a reversible motor, and means for automatically controlling the direction and extent of motion of the reversible motor.

The invention is illustrated in the accompanying drawings which show the best embodiment of the invention of which I am at present informed, but it is to be understood that this embodiment is chosen for illustrative purposes as the invention obviously is capable of other embodiments. In the accompanying drawings, the invention is shown as attached to a brick press of Chisholm, Boyd & White Company, of Chicago, Illinois, especially their Model X. This press is well known and is a complicated and powerful machine. But as this invention relates to auxiliary equipment therefor or for an equivalent press, there will only be shown in the drawings, those brick forming parts of that press which are believed to be necessary to a clear understanding of this invention.

In the drawings,

Fig. 1 represents the electrical system with associated devices for automatically controlling the volume of the mold by way of contact means responsive to the electrical energy demand of the load cycle.

Fig. 2 shows plunger arrangement and parts of a molding press, which are substantially directly concerned in mold adjustment and brick formation.

Fig. 3 shows an electrical system similar to that of Fig. 1 except for a different type and arrangement of the energy responsive contact means.

The general type of machine to which the present improvements apply, is well known, and it is exemplified, for instance, in patents to Flood No. 985,153 and No. 987,124. For a general identification it is sufficient to say that a mold table containing the mold is supported in the main frame of the machine. The mold is fed and the brick delivered by a horizontally reciprocating charger. A top and a bottom plunger disposed opposite one another fit the mold and act upon

the material placed therein by the charger. In the course of a brick pressing cycle both plungers compress the material in the mold, then the upper plunger withdraws upwardly and the bottom plunger advances to lift the resultant brick out of the mold and to the level of the mold table, whereupon the advancing charger delivers the brick onto the table and simultaneously refills the mold. After the charger has been withdrawn the brick forming cycle starts anew.

Referring to the drawings, it will be seen that the brick forming cycle in a brick press, such as, for example, in what is familiarly known in the industry as the "Boyd press," consists of feeding the brick forming material from a hopper 18 into a mold-feeding box or charger 19, which has a capacity greater than that required to fill the mold 20; the loaded mold-feeding box 19 moves to a dotted line position 19' over a mold, filling the mold, the bottom of which mold is the bottom press plunger 21; the mold-feeding box returns to its loading position under the hopper 18, leveling the excess loose material even with the top of the mold; the top plunger 17 enters the mold 20 pressing the brick forming mixture, the maximum pressure being reached approximately at the bottom of the down stroke of the top plunger; the maximum pressure is maintained for a short period of time as the bottom plunger starts its upward stroke; the top and bottom plungers move upwardly, maintaining approximately their relative positions until the bottom plunger reaches the top of the mold; the upward stroke of the bottom plunger is stopped at the top of the mold and the top plunger continues its upward travel to a position which provides clearance for sliding or removing the brick from the press, and for the passage of the mold-feeding box over the mold. After the brick has been removed from the press, the bottom plunger returns to the position at the bottom of the mold, the top plunger remaining stationary, the mold-feeding box fills the mold as described above and the cycle is repeated.

The pressure exerted on the brick-forming mixture by the top plunger 17, on its downward stroke into the mold 20, causes the bottom plunger 21, which is fastened to the saddle 22, to move toward the lower cross-head 23, until the saddle 22 touches the lower cross-head 23, compressing the saddle spring 24. The downward movement of the saddle 22 lowers the saddle-rod 29 and the cross-bar 28 so that the cross-bar 28 is no longer in contact with the pressure adjusting lever 26. The entire pressing mechanism then rises in relation to the press frame, although the top plunger 17 is still moving downwardly toward the ascending bottom press plunger causing maximum compression of the brick-forming mixture when the top plunger 17 and the bottom plunger 21 are closest together. After the brick is pressed, if the operator of this machine desires to vary the volume of brick-forming material passing into the mold for the next cycle, he turns hand-wheel 16' that operates a pressure adjusting screw 16 that carries a threaded sleeve 27 provided with lugs or bosses 41 that engage slots 42 of adjusting lever 26. This lever is fastened on lever shaft 30 which in turn is supported by brackets 25 extending from the lower cross-head 23. The other end of lever 26 is engageable with cross bar 28.

Turning the hand-wheel 16' in one direction depresses the sleeve 27 which in turn depresses the outer end of lever 26 by means of the lugs

41 engaging the slots 42 of the lever. This causes the inner end of the lever 26 to rise so that at the completion of the next downward stroke of the lower cross-head 23 the position of the bottom plunger will be raised because the contact of the inner end of the lever 26 and the cross-bar 28 has been raised. This in turn permits the mold 20 to receive a smaller volume of brick-forming material from the mold feeding box 19. The result of this is that decreased pressure will be exerted by the plungers on the material being molded, whereupon the peak value of the current consumption curve of the press operating motor 35 will drop.

If, however, the operator turns the hand-wheel 16' in the opposite direction, a reverse train of events takes place. This increases the volume of brick-forming mixture or material entering the mold 20. And this in turn will increase the pressure required for the next pressing cycle, thus tending to increase the peak value of the current consumption curve of the press operating motor 35.

43 indicates the die carried by the top plunger 17 while 44 indicates the die carried by the bottom plunger 21. 45 indicates the table of the press. The plungers 17 and 21 are moved toward and away from each other through the medium of suitable levers and toggles motivated from the main press operating motor. The bottom plunger is reciprocated by reciprocation of the cross-head 23 by levers just mentioned. All of this motivating arrangement is well known and therefore not shown.

The present invention contemplates providing on the motor 35 driven main shaft 1 of the press, a cam shaft 2, of the two cam switches 3 and 4. The shaft 1, and therefore the cam switch shaft 2, makes one revolution for each press cycle. One of the cam switches 3 makes one momentary contact per revolution of its shaft, and the cam is set so that the contact is made at the instant the ammeter curve is at its peak. The cam on switch 4 is arranged so that the contact is in closed position when switch 3 makes its contact, and so that the contact on switch 4 is maintained for a predetermined period of time, and then broken.

Current responsive devices are to be influenced by the motor driving the press, hence the solenoid coils of the current relays 5 and 6 are connected in series with one phase of the press motor current. An ammeter or wattmeter with suitable contacts may be substituted for each of the two current relays. Both relays 5 and 6 are adjustable (for example, by added weights) to operate at a predetermined amperage of the press motor. Relay 5 is normally closed, and relay 6 is normally open. A transformer 7 is used to transform the motor current to an amperage suitable for the relays. The operating coils 8 and 9, and the holding interlocks 10 and 11, of a reversing magnetic starter 11a are electrically connected to the cam switches 3 and 4 through the current relays 5 and 6. When energized, the coil 8 closes switch contacts 12, causing the motor 14 to run in the forward direction, the holding interlock 10 providing current to energize the coil 8 after the momentary contact of switch 3 is broken. The motor 14 connected to the press pressure adjusting screw 16 by the speed reducer 15, when running in the forward direction, regulates the press pressure adjusting mechanism, so that on the next cycle of the press, the position of the bottom plunger

is lowered at the time of mold filling. If, however, coil 9 is energized, it closes the switch contacts 13, causing the motor 14 to run in the reverse direction, the holding interlock 11 providing current to energize the coil 9 after the momentary contact of switch 3 is broken. The motor 14, when running in the reverse direction, reverses the action of the adjusting mechanism so that on the next cycle of the press, the position of the bottom plunger is raised at the time of mold filling. When the contact at switch 4 is broken, the circuit through the holding interlock 10 or 11 to the coils 8 or 9 respectively is broken, and the motor 14 stops.

As an example, it is desired to operate the brick press so that the peaks of the ammeter curve will be maintained as closely as possible within the definite limits of 40 to 42 amperes. As explained previously relay 5 is normally closed and relay 6 is normally open. In this case relay 5 must be adjusted to open at 40 amperes, and relay 6 must be adjusted to close at 42 amperes.

If the peak of the ammeter curve is between 40 and 42 amperes, relay 5 opens, relay 6 remains open, and therefore no current flows to either of the operating coils 8 or 9, when the momentary contact is made at switch 3. Therefore the motor 14 does not move, no adjustment of the position of the lower press plunger being necessary.

If the peak of the ammeter curve is below 40 amperes, when the momentary contact is made at switch 3, the relays 5 and 6 remain in their normal positions, that is relay 5 is closed and relay 6 is open. The current then passes through relay 5 and energizes operating coil 8, and as explained previously, causes the motor 14 to run in the forward direction, lowering the position of the bottom press plunger at the time of the next mold filling. This increases the volume of the brick forming mixture entering the mold, which in turn increases the press pressure required for the next cycle of the press, and tends to bring the peak of the ammeter curve within the desired limits. After a predetermined period of time the motor 14 is stopped by breaking the circuit at cam switch 4.

If the peak of the ammeter curve is above 42 amperes, when the momentary contact is made at switch 3, relay 5 is opened, relay 6 is closed, and the current passes through relay 6, energizing the operating coil 9, and causes the motor 14 to run in the reverse direction. Running in the reverse direction, the motor 14 raises the position of the bottom press plunger at the time of the next mold filling. This decreases the volume of brick forming mixture entering the mold, thus decreasing the pressure required for the next cycle, and tending to bring the peak of the ammeter curve within the desired limits. After a predetermined time the motor 14 is stopped by breaking the circuit at cam switch 4.

To prevent over-shooting or hunting, the cam switch 4 is preferably timed to stop the motor 14 after allowing from one-fourth to one-half revolution of the pressure adjusting screw 16.

The operating coils 8 and 9, the holding interlocks 10 and 11, and the switch contacts 12 and 13 are embodied in commercial line-starters and I make no claim to the invention of such equipment. I have described the electrical operation of the line-starter merely to clarify its action in respect to my invention, and not to

indicate that the arrangement of these particular parts is new or novel.

The control system as represented by the wiring diagram will now be described with respect to conductors, circuit portions, circuit means, and circuits involved:

A three-phase power circuit 46, having phases 46^a, 46^b, 46^c, feeds the main driving motor 35 herein also called the press motor because it operates a press. One of the phases, for instance 46^c, has therein a current indicating instrument, such as an ammeter 47 and the primary coil 7^a of the transformer 7. The secondary transformer coil 7^b is part of the secondary transformer circuit 48 which energizes the solenoids 5 and 6.

Then, there is what is herein called a secondary or auxiliary circuit alternatively operative system 49 which is functionally divided into a pair of parallel secondary circuit portions 50 and 51. The circuit portion 50 includes the contacts of the solenoid device 5 and the magnet coil 8. The circuit portion 51 correspondingly includes the contacts of the solenoid device 6 and the other magnet coil 9. Common conductors or power connections 52 and 53 feed the secondary circuit portion 50 or 51 respectively by way of the momentary switch 3 and the stop switch 4 from a source of power indicated at 54. Coupled with the secondary circuit system 49 are interlock circuit means 55, which correspondingly include alternatively operative branches 56 and 57.

Branch 56 leads over interlock contacts 10 and a conductor 58 to a point 59 of the secondary circuit system. Branch 57 leads over interlock contacts 11 and a conductor 60 to a point 61 of the secondary circuit system. A conductor 62 leads from a point 63 of the interlock circuit means to the power supply 54 in a manner to establish a holding or maintaining circuit for the respective holding coils 8 or 9 of the magnetic line starter, which circuit is independent of the momentary switch 3, but may be broken or established respectively by the stop switch 4 in conjunction with the interlock contacts 10 or 11 respectively of the line starter.

Then, there is what is herein called the control circuit for energizing the auxiliary motor 14. It feeds from a source 63 indicated by the three phases 63^a, 63^b, 63^c. This circuit includes the auxiliary motor 14 and corresponding contacts 12 and 13 respectively of the line starter 11^a. It will thus be seen that the line starter 11^a is divided into sections 12^a and 13^a alternatively supplied from the source 63, depending upon which of the two solenoid contact devices 5 and 6 have been actuated in response to peak power demand of the load cycle of the press. Conductors 64^a, 64^b, 64^c lead from the line starter 11^a to the auxiliary motor 14.

It should be understood that instead of each of the solenoid actuated contact devices there may be used a current indicating instrument such as an ammeter having limit contacts.

A further modification including the use of an ammeter (or a wattmeter) in controlling the secondary circuit system is shown in the wiring diagram of Fig. 3. A single ammeter contact device 65 takes the place of the two individual contact devices 5 and 6 of Fig. 1. This ammeter device may be said to be of the double acting type in that it has a limit contact or contact plate 66 corresponding to a lower predetermined current value of the peak power demand, and

spaced therefrom another limit contact or contact plate 67 corresponding to a somewhat higher predetermined current value of peak power demand. The contact plates 66 and 67 are adjustable and may be moved along the ammeter or wattmeter scale. The pointer or indicator 68 of the instrument has a contact point. The space 69 between the two contact plates 66 and 67 represents the admissible margin within which no regulatory effect on the power demand needs take place, and accordingly, when the pointer 68 is in the space between the two contact plates both secondary circuit portions 70 and 71 respectively are open. When one or the other contact plate is touched by the pointer as a result of a corresponding peak power demand, a corresponding section 72 or 73 respectively of a magnetic line starter will be actuated, and a motor 74 energized. The motor 74 corresponds to the similar motor 14 in Fig. 1. A conductor 75 leads from the momentary switch 76 to the ammeter 65. Feed conductors for the ammeter are those at 77 in which fluctuates a current proportional to the power demand of the load cycle. Otherwise the operation of this system corresponds closely to that of Fig. 1 as described, and like parts and their functions will therefore be readily identified by the like numbers applied thereto.

One embodiment of the mechanical effect of the electrical control is shown in Fig. 2. The drawings illustrate the lower portion of a brick press with the addition of the motor 14 and the speed-reducer 15, both of which are parts of the control equipment described previously. In the drawings, the press parts are in the mold-filling position. The brick-forming mixture drops from the hopper 18 into the mold-feeding box at position 19. The mold-feeding box moves beneath the top plunger 17 to the position 19', filling the mold 20. The mold-feeding box returns through the position 19' to the position 19, leveling the loose material even with the top of the mold 20.

The pressure exerted on the brick-forming mixture by the top plunger 17, on its downward stroke into the mold 20, causes the bottom plunger 21, which is fastened to the saddle 22, to move toward the lower cross-head 23, until the saddle 22 touches the lower cross-head 23, compressing the saddle spring 24. The downward movement of the saddle 22 lowers the saddle-rod 29 and the crossbar 28 so that the crossbar 28 is no longer in contact with the pressure adjusting lever 26. The entire pressing mechanism then rises in relation to the press frame, although the top plunger 17 is still moving downwardly toward the ascending bottom plunger 21, causing maximum compression of the brick-forming mixture when the top plunger 17 and the bottom plunger 21 are closest together. At this point in the cycle the momentary contact switch 3 closes, permitting the motor 14 to turn the adjusting screw 16 if required by the control apparatus, all as explained previously. As the adjusting screw 16 turns, it moves the adjusting sleeve 27, on which lugs extend into the slots of the adjusting lever 26. The lugs are the fulcrum about which the adjusting lever 26 acts. Before the filling of the mold box occurs, as described above, the lower cross-head 23 comes to rest at its lowest position. This position is the same for every cycle of the press. The adjusting lever 26 is fastened at the lever shaft 30 to the lower cross-head 23 by the adjusting lever bearing 25. Changing the fulcrum position of the adjusting lever 26 varies the depth at which the cross-bar

28 comes to rest, being pushed down by the lever 26. The position of the cross-bar 28, because it is fixed to the bottom plunger 21 by means of the saddle rod 29 and the saddle 22, determines the relative position of the bottom plunger 21 with respect to the top of the mold 20. The mold 20 is filled again and the cycle repeated.

Thus, it can be seen that this invention makes use of the peak pressure to control adjustment of the parts to provide a desired peak pressure of the succeeding pressure cycle. The invention is useful in all pressure molding presses such as are common for making briquettes and for molding plastics, so long as the features are made use of that are specified in the appended claims.

I claim:

1. In an electrically driven machine that makes a cyclic demand for power, such as a press, a control system comprising a driving motor to satisfy said demand, means for regulating the peak power demand, a reversing motor for actuating the regulating means, a control circuit to energize said reversing motor, comprising a reversing magnetic line starter having two alternately operable magnet coil actuated sections adapted to control the direction in which the reversing motor is to run, a secondary circuit portion comprising the magnet coil of the one starter section, and adapted to be closed when the power current drops below a predetermined value, another secondary circuit portion in parallel with the first-mentioned secondary circuit portion and operative alternative thereto and comprising the magnet coil of the other starter section, and adapted to be broken when the power current rises above a predetermined value somewhat higher than the first-mentioned predetermined value, which values are proportional to respective power demands of the operating cycle of the machine, contact means responsive to electrical energy demand and effective to close one of said secondary circuit portions in response to power currents at and below said predetermined lower current value, and to close the other of said secondary circuit portions in response to power currents at and above said predetermined upper limit value, common connections for both said parallel secondary circuit portions, a momentary-contact switch in said common connections, timed with the load cycle of the machine for making contact at the time of peak demand on the driving motor, to allow current to flow to the reversing magnetic line starter through one or the other of said secondary circuit portions depending upon the then response condition of said contact means, to operate the reversing motor at amperages above and below said respective predetermined current values, a stop switch also timed with the load cycle of the machine, to break whichever secondary circuit is then operative and thereby effective to de-energize the respective magnetic line starter section to stop the reversing motor after a predetermined period of time, and interlock circuit means directly coupled with said secondary circuit portions for maintaining said magnetic coils energized after said momentary switch has opened, which interlock circuit means are arranged with respect to said connections to function independently of said momentary contact switch, said stop switch being disposed for directly controlling said maintaining interlock circuit means to open the same when the stop switch opens.

2. A molding press having a mold and adapted

to operate in a cycle in which material is fed in a first operating phase to fill the mold, the material compressed in a second operating phase, and the compressed material removed from the mold in a third phase, said molding press further having means for feeding said material to the mold, a top plunger means and a bottom plunger means cooperating with the mold and forming a top and a bottom respectively for it, means by which at least one of said plungers is reciprocated in a manner that one stroke is a pressing stroke that exerts a peak pressure upon the material in the mold, main electro-motivating means for effecting the plunger reciprocation, and an electrical control system responsive to the peak pressure incident to the pressing stroke in one operating cycle for adjusting the relative position of the bottom plunger with respect to the mold during the mold filling phase of the next succeeding cycle, said electrical control system comprising means responsive to the peak power consumption of said main electro-motivating means.

3. A molding press according to claim 2, in which said electrical control system further comprises auxiliary electro-motivated means, and means for controlling the same from said main electro-motivating means for influencing said relative position of the bottom plunger.

4. A molding press according to claim 2, in which said electrical control system further comprises auxiliary electro-motivated means comprising a reversible motor, and means for controlling the direction and extent of motion of the reversible motor from said main electro-motivating means for influencing said relative position of the bottom plunger.

5. A molding press according to claim 1, in which the electrical control system further comprises auxiliary electro-motivated means comprising a pressure adjusting screw for positioning the bottom plunger, a reversible motor for operating said adjusting screw, and means for controlling the starting, direction, and extent of motion of the reversible motor from said main electro-motivating means, for influencing said relative position of said bottom plunger.

6. A molding press according to claim 1, in which said electrical control system comprises electro-motivated means having a reversible motor, means for controlling the starting, direction, and extent of motion of the reversible motor from said main motivating means, and timing means associated with said main motivating means for automatically stopping the operation of the reversible motor after a predetermined running period.

7. A molding press according to claim 1 in which said electrical control system further comprises auxiliary electro-motivated means having a reversible motor, and means for controlling the starting, direction, and extent of motion of the reversible motor from said main motivating means, and cam-operated timing means driven from the main motivating means for automatically stopping the operation of the reversible motor after a predetermined running period.

8. In a power driven molding press having a mold and adapted to operate in a load cycle having a cyclic power demand, in which cycle the material is fed to the press in a first operating phase to fill the mold, the material compressed in a second operating phase and the compressed material removed from the mold in a third operating phase, said press further having a bottom plunger means, means for filling the mold

with the material to be pressed, and means for regulating the position of the plunger during the mold-filling phase, comprising a pressure adjusting screw, a reversing motor for operating the adjusting screw, a reversing magnetic line starter for starting the reversing motor and provided with holding coils for establishing magnetic holding circuits, dual switch contact means for operating the reversing magnetic line starter to run the motor in the one or the other direction, said dual contact means being of the current-responsive type constructed and adjusted on the one hand to close a circuit in response to power demands at or below a lower limit value, and on the other hand to close another circuit in response to power demands at or above an upper limit value, no contact being made at power demands between said lower and said upper value, a momentary contact switch timed with the operating cycle of the press for making contact at the time of peak power demand on the press driving motor, circuit means for establishing the one or the other of said respective circuits through said contact switch means and the holding coils of said line starter when said momentary switch is closed, to actuate said line starter in response to said upper or lower power demands so as to rotate the reversing motor in the one or the other direction respectively, and a stop switch controlling the magnetic holding circuits for the magnetic line starter, and timed with the load cycle of the press for stopping the reversing motor after a predetermined period of running time.

9. In a power driven molding press a combination according to claim 8, in which the dual contact means comprises a pair of solenoid operated contact devices, the one of which is set to close at and below said lower limit current value, the other of which is set to close at and above said upper limit current value, with the addition of a circuit for energizing the solenoids, which fluctuates with the power demand.

10. In a power driven molding press a combi-

nation according to claim 8, in which the dual contact means comprises a current indicating instrument having adjustable lower and upper limit contacts, one of which contacts is set to function at and below said lower limit current value, the other of which is set to function at and above said upper limit current value.

11. In an electrically driven machine that makes a cyclic demand for power, the combination of a driving motor, means for regulating the peak power demand, a reversing motor for operating the regulating means, a reversing magnetic line starter for starting the reversing motor and provided with holding coils for establishing magnetic holding circuits, dual switch contact means for operating the reversing magnetic line starter to run the motor in the one or the other direction, said dual contact means being of the current-responsive type constructed and adjusted on the one hand to close a circuit in response to power demands at or below a lower limit value, and on the other hand to close another circuit in response to power demands at or above an upper limit value, no contact being made at power demands between said lower and said upper value, a momentary contact switch timed with the operating cycle of the machine for making contact at the time of peak power demand on the driving motor of the machine, circuit means for establishing the one or the other of said respective circuits through said contact switch means and the holding coils of said line starter when said momentary switch is closed, to actuate said line starter in response to said upper or lower power demands so as to rotate the reversing motor in the one or the other direction respectively, and a stop switch controlling the magnetic holding circuits for the magnetic line starter, and timed with the load cycle of the press for stopping the reversing motor after a predetermined period of running time.

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