March 2, 1948. L. E. MAQUAT 2,437,109

DIPPING MACHINE

Filed Feb. 25, 1941 4 Sheets-Sheet 1

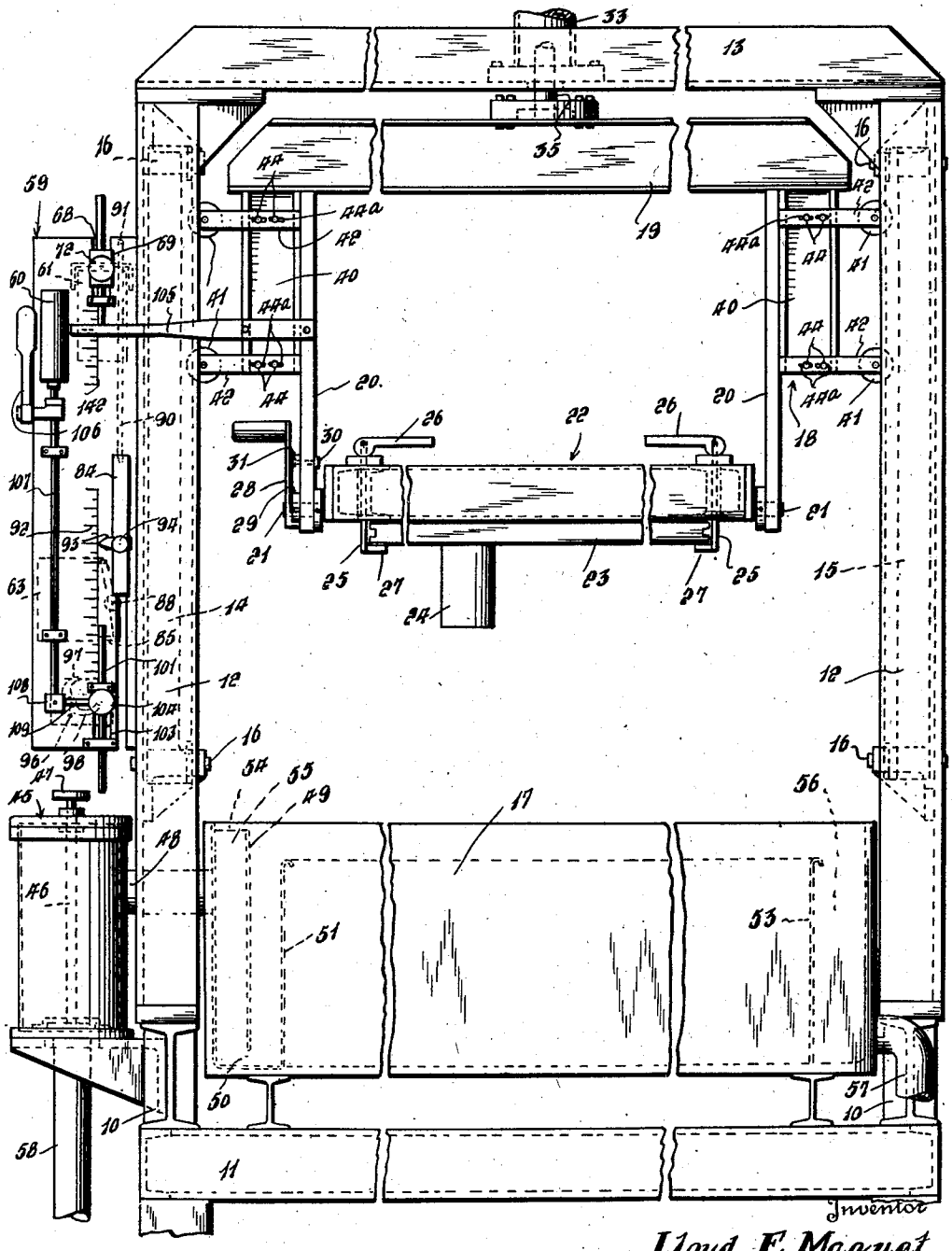

Fig. 1.

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DIPPING MACHINE

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Fig. 2.

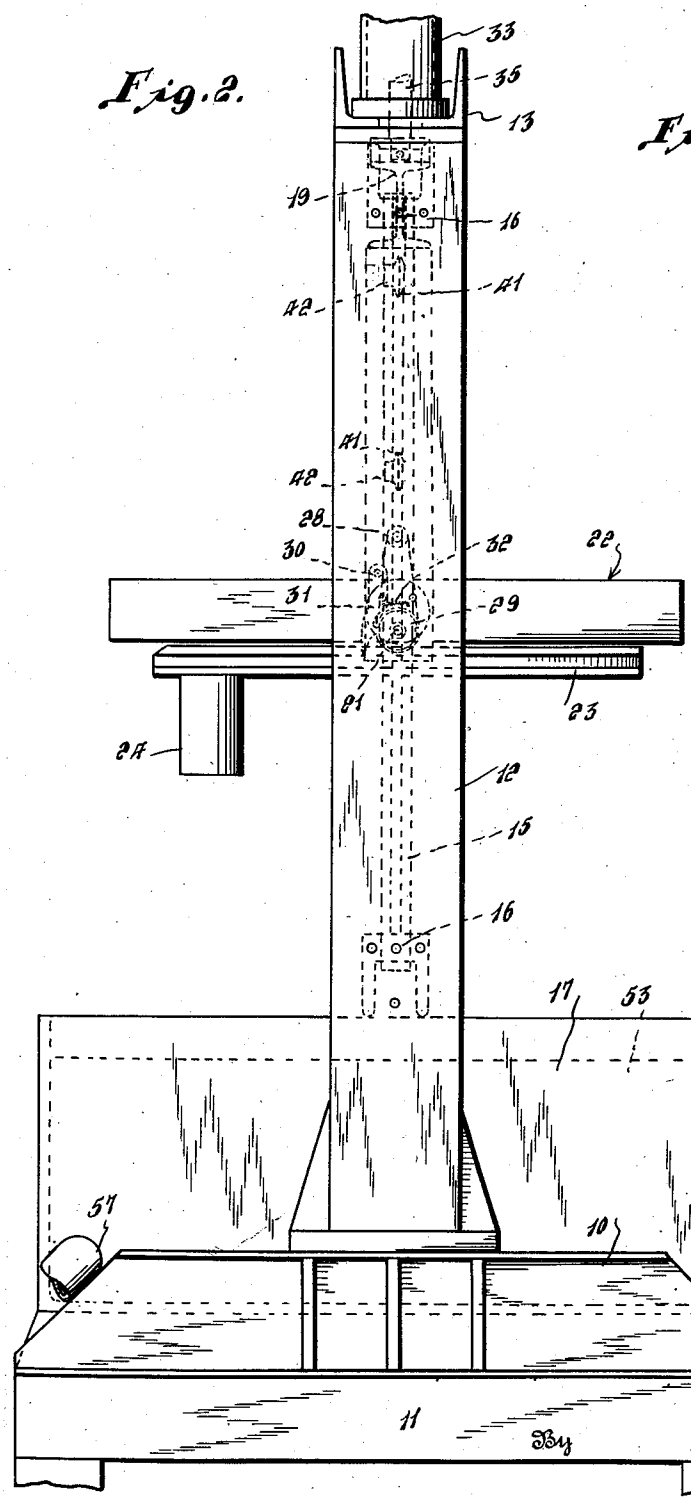
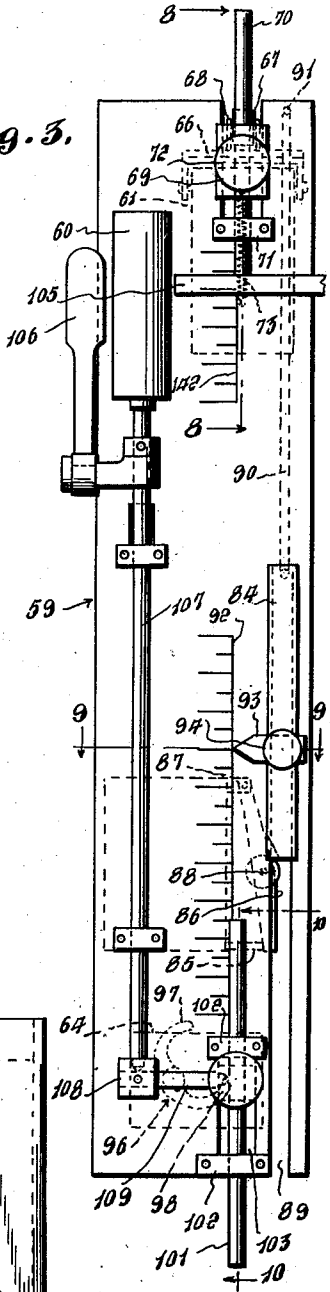


Fig. 3.



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DIPPING MACHINE

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Fig. 4.

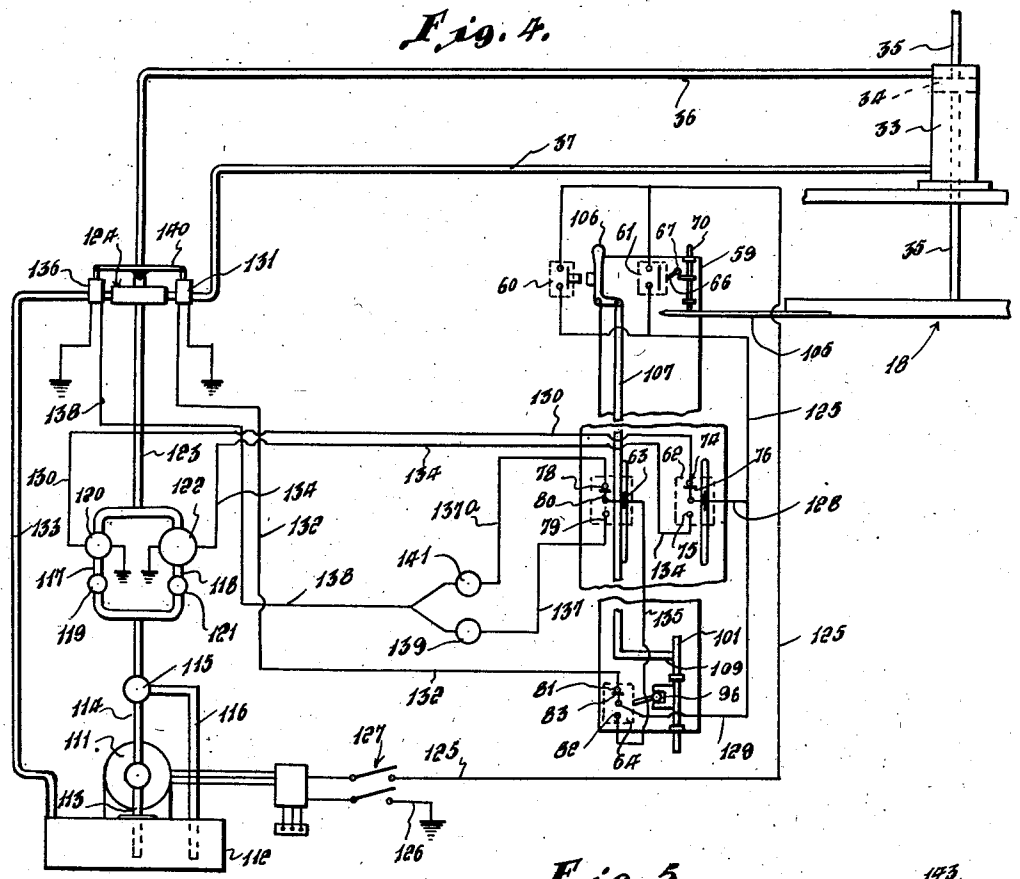


Fig. 5.

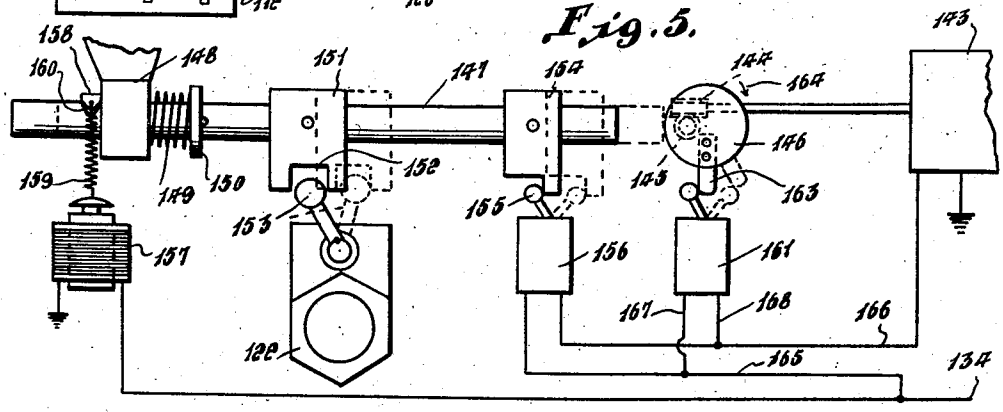
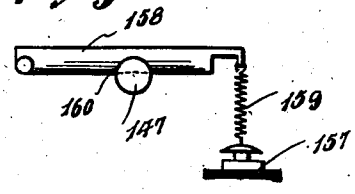


Fig. 5a



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DIPPING MACHINE

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Fig. 6.

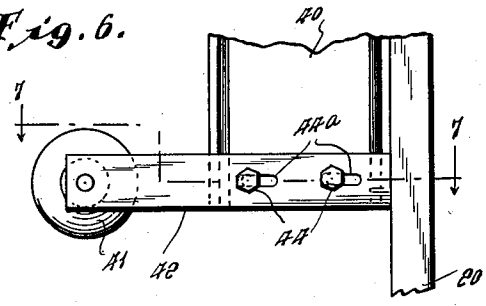


Fig. 7.

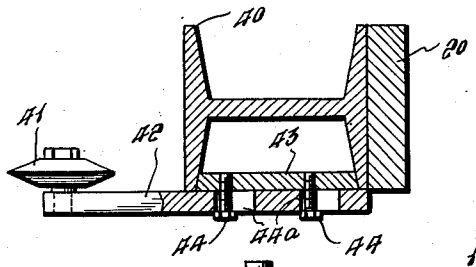


Fig. 8.

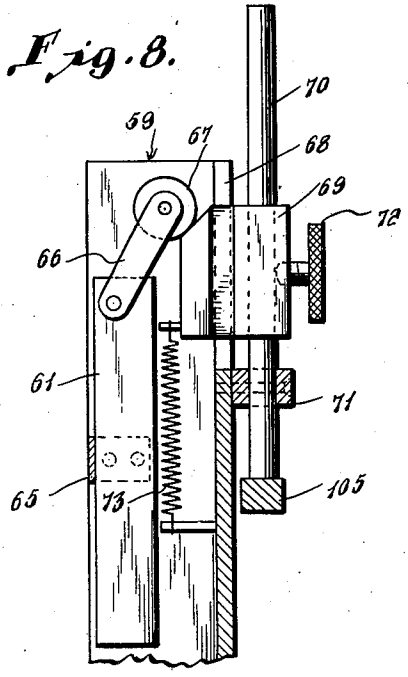
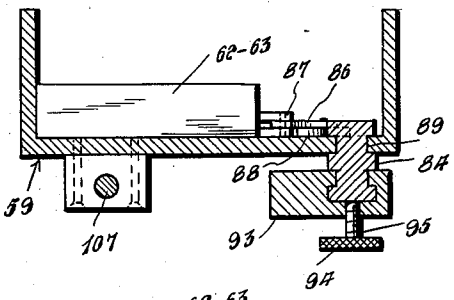


Fig. 9.



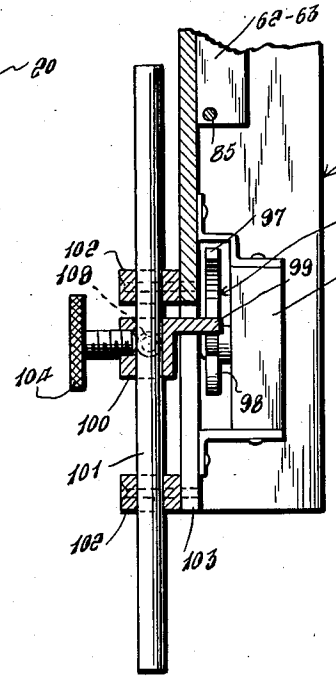


Fig. 10.

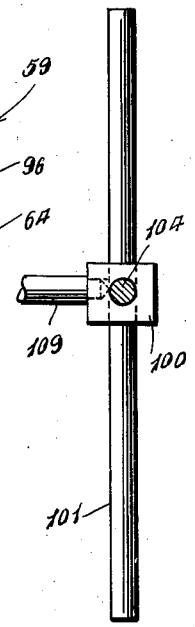


Fig. 11.

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UNITED STATES PATENT OFFICE

2,437,109

DIPPING MACHINE

Lloyd E. Maquat, Easton, Conn., assignor to The Black Rock Manufacturing Company, Bridgeport, Conn., a corporation of Connecticut

Application February 25, 1941, Serial No. 380,452

9 Claims. (Cl. 18—24)

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This invention relates to new and useful improvements in rubber dipping machines and has particular relation to an automatic machine having a definite cycle of operation and adapted for the making of dipped rubber articles made from any solution of rubber or rubber-like material or of any rubber or rubber-like latex.

The objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings—

Fig. 1 is a front elevational view of the machine of the invention;

Fig. 2 is a side elevational view thereof;

Fig. 3 is an enlarged front elevational view of the control panel of the machine;

Fig. 4 is a diagrammatic view showing the piping arrangement and the wiring diagram;

Fig. 5 is a wiring diagram of a slow motion control valve;

Fig. 5a is a detail view showing a locking or latching means employed in the control of the slow motion valve;

Fig. 6 is a detail elevational view of the mounting of a guide roller;

Fig. 7 is a sectional view taken as along the line 7—7 of Fig. 6;

Fig. 8 is a sectional view taken as along the line 8—8 of Fig. 3;

Fig. 9 is a sectional view taken as along the line 9—9 of Fig. 3;

Fig. 10 is a sectional view taken as along the line 10—10 of Fig. 3; and

Fig. 11 is a view taken as looking from the left in Fig. 10.

Referring in detail to the drawings the machine of the invention comprises a base including side members 10 and a cross member 11. The machine frame mounted on the base includes vertical side members 12 and a top cross member 13. All of the structural members mentioned are I-beams or channel members of sufficient dimensions to give the machine the desired rigidity. Vertical side members 12 are channel members and are arranged with their open sides facing one another. Within said channel members are mounted vertical guides 14 and 15 respectively secured in place as by bolts

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16 and each having a V-shaped channel therein receiving and forming runways for rollers as will appear.

Supported on the cross member 11 of the machine base is a tank 17 containing a rubber solution or containing latex as the case may be. Vertically movable in the machine frame is a carrier generally designated 18 and comprising an upper member or I-beam 19 from which depends bars 20 at their lower ends receiving short shafts 21 projecting from the ends of a rack 22. This rack, which is preferably made up of four channel iron members, is a part of the above mentioned vertically movable carrier and is adapted to support, in a manner to be described, form boards 23 on which are mounted any desired forms 24.

Passing through an opposite pair of the channel members of the rack 22 are the longer arms of clamps 25. At the upper side of the rack the ends of these arms are pivotally connected with cam-levers 26 and it will be clear, especially from Fig. 1, that the cam-levers are movable from positions wherein their lower ends 27 are clamping the form boards 23 against the underside of the rack to positions wherein said ends are lowered with respect to the said sides of the rack. When the cam-levers have been manually rocked to lower the form boards the latter may be removed from the rack for placement in a drier as is usual in the art.

Fixed to one of the short shafts 21 is a crank 28 adapted to be manually manipulated to rock the rack through an arc of 180 degrees whereby to dispose the form boards at the upper side of the rack. The purpose of this swinging of the rack will later be described.

Mounted on the shaft with the crank is a ratchet disc 29 and mounted on a bar 20 by means of a pivot 30 is a pawl 31 normally urged by a spring 32 in a direction to enter a notch in the ratchet disc 29. With this construction when the rack is to be reversed the operator disengages the pawl 31 from the disc 29 and then using the crank 28 swings the rack through the arc of 180 degrees. Then the pawl, being released, is moved by the spring 32 and engages in the next notch of the ratchet disc and secures the parts in their new positions. For the present purpose the ratchet disc has but two notches arranged 180 degrees apart.

Vertical movement is imparted to the carrier 18 by hydraulic means. Such means as herein disclosed includes a cylinder 33 mounted on the top cross bar or member 13 of the machine frame.

Within cylinder 33 is a piston 34 (see Fig. 4) and a piston rod 35 passes through both ends of the cylinder and is connected with the piston 34. Since the piston rod extends from both sides of the piston the latter has the same exposed area at each of its sides. A pipe 36 is provided for supplying and exhausting fluid under pressure to and from the upper end portion of cylinder 33 while a similar pipe 37 performs the same functions in connection with the lower end portion of the cylinder.

Mounted on the carrier 18 (see Fig. 1) and located at the outer sides of the rods 20 are short vertically disposed sections 40 of I-beams. These parts serve to mount small rollers 41 having V-shaped edge portions received or operating in the channels of the vertical guides 14 and 15 above described. Each of these rollers is mounted on the outer end of a bar 42. Plates 43 are welded to the I-beans 40 (see Figs. 7 and 8) and the bars 42 are secured to said plates as through the use of bolts 44 passing through the bars and threaded into tapped openings in the plates. To provide for proper adjustment of the rollers with relation to the guideways or tracks 14 and 15 the bars are slotted at 44*a* for the passage of the bolts 44. Owing to the use of the pair of vertically spaced rollers at each side of the carrier should the top bar 19 of the carrier spring slightly under load there will be no binding of the rollers in the guideways such as would occur if elongated guide members were engaged in the guideways.

The fluid rubber or latex in the tank 17 is slowly circulated therein to prevent the formation of a skin thereon. However the circulation must not serve to agitate the upper surface of the liquid in any such manner as to trap air therein. As herein disclosed the liquid is circulated by a pump generally designated 45 the impeller carrying shaft 46 of which is rotated by a driven belt (not shown) trained over a pulley 47 on the outer end of such shaft. The impeller serves to feed the liquid rubber slowly through a pipe 48 into one end of the tank. At such end of the tank is a high baffle plate 49 is disposed so that the liquid enters the tank in a portion thereof which is not to be entered by a form during a dipping operation.

Baffle 49 is raised from the bottom of the tank to leave a passage 50 and inwardly of the baffle 49 is a second baffle 51 reaching from the bottom of the tank to a point below the upper end of baffle 49. Near the other end of the tank is a baffle 53 similar to baffle 51. The space between the baffles 51 and 53 is that into which the forms are dipped during the use of the machine. As the fluid rubber enters the tank from pipe 48 it builds up in the space 55 between the tank end and the baffle 49 as to a height above the upper end of baffle 51. The height which the liquid rubber may reach in the space 55 is indicated by the line 55.

The level of the liquid rubber into which the forms are dipped is just over the upper edges of the baffles 51 and 53. Thus a slight head is built up in the space 55 by the pump 45 and this head is the force used for moving the rubber through the space 50 and over the baffle 51 into the main portion of the tank. Necessarily a very slight flow of the liquid rubber results and any excess of the liquid rubber overflows into the space 56 between the baffle 53 and the tank end and is removed from the tank through a pipe 57 connected (in a manner not shown) with the intake pipe 58 to the pump 45. Thus the liquid rubber is kept in constant circulation and the upper or top portion thereof does not have an opportunity to form a skin.

Mounted on one of the vertical side members 12 of the main frame of the machine is a control panel generally designated 59. Preferably this panel comprises a sheet of brass or the like bent to a channel formation as shown best in Fig. 9. Starting and stopping switches 60 and 61, respectively, are mounted on the upper portion of panel 59. On an intermediate portion of the panel are located speed control switches 62 and 63 while on the lower portion of the panel is a reversing switch 64. Switch 60 is a normally open switch while switch 61 is a normally closed switch.

As shown in detail in Fig. 8 switch 61 is mounted on the rear side of panel 59 as by means of a strap 65 and includes an operating arm 66 carrying a roller 67 at its upper end. In alignment with the switch arm 66 the panel is provided with a slot 68 opening through the upper end of the panel. Slidable in and guided by the edges of the slot is a block 69 secured to a rod 70 located at the forward side of the panel and movable through a bearing 71. A screw 72 serves to secure the block and rod together in the desired positions of adjustment. A coil spring 73 has one end secured to the block 69 and has its other end anchored as to the panel 59 and this spring constantly tends to move the block and rod downwardly from the switch arm roller 67. When the block is in a lowered position the switch is free to close.

Switch 62 comprises upper and lower fixed contacts 74 and 75 and a movable contact element 76 adapted to engage either of said fixed contacts. This switch operates with a toggle-like action and when the movable element is forced from engagement with one of the fixed contacts and through a dead center position it is snapped into engagement with the other of the fixed contacts. Thus the movable contact element 76 is in position engaging one of the fixed contacts at substantially all times.

Switch 63 (which is in the same housing as the switch 62 and is operated by the same means and at the same times as in Figs. 3 and 9) comprises two fixed contacts 78 and 79. A movable contact element 80 in said switch is adapted to engage either of said contacts as described in connection with the element 76 of switch 62 and is in fact operated in unison with said element 76 as will appear.

Switch 64 is of substantially the same construction as either of the switches 62 and 63 and comprises two fixed contacts 81 and 82 and a movable contact element 83 adapted to engage either of the fixed contacts. This movable contact element is also operated with a snap action and when moved through a dead center position from engagement with one of the fixed contacts immediately snaps into engagement with the other fixed contact.

As shown in Fig. 3 the switches 62 and 63 are adapted to be operated by the lower end of a bar 84 vertically movable on the panel 59. To this end the switches include an operating rod or button 85 against the outer end of which is located one end portion of an arm 86 pivotally mounted as at 87 and on its intermediate portion carrying a roller 88 adapted to be engaged by the lower end of the bar 84 as will appear. Movement of bar 84 relative to the panel 59 is guided

as the panel is provided with a slot 89 opening through its lower end and the bar is movable in said slot as suggested in Fig. 9.

Attached to the upper end of the bar 84 is a coil spring 90 having its upper end anchored to the panel as at 91 and it will be clear that this spring is constantly tending to move the bar 84 upwardly and that upward movement of the bar is limited by the upper end of the slot 89. A scale 92 is marked off on the panel or on a separate plate secured to the panel as may be desired. Movable over this scale and carried by the bar 84 is a pointer 93 secured to the bar as by means of a screw 94 having a relatively long exposed shank portion 95.

It is to be understood that as the bar 84 is moved downwardly its lower end engages the roller 88 and shifts the movable contact elements of the switches 62 and 63 from engagement with the upper contacts of said switches into engagement with their lower contacts. Then as the spring 90 moves the bar upwardly releasing the roller 88 the switches return to normal and the movable elements of the switches return to positions engaging the upper contacts.

As pointer 93 is secured to the bar 84 by the screw 94 it will be understood that the pointer may be adjusted along the bar and the purpose of this arrangement will appear. During downward movement of bar 84 the latter rides against the roller 88 maintaining the switches in the positions to which they have been moved as when the upward movement of the bar, under the action of the coil spring, carries the bar above the roller 88 the switches return to normal.

Reversing switch 64 includes a crescent shaped operating member 96 the free ends of the arms 97 and 98 of which are disposed above and below, respectively, a lug 99 on a block 100 adjustably secured on a rod 101 located at the forward side of the panel 59 and vertically movable in bearings 102. Switch 64 is located at the rear of panel 59 but the latter is provided with a slot 103 opening through its lower end and into which slot the lug 99 projects for cooperation with the switch arms 97 and 98 and also to guide the movements of the block 100 and rod 101. A screw or other suitable means 104 adjustably secures the block on the rod.

With the arrangement described it will be understood that on the lug 99 being moved downwardly (from the position of Fig. 3) it will engage the switch arm 98 and reverse the movable contact element of the switch 64. Similarly on the lug 99 being thereafter moved upwardly it will engage the switch arm 97 and restore the switch to normal. This is true since the switch is a snap switch and when the arm 98 is engaged and moved to carry the movable contact element of switch 64 through a dead center position the arm 97 also moves and then is carried to a position over the lug 99 when the switch snaps over to close a circuit through the lower of its fixed contacts.

A rigid arm 105 movable with the carrier 18 projects over the panel 59 in a manner to bring about operation of the switches. At the end of a dipping cycle said arm engages the lower end of rod 70 and moves the same upwardly against the action of spring 73 opening the switch 61 and bringing the machine to a stop.

To start the machine the operator manipulates a handle 106 to close the normally open switch 60 and at the same time the required movement of the handle results in an upward movement being given a rod 107 extending vertically along the panel. At its lower end this rod is threaded or otherwise secured in a block 108 carrying a short bar 109 fixed in the block 100 above mentioned. Thus as the handle is manipulated to close the starting switch 60 the block 100 is moved upwardly whereby its lug 99 engages the upper switch arm 97 and returns the switch 64 to normal.

Referring now to diagrammatic Fig. 4 at 111 is indicated a constantly operating hydraulic pump taking liquid from a supply tank 112 through a pipe 113. The discharge of the pump is through a pipe 114 having a pressure regulating and relief valve 115 therein and which serves to control the pressure at which the liquid is delivered to the cylinder 33 by by-passing excessive liquid back to the tank 112 through pipe 116.

Beyond the relief valve 115 the pipe 114 discharges into a pair of branches 117 and 118 in the former of which is located a manually adjustable needle valve 119 and a "fast" valve 120 while in the latter is located a manually adjustable needle valve 121 and a "slow" valve 122. Branches 117 and 118 discharge into a pipe 123 connected with a four-way reversing valve 124. Said reversing valve supplies liquid under pressure to and provides for exhausting of liquid from the pipes 36 and 37 above mentioned and which are connected with the upper and lower portions of the cylinder.

Needle valves 119 and 121 are manually adjusted to permit of a maximum rate of flow through the respective branches 117 and 118 of the pipe line to valve 124. The adjustments made will depend on any particular job to be performed by the machine. Usually valve 121 is more nearly closed than is valve 119 whereby a more restricted flow is possible through line 118 than through line 117 and line 118 may therefore be referred to as a "slow" line.

Valve 120 is called a "fast" valve as it opens and closes fast and is in the "fast" line to distributing valve 124. While the particularly construction of valve 120 is not important it may be of the construction of the valve shown on page 13 (May 1, 1939) of the "Industrial Control Handbook," published by General Electric Company, of Schenectady, New York. Valve 122 is herein identified as a "slow" valve since it is in the "slow" line to valve 124 and is opened slowly by the cam 146 as hereinafter more fully set forth.

Valves 120, 122 and 124 are electrically controlled. To simplify the drawing the various circuits are shown as grounded. Current supply line from any suitable source includes wires 125 and 126 in which are located a main switch 127. Starting and stopping switches 60 and 61 are connected in parallel in line 125 and the movable contact elements of switches 62 and 64 are connected with such line by wires 128 and 129. Thus when switch 60 is closed to start the machine a circuit is closed through the contacts 74 of switch 62 and through a wire 130 to the "fast" valve 120 energizing the solenoid thereof and opening such valve. At the same time through the upper contact 81 of switch 64 a circuit is completed to the solenoid 131 of the valve 124 through wire 132 whereby the valve is placed in condition to supply liquid under pressure to the pipe 36 and cylinder 33 and to place the pipe 37 in communication with a return pipe 133.

As the liquid under pressure moves the carrier

18 downwardly bar 105 releases rod 70 and the coil spring 73 moves the rod and the block 69 downwardly permitting the normally closed switch 61 to close. Now the starting switch may be released. The carrier continues downwardly and at the desired point, depending on the adjustment of the pointer 93 on the rod 84, it engages the shank 95 of the screw 94 and forces the rod 84 downwardly engaging the roller 88 and reversing the switch 62 so that its movable element 76 is shifted from engagement with the upper fixed contact 74 into engagement with the lower fixed contact 75.

This brings about an opening of the circuit to the "fast" valve 120 and a closing, through wire 134, of a circuit to the "slow" valve 122. Valve 120 is thus closed and valve 122 is opened as will later appear. The tripping of switch 62 results in tripping of switch 63 so that its movable contact 80 is shifted from engagement with fixed contact 78 into engagement with fixed contact 79. However, at this time switch 63 is not energized.

Continued downward movement of the carrier results in bar 105 being brought into engagement with the upper end of rod 101 and movement of the same and the lug 99 downwardly causing the latter to engage the switch arm 98 and bring about a tripping of the switch 64 shifting its element 83 from engagement with contact 81 into engagement with contact 82. This results in an opening of the circuit to the reversing valve solenoid 131 and the closing of a circuit through a wire 135 to the movable element 80 of switch 63 and which element is now in engagement with contact 79 of such switch.

Thus while the circuit to the solenoid 131 of the reversing and distributing valve 124 is now open, a circuit to the solenoid 136 of such valve is closed through wire 137 from switch contact 79 and a wire 138 connecting wire 137 with the solenoid 136. Connected in the wire 137 is a timer device 139 which functions to keep open the circuit to solenoid 136 for a predetermined length of time for a purpose to be set forth.

When the solenoid 131 is energized it attracts the armature or core attached to lever 140 and rocks the latter to position the valve 124 for the supplying of liquid under pressure to the upper end portion of cylinder 33 and for exhausting of liquid from the lower end of the cylinder so that when the solenoid 131 is energized the carrier is being moved downwardly. At the end of the downward movement of the carrier the bar 105 tripping element 83 from contact 81 into engagement with contact 82 opens the circuit to solenoid 131 and attempts to close a circuit to solenoid 136. When the latter is energized the valve 124 is reversed and supplies liquid under pressure to the lower end portion of cylinder 33 and permits of the exhausting of liquid from the upper end portion of such cylinder. Now the piston 34 will be moved upwardly in the cylinder and rod 35 being connected with carrier 18 the latter will be moved upwardly in the main frame of the machine.

At a predetermined point in the upward movement of the carrier the bar 105 will be moved from the bar 84 or at least from engagement with the shank 95 of the screw 94 and the coil spring 90 will raise such bar and the switches 62 and 63 will be reversed or shifted back to normal condition. As the switch element 76 is thus moved it leaves contact 75 opening the circuit to the slow valve 122 and it engages contact 74 closing the circuit through wire 130 to the fast valve 120.

When the switch 63 is reversed at this time its element 80 is moved from engagement with contact 79 into engagement with contact 78 placing the same, through a wire 137*a* in circuit with wire 138 connected with the reversing valve solenoid 136. A timer 141 in the line 137*a* keeps the circuit open through such wire for a predetermined time for a purpose to be explained. After such delay as is experienced due to the presence of the timer 141 the upward movement of the carrier is resumed at a "fast" rate valve 120 now being open. As the rack reaches the limit of its upward movement bar 105 engages the lower end of rod 70 (see Fig. 8) and moves such rod upwardly carrying block 69 into engagement with roller 67 and bringing about opening of the normally closed stopping switch 61.

Thus since the switch 60 is open the machine is brought to a stop, solenoids 131 and 136 each being deenergized the valve 124 is balanced and the whole machine is at rest. The operator now moves the crank 28 and reverses the rack 22 to dispose the latter with the form boards at its upper side. The form boards are removed and placed in a drier or the like and new boards mounting forms are placed on the rack, the latter is reversed by using the crank 28 and the handle 106 is operated to close the starting switch 60 and as soon as the bar 105 is carried downwardly away from the bar 70 such handle may be released and the machine will then automatically go through its predetermined cycle of operation.

In this connection it is noted that when the operator shifts the handle 106 to close switch 60 he moves the rod 107 and through the cross bar 109 raises the rod 101 with the block 100 and the lug 99 and the latter trips the switch 64 to dispose its movable contact element in the position of Fig. 4 wherein the circuit is closed to the "down" solenoid 131 of the reversing and distributing valve 124.

By loosening screw 72 the rod 70 is made free for adjustment through the block 69 and the location of the lower end of the rod determines the point at which the carrier 18 will stop at the end of a cycle of the machine's operation. When making an adjustment of the rod the point of stoppage of the machine may be determined by locating the lower end of the rod with reference to the graduations 142 which may be on the panel 59 or may be on a separate plate attached to such panel.

As engagement of the bar 105 with the shank 95 of screw 94 determines the movements of bar or rod 84 adjustment of such screw in relation to the length of the rod will bring about a change in the timing of the machine. When the screw is loosened it is adjusted along with the pointer 93 and by reading the latter in connection with the marks 92 the times at which the "fast" valve 120 and the "slow" valve 122 are placed in and out of operation may be controlled.

Since switch 64 brings about a reversal of the direction of movement of the carrier 18 it will be seen that adjustment of the rod 101 vertically will bring about a change in the depth to which the forms are moved into the contents of the receptacle 17. Rod 101 may be adjusted through the block 103 on loosening of the screw 104 and if it is adjusted downwardly the forms will be carried deeper into the tank 17 while if it is adjusted upwardly the dip will not be so deep. Thus

the rod 101 is adjusted according to the length of the articles being manufactured.

Fig. 5 diagrammatically illustrates the immediate control of the "slow" valve 122. In such figure an electric motor 143 through a worm and worm gear 144 and 145 respectively, drives a cam 146 against which rides, except when the valve 122 is open, a bar 147 longitudinally movable through any suitable support as through a mounting 148. A coil spring 149 about a portion of bar 147 and bearing at one end against the support 148 and at its other end against a collar 150 fixed to the bar, normally tends to keep the bar in engagement with the cam 146 and when the bar is not otherwise held does keep it against the cam.

Fixed to the bar 147 is a block 151 having a notch 152 receiving the free end portion of the operating lever 153 of the valve 122. Also fixed to said bar is a block 154 adapted to engage and move the handle 155 of a switch 156 as will appear. A solenoid 157 controls a locking bar 158 and a coil spring 159 connects said locking bar with the core of the solenoid. The locking bar is pivotally mounted as in Fig. 5a and includes a bevelled portion 160 which is pulled into a notch in the bar 147 when the latter is in the extreme position in which it is shown in Fig. 5 and the solenoid is energized.

The solenoid is connected with the latch 158 through the spring 159 in order that the solenoid core may seat home before the latch actually reaches the bottom of the notch in bar 147. Owing to the bevel of part 160 the spring 149 may move the locking bar 158 out of the notch in the bar 147 when the solenoid is deenergized although if desired a counterbalancing spring may be attached to the locking bar.

When the solenoid 157 is deenergized the coil spring 149 urging the bar 147 to its normal position causes the sides of the notch to act on the bevelled sides of part 160 of the locking part or bar 158 whereby the latter is cammed out of said notch and then the spring 149 returns the parts to normal positions. A second switch 161 has a handle 162 disposed for operation by a finger-like member 163 carried by the cam 146. The latter is rotated in the direction indicated by the arrow 164 and the motor 143 includes a variable speed drive for the shaft 165 through which the worm gear 145 is driven.

Prior to the tripping of the switch 62 on the downward movement of carrier 18 and after tripping of said switch during upward movement of the carrier the wire 134 is deenergized. At these times the valve 122 is completely closed and the switches 156 and 161 are both normally closed switches and are closed. Now on energizing of wire 134 solenoid 157 is energized and tries to move the lock bar 158 downwardly to a position locking the bar 147 against movement by the coil spring 149. However, the notch in the bar 147 is not in alignment with the locking bar at this time as such bar 147 is in the dotted line position of Fig. 5 and against the low point of cam 146.

At this time switch 161 is open its handle being held in the full line position by the finger 163 on the cam 146 but switch 156 is closed its handle being in the dotted line position. Thus through switch 156 a circuit is completed to motor 143 through wires 165 and 166 and the motor is operating moving the cam 146. As the cam turns it shifts the bar 147 toward the left (as viewed in Fig. 5) moving the block 151 and through the valve handle 153 gradually opening the valve 122 so that the piston 34 is moved but slowly in the cylinder 33 and thus the carrier 18 is moved but slowly.

The speed of movement of piston 34 and thus of the carrier 18 is controlled by the configuration of the cam 146. As the valve 122 is being opened the block 154 is moving switch handle 155 and thus brings about opening of the switch 156. However, the circuit to the motor 143 is maintained since the finger 163 has now passed the switch handle 162 and the switch 161 returns to its normal closed condition maintaining the circuit to the motor as its wires 167 and 168 connect it in parallel with the switch 156. When the high point of cam 146 is reached the solenoid 157 being energized its locking bar 158 is drawn downwardly moving the locking bevelled portion 160 into the notch in the bar 147 and securing the latter in the full line position shown.

The motor 143 continues to operate and finally the finger 163 engages the switch handle 162 and moves the same opening the switch 161 whereupon the motor circuit is broken and the latter stops. As the locking bar 158 is functioning the valve 122 is maintained opened but when the line 134 is next deenergized on revesal of the switch element 76 by the bar 105 during upward movement of the carrier 18, the coil spring 149 acts as above described shifting the bar 147 back to the dotted line position of Fig. 5. This results in closing of the valve 122 and closing of the switch 156 as well as deenergizing of the motor 143. Thus the means controlling valve 122 is returned to normal condition ready for use when line 134 is again energized.

Assuming rack 18 to be loaded with forms the operator closes switch 60 and thus completes circuits to the "fast" valve 120 and the "down" solenoid 131. At this time valves 119 and 121 have been manually set and control the maximum passage of liquid under pressure to the cylinder 33. The carrier starts downwardly rather rapidly and moves at the rate established by the setting of valve 119 until the bar 105 reverses the switch 62 deenergizing the solenoid of valve 120 and energizing the motor 143 of the "slow" valve 122. This occurs just as the forms 24 (or other forms) on the carrier are about to enter the rubber in tank 17 and is controlled by the setting of rod 84 and screw 94. Thus the speed at which the forms enter the rubber depends on the rate of opening of the valve 122 and the forms enter the rubber very slowly.

From the foregoing it will be understood that the rate of movement of the forms into the rubber depends on the configuration of the cam 146 and that the rate of movement of the forms in the rubber depends on the setting of the valve 121 and the extent to which the valve 122 is opened by the cam 146. When the "fast" valve 120 is closed the carrier is stopped and then is started with a gradually accelerating movement as the cam 146 slowly opens the valve 122 and because of the setting of the needle valve 121 the carrier is not moved as fast when the valve 122 is fully opened as when the valve 120 is fully open. At the end of the down stroke, which depends on the setting of the rod 101, switch 64 is reversed opening the circuit to the "down" solenoid 131 and closing the circuit through wires 137—138 and the timer 139. The setting of the timer is predetermined and controls a pause of the carrier 18 at the lower limit

of its stroke so that rubber may collect or coat onto the forms.

When the timer closes, the circuit to the "up" solenoid 136 is completed and the circuit to the "slow" valve remains closed so that the carrier and its load move slowly upwardly raising the forms in the rubber. When the bar 105 trips the switches 62 and 63 during upward movement of the carrier the circuit to the "slow" valve 122 is interrupted and the circuit to the "fast" valve 120 is again completed. However, at this time the circuit to the "up" solenoid 136 is through the lines 137a—138 and is interrupted by the timer 141.

Thus the valve 124 is balanced and no additional fluid under pressure is being fed the cylinder 33 and the carrier is temporarily stationary. This described operation takes place just as the forms are leaving the rubber contents of the receptacle 17 and gives the forms a chance to drain while yet approximately in contact with the contents of the tank. When the timer 141 closes the circuit to the solenoid 136 the "fast" valve 120 is open and the carrier 18 moves upwardly rather rapidly as compared with its rate of movement during the times the forms were in the rubber.

At the upper end of the stroke the bar 105 opens switch 61 bringing the machine to rest. It will be understood that the proper adjustments are made for any particular job so as to have the carrier travel the minimum distance required for that particular job and that the timers 139 and 141 are adjusted or set to represent the minimum pauses to prevent loss of time and that for the same reason the "slow" valve 122 is used as little as possible and the "fast" valve 120 as much as possible and yet have the machine produce the desired quality of product. The configuration of the cam 146 is determined by the particular job to be performed. Valves 119 and 121 having been manually adjusted for a job they remain fixed until another job is to be undertaken. The adjustments of these valves determines the maximum rates of movements of the forms when the "fast" and "slow" valves are open.

Having thus set forth the nature of my invention, what I claim is:

1. In a dipping machine, a receptacle, a frame, a carrier mounted by said frame for guided movements toward and from the contents of the receptacle, means for mounting forms on said carrier, hydraulic means for moving said carrier in the frame to carry the forms into and out of the contents of the receptacle, said hydraulic means including a piston and cylinder construction, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of the piston to lower and raise the carrier, a pair of valves comprising a fast and a slow valve controlling the passage of said liquid under pressure to the distributing valve, means whereby said fast valve is open and said slow valve is closed during movements of the forms toward and from the contents of the receptacle and said fast valve is closed and said slow valve is open during movement of the forms into and out of and while in the said contents of the receptacle, and said means for opening said slow valve including a cam whereby the rate of opening of said slow valve is controlled by the contour of said cam.

2. In a hydraulic system, a piston and cylinder construction, means movable by said piston to projected and retracted positions, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of the piston to project and retract said means, fast and slow valves controlling the rate at which said liquid is supplied to the cylinder, means controlling said valves whereby said liquid is supplied at a higher rate during initial movement of the first mentioned means toward and its final movement from projected position than during final movement of said first mentioned means toward projected position and its initial movement from projected position whereby said first mentioned means is moved at a faster rate during the first mentioned times than during the latter mentioned times, said means controlling said valves comprising electrical means, switch means controlling said electrical means, means whereby on its movements to and from projected position the means movable by the piston trips said switch means to close said fast valve and open said slow valve as said means completes the initial part of its movement toward projected position and to close said slow valve and open said fast valve as the said means movable by the piston completes the initial part of its movement toward retracted position, said switch means including adjustable means that may be tripped by the means movable by the piston from the desired position of the latter to vary the relation between the initial and final positions of its movements, and said means for opening said slow valve including a cam whereby the rate of opening of said valve is controlled by the contour of said cam.

3. In a hydraulic means, a piston and cylinder construction, a carrier connected to be moved by said piston, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of the piston to raise and lower said carrier, automatic means controlling said valve means whereby the liquid under pressure is supplied to the respective sides of the piston at predetermined times, a line for supplying said liquid under pressure to said valve means for distribution thereby to said piston, a second line for supplying said liquid under pressure to said valve means for distribution thereby to said piston, independently adjustable manually operable valves located one in each of said lines and controlling the maximum rate at which such liquid under pressure may be supplied the valve means by the respective lines, a quick opening and closing valve in the line with one of said manually operated valves, and a slow opening valve in the line with the other of said manually operable valves.

4. In a hydraulic system, a piston and cylinder construction, a carrier movable by said piston, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of said piston to raise and lower the carrier, electrical means controlling the position of said valve means and thus the side of the piston to which said liquid is supplied, a normally open manually operable starting switch for controlling said electrical means to have said valve direct said liquid to a side of the piston to cause movement of the carrier downwardly, a normally closed stopping switch connected in parallel with said starting switch and located to be opened by said carrier at the end of its return movement and to be held open by said carrier until the latter starts its next downward movement on closing of the starting switch, a reversing switch connected in series

with said starting and stopping switches and operable by the carrier on its downward movement from one circuit closing position to another to cause said electrical means to reverse said valve and supply said liquid under pressure to the other side of said piston to raise the carrier, and a mechanical connection between said starting switch and said reversing switch whereby as the former is manually closed the latter is returned to a position completing the closing of the circuit to said electrical means in a manner to have the same again actuate the valve means to supply the liquid under pressure to the side of the piston to again move the said carrier downwardly.

5. In a dipping machine, a receptacle, a frame, a carrier mounted in said frame for vertical movements toward and from the contents of said receptacle, means for mounting forms on said carrier, a piston and cylinder construction, means connecting said piston with said carrier, a source of fluid under pressure, a distributing valve, a line to said valve comprising a pair of branches each leading to said valve from said source, lines from said valve to the respective end portions of the cylinder for the application of fluid under pressure to the respective sides of said piston to move said carrier to and from the contents of said receptacle, independently adjustable manually operable valves located one in each of said branches and controlling the maximum rate at which said fluid may be supplied said distributing valve through the respective branches, a fast opening valve in one of said branches, a slow opening valve in the other of said branches, individually electrically operated means controlling said distributing, fast opening and slow opening valves, electrical circuits including a manually operable starting switch to close circuits to the controls of said fast opening and distributing valves to rapidly supply fluid to the side of said piston to lower the carrier and forms toward the contents of the receptacle, and operating rod movable with said carrier, a second switch in said circuits and operable from normal to reverse position by said rod to open the circuit to the control of said fast opening valve and close the circuit to the control of the slow opening valve as the piston moves the forms into the contents of the receptacle whereby said forms are moved slowly into and while being lowered into such contents, a reversing switch operable from a normal condition by said rod to reverse the circuit to the control of said distributing valve on submersion of the forms in the contents of the receptacle to position the same for supplying said fluid to the other side of the piston, a timing device in said circuit whereby the forms are held stationary in the receptacle for a predetermined time on reversal of said reversing switch, another switch in the last mentioned circuit and operable from closed circuit relation to said timer to closed circuit relation with a separate branch of the circuit to the control of the distributing valve as the piston moves said forms from the contents of the receptacle, a second timer device in said branch circuit whereby the piston movement is temporarily halted as the forms leave the contents of the receptacle, said second switch positioned to be shifted back to normal substantially simultaneously with said movement of the last mentioned switch to open the circuit to the control of the slow opening valve and close the circuit to the control of the fast opening valve whereby

at the end of said temporary halt the carrier and forms are moved rapidly upwardly in the frame, and a normally closed stop switch positioned to be engaged and held open by said rod at the limit of upward movement of the carrier to open the circuit to all said electrical valve controls.

6. The combination as in claim 5 including a means connecting said starting and reversing switches whereby as the starting switch is manually closed said reversing switch is moved back to normal condition.

7. In a dipping machine, a receptacle, a frame, a carrier mounted by said frame for guided movements toward and from the contents of the receptacle, means for mounting forms on said carrier, hydraulic means for moving said carrier in the frame to carry the forms into and out of the contents of the receptacle, said hydraulic means including a piston and cylinder construction, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of the piston to lower and raise the carrier, a pair of lines for supplying liquid under pressure to the distributing valve, a fast valve in one of said lines, a slow valve in the other of said lines, independently adjustable manually operable valves located one in each of said lines for controlling the maximum rate at which fluid under pressure may be supplied the distributing valve by the respective lines. and means whereby said fast valve is opened and said slow valve closed during movements of the forms toward and from the contents of the receptacle and said fast valve is closed when the slow valve is open during movements of the forms into and out of and while in said contents of the receptacle.

8. In a dipping machine, a receptacle, a frame, a carrier mounted by said frame for guided movements toward and from the contents of the receptacle, means for mounting forms on said carrier, hydraulic means for moving said carrier in the frame to carry the forms into and out of the contents of the receptacle, said hydraulic means including a piston and cylinder construction, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of the piston to lower and raise the carrier, a pair of lines for supplying liquid under pressure to the distributing valve, a fast valve in one of said lines, a slow valve in the other of said lines, independently adjustable manually operable valves located one in each of said lines for controlling the maximum rate at which fluid under pressure may be supplied the distributing valve by the respective lines, and said means for opening said slow valve including a cam whereby the rate of opening of said valve is controlled by the contour of said cam.

9. In a hydraulic means, a piston and cylinder construction, a carrier connected to be moved by said piston, a source of liquid under pressure, valve means for distributing such liquid to the cylinder at opposite sides of the piston to raise and lower said carrier, automatic means controlling said valve means whereby the liquid under pressure is supplied to the respective sides of the piston at predetermined times, a line for supplying said liquid under pressure to said valve means for distribution thereby to said piston, a second line for supplying said liquid under pressure to said valve means for distribution thereby to said piston, independently adjustable

manually operable valves located one in each of said lines and controlling the maximum rate at which such liquid under pressure may be supplied the valve means by the respective lines, a quick opening and closing valve in the line with one of said manually operated valves, a slow opening valve in the line with the other of said manually operable valves, and a cam for opening said slow opening valve whereby the rate of opening thereof is controlled by the contour of said cam.

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