Nov. 23, 1943. R. S. THACKER 2,334,965

CONTROL FOR WASHING MACHINE CYLINDERS

Filed April 1, 1942 2 Sheets-Sheet 1

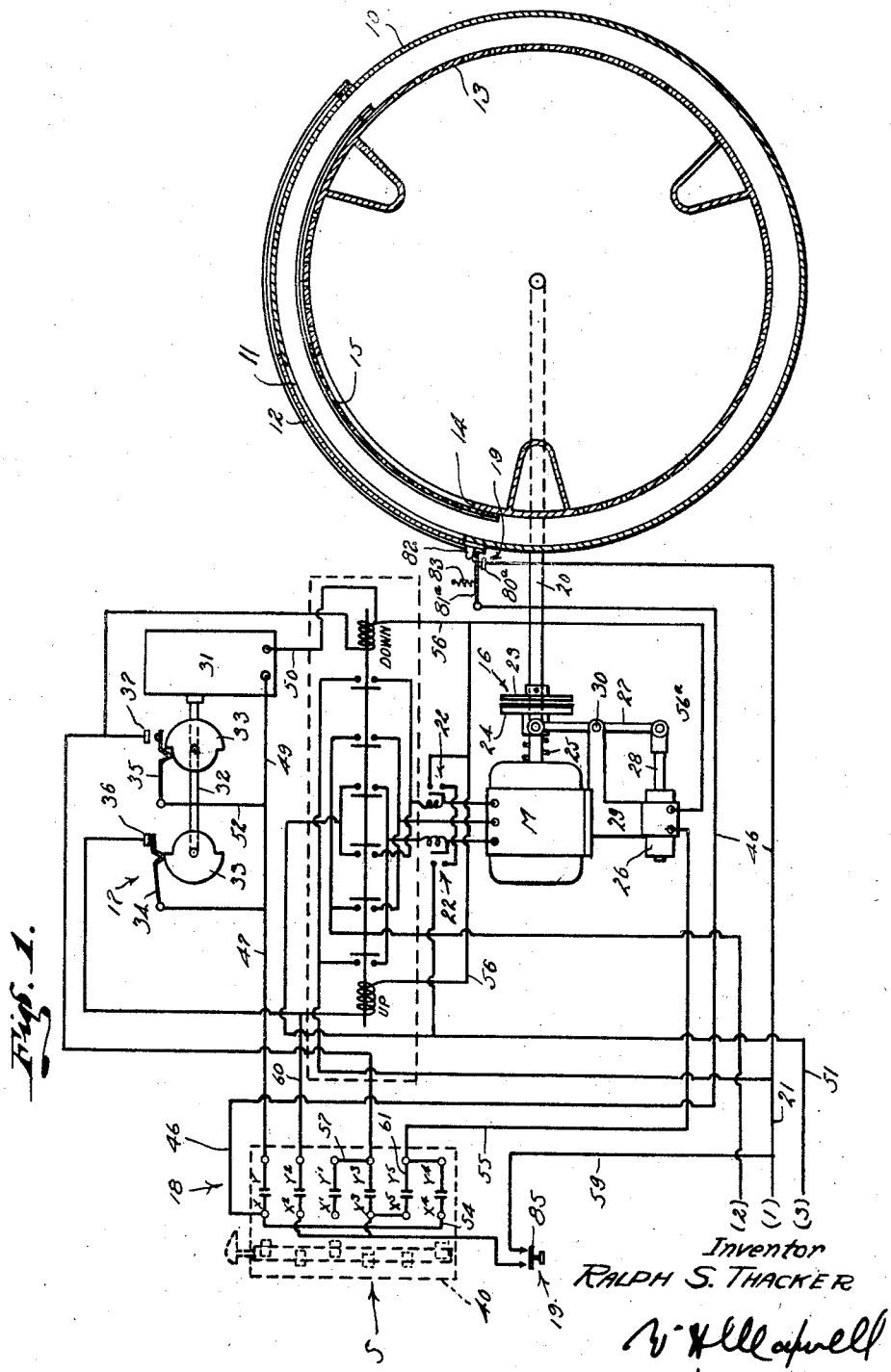


Fig. 1.

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Fig. 2.

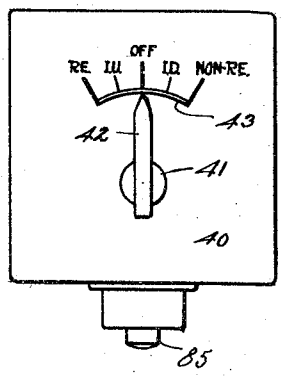


Fig. 3.

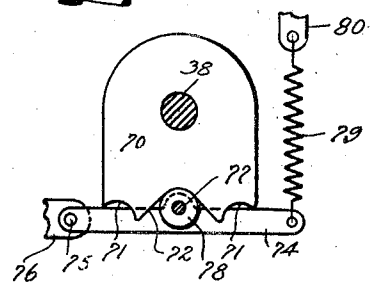


Fig. 4.

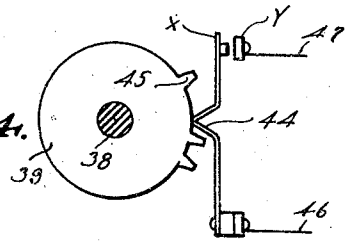
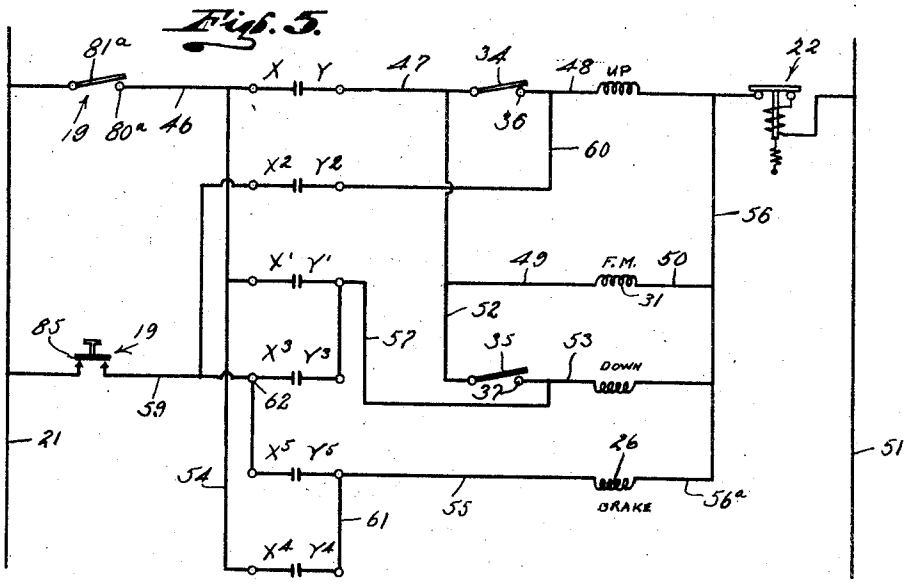


Fig. 5.



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CONTROL FOR WASHING MACHINE CYLINDERS

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Application April 1, 1942, Serial No. 437,243

11 Claims. (Cl. 192—131)

This invention relates to control systems and relates more particularly to controls for operating and governing moving machine parts, such as the cylinders of commercial washing machines. A general object of this invention is to provide a safe, inexpensive and easily operated control for washing machine cylinders and other moving machine parts.

In the operation of a commercial washing machine, embodying a rotatable cylinder and a shell enclosing the cylinder, it is desirable to bring the cylinder to a stop in a position where its door is in registration with the door of the shell in order to permit free loading and unloading of the machine. The drive for the cylinder is usually such that the cylinder may be "reversed," that is, successively alternately rotated in one direction and then the other or, if desired, may be continuously rotated in one direction. This requires the provision of a "reverse switch" and a "non-reverse switch," both usually in the form of push buttons. An "off" push button is provided to de-energize the driving motor and it has been necessary to provide an "inch up" switch and an "inch down" switch for the purpose of moving the cylinder short distances in either direction at the end of the cylinder operation to bring the cylinder door into registration with the door of the shell. Thus, in most machines, it has been necessary to provide at least five switches or push buttons for the control and inching of the cylinder. The operator must use great care in selecting and operating these many switches and it is easy to become confused and operate the wrong switch and cause injury to himself or others.

An important object of this invention is to provide a control for the cylinder of a washing machine, or the like, which embodies a single simple switch operable to fully control the various operations of the cylinder. The single switch of the present invention has a handle or operating part which may be moved between clearly designated or indicated positions for the selective rotation of the cylinder, either in a "reverse" manner or in one direction, for the inching of the cylinder in both directions and for the stopping of the cylinder. The simple handle is readily operated between its several positions to insure the safe intended control and operation of the cylinder.

Difficulty has been encountered in prior controls in maintaining the brake on the motor in the "off" or released position while the cylinder is in normal reverse or non-reverse operation and still have the brake immediately available for the inching operation. In the controls heretofore employed it has been found necessary to use relays and other additional equipment for the control of the brake.

Another object of this invention is to provide a control of the character mentioned in which the brake is positively held released during the rotary operations of the cylinder and yet is immediately available for the inching operations without resorting to the use of relays or other expensive unreliable equipment.

Another object of this invention is to provide a novel control circuit for the cylinder of a washing machine in which the reversible motor, the brake, and the flasher for reversing the motor for the "reverse" operation are all under the control of a single switch, thus greatly simplifying the installation and the manual control and reducing the cost of the machine.

Another object of this invention is to provide a control of the character mentioned in which the control switch cannot be left in either of the inching positions to cause injury to the operator when in the process of loading or unloading the machine. The master switch or control switch automatically restores to the "off" position when left in either of the inching positions.

Another object of this invention is to provide a control of the character referred to embodying an inching lock-out switch or push button independent of the control switch and so located that the operator must, of necessity, use two hands for the inching operations and, therefore, cannot get either hand injured while the cylinder is in motion during the inching operations. Certain Government specifications for commercial washing machines require that the control for the cylinder be such that two hands are required for the inching operations to preclude the possibility of the operator being injured. This requirement is fully met by the control system of the present invention and yet the system retains the advantages heretofore set forth resulting from a single switch having a single handle for the full control and inching of the cylinder.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a wiring diagram of the control system of the present invention illustrating a typical washing machine cylinder and shell in transverse cross section with their doors in registration.

Fig. 2 is an enlarged face or front view of the master control switch with the inching lock-out button thereon. Fig. 3 is an enlarged vertical detailed sectional view of the detent means of the master control switch. Fig. 4 is an enlarged vertical detailed sectional view illustrating one contact of the switch and the cam means for operating the same and Fig. 5 is a schematic wiring diagram of the electrical circuits.

The portion of the typical commercial washing machine illustrated in Fig. 1 comprises a stationary shell 10 having an opening 11 in its wall closed by a door 12. In the case illustrated the door 12 moves in a circumferential direction between the opened and closed positions. A rotatable cylinder 13 is arranged within the shell 10 to hold or receive the clothes or other materials to be washed. An opening 14 is provided in the wall of the cylinder 13 and is normally closed by a door 15 movable in a circumferential direction between the opened and closed positions. The openings 11 and 14 of the shell and cylinder are provided to give access to the interior of the cylinder for the purpose of loading and unloading the machine. The present invention is not concerned with the means for mounting the shell 10 or for supporting the cylinder 13 and these details are omitted from the disclosure.

The control system of the present invention may be said to comprise, generally, a reversible motor M for driving or rotating the cylinder 13, a brake 16 for holding the cylinder 13 against movement, means 17 for reversing the motor M, a single switch control 18 for the motor M, the brake 16 and the means 17, and safety means 19.

The motor M is operable to rotate the cylinder 13 in either direction, being a suitable reversible electric motor. As diagrammatically illustrated, the motor M directly drives the shaft 20 of the cylinder 13. The motor M is supplied with operating current by a three wire or three phase circuit 1, 2 and 3, the middle lead 2 of which may directly extend from one side 21 of a power supply. The "up" and "down" or right and left leads 1 and 3 of the motor M are under the control of the means 17 and the control 18.

The brake 16 serves to stop the cylinder 12 at the termination of its operation and to hold the cylinder in position where the access openings 14 and 11 are in registration. The brake 16 is governed or released by the control 18 and therefore is preferably electrically operated or released. As illustrated, the brake 16 may be of the disc type embodying a disc 23 fixed on the cylinder shaft 20 and a non-rotatable disc 24 slidable on the shaft and cooperable with the disc 23. A spring 25 urges the disc 24 toward the disc 23 so that the brake 16 normally tends to stop or hold the cylinder 13 against rotation. The means for operating or releasing the brake 16 comprises a solenoid 26 and a suitable operative connection between the solenoid and the movable brake disc 24. This operative connection may comprise a link or pivoted lever 27 having one end pivotally connected with the armature or movable element 28 of the solenoid 26 and having a suitable yoke connection with the disc 24. The bracket 29 which carries the solenoid 26 serves to pivotally support the brake lever 27 at 30.

The means 17 for controlling the motor circuit 1, 2 and 3 to effect reversal of the motor M may be of any selected form, for example, it may be a relay means. It is preferred, however, to employ a motor driven flasher for the purpose of effecting reversal of the motor M. Such motor driven flashers are well known and, accordingly, the details of the flasher are omitted from the present disclosure. As diagrammatically illustrated the flasher includes a motor 31 which drives a shaft 32. The shaft 32 carries two cams 33. The cams 33 operate contacts 34 and 35, being operable to move these contacts 34 and 35 into engagement with mating or opposing stationary contacts 36 and 37. The cams 33 are approximately 180° in extent and are in opposed relation, as shown in Fig. 1, so that one cam operates while the other cam is idle. Accordingly, there can be only one contact 34 or 35 closed at any one time and the contacts 34 and 35 are closed in immediate succession to provide for a continuous sequence of alternating reversals of the motor M and cylinder 13 when the cylinder is operated in the so-called "reverse" manner. It is to be understood that the shaft 32 is geared down to rotate slowly, there being a speed reduction gearing interposed between the motor and the shaft 32 as is the common practice in motor driven flashers.

The control 18 is characterized by a single switch or single compound switch which serves to complete and open the circuits for the brake means 16 and the means 17 for the operation of the cylinder 13 in the manner required. This master switch S may be of the drum type embodying a turnable shaft 38 and a drum 39 fixed on the shaft. In practice, there may be a plurality of independent drums 39 but for the sake of simplicity, it will be considered that there is a single drum. The switch structure is mounted in a suitable case 40 and the shaft 38 is carried for movement through a partial rotation. The shaft 38 projects from the forward end of the case 40 and a handle 41 is fixed to the projecting end of the shaft.

The handle 41 is shaped at one end to constitute a pointer 42. An arcuate row of calibrations 43 is provided on the case front and these calibrations are designated "Reverse," "Off" and "Non-reverse" or abbreviations of the same, respectively, indicating that the cylinder 13 will be successively and alternately rotated in opposite directions when the pointer 42 is at "Reverse," will be stationary when the pointer 42 is at "Off" and will be continuously rotated in one direction when the pointer 42, is at "Non-reverse." Between the marks "Reverse" and "Off" there is a calibration labelled "Inch up," meaning that when the pointer 42 is at this mark the cylinder 13 will be inched or advanced to the right or in an "Up" direction. Between the calibrations "Off" and "Non-reverse" there is a calibration labelled "Inch down" which indicates that when the pointer 42 is at this mark the cylinder 13 will advance or inch in the down direction.

A multiplicity of stationary contacts is embodied in the switch S and these stationary contacts are engaged by contacts under the control of the drum 39. The several stationary and movable contacts may be alike and the following description of a pair of these contacts and the illustration in Fig. 4 are applicable to the other contacts of the switch S to be specifically referred to hereinafter. The movable contact illustrated has been designated X and this contact has an offset or inwardly bent part 44 engageable by cams 45 on the periphery of the drum 39. There are spaced cams 45 for engaging with the contact part 44. The cams 45 are formed and arranged to move the contact X into engagement with its opposed and mating contact Y. The

drum 39 is turned given distances in opposite directions. The several contacts of the switch S are designated X and Y, X' and Y', X^2 and Y^2, X^3 and Y^3, X^4 and Y^4, X^5 and Y^5, the contacts being in simple pairs. It is to be understood that there may be sets of two pairs of contacts with connecting buses but it is believed that the description is simplified by the single pair relationship illustrated.

The circuits of the novel control 18 include a lead 46 extending from the power line 21 (phase 1) to the door 12 of the shell 10 and thence to the contact X of the switch S. A lead 47 extends from the mating contact Y to the contact 34 of the flasher 17 and a lead 48 continues from the mating stationary contact 36 to the "Up" coil of reversing contactor controlling motor M. A line 49 taps into the lead 47 and extends to one side of the motor 31 of the flasher 17 and a line 50 extends from the other terminal of the flasher motor 31 to the second power lead 51 (phase 3) through wire 56 and overloads 22. With the circuit just described positioning of the handle 41 with its pointer 42 at the designation "Reverse" the circuit is completed from the power line 21 through the lead 46 to the engaged contacts X and Y, then through the line 47 to the flasher motor 31 and then through the lines 50 and 56 to the overloads 22 and the second power lead 51 (phase 3). A tap 52 from the line 47 extends to the contact 35 of the flasher 17 and a line 53 connects the mating stationary flasher contact 37 with the "Up" coil of the contactor controlling motor M. The operation of the flasher 17 serves to alternately and successively complete the motor contactor control circuits from the line 47 through the contacts 34 and 36 and the line 48 to the "Up" coil of the motor M contactor and through the tap 52, contacts 35 and 37 and line 53 to the "Down" coil of the motor contactor. From the above it will be seen that operation of the handle 41 to the "Reverse position" engages the contact X with the contact Y to energize the flasher 17 and to condition or set up the circuits for the "Reverse" operation of the motor M through its controlling contactor.

It is necessary that the brake 16 be released during the above described "Reverse" operation of the motor M. When the switch handle 41 is in the "Reverse" position the contact X^4 is engaged with the contact Y^4. A bus or tap 54 extends from the contact X, or the line 46, to the contact X^4 and a lead 55 extends from the mating contact Y^4 to one terminal of the brake releasing solenoid 26. A line 56a connects the other terminal of the solenoid 26 with the power line 51 through line 56 and the overloads 22. With the switch handle 41 in the "Reverse" position the flasher 17 is in operation and the "Up" and "down" coil circuits for the contactor of motor M are conditioned for control by the flasher and the solenoid 26 is energized to hold the brake 16 released so that the cylinder 13 may be operated in the reverse manner, that is, alternately and successively rotated in opposite directions. The circuit of the solenoid 26 is completed through the lines 46 and 54, the contacts X^4 and Y^4, the lead 55, the line 56a, the line 56 and the overloads 22, thus completing the circuit between the two power lines 21 and 51. Figs. 1 and 5 show the circuits completed for the "Reverse" operation of the cylinder 13.

With the switch handle 41 in a position where its pointer 42 is in the "non-reverse" position a circuit is completed to the "down" coil of the contactor for motor M and a circuit is completed through the brake releasing solenoid 26 to produce continuous rotation of the cylinder 13 in one direction. When the pointer 42 is at the "non-reverse" position the contacts X' and Y' and the contacts X^4 and Y^4 are made. The contact X' is connected in the line or bus 54. A lead 57 extends from the mating contact Y' to the line 53 of the down contactor coil of motor M and with the contacts X' and Y' engaged the circuit is completed to the "down" coil of the contactor for motor M from the power line 21 through line 46, bus 54, contacts X' and Y' and line 57 to the "down" contactor coil, through the lead 56 and through overloads 22 to the power line 51. With the switch handle 41 in the "non-reverse" position the contacts X^4 and Y^4 are also engaged to electrically connect the bus 54 with the lead 55 of the brake solenoid 26 so that a circuit is completed through the solenoid 26 to hold the brake 16 released. The motor M remains energized to rotate the cylinder 13 in one direction which I have designated the "down" direction and the brake 16 remains deenergized or released so long as the switch handle 41 remains in the "non-reverse" position.

When the switch handle 41 is in the position where its pointer 42 is at the "inch up" calibration the contacts X^2 and Y^2 and X^5 and Y^5 are made or engaged. The contact X^2 is connected in a branch 59 of the power line 21. A line 60 extends from the mating contact Y^2 to the "up" coil terminal. Thus, closing of the contacts X^2 and Y^2 completes a circuit from the power line 21 through the line 59, the contacts X^2 and Y^2, through the contactor of motor M, wire 56 and overloads 22 to the second power line 51. It is necessary that the brake 16 be released when the motor M is energized to inch the cylinder 13 up. With the switch handle 41 in the "inching up" position the contacts X^5 and Y^5 of the switch S are engaged. A branch or tap 61 connects the contact Y^5 with the above described line 55 and the contact X^5 is connected in the branch power lead 59 as at 62. With the contacts X^5 and Y^5 made or engaged the circuit is completed through the line 56a, the lead 55, the contacts X^5 and Y^5 and the lead 59 to hold the solenoid 26 energized.

When the switch handle 41 is in the position where its pointer 42 is at "off" none of the contacts of the switch S are engaged and the circuits are idle. It is to be observed that with this condition the spring 25 holds the brake 16 active so that the cylinder 13 is held against movement. So long as the solenoid 26 remains deenergized the brake 16 remains active to hold the cylinder against turning.

When the handle 41 of the switch S is brought to the "inch down" position the contacts X^3 and Y^3 are made or engaged and the contacts X^5 and Y^5 are engaged. The contact X^3 is tapped to line 59 at 62, while the contact Y^3 is connected in the above described line 57 which extends to the "down" coil of the contactor for motor M. Accordingly, a circuit is completed through the line 59, the contacts X^3 and Y^3 and the line 57 to the "down" coil of the contactor for motor M, the line 56, and the overloads 22 to the second power line 51. A circuit is also completed to the solenoid 26 when the contacts X^3 and Y^3 are engaged, this latter circuit being through the line 59, the contacts X^5 and Y^5, the line 55 to the solenoid 26, and then through line 56a, line 56, the overloads 22 and to the power line 51.

It is to be observed that the flasher 17 is shunt-

ed out or inactive when the switch S is in either of its inching positions, that is, in the "inching up" or "inching down" position. The contacts Y^2 and Y^3 are connected with the lines 60 and 57, respectively, which pass directly to the "up" and "down" coils, respectively, of the motor contactor, thus avoiding the flasher 17. From an inspection of Fig. 5 of the drawings it will be apparent that there can be no feed back through the circuits when the switch S is in either of the "inch up" or the "inch down" conditions.

The switch S embodies a detent means for releasably holding the shaft 38 in the "reverse" and "non-reverse" positions and for preventing the shaft from remaining in either of the "inching" positions. This detent means is shown in Fig. 3 wherein it will be seen that the switch shaft 38 carries a plate 70. The plate 70 is fixed to the shaft 38 and is provided with two spaced notches 71. These notches 71 have curved or cylindrical walls and are pitched or outwardly divergent. A larger central notch 72 occurs in the edge of the plate 70 between the spaced notches 71. The notch 72 has inwardly convergent straight walls. The detent means further includes a pivoted arm or lever 74. The lever 74 may be supported by a pin 75 on a fixed part 76 of the switch S and extends below the plate 70 or below the terminal 39. A pin 77 on the lever 74 rotatably carries a roller 78. The roller 78 cooperates with the notches 71 and 72. A spring 79 is engaged or connected between the outer part of the lever 74 and a fixed portion 80 of the switch S. The spring 79 yieldingly urges the roller 78 upwardly against the notched edge of the plate 70. When the handle 41 is moved either to the "reverse" or "non-reverse" position a notch 71 is brought into engagement with the roller 78. The engagement of the roller 78 in the notch releasably holds the shaft 38 against turning and thus holds the switch mechanism either in the "reverse" or the "non-reverse" condition as the case may be. On the other hand when the handle 41 is moved to bring its pointer 42 to either the "inching up" or the "inching down" position the roller 78 merely engages one of the converging walls of the intermediate notch 72. The engagement of the spring urged roller 78 with the pitched wall of the notch 72 will automatically restore the switch to the "off" position. Accordingly, it is necessary for the operator to manually hold the handle 41 in the "inch up" or "inch down" position, as required, and immediately upon releasing the handle the detent means restores the switch S to the "off" position where none of the contacts are engaged.

The safety means 19 is such that the contactor for motor M cannot be energized when the shell door 12 is open or partially open and is such that the contactor for motor M cannot be energized to effect inching of the cylinder 13 unless the operator uses two hands in the control of the system. The safety means 19 includes a switch 81 connected in the line 46 and controlled by the door 12. As above described the line 46 is in effect a continuation or branch of the power line 21 so that a switch in the line 46 operates when open to completely deenergize the system. The safety switch in the line 46 may be of any selected form. In the case illustrated the safety switch includes a stationary contact 80^a and a movable contact 81^a. The switch is positioned and formed so that the contact 81^a is engaged and moved to the closed position against the contact 80^a when the door 12 is brought to its closed position. A lug 82 on the door 12 may engage the contact 81^a to move against the contact 80^a when the door 12 reaches or approaches its closed position. A spring 83, or the equivalent, is provided to move the contact 81^a to the open position when the door 12 is opened or partially opened. The safety switch just described makes it impossible for the contactor for motor M to be energized with the shell door 12 in the opened or partially opened positions and, therefore, precludes injury to the operator by operation of the cylinder 13 when loading and unloading the machine.

The safety means 19 further includes a lock-out switch that serves to prevent inching of the cylinder 13 in either direction unless the operator employs two hands in the inching operations. This lock-out switch 85 is positioned with relation to the handle 41 so that it is impossible for the handle 41 and the switch 85 to both be controlled and operated by one hand for the inching of the cylinder 13. The inching lock-out switch 85 may be connected in either the line 46 or 59. In the case illustrated the lock-out switch 85 is connected in the line 59. In practice, the switch 85 may be a simple push button type switch. As illustrated in Fig. 2 of the drawings the switch 85 may be mounted on a side of the switch case 40, for example, it may be mounted on the under side of the case in a position where the operator's hand engaged with the handle 41 for the inching operation cannot possibly operate the lock-out switch.

In the use or operation of the apparatus of the present invention the cylinder 13 is completely controlled by the operation of the single switch S and the lock-out switch 85. To produce operation of the cylinder 13 it is necessary to first close the door 12, thus preventing injury to the operator, etc. With the door 12 closed the switch handle 41 may be brought either to the "reverse" or "non-reverse" position as required and the roller 78 will engage in a notch 71 to yieldingly retain the switch in the selected position. This results in rotation of the cylinder 13 either in the "reverse" manner or continuously in one direction depending upon the setting of the switch S. The circuits for effecting this operation of the cylinder 13 and for maintaining the solenoid 26 deenergized during cylinder operation have been described in detail and have been traced out above. To stop the operation, the switch handle 41 is moved to the "off" position which leaves the switch in a condition where all of its contacts are open so that the electrical circuits are all idle and the brake 16 is allowed to operate. In practice, it is often found necessary to inch the cylinder 13 in one direction or the other to bring its opening 14 into register with the opening 11. This is done by merely pressing the push button 85 and swinging the handle 41 to the right or to the left while maintaining the switch 85 closed. As above described, movement of the handle 41 to the "inch up" or the "inch down" position energizes the motor M to turn or move the cylinder 13 either to the right or to the left. The handle 41 may be moved back and forth to inch the cylinder 13 as required to bring the openings 14 and 11 into registration. Upon opening of the door 12 the system is rendered ineffective so that the machine may be loaded and unloaded with safety.

Having described a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any

variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A control for the rotatable cylinder of a washing machine comprising a reversible electric motor for rotating the cylinder, reversing means operable to cause alternate operation of the motor in opposite directions, non-reversing means operable to cause continued operation of the motor in one direction, and a single manually operable switch for transferring control of the motor from the reversing means to the non-reversing means and vice versa.

2. In combination with a rotatable element, a reversible electric motor for rotating the element, an energizing circuit for the motor, reversing means in the circuit operable to cause alternate operation of the motor in opposite directions, and a single manually operable switch controlling said circuit operable to make the reversing means operative and inactive at will and operable to cause continued operation of the motor in one direction and to de-energize the motor at will.

3. In combination with a rotatable element, a reversible power means for rotating the element, an energizing circuit for the power means, reversing means in the circuit operable to cause alternate operation of the power means in opposite directions, a single manually operable switch controlling said circuit operable to make the reversing means operative and inactive at will and operable to cause continued operation of the power means in one direction and to de-energize the power means at will, and a brake controlled by said switch to stop the element when the power means is de-energized.

4. In combination with a rotatable element, a reversible electric motor for rotating the element, an energizing circuit for the motor, reversing means in the circuit operable to cause alternate operation of the motor in opposite directions, and a switch in the circuit of the motor and reversing means including a pair of reversing contacts engageable to cause operation of the reversing means, a pair of contacts engageable to cause operation of the motor continuously in one direction, and a single movable switch member operable to selectively engage either of said pairs of contacts.

5. In combination with a rotatable element, a reversible electric motor for rotating the element, an energizing circuit for the motor, reversing means in the circuit operable to cause alternate operation of the motor in opposite directions, and a switch in the circuit of the motor and reversing means including a pair of reversing contacts engageable to cause operation of the reversing means, a pair of contacts engageable to cause operation of the motor continuously in one direction, two pairs of contacts engageable to cause operation of the motor in opposite directions to effect inching of the element, and a single movable switch member movable to positions to selectively engage any one of said pairs of contacts.

6. In combination with a rotatable element, a reversible electric motor for rotating the element, an energizing circuit for the motor, reversing means in the circuit operable to cause alternate operation of the motor in opposite directions, and a switch in the circuit of the motor and reversing means including a pair of reversing contacts engageable to cause operation of the reversing means, a pair of contacts engageable to cause operation of the motor continuously in one direction, two pairs of contacts engageable to cause operation of the motor in opposite directions to effect inching of the element, and detent means for releasably holding said member in position to maintain the two first mentioned pairs of contacts engaged.

7. In combination with a rotatable element, a reversible electric motor for rotating the element, an energizing circuit for the motor, reversing means in the circuit operable to cause alternate operation of the motor in opposite directions, and a switch in the circuit of the motor and reversing means including a pair of reversing contacts engageable to cause operation of the reversing means, a pair of contacts engageable to cause operation of the motor continuously in one direction, two pairs of contacts engageable to cause operation of the motor in opposite directions to effect inching of the element, a movable member selectively movable to positions to cause engagement between the contacts of any one of said pairs, detent means for releasably holding said member in the positions to maintain the two first mentioned pairs of contacts engaged, and means for automatically moving the member to a position where none of the contacts are engaged when the member is left where either of said two pairs of contacts are engaged.

8. In combination with a rotatable element, a reversible power means for rotating the element, an energizing circuit for the power means, reversing means in the circuit operable to cause alternate operation of the power means in opposite directions, a brake for stopping movement of the element, means for releasing the brake, and a manually operable switch in the circuit of the power means and reversing means and operable to control the brake releasing means, the switch including a pair of contacts engageable to cause operation of the reversing means, a pair of contacts engageable to cause continuous operation of the power means in one direction, contacts engaged when either of the first mentioned pairs of contacts are engaged to energized the brake releasing means, and a switch member movable to given positions to engage either of said first mentioned pairs of contacts.

9. In combination with a rotatable element, a reversible power means for rotating the element, an energizing circuit for the power means, reversing means in the circuit operable to cause alternate operation of the power means in opposite directions, a brake for stopping movement of the element, means for releasing the brake, and a manually operable switch in the circuit of the power means and reversing means and operable to control the brake releasing means, the switch including a pair of contacts engageable to cause operation of the reversing means, a pair of contacts engageable to cause continuous operation of the power means in one direction, pairs of contacts engageable to cause operation of the power means in either direction to effect inching of the element, and contacts engageable to cause energization of the brake releasing means, and a single manually movable member operable to selectively engage any of said pairs of contacts and to simultaneously therewith engage the last named contacts.

10. In combination with a rotatable element, a reversible power means for rotating the element, an energizing circuit for the power means, brake means for the element, means for releasing the brake means, a circuit governing the brake

releasing means, a switch controlling the circuits of the power means and brake releasing means and having a position where the power means is energized for continuous operation of the element and the brake releasing means is energized and having positions where only the power means is energized, and a lock out switch in the circuit of the brake releasing means manually operable to close the same when the first named switch is in its second named position.

11. A control for a reversible power means for driving a rotatable element and having an energizing circuit, the control including brake means for the element, means for releasing the brake means, a circuit governing the brake releasing means, a manually operable switch controlling the circuits of the power means and brake releasing means and having a position where the power means is energized for continuous operation of the element and the brake releasing means is energized and having positions where only the power means is energized, and a lock out switch in the circuit of the brake releasing means manually operable to close the same when the first named switch is in its second named position, said switches having manually engageable operating parts so spaced and positioned that the operator must use both hands for their simultaneous control, the first named switch being operable to cause operation of the element when the lockout switch is idle.

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