April 12, 1932. L. C. SHIPPY 1,853,087

ELECTRIC SWITCH

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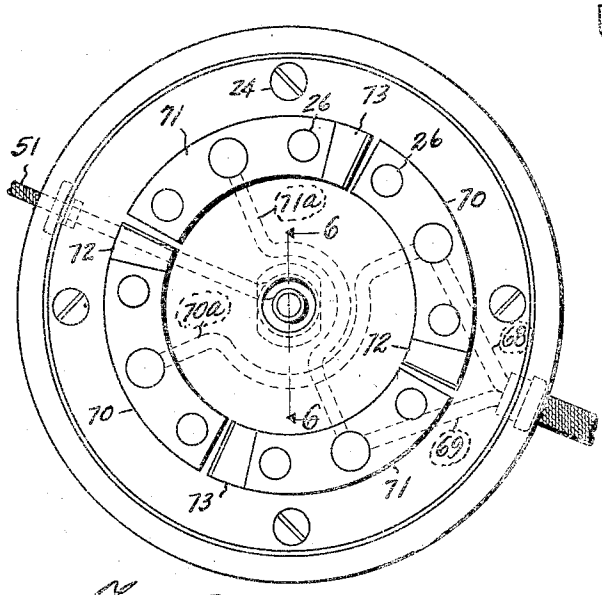

Fig. 2

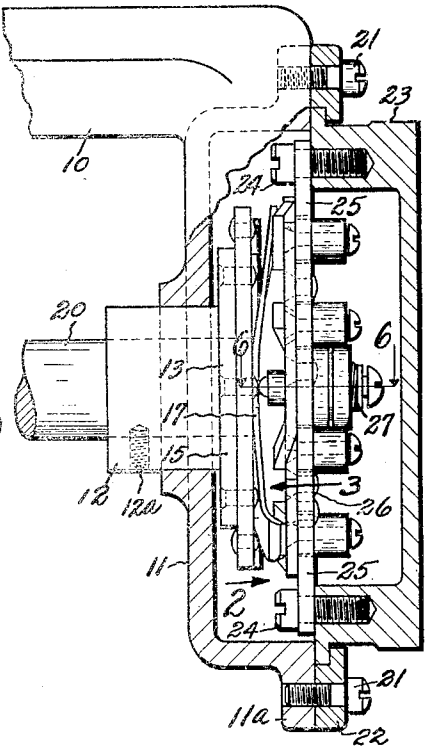

Fig. 1

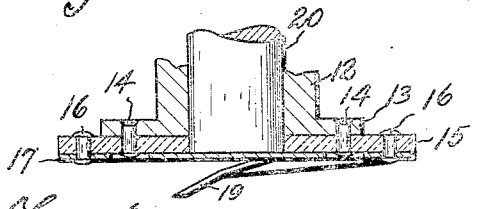

Fig. 4

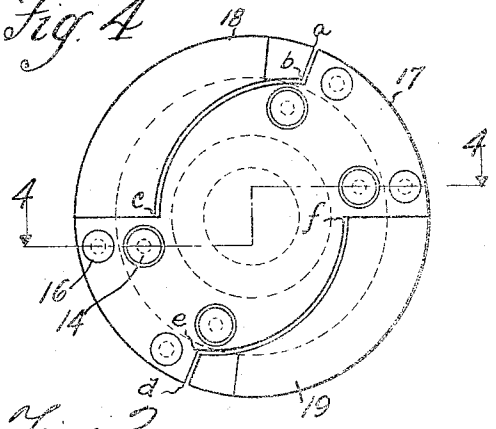

Fig. 3

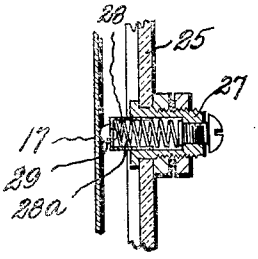

Fig. 6

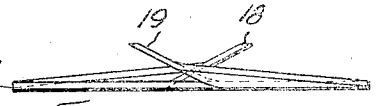

Fig. 5

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ELECTRIC SWITCH

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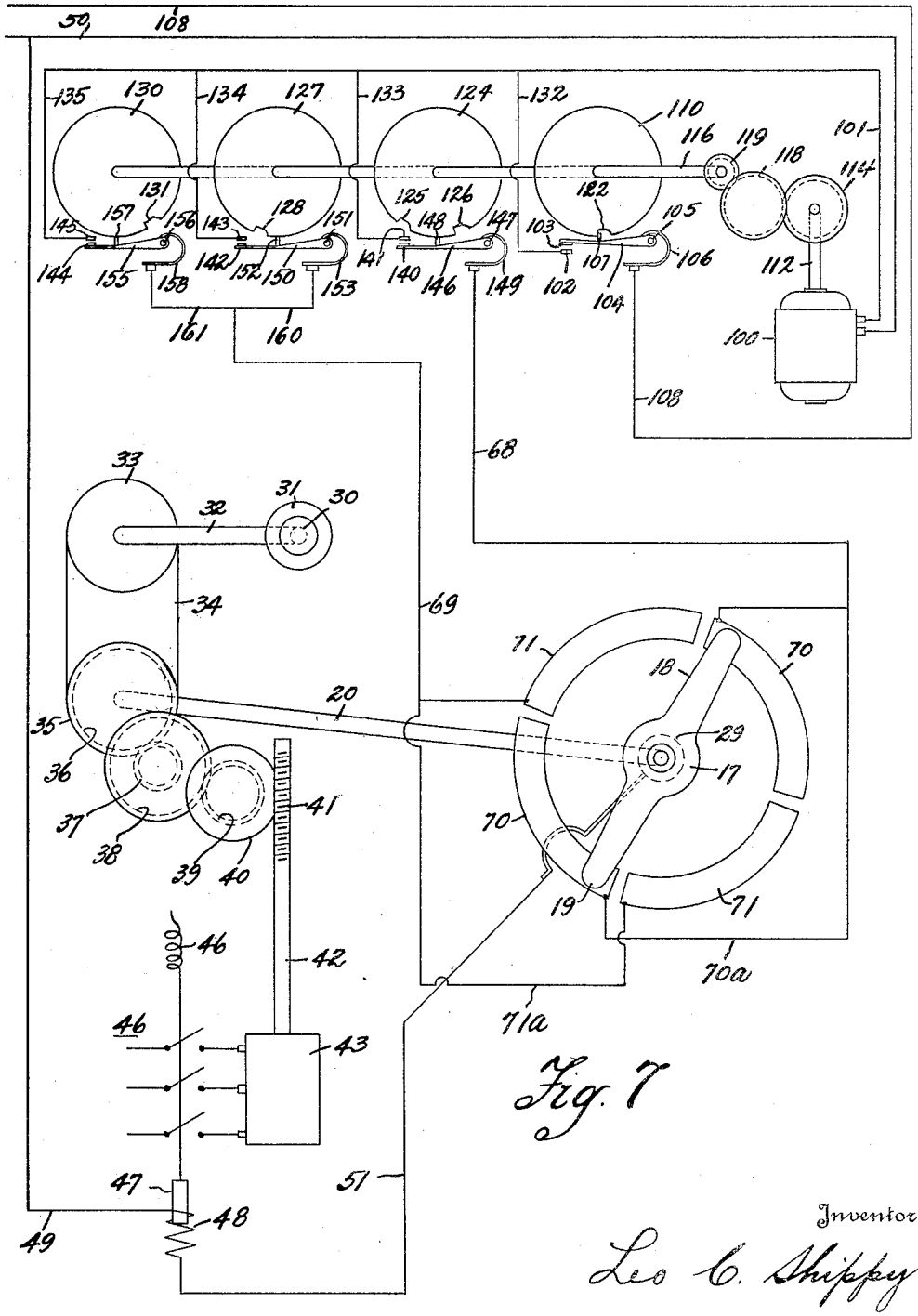

Fig. 7

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed January 6, 1930. Serial No. 418,849.

This invention relates to automatic controls for valves and the like, particularly for controlling pressure applied to hydraulic presses, for example, presses for molding articles from material which is of phenolic condensation product. One example of such control is shown in my copending application, Serial Number 352,310 filed April 3, 1929. This application discloses a rotary valve having four positions into which the valve may be moved by quarter turn revolutions of the operation shaft of the valve. The valve shaft is operated by an electric motor which is caused to operate intermittently at predetermined times to produce the one-quarter turn revolutions of the valve shaft by an electrically operated control mechanism operated by a small constant speed motor running at substantially constant speed and including certain circuit breakers operated by cams driven by the small motor which control circuits also controlled by a two-way switch operated by a shaft which moves with the shaft which turns the valve.

One of the objects of the present invention is to provide such improvements in a two-way switch adapted for the control system referred to so as to enable it to be produced at low cost.

A further object of the invention is to provide for certain adjustments of the two-way switch by which the relation between the switch operating mechanism and the cycle of operations of the switch may be varied.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a side view of a switch embodying the present invention showing the switch housing members in longitudinal cross section.

Fig. 2 is a side elevation of a stationary part of the switch looking in the direction of the arrow 2 in Fig. 1.

Fig. 3 is a side elevation of the removable part of the switch looking in the direction of the arrow 3 in Fig. 1.

Fig. 4 is a sectional view on the line 4—4 of Fig. 3.

Fig. 5 is an edge view of the movable switch contact member shown in Fig. 3.

Fig. 6 is a fragmentary sectional view on the line 6—6 of Fig. 1.

Fig. 7 is a wiring diagram illustrating the use of the present invention.

A stationary bracket 10 is integral with a cup-shaped switch housing 11 providing a bearing for a hub 12 integral with a flange 13 which is attached by rivets 14 with a non-conducting disc 15 to which rivets 16 secure a metal disc 17 which has been partly sheared away along the lines *a*, *b*, *c* and *d*, *e*, *f* to provide resilient spring fingers 18 and 19 respectively which are bent away from the plane of the main portion of the disc 17. The hub 12 is fastened by screw 12*a* to an operating shaft 20.

The flange 11*a* of the housing 11 is attached by screws 21 to a clamping ring 22 which provides a journal bearing for a rotatable housing 23 which may be angularly adjusted relative to the axis of the shaft 20 and which may be clamped against the housing 11 in the desired position of adjustment by tightening the screws 21. The screws 24 secure a non-conducting plate 25 to the housing 23. Plate 25 carries a pair of diametrically opposite arcuate contacts 70 located in a circular row together with a pair of diametrically opposite contacts 71. These contacts are attached in any suitable manner as by rivets 26. The pair of contacts 70 is connected by a jumper 70*a* and one of these contacts is connected with a wire 68. The other pair of contacts 71 are connected by a jumper 71*a* and one of these contacts is connected with a wire 69. The wires 68 and 69 and also the common lead wire 51 enter the housing 23 through suitable holes in the side wall thereof. The common wire 51 is connected with a central terminal 27 secured to the plate 25 and providing a recess 28 for receiving a spring 28*a* which urges a contact 29 against the central portion of the movable contact disc 17. Each of the contacts 70 is provided with an out-

wardly bent end portion 72, and each of the contacts 71 is provided with similarly outwardly bent end portion 73, each outwardly bent portion being located adjacent the unbent end of an adjacent contact. Assuming that the spring fingers 18 and 19 are engaging contacts 70 as shown in Fig. 7, the turning of the shaft 20 clockwise as viewed in Fig. 7 or Fig. 2 (counter-clockwise as viewed in Fig. 3) the fingers 18 and 19 will ride upon the outwardly bent portion 72 of the contact 70 and then will abruptly move away from the contact portion 72 into engagement with the adjacent contacts 71 in order to quickly interrupt the circuit formerly made through the engagement of the fingers 18 and 19 with the contact 70. Similarly, the spring fingers 18 and 19 must ride up along the outwardly bent portion 73 of contact 71 before moving out of engagement with the contact 71 and into engagement with the contact 70. In this way a quick breaking of the circuit is effected, thereby tending to reduce arcing and prolong the life of the switch contacts.

The manner of using the two-way switch embodying the present invention will be explained with reference to Fig. 7. In this figure numeral 30 designates a rotary valve operating within a housing 31 and operated by a shaft 32 connected by a sprocket gear 33, chain 34 and sprocket gear 35 with the shaft 20. Shaft 20 carries a square gear 36 meshing with a gear 37 driven by a coaxial gear 38 meshing with a gear 39 driven by a coaxial worm gear 40 driven by a worm 41 on a shaft 42 driven by an electric motor 43. The main motor switch is designated by numeral 45 and is electromagnetically operated into circuit closing position by an electro-magnet comprising an armature 47 and a relay winding 48. A spring 46 tends to maintain the switch 45 in open position. Numeral 50 designates a power line connected by a wire 49 with the relay magnet 48 having its other end connected with the center contact 29 of my improved two way switch.

The power line 50 is connected with one of the terminals of a small constant speed motor 100 and its other terminal is connected by wire 101 with wires 132, 133, 134 and 135 which are connected respectively with stationary contacts 102, 141, 143 and 145. The other power line 108 is connected by a flexible leaf spring conductor 106 with a circuit breaker 104 pivoted at 105 and carrying a movable contact 103 cooperating with the contact 102. Lever 104 carries a rubbing block 107 urged by the spring 106 against a cam 110 provided with a notch 122 which, when located adjacent the rubbing block 107 permits movement of the lever 104 toward the cam 110 sufficiently to allow the contact 103 to separate from the contact 102. The cam 110 is mounted on a shaft 116 carrying a gear 119 meshing with a gear 118 driven by a gear 114 operated by the shaft 112 of the motor 100. The shaft 116 carries also cams 124, 127 and 130.

Cam 124 is provided with notches 125 and 126. The wire 68 is connected with contacts 70 of the two-way switch leads to a leaf spring conductor 149 attached to a circuit breaker lever 146 pivoted at 147 and carrying a rubbing block 148 which is urged by the spring 149 against the cam 124. Lever 126 carries a contact 140 cooperating with the contact 141.

The wire 69 to which the contacts 71 of the two-way switch are connected is connected by wire 160 with a leaf spring conductor 153 connected with a circuit breaker lever 150 carrying a contact 142 cooperating with the contact 143. The lever 150 is pivoted at 151 and is urged toward the cam 127 by the leaf spring 153. The cam 127 is provided with a notch 128 for receiving the circuit breaker rubbing block 152 when permitting the contact 142 to engage the contact 143.

The wire 69 is connected also with a wire 161 leading to a leaf spring conductor 158 connected with a circuit breaker 155 carrying a contact 144 which cooperates with the contact 145. The lever 155 is pivoted at 156 and carries a rubbing block 157 urged by the spring 158 against the cam 130 which is provided with a notch 131 for receiving the rubbing block 157 when it is desired to permit the contact 144 to engage the contact 145.

Fig. 7 shows the apparatus in normal position. It will be noted that the switches controlling the motors 100 and 43 are open. In order to initiate cycle of movement of rotary valve 30, the motor 100 must be started. This is accomplished by manually turning the cam 110 in a clockwise direction as viewed in Fig. 7, so that the notch 122 can be moved away from the cam follower 107 in order to close the switch contacts 102 and 103. Then the motor 100 will drive the shaft 116 through the train of gearing so that the shaft 116 will turn clockwise very slowly, the shaft completing one revolution for every cycle of movements of the valve 30. After a slight rotation of the shaft 116 has taken place, the notch 126 will be moved into radial alignment with the cam follower 148 in order to permit the spring 149 to close the switch contacts 140 and 141. When this occurs, the magnet 48 will be energized through the circuit: wire 49, magnet coil 48, wire 51, contacts 29, 17 and 70, wire 68, spring 149, lever 146, contacts 140 and 141, wires 133 and 132, contacts 103 and 102, lever 104, spring 106 and wire 108. Then the main switch 45 will be closed and the valve actuating motor 43 will turn shaft 32 90° in a clockwise direction, as viewed in Fig. 7. During this movement, the switch arms 18 and 19 will be moved by shaft 20 away from contacts 70 and will contact with contacts 71 and the motor 43 will stop

since the circuit of magnet coil 48 is interrupted.

The motor 100 will continue to rotate until the notch 131 of the cam 130 has been moved into radial alignment with the cam follower 157 in order to permit the closing of the switch contacts 144 and 145. When this occurs, the magnet 48 will be energized into the following circuits: wires 50 and 49, coil 48, wire 51, contacts 29, 17 and 71, wires 69 and 161, spring 158, lever 155, contacts 144 and 145, wires 135 and 132, contacts 103 and 102, lever 104, spring 106 and wire 108. Then the switch 45 will be closed and the motor 43 will rotate the shafts 20 and 32 through the second quadrant so as to rotate the valve 30 through a second 90°. During this movement the shaft 20 is turned so as to disconnect the contact arms 18 and 19 of contact 17 from contacts 71 and to connect said arms 18 and 19 with contacts 70. The motor 43 will again stop, since the circuit of the magnet coil 48 is interrupted. When this occurs, the magnet 48 is de-energized causing the spring 46 to open switch 45.

The motor 100 continues to rotate until the notch 125 of the disc 124 is moved into radial alignment with the cam follower 148 in order to permit the closing of the switch contacts 140 and 141. When this occurs, the magnet coil 48 will be energized by the following circuits: wires 50 and 49, coil 48, wire 51, contacts 29, 17 and 70, wire 68, spring 149, lever 146, contacts 140 and 141, wires 133 and 132 (contacts 102 and 103, lever 104, spring 106 and wire 108. When this occurs, magnet coil 48 will be energized again, the switch 45 will be closed, and the motor 43 will rotate the shafts 20 and 32 through the third quarter turn thereby to move valve 30 into its third position and to move the contact arms 18 and 19 of contact 17 from the contacts 70 to the contacts 71. The motor 43 will stop since the circuit of magnet 48 is again interrupted.

The motor 100 will continue to rotate until the notch 128 of the disc 127 has been moved sufficiently to permit the cam follower 152 to move into notch 128 to permit closing of the contacts 142 and 143. When this occurs, the magnet coil 48 will be energized by the following circuits: wires 50 and 49, magnet coil 48, wire 51, contacts 29, 17 and 71, wires 69 and 160, spring 153, lever 150, contacts 142, and 143, wires 134 and 132, contacts 102 and 103, lever 104, spring 106 and wire 108. When this occurs, magnet coil 48 will be energized again, the switch 45 will be closed, and the motor 43 will rotate the shafts 20 and 32 and the valve 30 through the fourth quarter turn, thereby causing the contact arms 18 and 19 of contact 17 to move from contacts 71 to contacts 70. When this occurs, the magnet 48 is de-energized and the spring 46 opens the motor switch 45 and the motor 43 will stop.

The motor 100 will now operate for a brief period sufficiently to bring the notch 122 of the disc 110 into radial alignment with the cam follower 107 to permit opening of the contacts 102 and 103. Then the motor 100 will stop as the circuit through the motor will be opened. The cycle of operation of the switches controlled by the motor 100 is now completed and will not be repeated until the operator manually turns the disc 110 sufficiently to close the contacts 102 and 103 again.

By changing the angular relation of the stationary contact supporting plate 25 relative to the shaft 20, the relation which the valve 30 bears to its seat 31 when the valve 30 stops rotating may be varied. If the valve 30, when brought to rest, should not be in proper position with respect to certain ports (not shown) in valve seat 31, the screws 21 may be loosened so as to permit turning the housing 23 upon the bearing provided by the clamping ring 22. By turning the housing 23, the plate 25 carrying contacts 70, 71, 70, 71 is turned so as to change the angular distance through which the valve 30 will be turned during the next operation of the motor 43 before the latter stops.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An electric switch comprising, in combination, a case, a shaft extending into and supported by the case, a movable contact supported by the shaft, a plate, relatively stationary contacts insulatingly supported by the plate and cooperating with the movable contact, a cover supporting the plate, and means attached to the case for supporting the cover in various positions of angular adjustment relative to the axis of rotation of the rotary contact.

2. An electric switch comprising, in combination, a case, a shaft extending into and supported by the case, a movable contact supported by the shaft, relatively stationary contacts within the case cooperating with the movable contact, a cover for the case insulating supporting the stationary contacts, and means for securing the cover to the case in various positions of angular adjustment relative to said shaft.

3. An electric switch comprising, in combination, a case, a shaft extending into and supported by the case, a movable contact having a central portion and contact arms extending therefrom insulatingly supported by the shaft, a stationary central contact for engaging the movable contact at the central portion thereof, other relatively stationary

contacts arranged in a circular row for cooperation with the arms of the movable contact, a nonconducting plate supporting all of the stationary contacts secured to a movable housing, and means for securing the housing to the case in various positions of angular adjustment relative to the axis of the shaft.

4. An electric switch comprising in combination, a case, a shaft extending into and supported by the case; a movable contact supported by the shaft, relatively stationary contacts within the case cooperating with the movable contact, a cover for the case insulatingly supporting the stationary contacts; and means for securing the cover to the case to adjust infinitely the angular movement of the contacts relative to the axis of the shaft.

In testimony whereof I hereto affix my signature.

LEO C. SHIPPY.