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C. THUMIM

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ELECTRIC SWITCH

Filed March 28, 1928

Fig. 1.

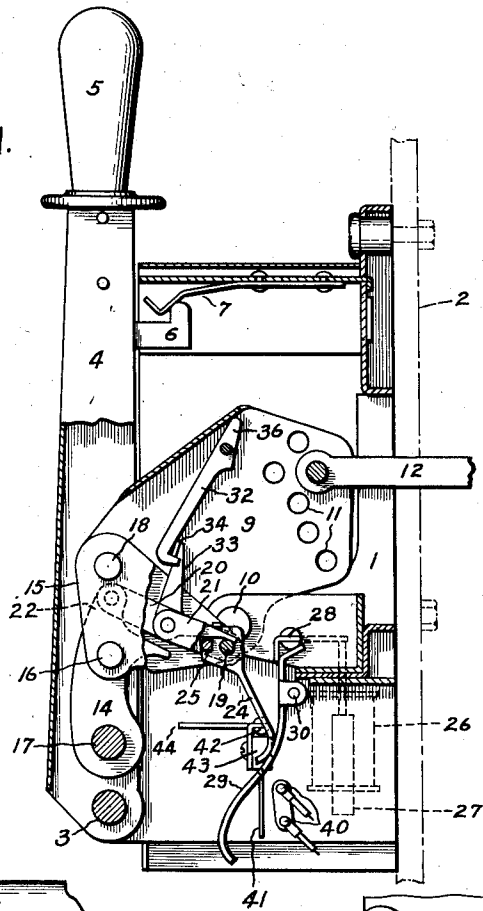


Fig. 2.

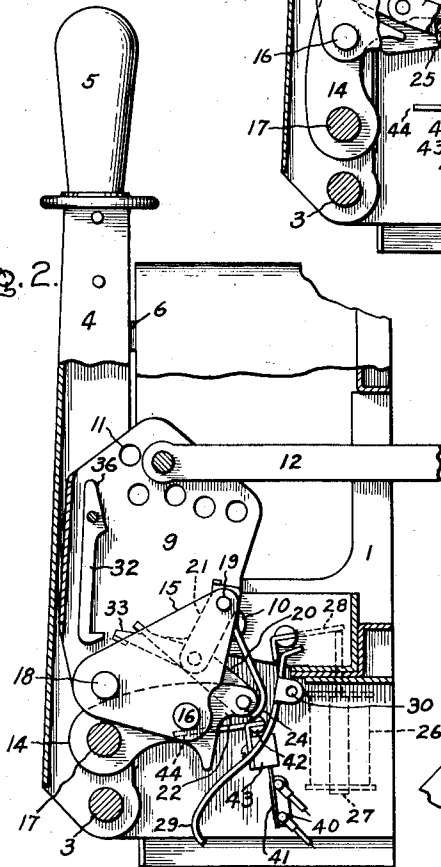
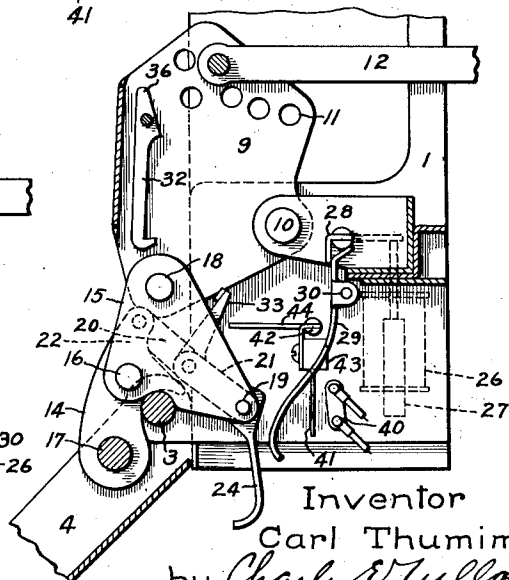


Fig. 3.



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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

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My invention relates to electric switches and particularly to operating mechanism therefor. The object of my invention is the provision of an improved switch operating mechanism which is simple in construction, easy to operate, trip free throughout a wide range of its movement and is adapted to be tripped open in response to a reverse movement thereof.

My invention will be better understood from the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring to the drawings, Figs. 1, 2 and 3 show one embodiment of the mechanism respectively in switch closed position, tripped position, and resetting position.

In the drawings, the frame 1 of the mechanism is adapted to be secured to the face of a panel 2 and is shown in the form of a housing for the operating parts. To the lower front portion of the frame is pivoted at 3 the switch actuating means as the hand lever 4 having the handle 5 and projection 6 adapted to engage the spring detent 7 to assist in holding the lever in closed circuit position. Operated member 9 is pivoted to the frame at 10 and is provided with a series of holes 11 in any one of which may be pinned the rod 12 leading to the switch to be operated. Lever 4 and member 9 are connected together by means of the toggle links 14 and 15. These links are pivoted together at 16 and are pivoted at their ends to the lever 4 and member 9 respectively at 17 and 18. When the lever is in the closed circuit position illustrated, pivot centers 3, 17 and 18 are in alignment whereby little effort is required on the part of the operator to push the contacts of the switch into fully closed position. Toggle link 15 comprises a pair of plates, shown triangular in form at one corner of which is pivoted at 19 the toggle comprising the links 20 and 21, the opposite end of the toggle being pivoted to the extension 22 of link 14. In the switch closed position of the apparatus toggle links 14 and 15 are maintained in a slightly underset relation by the toggle links 20 and 21 which links are held in a slightly

overset relation by the engagement of an extension on link 20 with pivot pin 19. For tripping the mechanism I have provided an element, as the member 24 pivoted on pin 19 and having the projection 25 adapted to raise the extension in link 20 to cause the toggle to buckle. Overload coil 26 has the plunger 27 connected to actuate lever 28 which in turn rocks lever 29 pivoted at 30. This lever 29 is so shaped that it conforms closely to the path of movement of the cooperating end of member 24 as the mechanism moves toward the closed circuit position thereof. The mechanism is thus rendered trip free over that entire portion of its movement from the time the switch contacts first touch each other to their fully engaged position.

It is some times desirable to be able to open the switch by means of the operating handle and when this is done the operator should be safeguarded from being subjected to a kick from the switch due to the reaction incident to a heavy load or short circuit. For this purpose I have provided a latching means on the operated member for automatically tripping the mechanism in response to movement of the handle in the direction to open the switch. This means comprises the latch 32 pivoted to member 9 and the lateral extension 33 on toggle link 21, the latter being constructed with the lip 34 and arranged automatically to be engaged by the latch when the mechanism is being moved from the set position shown by Fig. 3 toward the closed circuit position shown by Fig. 1. The latch is loosely pivoted to the member 9 and has the tail 36 which when the member is rotated from the position shown in Fig. 3 to that shown in Fig. 1 engages the flanged edge thereof, the latch thereby being held in the proper position to receive the lip 34 upon further movement of the member. The parts are so constructed and arranged that the lip hooks over the latch just prior to the initial connection of the contacts of the switch. It is therefore not necessary to completely close the switch in order to be able to trip it open by a reverse movement of the operating handle. For example, if the switch is closed on a heavy load or short circuit the reaction of

the switch on the operator's hand arising from the electromagnetic forces or from gas formation in the switch is not severe since a small reverse movement only of the handle is necessary to cause the latch to throw the toggle 20 and 21 over center and release the switch. In other words, as lever 4 is rotated slightly in a counter clockwise direction, pivot 17 which is secured thereto moves in an arc about pivot 3, and for a small degree of rotation of lever 4 there is very little vertical change in the position of pivot 17. Its movement is for the most part horizontal, with the result that pivot 18, which is secured to the operated member 9, remains nearly stationary. The above described movement, therefore, in effect, tends to rotate the toggle links 14-15 as a unit about pivot 18, in a clockwise direction and thereby lower the pivot 19 secured to link 15 and forming a part of toggle link 21. Accordingly, toggle link 21 and its lateral extension 33 are lowered, i. e., tend to rotate in clockwise direction about pivot 18, while the operated member 9 remains practically stationary. Latch 32, however, is pivotally mounted on the operated member 9 and so cannot partake of downward movement independently thereof. It follows therefore that as the lateral extension 33 is moved downwardly due to the initial slight rotative movement of lever 4 towards open position, the lip 34 tends to drag latch 32 along with it, but is restrained by the latch from such downward movement, thereby causing rotation of toggle link 21 in a clockwise direction to buckle the toggle 20-21, thus permitting the switch to trip free of the lever 4. This construction also has the advantage of preventing the closing of the switch in a manner some times practiced by timid operators which results in more or less severe burning of the switch contacts. If one attempts to close the switch too gently and after initial contact has been made vibrates the handle in successive efforts to get the switch completely closed the first reverse movement will cause the tripping out of the switch. This will save unnecessary burning of the contacts and should emphasize to the operator the fact that the switch should be closed by a single, powerful thrust of the handle.

The switch which I have devised is provided with a visual indicator and an electric signal, both of which are not shown, for indicating to the switch attendants that the switch has tripped out. The electric signal may, for example, be of the well known bell alarm or horn type which operates whenever the switch or one of a number of switches of a group trips out and stops when the tripped switch is reclosed. In the reclosing operation some operators find that they are somewhat disturbed by the violent ringing of a bell or the sounding of a horn and pre-

fer to shut off the alarm before closing the switch. When such is done with former apparatus there is the danger that the operator will forget to turn on the alarm after he has closed the switch in readiness for the next switch that may trip out. In the switch disclosed herein I have provided an alarm contact device which will close the alarm circuit when the switch trips open but which may be operated to open the alarm circuit by a small movement of the operating handle prior to and independently of the switch closing movement thereof. Two fixed contacts 40 connected in the alarm circuit are adapted to be bridged by the contact plate 41 when the switch is tripped open. Plate 41 is pivotally mounted at 42 and a small weight 43 serves normally to hold the plate out of contact with the contacts 40. Attached to the plate and the weight is the arm 44. This arm has such a length and is in such a position that in the collapsing movement of the toggle links 14 and 15 as the switch trips open the intermediate pin 16 will engage the upper surface of the arm and press the contact plate 41 against contacts 40, thereby closing the alarm circuit. Preferably both the arm 44 and the plate 41 are resilient, the former conveniently being made in the form of a flat spring. Fig. 2 shows the parts in the tripped position with the alarm circuit closed. If the operator wishes to silence the alarm before reclosing the switch he has only to swing down the handle a short distance which movement causes the pin 16 to further depress the spring arm 44 until it slips off the end thereof when the weight 43 returns the contact plate 41 to the open circuit position. The handle may then be returned to the upright position if desired without reclosing the switch, in which case the pin 16 swings below arm 44 and positively holds the contact plate away from contacts 40. The alarm is now silenced and although the pin 16 is now below the spring arm instead of above it, the subsequent closing operation of the switch is unaffected thereby.

I have chosen the particular embodiment described above as illustrative of my invention and it will be apparent that various modifications may be made without departing from the spirit and scope of my invention, which modifications I aim to cover by the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A switch operating mechanism comprising an operating lever movable to a predetermined closed circuit position, an operated member, a releasable connection therebetween including a toggle, and a latch carried by said operated member and arranged to engage said toggle when the lever is moved toward said position, said latch causing the

release of the toggle in response to a subsequent reverse movement of the lever.

2. A switch operating mechanism comprising an operating lever movable to a predetermined closed circuit position, a member operated thereby, a releasable connection therebetween, and a member carried by said operated member for causing the release of said connection when the lever is moved in the reverse direction, said releasing member being arranged to engage said connection prior to the initial closing of the switch contacts.

3. A manual switch operating mechanism comprising a hand lever, a member operated thereby, toggle links connecting said member to said lever, said links being connected to the lever at a point spaced from the fulcrum thereof whereby the intermediate portion of the lever and said links form a second toggle arranged to assume a straightened position when the lever is in its closed circuit position, releasable retaining means for said toggle links movable with said mechanism in the switch closing movement thereof, and tripping means therefor comprising a member shaped to conform to the path of movement of said retaining means.

4. A manual switch operating mechanism comprising a hand lever, a member operated thereby, a pair of toggle links connecting the lever to the member, one of said links having an extension thereon, a toggle between said extension and the other of said links, an element adapted to buckle said toggle and a tripping member adapted to engage a portion of said element having an engaging part shaped to conform to the path of movement of the engaged portion of the element.

5. A manual switch operating mechanism comprising a hand lever, a pivoted member operated thereby, a pair of toggle links connecting the lever to the member, one of said links having an extension thereon, a toggle between said extension and the other of said links, a toggle releasing latch carried by said pivoted member and arranged to engage said toggle during the movement of the lever toward its closed circuit position, whereby a reverse movement of the lever is effective to cause the release of the toggle.

6. A manual switch operating mechanism comprising a hand lever, a member operated thereby, a releasable connection therebetween, and an alarm controlling means constructed and arranged to be actuated by the release of said connection, said alarm controlling means rendered inoperative while the switch is open in response to an initial switch opening movement of the hand lever, return of said hand lever to closed position being ineffective to actuate said means.

7. A manual switch operating mechanism comprising a hand lever, a member operated thereby, a releasable trip-free connection

therebetween, an alarm switch and an operating member therefor arranged in the path of movement of a portion of said connection to move in one direction in response to the release of said connection when tripped independently of said hand lever and to move in the opposite direction in response to an initial movement of the hand lever from its closed position independent of the switch closing or resetting movement thereof.

8. A manual switch operating mechanism comprising a hand lever, a member operated thereby, a releasable toggle connection therebetween, an alarm switch, and an operating member therefor arranged to be engaged by a portion of said toggle connection when the same is released to close the alarm switch, said portion being arranged to release said operating member when the hand lever is initially moved in a direction opposite to that of its closing movement.

9. In a switch operating mechanism comprising a switch operating member and actuating means therefor, the combination of a releasable connection therebetween including a toggle, said connection adapted to transmit movement from said actuating means to the switch operating member for effecting closing movement of the switch, and a latch associated with said toggle for causing collapse thereof and consequent opening movement of the switch in response to reverse movement of the actuating means during the switch closing operation.

In witness whereof I have hereunto set my hand this 24th day of March, 1928.

CARL THUMM.