March 4, 1930. J. J. HOGAN 1,749,536

SWITCH

Filed Jan. 21, 1927

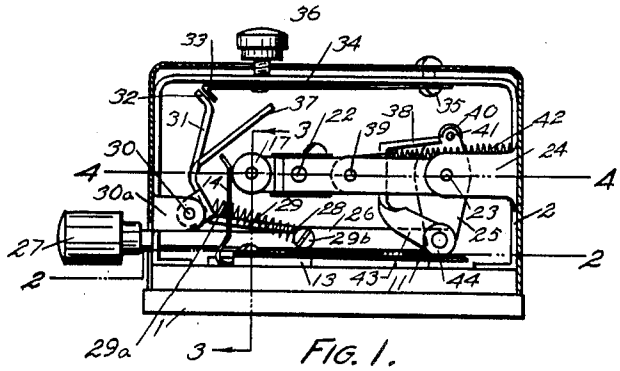


FIG. 1.

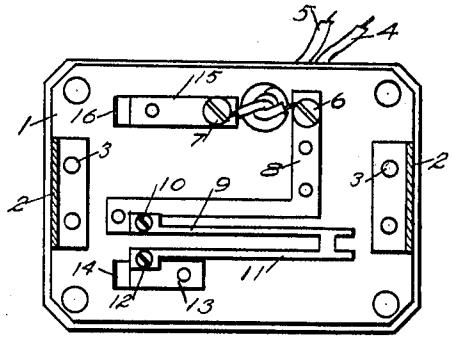


FIG. 2.

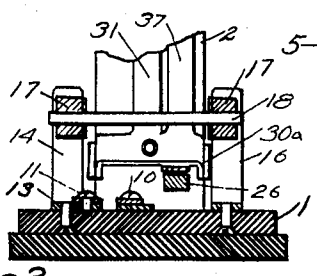


FIG. 3.

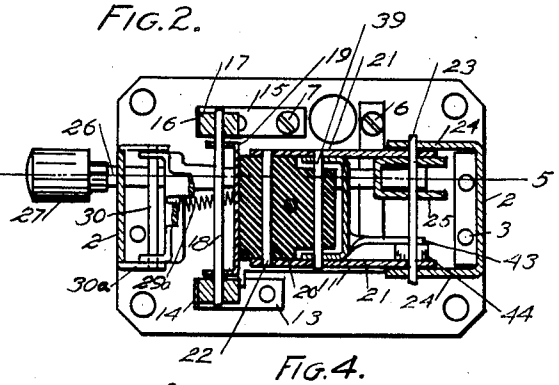


FIG. 4.

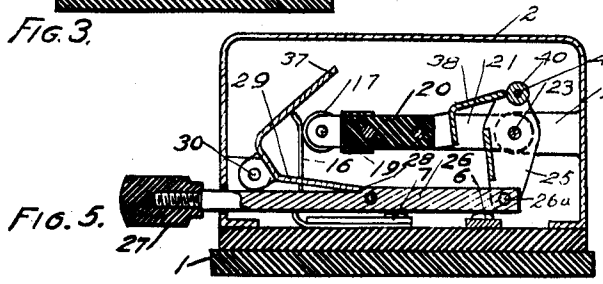


FIG. 5.

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Patented Mar. 4, 1930 1,749,536

UNITED STATES PATENT OFFICE

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SWITCH

Application filed January 21, 1927. Serial No. 162,487.

This switch is particularly designed to take care of over-loads. With many devices, particularly such as are used for domestic purposes some means of opening the switch with dangerous over-loads is desirable and this preferably should be accomplished directly through the switch which is ordinarily manually operated to open and close the circuit. With the present invention this is not only accomplished through the switch ordinarily used for controlling the circuit but the operation of the emergency mechanism opening the switch entails no different manipulation of the switch on the part of the operator than where the switch is opened in the normal manner. This is one feature of my invention.

In carrying out my invention I employ not only manually operated means, but also a thermal element responsive to over-load electrical conditions for tripping the switch. I also provide the tripping mechanism with a roller, thus relieving the thermal element of the frictional load necessary to trip the switch. I have designed such a switch in a simple and economical manner so that its various operations may be accomplished with few parts and with a device that will operate with certainty and through the action of push buttons with which the average operator is apt to be familiar.

A preferred embodiment of the invention is illustrated in the accompanying drawings as follows:—

Fig. 1 shows a side elevation of the switch, the cover being in section.

Fig. 2 a section on the line 2—2 in Fig. 1.

Fig. 3 a section on the line 3—3 in Fig. 1.

Fig. 4 a section on the line 4—4 in Fig. 1.

Fig. 5 a section on the line 5—5 in Fig. 4.

1 marks the base and 2 the switch frame which is secured to the base by screws 3. Lead wires 4 and 5 extend to posts 6 and 7. The post 6 is connected with a plate 8 and the plate 8 is connected by a screw 10 with one leg 9 of the thermal element. The other leg 11 of the element is secured by a screw 12 on a contact base 13 carrying a resilient contact plate 14. The post 7 is secured to a contact base 15 carrying a contact plate 16.

Contact rollers 17 are journaled on a bridge pin 18. The bridge pin is mounted in a supporting plate 19 secured on an insulated block 20. The insulated block is secured between arms 21 by means of a pin 22. The arms 21 are journaled on a cross pin 23 carried by ears 24 bent inwardly from the frame 2. These parts form a contact arm, the rollers 17 acting through the pin 18 forming a bridge between the contacts 16 and 14 so that as the contact arm is swung down carrying the rollers into engagement with the contact the switch is closed and the rollers eliminating friction permit the engagement and disengagement of the switch with little effort. This is of importance particularly as to the opening of the switch which is controlled by the thermal element as hereinafter described.

A control lever 25 is also pivotally mounted on the pin 23. A push rod 26 is pivotally connected to the control lever by a pin 26^a. The rod extends through the frame 2 at the front of the switch and is provided with a push button 27 at its outer end. The push rod is provided with a catch shoulder 28 which is engaged by a latch 29. The latch 29 is pivotally mounted on a pin 30 carried by ears 30^a extending from the frame. A spring 29^a is secured to the push rod by a screw 29^b and the opposite end of the spring is secured to the latch 29 so as to draw the latch downwardly so that it will readily snap into engagement back of the shoulder 28 when the push rod is moved forward. The spring also retracts the push rod when the latch is released permitting a release of the contact arm to open the switch as hereinafter described.

The latch 29 may be manually tripped as follows: An arm 31 extends from the latch and has a cam formed end 32 which is adapted to be engaged by a cam end 33 of a spring plate 34. The spring plate is secured by a screw 35 on the frame 2. A push button 36 extends from the frame 2 and is secured to the plate 34. On a downward movement of the button 36 the cam end 33 is moved downwardly operating on the arm 31 and this lifts the latch 29 thus releasing the push rod and with it the control lever 25 and contact arm. The arm 31 is provided with an automatic releasing projection 37 which is in the path

of the rod 18 so that when the contact arm is lifted out of contact in the opening of the switch through the emergency control hereinafter described the latch 29 is automatically released thus freeing the push rod and control lever. The parts then assume the disengaged position exactly as if the latch had been manually tripped, and may be manually reset without any further operation, or attention by the operator.

A latch 38 is pivotally mounted on a pin 39 between the arms 21 of the contact arm. The latch 38 engages a roller 40 pivotally mounted on a pin 41 at the upper end of the control lever 25. A spring 42 extends from the frame to the latch and is secured to the latch 38 slightly above the line of the pivot 39. The operation of the spring is not only to yieldingly hold the latch in its engaging position but also when either of the latches 29, or 38, is released to operate the connection afforded by the latch 38 between the spring and the contact arm to lift the contact arm carrying the rollers 17 out of engagement with the plates 14 and 16. An arm 43 extends from the latch 38 and is provided with a roller 44 at its lower end. The roller 44 is brought into contact with the thermal element formed of the legs 9 and 11. The thermal element is formed of dual metal and is such that upon variations of temperature it bends owing to the differences in the coefficient of expansion and contraction of the two metals. This thermal element upon receiving an over-load or excess of current flowing through the legs 9 and 11 is deflected, or bent upwardly and this acting on the roller 44 pushes the latch 38 upwardly thus releasing the contact arm from the control lever. Upon this release the contact arm swings upwardly opening the switch and at the same time, by striking the arm 37, automatically opening the latch 29 to release the push rod 26. It will be noted that the action of the thermal element is controlled through rollers in tripping the latch and thus this action may be made very sensitive. The spring 42 may also be made somewhat lighter than would otherwise be possible by reason of the rollers 17 so that the load on the thermal element is comparatively small. It will also be noted that when the thermal element has released the contact arm from the control lever any action of the push rod, or swinging of the control lever will not close the switch so that so long as an excess of current continues the switch cannot be closed by a manual operation. If, upon the closure of the switch there should be an excess of current at the moment, the switch will remain closed only a sufficient length of time for the thermal element to respond to the action of this excess current so that in any event with an excess of current it is impossible to maintain a closed switch.

A further word may be said about resetting the switch. Whether the mechanism is tripped manually by pressing the button 36, or by an excess of current distorting the thermostat 9, 11 which presses against the roller 44, the rod 18 will strike the projection 37 immediately after contact is broken. When the rod 18 strikes the projection 37, the latch 29 is lifted and the push rod 26 flies to the left thereby turning the control lever 25 in a clockwise direction about the pin 23. The distance through which the push bar moves is such that the roller 40 swings farther than does the latch 38. When the push rod 26 is moved back into latched position it swings the control lever 25 in a counter clockwise direction, and the roller 40 comes in contact with the latch 38, pushing the mechanism back into contacting position with the rollers 17 against the contacts 14 and 16.

When the thermostat trips the mechanism, the break at pin 39 is only slight and momentary, and the toggle 23—39—22 straightens out as the mechanism trips under the influence of the spring 42. As the rod 18 strikes the projection 37 the push rod is released and the roller 40 pulls away from the latch 38 as before. The re-set operation is the same, however the mechanism may be tripped.

Any suitable case, as 45, may be provided for the switch.

The foregoing provides a construction of combined thermal and manual switch, in which the switch will always open automatically on an excess of current even though the user should mistakenly press the button 27 to reset the switch to closed position. This is accomplished by a relatively simple and reliable combination of mechanism, owing in part to the fact that my thermal element—a thermo-bar—is of the non-fusible type.

What I claim as new is:—

1. In a switch, the combination of a manually actuated closing means; a manually actuated opening mechanism; an electrically responsive member put in circuit by the closing of the switch; and devices actuated by the electrically responsive member opening the switch comprising a catch, one engaging surface of the catch being a roller.

2. In a switch, the combination of a manually actuated closing means; a manually actuated opening means; an electrically responsive member put in circuit by the closing of the switch; and devices actuated by the member opening the switch comprising a catch and tripping means for the catch, said tripping means comprising a roller operated upon by the member.

3. In a switch, the combination of switch contacts comprising a roller through which the contacts are opened, or closed; manually actuated closing means; manually actuated opening mechanism; a thermal element put in circuit by the closing of the switch; and de-

vices actuated by the thermal element opening the switch comprising a catch, one engaging surface of the catch having a roller.

4. In a switch, the combination of a contact arm closing and opening the switch by its movement; a spring operating the arm to open the switch; a manual means operating the arm to close the switch; two latches locking the arm in closed position; a manually actuated mechanism tripping one latch to open the switch; and electrically responsive devices tripping the other latch to open the switch.

5. In a switch, the combination of a contact arm closing and opening the switch by its movement; a spring operating the arm to open the switch; a manual means operating the arm to close the switch; two latches locking the arm in closed position; a manually actuated mechanism tripping one latch to open the switch; electrically responsive devices tripping the other latch to open the switch; and means operated upon the opening of the switch through the tripping action of the electrically responsive devices for tripping the first-mentioned latch.

6. In a switch, the combination of a contact arm closing and opening the switch by its movement; a spring operating the arm to open the switch; a manual means operating the arm to close the switch; two latches locking the arm in closed position; a manually actuated mechanism tripping one latch to open the switch; electrically responsive devices tripping the other latch to open the switch; and means operated upon the opening of the switch through the tripping action of the electrically responsive devices for tripping the first-mentioned latch and re-setting the last-mentioned latch.

7. In a switch, the combination of a contact arm opening and closing a switch by its movement; a spring operating the arm to open the switch; a control lever; a latch between the control lever and the arm locking them to swing together against the spring; a second latch locking the control lever in closed position; and electrically responsive means tripping the first-mentioned latch.

8. In a switch, the combination of a contact arm opening and closing a switch by its movement; a spring operating the arm to open the switch; a control lever; a latch between the control lever and the arm locking them to swing together against the spring; a second latch locking the control lever in closed position; electrically responsive means tripping the first-mentioned latch; and devices tripping the second-mentioned latch on the opening of the switch when released by the first-mentioned latch.

9. In a switch, the combination of a contact arm opening and closing the switch by its movement; a spring operating the arm to open the switch; a control lever; a latch on the arm between the control lever and the arm locking them to swing together against the spring; and electrically responsive means tripping said latch.

10. In a switch, the combination of a contact arm opening and closing the switch by its movement; a spring operating the arm to open the switch; a control lever; a latch on the arm between the control lever and the arm locking them to swing together against the spring; electrically responsive means tripping said latch; and a second latch locking the control lever in closed position.

11. In a switch, the combination of a contact arm opening and closing the switch by its movement; a spring operating the arm to open the switch; a control lever; a latch on the arm between the control lever and the arm locking them to swing together against the spring, said latch comprising an engaging surface in the form of a roller; and electrically responsive means tripping said latch.

12. In a switch, the combination of a contact arm opening and closing the switch on its movement; a spring operating the arm to open the switch; a control lever; a latch between the control lever and the arm locking them to swing together against the spring; a push rod operating on the control lever; a latch operating on the push rod to lock the control lever and contact arm in closed position; and electrically responsive tripping means tripping the first-mentioned latch.

13. In a switch, the combination of a contact arm opening and closing the switch on its movement; a spring operating the arm to open the switch; a control lever; a latch between the control lever and the arm locking them to swing together against the spring; a push rod operating on the control lever; a latch operating on the push rod to lock the control lever and contact arm in closed position; electrically responsive tripping means tripping the first-mentioned latch; and manually actuated means tripping the second-mentioned latch comprising a cam on the latch operating with the latch, a push button, and a cam operated by the push button operating on the cam on the latch.

14. In a switch, the combination of a contact arm opening and closing the switch on its movement; a spring operating the arm to open the switch; a control lever; a latch between the control lever and the arm locking them to swing together against the spring; a push rod operating on the control lever; a latch operating on the push rod to lock the control lever and contact arm in closed position; electrically responsive tripping means tripping the first mentioned latch; and devices tripping the second-mentioned latch with the opening of the switch when released by the first-mentioned latch.

15. In a switch, the combination of a con-

tact arm opening and closing the switch by its movement; a spring operating on the arm to open the switch; a control lever; a latch on the arm operating against the control lever to lock the same against the action of the spring; a push rod on the control lever; a latch locking the push rod in closed position; a cam extension on the latch; a trip finger on the latch in the path of the contact arm; means operating on the extension for tripping the second-mentioned latch; and an electrically responsive device operating on the first-mentioned latch.

16. In a switch a lever system for closing the switch, a latch adapted to engage with a member of said lever system to hold said switch in closed position, and a manually actuated mechanism for disengaging said latch, in combination with a second latch in said lever system adapted when disengaged to release said switch from closed position, and an electrically responsive member put in circuit by the switch, said electrically responsive member being adapted upon an excess of current to disengage said second latch.

17. In a switch a lever system for closing the switch, a latch adapted to engage with a member of said lever system to hold said switch in closed position, and a manually actuated mechanism for disengaging said latch, in combination with a second latch in said lever system adapted when disengaged to release said switch from closed position, and an electrically responsive member put in circuit by the switch, said electrically responsive member being adapted upon an excess of current to disengage said second latch, said lever system being operative to close the switch with the same manual action following the opening of the switch by either the mechanism or the second latch.

18. In a switch a lever system for closing the switch, a latch adapted to engage with a member of said lever system to hold said switch in closed position, and a manually actuated mechanism for disengaging said latch, in combination with a second latch in said lever system adapted when disengaged to release said switch from closed position, push-buttons operating said lever system and said mechanism, and an electrically responsive member adapted upon an excess of current to disengage said second latch, said lever system being operative to close the switch with the same manual action following the opening of the switch by either the mechanism or the second latch.

19. In a switch a lever system for closing the switch, a push-button for said lever system, a latch adapted to engage with a member of said lever system to hold said switch in closed position, a manually actuated mechanism for disengaging said latch, and a push-button operating said mechanism, in combination with a second latch in said lever system adapted when disengaged to release said switch from closed position, and an electrically responsive member put in circuit by the switch, said electrically responsive member being adapted upon an excess of current to disengage said second latch, said lever system being operative to close the switch with the same manual action following the opening of the switch by either the mechanism or the second latch.

20. In a switch, a lever system for closing the switch, a latch adapted to engage with a member of said lever system to hold said switch in closed position, and a manually actuated mechanism for disengaging said latch, in combination with a second latch in said lever system adapted when disengaged to release said switch from closed position, tripping means adapted to disengage said second latch, and an electrically responsive member put in circuit by the switch adapted to actuate said tripping means, said tripping means including a roller operated upon by the member.

In testimony whereof I have hereunto set my hand.

JAY J. HOGAN.

DISCLAIMER

1,749,536.—*Jay J. Hogan*, Erie, Pa. SWITCH. Patent dated March 4, 1930. Disclaimer filed January 16, 1934, by the assignee, *The Bryant Electric Company*.

Hereby enters his disclaimer to that part of the claim in said specification which is in the following words to wit:

"9. In a switch, the combination of a contact arm closing and opening the switch by its movement; a spring operating the arm to open the switch; a manual means operating the arm to close the switch; two latches locking the arm in closed position; a manually actuated mechanism tripping one latch to open the switch; electrically responsive devices tripping the other latch to open the switch; and means operated upon the opening of the switch through the tripping action of the electrically responsive devices for tripping the first-mentioned latch and re-setting the last-mentioned latch."

[*Official Gazette February 20, 1934.*]