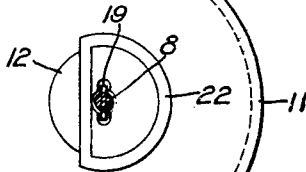
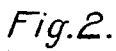


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AUTOMATIC SWITCH

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AUTOMATIC SWITCH.

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Our invention relates to automatic electric switches and particularly to those of the type wherein a protective means is employed to cause actuation thereof upon the occurrence of predetermined conditions in the circuit that is controlled thereby.

The object of our invention is to combine, with a switch, means for causing the same to be operated, either upon the falling of the current in a circuit below a predetermined value or upon the occurrence of an overload on the circuit, and to embody such protective feature in a simple and compact form of construction.

Our invention is especially applicable for use in connection with electrically operated domestic appliances and may replace the ordinary push-button or snap switches that are usually incorporated in such appliances.

As shown in the accompanying drawings,

Figure 1 is a view, partially in side elevation and partially in section, of a circuit interrupter embodying our invention, and

Fig. 2 is a view taken on the line II—II of Fig. 1.

The switch controls a supply circuit 3 for a motor 4 and is mounted upon a base 5 to which contact members 6 are secured. A bridging contact member 7 is secured to, and insulated from, a non-magnetic operating rod 8 that is provided, at its upper end, with a push button 9. The rod 8 is biased upwardly by a compression spring 10, to normally maintain the bridging member 7 out of engagement with the contact member 6.

An electromagnet 11 is connected in series with the circuit 3 and is provided with a core member 12, through which the rod 8 extends. A bracket 14 serves to pivotally support armatures 15 and 16, the armature 15 being sufficiently small so that, when saturated by the flux from the electromagnet, the attraction thereof does not increase, in proportion to the current flow, to the extent of the increase in attraction of the armature 16.

The armature 15 is engaged, on its upper and lower sides, by the pins 18 and 19, respectively, that extend through the rod 8 and there is a tendency for it to be biased out of operative engagement with the core 12 by the action of the spring 10.

Upon the depression of the button 9, the

circuit is closed across the contact members 6, and the armature 15 is brought into engagement with the core 12 and maintained in such position, against the action of the spring 10, so long as the current in the circuit 3 does not fall below a value sufficient to maintain enough energy in the electromagnet to hold the bridging member 7 in closed position. The switch may be normally opened by depressing a button 20, whereupon the electromagnet 11 will, of course, be de-energized.

The coil 11 is provided with a shading coil 22 that may consist of a brass or copper ring. The shading coil is necessary only when used in connection with a single-phase alternating current and functions, in the usual manner, to provide a substantially steady pull on the armature 15.

In case an overload occurs in the circuit 3, the armature 15 will become saturated and the armature 16 be energized to such point that it will be actuated first into engagement with a pin 23 that extends through the rod 8 and then into engagement with the lower end of the core member 12, thus overcoming the force exerted by the armature 15 on the pin 19 and moving the rod 8 upwardly to interrupt the circuit. A screw 24 is provided to regulate the distance between the armature 16 and the core 12, for causing the actuation of such armature to any desired degree of overload in the circuit.

From the foregoing, it will be seen that we provide a compact and efficient form of protective device that is automatically operable to open a circuit under abnormal or predetermined conditions of either overload or low voltage.

Various changes in detail and general arrangement may be readily made without departing from the spirit and scope of the invention, as defined by the accompanying claims.

We claim as our invention:

1. The combination with a circuit interrupter and an operating rod therefor, of means for yieldingly maintaining the interrupter in open position, an electromagnet, an armature co-operating with one side of the said magnet and having engagement with the said rod to hold it in closed position, and a second

armature co-operating with the other side of the magnet and also having connection with the rod, to move the first named armature out of engagement with the electromagnet upon the occurrence of an increase of current in the electromagnet.

2. The combination with a circuit interrupter and an operating rod therefor, of means for yieldingly maintaining the interrupter in open position, an electromagnet, an armature co-operating with one side of the said magnet and having engagement with the said rod, to hold it in closed position, a second armature co-operating with the other side of the magnet and also having connection with the rod, to move the first named armature out of engagement with the electromagnet upon the occurrence of an increase of current in the electromagnet, and means for adjustably supporting the second named armature in spaced relation to the magnet.

3. The combination with a circuit interrupter normally biased to open position, of an electromagnet, an armature having connection with the interrupter to hold it in closed position when the current in the electromagnet exceeds a predetermined value, and a second armature having connection with the interrupter to move it to open position and to release the first armature upon the occurrence of a current flow in the electromagnet in excess of the said predetermined value.

4. The combination with a circuit interrupter normally biased to open position, of an electromagnet, an armature having connection with the interrupter to hold it in closed position when the current in the electromagnet exceeds a predetermined value, and a second armature having connection with the interrupter to move it to open position by releasing the first said armature upon the occurrence of a current flow in the electromagnet in excess of a predetermined value.

5. The combination with a circuit interrupter, of actuating means therefor comprising an electromagnet, an armature manually operable into and out of engagement with the electromagnet and having connection with the interrupter to hold it closed during the presence of normal flow of current in the electromagnet and a second armature having lost-motion connection with the first named armature and normally occupying an inoperative position, actuated to move the first-named armature to inoperative position to open the circuit interrupter upon the occurrence of an increase in current to a predetermined amount.

6. The combination with a circuit interrupter, of actuating means therefor comprising an electromagnet, an armature manually operable into and out of engagement with the electromagnet and having connection with the interrupter to hold it closed during the presence of a normal flow of current, means

for biasing the interrupter against the holding force of the electromagnet, a second armature having lost-motion connection with the first named armature and actuated by the electromagnet upon an increase of current therein to move the first named armature and the circuit interrupter to inoperative position.

7. The combination with a circuit interrupter, of actuating means therefor comprising an electromagnet, an armature manually operable into and out of engagement with the electromagnet and having connection with the interrupter to hold it closed during the presence of normal flow of current in the electromagnet, a second armature normally occupying an inoperative position adapted to be attracted upon the occurrence of an overload in the electromagnet to move the first-named armature to inoperative position.

8. The combination with a circuit interrupter, of actuating means therefor comprising an electromagnet, an armature co-operating with the electromagnet and having connection with the interrupter to hold it closed during the presence of normal flow of current in the electromagnet, a second armature having lost-motion connection with the first-named armature and normally occupying an inoperative position adapted to be attracted upon the occurrence of an overload in the electromagnet to move the first-named armature to inoperative position.

9. In switching apparatus, the combination with a circuit interrupter, of means for closing the interrupter, magnetic means for holding the interrupter closed, and means controlled by predetermined conditions in the magnetic means for overcoming the magnetic force of the holding means and for moving the circuit interrupter to open position.

10. In switching apparatus, the combination with a circuit interrupter, of means for closing the interrupter, magnetic means for holding the interrupter closed and an armature actuated upon the occurrence of an overload in the magnetic means, for moving the interrupter to open position after releasing the holding means.

11. In switching apparatus, the combination with a circuit interrupter, of means for closing the interrupter, an electromagnet, an armature for holding the interrupter closed and means controlled by predetermined conditions in the electromagnet for overcoming the magnetic force of the holding means and for moving the circuit interrupter to open position.

12. In switching apparatus, the combination with a circuit interrupter, of means normally biasing the switch to open position, electromagnetic means for holding the interrupter closed during the presence of a predetermined current value, and electromagnetic means actuated upon the occurrence of

an increase of current for neutralizing the force of the said holding means causing its release.

13. The combination with a circuit interrupter, of an electromagnet, an armature energized by the electromagnet to hold the interrupter in one position, a second armature energized by the electromagnet for causing movement of the first said armature and the interrupter to another position when an increase in current flows through the magnet.

14. The combination with a circuit interrupter, of an electromagnet, an armature energized by the electromagnet to hold the interrupter in one position, a second armature energized by the electromagnet for causing movement of the first said armature and the interrupter to another position, the first-named armature being of such size that it becomes saturated upon an increase of current in the electromagnet.

15. The combination with a circuit interrupter, of an electromagnet, an armature energized by the electromagnet to hold the interrupter in one position, a second armature energized by the electromagnet for causing movement of the first said armature and the interrupter to another position, the first-named armature being of such size that it becomes saturated and released upon

an increase of current in the electromagnet due to the second named armature being more strongly attracted by such increase.

16. The combination with a circuit interrupter, of an electromagnet, an armature energized by the electromagnet to hold the interrupter in one position, a second armature energized by the electromagnet for causing movement of the first said armature and the interrupter to another position, the first-named armature being of such size that it becomes saturated upon an increase of current in the electromagnet, the two armatures being so connected that, upon movement of one of them toward the electromagnet, the other is moved away from said magnet.

17. The combination with a magnetically-actuated circuit interrupter, of an armature normally energized to hold the interrupter in one position, a second armature in position to be energized for causing movement of the first said armature and the interrupter to another position and means whereby, upon saturation of the first named armature, the said second armature is actuated.

In testimony whereof, we have hereunto subscribed our names this 21st day of March, 1922.

CHARLES H. HODGKINS.
CHARLES McL. MOSS.