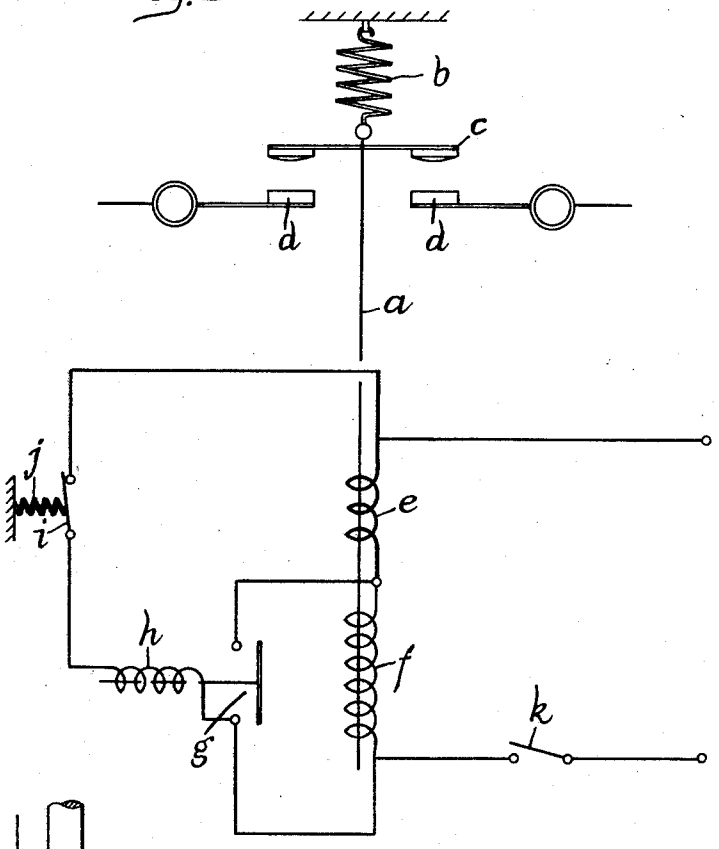
Oct. 22, 1963 C. E. HAYTER 3,108,208

ELECTROMAGNETICALLY-ACTUATED ELECTRIC SWITCHES

Filed July 17, 1959

Fig. 1



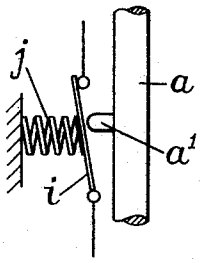


Fig. 2

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ELECTROMAGNETICALLY-ACTUATED ELECTRIC SWITCHES

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1 Claim. (Cl. 317—155.5)

This invention relates to electromagnetically-operable electric switch mechanisms of the kind having an actuating electromagnet provided with a main winding and an auxiliary winding.

The object of the invention is to prevent overheating of the main winding of the electromagnet as a result of variations in the voltage of the energising current.

The invention comprises in combination a first electromagnet having a main winding and an auxiliary winding interconnected in series, a second electromagnet having a single winding connected in parallel with the main and auxiliary windings of the first electromagnet, a main switch having an actuating member movable by the first electromagnet to effect closure of the main switch, a second switch connected in parallel with the auxiliary winding of the first electromagnet and operable by the second electromagnet for short-circuiting the said auxiliary winding, and a third switch connected in series with the winding of the second electromagnet and movable to its open position by the actuating member of the main switch during movement of the said member by the first electromagnet.

In the accompanying drawings, FIGURE 1 is a diagram illustrating one mode of carrying the invention into effect, and FIGURE 2 is a fragmentary view illustrating diagrammatically how the third switch can be opened by the actuating member of the main switch.

Referring to FIGURE 1, the part herein referred to as the main switch comprises a plunger *a* or other movable member loaded by a spring *b* and carrying a contact piece *c* for co-operating with fixed contact pieces *d* in the circuit to be controlled by the switch. The electromagnet for actuating the main switch comprises a pair of windings *e*, *f* connected in series. The winding *e* (herein referred to as the main winding) is of considerably lower resistance than the other winding *f* (herein referred to as the auxiliary winding) and is designed to be capable of closing the main switch when a given voltage is applied to it.

The auxiliary winding *f* is controlled by a short-circuiting switch comprising a movable member *g* and an electromagnet *h* connected in parallel with the windings of the main switch. The circuit containing the electromagnet *h* is controlled by a switch *i* loaded by a spring *j* and movable to its open position by the movable member of the main switch through any convenient means such as that shown in FIGURE 2 in which a radial projection a^1 on the movable member *a* of the main switch is adapted to act on and open the switch *i* during movement of the said member by the first mentioned electromagnet.

The circuit which supplies energising current to the main switch windings *e*, *f*, and the circuit containing the electromagnet *h* and switch *i* is controlled by a manually or otherwise operable switch *k*.

The arrangement is such that when the main switch is open, the short-circuiting switch *g* is open, and the relay control switch *i* is closed. To close the main switch, the switch *k* in the energising circuit is closed. If a sufficient voltage exists in the energising circuit, the immediate effect is to cause the current in the electromagnet *h* to close the short-circuiting switch *g*. A relatively heavy current then passes momentarily through the main winding *e* and causes the main switch to be closed. With the closing of the main switch the control switch *i* is opened, and a relatively small current then passes through the main and auxiliary windings for holding the main switch closed. On interrupting the energising current the parts revert to their initial condition.

The switch above described is required more particularly where the voltage of the energising circuit is liable to large variations. Assuming this voltage to be low when the switch *k* in this circuit is closed, and assuming also that the auxiliary winding *f* and short-circuiting switch *g* are not provided, the current supplied to the main winding *e* may be insufficient to close the main switch, but sufficient, if maintained, to incur a risk of burning out of the said winding. But by combining with the winding *e*, the winding *f* and short-circuiting switch *g*, as above described, this risk is obviated, as the main switch would fail to respond to a low voltage and the short-circuiting switch *g*, *h* would remain open. In this case the current supplied to the windings *e*, *f* of the main switch, whilst inadequate to close the switch would be insufficient to incur risk of excessive heating of these windings.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

An electromagnetically operable electric switch mechanism comprising in combination a first electromagnet having a main winding and an auxiliary winding providing an impedance interconnected in series across a source of voltage, a second electromagnet having a single winding connected in parallel with the main and auxiliary windings of the first electromagnet, a main switch having an actuating member movable by the first electromagnet in response to a predetermined flow of current through the main winding to effect closure of the main switch, a second switch connected in parallel with the auxiliary winding of the first electromagnet and operable by the second electromagnet in response to a second predetermined flow of current through the single winding for short-circuiting the said auxiliary winding, and a third switch connected in series with the winding of the second electromagnet and movable to its open position by the actuating member of the main switch during movement of the said member by the first electromagnet.

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