M. M. MASON.

ELECTROMAGNETIC SWITCH.

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1,260,230.

Patented Mar. 19, 1918.

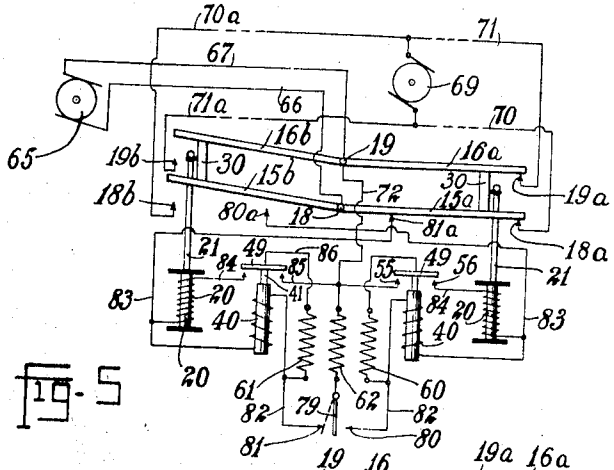


Fig. 5

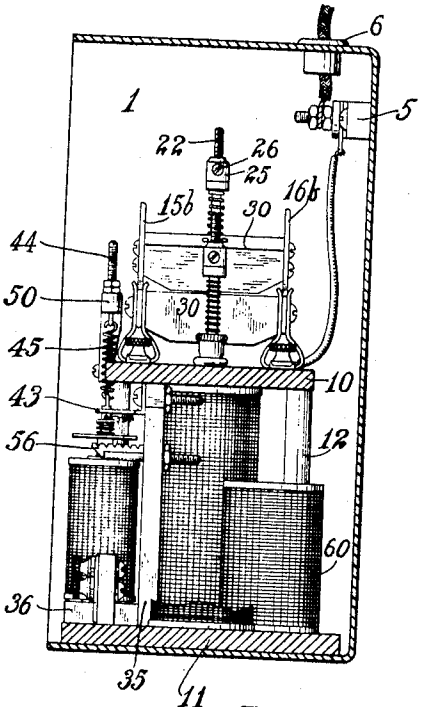


Fig. 2

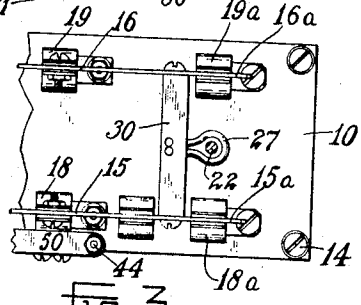


Fig. 3

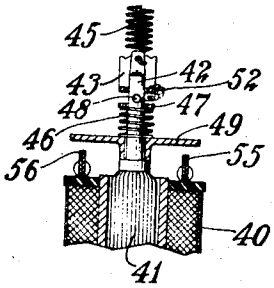


Fig. 4

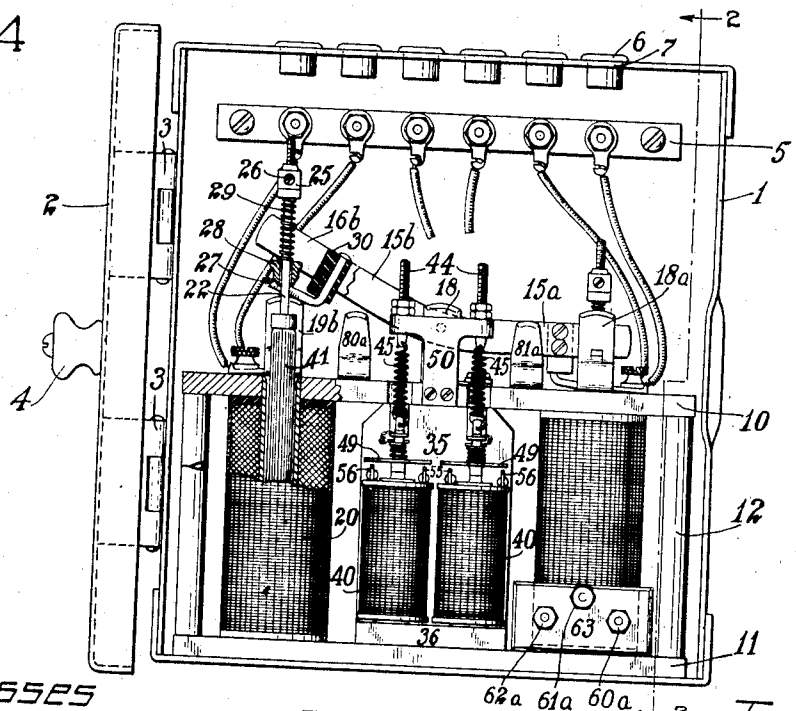


Fig. 1

Witnesses

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ELECTROMAGNETIC SWITCH.

1,260,230. Specification of Letters Patent. Patented Mar. 19, 1918.

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To all whom it may concern:

Be it known that I, MERLE M. MASON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Electromagnetic Switches, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to electromagnetically controlled switches and more particularly to switches adapted to be controlled by a light current such as is desirable to use through the contacts which may be provided in a thermostat, pressure gage, etc.

The object of this invention is to provide such a device which shall be simple in construction, capable of being accurately adjusted and conveniently handled.

A feature of my invention is that none of the contacts are broken previous to the opening of the main switch, which prevents arcing at the contacts.

Another feature of my invention is that the instant the relay controlled by the indicator of the thermostat is operated, the current through the indicator is automatically shunted off.

Other objects will become apparent in the following description in connection with the drawings, and the essential characteristics are set forth in the claims.

In the drawings, Figure 1 is a side elevation of my electro-magnet control showing the case, containing this apparatus, open; Fig. 2 is a section on the line 2—2 of Fig 1; Fig. 3 is a partial plan view of the switch; Fig. 4 is an enlarged fragmentary view of the relay solenoid shown in Fig. 1; Fig. 5 illustrates my invention diagrammatically showing the wiring connections.

Referring to the parts by numeral, the device as shown is inclosed in a suitable case 1 provided with a cover 2, hinged to the case as at 3 and having a suitable knob 4 for conveniently opening the cover. Attached to the back of the casing near the top, is shown a terminal strip 5 of insulating material and carrying suitable terminals for the incoming and outgoing wires which may pass through insulated sleeves 6 provided in the holes 7 in the top of the case. The frame of my device comprises an upper plate 10 and a lower plate 11, composed of insulating material, spaced apart at their four corners by tubular struts 12 through which bolts 14 act to clamp the whole together.

Mounted on the upper plate 10 is shown a form of double-pole, double-throw switch, which the mechanism hereinafter described is adapted to operate. This switch comprises a pair of knife blades 15 and 16 pivoted at their center by suitable bolts, in the contacts 18 and 19 respectively, and so formed that when one half of the blade is horizontal as at 15^a or 16^a, the other half extends upwardly as at 15^b or 16^b, at a sufficient incline to clear its respective contacts. These contacts provided at the ends of each half of the blades, are numbered 18^a, 19^a, 18^b, 19^b, respectively, and in common with the contacts 18 and 19 are mounted on the plate 10 and are each provided with a suitable connecting terminal adapted to receive the end of its respective wire.

Interposed between the plates 10 and 11 at each side of the center and located in a plane between the blades of the switch, is provided a solenoid 20, of the usual type having a laminated core 21 adapted to extend through the plate 10 and having rigid at its upper end a rod 22 threaded for a considerable distance at its upper end to receive an adjustable collar 25 having a set screw 26, for securing it in position. A cross brace 30 of insulating material, rigidly connects each pair of blades intermediate the rod 22 and the center and is adapted to transmit the downward movement of the rod 22 to the blades of the switch through flexible take-up connections, which allows the solenoid core to accumulate considerable momentum before starting the switch. As shown, this connection consists of a loop of stiff wire 27, forming a partial ring around the rod 22 and having its ends extending outwardly toward the cross brace 30 and bent upwardly through the brace and riveted, and a conical pointed collar 28 carried on the loop and slidable on the rod 22 and a spring 29 surrounding the rod 22 and interposed between this collar 28 and the collar 25, before mentioned. It will be seen that the spring 29 is adapted to store up energy during the early part of the movement of the solenoid core and utilize this energy at the conclusion of the movement of the core to insure a quick movement of the switch blades.

Clamped between the plates 10 and 11 at the center, near the front edge, I have provided a panel 35 of insulating material having a forwardly extending foot 36 adapted to support the relay solenoids 40. These solenoids are of a usual construction adapted to operate under a very light current and have a laminated core 41 which carries an upright rod 42, extending through an L-shaped guide 43, supported by and extending outwardly from the panel 35, and is fastened at its upper end to one end of a spring 45. Suitably connected to the other end of each spring 45 is an adjusting screw 44 extending through and supported by the outstandang arms of a T-shaped support 50, of insulating material, rigidly connected to the upper plate 10. A flanged collar 49 formed of some electro conductive metal is slidably mounted on the rod 42 and supported by the shoulder formed at its junction with the core 41, and is retained against this shoulder by a coiled spring 46 interposed between the flanged collar 49 and a washer 47 held in place by a pin 48 through the rod 42. When the solenoid 40 is energized, the flange 49 of the collar is depressed sufficiently to bring it against contacts 55 and 56 mounted in the panel 35, which contacts will hereinafter be described in connection with the circuits.

The collar 49 being loosely mounted, is adapted to be tipped or revolved and so insure equal contact pressure at each side, and is provided with a lead wire 52 insuring an electric connection between the collar and the guide 43, which in common with the contacts 55 and 56 are provided with connecting terminals. Resistance coils 60, 61 and 62, have been provided and are mounted on the base 11 preferably in back of the relay solenoids 40, and one terminal of each is adapted to be connected to terminals 60^a, 61^a and 62^a respectively, in the panel 63 carried by the base 11, the other connections for which will be hereinafter described in connection with the circuits.

Referring to Fig. 5, a source of current is shown at 65, having two lead wires 66 and 67 connected respectively to the center contacts 18 and 19 of the double throw switch. Lead wires 70 and 71 are shown connecting the contacts 18^a and 19^a to a motor 69 which, for convenience, the device is shown as controlling, and complementary lead wires 70^a and 71^a, lead respectively from the contacts 18^b and 19^b to the opposite poles of the motor 69. It will be seen that when the knife switch is in one position the motor will be adapted to run in one direction and when the switch is thrown into the other position it will reverse the current through the motor. It may be desirable to use only one set of wires 70 and 71, as for instance in an electric oven, wherein the current is either entirely on or entirely off.

A lead 72 is shown as connecting the contact 19 to one terminal of the resistance coil 62, the other terminal being connected to a switch member 79 of a thermostat or pressure gage or other automatic controlling means. Two contacts 80 and 81, corresponding by position to a maximum and minimum of pressure or temperature, etc. are connected by wires 82 to one terminal of each of the relays 40, the other terminal of each being connected respectively to contacts 80^a and 81^a mounted on the plate 10 and adapted to engage the blades 15^b and 15^a respectively, when the adjacent portion of the switch is in a horizontal position. When the knife switch is in the position shown, and the switch member 79 is moved, touching the contact 81, as indicated in dotted lines, the current passing from the terminal 19, through the wire 72, resistance 62, switch member 79, lead wire 82, through the corresponding solenoid 40, through one of the wires 83, to the contact 81^a, through the blade 15^a to the contact 18 thus forming a complete circuit. This energizes the solenoid 40 and pulls downwardly on the laminated core 41, bringing the flange 49 against the contacts 55 and 56. The contact 55 being connected by a lead 85 to the wire 72, and the contact 56 being connected by a wire 84 to one terminal of the solenoid 20, and the other terminal of the solenoid connected to the lead wire 83, it will be seen that when the flange 49 is against the contacts 55 and 56, the relay 20 is energized and pulls downwardly on the core 21, thereby depressing the blades 15^b and 16^b, and bringing them into contact with the terminals 80^a and 18^b, and 19^b respectively.

It is desirable that only comparatively light current should pass through the switch 79 to the contacts 80 and 81. Accordingly, the resistance coil 62 is provided in the circuit between the wire 72 and the switch 79. Undue heating of this resistance 62 is prevented becaues immediately on the closing of the switch 79 one of the relay magnets 40 is energized, the armature of which closes the line 85, 49, 84, from the line 72 through the solenoid to the line 83. The path of the current through the solenoid has so much lower resistance than that through the resistance coil 62 that the major portion of the current passes through the solenoid. To insure the maintenance of the closed circuit through the flange 49 and solenoid until the main switch is operated, even though the switch 79 should be moved from its contact 80 or 81, I provide another high resistance path for the current through the magnet 40. This is provided by a conductor 86 leading from the flange 49 through resistance 60 or 61 to the line 82. Accord-

ingly, as soon as the relay magnet 40 has operated, the continuance of the current through that magnet is insured (either by the flange and resistance 60 or 61 alone or by that path in conjunction with the resistance 62 and switch 79), until the solenoid has operated the main switch to break the circuit at 80^a or 81^a.

Briefly the operation of my device is as follows: When the switch member 79 is moved (as shown) touching the contact 81, it energizes the relay 40 closing the circuit through the collar 49 which energizes the solenoid 20, which opens or closes the main circuit depending on which connections are used. Inasmuch as the device comprises two symmetrical units, it can readily be seen that one of these units comprises an operable device and embodies the features of my invention. In this case the switch may be moved in the opposite direction by some suitable means or operated manually. When it is desired to make the control entirely automatic, however, it is desirable to use two units as shown. In this instance presuming the switch to have been operated as above described, the pressure or temperature in changing, moves the switch member 79 in the other direction, finally touching the contact 80. The knife switch now being in a position to engage the contact 80^a, the circuit is completed as hereinbefore described and the switch is moved to its former position.

Thus it will be seen that I have provided an electro-magnetic switch control for the usual line current adapted to be operated by a comparatively light current, and that this control is so designed as to break the circuits at the main switch and so prevent all arcing on the indicator or relay contacts.

Having thus described my invention, what I claim is:

1. The combination, with a source of current, two main lines and a main switch connected therewith, of an electro-magnetic device for operating said main switch, an electro-magnetic relay, a controlling switch in series therewith, means connecting said relay and switch in a shunt across said main lines, a circuit for said electro-magnetic device controlled by the armature of said relay, and a shunt about the last mentioned switch controlled by the armature of the relay and adapted to carry current to the relay independently of said switch.

2. The combination with a source of current and means operated thereby, of circuits connecting said means and the source of current, a double-throw main switch in said circuits, a pair of solenoids adapted to move the switch in opposite directions, circuits for the two solenoids respectively adapted to be electrically connected with the main switch or disconnected therefrom according to the position of said main switch, two relays for closing the respective solenoid circuits and connected with the source of current, a switch directing current through either of the last mentioned circuits, an openable shunt about the last named switch leading through each of the relays, and means for closing the shunt when the relay is operated so that current may be directed through the relay until the main switch is operated.

3. The combination with a source of current, means supplied thereby, circuits connecting said means with the source of current including a double-throw main switch, a pair of solenoids adapted to move the switch in opposite directions, a circuit for each solenoid comprising a shunt across the main connections and each including a portion of the main switch, a contact coöperating with the main switch for each of said shunt circuits, a pair of relays and circuits operating them for controlling the respective shunt circuits mentioned, and means for holding either of said relays in a closed position until the shunt circuit contact is broken by the main switch.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

MERLE M. MASON.

Witnesses:

JUSTIN W. MACKLIN,

ARCHER W. RICHARDS.