March 4, 1924. 1,485,750

N. A. WOLFE ET AL

ELECTROMAGNETIC SWITCH

Filed May 14, 1921

Fig. 1.

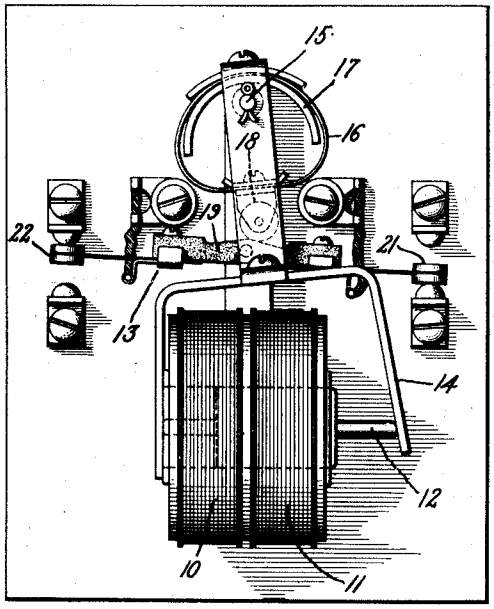


Fig. 2.

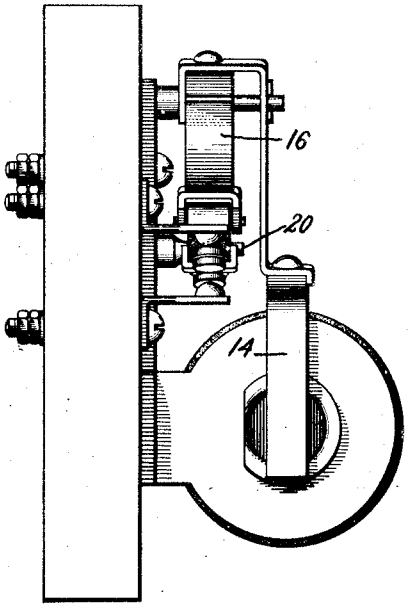


Fig. 3.

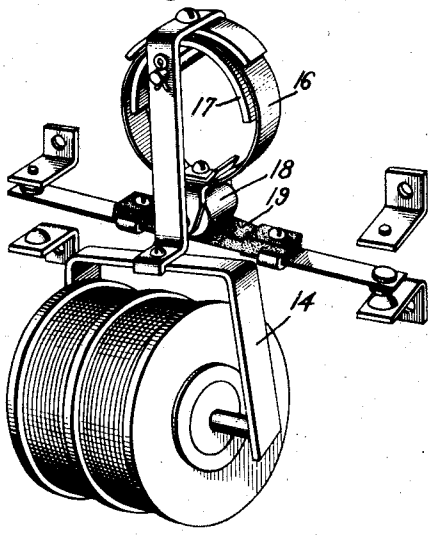
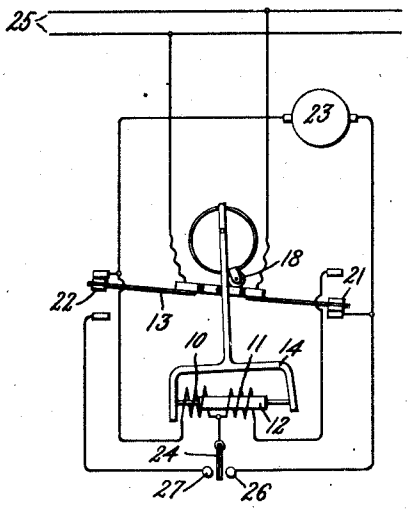


Fig. 4.



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Patented Mar. 4, 1924. 1,485,750

UNITED STATES PATENT OFFICE.

NOBLE A. WOLFE, OF NISKAYUNA, AND EUGENE PONS, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTROMAGNETIC SWITCH.

Application filed May 14, 1921. Serial No. 469,593.

To all whom it may concern:

Be it known that we, NOBLE A. WOLFE and EUGENE PONS, citizens of the United States, residing, respectively, at Niskayuna, in the county of Schenectady, State of New York, and Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electromagnetic Switches, of which the following is a specification.

Our invention relates to improvements in electric switches for opening and closing electric circuits, and the invention has for its object the provision of an improved electromagnetic switch which shall be simple in construction, cheap to manufacture and one which shall nevertheless be reliable in operation.

The invention relates to features of construction and arrangement which will be particularly disclosed hereinafter and the scope of the invention will be indicated by the claims.

In carrying the invention into effect in one form, we provide an operating electromagnet with a movable magnetic member, preferably a plunger, supported within the electromagnet. A pivoted strap is adapted to embrace the electromagnet so as to cooperate with both ends of the plunger to be operated thereby and a switch member is adapted to be reciprocated by the strap between two definite positions responsively to the reciprocations of the plunger. A resilient connection is provided between the switch member and the strap, and the arrangement is such that the switch member is thrown with a snap action from each of its definite positions to the other position, and resiliently held in the last position to which it is thrown by the operation of the plunger. To provide for reciprocating the plunger within the electromagnet, the electromagnet may be provided with two coils, so that when one coil is energized the plunger is moved in one direction, and when the other coil is energized the plunger is moved in the opposite direction.

For a better understanding of the invention reference is had to the accompanying drawings in which we have shown an embodiment of our invention for purposes of illustration, and in which Fig. 1 is a plan view of an electromagnetic switch constructed in accordance with the invention; Fig. 2 is a side view of the same; Fig. 3 is a detail perspective view of the switch operating mechanism; and Fig. 4 is a very simplified diagram of a motor control arrangement embodying the electromagnetic switch shown in Figs. 1 to 3.

Referring to the drawings, the electromagnetic switch comprises an electromagnet having a two part winding, the one part designated by the numeral 10 and the other part by the numeral 11. The electromagnet is provided with a movable magnetic member, the plunger 12 which is suitably supported within the winding of the electromagnet. This plunger is adapted to reciprocate the pivoted switch member 13 back and forth on its pivotal support between two operative positions.

The strap 14 is adapted to embrace the operating electromagnet so as to cooperate with both ends of the plunger 12 to be reciprocated back and forth about its pivotal support 15 responsive to the reciprocations of the plunger of the electromagnet. A resilient connection is provided between the pivoted strap 14 and the switch member 13 for the purpose of tilting the switch member about its pivotal support with a snap action and for holding the switch member resiliently in the position to which it has been thrown by the last operation of the plunger 12. This resilient connection comprises the spring loop 16 secured to the strap 14 by means of the clamp 17, and the spring loop 16 carries a roller 18 which is adapted to cooperate with the cam surface of an insulating block 19 pivotally mounted on the post 20. The resiliently mounted movable contact 21 is suitably secured to the right hand end of the block 19, and the resiliently mounted movable contact 22 is secured to the left hand end of the block 19. Each of these contacts is adapted to make engagement with either one of a set of oppositely disposed stationary contacts which form the circuit terminals of the device.

The operation of our invention, as thus constructed and arranged and with the parts in the various positions shown in the drawings, will be understood from a consideration of Fig. 4 taken in connection with the other figures. The electromagnetic switch of our invention is adapted to control the armature circuit of an electric motor 23 at the will of the operator or in response to some predetermined condition. In the arrangement shown in Fig. 4, the electric

motor is adapted to be controlled responsively to the operation of a thermostatic circuit controller 24, and it will be understood that the circuit controller 24 may be either controlled manually or automatically in response to some condition other than variations in temperature. As shown in the drawings, the armature of the electric motor is connected to the source of supply 25 by means of our improved electromagnetic switch, the circuit being from the lower supply conductor through the movable contact 22, the motor armature, through the movable contact 21 to the upper supply conductor. If the thermostatic circuit controller 24 is operated to make engagement with the stationary contact 26, the part 10 of the winding of the electromagnetic switch will be energized from the supply circuit through a circuit including the movable contact 22, the part 10 of the winding, thermostat 24, contact 26, movable contact 21 to the other supply conductor. The plunger will thereupon be attracted within the winding 10 and be moved quickly to its left hand position. In moving to the left hand position, the plunger will carry with it the strap 14 and move this strap clockwise about its pivotal support. The resiliently mounted roller 18 will also be moved about the pivotal support 15 for the strap, and by reason of the fact that the roller 18 cooperates with the cam surface of the member 19, the roller 18 will be moved forward on the cam surface until it has been moved past the ridge of the cam surface. Moving upwardly along the cam surface, the spring 16 is put under strain, so that when the ridge of the cam surface has been passed the switch member 13 will be quickly tilted to its other position by the energy stored in the spring 16. The switch is thereby operated from one position to its other position with a snap action, and the switch is resiliently held in the position to which it is thrown by the last operation of the plunger 12.

When the switch is thus moved to its other position, the electric motor is deenergized and the circuit through the part 10 of the winding of the electromagnet is also deenergized. It will be observed that the circuit for the winding of the switch is opened at the main contacts instead of at the thermostatic contacts, so that pitting and burning of the thermostatic contacts are thereby prevented.

When the thermostat 24 makes engagement with the stationary contact 27, the part 11 of the winding of the operating electromagnet is energized through a circuit including the movable contact 22, the contact 27, thermostat 24, winding 11, movable contact 21, to the other supply conductor. The plunger 12 will thereupon be moved to the position shown in Fig. 4, and the switch member 13 will be tilted quickly to the position shown in the drawings with a snap action and will be resiliently held in that position by means of the spring 16, in a manner which will be well understood by those skilled in the art from the description of the operation which has been previously given.

It will be observed that our invention has features of simplicity of construction and arrangement, and that the switch will be reliable in operation by reason of the fact that there are comparatively few parts to get out of order. It will also be observed that by reason of the fact that the magnetic movable member of the operating electromagnet is a plunger supported so as to be freely reciprocated within the operating winding of the electromagnet, the operation of the switch will be quick and positive in any event. It will also be observed that currents of considerable capacity may be interrupted without the risk of serious arcing at the contacts. It will also be observed that very powerful magnets may be employed to insure the quick make and quick break action of the switch member. Although the opening and closing of the main circuit of the switch is positive in any event, the particular part of the winding which was energized to effect the movement of the switch member from one position to the other is deenergized as soon as it has performed its intended function. The switch winding is therefore only energized during the time that the switch is in operation, and the current taken by the switch is comparatively small.

In accordance with the provisions of the patent statutes, we have described the principle of operation of our invention, together with the apparatus which we now consider to represent the best embodiment thereof, but we desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

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

1. An electromagnetic switch comprising an operating electromagnet having a reciprocable plunger, a movable strap embracing the said electromagnet cooperating with both ends of said plunger to be operated thereby, a switch member operated back and forth between two positions by the said strap, and resilient means for biasing the switch member to the position to which it is moved by the last operation of the plunger.

2. An electromagnetic switch comprising an operating electromagnet having a reciprocable plunger, a pivoted strap embracing

the electromagnet cooperating with both ends of the said plunger to be operated thereby, a pivotally mounted switch member, and resilient means connecting the said strap and switch member for reciprocating the switch member about its pivotal support responsively to the reciprocation of the plunger and for resiliently holding the switch member in the position to which it is moved by the last operation of the plunger.

3. An electromagnet switch comprising an electromagnet having a reciprocating plunger, a pivoted strap embracing the electromagnet cooperating with both ends of the said plunger to be operated thereby, a pivotally mounted switch member having a cam surface and a resiliently mounted roller connecting the said strap and switch member for cooperating with the said cam surface to reciprocate the switch member about its pivoted support with a snap action responsively to the reciprocation of the plunger and for resiliently holding the switch member in the position to which it is moved by the last operation of the plunger.

In witness whereof, we have hereunto set our hands this 12th day of May, 1921.

NOBLE A. WOLFE.
EUGENE PONS.