

Aug. 17, 1937.

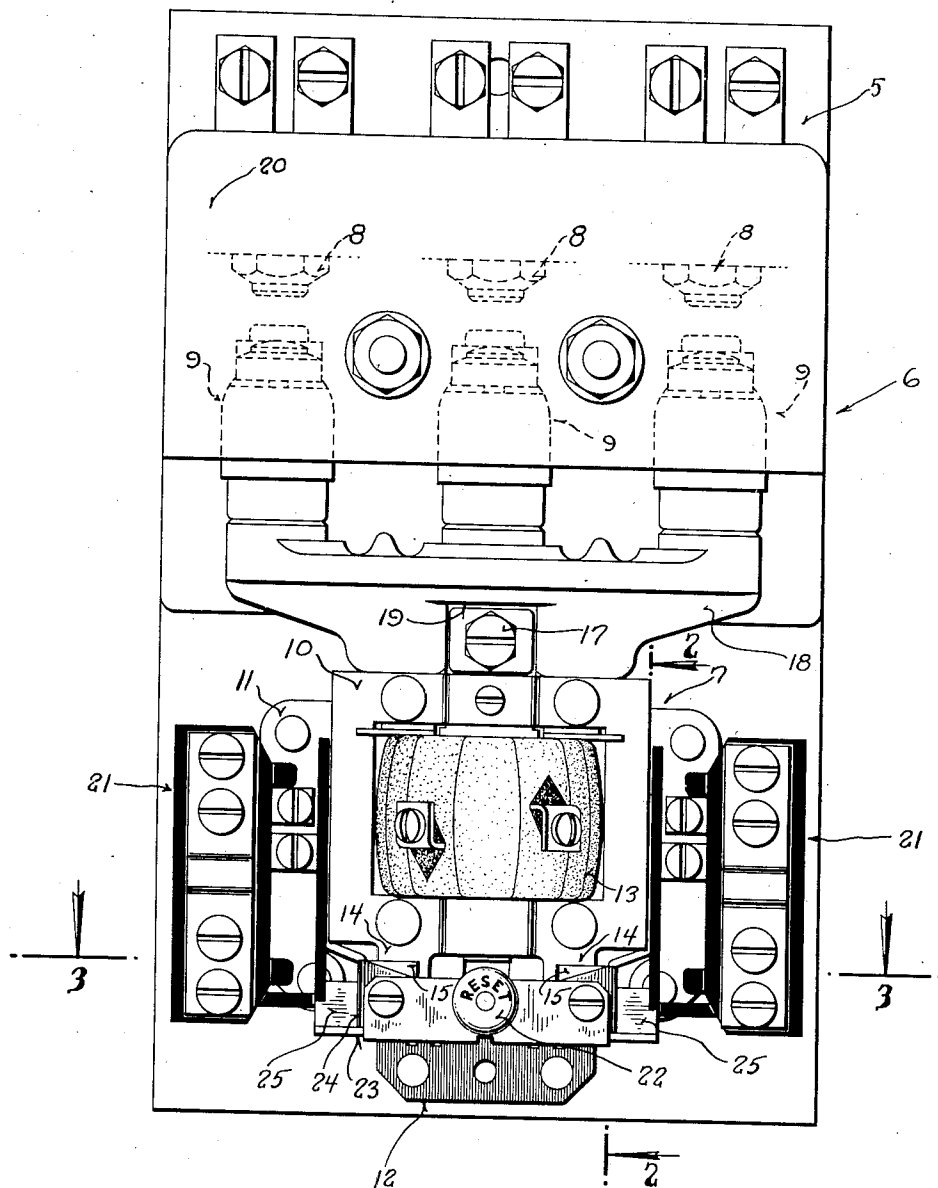
G. O. WILMS ET AL

2,090,169

ELECTRIC SWITCH

Original Filed July 11, 1935 2 Sheets-Sheet 1

Fig. 1.



Inventors
Gustav O. Wilms
Hans Petersen
By [Signature] Jones
Attorney

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Fig. 2.

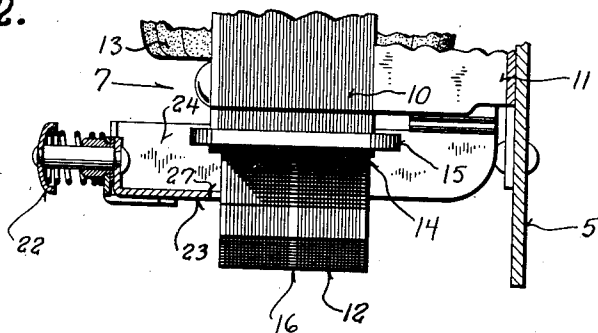


Fig. 3.

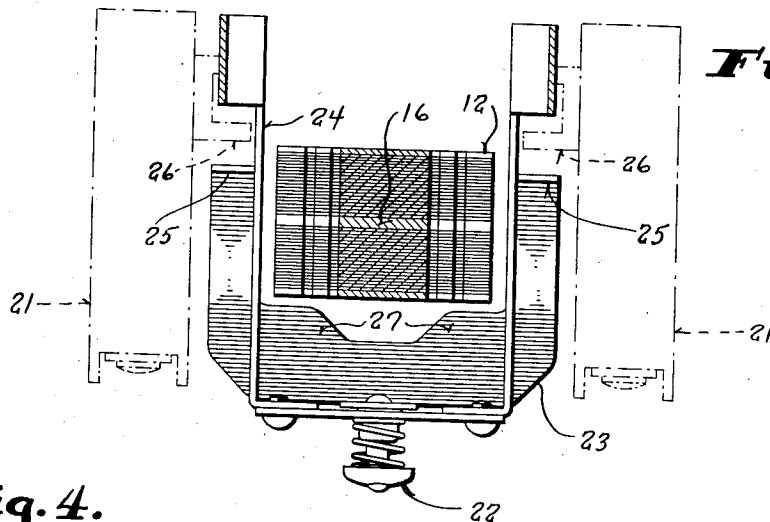
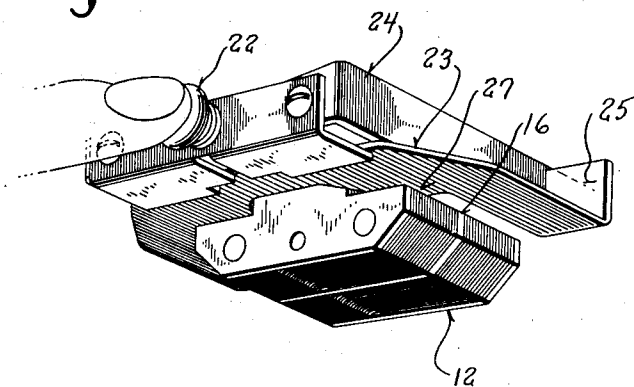


Fig. 4.



Inventors
Gustav O. Wilms
Hans Petersen
By D. M. H. Jones
Attorney

UNITED STATES PATENT OFFICE

2,090,169

ELECTRIC SWITCH

Gustav O. Wilms, Milwaukee, and Hans Petersen, Wauwatosa, Wis., assignors to Allen-Bradley Company, Milwaukee, Wis., a corporation of Wisconsin

Original application July 11, 1935, Serial No. 30,790. Divided and this application January 8, 1937, Serial No. 119,554

12 Claims. (Cl. 200—5)

This invention relates to improvements in electric switches and refers more particularly to electromagnetically actuated control switches of the type shown in Reissue Patent No. 20,094, issued to Gustav O. Wilms, et al., and is a division of application, Serial No. 30,790, filed July 11, 1935, now Patent No. 2,071,149, February 16, 1937.

Switches of this type, and in fact practically all automatic switches, are equipped with overload protection generally in the form of a relay adapted to be manually reset after tripping. Heretofore, it has been possible to defeat this overload protection by holding "in" the reset button. This condition is obviously objectionable and hence it is an object of this invention to provide means operable upon depression of the reset button to block closure of the switch until the reset button is released and returned to its normal position.

Another object of this invention is to effect the desired result entirely without the use of additional electrical contacts.

A further object of this invention is to provide a positive and simple mechanical device for preventing closure of the switch during the resetting of its overload protective relay.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a front view of a switch embodying this invention;

Figure 2 is a longitudinal sectional view through the lower portion of the structure taken on the plane of the line 2—2 in Figure 1;

Figure 3 is a horizontal sectional view taken on the line 3—3 of Figure 1; and

Figure 4 is a perspective view of the lower portion of the solenoid and the overload reset member, showing how closure of the switch by the solenoid is prevented when the reset button is held in.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral

5 designates a flat sheet metal panel upon which the switch mechanism, indicated generally by the numeral 6, and the electromagnetic actuating means or solenoid 7 are mounted. The switch mechanism comprises a plurality of pairs of stationary contacts 8 (only one of each pair being shown) adapted to be electrically bridged by movable contact units 9 actuated in a straight line motion by the electromagnetic actuator or solenoid 7.

The electromagnetic actuator or solenoid 7 in its general aspects is substantially like that shown in the aforementioned patent to Wilms, et al. It incorporates a laminated field piece 10 rigidly mounted on the panel 5 by means of a bracket 11. The field piece 10 is substantially of inverted U-shape and has an armature 12 slidably received between its legs to move through a coil 13 readily detachably mounted in the hollow of the field piece.

The pole pieces of the magnet are provided by downwardly extending projections 14 at opposite sides of the armature. Shading coils 15 are mounted on these projections as is customary.

The armature 12 is of inverted T-shape with the stem thereof slidable through the coil and field piece as described and its head projecting to opposite sides for coaction with the pole pieces 14. Like the field piece 10, the armature is also of laminated construction and a central lamination 16 of non-magnetic metal, slidably projects through an opening in the top of the field piece.

Attached to the extended end of this central lamination 16 by means of a screw 17 is a contact carrier 18. This carrier 18 comprises a cross bar of molded insulating material with a metal insert providing a reinforcing rib therefor. The front of the molded cross bar is recessed at its lower portion as at 19 to expose the adjacent central portion of the metal reinforcing rib to allow said extended end of the central lamination to be clamped directly thereto by the screw 17.

The contact carrier 18 mounts the movable contact units 9 (three in this instance) for straight line motion into and out of engagement with the stationary contacts 8.

The stationary contacts 8 are fixed to the top wall of an arc enclosing or arc suppressing chamber 20 which is totally enclosed and provides a complete enclosure for the contacts. The specific construction of this chamber and also the movable contact units is described in detail in the application, Serial No. 30,790, filed July 11, 1935 now Patent No. 2,071,149, February 16, 1937, of which this application is a division.

In operation, when the electromagnet is energized, the armature is drawn up in a straight line to impart a straight line motion to the contact carrier which lifts all of the movable contact units simultaneously from their switch open positions to which they move by gravity into switch closing positions with each unit properly engaging its respective stationary contacts.

Upon deenergization of the electromagnet, the carrier 18 with its movable contact units drops to an open position.

Overload relays, indicated generally by the numeral 21, are mounted one at each side of the electromagnet assembly. The detail of these units forms no part of this invention and is therefore not shown or described. For a description of their specific construction, reference may be had to Patent No. 1,992,595, issued to Gustav O. Wilms February 26, 1935.

These overload relays are of the resisto-thermo type and when tripped may be reset by depressing a button 22 which is accessible from the outside of the cabinet in which the switch is mounted.

The resetting mechanism includes, besides the button 22, a sliding structure 23 slidable in a stationary guideway 24. The inner spaced ends 25 of the sliding structure are engageable with the reset arm 26 of the relays so that upon depression of the button, the resetting of the relays is effected.

Heretofore, in switches of this type, it was possible to defeat the overload protection by holding "in" the reset button, but with the present invention this is impossible because of the fact that as long as the reset button is held down, movement of the armature to effect closure of the switch is blocked. To this end, the sliding structure 23 has two wings 27 which move into the path of the pole pieces of the armature upon depression of the reset button, as best shown in Figure 4. Consequently, as long as the button is held "in", lifting of the armature by the solenoid to close the switch is prevented. Hence, it is impossible with this construction to defeat the protective feature of the overload relays.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art, that this invention provides a simple but effective manner of guarding against the defeat of the overload protection by manually holding "in" the reset button.

What we claim as our invention is:

1. In an electric switch, the combination of stationary and movable contacts, electromagnetic means for actuating the movable contacts including a movable armature, an overload protective relay having a resetting arm, means operable upon said arm to reset the relay, and means movable into a position blocking movement of the armature upon actuation of said resetting means so as to preclude closure of the switch as long as the resetting means is held in.

2. In an electric switch, the combination of stationary and movable contacts, electromagnetic means for actuating the movable contacts to closed position, said electromagnetic means including an armature, a connection between the armature and said movable contacts, an overload protective device adapted to open the circuit of the electromagnetic means and thereby effect opening of the switch, means for resetting the overload protective relay after it has tripped whereupon the electromagnetic means is again rendered operable, and means movable to a position

blocking switch closing motion of the armature for preventing closure of the switch by said electromagnetic means as long as the resetting means is operative.

3. In an electric switch, the combination of stationary and movable contacts, electromagnetic means for actuating the movable contacts including a movable armature, a connection between the armature and the movable contacts so that the movable contacts and the armature move together, an overload protective device, and manually operable means for resetting the overload protective device and movable into a position blocking switch closing movement of the armature, so that closure of the switch is prevented as long as said manually operable means is in its operative resetting position.

4. In an electric switch, the combination of electromagnetically operated actuating means for opening and closing the switch, an overload protective device operable upon tripping to render the electromagnetically operated actuating means inoperative and having a part movable to a definite position when it is tripped, and manually operable means movable to engage said part to reset the relay and again render the actuating means operable and simultaneously therewith move to a position blocking switch closing movement of the electromagnetically operated actuating means so that closure of the switch by said electromagnetically operated actuating means is prevented as long as the manually operable means is in its operative resetting position.

5. In an electric switch, electromagnetic means for closing the switch including a movable armature, an overload protective relay having a movable resetting member, a member operable to engage and move the resetting member to reset the relay and having a part movable into a position blocking switch closing movement of the armature as long as the resetting member is held in, and spring means for yieldingly holding said member in an inoperative position to permit unrestricted movement of the armature.

6. In an electric switch, the combination of complementary contacts, electromagnetic means for effecting engagement of the contacts including an armature having a pole face, an overload protective relay, means for resetting the overload protective relay after it has tripped, and means movable into a position engageable with the pole face of the armature upon actuation of said resetting means so as to block movement of the armature necessary to effect engagement of the contacts.

7. In an electric switch, a movable contact, an electromagnet for actuating the movable contact in one direction including an armature connected with the movable contact so that the movable contact and armature move in correspondence, an overload protective device, an element operable to effect resetting of the device after it has tripped, and a barrier movable with said element into a position blocking movement of the armature to restrain the movable contact against motion in said direction.

8. In an electric switch having a contact movable to and from switch closing position, an electromagnet including an armature connected with the movable contact and operable to move the same to switch closing position, said armature having a substantially inverted T-shaped formation with the lateral projections thereof providing pole faces, an overload protective device having a resetting arm, a substantially U-shaped element

movable in a plane transverse to the line of motion of the armature and operable to actuate said resetting arm, said U-shaped element embracing the shank of the armature, and barriers on said element adapted to be engaged by the pole faces of the armature when said element is moved to its operative position resetting of the relay so as to prevent switch closing movement of the armature.

9. In an electric switch having a movable contact, an electromagnet for actuating the movable contact comprising a field piece and an armature, said field piece and the armature having meeting pole faces, an overload protective device for the switch having a part movable to effect resetting of the relay, a manually operable element for actuating said part, and a barrier movable with said element into a position between the pole faces of the field piece and armature to block the armature against moving "home".

10. In an automatically operated switch, primary actuating means movable in a defined path to open and close the switch, an overload protective device, and manually operable means for resetting the overload protective device and movable into a position at which it holds the primary actuating means from switch closing movement, whereby closure of the switch is prevented as

long as said manually operable means is in its operative resetting position.

11. In an automatically operated switch, primary actuating means movable in a defined path to open and close the switch, an overload protective device operable upon tripping to render the primary actuating means inoperative and having a part movable to a definite position when the relay is tripped, and manually operable means movable to engage said part to reset the relay and again render the primary actuating means operable and simultaneously therewith move into the path of the primary actuating means to block its switch closing movement, whereby closure of switch is prevented as long as the manually operable means is in its operative resetting position.

12. In an electric switch having a contact movable to and from switch closing position, a plunger type electromagnet for moving said contact to closed position, said plunger type electromagnet having an armature moving in a straight line, a connection between the armature and the contact, an overload protective device, and manually operable means movable in a plane normal to the line of motion of the armature for resetting the overload protective device and for blocking contact closing movement of the armature.

GUSTAV O. WILMS.
HANS PETERSEN.