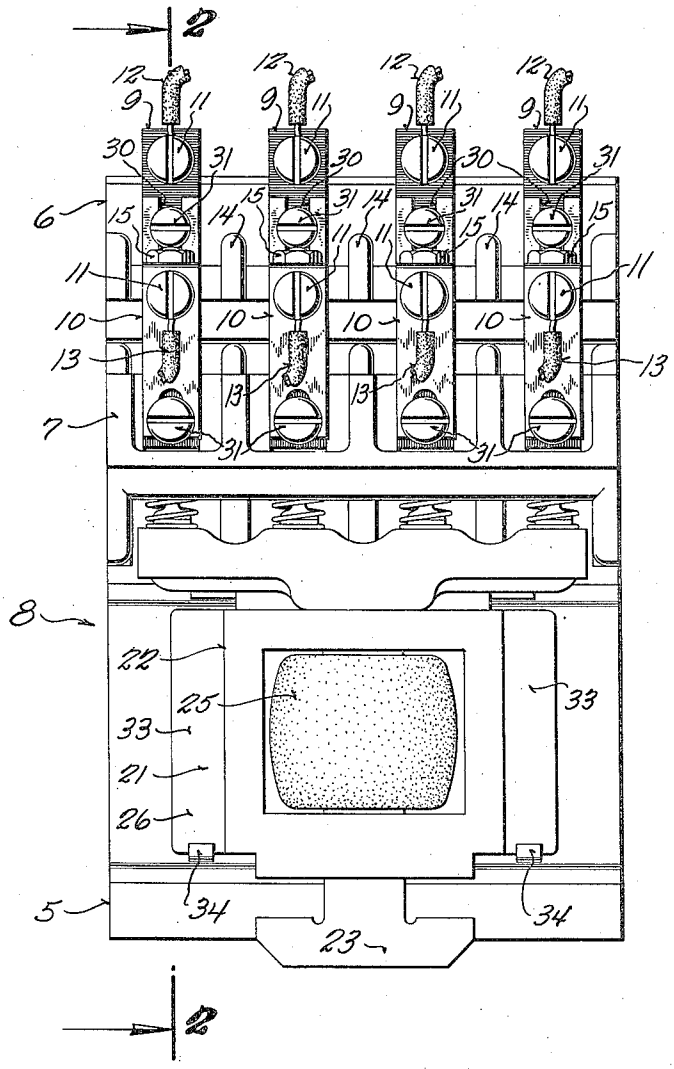
Sept. 12, 1939. G. O. WILMS 2,172,633

ELECTRIC SWITCH

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Fig. 1.



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Fig. 2.

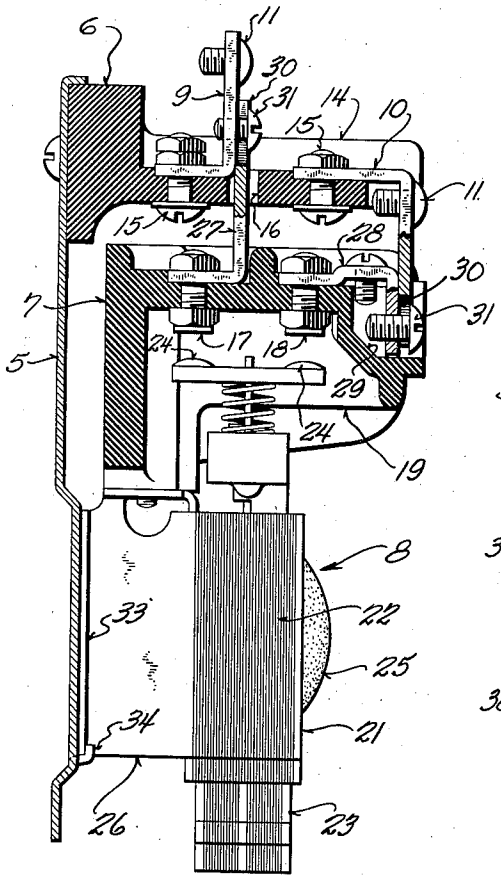


Fig. 4.

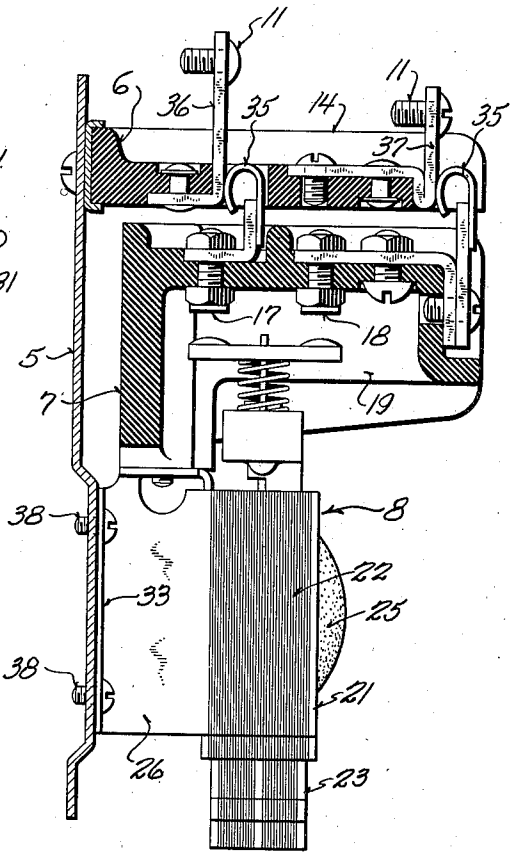
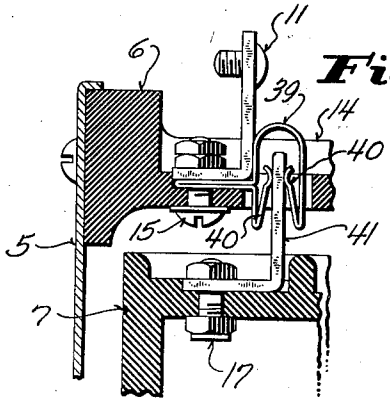


Fig. 5.



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Fig. 3.

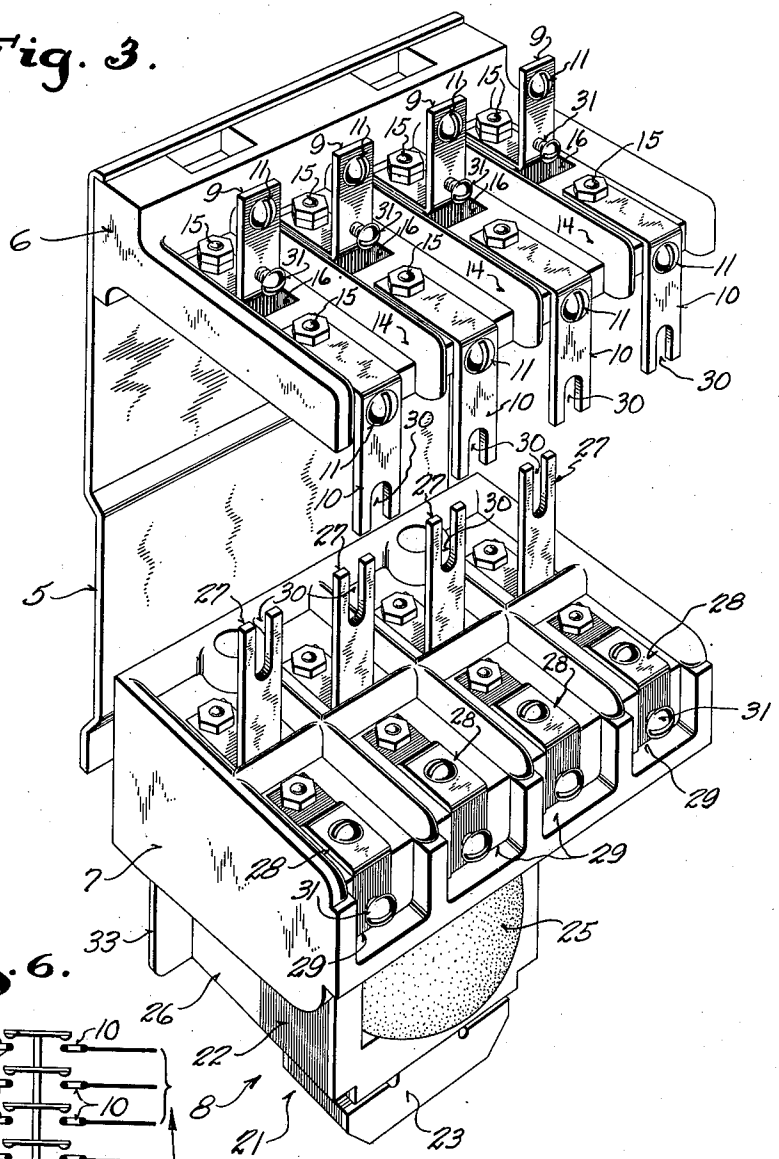
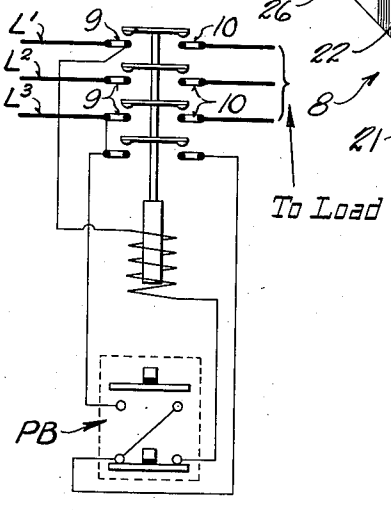


Fig. 6.



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Patented Sept. 12, 1939

2,172,633

UNITED STATES PATENT OFFICE

2,172,633

ELECTRIC SWITCH

Gustav O. Wilms, Milwaukee, Wis., assignor to Allen-Bradley Company, Milwaukee, Wis., a corporation of Wisconsin

Application December 18, 1937, Serial No. 180,565

8 Claims. (Cl. 200—168)

This invention relates to improvements in electric switches and refers particularly to control switches of the type forming the subject matter of Reissue Patent No. 20,094 issued September 1st, 1936, to Gustav O. Wilms and Albert J. Dawe.

Where switches operate under severe service demands or on heavy duty, they are subject to considerable wear and may be rendered inoperative; and in many such instances interruptions in service are costly. One such use is on conveyor lines of manufacturing plants where any break in the continuity of operation seriously affects the production of the plant. Another instance where continuity of service is of extreme importance is in high speed production with punch presses, automatic screw machines, lathes and the like. Here every precaution must be taken to guard against the possibility of time consuming "breakdowns".

It is therefore customary to remove the defective or worn switch as quickly as possible, replace it with a new one and effect the necessary repairs to the removed switch when convenient.

With this objective in view, the invention has as one of its objects to provide an electric controller switch capable of being substantially instantly disconnected and connected in the circuit it controls.

More specifically it is an object of this invention to provide a switch of the character described which is so designed that the entire switch can be bodily removed to permit its replacement with a new switch without entailing the loosening and replacement of lead wires and its attendant loss of time.

Another object of this invention is to provide a novel manner of removably mounting a switch and readily detachably connecting its terminals with the lead wires whereby proper positioning of the parts during replacement of the switch and rigidity in its securement are assured.

Another object of this invention is to provide simplified means for establishing readily separable electrical connections between the terminals of the switch per se and the terminals to which the wire leads are permanently attached so that upon replacement of a switch, good electrical connections between the wire leads and the switch terminals will be assured.

Another object of this invention is to provide a switch for the purpose described which is so constructed and designed that the entire unit is mounted on a metal back plate by which the switch may be mounted in its cabinet or directly on any other support without entailing insulation in the support.

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 several complete examples of the physical embodiment of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a front view of a switch constructed in accordance with this invention;

Figure 2 is a vertical sectional view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a perspective view of the switch illustrating the manner in which removal and replacement can be quickly effected;

Figure 4 is a vertical sectional view similar to Figure 2, illustrating a slightly modified embodiment of the invention;

Figure 5 is a fragmentary vertical sectional view illustrating another modification; and

Figure 6 is a schematic view depicting the electrical connections employed in the device.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates a metal back plate upon which the entire switch is mounted. This back plate may be mounted in a cabinet or directly on any other desired support.

Fixed to the upper end portion of the back plate is an insulated terminal board 6. This board is preferably formed of molded insulating material and projects forwardly from the back plate to overlie the insulated terminal head 7 of an electromagnetic switch, indicated generally by the numeral 8, secured to the lower portion of the back plate.

The terminal board 6 has a plurality of sets of terminals 9 and 10 mounted thereon, each provided with a screw 11 by which wire leads 12 and 13 are connected to the terminals 9 and 10, respectively. Between each set of terminals the board has upstanding ribs 14 which extend around the front edge of the board to provide insulating barriers between each set of terminals. Any suitable manner of securing the terminals

to the board may be provided and in the present instance they are secured in place by bolts 15.

It is to be observed that the terminal board has an opening 16 adjacent to each of the terminals 9 and that the terminals 9 project upwardly from the terminal board, whereas the outer end portions of the terminals 10 project downwardly around the front edge of the board. In each instance, however, the screws 11 by which the wire leads are secured to the terminals face the front, and inasmuch as one is located above the other, the attachment of the leads to the terminals is facilitated.

The electromagnetic switch 8 is substantially like that illustrated in the aforesaid reissue patent and can be briefly described as comprising the insulated head 7 which mounts the sets of stationary contacts 17 and 18 with each set separated from the other by a partition wall 19; and an electromagnet 21 including a field piece 22 and an armature 23 which carries the sets of movable contacts 24.

The specific manner in which the movable contacts are mounted and the other details of the switch per se form no part of this invention, and consequently need not be described. It is sufficient to note that the armature moves through the center of the magnet coil 25 and that the field piece 22 is fixed to a frame 26 by which the entire switch is mounted on the back plate 5 and to which the insulated head 7 is secured.

The contacts 17 and 18 are electrically connected to external terminals 27 and 28, respectively, located on the top of the insulated terminal head 7. The terminals 27 have upwardly projecting end portions adapted to pass through the openings 16 in the terminal board for engagement with the front faces of the terminals 9. The terminals 28 have downwardly projecting end portions disposed in pockets or recesses 29 formed in the front face of the insulated terminal head 7 to be engageable with the inner faces of the downwardly extending terminals 10.

The upwardly projecting terminals 27 and the downwardly projecting parts of the terminals 10 have their outer extremities bifurcated as at 30 to receive clamping screws 31 threaded in the terminals 9 and 28 to enable the engaging terminal portions to be securely clamped together. In this manner readily separable electrical connections are established between the switch terminals and the terminals mounted on the terminal board. The switch is thus readily removable for replacements without entailing loosening of the wire leads 12 and 13 by which the switch is connected in an electrical circuit.

Ordinarily, the leads 12 constitute the power lines and the leads 13 are connected to an electrical translating machine adapted to be connected with the power lines upon closure of the switch.

Any suitable manner of readily detachably securing the switch to the back plate may be employed, and in the preferred embodiment of the invention illustrated in Figures 1, 2 and 3, the metal frame 26 of the switch magnet has outwardly directed flanges 33 which overlie the front face of the back plate, and have their lower end portions engageable in back of hooks 34 struck forwardly from the back plate.

With this construction, the attachment of the switch requires merely the proper engagement of the bifurcated ends of the terminals with their clamping screws, a slight upward movement to carry the lower edges of the flanges 33 past the hooks, and then a downward motion to firmly engage the flanges in back of the hooks. Tightening the screws 31 holds the switch in place.

If desired, the separable electrical connection between the terminals on the switch and those carried by the terminal board may be made by spring clips, such as illustrated in the modified embodiments of the invention shown in Figures 4 and 5.

In the construction shown in Figure 4, the switch terminals have spring clips 35 riveted or otherwise fixed thereto. These clips extend upwardly to engage the front faces of the terminals 36 and 37 carried by the terminal board. With this arrangement, it is preferable to have the front terminals 37 provided with upwardly directed end portions in which the screws 11 are threaded.

It is also preferable in this construction to secure the switch to the back plate by means of screws 38. These screws rigidly hold the switch in place independently of the means employed to effect the electrical connections between the terminals. As the screws 38 are tightened the switch is drawn toward the back plate and consequently place the spring clips 35 under tension.

In the embodiment of the invention illustrated in Figure 5, the terminal board carries spring clips 39, each of which has a pair of fingers 40 yieldingly urged toward each other and between which a blade 41 carried by the switch head is insertable. In other respects, the construction of Figure 5 may be like that of Figure 4.

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 enables ready removal and replacement of control switches without entailing the loosening of lead wires and its attendant delays.

What I claim as my invention is:

1. In combination: an electric switch having an insulated head at its top; terminals on the exterior of the head; a terminal board separate from the switch; terminals on said board equivalent in number to those on the head; a fixed support mounting the terminal board in a substantially horizontal position; lead wires fastened to the terminals on the board; means readily detachably mounting the switch with its insulated head directly under the terminal board; and means for establishing a readily separable electrical connection between the terminals of the switch head and those of the terminal board upon mounting of the switch in position so that the switch is readily removable and replaceable without necessitating loosening of the wire leads.

2. In combination: an electromagnetic switch having an insulated head; terminals on the exterior of the head for electrically connecting the switch in a circuit; a terminal board; terminals on said board; a fixed supporting panel to which the terminal board is secured; wire leads attached to the terminals on the board; means for readily detachably mounting the switch in a position with its head directly under the terminal board; and complementary means carried by the terminal board and the insulated head of the switch for establishing readily separable electrical connections between the terminals on the board and those on the insulated head of the switch upon mounting of the switch in position so that the switch is readily removable and replaceable without necessitating loosening of the wire leads.

3. In combination: a rigid back plate; a terminal board fixed to the back plate and projecting

outwardly therefrom to form a ledge jutting out from the back plate; terminals carried by the board and extending upwardly therefrom; the board having passages therethrough to permit access to the terminals from the underside of the board; means directly accessible from in front of the terminal board for securing wire leads to the terminals on the board; an electromagnetic switch having a terminal carrying head at its top; terminals mounted on said head for connecting the switch in a circuit; means for readily detachably mounting the switch on the back plate with its terminal head under the ledge formed by the terminal board; and means carried by the terminal head of the switch electrically connected with its terminals and projecting upwardly therefrom to pass through said passages in the terminal board and electrically engage the terminals on the board for establishing readily separable electrical connections between the terminals on the board and the terminals of the switch upon proper mounting of the switch on the back plate so that the switch is readily removable and replaceable without entailing loosening of the wire leads.

4. In combination: a metal back plate adapted to be mounted in an upright position; an insulated terminal board fixed to the back plate and projecting substantially perpendicularly therefrom to form a ledge; terminals carried by the board; wire leads attached to the terminals; an electromagnetic switch having an insulated terminal head at its top; switch terminals on said head for connecting the switch in an electric circuit; means for readily detachably mounting the switch on the back plate with its insulated head directly under the ledge formed by the terminal board; and mutually engageable means carried by the terminal board and the terminal head of the switch for establishing readily separable electrical connections between the terminals of the switch and those of the board upon proper mounting of the switch on the back plate.

5. In combination: an upright metal back plate; a terminal board fixed to the back plate and projecting forwardly therefrom to form a ledge; terminals on the board; wire leads secured to the terminals; an electromagnetic switch having a metal frame and an insulated contact carrying head at its top; terminals on the exterior of the head for connecting the switch in an electric circuit; mutually engageable means on the terminal board and insulated switch head for effecting readily separable electrical connections between the terminals of the switch and those of the board, said interengaging means holding the switch in a fixed position under the terminal board; and a readily detachable mechanical connection between the frame of the switch and the metal back plate cooperating with said interengaging means to readily removably secure the switch in position.

6. In combination: an upright metal supporting plate; two units, each unit comprising insulation and electrical conducting terminals mounted thereon; means rigidly fastening one of said units to the metal plate near its top and with said unit projecting forwardly from the plate to form a ledge; and means removably securing the second unit to the plate in the space under the ledge formed by the first unit with certain of the terminals of the second unit engaging certain of the terminals of the first unit.

7. In combination: a rigid back plate adapted to be mounted in an upright position; an insulated terminal board rigidly fixed to said back plate and jutting outwardly therefrom to form a ledge; an electrical instrumentality readily removably mounted under said ledge, said electrical instrumentality having a plurality of external terminals by which said instrumentality is connected in circuit; other terminals permanently carried by the terminal board; lead wires permanently connected to said last named terminals; and readily separable electrical connections between the terminals of the electrical instrumentality and the terminal board, whereby removal and replacement of the electrical instrumentality may be quickly effected without necessitating loosening the wire leads.

8. In combination: a back plate; an insulated terminal head fixed to the back plate and jutting outwardly therefrom to form a ledge; an electrical instrumentality of a size to substantially fit within the space in front of the back plate and under the terminal board, said electrical instrumentality having external terminals through which the instrumentality is connected in circuit; other terminals fixed to the terminal board; wire leads permanently connected with said last named terminals; electrical connections between the terminals on the board and the terminals of the electrical instrumentality, said connections providing some support for the electrical instrumentality; and a readily separable connection between the electrical instrumentality and the back plate cooperating with said electrical connections in holding the electrical instrumentality in position under the terminal board.

GUSTAV O. WILMS.