July 7, 1936. A. L. MOORE 2,046,401

ELECTRIC SWITCH

Filed Aug. 25, 1933 3 Sheets-Sheet 1

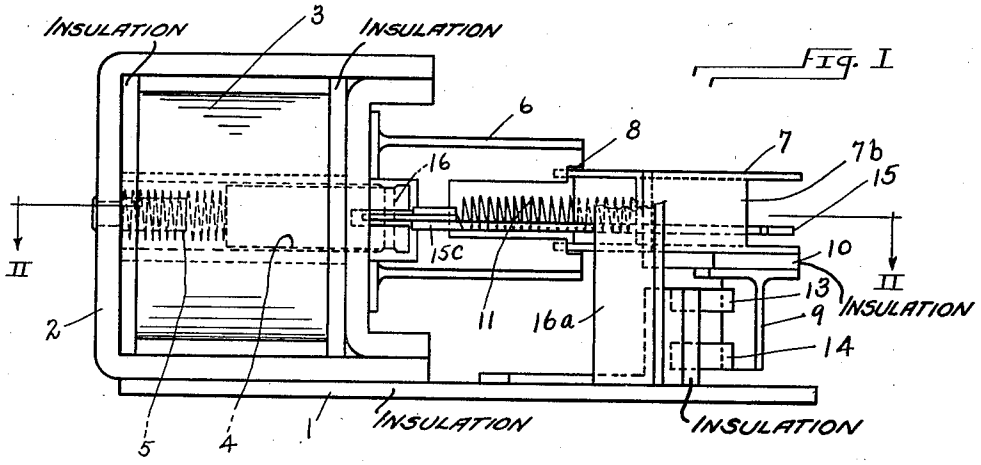


Fig. I

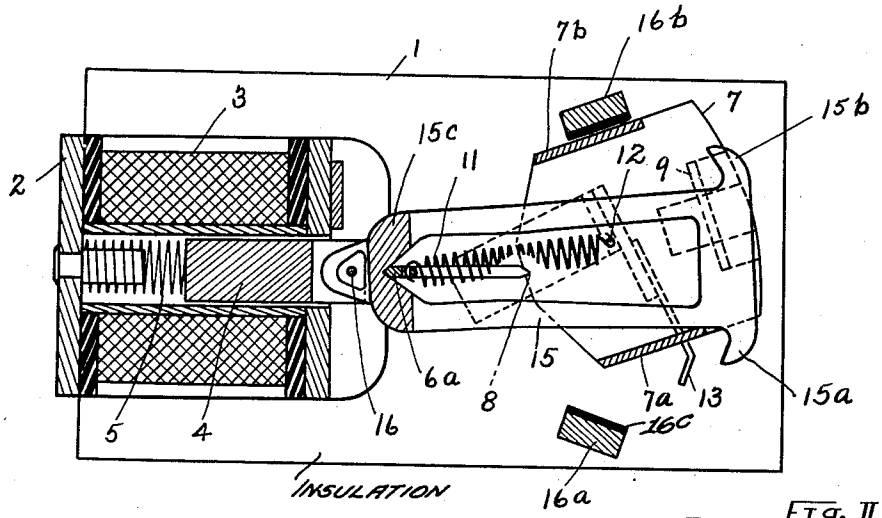


Fig. II

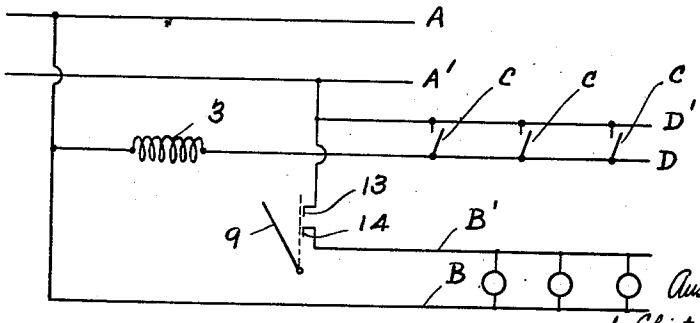


Fig. III

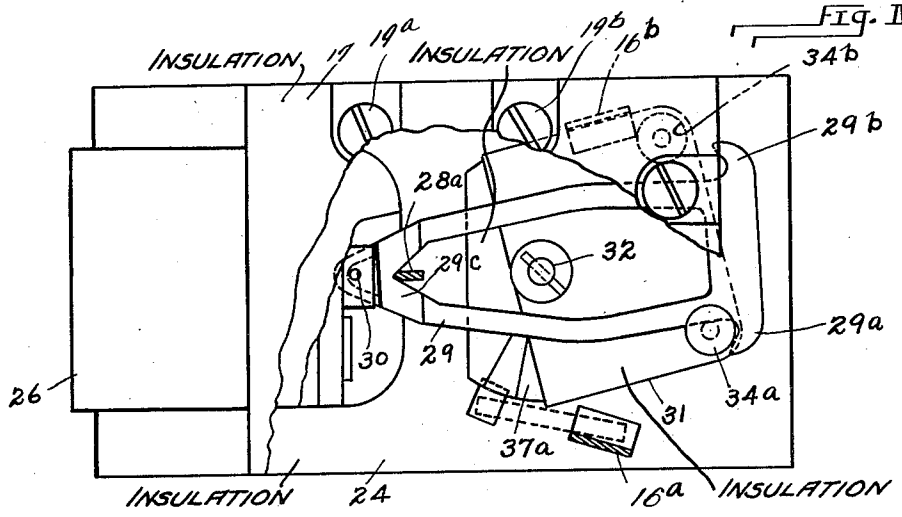
INVENTOR
Austin L. Moore
by Christy Christy and Wharton
his attorneys

July 7, 1936. A. L. MOORE 2,046,401

ELECTRIC SWITCH

Filed Aug. 25, 1933 3 Sheets-Sheet 2

Fig. IV



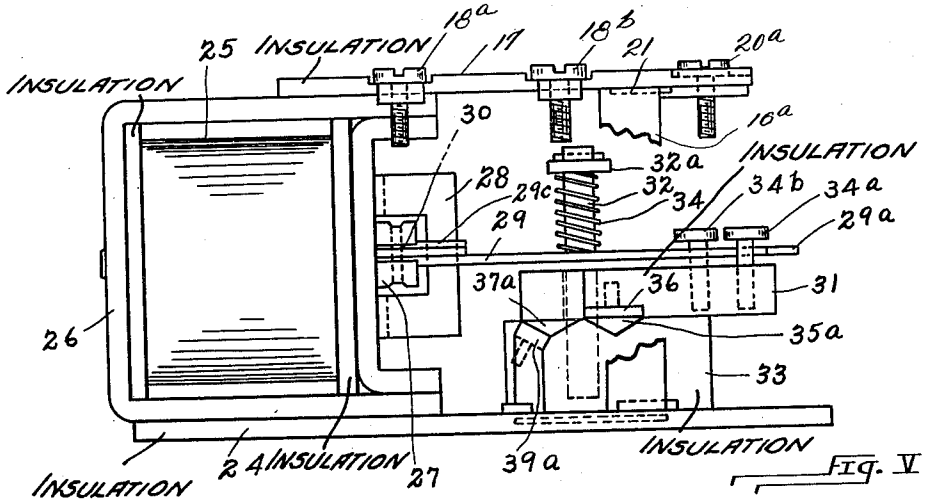


Fig. V

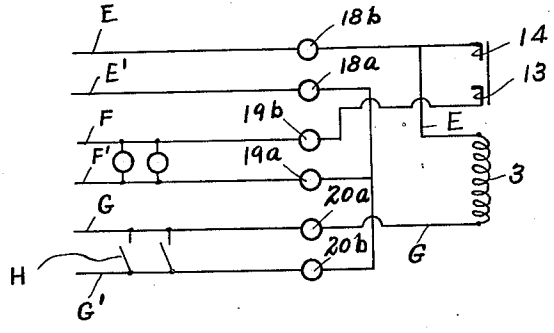


Fig. XI

INVENTOR

Austin L. Moore

by Christy & Christy and Wheaton

his Attorneys

July 7, 1936. A. L. MOORE 2,046,401

ELECTRIC SWITCH

Filed Aug. 25, 1933 3 Sheets-Sheet 3

Fig. VI

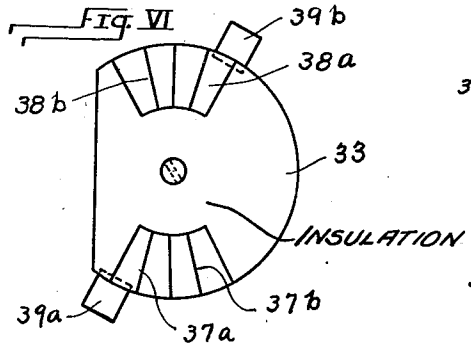


Fig. VIII

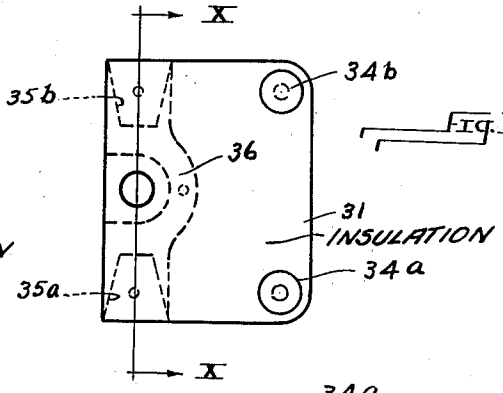


Fig. VII

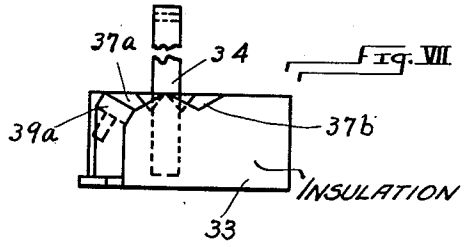


Fig. IX

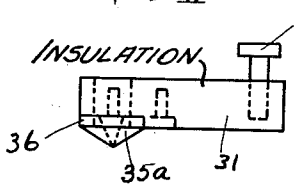


Fig. X

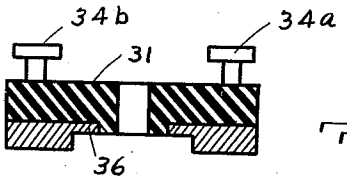


Fig. XIII

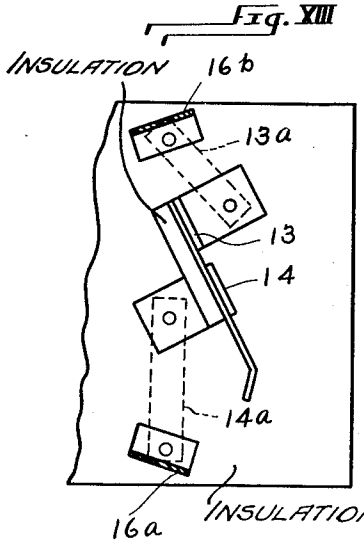
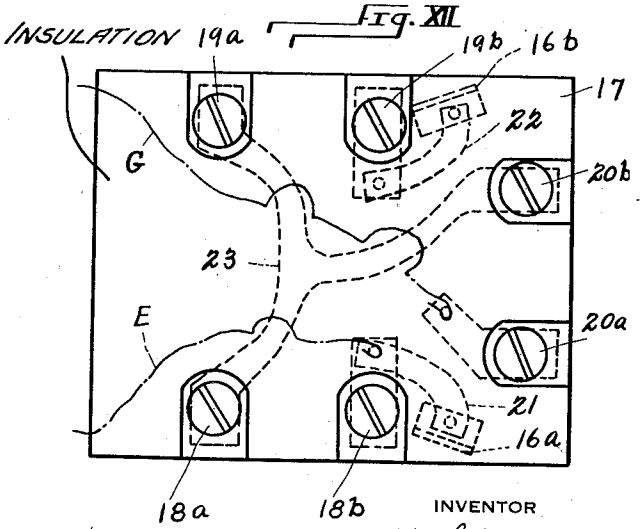


Fig. XII



INVENTOR

Austin L. Moore

by Christy Christy and Wharton

his attorneys

Patented July 7, 1936 2,046,401

UNITED STATES PATENT OFFICE

2,046,401

ELECTRIC SWITCH

Austin L. Moore, Southmont Boro, Pa.

Application August 25, 1933, Serial No. 686,745

8 Claims. (Cl. 200—87)

This invention relates to an electrically operable switch for controlling electric lighting circuits, and other electrical circuits.

The object of the invention is to provide a switch for the control of electrical circuits, such as electric lighting circuits, which operates by a slight touch on a push button, or the like, to make or interrupt the circuit which is controlled.

It is an object to provide a control switch, electrically operated, which is of such sensitivity, and which is also capable of such positive action, that it is well adapted for use in the remote control of electrical circuits.

In further accord with the aims of my invention, I provide a switch which need not be (but may be) operated by current from the same source and at the same potential as the current in the circuit controlled by the switch.

In the accompanying drawings, Figure I is a side elevation of my switch; Figure II is a horizontal sectional view through the switch, taken on the line II—II of Figure I; Figure III is a wiring diagram of a circuit controlled by the switch, and the control circuit of the switch, as the switch is shown in Figures I and II, illustrating generally a wiring system in which the switch may be installed.

Figure IV of the drawings is a plan view of a modified form of my switch, with the cover plate of the switch partially broken away to show underlying parts; Figure V is a side elevation of the switch shown in Figure IV; Figure VI is a detail plan view of the stationary contact structure of this modified form of switch; Figure VII is a side elevation of the stationary contact structure shown in Figure VI; Figure VIII is a detail plan view of the movable contact element of my modified form of switch; Figure IX is a side elevation of the movable contact element shown in Figure VIII; Figure X is a cross-sectional view taken on the line X—X of Figure VIII.

Figure XI of the drawings is a wiring diagram of the circuit controlled by the switch and the control circuit of the switch, the arrangement being that adapted to the structure shown in Figures XII and XIII of the drawings and showing connections involved in the terminal board illustrated in Figures XII and XIII; Figure XII is a plan view of a terminal board adapted to use with the switch structure shown in Figures I and II of the drawings, (or with structure shown in Figs. IV and V) and with connections in accordance with the wiring diagram shown in Figure XI; Figure XIII is a detail plan view illustrating a different arrangement of brackets supporting fixed contacts and the connection whereby the frame supports of the switch are brought into the electrical connections as a part thereof.

Referring to Figures I to III, inclusive, of the drawings, reference numeral 1 designates the base plate of the switch, and reference numeral 2 a solenoid bracket thereon. A solenoid 3 has therein a core plunger 4, and a spring 5 mounted to bear against the plunger. This assembly provides motive power for operating the switch elements proper.

The switch elements proper comprise a frame 6, which is shown as mounted on the forward wall of solenoid bracket 2. The movable contact element 7 comprises a horizontally lying plate pivoted to the frame 6 at the point 8, and having a contact element, or plate 9, depending from an insulating plate 10 carried on the under surface of the forward region of movable contact element 7. A longitudinally disposed coil spring 11 is attached to pin 12 on movable contact element 7 and to an upright member 6a on frame 6.

In circuit-completing position, contact element, or plate, 9 serves to complete a load circuit by interconnecting two fixed contact members 13 and 14.

Movable contact structure 7 is operated by a connecting link 15, which is pivoted at 16 to the solenoid plunger 4. At its forward end, connecting link 15 carries two hooks 15a and 15b, adapted to engage the sides 7a and 7b of the movable contact member 7. The plunger 4, under the influence of spring 5, normally bears against a lug 15c on the connecting link, forcing the link against the upright 6a of the frame 6. This maintains connecting link 15 in a uniformly centered position longitudinally of frame 6, so that it may act by means of its hooks 15a and 15b to shift the position of movable contact 7.

Figure II of the drawings illustrate the inoperative position of movable contact member 7. In this position solenoid 3 is deenergized, and spring 5 forces plunger 4, and connecting link 15 outwardly. As shown, the movable contact has been shifted into position abutting upright stop 16b, and hook 15a on the connecting link is in position to engage side 7a of the movable contact. Coil spring 11, having been forced past center, exerts a force tending to maintain movable contact 7 against stop 16b.

If, with the parts in this position, solenoid 3 be energized, plunger 4 is drawn inwardly, drawing with it the connecting link 15. As the movement of connecting link 15 is in a straight line, the engagement of connecting-link hook 15a with side

7a of the movable contact swings the contact past center about its pivot point 8. When the center line has been passed, spring 11 acts to continue rotation of the contact member to the limit imposed by abutment with upright stop 16a. As the parts are arranged in the drawing, this is the position in which fixed contacts 13 and 14 are interconnected by conducting plate 9, which is part of the movable contact structure.

In contact-completing position, movable contact 7 is held against stop 16a by the off-center position of spring 11. Release of the plunger 4 to spring 5 by de-energization of solenoid 3, and forward movement of connecting link 15 to its forward limit of movement, does not change the position of the movable contact. Since the position of movable contact 7 has been shifted, while connecting link 15 remains in central position, hook 15b of the link lies therefore in line to engage side 7b of the movable contact.

With the parts in the position described, a second energization of solenoid 3 therefore acts to reverse the movement of contact structure 7, disconnecting contacts 13 and 14, and restoring the parts to the position shown in Figure II of the drawings.

As illustrated in Figure III of the drawings, A, A' represents the line, and B, B' represents the load circuit. Switches C, such as push-button switches, serve to complete the control circuit D, D' to solenoid 3. Action of contact plate 9, under the influence of solenoid 3, serves in the manner explained to make or break the load circuit at the contacts 13, 14, in the load wire B'.

A terminal board, and the structural elements associated with it for connection of the switch, are shown in Figure XI, XII, and XIII of the drawings. The terminal board as a whole is designated by reference numeral 17, and like parts shown in Figures I and II are given like reference numerals, as such parts appear in these figures. As shown, there are two line-binding posts 18a and 18b, and two load-binding posts 19a and 19b, two posts 20a and 20b, for the control circuit, are also shown.

As shown, line post 18b is connected by strap 21 with the upright stop 16a, and load post 19b is connected by strap 22 with the upright stop 16b. A multi-branch strap 23 interconnects line post 18a, load post 19a, and control circuit post 20b. From control circuit post 20a a wire G leads to the solenoid 3, and a wire E leads from line post 18b to the solenoid. At the base of the switch a strap 14a connects contact 14 with upright stop 16a, and strap 13a connects contact 13 with upright stop 16b. The stops thus perform a conducting function in the assembly, and it is to be understood that they should be insulated from movable contact 7 by suitable means, such as insulating pads of rubber or the like, 16c.

The wiring diagram of Figure XI illustrates this more specific circuit connection of the switch, in which the stops 16a and 16b serve as conductive elements associated with the fixed contacts of the switch. In this diagram, the line wires E and E' are shown as comprising respectively the posts 18b and 18a, and the load wires F and F' as comprising the posts 19b and 19a, respectively. The control circuit has therein switches, such as push-button switches H, for interconnecting control wires G and G', and thereby completing a circuit to solenoid 3.

A modification in my switch is shown in Figures IV to X, inclusive, of the drawings. In this modification the general structure is similar to that disclosed in Figures I and II of the drawings, there being a base 24, a solenoid 25 supported in bracket 26, and a plunger 27 acted upon by the solenoid and a spring housed in the solenoid. In this form, however, the frame 28 is abbreviated, serving merely as a stop for connecting link 29, which is pivoted at 30 to plunger 27.

The movable contact structure 31 is pivotally mounted on a pivot post 32 fixed in mounting block, or body, 33. This block, or body, 33 constitutes the fixed contact structure of the switch. Movable contact structure 31 and fixed contact structure 33 are yieldingly pressed together by a coil spring 34, which surrounds pivot post 32 bearing against movable contact 31 and a stop 32a on the post.

Movable contact structure 31 has projecting upwardly therefrom pins 34a and 34b adapted to be engaged by hooks 29a and 29b on connecting link 29. On the under side of movable contact structure 31 are two pointed projections 35a and 35b of conducting material, which are formed on a conducting plate, or bridge, 36. Each of the projections 35a and 35b of conducting plate 36 are downwardly pointed, and are triangular in cross-section.

In the upper region of fixed contact block 33 are two pairs of triangular sockets 37a and 37b, and 38a and 38b. Of these, the sockets 37a and 38a are "live" sockets, having contact members 39a and 39b, respectively, at their bases, and sockets 37b and 38b are "dead" sockets.

Figure IV of the drawings shows movable contact 31 in disconnecting position, with contact pieces 35a and 35b lying in the dead sockets 37b and 38b. In this position, hook 29a of the connecting link 29 is in position to engage pin 34a on movable contact 31. If, in this position of the parts, solenoid 25 be energized, connecting link 29 being drawn rearwardly rotates movable contact 31 about pivot post 32. Spring 34 yields to permit contact pieces 35a and 35b to ride out of sockets 37b and 38b, and to engage in live sockets 37a and 38a.

In this circuit-completing position, contact pieces 35a and 35b are held in the live sockets by coil spring 34, and remain in this position when the solenoid is deenergized. Due to the shifting of movable contact 31, hook 29b of the connecting link lies in position to engage pin 34b on the movable contact structure. A further energization of solenoid 25, therefore, serves to shift contact member 31 back to the position shown in Figure IV.

It should be understood that with both forms of the switch shown the connecting link is pushed or pulled straight forwardly or rearwardly. There is, however, in both forms sufficient freedom of movement in the connecting link about its pivotal connection to the solenoid plunger to permit it to accommodate itself to the angular movement of the movable contact structure. In the structure of Figures IV to X of the drawings, as in the structure of Figs. I and II, the plunger 27 normally bears against a lug 29c on the connecting link 29, forcing the link against the upright 28a of frame 28, thus maintaining connecting link 29 in a uniformly centered position.

In Figures IV and V of the drawings, the terminal board 17 is shown as mounted on the frame structure of the switch. As so mounted, the posts 16a and 16b, respectively, connect electrically terminal posts 18b and 19b with the fixed contacts

39a and 39b of the modified switch structure. These members 16a and 16b thus serve both to support the terminal board in physical association with the other elements of the switch, and also perform an electrical function in the assembly.

In association with the modified structure of Figures IV to X, inclusive, posts 16a and 16b do not necessarily perform the function of stops limiting the movement of the movable contact element, since the sockets in which the movable contact element rests may be made effectively to limit its movement in either direction. When, however, the terminal board 17 is applied to the switch structure, as shown in Figures I and II of the drawings, the posts 16a and 16b perform the limiting function above described, and as above described should be insulated from the movable contact when used as conductive elements interconnecting terminal posts of the terminal board with the fixed contacts of the switch.

It should be understood that both modifications of the switch are insertable in a circuit arrangement, such as that shown in Figure III of the drawings, and that the diagram of Figure XI, illustrating the terminal board connections as introduced into the more general diagram of Figure III, is appropriate to both modifications of the switch, as equipped with the terminal board 17.

It should be understood that the dead sockets 37b and 38b in the fixed contact block may, if desired, be made the live sockets of an additional and independent circuit. Similarly, in the form of the switch shown in Figures I and II, an additional pair of contacts controlling an independent circuit may be completed in what is shown as the "off position" of the switch. It is to be understood that these changes involve merely the addition of contacts and the connection of an additional circuit, since they need not enter into the general wiring of the switch for solenoid control. If such additional contacts be added, the function of the switch is then to alternate selectively between two load circuits, both controlled by the switch.

It will be perceived that it is not necessary that the operating current for the switch be from the same source or of the same voltage as the controlled circuit. As shown in Figs. I, II the terminals 13, 14 may be connected in one leg of the controlled circuit, and the terminals of the solenoid wires may be connected to an independent source of current through the control push-buttons or switch.

I claim as my invention:

1. In an electrically operable electrical switch the combination of a frame structure, a solenoid having a plunger resiliently urged in opposition to solenoid action, a pair of fixed contacts for completion of an exterior circuit, a movable contact structure mounted for angular movement into two alternate positions and in one of the said alternate positions electrically to interconnect the pair of fixed contacts, means for producing angular movement of the movable contact in and out of position to interconnect the said fixed contacts comprising a connecting link carried by the solenoid plunger and normally free of the movable contact and engaging means on said connecting link arranged to engage the movable contact under plunger movement caused by solenoid energization to shift the movable contact into and out of position to interconnect the fixed contacts, means for maintaining the movable contact in its assumed position during intervals of solenoid deenergization; together with a terminal board mounted on the frame structure of the switch for controlling operation of the switch, carrying two pairs of terminal posts at which current is brought to and carried from the switch with a conductor electrically connecting a contact of one pair with a contact of another pair, a pair of terminal posts for making electrical connection to the solenoid of the switch one of which has electrical connection both with a terminal post for incoming current and with a terminal post for outgoing current; and a pair of conducting posts included as structural elements of the switch frame in electrical contact respectively with the fixed contacts of the switch and in electrical contact respectively with that terminal post for incoming current and that terminal post for outgoing current which are not electrically interconnected in the terminal board.

2. A switch and terminal board assembly in accordance with claim 1 in which the conducting posts are disposed in the path of movement of the movable contact element of the switch and are insulated therefrom to serve as stops limiting angular movement of the said movable contact.

3. In an electrically operable electrical switch the combination of a frame structure, a solenoid having a plunger resiliently urged in opposition to solenoid action, a pair of fixed contacts for completion of an exterior circuit, a movable contact structure mounted for angular movement into two alternate positions and in one of the said alternate positions electrically to interconnect the pair of fixed contacts, means for producing angular movement of the movable contact in and out of position to interconnect the said fixed contacts comprising a connecting link carried by the solenoid plunger and normally free of the movable contact and engaging means on said connecting link arranged to engage the movable contact under plunger movement caused by solenoid energization to shift the movable contact into and out of position to interconnect the fixed contacts, means for maintaining the movable contact in its assumed position during intervals of solenoid deenergization; together with a terminal board mounted on the frame structure of the switch for controlling operation of the switch, said terminal board providing terminal connection for current passing to and from the switch and for energization of the switch solenoid, and conducting posts included as structural elements of the switch frame in electrical contact respectively with the fixed contacts of the switch and in contact respectively with a connection of the terminal board for incoming current and with a connection of the terminal board for outgoing current.

4. A switch and terminal board assembly in accordance with claim 3 in which the conducting posts are disposed in the path of movement of the movable contact element of the switch and are insulated therefrom to serve as stops limiting angular movement of the said movable contact.

5. An electrically operable switch for controlling a circuit comprising in combination, a solenoid having a plunger spring-urged in opposition to solenoid action, a fixed contact structure having a face provided with a plurality of recesses, contacts for the circuit controlled in two of the recesses, other detent recesses, an angularly movable contact member having associated therewith electrically interconnected contact

members arranged to interconnect the contact recesses in one position and to lie in the detent recesses in another position, means for yieldingly engaging the movable contact structure with the fixed contact structure, together with means for producing angular movement of the movable contact into and out of position to complete the circuit controlled by the switch comprising a connecting link carried by the solenoid plunger and normally free of the movable contact, and engaging means on said connecting link arranged to engage the movable contact under plunger movement caused by solenoid energization to shift the movable contact into and out of position to interconnect the fixed contacts, thereby making or breaking the controlled circuit.

6. The combination of claim 5 comprising additionally a structure serving to align the connecting link with the solenoid plunger whereby the angularity of the movable contact structure in either of its positions causes it to be engaged by the engaging means of the connecting link in movement of the connecting link caused by solenoid energization.

7. An electrically operable switch for controlling a circuit comprising in combination, a solenoid having a plunger spring urged in opposition to solenoid action, a fixed contact structure having a face provided with a plurality of detent regions, at least two of said regions having electrical connection thereto whereby when interconnected a circuit is completed by way of said regions, an angularly movable contact structure arranged to interconnect the live regions on the fixed contact in one position and to be detained out of contact with said live regions in the other position, means for yieldingly engaging the fixed contact structure with the movable contact structure, together with means for producing angular movement of the movable contact into and out of position to complete the circuit controlled by the switch comprising a connecting link carried by the solenoid plunger and normally free of the movable contact, and engaging means on said connecting link arranged to engage the movable contact under plunger movement caused by solenoid energization to shift the movable contact into and out of position to interconnect the fixed contacts, thereby making and breaking the controlled circuit.

8. The combination of claim 7 comprising additionally a structure serving to align the connecting link with the solenoid plunger whereby the angularity of the movable contact structure in either of its positions causes it to be engaged by the engaging means of the connecting link in movement of the connecting link caused by solenoid energization.

AUSTIN L. MOORE.