

Jan. 7, 1941.

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2,227,434

ELECTRIC SWITCH

Filed Feb. 4, 1938

4 Sheets-Sheet 1

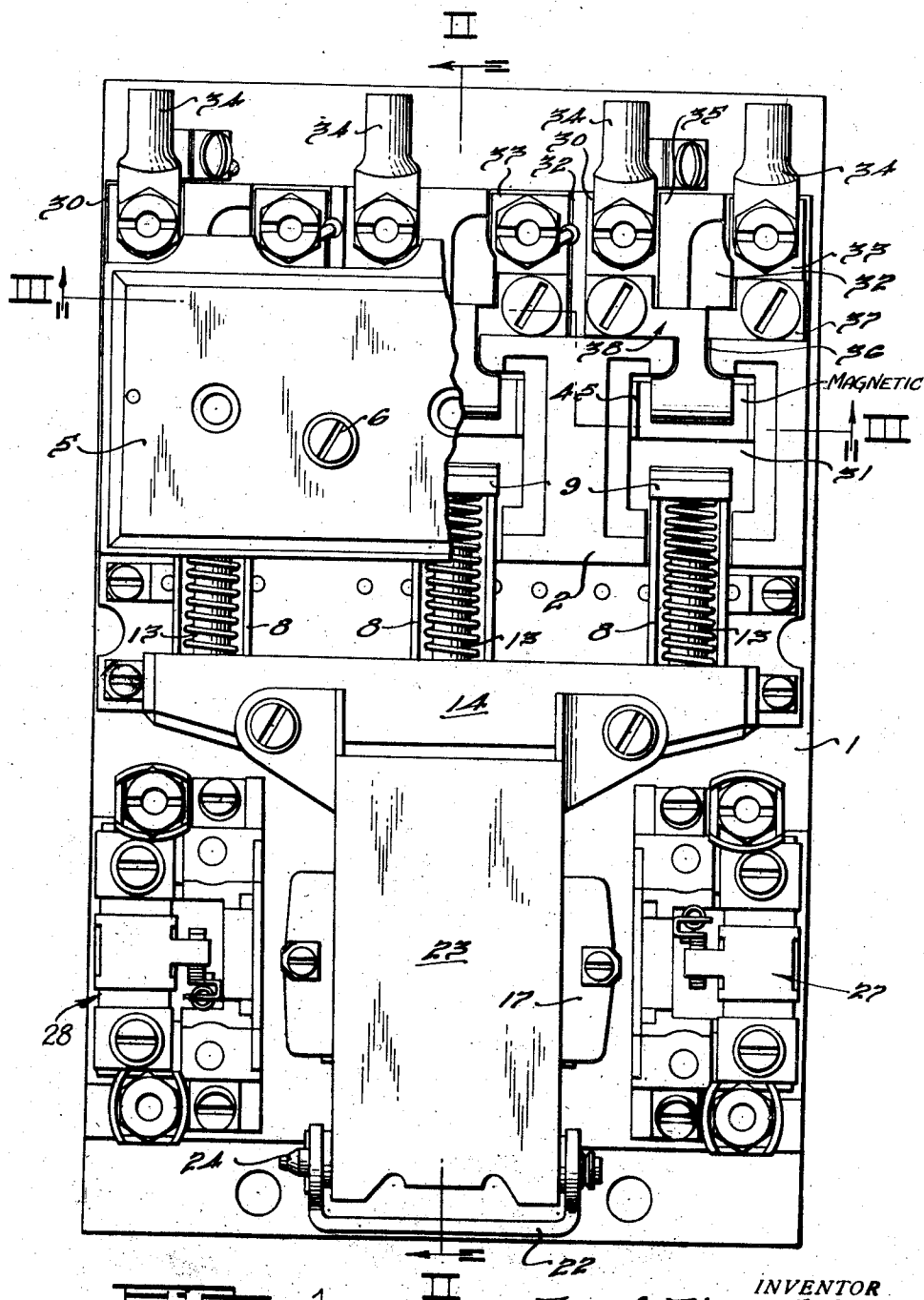


FIG. 1.

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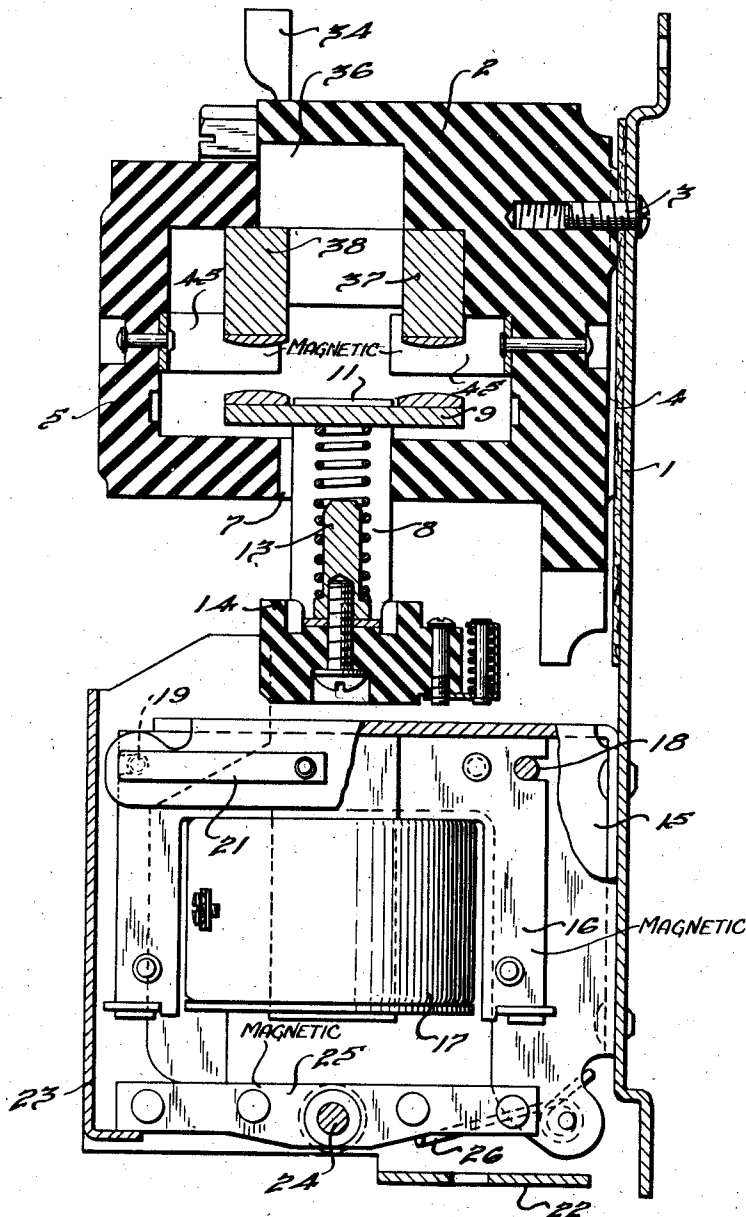
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FIG. 2.



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4 Sheets-Sheet 3

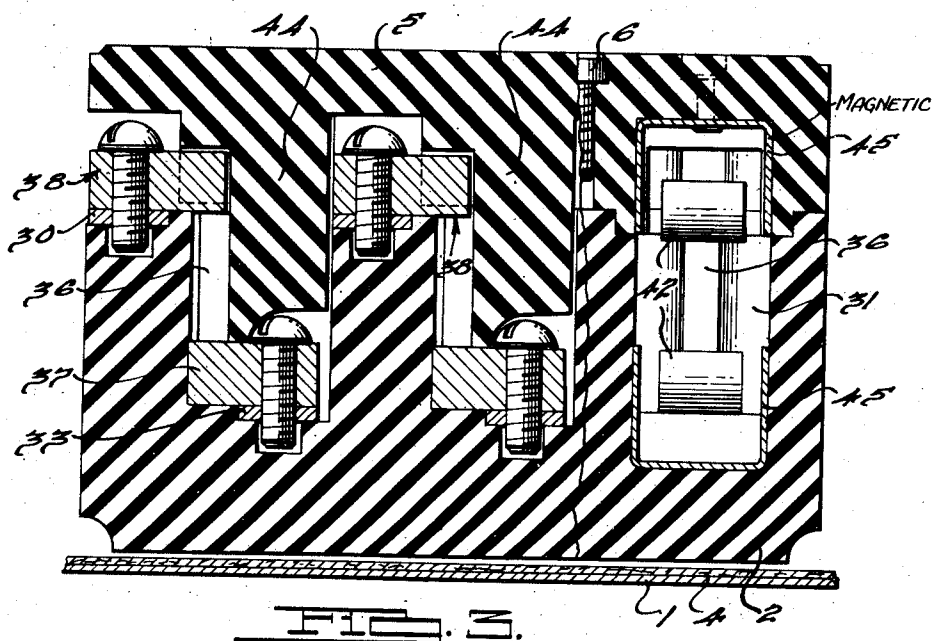


FIG. 3.

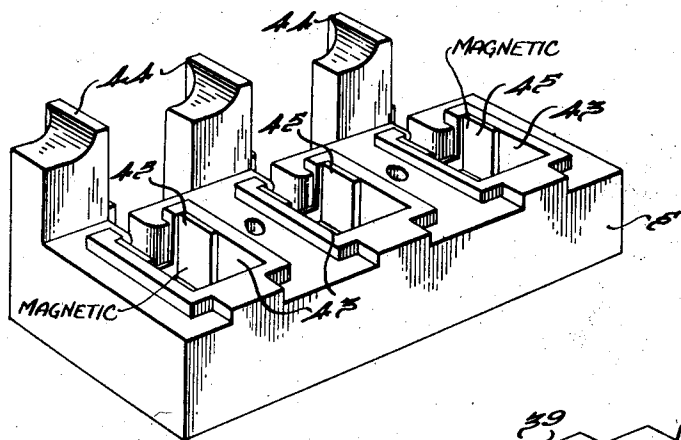


FIG. 4.

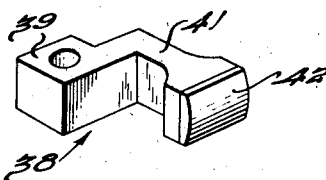


FIG. 5.

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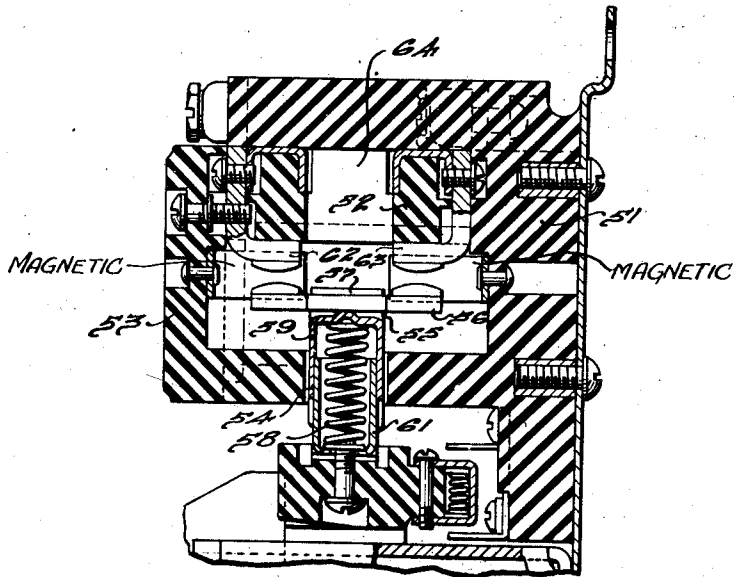
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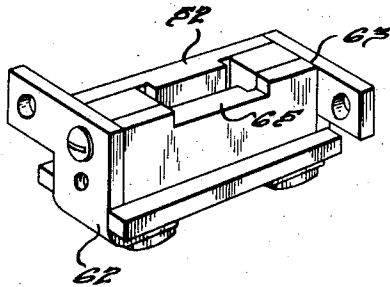
ELECTRIC SWITCH

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4 Sheets-Sheet 4



SECRET



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UNITED STATES PATENT OFFICE

2,227,434

ELECTRIC SWITCH

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Application February 4, 1938, Serial No. 188,592

7 Claims. (Cl. 200—144)

This invention relates to electric circuit controlling devices and more particularly to electromagnetically operated electric switches.

One object of the invention provides an electric switch with an improved form of contact chamber providing an entrance opening in the bottom wall through which extends the manipulable means supporting the movable contact and a second top opening in the chamber, both of said openings providing means for venting gases from within the chamber.

Another object of the invention is to provide an electric switch with a contact enclosing chamber formed of two pieces which together cooperate to form all the chamber walls and venting openings to the exterior of the chamber.

Another object of the present invention is an electric switch having an improved form of contact chamber arrangement wherein there is provided substantially a single opening providing for the venting of arc gases from the interior of the chamber.

Another object of the invention is to provide in an electric switch a contact enclosing chamber formed of two pieces with the rear pieces being provided with formations slidably receiving the stationary contacts and limiting removal thereof to a forward sliding movement.

Other objects and features of the invention will be readily apparent to those skilled in the art from the following specification and the appended drawings illustrating certain preferred embodiments of the invention in which:

Figure 1 is a front elevational view of an electric switch according to the present invention with the front contact enclosure section broken away in parts.

Figure 2 is a vertical sectional view on the line II—II of Figure 1.

Figure 3 is a horizontal sectional view on the line III—III of Figure 1.

Figure 4 is a perspective view of the front section of the contact enclosure taken from the rear and bottom faces.

Figure 5 is a perspective view of a stationary contact arrangement.

Figure 6 is a vertical sectional view through a modified form of contact chamber arrangement.

Figure 7 is a perspective view of a top contact spacing slider portion from the contact enclosure of Figure 6.

The electric switch in the preferred embodiment of the invention includes a back metallic supporting plate 1 having mounted thereon adjacent the top thereof the insulating back section 2 of the contact enclosing chambers as by means of studs 3. A further insulating sheet 4 may be disposed between the back plate 1 and the section 2. Upon the back section 2 is mounted a complementary front section 5 as by means of

studs 6. The sections 2 and 5 cooperate to form a plurality of chambers for the cooperating contacts, as herein illustrated three, although it is understood that one or any desired number of chambers may be so constructed.

At the juncture of the bottom walls of the sections 2 and 5 there are provided openings 7 providing entrance into the contact chambers and through these openings 7 extend U-shaped elements 8 carrying the bridging movable contacts 9 which are pressed against intumed ends 11 on the U-shaped elements 8 by means of compression springs 12. A spring guide post 13 is rigidly secured with each of the U-shaped elements 8 to a movable insulating supporting element 14 common to the movable contact elements.

Rigidly secured to the supporting plate 1 is a bracket 15 of inverted L-shape and U-shaped in cross section. Within the U formed by the opposite sides of the bracket is disposed a stationary core member 16 of E shape upon the central leg of which is mounted an operating coil 17. The core 16 is maintained in place by a pin 18 rigid with the bracket 15 and engaging in a slot in the back of the core piece as shown more particularly in Figure 2 and at its front by a similar but removable pin 19 extending through the bracket 15 and through a similar slot and removably maintained by spring clips 21 on the bracket. At the lower end of the bracket 15 there is pivotally mounted a link 22 also U-shaped in cross section and to the link 22 is pivotally mounted a bracket 23 U-shaped in cross section and also U-shaped in side elevation. The link 22 and the bracket 23 are pivoted together by the pin 24 and upon the pin 24 is also pivotally supported the movable armature member 25. A spring 26 is provided for holding the armature 25 in a desired position while the coil 17 is deenergized. The bracket 23 is rigidly connected to the insulating supporting member 14 and serves to transmit movement of the armature 25 thereto so as to effect substantially vertical reciprocatory movement of the insulating support 14 and the movable contacts 9 in response to attraction and release of the armature 25.

Also mounted upon the supporting plate 1 and at opposite sides of the core and armature assembly are current overload relays indicated generally at 27 and 28. These relays may be of conventional form and as they form no part of the present invention will not be specifically described herein. They are of the ordinary current responsive type and serve upon current overload to interrupt the circuit to the energizing coil 17. The back section 2 forming the contact chamber enclosures is provided with recesses 31 forming the rear portions of the contact chambers and with top backwardly extending recesses 32 dis-

posed above and to the right of the center line of each of the chambers and having mounted therein terminals 33 having connected thereto conductor lugs 34 or conductor ends as illustrated. Upon the front portions 35 adjacent the recesses 32 are mounted terminals 30 also receiving conductor lugs 34 or conductor terminals. The recesses 31 and 32 are connected by means of slots 36 receiving portions of the stationary contacts and also providing venting openings into the chambers as will be hereinafter described.

The stationary contacts are arranged in pairs in each recess 31 spaced longitudinally thereof, the rear contact in each pair being designated at 37 and the front contact at 38. These contacts are relatively massive in form and are shown in perspective in Figure 5. They include a terminal portion 39 connectible to the terminals 30 and 33, a vertical portion 41 received within the slots 36 and a contact face 42. The recesses and slots within the back enclosure section and the stationary contacts are so formed that the contacts are received and guided by portions on the back section so that their movement is restricted to a forward sliding movement for removal.

The front insulating section 5 forming the contact enclosures is shown in perspective in Figure 4 and includes recesses 43 cooperating with the recesses 31 to form the chambers and rearwardly extending projections 44 partially filling the recesses 32 in the rear section 2. These projections and other portions on the front section are so arranged as to cover the stationary contacts 37 and 38. As more particularly shown in Figure 1, the top front portions 35 of the back section 2 remain of a somewhat inverted L shape due to the form of the recesses 32. The projections 44 are so dimensioned that they do not meet the inverted bases of the L's, thus providing communication from the slots 36 through the portions of the recesses 32 immediately adjacent the projections 44 to the exterior of the contact chambers. The arrangement of these openings is apparent from an inspection of the upper left hand portion of Figure 1 and of Figures 2 and 3. Within each of the recesses 43 and 31 in the sections 5 and 2 are disposed U-shaped magnetic elements 45 each disposed with its legs embracing the adjacent stationary contact.

With the construction herein illustrated it is seen that the contact chambers, which may be of any desired number, are formed from two cooperating insulating sections while providing for stationary contacts disposed in pairs within the chambers and spaced apart at right angles to the plane of the sections, which stationary contacts are readily accessible for inspection and removal when the front insulation section for the contact chambers is removed. The openings 7 at the bottom walls of the chambers through which the supports for the movable contacts extend are seen to be relatively open so that they provide venting means for gases generated within the chambers. Also, the slots 36 in the top walls of the chambers cooperate with the adjacent portions of the front recesses in the back section to provide top vents to the exterior of the chambers. Hence it is seen the construction is such as to provide both a top and bottom vent for each of the contact chambers with the bottom vent further serving as entrance means for the parts supporting and moving the movable contact elements.

A modified form of the invention is illustrated

in Figures 6 and 7 wherein the contact enclosing insulating chamber is formed of three sections comprising a rear and partial top section 51, a second top section 52, and a front section 53. The bottom walls of the sections 51 and 53 are provided with an opening 54 through which extends a U-shaped contact supporting element 55 in which is disposed a bridging contact plate 56, maintained forwardly by inturned ends 57 on the U-shaped element 55. The bridging contact 56 is biased upwardly by means of a compression spring 58 disposed between the legs of the U-shaped element 55 and further enclosed by a pair of oppositely directed U-shaped elements 59 and 61 slidably nesting in each other. The U-shaped elements 55, 59 and 61 together form a complete enclosure for the compression spring 58 and this enclosure is so dimensioned as to substantially enclose the opening 54 in the bottom wall of the contact chamber. The top section 52 which is illustrated in perspective in Figure 7 is received upon the back section 51 and serves to space the stationary contact elements 62 and 63 which are relatively loosely engaged therewith. The contact elements 62 and 63 are connectible to terminals rigidly mounted upon the rear section 51 similarly to the terminals 30 and 33 in the preferred embodiment of the invention and thus serving to rigidly mount the stationary contact as well as the top section 52. The top section 52 is provided with a vertical slot 64 and with a top and side recess 65 which cooperate to provide a communicating vent from the interior of the contact chamber to the exterior thereof. The actuating and manipulable portions of the switch of this form are identical with those previously illustrated and described in the preferred form.

In this modified form of contact chamber arrangement it is seen that when the front section 53 is removed and the stationary contacts 62 and 63 disconnected from their terminals that the top section 52 and the stationary contacts may be readily removed as a unit for removal and/or replacement as a whole. It is seen that this contact chamber is substantially entirely enclosed except for the single vent formed by the slot 64 and recess 65. Thus, gases generated within the contact chamber will all be vented upwardly and outwardly from the contact chambers through the top slot since the bottom opening is substantially closed by the spring enclosure formed by the U-shaped elements 55, 59 and 61.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In an electric circuit controlling device, a rear insulating section, a forward insulating section, said sections having cooperating recesses forming a contact chamber, a rearwardly extending recess in the front face of said rear section and above said contact chamber forming recess, a slot in the top wall of said rear section establishing communication between said recesses, a stationary contact mounted on said rear section and having a contacting portion disposed within said chamber forming recess, a shank portion disposed within said slot and a terminal portion offset from said contacting and shank portion

and disposed in the upper recess and adapted to be rigidly connected to a terminal element therein, a movable contact within said chamber, and means for moving said movable contact to perform the switching operation.

2. In an electric circuit controlling device, a rear insulating section, a forward insulating section, said sections having cooperating recesses forming a contact chamber, a rearwardly extending recess in the front face of said rear section and above said contact chamber forming recess, a slot in the top wall of said rear section establishing communication between said recesses, a stationary contact mounted on said rear section and having a contacting portion disposed within said chamber forming recess, a shank portion disposed within said slot and a terminal portion offset from said contacting and shank portion and disposed in the upper recess and adapted to be rigidly connected to a terminal element therein, said stationary contact and rear section formations cooperating to limit movement of the contact to a straight line forward removal thereof and providing for self support of said stationary contact in its interior position independent of its connection to the terminal element, a movable contact within said chamber, and means for effecting movement of the movable contact to perform the switching operation.

3. In an electric circuit controlling device, a rear insulating section, a forward insulating section, said sections having cooperating recesses forming a contact chamber, a rearwardly extending recess in the front face of said rear section and above said contact chamber forming recess, a slot in the top wall of said rear section establishing communication between said recesses, a stationary contact mounted on said rear section and having a contacting portion disposed within said chamber forming recess, a shank portion disposed within said slot and a terminal portion offset from said contacting and shank portion and disposed in the upper recess and adapted to be rigidly connected to a terminal element therein, a backwardly extending projection on said front insulating section disposable in said top recess to cover the stationary contact and its connection to the terminal element, said projection cooperating with a side wall of said recess to effect a continuation of said slot and providing for the opening thereof to the exterior atmosphere.

4. In an electric circuit controlling device, a rear insulating section, a forward insulating section, said sections having cooperating recesses forming a contact chamber, a rearwardly extending recess in the front face of said rear section and above said contact chamber forming recess, a slot in the top wall of said rear section establishing communication between said recesses, a stationary contact mounted on said rear section and having a contacting portion disposed within said chamber forming recess, a shank portion disposed within said slot and a terminal portion offset from said contacting and shank portion and disposed in the upper recess and adapted to be rigidly connected to a terminal element therein, a second and oppositely offset contact element having its terminal portion mounted at the front face of the rear element with its shank portion at least partially disposable in said slot, whereby said stationary contacts are spaced longitudinally of the contact chamber, a bridg-

ing movable contact within said chamber, and means for moving said movable contact to perform the switching operation.

5. In an electric circuit controlling device, a rear insulating section, a front insulating section, and an at least partial top insulating section, said sections when properly assembled cooperating to form a contact chamber, stationary contacts loosely supported on said at least partial top section and adapted to be rigidly connected to and supported by said rear section, said at least partial top section and stationary contacts being removable as a unit after removal of said front section, a bridging contact element within said chamber movable into and out of engagement with said stationary contacts, means extending into said chamber for effecting movement of the movable contacts, and a slot in said at least partial top section between said stationary contacts and communicating with the exterior atmosphere to provide a vent for gases generated within the chamber, said slot extending vertically through said at least partial top section and communicating with a recess in the top side wall thereof, the rear section having a top portion engageable with the top of said at least partial top portion, whereby said vent, after leaving the contact chamber, communicates with the exterior through an orifice disposed in a vertical plane.

6. In an electric circuit controlling device, a plurality of insulating sections cooperating, when properly assembled, to form a contact chamber, with an elongated slot in the top wall of said chamber leading to the interior thereof, stationary contacts mounted within said chamber spaced longitudinally thereof and having integral connection means extending through said slot and connected to terminals mounted at the exterior of the chamber, a bridging contact element within said chamber, the bottom wall of said chamber being provided with an opening through which extend the means for supporting and moving said bridging contact element, said slot serving as a vent for gases generated by an arc drawn between said contacts and contact element, with the front and back walls of the slot formed by the integral connecting means of the stationary contacts.

7. In an electric circuit controlling device, a rear insulating section, a forward insulating section, said sections having cooperating formations which form a contact chamber when the sections are properly assembled, a slot in the top wall of said rear section leading from said contact chamber to the exterior thereof, a stationary contact mounted on said rear section and having integral connection means extending through said wall and secured to a terminal rigidly mounted on said rear section at the exterior of the chamber, said rear section and integral connection means for the stationary contact having cooperating formations limiting removal of said stationary contact to a straight line forward movement whereby to provide for self-support of the stationary contact in its interior position independent of its connection, to the terminal, a movable contact within said chamber, and means for effecting movement of the movable contact to perform the switching operation.

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