Feb. 13, 1934. J. SACHS 1,947,276

ELECTRIC CIRCUIT CONTROLLING APPLIANCE

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Fig. 1

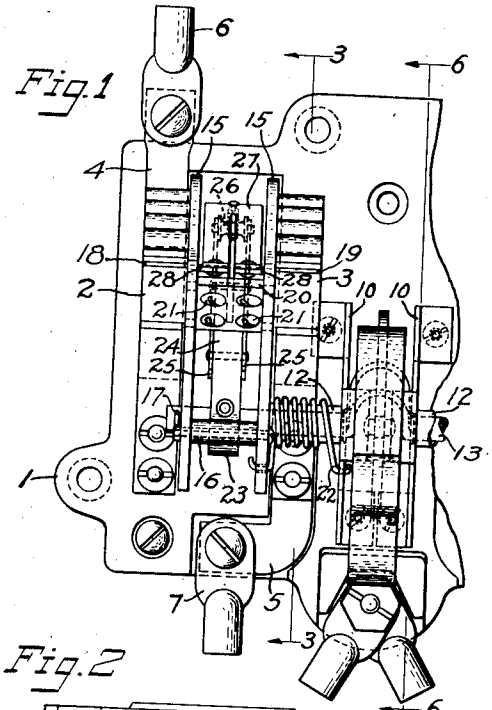


Fig. 2

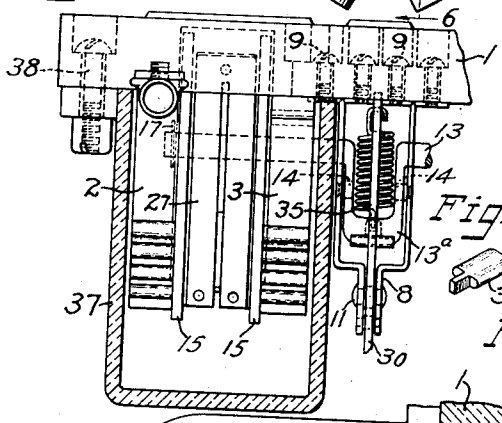


Fig. 3

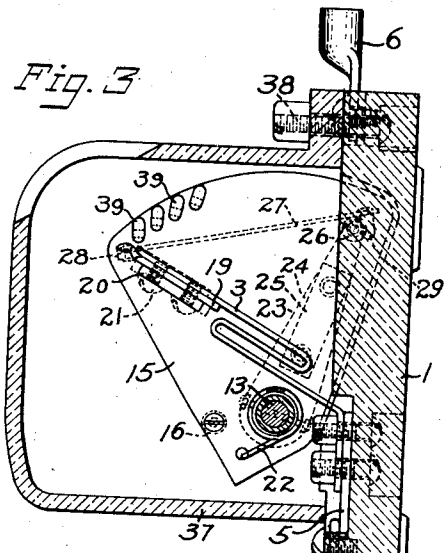


Fig. 4

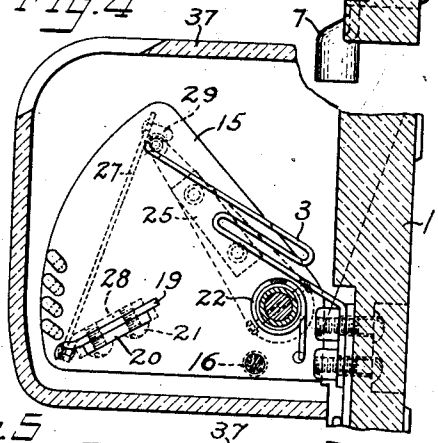


Fig. 7

Fig. 5

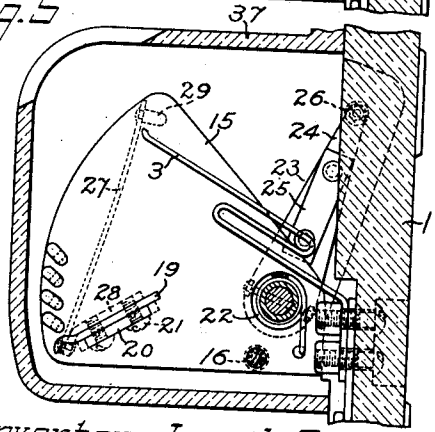
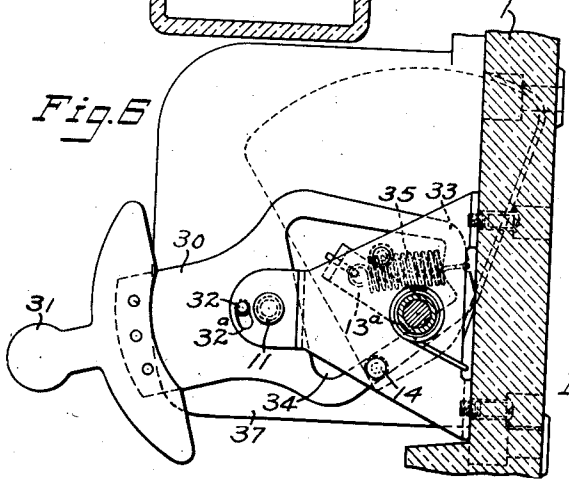


Fig. 6



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ELECTRIC CIRCUIT CONTROLLING APPLIANCE

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Fig. 8

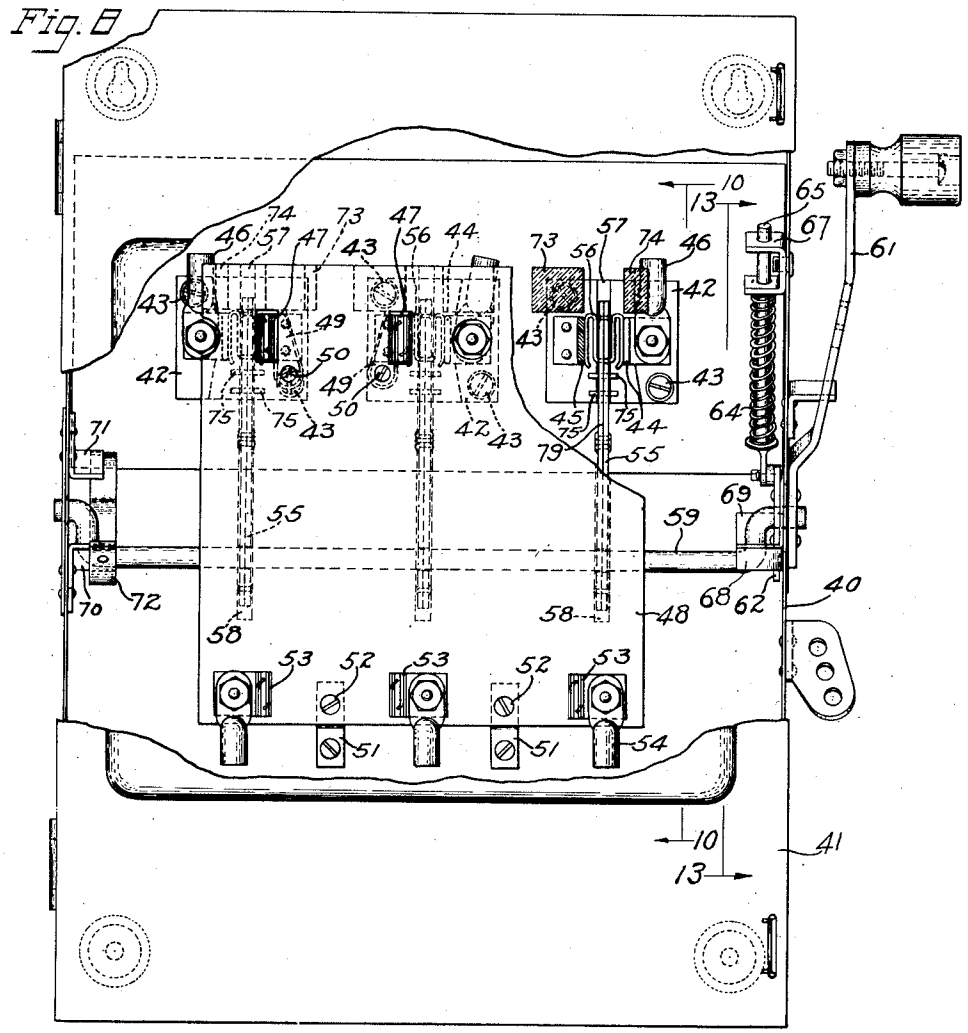
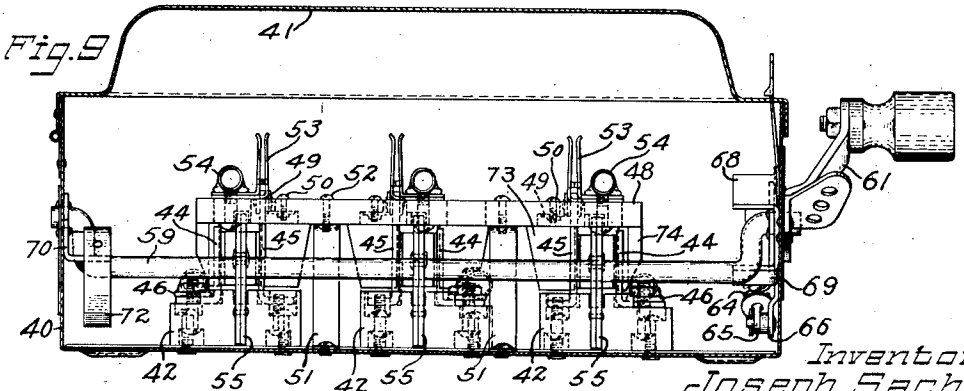


Fig. 9



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ELECTRIC CIRCUIT CONTROLLING APPLIANCE

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Fig. 10

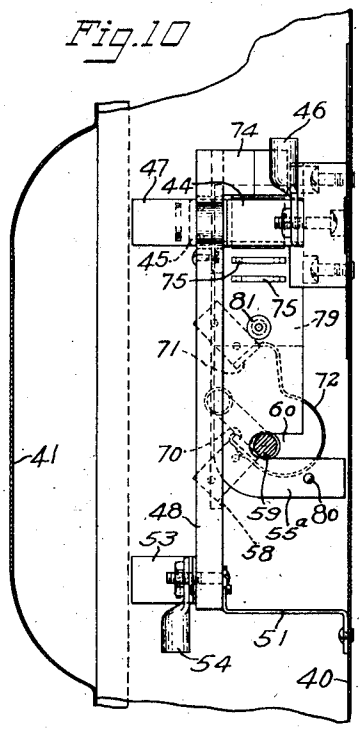


Fig. 11

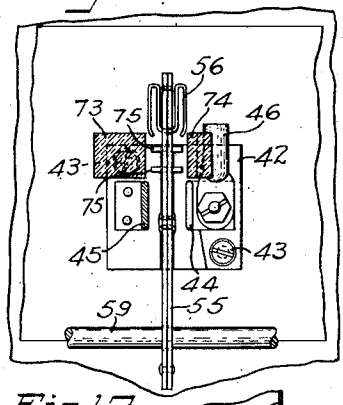


Fig. 12

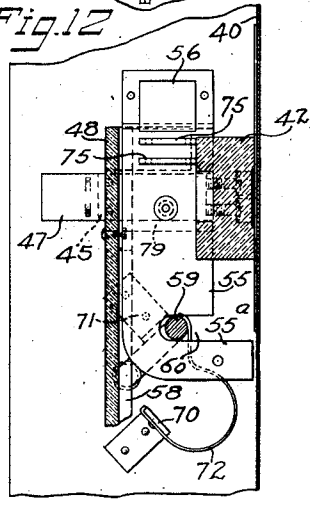


Fig. 13

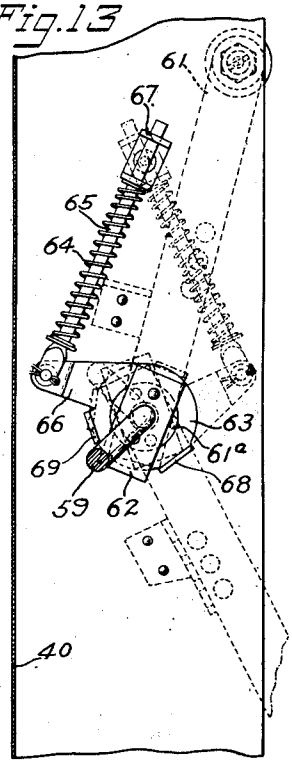
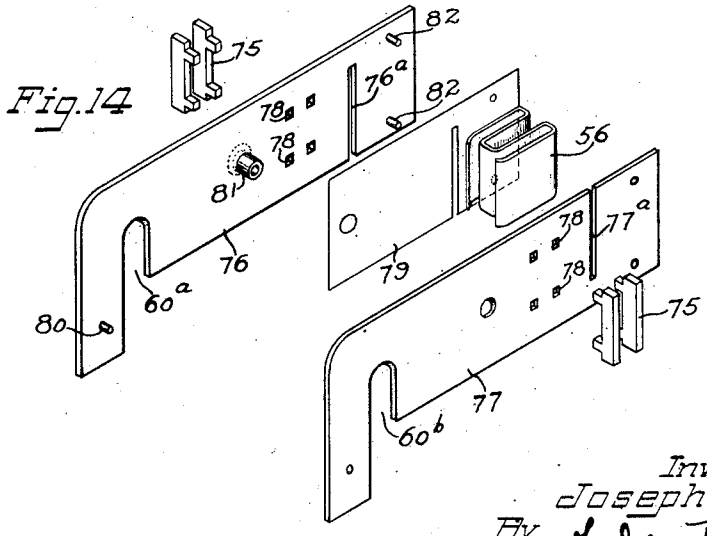


Fig. 14



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UNITED STATES PATENT OFFICE

1,947,276

ELECTRIC CIRCUIT CONTROLLING APPLIANCE

Joseph Sachs, West Hartford, Conn.

Application September 16, 1931
Serial No. 563,149

19 Claims. (Cl. 200—144)

One of the principal objects of the invention is to provide for an electric switch or an automatic circuit breaker or other electric circuit controlling appliance, a simple and efficient, but nevertheless effective and reliable means, for minimizing arcing between the contacts as they are separated from each other. The means which I provide for this purpose is of such character that it may be incorporated in circuit making and breaking devices without materially altering the general design and construction thereof.

A further object of the invention is to provide certain advantageous structural features for an electric circuit controlling appliance of the type where there are one or more rectilinearly movable switching members cooperating with stationary switch contacts.

This present application constitutes a continuation-in-part of my copending application for Automatic circuit breakers, Serial No. 508,942, filed January 15, 1931.

In the accompanying drawings I have shown an automatic circuit breaker having my present invention incorporated therein, and I have also shown a manually operable switch having my present invention incorporated therein. It will be understood, however, that the drawings are intended for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a fragmentary front view showing a part of a circuit breaker embodying the invention. In this view the cover which normally encloses the operative parts is omitted.

Fig. 2 is a fragmentary plan view of the parts shown in Fig. 1, the cover being shown in section.

Fig. 3 is a vertical sectional view taken along the line 3—3 of Fig. 1.

Figs. 4 and 5 are views similar to Fig. 3, but showing the parts of the circuit breaker mechanism in different relative positions.

Fig. 6 is a fragmentary vertical sectional view taken along the line 6—6 of Fig. 1.

Fig. 7 is a perspective view of one of the separate insulated conducting elements.

Fig. 8 is a front view of an electric switch embodying the invention, a part of the cover being broken away as is also a part of the plate carrying the fuse contacts.

Fig. 9 is a bottom view of the switch shown in Fig. 8, the enclosing cabinet being shown in section.

Fig. 10 is a fragmentary vertical sectional view taken along the line 10—10 of Fig. 8.

Fig. 11 is a fragmentary front view similar to Fig. 8, but showing one of the movable switch members in its upper or open-circuit position.

Fig. 12 is a fragmentary view similar to Fig. 10, but showing the switch member in its upper or open-circuit position.

Fig. 13 is a fragmentary view of the switch operating mechanism, this view being partly in section along the line 13—13 of Fig. 8.

Fig. 14 is a perspective view showing on an enlarged scale the parts of the movable switch member separated from each other in order that their details of construction may be more clearly apparent.

In Figs. 1 to 7 I have shown a circuit breaker, which is more fully shown and described in my aforesaid copending application. The complete circuit breaker comprises two circuit making and breaking mechanisms controlled by a single operating means. For the sake of simplicity I have shown in the present drawings only one of the circuit breaker mechanisms, this being the one at the left.

The circuit breaker is provided with a main insulating base 1, on which all of the essential parts are mounted. Carried by the base 1 are two stationary electric contacts 2 and 3, these being spaced apart transversely and adapted to be engaged by movable contacts of the corresponding circuit breaker mechanism to be presently described. Each of the contacts 2 and 3 comprises a flat strip of metal bent as shown most clearly in Figs. 3, 4 and 5, and having the contact face thereof located in a transverse plane. The contacts 2 and 3 are electrically connected by means of straps 4 and 5 with wire terminals 6 and 7.

All of the movable parts of the circuit breaker are carried by a central metallic bracket 8 which is secured to the insulating base 1 by means of screws 9, 9. The bracket 8 comprises two parallel metallic plates 10, 10 and near the front the two plates 10, 10 are offset toward each other and are connected by a shouldered rivet 11. Bearing bushings 12, 12 are carried by the respective side plates 10, 10 of the bracket 8. Rotatably mounted in the said bearing bushings 12, 12 is a shaft 13 having a crank portion 13^a which is positioned between the said plates 10, 10. The cranked shaft 13 is adapted to oscillate, the extent of oscillation being limited by means of studs 14, 14 which are riveted in place at the inner sides of the plates 10, 10.

The shaft 13 serves as the means for supporting and moving the two electro-responsive circuit controlling mechanisms, these mechanisms being carried on the shaft at opposite sides of the central supporting bracket 8. Each circuit breaker mechanism comprises a contact member which includes an insulating element and preferably two electric contacts thereon. The insulating element of the contact member comprises two spaced side plates 15, 15 rotatably mounted on the shaft 13. The two plates are held in spaced relationship in part by a spacing bar 16. The right hand plate abuts against the corresponding bearing bushing 12 and the left hand plate is engaged by a cotter pin 17 which prevents endwise movement of the contact member with respect to the shaft 13.

Two movable contacts 18 and 19 are carried by the contact member at the sides thereof, these contacts preferably projecting laterally from the respective side plates 15, 15 and being adapted to be engaged with and disengaged from the respective stationary contacts 2 and 3 which have already been described. The two contacts 18 and 19 are electrically connected and will be referred to collectively as contact means, and the said contacts together with the insulating element or elements which carry them will be referred to collectively as a switching member.

The said contacts 18 and 19 are preferably in the form of metallic plates which project inward through slots in the respective side plates. Extending transversely between the two side plates is an insulating bar 20, the ends of which also project into the slots in the side plates as clearly shown in Figs. 3, 4 and 5. The inner ends of the contacts 18 and 19 engage the bar 20 at the rear face thereof and are held in place by means of screws 21, 21. The bar 20 serves as an additional means for holding the plates 15, 15 in their proper spaced relation.

The contact member is biased for movement in the circuit opening direction, that is, in the counter-clockwise direction, by means of a spring 22 surrounding the corresponding bearing bushing 12. One end of the spring engages the inner side plate of the contact member and the other end of the spring engages the adjacent side plate 10.

Rigidly mounted on the shaft 13 between the two plates 15, 15 is an actuator 23, which comprises an insulating element 24 pinned to the shaft 13, and two spaced arms 25, 25 secured to the element 24. Carried between the said arms 25, 25 at their outer ends is a small roller 26.

There is provided a metallic thermal element or strip 27 which is substantially U-shaped and has the legs of the U connected respectively with the movable contacts 18 and 19. As illustrated there are connecting elements 28, 28 engaging the respective contacts and held in place by the screws 21, 21, and the end portions of the legs of the strip 27 are riveted to these connecting elements. It will be observed that the strip 27 provides an electrical connection between the two movable contacts 18 and 19, thus completing the circuit through the entire mechanism when the movable contacts 18 and 19 are in engagement with the stationary contacts 2 and 3.

The strip 27 is so shaped and so positioned that it serves in and of itself as a latch to hold the contact member and the actuator in normally fixed relationship with each other. For this purpose the strip 27 is provided with a pin 29 adapted to engage the roller 26. Under normal conditions the strip 27 serves to mechanically connect the contact member and the actuator, but when the bi-metallic strip is heated by reason of the passage of excess current therethrough it is deflected upward so as to cause the pin 29 to disengage the roller 26. This permits the contact member to move automatically in the counterclockwise direction so as to separate the contacts 18 and 19 from the contacts 2 and 3 and thus break the circuit in two places.

It will be apparent that the contact member may be moved for normal switching purposes when the shaft 13 is moved. For the sake of convenience the shaft 13 and the actuator 23 thereon will be referred to collectively as the actuating member. For operating the actuating member there is provided a manually movable operating member, and this operating member is connected with the actuating member by a mechanism having a snap action to effect a quick break of the circuit and preferably also a quick make.

The operating member is shown at 30 and it is preferably pivotally movable about an axis separated from the pivotal axis of the actuating member. The operating member 30 is pivotally mounted on the before-mentioned rivet or stud 11, which connects the two plates 10, 10 of the bracket 8. Connected with the operating member 30 is a handle 31, and pivotal movement is limited by means of a transverse stud 32 which extends through a slot 32^a in the said member 30. Preferably the operating member 30 is formed with a yoke 33 which embraces or bridges the shaft 13 of the actuating member. In other words, the operating member 30 is provided with a relatively large opening 34 through which the shaft 13 extends.

The operating member is operatively connected with the shaft 13 by means of a tension coil spring 35 which in the particular construction disclosed constitutes an essential part of the quick-make-and-break mechanism. The spring is connected at one end with the central portion of the yoke 33 and at the other end with the crank portion 13^a of the shaft 13. Fig. 6 shows the operating and actuating members in the positions corresponding to the closed-circuit positions of the contact member. The tension spring 35 tends to hold the parts in the position shown. It will be apparent, however, that when the operating member is moved to the reversed position, the inner or right hand end of the spring 35 is moved downward over the center of the shaft 13, with the result that the actuating member and the connected contact member are moved by the spring to the open-circuit position. This movement takes place quickly and with a snap action when the spring passes the center and the contacts are, therefore, quickly separated. It will similarly be apparent that when the operating member is moved from the open-circuit position to the position shown in Fig. 6 the inner or right hand end of the spring 35 is moved upward over the center of the shaft 13, with the result that the actuating member with the connected contact member is moved to the closed-circuit position with a quick or snap action.

Preferably each circuit breaker mechanism is enclosed in its own individual casing or cover. A cover 37 is shown, this being connected with the main base 1 by means of screws 38. The cover has the primary function of protecting the circuit breaker mechanism, excluding dirt

and preventing unauthorized tampering or adjustment.

From the foregoing description it will be apparent that I have provided two stationary electric contacts 2 and 3 and two movable electric contacts 18 and 19 movable to a predetermined extent in fixed paths and adapted to engage or disengage the respective stationary contacts 2 and 3. The two movable contacts 18 and 19 are electrically connected and together constitute contact means, and the circuit through the device is made or broken when the stationary contacts are engaged or disengaged. In order to minimize arcing between each movable contact and the corresponding stationary contact, I provide at least one conducting element which is movable with the movable contact and is completely insulated from the other conducting parts of the device. The insulated conducting element is spaced from the corresponding contact by a distance much less than the extent of movement and is so located that upon movement in the circuit opening direction it travels beyond the stationary contact in a path closely adjacent thereto.

In the drawings I have shown for each pair of contacts not only one, but a series of such insulated conducting elements, these being indicated at 39, 39. It will be observed that the elements 39, 39 are so spaced and positioned with respect to the corresponding movable contact that during the circuit opening movement they pass in close proximity to and beyond the corresponding stationary contact. When the movable contact is carried by an insulating element such as one of the plates 15, the separate insulating elements 39, 39 are preferably also carried by the same insulating plate. As shown each plate 15 is formed with a series of small rectangular holes and each element 39 is provided with a rectangular extension as shown in detail in Fig. 7, which extension is adapted to tightly fit into one of the rectangular holes. Thus the elements 39 may be put in place and held by merely driving them into the holes in the plate.

These insulated conducting elements 39, 39 act upon any arc that may be formed so as to break it up into smaller arcs, the result being that, with the voltage for which the device is designed, the several smaller arcs cannot be maintained and are automatically extinguished practically instantaneously. It will be appreciated that the number of conducting elements to be provided is dependent upon the voltage and upon other electrical conditions. I have shown four such conducting elements, but it will be understood that this number may be varied and that in many instances a single such element adjacent each movable contact will be sufficient.

I am aware that it has been heretofore proposed and practiced to provide one or more stationary conducting or arcing elements in the arcing zone to cause the formation of a plurality of relatively small arcs. In accordance with the present invention and in contrast with prior knowledge and practice I mount the arcing element or elements for movement with the movable contact, thus attaining distinct advantages. As a result of the invention I attain greater simplicity of structure and lower manufacturing cost, for the reason that with many types of construction, as for instance that illustrated in Figs. 1 to 6 of the drawings, the arcing element or elements can be directly mounted on the movable contact member adjacent the movable contact at very small cost, whereas they could be stationarily mounted adjacent the stationary switch contact only by providing a special and relatively expensive supporting structure therefor.

The movable mounting of the arcing element or elements has the further and very important advantage that there is provided a turbulence in the arcing zone which additionally assists in extinguishing the arcs. The arcing element or elements serve as already described to break up the arc into a plurality of smaller arcs, and when the said element or elements are movable, and particularly when they project as shown in the drawings, they cause a blowing or fanning action which tends to prevent arc maintenance. The effectiveness of this blowing or fanning action is dependent to a large extent upon the speed of movement, and it is therefore particularly desirable to provide a spring such as 35, or other suitable means, for effecting a quick opening movement of the movable switch contacts and of the arcing elements associated therewith.

In Figs. 8 to 14 of the drawings I have shown a manually operable fused switch embodying the invention. In this switch there are incorporated means similar to those already described for minimizing arcing, and in addition there are incorporated other novel features to be described.

The fused switch embodying the invention is particularly adapted to be mounted within an enclosing cabinet, such as 40, and it is so shown. The cabinet 40 may be of any usual or preferred construction and is illustrated as being rectangular in form with an openable front cover 41. The rear wall and the side walls of the cabinet serve to support the various parts of the switch.

As shown, there are three pairs of fuse contacts and three separate switching devices for three legs of a circuit, but it will be understood that the number of fuses and switches is immaterial. For the sake of convenience and simplicity of description, I will describe in detail only those parts at the right side of the appliance, it being understood that the other parts are, or may be similar or identical in construction.

Secured to the rear supporting wall, in this case the rear wall of the cabinet 40, is an insulating supporting device 42 held in place by screws 43, 43. Secured to the supporting device 42 and projecting forward therefrom are two opposed stationary switch contacts 44 and 45, having at their inner sides parallel contact faces. Connected with the contact 44 is a wire connecting lug 46. Electrically connected with the contact 45 is a fuse contact 47 which is one of a pair of such contacts. Preferably the fuse contact 47 is mounted directly upon the switch contact 45 which is extended forward to permit such mounting.

Positioned at the front of the switch contacts 44 and 45 is an insulating plate 48 which is spaced forward from the insulating supporting device 42. This plate is provided with one or more apertures through which project the fuse contacts 47 and the extensions on the corresponding switch contacts 45. Preferably the plate 48 is supported near the top by means of small metal brackets 49 secured to the projecting parts of the switch contacts 45, being connected with the said brackets by means of screws 50. The plate 48 is supported at or near the bottom by means of brackets 51, 51 secured to the rear wall of the cabinet. The plate is connected with these brackets by means of screws 52, 52. Carried by

the plate 48 near the bottom thereof are fuse contacts 53, 53 which, with the before-mentioned contacts 47, 47, constitute pairs of fuse contacts. The fuse contacts as shown are adapted for receiving cartridge fuses with knife blade contacts, but it will be understood that other types of fuse contacts may be provided. Connected with each fuse contact 53 is a wire terminal 54.

For making and breaking the circuit between the stationary switch contacts of each pair, that is, between the switch contacts 44 and 45, I provide a switching member which is movable behind the insulating plate 48 and between the contacts 44 and 45. The switching member comprises an insulating element 55 and a conducting contact 56. The insulating element 55 is preferably a thin flat plate which is vertical and which is perpendicular to the rear supporting wall. The contact 56 extends through a slot in the flat insulating element and is provided with substantially parallel outward facing contact faces adapted to electrically engage the respective contact faces of the stationary contacts 44 and 45.

The switching member as an entirety is preferably rectilinearly movable and it is guided in part for such movement between the insulating supporting device 42 at the rear and the plate 48 at the front. The insulating device 42 and the plate 48 are provided respectively with grooves 57 and 58 for receiving the edge portions of the insulating element 55, but it will be observed that these slots are wider than the said element so as to permit the switching member to adjust itself transversely without being closely limited by the walls of the grooves. Preferably the insulating element 55 has a rearward extension 55^a which is adapted to engage the rear wall of the cabinet which thus serves as an additional guide for the movable switching member.

When there are two or more pairs of switch contacts and two or more separate switching devices as herein shown, there may be a single transverse insulating supporting device which is large enough to support all of the stationary switch contacts. Preferably, however, there is provided a separate insulating supporting device 42 for each pair of contacts, these separate supporting devices being separately supported on the rear wall of the cabinet entirely independently of each other. The several separate contact units may be identical in construction, or they may differ. As shown the right hand unit and the center unit are the same, and the left hand unit is similar but reversed. The provision of such separate contact units has the advantage of simplifying manufacture as but a small number of styles of unit is required for a large variety of switches having different numbers of legs and otherwise differing from each other. It has the further advantage that, in case of injury to the contacts of one pair the corresponding unit can be removed and replaced without disturbing other units.

For operating the switching member or members there is provided a cranked operating member 59 which is pivotally mounted in suitable apertures or bearings in the opposite side walls of the cabinet 40. This operating member extends through a slot 60 in the insulating element 55 of the switching member. When there are two or more switch members as shown they are all operated by the same operating member.

There is provided an operating handle 61, but this handle, instead of being mounted directly on the member 59, is connected therewith by means of a suitable quick-make-and-break mechanism. The handle 61 is secured to a hub 61^a which is rotatable in a relatively large aperture in the corresponding side wall of the box. Secured to the hub 61^a is a projecting operating finger 62. Rotatably mounted on the hub 61^a is an intermediate member 63 which is held in one or the other of two extreme positions by means of an over-the-center spring 64 which surrounds a guide rod 65. The lower end of the guide rod is enlarged and is pivoted to an ear 66 on the intermediate member 63 and the other end of the rod 65 is guided in a bracket 67 secured to the side wall of the box. The intermediate member 63 is provided with ears 68 and 69 which are adapted to be engaged by the operating finger 62 and which are also adapted to directly engage the crank portion of the operating member 59.

The full lines in Fig. 13 show the parts in the position which they occupy when the switch is closed. When the handle 60 is moved downward the finger 62 is turned in the clockwise direction and this causes a similar movement of the intermediate member 63. This movement continues until the ear 68 engages or approximately engages the cranked portion of the member 59, at which time the spring 64 is at or near the dead center. Continued movement carries the spring past dead center and the spring thereupon acts to throw the parts quickly to the positions shown by dotted lines. The operating member and the switch members are carried with a snap action to their open-circuit positions. When the switch is to be closed the operation described is reversed and the cranked portion of the member 59 is engaged by the ear 69 and is carried with a snap action from its closed-circuit position to its open-circuit position. Figs. 8 and 10 show the switch parts in their closed-circuit positions and Figs. 11 and 12 show the switch parts in their open-circuit positions.

Stops 70 and 71 are preferably provided for limiting the movement of the operating member 59 and preferably there is secured to one of the stops a spring detent 72 which assists in holding the operating member in its uppermost open-circuit position.

In order to reduce arcing manifestations it is preferable that walls of insulating material be provided at opposite sides of the path of movement of the switch contact 56, these walls serving to confine any arcs that may be formed. In accordance with the present invention there are provided for this purpose rearward projections 73 and 74 on the insulating plate 48, there being two of these projections for each switch device. The projections 73 and 74 are so positioned that the switch contact 56 passes close to the walls thereof as it moves from its closed-circuit position to its open-circuit position. Inasmuch as these projections 73 and 74 are carried by the plate 48 it will be apparent that they are removed and taken out of the way whenever the plate 48 is removed to provide more convenient access to the switch contacts.

Carried by the switching member, preferably by the insulating element 55 thereof, are insulated conducting elements 75, 75 similar in function to the conducting elements 39, 39 already described in conjunction with the device shown in Figs. 1 to 7. The conducting elements 75, 75 are located at opposite sides of the insulating element 55 and in close proximity to the contact 56. I have shown two insulated conducting elements 75 at each side,

but it will be understood that the number may be varied and that under some circumstances a single such conducting element at each side will be sufficient. By referring to Figs. 8 and 12 it will be apparent that when the switch member moves from its closed-circuit position to its open-circuit position the conducting elements 75, 75 move beyond the respective stationary contacts 44 and 45 in paths closely adjacent thereto, serving to break up or subdivide any arc that might be formed. It will be apparent that these separate conducting elements cooperate with the insulating walls on the projections 73 and 74 to minimize and to practically eliminate any arcing manifestation.

The separate conducting elements at the opposite sides of the insulating element 55 are insulated from each other and in Fig. 14 I have shown the preferred detailed construction of the switching member which makes possible this insulation of the oppositely disposed conducting elements, and also provides other advantages.

The flat insulating element 55 instead of being formed of a single piece of insulating material is formed of two separate similar plates 76 and 77 which are shown separately in Fig. 14 and which are shown in their normal face to face relationship in Fig. 8. The two plates are provided with similar slots 60^a and 60^b which normally register with each other to form the before-mentioned composite slot 60 for the operating member.

The two plates are also provided respectively with slots 76^a and 77^a. As shown the slot 76^a extends upward from the bottom edge of the plate 76 and the slot 77^a extends downward from the top edge of the plate 77. The two slots are so positioned that their inner end portions are normally in register with each other. When the slots are thus in registry they provide an opening which extends transversely entirely through the composite element 55 and which is closed at the top and at the bottom. The closure at the top is provided by the top wall of the slot 76^a and the closure at the bottom is provided by the bottom wall of the slot 77^b.

The respective plates 76 and 77 are formed with pairs of holes 78, 78, the number of pairs in each plate corresponding to the number of insulated conducting elements to be provided. As shown there are two pairs of holes in each plate. Each conducting element 75 is provided with lugs adapted to enter the holes 78, 78. If desired, the inner ends of the lugs can be riveted or peened to hold the elements in place.

After the elements 75, 75 have been connected the plates 76 and 77 are assembled with the contact 56, the two plates being pushed respectively downward and upward. In order that there may be no electrical connection between the conducting elements 75, 75 at opposite sides of the switch member I preferably provide a thin sheet 79 of insulating material which is put in place between the two main plates 76 and 77 when the said plates are assembled with the contact 56. The two plates 76 and 77 are preferably mechanically connected by means of rivets 80, 81 and 82 preferably formed of insulating material.

When the screws 50, 50 and 52, 52 are removed or loosened the front plate 48 may be removed. This permits free removal in the forward direction of any one or all of the movable switching members. Inasmuch as the arcing elements are carried by the switching members and are removable therewith, it is possible to easily inspect, repair or replace any switching member and the arcing elements thereof. Thus if the switch is damaged by being operated to interrupt current in excess of its intended capacity, it is possible to easily and quickly replace all of the parts subject to arcing manifestation, excepting only the main stationary contacts.

The removability of the switching members has the additional advantage that it permits the characteristics of a switch to be readily changed by substituting one switching member for another, as for instance by substituting a switching member having a plurality of arcing elements adjacent each contact for a switching member having only one such arcing element.

What I claim is:

1. In a device of the class described, the combination of a stationary contact, a contact movable in a fixed path to engage or disengage the stationary contact and thereby close or open the circuit, and an insulated conducting element movable in fixed relationship with the movable contact and spaced therefrom by a distance less than the extent of movement, the said conducting element upon movement in the circuit-opening direction traveling beyond the stationary contact in a path closely adjacent thereto.

2. A device as set forth in claim 1, wherein there is an operating handle, and a quick-break mechanism connected with the handle and serving upon movement of the handle to quickly move the movable contact member and the insulated contact element in the circuit-opening direction separately from the handle.

3. In a device of the class described, the combination of a stationary contact, a contact movable in a fixed path to engage or disengage the stationary contact and thereby close or open the circuit, the said movable contact being readily removable as an entirety from the stationary contact and the other parts of the device, and a movable insulated conducting element mounted in fixed relationship with the movable contact and removable therewith, the said conducting element being spaced from the movable contact by a distance less than the extent of movement and upon movement in the circuit-opening direction traveling in a path closely adjacent the stationary contact.

4. In a device of the class described, the combination of a stationary contact, a contact movable in a fixed path to engage or disengage the stationary contact and thereby close or open the circuit, and a series of insulated conducting elements movable in fixed relationship with the movable contact and arranged with the spacing between the movable contact and the several elements less than the extent of movement, the said conducting elements upon movement in the circuit-opening direction traveling beyond the stationary contact in a common path closely adjacent thereto.

5. The combination of a stationary electric contact, a second contact movable in a fixed path and adapted to engage or disengage the stationary contact to thereby close or open the circuit, a movable insulating element rigidly connected with the movable contact, a conducting element carried by the insulating element and separate from the said movable contact, the said conducting element being in closely spaced relationship with the movable contact and upon movement in the circuit-opening direction traveling beyond the stationary contact in a path closely adjacent thereto, and an operating means directly engaging the insulating element to move it and thereby

move the movable contact and the separate conducting element.

6. The combination in a device of the class described, of a stationary contact, an insulating element movable in a fixed path, a movable contact carried by the insulating element and adapted to engage or disengage the stationary contact to thereby close or open the circuit, and a conducting element separately carried by the insulating element and arranged in closely spaced relationship with the movable contact, the said conducting element upon movement in the circuit-opening direction traveling beyond the stationary contact in a path closely adjacent thereto.

7. The combination as set forth in claim 6, wherein there is an operating means directly engaging the insulating element to move it and thereby move the movable contact and the separate conducting element.

8. The combination in a device of the class described, of a stationary contact, an insulating element movable in a fixed path, a movable contact projecting from the insulating member at one side thereof and adapted to engage or disengage the stationary contact to thereby close or open the circuit, and a conducting element separately carried by the insulating element and projecting from the said side thereof, the said conducting element being arranged in closely spaced relationship with the movable contact and so positioned that upon movement of the insulating element in the circuit-opening direction it travels beyond the stationary contact in a path closely adjacent thereto.

9. In a device for making and breaking a circuit, the combination of two stationary contacts spaced apart, a conducting contact means movable in a fixed path and having two contact faces adapted to engage or disengage the respective stationary contacts and thereby close or open the circuit, and two separate insulated conducting elements movable in fixed relationship with the movable contact means and spaced from the respective contact faces thereof by distances less than the extent of movement, the said conducting elements upon movement in the circuit-opening direction traveling beyond the respective stationary contacts in separate paths closely adjacent thereto.

10. A device as set forth in claim 9, wherein there are two opposite insulating walls closely adjacent the respective paths of movement of the two insulated conducting elements.

11. In a device for making and breaking a circuit, the combination of two stationary contacts spaced apart, a conducting contact means movable in a fixed path and having two contact faces adapted to engage or disengage the respective stationary contacts and thereby close or open the circuit, and two separate series of closely spaced insulated conducting elements movable in fixed relationship with the movable contact means and arranged with the elements of the two series in closely spaced relationship with the respective contact faces of the said contact means, the said two series of conducting elements upon movement in the circuit-opening direction traveling beyond the respective stationary contacts in separate paths closely adjacent thereto.

12. The combination in a device for making and breaking a circuit, of two stationary contacts spaced apart, an insulating element movable in a fixed path, a conducting contact means on the insulating element having two contact faces adapted to engage or disengage the respective stationary contacts and thereby close or open the circuit, and two conducting elements separately carried by the insulating element and arranged in closely spaced relationship with the respective contact faces of the said contact means, the said conducting elements upon movement in the circuit-opening direction traveling beyond the respective stationary contacts in separate paths closely adjacent thereto.

13. The combination in a device for making and breaking a circuit, of two stationary contacts spaced apart, an insulating element movable in a fixed path, a conducting contact means on the insulating element having two contact faces projecting at opposite sides thereof and adapted to engage or disengage the respective stationary contacts and thereby close or open the circuit, and two conducting elements separately carried by the insulating element and protecting therefrom at the said opposite sides thereof, the said conducting elements being arranged in closely spaced relationship with the respective contact faces of the said contact means and so positioned that upon movement in the circuit-opening direction they travel beyond the respective stationary contacts in separate paths closely adjacent thereto.

14. The combination in a device for making and breaking a circuit, of two stationary contacts spaced apart, a movable thin flat insulating element having parallel edges for guiding it in a fixed rectilinear path, a movable conducting contact carried by the insulating element and having two contact faces projecting at opposite sides thereof and adapted to engage or disengage the respective stationary contacts and thereby close or open the circuit, and two conducting elements separately carried by the insulating elements, and projecting therefrom at the said opposite sides thereof, the said conducting elements being arranged in closely spaced relationship with the respective contact faces of the movable contact means and so positioned that upon movement in the circuit-opening direction they travel beyond the respective stationary contacts in separate paths closely adjacent thereto.

15. The combination of two stationary electric contacts spaced apart, an element movable in a fixed path and comprising two separate plates of insulating material connected for movement in unison, a conducting contact means on the said insulating element having two contact faces respectively adjacent the said plates and adapted to engage or disengage the respective stationary contacts and thereby close or open the circuit, and two conducting elements separately carried respectively by the two insulating plates constituting the insulating element and arranged in closely spaced relationship with the respective contact faces of the said contact means, the said conducting elements upon movement in the circuit-opening direction traveling beyond the respective stationary contacts in separate paths closely adjacent thereto.

16. The combination as set forth in claim 15, wherein the two plates of the insulating element are closely adjacent each other and are guided at their edges for rectilinear movement.

17. As an article of manufacture, a switching member comprising an insulating element adapted to be guided for rectilinear movement, a movable contact carried by the said insulating element and adapted upon movement thereof to engage or disengage a stationary switch contact, and a conducting element separately carried by

the insulating element in closely spaced relation to the movable contact and positioned to move in a path closely adjacent the stationary contact.

18. As an article of manufacture, a switching member comprising a thin flat insulating element adapted to be guided for rectilinear movement and provided with means for engagement with an operating device, a movable contact carried by the said insulating element and having two contact faces at opposite sides thereof and respectively adapted upon movement of the said element to engage or disengage two stationary switch contacts, and two conducting elements insulated from each other and separately carried by the insulating element at opposite sides thereof, the said conducting elements being in closely spaced relation to the respective faces of the movable contact and positioned to move in paths closely adjacent the stationary contacts.

19. As an article of manufacture, a switching member comprising a thin flat insulating element comprising two separate closely adjacent plates and being adapted to be guided for rectilinear movement, a movable contact carried by the said insulating element and having two contact faces at opposite sides of the respective plates thereof and respectively adapted upon movement of the said element to engage or disengage two stationary switch contacts, two oppositely disposed conducting elements held in apertures in the respective plates of the insulating element and projecting at opposite sides thereof, the said conducting elements being in closely spaced relation to the respective faces of the movable contact and positioned to move in paths closely adjacent the stationary contacts, and a thin sheet of insulating material between the two plates serving to insulate the two conducting elements from each other.

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