

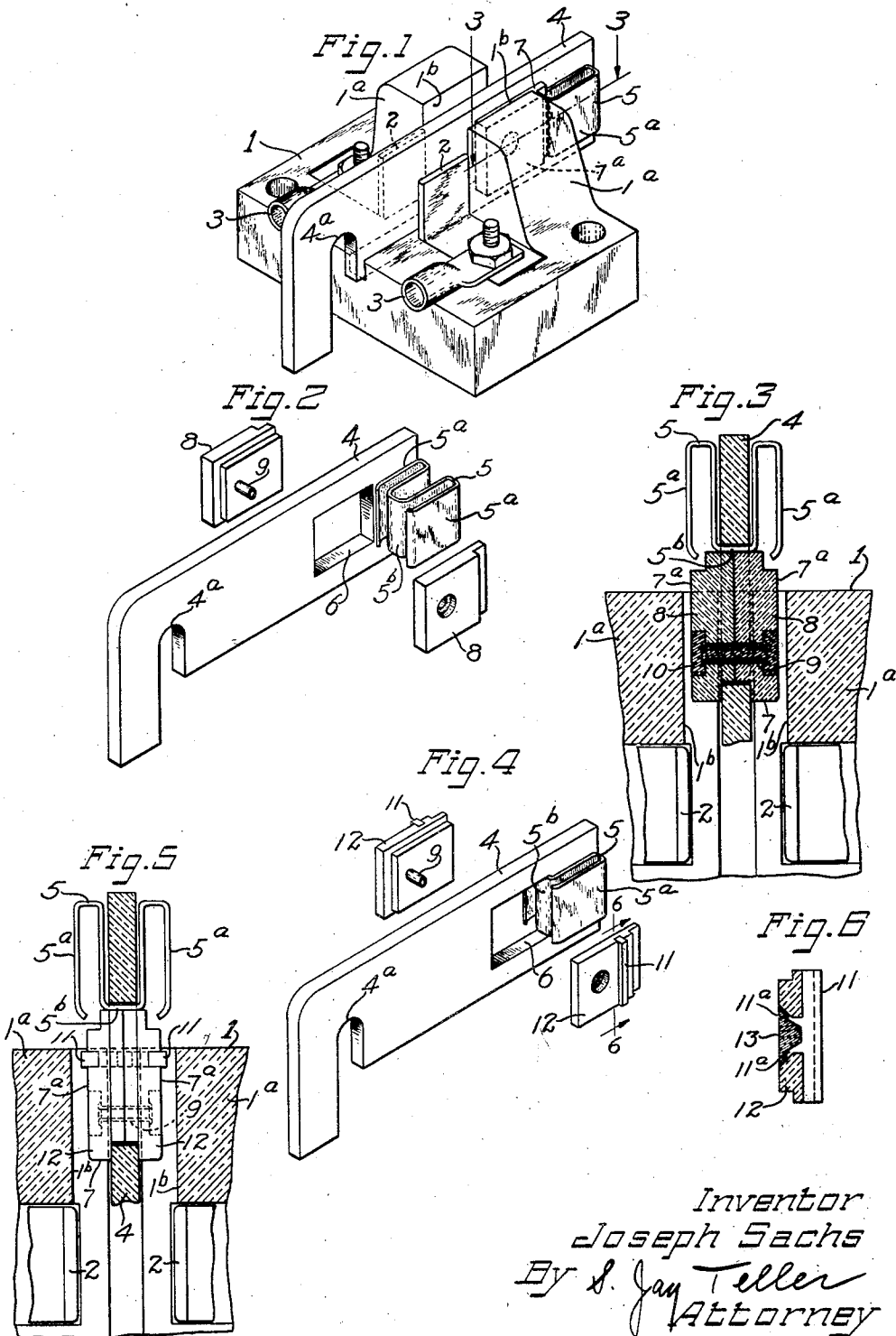
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J. SACHS

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ELECTRIC SWITCH

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Inventor
Joseph Sachs
By S. Jay Teller
Attorney

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ELECTRIC SWITCH

Joseph Sachs, West Hartford, Conn.

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16 Claims. (Cl. 200—144)

The present invention relates particularly to electric switches or circuit controlling appliances of the type disclosed in my Patents No. 1,754,443 and No. 1,754,445 dated April 15, 1930 and No. 1,755,367 dated April 22, 1930. It will be understood, however, that while the invention is particularly applicable to switches of the type referred to it is not necessarily so limited as concerns its broader aspects.

10 An important object of the invention is to provide a switching member or slide adapted to be economically manufactured and incorporating a special or additional structure which is positioned and particularly adapted to resist the heat of any arcs that may be formed when the movable switch contact is separated from the stationary switch contact.

15 A further object of the invention is to provide a switching member or slide having a special structure, whether particularly arc resistant or not, adapted to cooperate with stationary insulating walls adjacent the switch contacts in such a way that a wiping or pinching action is obtained which snuffs out any arcs that may be formed.

20 A further object of the invention is to provide in combination with the said special or additional structure on the slide one or more movable conducting arcing elements which are adjacent the movable contact and which serve to minimize arcing.

Other and more specific objects of the invention will be apparent from the following specification and claims.

25 In the accompanying drawing I have shown two embodiments of the invention, but it will be understood that the drawing is intended for illustrative purposes only and that there may be wide variation from the structure shown, particularly as concerns the stationary switch contacts and the means for supporting and guiding the movable switching member. The drawing is 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.

30 Of the drawing:

Fig. 1 is a perspective view of an electric switch embodying the invention.

35 Fig. 2 is a perspective view showing the parts of the movable switch member separated from each other.

Fig. 3 is an enlarged longitudinal sectional view of the switching member taken along the line 3—3 of Fig. 1.

40 Fig. 4 is a view similar to Fig. 2, but showing an alternate embodiment of the invention.

Fig. 5 is a view somewhat similar to Fig. 3, but showing the alternate construction shown in Fig. 4.

Fig. 6 is an enlarged vertical transverse sectional view taken along the line 6—6 of Fig. 4.

Fig. 1 of the drawing shows the essential parts of a switch embodying the invention, but inasmuch as the invention relates primarily to the movable switching member the remaining parts of the switch are shown in elemental form or are omitted entirely. A switch of this type is ordinarily mounted in a suitable enclosing box, and a transversely extending cranked operating member is provided for effecting movements of the switching member. These parts are or may be of conventional construction and are omitted from the drawing.

As shown there is an insulating base 1 on which is mounted at least one, and preferably two, stationary switch contacts 2, 2. When there are two switch contacts as shown they are preferably mounted opposite each other and are provided with opposite substantially parallel contact faces. As shown, the two switch contacts are directly connected respectively with wire terminals 3, 3, but other connections may be provided as indicated in the aforesaid patents.

A movable switching member is provided, this member including an insulating element 4 movable in a fixed path. When there are two stationary contacts such as 2, 2 the path of movement of the insulating element extends between the said contacts. Preferably the insulating element 4 is in the form of a flat plate having opposite parallel guiding edges by means of which it is constrained to move in a rectilinear path. The switching member also includes a movable contact 5 carried by the insulating plate 4. When there are two stationary contacts such as 2, 2 the contact 5 is provided with two opposite contact faces 5^a, 5^a adapted respectively to engage or disengage the two stationary switch contacts to thereby close or open the circuit. As shown the base 1 is provided with a slot in which the lower or rear edge of the insulating plate 4 is entered, the bottom of the slot engaging one of the said guiding edges of the element. A suitable means, not shown, is preferably provided for engaging the front edge of the insulating plate 4, which means cooperates with the base 1 to guide the plate in a rectilinear path as already mentioned. This front guide may be a plate carrying fuse contacts, or it may be entirely independent of any fuse contacts.

As already stated there may be provided a

cranked operating member, not shown, for effecting movements of the switching member. The insulating plate 4 is provided with a slot 4^a through which the operating member can extend, and it will be apparent that when the crank is moved it effects corresponding movements of the switch member, all as set forth and explained in detail in my aforesaid Patents No. 1,754,443, No. 1,754,445 and No. 1,755,367.

In accordance with the present invention the insulating element or plate is or may be formed of a material having inferior arc resisting characteristics. This makes it possible to select a material for the insulating element 4 having great mechanical strength, or a material highly resistant to moisture absorption, or a material having some other desirable property, without giving any particular consideration to the ability of the material to resist burning or other deleterious effects resulting from subjection to electrical arcs. While it is one of the objects of the invention to make it possible to use any one of a variety of materials for the element 4, the said element may be made from vulcanized fiber or from a molded or laminated material having as a binder a suitable phenolic condensation compound or other synthetic resin. In order that the arcing action may be properly resisted I provide a separate arc resisting structure which is carried by the main insulating element in proper relation to the movable contact so that it is adjacent the arcs which may be formed when the movable contact is separated from the stationary contact or contacts. The details of this arc resisting structure may be widely varied, but I will now describe the construction which I now prefer and have illustrated in the drawing.

The insulating element or plate 4 is provided with a relatively large opening 6 extending transversely therethrough. The movable contact 5 is preferably formed as clearly shown in Fig. 2 with the two opposite contact portions 5^a, 5^a adapted to be positioned at opposite sides of the plate 4 and spaced away from the respective surfaces of the plate; and the said contact 5 is further formed with a connecting portion 5^b adapted to extend through the aperture 6 in the plate, as clearly shown in Fig. 3. Positioned on the insulating plate 4 in close proximity to the contact 5 is an arc resisting structure which is designated as an entirety by 7. This arc resisting structure 7 is in such a position relatively to the contact 5 that it is adjacent any arc that may be formed when the movable contact is separated from the stationary contact or contacts. When the movable contact has two separate contact faces such as 5^a, 5^a and when there are two stationary contacts such as 2, 2 the arc resisting structure has two similar opposite faces 7^a, 7^a which are in approximately contiguous relationship to the movable contact. The arc resisting structure 7 is preferably much thicker than the plate 4, so that the surfaces 7^a, 7^a are not only in approximately contiguous relationship to the contact, but are also in planes only slightly separated from the planes of the contact faces 5^a, 5^a. It will be evident from an inspection of the drawing that any arcs that may be formed will play against the surfaces 7^a, 7^a of the arc resisting structure 7 and will not come in contact with any part of the insulating plate 4. As already stated the plate 4 is or may be of a material not highly resistant to burning, but the arc resisting structure 7 is of a material which is highly resistant to the ef-

fects of arcing, such as porcelain or other molded arc resisting substance.

The insulating structure 7, whether formed in detail as already described or otherwise, may serve in cooperation with stationary walls on the base to quickly snuff out the arcs as they tend to form. As concerns this function of the said structure it is not absolutely essential that it be of material different from that of the main movable insulating plate 4. In order that the structure 7 may function in the manner mentioned, I provide a stationary insulating structure which preferably comprises forward projections 1^a, 1^a on the base 1 having surfaces 1^b, 1^b closely adjacent the paths of movement of the contact faces 5^a, 5^a. The thickness of the structure 7 is such that the surfaces 7^a, 7^a move in close proximity to the surfaces 1^b, 1^b.

When the contact 5 is moved away from the contacts 2, 2, the insulating structure 7 moves into the relatively restricted space between the two opposite surfaces 1^b, 1^b, substantially filling that space and thus leaving insufficient room for the maintenance of an arc. Any arc that may be formed when the switch contacts are first separated will be immediately snuffed out as the insulating structure 7 moves so as to bring the surfaces 7^a, 7^a into close proximity to the surfaces 1^b, 1^b. The arc formed gases tend to expand and to follow the paths of least resistance and it is, therefore, obvious that they will not remain in or enter into the very restricted spaces between the respective walls 7^a and 1^b.

The structure 7 preferably serves as already described to minimize the deleterious effects of arcing, either by resisting the heat of the arcs, or by snuffing out the arcs, or by both resisting and snuffing. The said structure 7 may also serve to hold the movable contact 5 in place in the aperture in the plate 4, and as concerns this function its arc resisting or arc minimizing functions are less important and may be omitted.

Preferably and as shown the aperture 6 in the plate 4 is made sufficiently large to permit the movable contact 5 to be bent to its final shape before assembly and to be then slipped in place on the plate 4. The connecting portion 5^b of the contact 5 occupies a position at one end of the aperture 6 as clearly shown in Fig. 3 and the structure 7 is so formed as to engage the contact and hold it in place. Preferably the said structure 7 extends into and substantially fills the opening 6.

The structure 7, whether of arc resisting or arc snuffing character or otherwise, may conveniently consist of two separate insulating blocks 8, 8 which may be duplicates of each other, these blocks preferably being so formed as to fit into the aperture 6 as shown. The blocks may be provided with countersunk holes through which extends a rivet 9 serving to hold them together. The said countersunk holes may be filled with a suitable insulating cement 10.

In Figs. 4 to 6 I have shown a construction which is similar with that shown in Figs. 1 to 3, the principal exception being that the insulating structure 7 carries at least one and preferably two conducting elements 11, 11 which are respectively adjacent the contact faces of the movable contact. When the insulating structure comprises two separate blocks 12, 12 as shown, each block may be provided with one conducting element. Preferably and as shown each block 12 is formed with a transverse groove

adapted to receive the conducting element. Registering with this groove is a countersunk aperture as shown in Fig. 6. The conducting element 11 is formed with prongs 11^a, 11^b which are bent over after assembly of the element 11 with the block 12 so as to hold the said element in place. The aperture is filled with insulating cement 13 as shown so as to prevent any possible transverse arcing from one conducting element 11 to the other.

These insulated conducting elements 11, 11 act upon any arcs that may be formed so as to break them up into smaller arcs, the result being that, with the voltage for which the switch is designed, the smaller arcs cannot be maintained and are automatically extinguished practically instantaneously. The blocks 12, 12 are shown as being somewhat thinner than the blocks 8, 8, for the reason that when the arcing elements 11, 11 are provided there is less need for the snuffing action which has been described. I have shown only one insulated arcing element 11 at each side, but it will be understood that a larger number of such elements may be provided for switches intended for use with higher voltages. When two or more arcing elements are provided they will be spaced apart longitudinally of the direction of movement.

I do not herein broadly claim movable arcing elements in association with a movable switch contact, this subject matter being set forth and claimed in my patent for Electric circuit controlling appliance No. 1,947,276 dated February 13, 1934.

What I claim is:

1. The combination in an electric switch, 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 movable arc resisting insulating structure carried by the said insulating element and formed of a material different therefrom, the said structure being so positioned relatively to the movable contact that it is adjacent any arc that may be formed when the said contact is separated from the stationary contact.

2. The combination in an electric switch, of two separate stationary contacts, an insulating element movable in a fixed path extending between the said contacts, a movable contact carried by the insulating element and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable arc resisting insulating structure carried by the said insulating element and formed of a material different therefrom, the said structure having two opposite surfaces in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts.

3. In an electric switch, the combination of two separate stationary contacts, an insulating plate movable in a fixed path extending between the said contacts, a movable contact carried by the insulating plate and having two contact faces spaced away from the respective surfaces of the plate and adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable arc resisting insulating structure carried by the said insulating plate and having two surfaces spaced

away from the respective surfaces of the plate and in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts.

4. The combination in an electric switch, of two separate stationary contacts, an insulating plate having guiding edges and movable in a fixed rectilinear path extending between the said contacts, a movable contact carried by the insulating plate between the guiding edges thereof and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable arc resisting insulating structure carried by the said insulating plate between the guiding edges thereof and formed of a material different therefrom, the said structure having two surfaces in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts.

5. An article of manufacture comprising in combination, an insulating plate having opposite edges adapted for guiding it in a fixed rectilinear path and also having an aperture there-through positioned between the said edges, a movable contact extending through the aperture and having two opposite contact faces, and an arc resisting insulating structure carried by the plate between the guiding edges thereof and formed of a material different therefrom, the said structure having two surfaces in approximately contiguous relationship to the movable contact.

6. In an electric switch, the combination of two separate stationary contacts, an insulating plate movable in a fixed path extending between the said contacts, a movable contact carried by the insulating plate and having two contact faces spaced away from the respective surfaces of the plate and adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, a stationary insulating structure having surfaces in close proximity to the paths of movement of the said contact faces, and a movable insulating structure carried by the said insulating plate and having two surfaces spaced away from the respective surfaces of the plate so as to move in close proximity to the respective stationary insulating surfaces, the said movable insulating structure cooperating with the said stationary insulating structure to snuff out any arcs that may tend to form.

7. The combination of two separate stationary switch contacts, an insulating plate movable in a fixed path extending between the said contacts and having a relatively large transverse aperture therethrough, a movable switch contact extending through the aperture in the insulating plate and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable arc resisting insulating structure carried by the said insulating plate and formed of a material different therefrom, the said structure extending into the aperture and serving to hold the contact in place therein and the said structure having two surfaces in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts.

8. The combination of two separate stationary switch contacts, an insulating plate movable in a fixed path extending between the said contacts and having a relatively large transverse aperture therethrough, a movable switch contact extending through the aperture in the insulating plate and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable insulating structure carried by the said insulating plate and engaging the movable contact to hold it in place in the aperture, the said structure having two surfaces spaced away from the respective surfaces of the plate and in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts.

9. An article of manufacture comprising in combination, an insulating plate having opposite edges adapted for guiding it in a fixed rectilinear path and also having a relatively large aperture therethrough positioned between the said edges, a movable contact extending through the aperture and having two opposite contact faces, and an insulating structure carried by the plate between the guiding edges thereof engaging the movable contact to hold it in place in the aperture, the said structure having two opposite surfaces spaced away from the respective surfaces of the plate and in approximately contiguous relationship to the movable contact.

10. In an electric switch the combination of two separate stationary contacts, an insulating plate movable in a fixed path extending between the said contacts, a movable contact carried by the insulating plate and having two contact faces spaced away from the respective surfaces of the plate and adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable arc resisting structure comprising two separate insulating blocks carried by the said insulating plate at opposite sides thereof and having their outer surfaces in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts.

11. The combination of two separate stationary switch contacts, an insulating plate movable in a fixed path extending between the said contacts and having a relatively large transverse aperture therethrough, a movable switch contact extending through the aperture in the insulating plate and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, and a movable structure comprising two separate insulating blocks carried by the said insulating plate at opposite sides thereof and engaging the movable contact to hold it in place in the aperture.

12. The combination of two separate stationary switch contacts, an insulating plate movable in a fixed path extending between the said contacts and having a relatively large transverse aperture therethrough, a movable switch contact extending through the aperture in the insulating plate and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the

circuit, and a movable structure comprising two separate insulating blocks carried by the said insulating plate and extending into and fitting the aperture to hold the movable contact in place therein.

13. An article of manufacture comprising in combination, an insulating plate having opposite edges adapted for guiding it in a fixed rectilinear path and also having a relatively large aperture therethrough positioned between the said edges, a movable contact extending through the aperture and having two opposite contact faces, and a structure comprising two separate insulating blocks carried by the plate and extending into and fitting the aperture to hold the movable contact in place therein.

14. The combination of two separate stationary switch contacts, an insulating plate movable in a fixed path extending between the said contacts and having a relatively large transverse aperture therethrough, a movable contact extending through the aperture in the insulating plate and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, a movable arc resisting insulating structure carried by the said insulating element and extending into the aperture so as to serve to hold the contact in place therein and the said structure having two surfaces in approximately contiguous relationship to the movable contact so that they are adjacent any arcs that may be formed when the said contact is separated from the stationary contacts, and two separate conducting elements carried by the arc resisting structure and respectively adjacent the contact faces of the movable contact but separated therefrom.

15. The combination of two separate stationary switch contacts, an insulating plate movable in a fixed path extending between the said contacts and having a relatively large transverse aperture therethrough, a movable switch contact extending through the aperture in the insulating plate and having two contact faces adapted respectively to engage or disengage the two stationary contacts to thereby close or open the circuit, a movable structure comprising two separate insulating blocks carried by the said insulating plate at opposite sides thereof and engaging the movable contact to hold it in place in the aperture, and two separate conducting elements carried by the respective blocks and respectively adjacent the contact faces of the movable contact but separated therefrom.

16. An article of manufacture comprising in combination, an insulating plate having opposite edges adapted for guiding it in a fixed rectilinear path and also having a relatively large aperture therethrough positioned between the said edges, a movable contact extending through the aperture and having two opposite contact faces, a structure comprising two separate insulating blocks carried by the plate and extending into and fitting the aperture to hold the movable contact in place therein, and two separate conducting elements carried by the respective blocks and respectively adjacent the contact faces of the movable contact but separated therefrom.