June 18, 1935. J. SACHS 2,005,684

ELECTRIC SWITCH

Filed June 10, 1932

Fig. 1

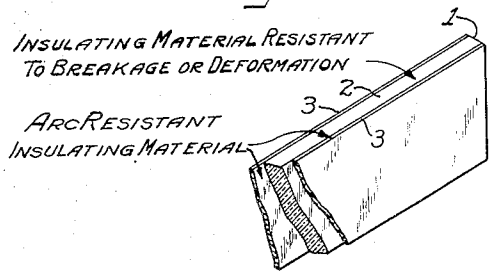


Fig. 2



Fig. 3

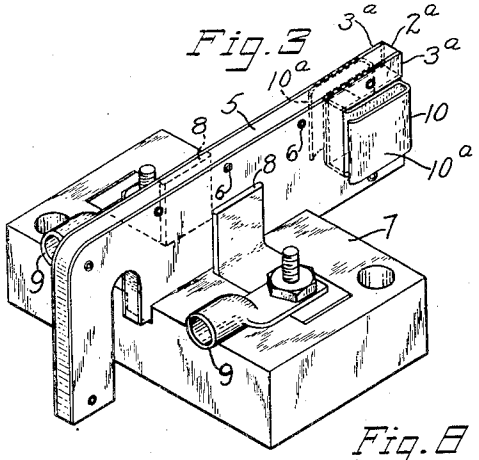


Fig. 4

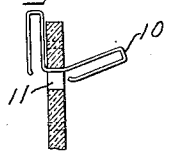


Fig. 5

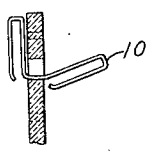


Fig. 6

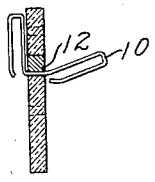


Fig. 7

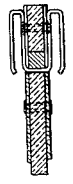


Fig. 8

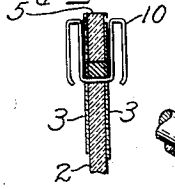


Fig. 9

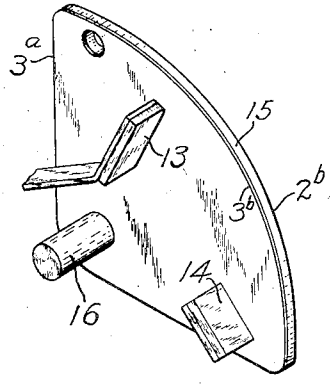
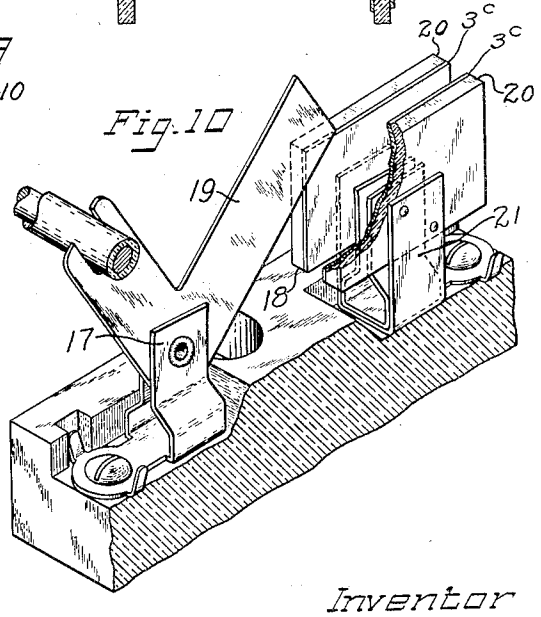


Fig. 10



Inventor
Joseph Sachs
By S. Jay Teller
Attorney

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UNITED STATES PATENT OFFICE

2,005,684

ELECTRIC SWITCH

Joseph Sachs, West Hartford, Conn.

Application June 10, 1932, Serial No. 616,406

5 Claims. (Cl. 200—144)

It is common practice in the design and manufacture of electric switches or other circuit making and breaking devices to make use of a sheet or plate of insulating material which is closely adjacent the arcs which may be formed when the contacts are separated. These sheets or plates may be for the purpose of carrying movable or stationary contacts or other conducting parts, or they may serve merely as separators, barriers or muffles. In many instances these insulating sheets or plates are required to have considerable mechanical strength, and for all uses they should be capable of resisting warping or deformation, particularly when subjected to moisture. Inasmuch as such sheets or plates are used in close proximity to electric arcs they should be of such character as not to be deleteriously affected to any considerable extent by the heat incident to the arcs. For the sake of convenience material of this general character will be referred to as being "arc resistant."

Heretofore difficulty has been experienced in obtaining an insulating sheet or plate which has the desired mechanical characteristics, particularly the required strength and freedom from warping, and which at the same time is sufficiently resistant to the burning action of the arcs to which the material may be subjected. For instance, I have found that vulcanized fiber, in sheet form or otherwise, constitutes a reasonably satisfactory material as concerns resistance to arcing, but unless specially treated it is not highly resistant to moisture absorption, and in fact is subject to considerable warping and deformation when used under conditions of considerable or excessive moisture. On the other hand, a molded or laminated material having a phenolic condensation compound or other artificial resin as a binder, is highly resistant to moisture absorption and has other desirable mechanical characteristics, but is not well suited to resisting the heat incident to an electric arc because of its rapid deterioration by conductive carbonization.

The principal object of the invention is to provide a switch or other electric circuit making and breaking device having incorporated therein a composite sheet or plate of the type described, which sheet or plate is so related to the switch contacts that full advantage is taken of its characteristic of being resistant to the burning effect of the arcs.

In the accompanying drawing I have shown several embodiments of the invention, but it will be understood that the drawing is intended to be illustrative only and 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.

Of the drawing:

Fig. 1 is a perspective view of a sheet or strip of material adapted to be used in an electric switch embodying the invention.

Fig. 2 is a view similar to Fig. 1, but showing an alternate embodiment of the invention.

Fig. 3 is a perspective view of an electric switch embodying the invention, the insulating sheet or plate as shown in this figure being structurally different from those shown in Figs. 1 and 2.

Figs. 4 to 7 are fragmentary longitudinal sectional views showing the procedure which is preferably followed in making the switch member shown in Fig. 3.

Fig. 8 is a view similar to Fig. 7, but showing a composite insulating plate of the type shown in Fig. 1.

Fig. 9 is a fragmentary view illustrating diagrammatically a different form of circuit making and breaking device embodying the invention.

Fig. 10 is a perspective view showing a still different electric switch embodying the invention.

Referring particularly to Fig. 1 of the drawing, 1 represents a composite sheet or plate of insulating material. As shown, this composite plate comprises a relatively thick sheet 2 having certain desirable mechanical characteristics, such characteristics for instance being ample mechanical strength, freedom from brittleness, and a high degree of resistance to moisture absorption. The material of the sheet 2, while having the aforesaid or other desirable mechanical characteristics, need not have and ordinarily does not have to a satisfactory extent the characteristic of being highly resistant to the burning effect incident to an electric arc. Serving as a facing for the said sheet 2 is a sheet 3 of an insulating material different from the material constituting the sheet 2 and having arc resisting characteristics superior to those of the sheet 2. The said sheet 3 is ordinarily thinner than the sheet 2 and it need not have and ordinarily does not have the same desirable mechanical characteristics which are incident to sheet 2. Any mechanical weakness or lack of stability in the sheet 3 is immaterial for the reason that the sheets 2 and 3 are connected together so that the sheet 3 provides the necessary strength and stability.

While the invention is not necessarily so limited, Fig. 1 shows a composite plate having two facing sheets 3 arranged at opposite sides of the

sheet 2. Fig. 2 shows a composite plate 4 similar to the sheet 1 shown in Fig. 1, but having only one facing sheet 2 instead of two such facing sheets.

There are several materials from which the main sheet 2 may be formed. For instance, it may be formed of a molded or laminated material having as a binder a suitable phenolic condensation compound or other artificial resin, or it may be molded from some other plastic material having the required characteristics. For the facing sheet or sheets 3 use is made of a material of the cellulose class, vulcanized fiber being particularly suitable for this purpose. Vulcanized fiber has the highly important advantage that in the presence of excessive arcing it gives out gases in relatively large quantities which assist in dissipating the arc.

The sheets 2 and 3 may be connected by means of a suitable cement, preferably a waterproof cement. When the sheet 2 comprises or includes an artificial resin advantage may be taken of the adhesive properties of the resin to cause the required adhesion between the two sheets. The sheets may be placed together while the artificial resin is still in an uncured or plastic condition and the two sheets may be pressed together in a mold or otherwise during the process of curing and hardening the resin. The resin will thus be forced into intimate contact with the material of the sheet or sheets 3 and the sheets 2 and 3 will thus be held together throughout their entire areas by the adhesive action of the resin.

While I ordinarily prefer to connect the sheets by a cementing or adhesive action, such as described, they may be connected by a suitable mechanical connecting means such as rivets. In Fig. 3 I have shown a composite plate 5 having the components 2^a and 3^a, 3^a thereof connected together by means of rivets 6, 6.

As shown in Fig. 3 the composite plate 5 is so shaped as to constitute the insulating element of a sliding switching member. The switch of which the plate 5 forms a part is shown only incompletely. In addition to the plate 5, the switch includes a base 7 on which is mounted at least one and preferably two stationary switch contacts 8, 8. When there are two switch contacts as shown they are preferably mounted opposite each other and are provided with opposite parallel contact faces. As shown the two contacts are directly connected respectively with wire terminals 9, 9. The movable switching member consists in part of the plate 5 which is guided for movement in a fixed path between the two stationary switch contacts 8, 8. The plate 5 is shown as having two parallel guiding edges by means of which it is constrained to move in a rectilinear path. The switch member also includes a movable contact 10 carried by the insulating plate 5. When there are two stationary contacts such as 8, 8 the contact 10 is provided with two opposite lateral portions having contact faces 10^a, 10^a adapted respectively to engage or disengage the two stationary switch contacts to thereby close or open the circuit.

As shown the base 7 is provided with a slot in which the lower or rear edge of the insulating plate 5 is entered, the bottom of the slot engaging one of the said guiding edges of the plate. A suitable means, not shown, is preferably provided for engaging the front edge of the insulating plate 5, which means cooperates with the base 7 to guide the plate in a rectilinear path as already mentioned. There may be provided a cranked operating member, not shown, for effecting movements of the switching member. The insulating plate 5 is provided with a slot 5^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 switching member.

The sheet 2^a is preferably formed with an opening 11 and the contact 10 is preferably initially formed in the shape shown in Fig. 4 so that it may be easily put in place through the opening 11 as indicated. After being entered in the opening as shown it is moved to the lower position indicated in Fig. 5 and a block 12 is then inserted in the opening 11 as indicated in Fig. 6. When the block 12 is in place the contact 10 is then bent to its final form as shown in Fig. 7. It will be understood that when the facing sheets 3^a, 3^a are connected by a mechanical means to the central sheet 2^a the contact is or may be put in place in the manner described prior to the attachment of the facing sheets 3^a, 3^a. Each facing sheet is shaped to conform to the desired outline of the complete composite plate and in addition it is provided with an opening therein adapted to receive the corresponding projecting lateral portion of the contact 10. This will be apparent from an inspection of Figs. 3 and 7. After the contact has been put in place as described, the facing sheets 3^a, 3^a are assembled to the central sheet 2^a and then all three sheets are connected together by means of the before-mentioned rivets 6, 6.

In Fig. 8 I have shown an alternative construction similar to that shown in Figs. 3 and 7, but differing in that there is provided a plate 5^a, similar to the plate 1 shown in Fig. 1 and having all three components held together by cementing. With this construction the same procedure is or may be followed in connection with the attachment of the contact 10, but the facing sheets 3, 3 are not provided with an opening to receive the projecting portions of the contact 10.

The advantages of my improved composite insulating plate and of a switch incorporating such a plate will be apparent from a consideration of Fig. 3. Inasmuch as the relatively thick central sheet 2^a is mechanically strong and is resistant to deformation such as that resulting from moisture absorption, the said composite plate 5 is well adapted to perform its required mechanical functions of holding and actuating the contact 10. The facing sheets 3^a, 3^a are resistant to the burning effect of any arcs, and therefore the composite plate 5 is adapted to resist such deterioration as might occur if the said facing sheets were not provided. The said facing sheets 3^a, 3^a are immediately adjacent the arcs and serve to completely protect the central sheet 2^a.

Fig. 9 represents somewhat diagrammatically a switch or circuit making and breaking device having a stationary contact 13 and a movable contact 14. The movable contact 14 is carried by a composite plate 15 which is pivotally movable about an axis at 16. When the plate 15 is actuated by a suitable means, not shown, the movable contact 14 can be brought into or out of engagement with the stationary contact 13. The plate 15 is a composite one which may conform in structure to the sheet 4 shown in Fig. 2. It will be apparent that the facing sheet 3^b is immediately adjacent any arcs that may be formed when the two contacts 14 and 13 are separated, and thus protects the sheet 2^b from any tendency

to burn or otherwise deteriorate as the result of the arcing action.

In Fig. 10 I have shown a switch of the knife blade type having a pivot contact 17 and a rupture contact 18. A blade 19 is pivoted to the contact 17 and is adapted to enter or leave the contact 18 to establish or break the electrical connection through the switch. In order to confine and control any arcs that may be formed when the blade 19 is withdrawn, there are provided two barrier or muffle plates 20, 20 which are positioned immediately adjacent the outer portions of the contact 18, being held in place by a U-shaped metallic clip 21. The two plates 20, 20 are or may be of the same construction as the plate 4 already described. It will be apparent that the arc resistant facing sheets 3^c, 3^c serve to prevent any burning as the result of contact with arcs which may be formed.

What I claim is:

1. In an electric switch, the combination of a stationary switch contact, a composite insulating plate movable in a fixed path adjacent the stationary contact, and a movable switch contact carried by the said plate at one side thereof and adapted to cooperate with the stationary contact, the said composite plate comprising a sheet of insulating material resistant to breakage or deformation and a sheet of different insulating material serving as a facing for the first said sheet at the surface thereof adjacent the said contacts and having arc resisting characteristics superior to those of the first said material.

2. In an electric switch, the combination of a stationary switch contact, a composite insulating plate movable in a fixed path adjacent the stationary contact, and a movable switch contact carried by the said plate at one side thereof and adapted to cooperate with the stationary contact, the said composite plate comprising a sheet of insulating material including artificial resin and resistant to breakage or deformation and also comprising a sheet of vulcanized fiber serving as a facing for the artificial resin material and having arc resisting characteristics superior thereto.

3. In an electric switch, the combination of a pair of opposed stationary switch contacts, a composite insulating plate movable in a fixed path extending between the said stationary contacts, and a movable switch contact carried by the said plate and projecting therefrom at both sides thereof and adapted to cooperate with both of the said stationary contacts, the said composite plate comprising a sheet of insulating material resistant to breakage or deformation and two sheets of different insulating material serving as facings for the first said sheet at the opposite surfaces thereof adjacent the respective stationary and movable contacts and having arc resisting characteristics superior to those of the first said material.

4. In an electric switch, the combination of a pair of opposed stationary switch contacts, a composite insulating plate movable in a fixed path extending between the said stationary contacts, and a movable switch contact carried by the said plate and projecting therefrom at both sides thereof and adapted to cooperate with both of the said stationary contacts, the said composite plate comprising a sheet of insulating material including artificial resin and resistant to breakage or deformation and also comprising two sheets of vulcanized fiber serving as facings at opposite sides of the first said sheet and having arc resisting characteristics superior thereto.

5. In an electric switch, the combination of a pair of opposed stationary switch contacts, an insulating sheet movable in a fixed path extending between the said stationary contacts, a movable switch contact carried by the said sheet and having projecting lateral portions extending along and in close proximity to the opposite faces thereof, the said lateral portions being adapted to cooperate with the respective stationary contacts, and two sheets of different insulating material serving as facings for the first said insulating sheet at the opposite surfaces thereof adjacent the respective stationary and movable contacts and having arc resisting characteristics superior to those of the first said sheet, the said facing sheets having openings therein for receiving the portions of the movable contact which extend along the opposite faces of the first said sheet.

JOSEPH SACHS.