Aug. 4, 1942. O. L. TAYLOR 2,292,177

ELECTRIC SWITCH

Filed July 19, 1940

Fig. 1.

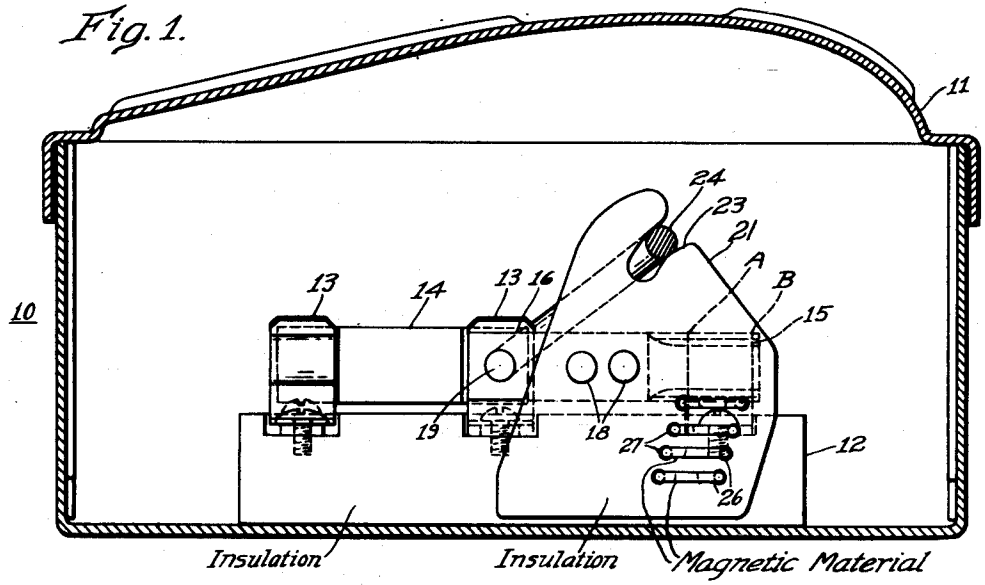


Fig. 2.

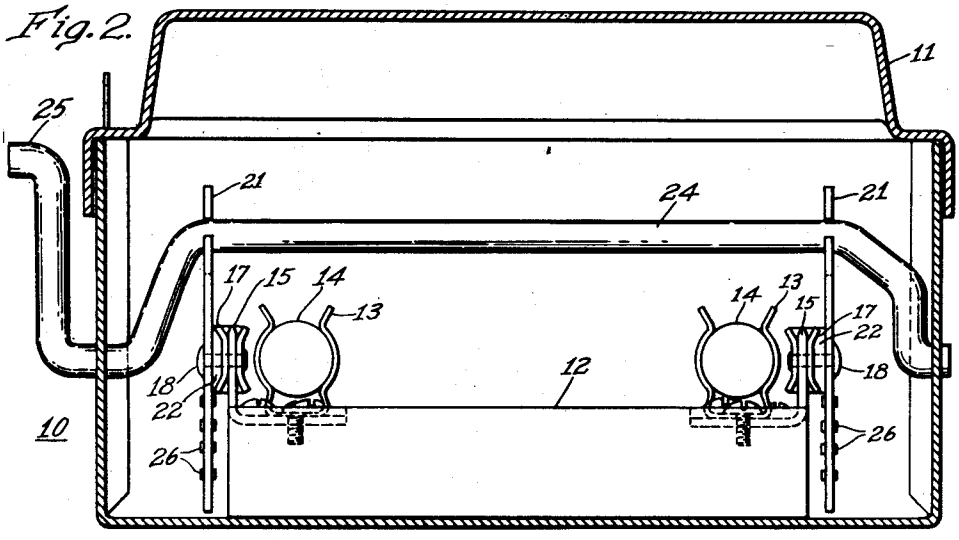
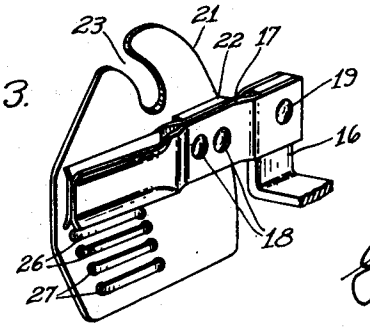


Fig. 3.



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ELECTRIC SWITCH

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5 Claims. (Cl. 200—147)

My invention relates, generally, to electric switches and, more particularly to electric switches of the enclosed type, commonly known as safety switches.

On a single break switch of the knife-blade type failure to ground or across the line may occur because the arc is not extinguished quickly enough. Also, beading of the contact members may occur, wherein the contact material is melted and forms a small ball or bead which may become of such a size as to prevent the proper operation of the switch.

An object of my invention, generally stated, is to provide a switch of the knife-blade type which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of my invention is to extinguish quickly the arc drawn between the contact members of a knife-blade switch.

Another object of my invention is to prevent the arc from grounding through the housing of an enclosed electric switch.

A further object of my invention is to prevent beading of the contact members of a knife-blade switch.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with my invention, a number of straps, composed of steel or other magnetic material, are so mounted on a fiber plate that they move through the field of the arc drawn between the moving switch blade and the stationary contact member, thereby drawing the arc towards the steel straps and their fiber support to break it up into small arcs. Beading is prevented by rapidly extinguishing the arc and moving the arc across the stationary contact blade upon opening the switch.

For a fuller understanding of the nature and objects of my invention reference may be had to the following detailed description, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view partially in side elevation and partially in section of a knife-blade switch embodying my invention and enclosed in a sheet metal cabinet;

Fig. 2 is a view, partially in end elevation and partially in section, of the switch and cabinet shown in Fig. 1; and

Fig. 3 is a view, in perspective, of a portion of the switch structure shown in Figs. 1 and 2,

Referring to the drawing, the enclosed switch shown therein comprises a metal housing 10 having a cover 11 which may be hinged to the housing in the usual manner. An insulating switch block 12 is secured to the bottom of the housing 10 for supporting the electrical members of the switch structure and insulating them from the housing. Since the switch illustrated is of the two pole type, two sets of electrical members are supplied, as illustrated in Fig. 2. However, since both poles are similar in construction, only one pole will be described in detail.

As shown in Fig. 1, fuse clips 13 for supporting a cartridge fuse 14 are secured to the top of the switch base 12. A stationary contact member 15 is also secured to the switch base 12. Likewise, a hinge jaw 16 is secured to the base 12 in the usual manner.

As shown in Fig. 3, a switch member comprising a pair of blades 17 which are secured together by rivets 18 is pivotally mounted on the hinge jaw 16 by means of a rivet 19. As shown in Fig. 2, the ends of the switch blades 17 opposite the hinge jaw 16 are spaced apart to engage opposite faces of the stationary contact member 15.

In accordance with a well known practice in switches of the present type, the switch blades 17 are provided with an insulating operating arm 21 that is secured to the blades by the rivets 18 and spaced from the blades by a spacing member 22. A notch 23 is provided in the operating arm 21 for receiving an operating bail 24 that is journaled in the side walls of the housing 10. The operating bail 24 is provided with an integral operating handle 25 that extends exteriorly of the housing. In this manner the switch blades 17 may be actuated about the pivot point 19 to disengage the stationary contact member 15.

In order to reduce the overall dimensions of switches of the present type, the side walls of the housing are necessarily disposed relatively close to the contact members of the switch. Consequently, it has been found that under certain conditions of operation the arc drawn between the stationary contact member 15 and the movable switch members 17 may jump across the space between the switch members and the side wall of the housing which is usually grounded. When the arc grounds through the switch housing, it endures until the circuit is interrupted by the fuse, thereby destroying the contact members by the excessive heat of the arc.

In order to prevent the foregoing condition, it has previously been proposed to provide a bar-

rier between the contact members of the switch and the side wall of the housing, and such barriers have been utilized in enclosed switches of the type herein illustrated. In the present structure the bottom of the insulating operating member 21 is extended a sufficient distance below the switch members 17 to provide a barrier between the contact member 15 and the side walls of the housing 10 when the switch is in its fully opened position. Therefore, the member 21 functions as a barrier to prevent the arc from jumping to the adjacent side wall of the switch housing.

With a view to extinguishing the arc more quickly than in previously known switches of the present type and to preventing the arc from jumping from one pole of the switch to another pole of opposite polarity, and also to preventing beading of the contact members of the switch, I have provided an arc controlling or dissipating means in the form of a plurality of straps 26 which are mounted on the insulating member 21 in spaced relation. The straps 26 may be composed of steel or other suitable material having a relatively low magnetic retentivity and may be attached to the member 21 in any suitable manner. In the present structure the member 21 is provided with holes 27 through which the ends of the straps 26 are inserted and then bent over to secure the straps on the member 21. Thus it will be seen that the straps 26 are carried by the member 21 through the field of the arc stream in a plane parallel to the arc drawn between the switch member 17 and the stationary member 17 and the stationary contact member 15 of the switch member 17 and the stationary contact member 15 of the switch structure. It is to be understood that any other suitable arrangement may be used in place of the straps 26 so long as it functions to produce the same result.

The presence of the magnetic steel straps weakens a portion of the magnetic field of the arc stream and draws the arc against these straps and their fiber support 21. The position of the arc is thus determined and no other confinement is necessary to prevent flashover between the opposite poles of the switch. The arc striking the fiber support releases gases which are an aid in extinguishing the arc. Furthermore, when the arc strikes the steel straps, it is broken up into a plurality of small arcs, thereby further aiding in extinguishing the arc.

The beading of the contact members is prevented by the quick extinction of the arc and by rapidly moving the arc across the contact blade 15 upon opening the switch. In previous switches an arc was usually drawn at a certain point on the contact member and continued to remain at this point until extinction. In such a structure the heat of the arc is concentrated upon a single point and tends to melt the contact metal. A cumulative process occurs which builds up a bubble of metal that may reach such proportions as to prevent closure of the switch.

In order to prevent the foregoing beading action in the present switch, the arc is always drawn at the point A and then rapidly swept across the length of the contact tip to the point B, as shown in Fig. 1. This is accomplished by so constructing the switch that the last point in contact and, therefore, the initial arcing point is always the same, and then sweeping the arc over the contact by electrical and magnetic means coupled with the movement of the switch blade and the fiber member which supports the magnetic straps 26.

From an analysis of the electrical forces involved, coupled with the movement of the switch blade and the steel straps, it will be seen that the current which is induced in the steel straps moving in the field of the arc stream produces a magnetic field which so reacts on the arc stream that the arc is driven across the surface of the contact member 15 while the switch is being opened. It will be noted that the straps 26 are disposed on the fiber support 21 at such an angle that they successively enter the field of the arc at substantially the same position during the opening of the switch, thereby producing the desired sweeping action on the arc. Furthermore, the magnetic members 26 are so positioned on the fiber barrier 21 that the arc is extinguished by the time the switch is fully opened.

As explained hereinbefore, the other pole of the switch is similar in structure and functions in the same manner as the one herein described. Therefore, it is apparent that I have provided an enclosed switch structure which prevents grounding of the arc during the opening of the contact members of the switch and also prevents flashover between opposite poles of the switch. Furthermore, beading of the contact members is reduced by the sweeping action of the magnetic field of the current induced in the magnetic members provided in the present structure.

In this manner I have provided an enclosed switch which is simple in structure, efficient in operation and which may be economically manufactured. Furthermore, actual tests have proven that the rating of a switch constructed as herein described may be increased without increasing its dimensions over prior switches.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. An electric switch of the knife blade type comprising a contact member of a predetermined width, a pivotally mounted switch member for engaging and disengaging the contact member at a predetermined point, an insulating member disposed adjacent the contact member and movable with the switch member, and a plurality of elongated spaced magnetic members carried by the insulating member and movable past the contact member in a plane parallel to the surface of the contact member engaged by the switch member said magnetic members having a length substantially equal to the width of said contact member to sweep the arc from said point of disengagement across the knife edge of the contact member when disengaged from the switch member.

2. An electric switch of the knife blade type comprising a contact member of a predetermined width, a pivotally mounted switch blade for engaging and disengaging the contact member at a predetermined point, an insulating member disposed adjacent the contact member and movable with the switch blade, and a plurality of elongated spaced magnetic members carried by the insulating member and movable in a plane parallel to the arc drawn between the contact member and the switch blade when they are

separated said magnetic members having a length substantially equal to or greater than the width of said contact member and disposed substantially parallel to said switch blade to sweep the arc from said point of disengagement across the knife edge of said contact member.

3. In an enclosed switch of the knife blade type, in combination, a housing, an insulating base therein, a contact member of a predetermined width mounted on the base, an angularly movable switch member for engaging and disengaging the contact member at a predetermined point, thereby drawing an arc at said point, a combined barrier and operating member for the switch member, said barrier being disposed between the contact member and a wall of the housing, and a plurality of elongated magnetic members disposed on said barrier in spaced relation, the length of said magnetic members being substantially equal to the width of said contact member, said magnetic members being moved at the side of the arc stream to sweep the arc from said point of disengagement across the knife edge of said contact member.

4. In an enclosed switch of the knife blade type, in combination, a housing, an insulating base therein, a contact member of a predetermined width mounted on the base, an angularly movable switch member for engaging and disengaging the contact member at a predetermined point, thereby drawing an arc at said point, a combined barrier and operating member for the switch member, said barrier being disposed between the contact member and a wall of the housing, and a plurality of elongated magnetic members disposed on said barrier in spaced relation, the length of said magnetic members being substantially equal to or greater than the width of said contact member, said magnetic members being carried past the contact member by said barrier to sweep the arc from said point of disengagement across the knife edge of said contact member.

5. In an enclosed switch of the knife blade type, in combination, a housing, an insulating base therein, a contact member mounted on the base, said contact member having a predetermined width, a pivotally mounted switch member for engaging and disengaging the contact member at a predetermined point, a combined barrier and operating member for the switch member, said barrier being disposed between the contact member and a wall of the housing, and a plurality of magnetic straps disposed on said barrier in spaced relation, the length of said straps being substantially equal to the width of said contact member, said magnetic straps being moved successively into the magnetic field of the arc drawn between the contact member and the switch member at said point of disengagement when they are separated, thereby sweeping the arc across the knife edge of the contact member.

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