

C. A. FOX

ELECTRICAL SWITCH

Fig.1

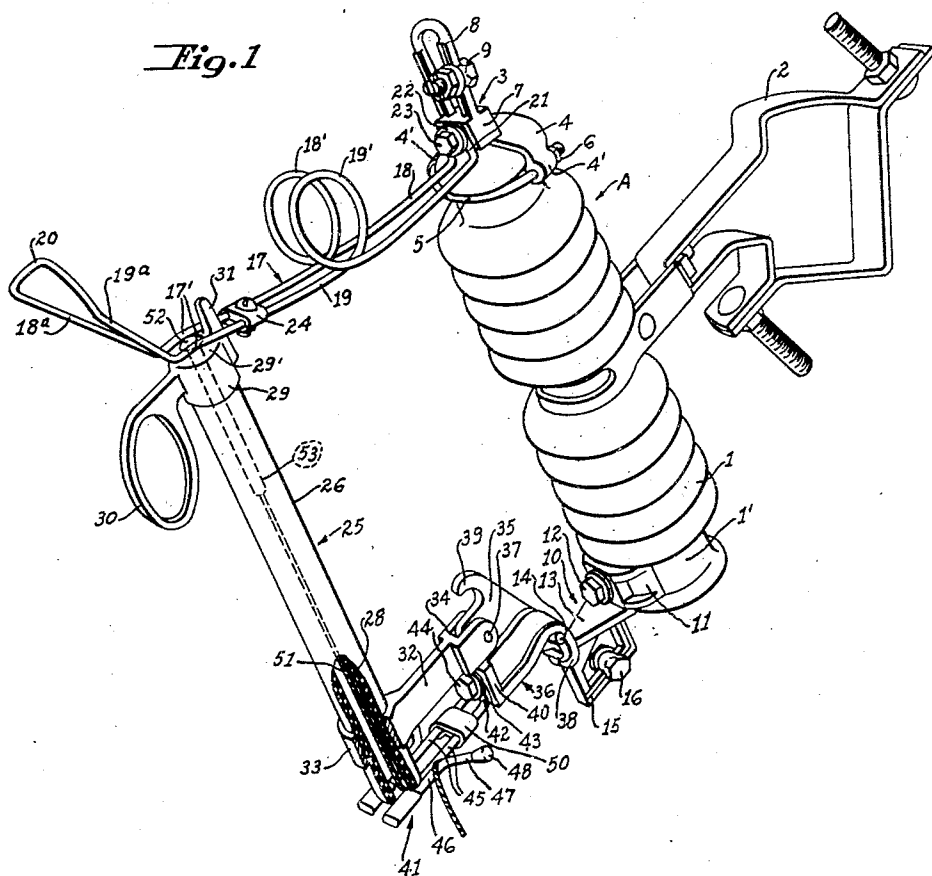
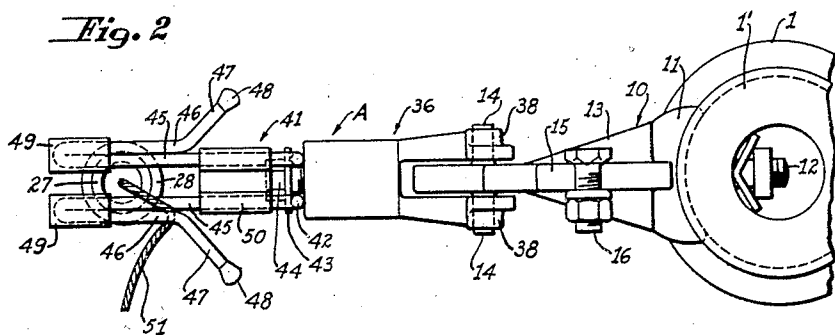


Fig. 2



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ELECTRICAL SWITCH

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4 Claims. (Cl. 200—114)

This invention relates generally to improvements in electrical switches and more specifically to electrical switches of the drop-out or trip-out type and of the general description of the electrical switch disclosed in United States Letters Patent No. 2,179,749, granted on November 14, 1939, in the names of Francis J. McCluskey and Charles Adin Fox, the predominant object of the invention being to provide an electrical switch of the general type of the switch disclosed in the above-identified Letters Patent which includes improved details of construction through the use of which the action of applying a fuse link to the switch is simplified.

Electrical switches of the type disclosed in the Letters Patent identified above have been widely used in the power distribution industry and their suitability of construction and efficiency of operation have been proved to the maximum degree. It has been considered, however, that the operation of applying a fuse link to the switch structure might be simplified slightly if, instead of securing the lower end portion of the fuse link to the switch structure through the use of means which includes a wing nut, a simple resilient clamping means were provided in the switch structure into clamping engagement with which the lower end portion of the fuse link could be drawn. The electrical switch disclosed herein follows the construction of the earlier patented switch structure and in general differs from said earlier patented switch structure only in the provision as a part of the switch structure of such resilient clamping means for engaging the lower portion of the fuse link.

Fig. 1 is a perspective of the improved switch construction disclosed herein.

Fig. 2 is an inverted plan view of the switch structure illustrated in Fig. 1.

In the drawing, wherein is shown for the purpose of illustration, merely, one embodiment of the invention, A designates the improved electrical switch generally. The switch A includes an insulator 1 of suitable construction to which is fixed a bracket structure 2 of suitable arrangement which serves, in an obvious manner to attach the switch A to a cross-arm of a pole or other support.

Secured to the upper end portion of the insulator 1 is an upper terminal 3 which includes a lower head portion 4 that partially embraces the upper end portion of the insulator 1, said head portion being provided at its opposite sides with eye portions 4' through which are extended the end portions of a curved clamping rod 5 that em-

braces the upper portion of the insulator. The outer end portions of the rod 5 which are extended beyond the eye portions 4' are screwthreaded and have mounted thereon nuts 6 which draw the rod into clamping engagement with the insulator and thereby secures the terminal 3 to said insulator. The upper terminal includes also an upstanding portion having a relatively thick lower portion 7 and an upper loop portion 8, said upstanding portion being formed integral with or secured to the head portion 4. The loop portion 8 of the upper terminal 3 has mounted on a leg thereof a suitable connector 9 which serves to electrically and mechanically attach a conductor to the upper terminal.

Secured to the lower portion of the insulator 1 is the lower terminal 10 of the switch A, said lower terminal including a portion 11 having an inner arcuate face which is disposed in contact with the outer curved surface of a portion 1' of the insulator 1. The portion 11 of the lower terminal 10 is secured to the insulator 1 by means of suitable fastening means, such as a bolt 12. Extended outwardly from the portion 11 of the lower terminal 10 is a tapered portion 13, which at its forward end is provided with an upwardly projected extension that supports trunnions 14 which are extended outwardly in opposite directions. Also the lower terminal 10 includes a rectangular bar structure 15 which extends downwardly from the portion 13 and supports a suitable connector 16, of the split bolt type, for instance, that serves to electrically and mechanically connect a conductor to said lower terminal.

Extended outwardly from the upper terminal 3 is a contact 17 which is preferably formed from a single length of heavy resilient wire. The length of wire from which the contact 17 is formed is bent double to provide a pair of substantially parallel portions 18 and 19 in which coiled portions 18' and 19' are formed to provide the contact with the required resiliency. The forward portions of the portions 18 and 19 of the contact 17 are extended upwardly and outwardly as indicated at 18a and 19a in Fig. 1, and these upwardly and outwardly extended portions are preferably flared slightly and are joined at their outer ends by a portion 20 of the contact. At the inner end of the contact 17 the end portions of the length of wire from which the contact is formed are bent upwardly as indicated at 21 in Fig. 1, and these end portions are secured to the upper terminal 3 by being clamped between the forward face of the portion 7 of said upper terminal and a washer 22 which is disposed beneath

the head of a bolt 23 whose shank is screwed into a screwthreaded opening formed in said portion 7 of the upper terminal 3. The substantially parallel portions 18 and 19 of the contact 17 have fixedly mounted thereon a member 24 which prevents excessive movement of said portions outwardly with respect to each other.

The switch A includes a cartridge 25 which is provided with a tubular fuse housing 26, said fuse housing being of the so-called expulsion type. The tubular fuse housing is preferably of composite construction, embodying an inner tubular portion formed of horn fiber, and an outer tubular jacketing portion of suitable insulating material having the required weather-resisting properties. It has been found advantageous to employ horn fiber in the construction of the fuse housing because of the fact that such material has a beneficial deionizing effect on the arc which occurs when the fuse link ruptures, aiding materially in causing the arc to become quickly extinguished. In Fig. 2 the inner horn fiber tube and the outer insulating tube are designated by the reference characters 27 and 28, respectively. Mounted on the tubular fuse housing 26, at the top thereof, is a cap 29 which embraces an upper portion of said fuse housing and is secured thereto. The top wall 29' of the cap 29 has an opening formed approximately centrally therethrough, and said cap has formed thereon and extended therefrom an eye portion 30 adapted for use in moving the cartridge 25 into and out of closed switch position. The cap 29 is provided also with an upstanding finger 31 which is disposed between the portions 18 and 19 of the contact 17 when the cartridge of the switch is in the closed switch position.

Mounted on the tubular fuse housing 26 and extended therefrom is an arm 32 which includes at one end thereof an eye portion 33 that embraces the fuse housing and is suitably secured thereto, said arm 32 at the opposite end thereof being provided with a bifurcated portion 34. The bifurcated portion 34 of the arm 32 embraces an upstanding portion 35 of a hinge member 36, and said bifurcated portion of said arm is pivotally secured to said portion 35 by a pivot element 37. The portion 35 is preferably an integral part of the hinge member 36 and said hinge member is provided at its rear end with opposed, spaced apart hook-shaped portions 38 which are adapted to embrace and engage the trunnions 14, said hook-shaped portions 38 being of elongated formation so that they are provided with substantially large openings leading therein to which facilitate application of the hook-shaped portions to the trunnions or removal of said hook-shaped portions from said trunnions. The portion 35 of the hinge member 36 is provided with a tool-receiving hook portion 39 and the lower portion of said hinge member 36 is provided with a forward wall portion 40.

Secured to the forward wall portion 40 of the hinge member 36 is a member 41 which is adapted to clampingly engage the lower portion of the fuse link of the switch cartridge 25. This member 41 is preferably formed from a single length of resilient wire which is shaped to provide an upwardly extended loop portion 42. The member 41 is secured to the hinge member 36 by having the loop portion 42 thereof clamped between the front face of the forward wall portion 40 of said hinge member 36 and a washer 43 which is disposed beneath the head of a bolt 44, the shank of which is screwed into a screw-

threaded opening formed in said forward wall portion of the hinge member 36. Extended outwardly from the lower ends of the spaced legs of the loop portion 42 of the member 41 is a pair of spaced, substantially parallel portions 45 of said member 41. The length of material from which the member 41 is formed is bent rearwardly at the outer ends of the portions 45 to provide portions 46 which are disposed parallel relative to the forward parts of the portions 45 and in contact therewith. The rear parts of the portions 46 are flared outwardly as indicated at 47 and the outer ends of these flared portions preferably have suitable tips 48 applied thereto. The forward portions of each associated pair of portions 45 and 46 have applied thereto a cap 49 which embraces said forward portions and prevents undue spreading of the portions 46 with respect to the portions 45, and also a band 50 is applied in embracing relation with respect to the rear portions of the portions 45 of the member 41 to prevent undesired relative lateral movement of said portions 45.

The fuse link 51 of the fuse cartridge 25 of the switch A comprises a length of flexible material which serves as a conductor, said fuse link being extended through the centrally located opening in the top wall 29' of the cap 29, and having a button 52 at its upper end which contacts with the top surface of said top wall of said cap 29. The fuse link includes a fusible section which is disposed in the upper portion of the tubular fuse housing 26 and preferably, though not necessarily, this fusible section is surrounded by a fiber tube 53 which forms a part of the fuse link.

In applying a fuse link 51 to the fuse cartridge of the switch A said fuse link is threaded through the opening in the top wall of the cap 29 at the upper end of the tubular fuse housing 26, and is drawn longitudinally through the fuse housing until the button 52 thereof contacts with the outer face of the top wall of said cap 29, the opening in the top wall of the cap 29 being sufficiently large to permit passage therethrough of the tube 53. The outer portion of the member 41 is moved into contact with the lower end of the fuse housing 26 and the fuse link is drawn taut and its end portion which extends from the lower end of the fuse housing is caused to underlie one of the portions 45 of the member 41, and an adjacent portion of the fuse link is drawn between said portion 45 and the associated portion 46 so as to be clampingly engaged between said portions of said member 41.

The fused cartridge may be associated with the mounting portion of the switch by moving the fused cartridge upwardly, with the aid of a switch stick that engages the hook portion 39 of the hinge member 36, to apply the hook-shaped portions 38 of said hinge member to the trunnions 14. The switch stick is then caused to engage the eye portion 30 of the cap 29 of the fuse housing and the end of said fuse housing at which said cap 29 is mounted is swung upwardly and inwardly about the pivot point provided by the trunnions 14, to force the cap 29 of the fuse housing beneath the outer portion of the contact 17. The resiliency of the contact 17 tends to move the outer portion of said contact downwardly and therefore said outer portion of the contact will engage the upper portion of the fuse housing 26 and retain the fuse housing in a closed switch position. When the fuse housing is in the closed switch position parts of the portions 18 and

19 of the contact 17 contact directly with the button 52 at the upper end of the fuse link to make good electrical contact therebetween, these parts of said portions 18 and 19 preferably being curved slightly, as indicated at 17' in Fig. 1, to provide a latching effect between the contact 17 and the button 52.

The operation of the switch, upon occurrence of an overload or short circuit, is believed to be obvious from the foregoing, but for purpose of completeness of description may be described as follows: When the fuse link becomes ruptured, as by reason of abnormal current passing there-through, the switch member 36, freed at its outer end and acting under the forces imparted thereto, turns rapidly about the two axes defined by the trunnions 14 and the pivot element 37. Movement of the hinge member 36 about the trunnions is accompanied by an endwise lowering of the fuse housing 26, which, when clear of the contact 17, swings under gravity action to full open position. It will appear that the unit comprised of the hinge member 36 and the member 41, considered as a lever, has a high velocity ratio and that its outer or link engaging end moves very rapidly. Accordingly the ruptured ends of the fuse link become quickly separated, resulting in practically instantaneous extinguishment of the arc created therebetween.

It is to be noted that the member 41 is provided with opposed pairs of fuse link clamping portions 45 and 46. Because of this arrangement a person applying a fuse link to the fuse cartridge 25 may employ the clamping portions at one or the opposite side of the member 41 as preferred.

I claim:

1. An electrical switch comprising a mounting which includes insulating means having spaced terminals supported thereby adapted to receive in electrical connection therewith incoming and outgoing conductors, and a resilient contact extending outwardly from said incoming terminal, and a fuse cartridge comprising a hinge member detachably attached to said outgoing terminal for pivotal movement with respect thereto, an elongated fuse housing adapted to be engaged at its upper end by said resilient contact, means associated with said fuse housing for pivotally connecting said fuse housing to said hinge member, a fuse link disposed within said fuse housing and extended from an end thereof, a fuse link engaging element secured to said hinge member and adapted to underlie and contact with the lower end of said fuse housing, said fuse link engaging element being formed from a length of material bent to provide an attaching portion at which said element is secured to said hinge member, parallel and spaced apart portions extended from said attaching portion and between which the fuse link extends, and means for maintaining the spaced relation of said extended portions, at least one of said spaced extended portions of said element being bent rearwardly upon itself to provide a gripping portion into which the portion of the fuse link which is extended from the fuse housing is drawn so as to engage said fuse link with said fuse link engaging element.

2. An electrical switch comprising a mounting which includes insulating means having spaced terminals supported thereby adapted to receive in electrical connection therewith incoming and outgoing conductors, and a resilient contact extending outwardly from said incoming terminal, and a fuse cartridge comprising a hinge member

detachably attached to said outgoing terminal for pivotal movement with respect thereto, an elongated fuse housing adapted to be engaged at its upper end by said resilient contact, means associated with said fuse housing for pivotally connecting said fuse housing to said hinge member, a fuse link disposed within said fuse housing and extended from an end thereof, a fuse link engaging element secured to said hinge member and adapted to underlie and contact with the lower end of said fuse housing, said fuse link engaging element being formed from a length of material bent to provide an attaching portion in the form of an angularly extended loop at which said element is secured to said hinge member, parallel and spaced apart portions extended from said attaching portion and between which the fuse link extends, and means for maintaining the spaced relation of said extended portions, at least one of said spaced extended portions of said element being bent rearwardly upon itself to provide a gripping portion into which the portion of the fuse link which is extended from the fuse housing is drawn so as to engage said fuse link with said fuse link engaging element.

3. An electrical switch comprising a mounting which includes insulating means having spaced terminals supported thereby adapted to receive in electrical connection therewith incoming and outgoing conductors, and a resilient contact extending outwardly from said incoming terminal, and a fuse cartridge comprising a hinge member detachably attached to said outgoing terminal for pivotal movement with respect thereto, an elongated fuse housing adapted to be engaged at its upper end by said resilient contact, means associated with said fuse housing for pivotally connecting said fuse housing to said hinge member, a fuse link disposed within said fuse housing and extended from an end thereof, a fuse link engaging element secured to said hinge member and adapted to underlie and contact with the lower end of said fuse housing, said fuse link engaging element being formed from a length of material bent to provide an attaching portion at which said element is secured to said hinge member, parallel and spaced apart portions extended from said attaching portion and between which the fuse link extends, and means for maintaining the spaced relation of said extended portions, each of said spaced extended portions of said element being bent rearwardly upon itself to provide a gripping portion into which the portion of the fuse link which is extended from the fuse housing may be drawn so as to engage said fuse link with said fuse link engaging element.

4. An electrical switch comprising a mounting which includes insulating means having spaced terminals supported thereby adapted to receive in electrical connection therewith incoming and outgoing conductors, and a resilient contact extending outwardly from said incoming terminal, and a fuse cartridge comprising a hinge member detachably attached to said outgoing terminal for pivotal movement with respect thereto, an elongated fuse housing adapted to be engaged at its upper end by said resilient contact, means associated with said fuse housing for pivotally connecting said fuse housing to said hinge member, a fuse link disposed within said fuse housing and extended from an end thereof, a fuse link engaging element secured to said hinge member and adapted to underlie and contact with the lower end of said fuse housing, said fuse link engaging element being formed from a length of

material bent to provide an attaching portion at which said element is secured to said hinge member, parallel and spaced apart portions extended from said attaching portion and between which the fuse link extends, means for maintaining the spaced relation of said extended portions, each of said spaced extended portions of said element being bent rearwardly upon itself to provide a gripping portion into which the por-

tion of the fuse link which is extended from the fuse housing may be drawn so as to engage said fuse link with said fuse link engaging element, and flared portions extended from the rearwardly bent portions of the spaced portions of said element which facilitate the action of drawing the fuse link into the gripping portions provided by said rearwardly bent portions.

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