July 22, 1941. S. R. SMITH, JR 2,250,211

ELECTRIC CIRCUIT INTERRUPTER

Filed July 19, 1939

Fig. 1.

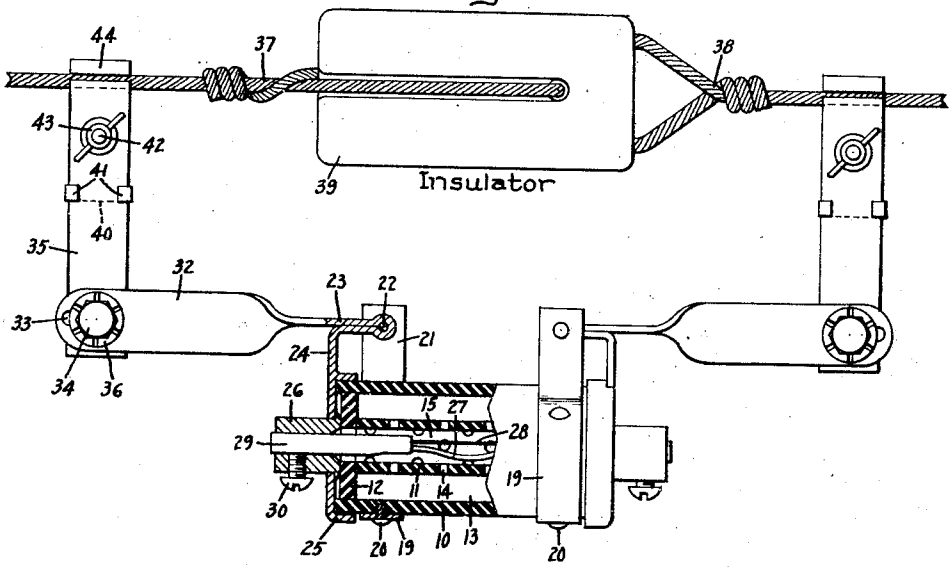


Fig. 2.

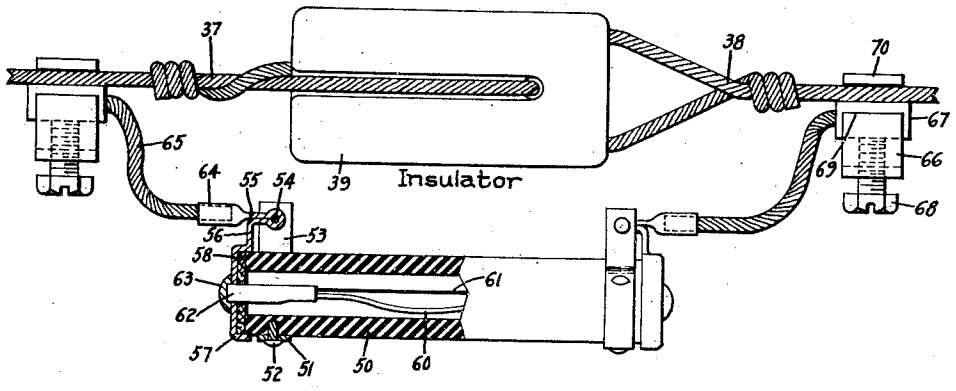


Fig. 3.

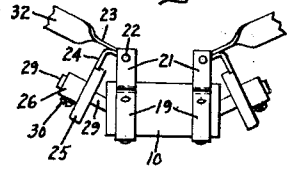
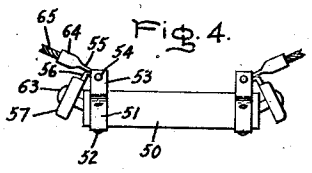


Fig. 4.



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ELECTRIC CIRCUIT INTERRUPTER

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Application July 19, 1939, Serial No. 285,340

8 Claims. (Cl. 200—117)

The present invention relates to electric circuit interrupting devices, and has for an object the provision of an improved, simplified, and low cost indicating circuit interrupter which requires no separate insulating support and which is suitable for suspension mounting directly on a line conductor or conductors of an overhead electric line.

A further object of the invention is the provision of an improved form of line suspension indicating "secondary" fuse cutout.

The invention has also, as one of its specific objects, the provision of a circuit interrupting unit which is suitable for suspension mounting directly on the conductors of an electric line, and which has improved supporting means operative normally to impose tension on the conductor of the unit and operative in response to circuit interruption to effect movement of an element or elements of the unit to indicating position.

As a further object of the present invention, I contemplate the provision of simple and low cost apparatus for carrying out certain aspects of the invention set forth and more broadly claimed in my application, Serial No. 285,339, filed concurrently with the present application and assigned to the same assignee as the present invention.

Other objects and the details of that which I consider to be novel and my present invention will become apparent from the following description and the claims appended thereto, taken in conjunction with the accompanying drawing wherein are shown two exemplary embodiments of the invention. In the drawing, Fig. 1 is a side elevation, partially cut away, of one of the embodiments; Fig. 2 is a sectional elevation, partially cut away of the other of the exemplary embodiments; and Figs. 3 and 4 show the operated positions of certain of the parts of the devices of Figs. 1 and 2 respectively.

The circuit interrupting unit of Fig. 1 has an insulating fuse holder or carrier which comprises, in the main, an insulating tubular casing 10, a concentrically disposed inner tube 11 of insulation, and insulating end plates 12, one of which end plates is shown in the drawing. The space between the inner and outer tubes provides an expansion chamber 13 which is in communication, by means of holes 14, with the arcing chamber 15 formed by inner tube 11. Two metallic straps 19 are clamped around the insulating carrier, respectively adjacent opposite ends thereof, and are fixedly secured to the carrier in any suitable manner, as for example, by self-threading screws 20. The ends 21 of each of the straps are bent so as to project upwardly from the carrier in parallel spaced apart relationship, and have a pivot pin 22 extending therebetween. Fulcrumed respectively on the pins 22 are two metallic bell-crank levers 23 which are arranged for swinging in opposite directions relative to each other and the body of the carrier.

One arm, 24, of each of the levers 23 normally extends transversely of a respective one of the ends of the insulating carrier, and is provided with a flanged cap 25 designed to cover the corresponding end of the carrier. Each of the caps 25 includes a longitudinally bored terminal element 26. Normally levers 23 are restrained in fixed relation to the body of the carrier, in the positions shown in Fig. 1, by the strain member of a fuse link connected between arms 24 of the levers and extending through inner tube 11 of the carrier. In the drawing there is shown, by way of example, a simple form of fuse link having a fusible section, comprised of a fuse wire 27 and a strain wire 28, and terminal shanks 29 adapted to be anchored in the bores of terminal elements 26 by means of screws 30 in the manner illustrated. However, as will be evident to one skilled in the art, other suitable forms of fuse links and fuse terminal fastening means may be employed if desired.

The other arms, 32, of levers 23, are arranged to extend in opposite directions relative to each other from their pivot points and at a substantial angle, which is approximately 90 degrees in the exemplary embodiment illustrated, to the arms 24 of the levers. Each of the arms 32 is provided, adjacent its outer end, with an elongated slot 33 for accommodation of a bolt 34 which serves pivotally to join the corresponding lever 23 with a conductive supporting hanger 35. Resilient washers 36 preferably are provided for maintaining good electrically conductive contact between the levers and the supporting hangers.

The hereinbefore described circuit interrupting unit is designed for suspension mounting directly on, and to electrically interconnect, two electric line conductors, such as 37 and 38, which are mechanically joined but electrically insulated from each other by a common form of strain insulator such as indicated at 39. For attachment of the circuit interrupting unit to the line conductors, each of the supporting hangers 35 is provided with suitable conductor clamping

means. By way of example, there is illustrated a simple form of clamping means which comprises a clamping plate **40** relatively loosely supported on the hanger strap **35** by means of bent-over lugs **41** which form part of plate **40**, and a clamping bolt **42** which is provided with a co-operating wing nut **43**. With clamping plate **40** loose, the hanger may be engaged readily with a line conductor, and then the conductor is clamped between the hanger strap and the clamping plate by tightening up on wing nut **43**. The clamping plate has an overhanging portion **44** arranged to rest on a supporting line conductor in the manner shown so as to insure against disengagement of the hanger from the line conductor.

When the circuit interrupting device is mounted on and connected in an electric line as described, rupture of the fusible section **27**, **28**, results in release of levers **23**, which thereupon, due to the weight of the fuse carrier, pivot about both bolts **36** and pins **22**. Thus the arms **24** of the levers are caused to swing outwardly in opposite directions from the ends of the fuse carrier to the positions illustrated in Fig. 3 to give an indication, clearly observable from a distance, of circuit interruption. The outward swinging of arms **24** with the terminals **26** carried thereby also effects a relatively rapid separation of the ends of the ruptured fuse link and opens the ends of tube **11** of the carrier for expulsion of gases therefrom, all of which aids in extinction of the arc and interruption of the current flow. Slots **33** permit the swinging of the levers relative to the fuse carrier even though the supporting hangers **35** are rigidly clamped to relatively taut line conductors so that the hangers themselves cannot swing appeciably.

In the construction of Fig. 2, the insulating fuse holder or carrier includes only a single, relatively long, insulating fuse tube **50** having straps **51** clamped therearound respectively adjacent opposite ends of the tube and affixed to the tube by self-threading screws **52** or other suitable means. In a manner similar to that previously described in connection with the first embodiment, the upwardly projecting, spaced apart and substantially parallel ends **53** of the straps have pivot pins **54** extending therebetween, and on each of these pins is pivotally mounted a bell-crank lever **55** which serves as a terminal for the fuse holder or carrier. One arm **56** of each of the levers is provided with a flanged cap **57** for closing a corresponding one of the ends of tube **50**. These caps normally are held in closing relation to the ends of the tube by means of a fuse link connected and tensioned between the caps. It is preferable to provide the caps with some form of gasket **58** to seal the ends of the tube, thereby to insure against entrance of moisture into the tube to cause deterioration of the tube walls and the fuse link. Although any suitable form of fuse link may be employed, there is illustrated a very simple form comprising a fuse wire **60**, a strain wire **61**, and terminal shanks **62**, one of which terminal shanks may be seen in the drawing. These terminal shanks may be anchored to terminal caps **57** in any suitable manner as, for example, by passing the shanks through openings in the caps and soldering, as indicated at **63**.

The other arms, **64**, of the bell-crank levers project outwardly in opposite directions relative to each other and at a substantial angle to the arms **56**, and each one of the arms **64** has one end of a flexible supporting conductor **65** fixedly attached thereto in any suitable manner, as for example, by crimping or welding. The other ends of conductors **65** are provided with suitable clamping means for engagement with conductors, such as **37** and **38**, of an electric line, which conductors are mechanically joined but electrically insulated by means of a strain insulator **39**. In the illustrated embodiment, there is employed a simple form of clamping means which includes a metallic yoke **66** and a clamping member **67** which is movable within the yoke by means of a clamping screw **68**. One side of the yoke is partially open, as indicated at **69**, to provide for engagement of the yoke with a line conductor. The yoke may be fastened securely to such line conductor by screwing the clamping member **67** upwardly so as to clamp the conductor between the clamping member and the overhanging end **70** of the yoke. The end of the flexible supporting conductor **65** is embedded in or otherwise fixedly attached to clamping member **67** so as to insure a good electric connection.

The operation of the device of Fig. 2 upon rupture of the fusible section **60**, **61**, due to overload or short-circuit, is similar to that previously described in connection with the device of Fig. 1, in that the bell-crank levers **55** are released, and the fuse carrier drops down slightly so as to cause pivoting of the levers about points **54**. The resultant outward swinging of caps **57**, to their indicating positions illustrated in Fig. 4, opens the ends of tube **50** for expulsion of gases therefrom and also effects a relatively rapid separation of the ruptured fuse link ends to facilitate arc extinction and current interruption.

As will be evident from the foregoing, the devices herein described are of simple construction, small, and easy to mount, and their insulating holders or carriers afford good weather protection so as to insure against deterioration of the internal parts. Proper tensioning of the fuse link, without excessive strain thereon, is provided by the described mounting arrangements. Also, the devices give a clear indication of circuit interruption so that a lineman may readily determine from a distance when refusing is required. Replacement of blown fuse links with new ones may be accomplished easily upon removal of the interrupting devices from the supporting line conductors. However, devices such as those illustrated, and more particularly such as illustrated in Fig. 2, are of such simple and low cost construction that they may be discarded economically after operation and replaced by completely new factory assembled devices.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A circuit interrupting device comprising, current carrying means operable to interrupt an electric circuit, an insulating carrier therefor, an element pivoted on said carrier so as to be swingable relative to the body of the carrier, means restraining said element in a predetermined position relative to the carrier and arranged to release said element upon circuit interrupting operation of said first means, and two conductive supporting elements relatively permanently joined with said carrier and electrically connected with said first means, each of which supporting elements has means adapted for engagement directly with an electric line wire or the like for suspension mounting of said carrier, and one of said supporting elements comprising a conductor attached to said pivoted element at a point spaced from the pivot point of

the latter in a manner to impose on the pivoted element a biasing force in opposition to said restraining means when said carrier is suspended from electric line wires or the like by said supporting elements.

2. A circuit interrupting device comprising an insulating carrier having spaced terminal means, at least one of which terminal means includes a lever-like element pivoted on said carrier so as to be swingable relative to the body of the carrier, circuit interrupting means including a tensioned conductor connected with said element so as normally to restrain said element in a predetermined position relative to the carrier and operative to release said element responsively to circuit interrupting operation, and two supporting conductors relatively permanently joined respectively with said terminal means and each having means adapted for engagement directly with an electric line wire or the like for suspension mounting of said carrier, one of said supporting conductors being attached to said pivoted element at a point spaced from the pivot point of the latter in a manner to impose on the pivoted element a biasing force in opposition to the restraining force of said tensioned conductor when said carrier is suspended from electric line wires or the like by the supporting conductors.

3. A circuit interrupting device comprising an insulating carrier having spaced terminal means, at least one of which terminal means includes a bell-crank lever pivoted on said carrier so as to be swingable relative to the body of the carrier, circuit interrupting means including a tensioned conductor connected with one arm of said bell-crank lever so as normally to restrain the lever in a predetermined position relative to the carrier and arranged to release the lever upon circuit interrupting operation, and two supporting conductors relatively permanently joined respectively with said terminal means, one of said supporting conductors being joined to the other arm of said bell-crank lever and each of the supporting conductors having means adapted for engagement directly with an electric line wire or the like for suspension mounting of said carrier.

4. A circuit interrupting device comprising an insulating carrier having spaced terminal means comprising two lever-like elements pivoted on said carrier so as to be swingable relative to each other and the body of the carrier, circuit interrupting means including a conductor tensioned between said elements so as normally to restrain the latter from swinging relative to the carrier and arranged to release said elements upon circuit interrupting operation, and two supporting conductors respectively joined to said elements at points spaced from the pivot points of the latter, each of which supporting conductors has means adapted for engagement directly with an electric line wire or the like for suspension mounting of said carrier.

5. A circuit interrupting device comprising an insulating carrier having spaced terminal means comprising two bell-crank levers pivoted to swing relative to each other and the body of the carrier, circuit interrupting means including a conductor tensioned between one arm of one of said levers and one arm of the other of the levers so as normally to restrain the levers from swinging relative to the carrier, said levers being releasable responsively to circuit interrupting operation, and two supporting conductors respectively attached to the other arms of said levers and each having means adapted for engagement directly with an electric line wire or the like for suspension mounting of said carrier.

6. A circuit interrupting device comprising an insulating carrier having spaced terminal means comprising two bell-crank levers pivoted to swing relative to each other and the body of the carrier, circuit interrupting means including a conductor tensioned between one arm of one of said levers and one arm of the other of the levers so as normally to restrain the levers from swinging relative to the carrier, said levers being releasable responsively to circuit interrupting operation, and two supporting conductors each having one end pivotally attached to the other arm of a respective one of said levers, the free end of each of said supporting conductors having means adapted for engagement with an electric line wire or the like to support said carrier.

7. A circuit interrupting device comprising an insulating carrier having spaced terminal means comprising two bell-crank levers pivoted to swing relative to each other and the body of the carrier, circuit interrupting means including a conductor tensioned between one arm of one of the levers and one arm of the other of the levers so as normally to restrain the levers from swinging relative to the carrier, said levers being releasable responsively to circuit interrupting operation, and two flexible supporting conductors each having one end joined to the other arm of a respective one of said levers, the free end of each of said supporting conductors having means adapted for engagement with an electric line wire or the like to support said carrier.

8. A circuit interrupting device comprising an insulating housing defining an arcing chamber having openings at opposite ends thereof, two lever-like elements pivoted on the housing to swing relative to each other and the housing and each having a closure part, means to interrupt an electric circuit in said chamber and including a conductor connected between said elements so as normally to restrain said closure parts in closing relation respectively to said openings, said conductor being arranged to release said elements responsively to circuit interrupting operation, and two supporting conductors each attached to a respective one of said elements at a point spaced from the pivot point of the element and each having means adapted for engagement directly with an electric line wire or the like to support said carrier.

SIDNEY R. SMITH, JR.