June 10, 1947. R. S. BENNETT 2,421,982

ELECTRIC CIRCUIT INTERRUPTER

Filed March 9, 1945

Fig.1.

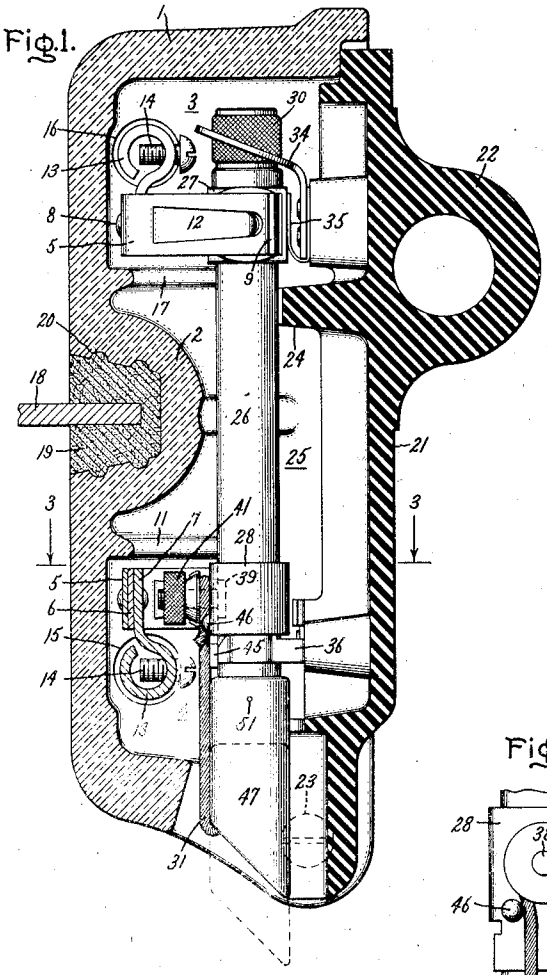


Fig.2.

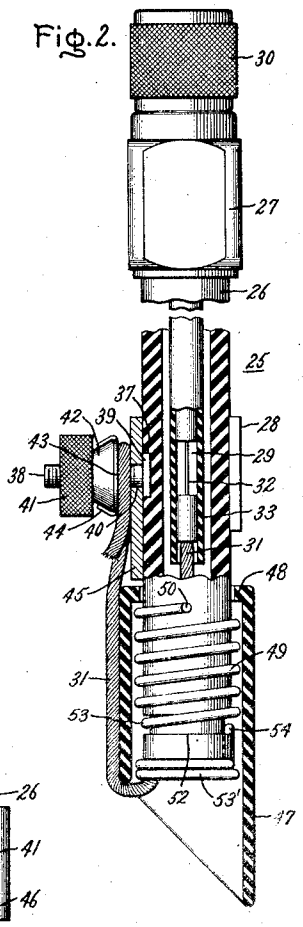


Fig.4.

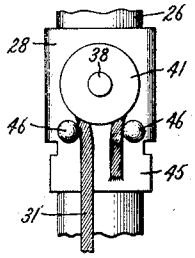


Fig.5.

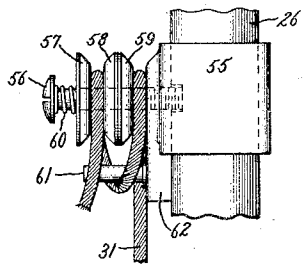
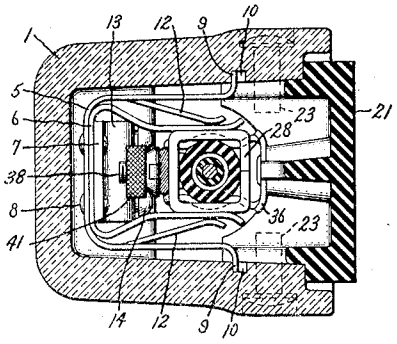


Fig.3.



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UNITED STATES PATENT OFFICE

2,421,982

ELECTRIC CIRCUIT INTERRUPTER

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8 Claims. (Cl. 200—114)

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My invention relates to electric circuit interrupters, and more particularly to a fuse cutout type of circuit interrupter.

It is an object of my invention to provide a new and improved fuse cutout type of circuit interrupter.

It is another object of my invention to provide a new and improved indicator means for a fuse cutout type of circuit interrupter.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a side elevation, partly in section, of an electric circuit interrupter of the fuse cutout type embodying my invention; Fig. 2 is an enlarged view, partly in section, of the fuse holder employed in Fig. 1; Fig. 3 is a sectional view taken on line 3—3 of Fig. 1, assuming Fig. 1 shows the complete structure; Fig. 4 is an enlarged view of one of the contacts on the fuse holder of Fig. 2, and Fig. 5 is a side view of the portion of the fuse holder shown in Fig. 4 illustrating a modification of the cable attaching means for the fuse link.

Referring now to the drawing, I have illustrated a housing or casing 1 formed of porcelain or similar insulating material having an integrally formed creepage barrier 2 which separates two stationary terminal or contact assemblies generally indicated at 3 and 4, respectively mounted within housing 1. Contact assembly 4, best shown in Figs. 1 and 3, consists of three metal elements 5, 6 and 7, all riveted together by means of rivet elements 8. The element 5 serves as a support or spring latch, the ends 9 of which engage abutments formed by recesses or notches 10 in the walls of housing or casing 1. Housing 1 is also provided with an integrally formed projection 11 which serves as a barrier to prevent the contact assembly 4 from being displaced from its latched position with the projections 9 of the support 5 being engaged in the recesses 10 in housing 1. The member 6 of contact assembly 4 is a spring contact or terminal clip for engaging with a corresponding contact of a fuse device, such as will be described hereinafter.

The support 5 is provided with lanced-out portions 12 which act as backing members for limiting the movement of spring clip 6. The member 7 includes a looped or cylindrical lead-receiving portion or passageway 13. A plurality of screws 14 are provided in the cylindrical lead-receiving portion or terminal 13 for clamping a conductor or lead inserted in the lead-receiving portion or passageway 13. The lead-receiving portion 13 of contact assembly 4 is mounted adjacent a lead entrance opening 15 in the lower part of housing 1 through which external connections with contact assembly 4 may be made.

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The contact assembly 3 is substantially identical with the contact assembly 4 described above and is mounted adjacent lead entrance opening 16 above projection 17 formed integrally with the upper part of housing 1. Contact assembly 3 includes members 5, 6 and 7 identical with the corresponding members of contact assembly 4. The corresponding parts of contact assembly 3 are designated by the same reference numerals as these portions of contact assembly 4.

The contact or terminal assemblies 3 and 4 described thus far and the method of assembling them in housing 1 are disclosed and claimed in my prior Patent 2,011,391, granted August 13, 1935, and assigned to the same assignee as the present application.

To the back of housing 1 there is secured a mounting bar 18 for attachment of the cutout to a suitable supporting structure (not shown). This mounting bar 18 is preferably cemented as indicated at 19 into an external recess 20 in housing 1.

In order to provide a closure for housing 1, I provide a cover or door 21 preferably made from a molded insulating compound or the like, which door or cover includes an integral handle or eye 22 which may be either grasped manually or engaged by a suitable form of switchstick to open and close the cover 21 with respect to housing 1. Door 21 is pivotally mounted to the lower front portion of housing 1 by means of insulating hinge pins 23 which pass through openings in housing 1 and threadedly engage door or cover 21. The cover 21 is also provided with a barrier 24 integrally formed with the inner surface of the door which cooperates with creepage barrier 2 of housing 1 to lessen the possibility of flash-over between the contact assemblies 3 and 4 by virtue of conducting gases passing therebetween.

The cover or door 21 is adapted to support a fuse holder generally indicated at 25 in Figs. 1 and 2. Fuse holder 25 comprises an expulsion fuse tube 26 provided with an upper terminal or contact 27 and a lower terminal or contact 28. The contacts 27 and 28 are adapted to engage with the corresponding contact clips 6 associated

with terminal or contact assemblies 3 and 4 respectively. Mounted within fuse tube 26 is the conventional fuse link 29 preferably of the button head type which is held in position in conducting engagement with the upper contact 27 by means of a cap 30 screwed to a threaded portion of contact member 27 which is fastened to the upper end of fuse tube 26. As will be understood by those skilled in the art, fuse link 29 mounted within fuse tube 26 includes a flexible cable or conductor portion 31 connected to the lower terminal of a fusible element 32. In the drawings, except for the sectional views of Figs. 2 and 3, the flexible conductor 31 is the only visible portion of the fuse link. The fuse link 29 also includes a small tube 33 enclosing the fusible element 32. It will be understood that the fuse device including fuse tube 26 and fuse link 29 operates on the expulsion principle to interrupt the electric circuit therethrough by expelling gases and fuse link parts through the open lower end of expulsion fuse tube 26.

The upper end of fuse tube 26 is secured to cover 21 by means of a metal support 34 having an opening therethrough through which the cap 30 of the fuse holder may be inserted. The enlarged portion of contact 27 will not pass through the opening in metal support 34 thereby preventing substantial longitudinal movement of the fuse tube 26 as a result of recoil upon rupture of fusible element 32. Metal member 34 is fastened to the upper portion of door or cover 21 by any suitable means and may include a spring member 35 to firmly connect electrical contact 27 and metal member 34. The lower portion of fuse tube 26 is held to door 21 by means of a spring clip 36 fastened to the inner side of door 21. Spring clip 36 is preferably also provided with a metal member similar to 35 to electrically connect it with lower contact 28 or else is positioned so that it electrically engages lower contact 28.

The lower contact 28 is constructed in a manner very similar to that disclosed and claimed in Hermann Patent 2,335,062, granted November 23, 1943, and assigned to the same assignee as the present application. As described in the Hermann patent, terminal 28 preferably comprises a formed stamping somewhat U-shaped with right angles at the base of the U so that the sides of the U furnish a rectangular contact for engaging lower terminal clip 6, as is clearly shown in Fig. 3. The fuse tube 26 is provided with a recess 37 best shown in Fig. 2 for accommodating a key which is illustrated as a bolt 38 having a head 39 which is shaped so that it will not turn when inserted in the recess 37 of fuse tube 26. As illustrated, head 39 is rectangular in shape. Bolt 38 is adapted to be inserted through an opening 40 in terminal 28 whereupon terminal 28 is slipped over fuse tube 26 so as to partially encircle it with the key comprising head 39 of bolt 38 inserted in recess 37 of fuse tube 26, whereby longitudinally to position contact 28 on fuse tube 26. The arms of the U-shaped stamping 28 are then bent or clamped around fuse tube 26 to assume the rectangular shape clearly shown in Fig. 3 whereupon the key comprising bolt head 39 is maintained in recess 37 and terminal 28 is fastened to fuse tube 26 in a simple and yet in a very effective manner.

Bolt 38 provides a convenient means for attaching the flexible conductor 31 to contact 28. I provide a knurled nut 41 having an undercut portion 42 so that a washer 43 may be rotatably attached to nut 41 as by wing members 44. The washer is rotatable relative to nut 41 and consequently will remain stationary when it frictionally engages flexible conductor 31 of fuse link 29. The method of fastening the lower contact 28 to fuse tube 26 described above, enables contact 28 to have a slight floating action on fuse tube 26 to insure good contact alignment between contact 26 and terminal or contact clip 6.

In order to prevent the insertion of fuse tube 26 into supporting clip 36 in any but the correct position, contact 28 is provided with a downwardly projecting lug 45, incorrect positioning being rejected by spring clip 36 which interferes with lug 45 in any but the correct position.

In order to prevent the flexible cable portion 31 of fuse link 29 from unwinding and coming free of clamping nut 41, contact 28 is provided with a pair of bosses 46 clearly shown in Figs. 1 and 4. When the fuse holder 25 is mounted on door 21 in the manner indicated in Fig. 1 the door is held in the closed and latched position by means of the contact clip 6 of upper terminal or contact assembly 3.

Since the fuse holder 25 is completely enclosed in housing 1, it would be desirable to provide indicating means for indicating to a lineman that the cutout has operated. Such cutouts are usually mounted on poles and indicating means therefore should be visible to some one standing on the ground. In accordance with my invention I provide an indicating means comprising an insulating sleeve 47 preferably colored red or some other readily discernible color, which insulating sleeve 47 is adapted to be slidably mounted over the lower end of fuse tube 26 below contact 28. Indicating sleeve 47 is provided with an upper circumferential flange 48 which fits around fuse tube 26. The inner diameter of sleeve 47 is somewhat larger than the outer diameter of fuse tube 26 so that a coiled tension spring 49 may be accommodated in the annular space between fuse tube 26 and indicating sleeve 47. The upper end 50 of tension spring 49 is adapted to be inserted in an opening 51, see Fig. 1, in indicating sleeve 47 thereby fastening one end of spring 49 to indicator 47. The lower end of fuse tube 26 is provided with an annular groove 52. The portion of coiled spring 49 adjacent annular groove 52 is provided with a turn or two 53, of a slightly reduced diameter so as to fit into groove 52. Reduced diameter turn 53 is connected with a turn or two 53' of the same diameter as the main part of spring 49 but displaced somewhat therefrom by a portion 54 extending along the axis of fuse tube 26 and adapted to fit into an axial notch or recess, as is obvious from Fig. 2. With this arrangement it is clear that the lower end of spring 49 is fastened to fuse tube 26. Spring 49 tends to move indicator 47 downwardly to the dotted position indicated in Fig. 1. Normally the indicator 47 is held in the non-indicating position by means of flexible cable 31, as is shown in Fig. 2, the lug 45 of contact 28 limiting the upward movement thereof.

I have found that the spring 49 arranged in the annular space between fuse tube 36 and indicator sleeve 47 performs a very essential function in that it acts as a baffle so that gases expelled from the lower end of fuse tube 26 cannot blow up between sleeve 47 and fuse tube 26, the circumferential flange 48 and spring 49 effectively preventing this. In prior art arrangements failure of the cutout occurred by virtue of the fact that the hot arc gases could flow upwardly.

In accordance with my invention the turn or turns **53'** of spring **49** are electrically engaged by flexible conductor **31** thereby avoiding any capacity effect with spitting or corona. Also the turn or turns **53'** effectively guide indicator **47**.

In Fig. 5 I have illustrated a modification of the arrangement for fastening the flexible conductor or cable portion of the fuse link to the lower contact of the fuse holder. This lower contact is designated by the reference numeral **55**. Lower contact **55** is substantially identical with lower contact **28** of Fig. 2. However the opening in contact **55** corresponding to the opening **40** of contact **28** is threaded so as to receive the screw **56** which is also adapted to be inserted in a cooperating recess in fuse tube **26** thereby positioning and fastening lower terminal **55** to fuse tube **26**. Slidably mounted on screw **56** are a plurality of dish-shaped washers **57**, **58** and **59** and a compression spring **60**. The compression spring **60** pushes the washers against each other and against the contact **55**. Dish-shaped washer **59** is adapted to have its contact surface held against contact **55** by spring **60**. Dish-shaped washer **58**, on the other hand, is arranged on screw **56** in opposed relationship to washer **59** and is adapted with washer **57** to provide a pair of contacting surfaces therebetween. With the arrangement described, the flexible cable portion **31** may merely be wrapped around pin **56** one or more times with the cable being held as is clearly shown in Fig. 5, between contact **55** and washer **59**, and if a second turn around pin **56** is desired between washers **57** and **58**. A pin **61** extending from contact **55** or from a lug **62** attached to contact **55** prevents crossing of the flexible cable **31**. It will be observed that with the arrangement disclosed in Fig. 5 putting in a new fuse link is a very simple matter.

While I have shown and described what I at present consider the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from my invention, and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

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

1. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder to be connected to one of said contacts, means for indicating operation of said fuse link comprising an insulating sleeve slidable on the lower end of said fuseholder and adapted to be held in the non-indicating position by said flexible lead portion, and spring means enclosed within said indicator sleeve for biasing said indicator to its indicating position.

2. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder to be connected to one of said contacts, means for indicating operation of said fuse link comprising an insulating sleeve slidable on the lower end of said fuseholder and adapted to be held in the non-indicating position by said flexible lead portion, and spring means enclosed within said indicator sleeve for biasing said indicator to its indicating position, said spring means being arranged to electrically engage said flexible lead portion.

3. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder to be connected to one of said contacts, means for indicating operation of said fuse link comprising an insulating sleeve slidable on the lower end of said fuseholder and adapted to be held in the non-indicating position by said flexible lead portion, and spring means enclosed within an annular space defined by said indicator sleeve and said fuseholder for biasing said indicator to its indicating position, said spring means acting as a baffle to prevent hot arc gases from passing through said annular space.

4. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder to be connected to one of said contacts, means for indicating operation of said fuse link comprising an insulating sleeve slidable on the lower end of said fuseholder and adapted to be held in the non-indicating position by said flexible lead portion, a circumferential flange on said sleeve, and spring means enclosed within an annular space defined by said indicator sleeve and said fuseholder for biasing said indicator to its indicating position, said spring and said flange substantially preventing hot arc gases from passing through said annular space.

5. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder to be connected to one of said contacts, means for indicating operation of said fuse link comprising an insulating sleeve slidable on the lower end of said fuseholder and adapted to be held in the non-indicating position by said flexible lead portion, spring means enclosed within an annular space defined by said indicator sleeve and said fuseholder for biasing said indicator to its indicating position, and means for fastening one end of said spring means to said fuseholder comprising a groove on said fuseholder and a turn of reduced diameter on said spring means to engage said groove.

6. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder to be connected to one of said contacts, means for indicating operation of said fuse link comprising an insulating sleeve slidable on the lower end of said fuseholder and adapted to be held in the non-indicating position by said flexible lead portion, spring means enclosed within an annular space defined by said indicator sleeve and said fuseholder for biasing said indicator to its indicating position, means for fastening one end of said

spring means to said fuseholder comprising a groove on said fuseholder and a turn of reduced diameter on said spring means to engage said groove, and means for fastening the other end of said spring means to said sleeve.

7. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said contacts and having a flexible lead portion extending out of said fuseholder, means for fastening said flexible lead portion to one of said contacts on said fuseholder comprising a pin extending from said one contact, a plurality of dish-shaped washers on said pin, and spring means on said pin for biasing said washers together so that said flexible lead portion may be wrapped around said pin and held between said washers.

8. In an electric circuit interrupter, spaced line terminals, a fuseholder provided with contacts arranged to engage said terminals, a fuse link in said fuseholder electrically interconnecting said

contacts and having a flexible lead portion extending out of said fuseholder, means for fastening said flexible lead portion to one of said contacts on said fuseholder comprising a first pin extending from said one contact, a plurality of dish-shaped washers on said pin, spring means on said pin for biasing said washers together so that said flexible lead portion may be wrapped around said pin and held between said washers, and a second pin extending from said one contact for preventing crossing of said flexible lead portion when wrapped around said first pin.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
2,135,739	Birkenmaier	Nov. 8, 1938
2,204,320	Schultz	June 11, 1940