

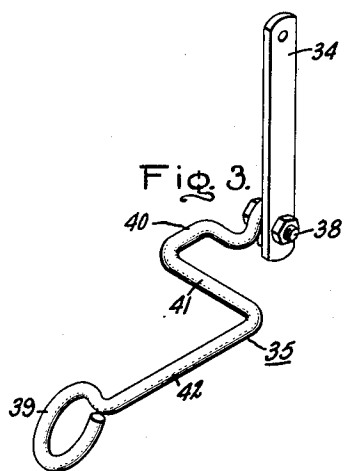
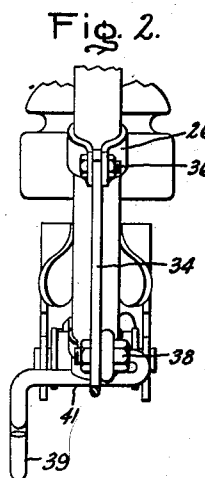
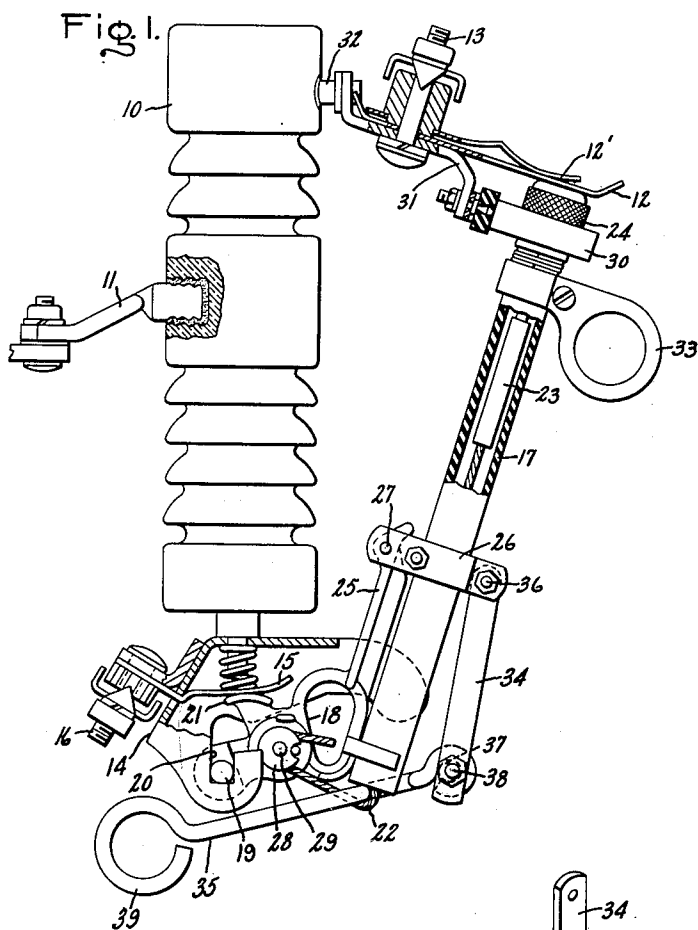
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CIRCUIT INTERRUPTER

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2,630,508

CIRCUIT INTERRUPTER

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This invention relates to electric circuit interrupting devices and more particularly to a new and improved arrangement whereby a load circuit in which such a device is installed may be manually opened while under load.

This function has been carried out in the case of a conventional fuse cutout type of device by the employment of a switch stick to disengage a movable contact on the device from a stationary contact, in other words, by opening the fuse holder in a similar manner to opening a disconnect switch. However, when the load on the circuit is of sufficiently high magnitude, a long arc is thereby drawn and, under these conditions, harmful flashovers between adjacent parts frequently occur. Thus, various arrangements involving the employment of levers which may be engaged by the switch stick have been incorporated on such cutouts to manually break or rupture a fuse link, and thereby interrupt the load inside a fuse tube, in a manner similar to a normal fuse blowing operation. However, all such prior art lever arrangements known to applicants possess objectionable features which it would be desirable to correct if at all possible. For example, in the case of one such arrangement, the application of a fuse link rupturing force by a switch stick to a fuse link rupturing lever tends to separate a movable contact at the top of the fuse tube from a stationary contact, which can only be avoided by the employment of a relatively complex and therefore costly locking arrangement to maintain the contacts in engagement. This disadvantage has been overcome in another case where a lever arrangement is so provided that the fuse link rupturing force is applied to the lever in an upward direction, which also tends to maintain the upper separable contacts in engagement. The application of an upward force, however, is objectionable in that the switch stick is more liable to slip off the rupturing lever and a downward pull with a switch stick is a much more normal movement for the operator. In addition, the area or surfaces presented by these prior art levers tend to reflect the arc gases upward and cause flashover. Moreover, these lever arrangements are not attachments but are part of the fuse holder or the fuse holder support so that a purchaser can only obtain them by buying a complete fuse holder or cutout.

It is therefore an object of our invention to provide an improved fuse cutout, incorporating auxiliary structure which will permit the manual interruption of a circuit while under load.

It is also an object of our invention to provide

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an arrangement in connection with which a downward force or pull may be applied to a fuse link rupturing lever, whereby the resulting force on the cutout structure tends to maintain separable contacts thereof in engagement.

It is a further object of our invention to provide a relatively simple lever arrangement presenting a minimum surface area.

It is still a further object of our invention to provide a fuse link rupturing device in the form of a simple, low cost attachment that may be simply and quickly applied or connected to existing fuse cutouts.

The invention will be better understood from the following description when taken in connection with the accompanying drawing, and the scope of the invention will be pointed out in the appended claims. In the drawing, Fig. 1 is a side elevation, partly in section, of a fuse disconnecting switch or cutout embodying the invention and shown in the circuit closed position; Fig. 2 is a front view of the lower portion of the Fig. 1 device; and Fig. 3 is a perspective view of the fuse link rupturing attachment of our invention.

For the purpose of illustration, we have shown in the drawing an open type fuse cutout in which the numeral 10 identifies a main support of porcelain or other similar insulating material of a size and shape used in connection with the fuse cutouts of the prior art. Insulating support 10 may be suitably mounted on a pole, not shown, in a conventional fashion, one manner of which is by a supporting arm or bracket 11, one end of which is cemented internally within the support 10. Adjacent one end of the insulator 10 and supported therefrom so as to extend transversely of the insulator is a first relatively stationary contact means 12, such as a leaf contact spring, in conducting relation with a line terminal 13. Supported from the opposite or lower end of the insulator, in line with the longitudinal axis thereof, is a hinge means or hook-type bearing member 14. A second relatively stationary contact means 15 in conducting relationship with a terminal 16 is suitably mounted on bearing member 14. To serve as a support for an expulsion tube 17, a hinge element 18 of conducting material is provided having trunnions 19 adapted to be inserted in the hooks 20 of the bearing element 14. Hinge element or support 18 is also provided with a contact 21 movable into and out of engagement with contact means 15 upon rotation of the hinge element. For completing a conducting path between the stationary contact means 12 and 15 and consequently the terminals

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13 and 16, a current conducting means is provided and comprises a conductor 22 having a portion 23 fusible at currents above a predetermined value. Conductor 22, including fusible portion 23 which is also relatively weak mechanically, is mounted within the expulsion tube 17 with one end of the conductor suitably connected electrically to a conducting cap 24, threadingly mounted on the upper end of tube 17 and engageable with stationary contact means 12. As shown, the tube 17 is directly mounted on an upwardly extending portion 25 of hinge element support 18 by a split clamp 26, which in turn is pivotally mounted at 27 on the hinge support element 18, constituting therewith a toggle which is held in the rigid condition shown by pulling the end of conductor 22 which extends out of the bottom open end of tube 17, transversely thereto, toward a portion of hinge support 18 where it is secured in any suitable manner such as clamping it between the hinge element and a nut 28, which may be drawn tight by a screw 29. The hinge element or support 18 and the expulsion tube 17 including the contact at one end thereof which together are all rotatable about the hinge point 19 comprise what is conventionally referred to in the industry as a fuse holder assembly. For maintaining the switch or fuse holder assembly in the closed circuit position shown in the drawing, there is provided a holding means which may be of any conventional type, such as the one illustrated, which comprises a U-shaped resilient member 30, the outer ends of the legs of which are bent inwardly and then outwardly to provide, in V-shaped formation, flared ends which yield sufficiently to permit entrance of contact cap 24 and thereupon close over the cap to restrict reverse movement. U-shaped holding member 30, terminal 13, leaf contact spring 12, and, in addition, a leaf backing spring 12', are all carried by a bracket 31 extending outwardly from insulator 10 and supported therefrom on a stud 32 mounted in the insulator.

The fuse tube 17 is made from or is lined with a material which will give off an arc extinguishing gas when subjected to the heat of an arc. Consequently, in the event of a current through conductor 22 in excess of the rating of fusible element 23, this element will rupture, whereupon the lower portion of conductor 22 will begin to drop downwardly through tube 17, thereby establishing an arc which will promptly be extinguished by the gas given off from the tube. In this manner, the portion of the circuit in which the device is installed may be opened or automatically isolated from the balance of the system as is well known in the art. In addition, the switch may be manually opened by inserting the hooked portion of a switch stick in an operating eye 33, mounted on the fuse tube 17, to separate movable contact 24 from stationary contact 12. However, as previously pointed out, this sometimes results in a long arc being drawn between these two contacts, which is difficult to extinguish and which may flash to adjacent parts or equipment with adverse results.

As thus far described, the cutout is similar to a type well known in the electrical industry. However, to manually open the device and at the same time realize the benefit of the arc extinguishing gas given off by the fuse tube 17, we have, in accordance with our invention, provided an improved means whereby the conductor 22 may be manually broken or ruptured at the fusible or relatively mechanically weak section 23.

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This means is very simple in that it comprises only three elements, a bar of metal 34, and a lever 35 of round rod or wire of sufficient strength, and a rivet or bolt fastening means 38. The bar 34 is pivotally or fixedly mounted at one end on clamping bolt 36 between the two halves of clamp 26, as better shown in Fig. 2. Lever 35 is pivotally mounted by means of an eye 37 and bolt or rivet 38 at the opposite or lower end of bar 34 adjacent the lower open end of the expulsion tube 17. A relatively large eye 39 has been formed at the opposite end of lever 35 to conveniently accommodate the hook portion of a switch stick. Lever 35 is otherwise bent, as better illustrated by Fig. 3 at 40, to clear the expulsion tube 17 with a portion 41 extending under and transversely across the open end of tube 17, and the remaining portion 42 extending normally to portion 41 and of sufficient length so that the operating end of the lever or eye 39 will be positioned on the opposite side of the hinge axis or trunnions 29 from the expulsion tube 17 when in the position shown in Fig. 1. In the course of assembling or replacing a fuse link, it will be understood that the conductor 22 thereof extending out of the lower open end of the tube is merely looped around the portion 41 of lever 35, and fixed to the hinge support element as previously described and as illustrated.

When it is desired to manually break the fuse link within the expulsion tube, a downward force or pull is applied to the eye 39, whereby a force several times the applied force is imposed upon the fuse link to effect rupture thereof, and withdrawal of conductor 22 from the open end of the fuse tube. Inasmuch as the expulsion tube, expulsion tube support or hinge element and fuse link may be considered for all practical purposes as a unitary mass at any time prior to actual rupture of the fuse link and since the operating force applied to lever 35 is to the left of the hinge point while the pivot point of the lever or point of application of the reactive force is applied to the mass on the opposite side of the expulsion tube axis from the hinge point, it will also be apparent that the resulting force on the structure is such as to rotate the expulsion tube or mass in a counterclockwise direction, as viewed in Fig. 1, about the hinge axis at the trunnions 19, so that there is no tendency for the contacts 24 and 12 to become separated. Of course, upon rupture of the fuse link but subsequent to extinguishment of the resulting arc within the expulsion tube, the toggle mounting will collapse allowing contact 24 to drop down away from holding member 30 and clockwise rotation of the fuse holder assembly.

Thus, we have provided a fuse link rupturing arrangement for fuse cutouts, whereby a fuse link may be manually ruptured by the application of a downward force to a rupturing lever, but in addition, the improved arrangement is such that the resulting force on the cutout structure does not tend to disengage the normally separable contacts. Moreover, the arrangement comprises a simple attachment which may be simply and quickly applied to existing cutouts. This is an economic advantage to the user permitting him to purchase and stock standard cutouts, at the same time being able to apply switching attachments to those particular cutout installations where the load switching requirements are relatively severe.

While we have, in accordance with the patent statutes, shown and described a particular em-

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bodiment of our invention, it will be obvious that changes and modifications can be made without departing from the invention in its broader aspects and we, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of our invention.

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

1. In an electric circuit interrupter, a fuse holder assembly rotatable about a hinge point comprising an expulsion tube support mounted at said hinge point, an expulsion tube having a contact at one end thereof, said expulsion tube being open at the opposite end and mounted on said support so as to be rotatable about said hinge point, a fuse link within said tube fixed at the contact end thereof and extending out of the open end of said tube, said extending portion of said fuse link being secured to said support and a fuse link rupturing lever pivotally mounted at one end on said fuse holder assembly on the opposite side of the axis of said expulsion tube from said hinge point, said lever having a portion located between said extending portion of said fuse link and the open end of said tube, the opposite end of said lever comprising an operating loop positioned on the opposite side of said hinge point from said fuse tube.

2. In an electric circuit interrupter, a fuse holder assembly rotatable about a hinge point comprising an expulsion tube rotatable about said hinge point and having an open end adjacent thereto, a contact mounted at the opposite end of said tube, a fuse link within said tube having one end thereof connected to said contact and the other end extending out of the open end of said tube and secured adjacent thereto and a fuse link rupturing lever pivotally mounted at one end on said fuse holder assembly on the opposite side of the axis of said expulsion tube from said hinge point, said lever having a portion positioned above and in engagement with the extending portion of said fuse link, the opposite end of said lever comprising an operating loop being positioned on the opposite side of said hinge point from said fuse tube.

3. In an electric circuit interrupter, a fuse holder assembly rotatable about a hinge point comprising an expulsion tube rotatable about said hinge point and having an open end adjacent thereto, a contact mounted at the opposite end of said tube, a fuse link within said tube with one end thereof connected to said contact and the other end projecting out of the open end of said tube and secured adjacent thereto and a fuse link rupturing attachment comprising a lever pivotally mounted at one end on said fuse holder assembly on the opposite side of the axis

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of said expulsion tube from said hinge point, said lever extending between said open end and said fuse link projecting therefrom, the opposite end of said lever comprising the operating end thereof positioned on the opposite side of said hinge point from said fuse tube.

4. In an electric circuit interrupter, a fuse holder assembly rotatable about a hinge point comprising a fuse holder tube having a contact at one end thereof and rotatable about said hinge point from a contact closed to a contact opened position, the opposite end of said tube being open and adjacent said hinge point, a fuse link within said tube connected to said contact and including a conductor portion projecting out of the open end of said tube and secured adjacent thereto and a fuse link rupturing attachment comprising a lever mounted on said fuse holder assembly on the opposite side of the axis of said tube from said hinge point and having a portion positioned between said projecting conductor and the open end of said tube, said lever having an operating end for the application of a fuse link rupturing force positioned on the opposite side of said fuse holder hinge point from said fuse holder tube whereby the application of a downward force to said operating end of said lever results in a force tending to hold said fuse tube in a contact closed position and a force tending to rupture said fuse link.

5. In a fuse switch having a fuse link within a fuse tube mounted on a hinged fuse tube support and constituting a fuse holder assembly rotatable about a hinge axis between an open and a closed position with the fuse link fixed at one end of the tube and extending out of and secured adjacent the opposite and open end thereof, a fuse link rupturing attachment comprising a lever mounted for pivotal rotation about one end thereof on said fuse holder assembly on the opposite side of the axis of said tube from said hinge axis and having a portion positioned above and in engagement with the extending portion of said fuse link, the opposite end of said lever comprising the operating end thereof being positioned on the opposite side of said hinge axis from said fuse tube.

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