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2,246,193

ELECTRIC FUSE DEVICE

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Fig.1.

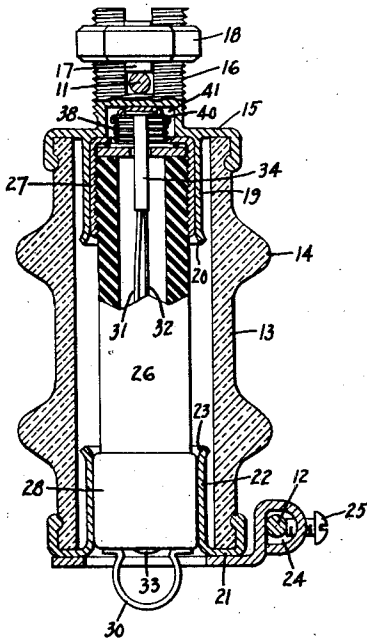


Fig. 2.

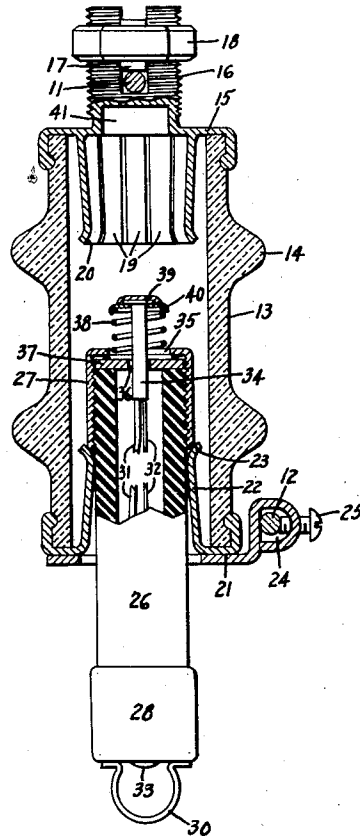
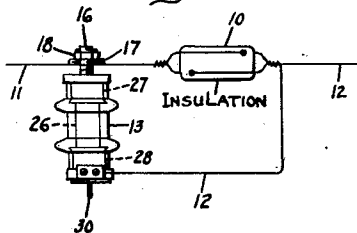


Fig. 3.



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ELECTRIC FUSE DEVICE

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9 Claims. (Cl. 200—117)

The present invention relates to electric fuses, and more particularly to so-called "secondary" fuses which are suitable for such purposes as protection of transformers from secondary faults, isolation of service entrance faults, and banking of transformer secondaries.

The invention has for a principal object the provision of an improved form of secondary fuse which is adapted for, but not necessarily limited to, outdoor installations such as on overhead distribution lines in conjunction with strain insulators; which has low construction, installation, and re-fusing cost; and which, upon fuse operation, functions so as to insure electric isolation of the fuse holder from at least one of the conductors connected therewith, while giving readily observable indication of fuse operation.

A further object of the invention is the provision of an improved form of fuse support, which is employable for suspension mounting of cartridge fuses on electric line conductors and like supporting means, and which is constructed so as to afford effective weather protection for fuses accommodated therein.

Other objects and the details of that which I consider to be novel and my invention will become apparent from the following description and the claims appended thereto, taken in conjunction with the accompanying drawing in which Fig. 1 shows, in longitudinal section, a fuse device embodying the present invention, with the fuse cartridge in connected position; Fig. 2 shows the device of Fig. 1 with the cartridge in dropped-out position following fuse operation, and Fig. 3 illustrates diagrammatically an exemplary installation of the fuse device of Fig. 1.

Although the device of the present invention is suitable for mounting in various ways, depending upon the particular location at which fused protection is desired, the device is illustrated for purposes of example as installed in conjunction with a strain insulator of a form common in the art. This insulator, designated 10, serves mechanically to join, in a well-known manner, two line conductors 11 and 12 with the conductor 12 attached to the insulator so as to leave an end thereof free for connection purposes as indicated in Fig. 3.

The fuse support of the present invention includes a hollow tubular insulator 13 constructed of glass or other suitable material which is transparent and has the required mechanical strength and electric insulation characteristics. Preferably this insulator is provided with spaced-

apart circumferentially extending ridges 14 or other suitable means for prevention of electric creepage across the insulator. Securely affixed to the insulator and closing the upper end of the longitudinal bore therein, is a metallic terminal piece 15 which is provided, externally, with a split connector stud 16, contact clip 17, and clamping nut 18 for attachment to a line conductor 11 or like support for the insulator. Terminal piece 15 is provided internally of the insulator with a tubular socket formed by a plurality of resilient contact fingers 19 which are flared at their extremities, as indicated at 20, so as to facilitate insertion of the end of a cartridge fuse into the socket. A second metallic terminal piece 21 is affixed to the lower end of insulator 13. This latter terminal piece may be constructed of two parts, as illustrated, or may be a single piece similar to upper terminal 15. Terminal piece 21 is provided with a plurality of resilient contact fingers 22 projecting into the lower end of the bore in insulator 13 in a manner to form a tubular socket for engagement with the lower end of a fuse cartridge in the insulator bore. The inner free ends of fingers 22 are flared, as indicated at 23, so as to facilitate removal of a fuse cartridge from the insulator in a manner to be described. Terminal piece 21 is provided externally with a socket 24 and clamping screw 25 for connection of a lead or conductor, such as the free end of conductor 12, thereto.

I have provided a special form of indicating fuse cartridge which is particularly suitable for use with the fuse support hereinbefore described. The fuse holder of this cartridge comprises an insulating tube 26 with terminal caps 27 and 28 screw-threaded on the upper and lower ends respectively of the tube. The cartridge is insertable into the bore of insulator 13 through the tubular socket formed by contact fingers 22, and terminal cap 28 is provided with a ring-shaped handle 30 for aid in manipulation of the cartridge into and out of the insulator. When in operative position, shown in Fig. 1, the upper terminal cap 27 of the cartridge is frictionally engaged by contact fingers 19 and the lower terminal cap 28 is frictionally engaged by contact fingers 22.

Within the fuse holder is a common form of fuse link including a fuse wire 31 and a strain wire 32. One end of this fuse link is anchored to lower terminal cap 28 in any suitable manner, as by soldering, as indicated at 33. The other end of the fuse link has a terminal shank 34 which is longitudinally movable, in the man-

ner of a plunger, through an opening 35 in the end of terminal cap 27, and an opening 36 in a washer 37 secured on the upper end of tube 26 by means of cap 27. In surrounding relation to shank or plunger 34 is a coiled compression spring 38 which is secured at its inner end between cap 27 and washer 37. The outer end of the spring is secured to the button head cap 39 of the fuse link by means of a spun-over cap 40. Normally the spring tends to impel plunger 34 from the upper end of the fuse cartridge but is restrained by the intact strain wire 32 of the fuse link. When the cartridge is in its operative position, shown in Fig. 1, the end of plunger 34 and the spring 38 are accommodated in a recess 41 in upper terminal piece 15, and cap 40 bears against the abutment formed by the base of the recess.

Upon rupture of fuse wire 31 and strain wire 32 due to excess current, the spring driven plunger 34—38 functions with sufficient force to eject the fuse cartridge from the upper terminal socket formed by contact fingers 19, and also draws out the arc in the fuse tube. At the same time, terminal cap 28 is forced out of the socket formed by fingers 22. This permits the cartridge to drop since tube 26 is of less diameter than cap 28 and therefore is not frictionally restrained by fingers 22. Finally, when the cartridge reaches the position illustrated in Fig. 2, it is held by engagement of the flared portions 23 of fingers 22 with terminal cap 27. Under these conditions the fuse holder of the cartridge is electrically isolated from upper terminal piece 15 and the conductor connected therewith, while the lower end of the cartridge depends below the bottom of insulator 13 to give readily observable indication of fuse operation.

By pulling down on ring 30 with sufficient force, terminal cap 27 may be caused to slide by the flared portions 23 of fingers 22 so that the blown cartridge may be withdrawn from the insulating support, thereby providing for installation of a new cartridge in the support. If desired, contact fingers 22 may be so formed, and spring 38 may be made of such strength, as to cause the fuse cartridge to eject itself completely from insulator 13. Under such circumstances the absence of a fuse cartridge in the fuse support may be readily detected due to the transparency of the walls of insulator 13.

Common forms of non-ejecting indicating fuse cartridges, such as of the black powder type, also may be employed with the improved fuse support of my present invention. In such case, indication of the blowing of the fuse is readily observable through the transparent walls of insulator 13. Moreover, through the employment of suitable adapters, it is possible to use different sizes and ratings of fuse cartridges in the fuse support. Thus the fuse support has the important advantage that it may be used for suspension mounting of standard forms of fuse cartridges as well as for mounting of the special indicating form of fuse cartridge hereinbefore described.

From the foregoing it will be seen that, due to the simplicity and low cost of the fuse support and its weatherproof construction, together with the ease of mounting the support on a line conductor or similar supporting means and the ease of installing in the support cartridge fuses either of standard form or of my improved form herein described, the device of the present invention is extremely well suited for secondary installa-

tions, such as at the ends of rural lines, where it is desired to have reliability of fuse protection with minimum expense.

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

1. A line suspension fuse device comprising in combination a hollow insulator having a fuse cartridge receiving bore open at one end for insertion of a fuse cartridge therein, spaced terminal elements carried by said insulator, one of said terminal elements having a clamping part adapted to be attached to an electric line conductor for supporting the fuse device directly on said conductor, a unitary fuse cartridge removably disposed in said bore and including a fusible element, means releasably retaining said cartridge in said bore with said fusible element electrically connected between said terminal elements, and means, forming an integral part of said cartridge, operative in response to operation of said fusible element to effect ejection of the cartridge at least partially from said open end of said bore.

2. A line suspension fuse device comprising in combination, a hollow insulator having a fuse cartridge receiving bore open at one end for insertion of a fuse cartridge therein, spaced terminal elements affixed to said insulator, one of said terminal elements having a clamping part adapted to be attached to an electric line conductor for supporting the fuse device directly on said conductor, a fuse cartridge having a fusible element therein, means releasably retaining said cartridge in said bore with said fusible element electrically connected between said terminal elements, means operative upon operation of said fusible element to impel said cartridge in the direction of said open end of said bore, and means to stop the cartridge in a partially ejected position wherein the cartridge is electrically isolated from at least one of said terminal elements and wherein a part of the cartridge projects from said open end of the bore.

3. A fuse device comprising in combination a hollow insulator defining a bore open at one end for insertion of a fuse cartridge therein, terminal elements affixed to said insulator respectively adjacent opposite ends of said bore, a unitary fuse cartridge removably disposed in said bore and including a fuse link and a plunger-like member normally occupying a retracted position, said member being arranged to bear against an abutment adjacent the end of said bore opposite to said open end, means releasably retaining said cartridge in said bore with said fuse link electrically connected between said terminal elements, and means cooperative with said plunger-like member upon operation of said fuse link to effect ejection of said cartridge at least partially from said open end of said bore.

4. A fuse device comprising in combination a hollow insulator defining a bore open at one end for insertion of a fuse cartridge therein, terminal elements affixed to said insulator respectively adjacent opposite ends of said bore, a unitary fuse cartridge removably disposed in said bore and including a fuse link and a plunger-like member normally occupying a retracted position, said member being arranged to bear against an abutment adjacent the end of said bore opposite to said open end, means releasably retaining said cartridge in said bore with said fuse link electrically connected between said terminal elements, means cooperative with said plunger-like member upon opera-

tion of said fuse link to impel said cartridge in the direction of said open end of said bore, and means to stop the cartridge in a partially ejected position electrically isolated from one of said terminal elements and with a part of the cartridge projecting from said open end of the bore.

5. A fuse device comprising in combination a hollow insulator defining a bore open at one end for insertion of a fuse cartridge therein, terminal elements affixed to said insulator respectively adjacent opposite ends of said bore, a unitary fuse cartridge removably disposed in said bore, and means frictionally retaining said cartridge in said bore electrically connected between said terminal elements, said cartridge having a spring driven member movable relative to the cartridge and normally held in a retracted position by a fuse link in the cartridge, said member being arranged to bear against an abutment adjacent the end of said bore opposite to said open end and being operative upon rupture of said fuse link to eject said cartridge at least partially from said open end of the bore.

6. A fuse device adapted for mounting on an electric line conductor or the like and comprising a hollow insulator defining a bore open at one end for insertion of a fuse cartridge therein, a pair of terminal elements affixed to said insulator respectively adjacent opposite ends of said bore, one of said terminal elements having means for clamping attachment to a supporting conductor and the other of the terminal elements having means for connection of a second conductor thereto, a unitary fuse cartridge removably disposed in said bore and having a fuse link therein, means releasably retaining said cartridge in said bore with said fuse link electrically connected between said terminal elements, and means operative upon rupture of said fuse link to effect ejection of said cartridge at least partially from said open end of said bore.

7. A fuse device adapted for mounting on an electric line conductor or the like and comprising a hollow insulator defining a bore open at one end for insertion of a fuse cartridge therein, a pair of terminal elements affixed to said insulator respectively adjacent opposite ends of said bore, one of said terminal elements having means for clamping attachment to a conductor

for supporting the fuse device and the other terminal element having means for connection of a second conductor or electric lead thereto, a unitary fuse cartridge removably disposed in said bore and having a spring driven member arranged to bear against a part fixed relative to said insulator, means including a fuse link in said cartridge normally restraining said member in a retracted position, contact means conductively associated respectively with said terminal elements and frictionally engaging said cartridge to retain the latter in said bore, and means cooperative with said spring driven member upon rupture of said fuse link to effect ejection of said cartridge at least partially from the open end of said bore.

8. A fuse device adapted for mounting on an electric line conductor or the like and comprising a hollow insulator defining a fuse cartridge receiving bore open at one end for insertion of a fuse cartridge therein, a unitary fuse cartridge removably disposed in said bore, a pair of terminal elements affixed to said insulator respectively adjacent the opposite ends of said bore, and contact means conductively associated respectively with said terminal elements and respectively engaging spaced terminals of said cartridge to retain the cartridge in said bore, one of said terminal elements having means for detachable connection to a conductor for supporting the fuse device and the other of the terminal elements having means for connection of a second conductor or electric lead thereto.

9. A fuse support adapted for mounting on an electric line conductor or the like and comprising a hollow insulator having transparent walls defining a fuse cartridge receiving bore open at one end for insertion of a fuse cartridge therein, a pair of terminal elements affixed to said insulator respectively adjacent opposite ends of said bore, one of said terminal elements having means for attachment to a conductor for supporting said insulator and the other of the terminal elements having means for connection of a second conductor thereto, and contact means conductively associated respectively with said terminal elements and engageable respectively with spaced terminals of a fuse cartridge in said bore.

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