

Dec. 19, 1933.

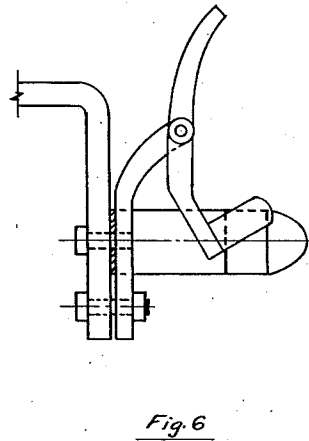
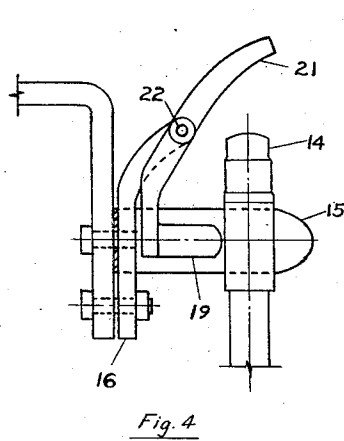
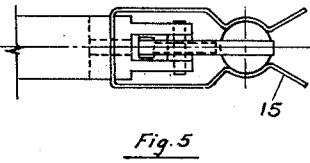
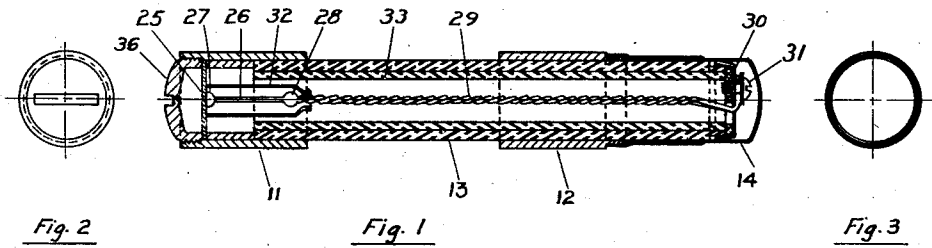
A. J. BOWIE

1,940,203

ELECTRIC CUT-OUT

Filed March 18, 1931

3 Sheets-Sheet 1



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INVENTOR

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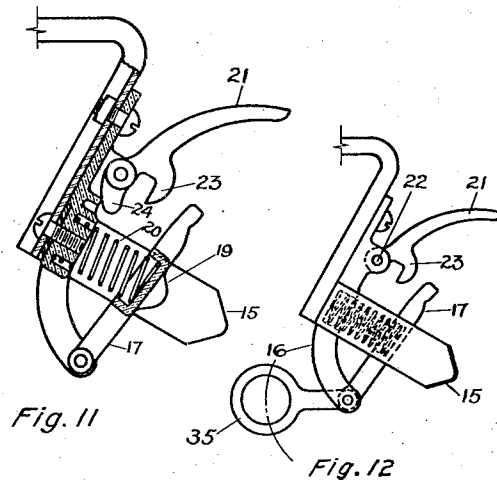
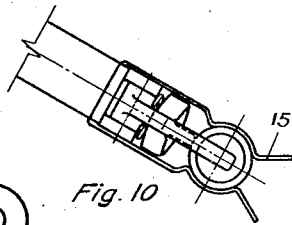
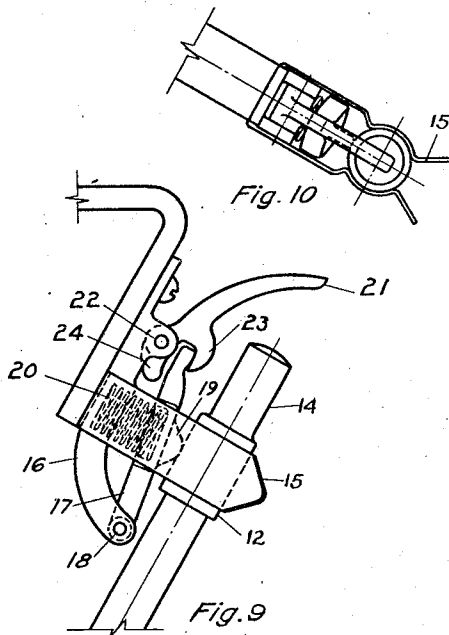
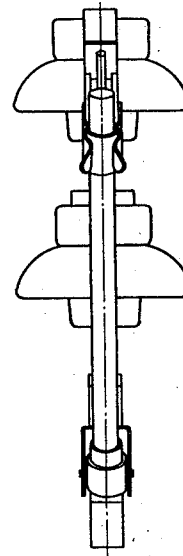
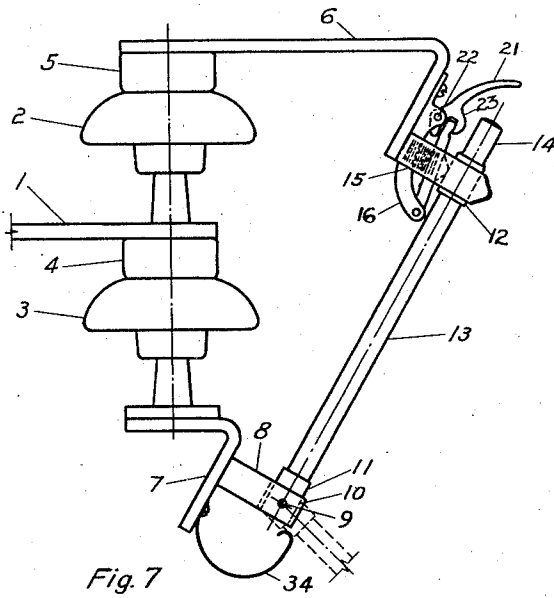
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

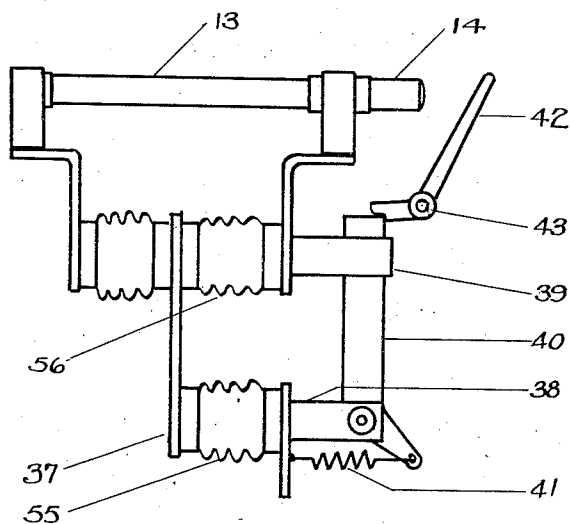


Fig. 13.

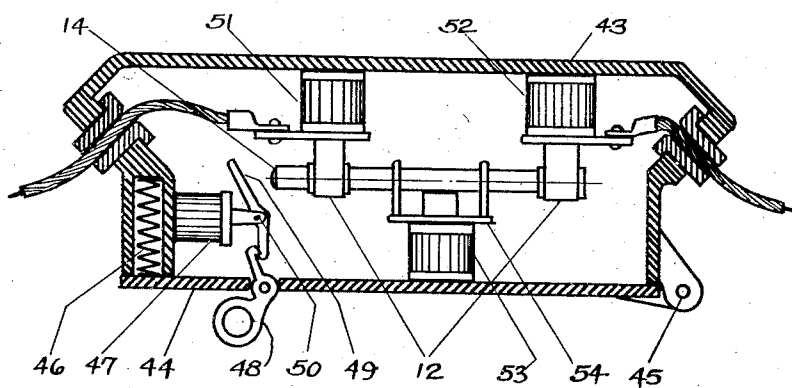


Fig. 14.

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## UNITED STATES PATENT OFFICE

1,940,203

## ELECTRIC CUT-OUT

Augustus Jesse Bowie, San Francisco, Calif.

Application March 18, 1931. Serial No. 523,390

11 Claims. (Cl. 200—116)

It is the object of this invention to provide improvements in cutouts, particularly where the blowing of a fuse causes the cutout to be actuated. One important use comprises a fuse element preferably in a tube, wherein the blowing of the fuse element actuates a member which will cause a rupture in the circuit external to the fuse tube, in addition to the circuit-interrupting feature of the fuse. One application is where the blowing of the fuse causes the fuse tube to be disconnected from its clip, thus inserting not only a gap in the tube caused by the blowing of the fuse, but also an additional air gap between the ferrule of the fuse and the clip with which it normally contacts.

A preferred design consists of a fuse closed at one end and provided with a cap at the other end which normally closes the fuse hermetically to the atmosphere. When the fuse blows, the pressure exerted within the tube will expel the cap, causing it to impinge on a trip mechanism adapted to cause the ejection of the fuse tube from the clip which retains it. A desirable blow-out cap and fuse arrangement consists of a cap which conveys the current from the inside of the fuse tube back up the outside of the tube into contact with a ferrule. When the cap is expelled, a positive air gap is left not only within the tube but back up the outside of the tube. In addition to this air gap the blowing of the fuse will cause an additional air gap to be inserted in the circuit between a ferrule of the fuse and the clip with which it normally contacts.

Figure 1 shows a longitudinal cross-section of a fuse, Figure 2 shows an end view thereof at the fusible end. Figure 3 shows an end view of the fuse at the blow-out cap end.

Figure 4 shows a plain fuse knockout in side elevation.

Figure 5 shows a plan view of Figure 4.

Figure 6 shows the fuse knockout illustrated in Figure 4 after the fuse has been knocked out.

Figure 7 shows a cutout in side elevation.

Figure 8 shows another elevation of the cutout.

Figure 9 shows in side elevation a detail of the spring-actuated fuse trip with the fuse in place.

Figure 10 shows a plan view of Figure 9.

Figure 11 shows in part section the detail of Figure 9 after the fuse has tripped.

Figure 12 shows an arrangement alternative to that in Figure 9 in side elevation, showing a hand operated re-setting device.

Figure 13 illustrates the manner in which an

independent switch in series with the fuse is caused to open by the blowing of the fuse.

Figure 14 shows the application to a fuse box whereby the blowing of the fuse causes the door of the fuse box to be opened and at the same time causes the disconnection of the fuse from the clip with which it engages.

1 is the cutout base on which are mounted insulators 2, 3 provided with caps 4, 5. Bracket 6 mounts on cap 5, and bracket 7 mounts on the pin of insulator 3. 8 is a hinge support mounted on 7 provided with trunnion pin 9 in which the socket 10 is swivelled. 34 is a recoil spring adapted to catch the socket 10 when the fuse opens. 11, 12 are ferrules mounted on an insulating fuse tube 13 provided at the upper end with a blow-out cap 14. 15 is a clip for engaging ferrule 12. 16 is a latch base member mounted on bracket 6. 17 is a pivoted knockout member mounted on pin 18 in base 16 and provided with a knockout piece 19 adapted to engage the bottom of the fuse tube and knock it out of the clip. 20 is a compression spring adapted to furnish the knockout energy. 21 is a lever mounted on pin 22 in the latch base 16 provided with a retaining latch 23 adapted to retain the end of the pivoted member 17 after it is set. 24 is a lip on member 21 attached to engage the end of member 17. The action of the cutout is as follows: the fuse tube 13 is swung around pivot 9 until it engages clip 15; but before entering engagement therewith it depresses lug 19 on piece 17 which first impinges on the outer side of latch 23 which is pushed back. Piece 17 is forced against a spring 20 until the end of piece 17 strikes the lug 24 causing the latch 23 to engage the end of piece 17. The position in which the cutout is commonly set will ensure the member 21 being in the position shown in Figure 9 by force of gravity. After the fuse has engaged the clip, latch 23 retains member 17 in position. When the fuse blows, the cap 14 is powerfully expelled from the end, impinging on arm 21 releasing the latch 23 and allowing the spring 20 pressing on knockout piece 19 to expel the fuse positively from the clip 15. The position of the fuse tube 13 then is such that its weight will cause it to open fully after leaving clip 15.

In the construction just described, the re-setting of the cutout spring 20 is accomplished by forcing the ferrule into the clip; but if a greater pressure than the fuse can advisably employ is desired, this may be accomplished by the method shown in Figure 12 wherein the ring 35, which is

part of the member 17, may be pulled down independently of the fuse through an insulated stick, re-setting the latch 23 and member 17. The fuse may then be inserted in the clip 15 with only sufficient manual effort to force it into the clip.

Figure 4 shows an alternative method of knockout wherein the energy for knocking the fuse out of the clip is provided solely by the energy with which the blow-out of the cap 14 is expelled, the blow cap 14 impinging on piece 21 being sufficient to knock the fuse out of the clip.

In Figure 1, 30 is a spring cap with attachment screw 31. 26 is a fusible link soldered to disc terminal 25 and to the conductor 29, the other end of which conductor attaches to the cap 30 through the screw 31. 27, 28 are two enlarged pieces of fusible metal composed of tin, lead, zinc or any alloys of these metals, through which the fuse 26 is attached. 32 is a small insulating tube, preferably of asbestos. 33 is an inner insulating lining for the fuse tube 13.

Conductor 29 is preferably made of copper. The cap 30 connects electrically to the blow-out cap 14, which in turn provides a path back up the outside of the fuse tube to the ferrule 12. When the fuse blows, link 26 melts and the arc is established between the disc 25 and the conductor 29. The fusible pieces 27 and 28 provide a mass of metal readily volatilizable for generating quickly sufficient gas pressure to expel cap 14. Cap 14 fits closely around the outer edge of the ferrule 12, providing an air-tight joint being held by friction. It is very important to provide the cap 14, hermetically sealing the tube from the atmosphere. As this cutout relies upon the forceful expulsion of cap 14 to effect the release of the fuse, it is very essential that the tube be sealed hermetically from the atmosphere, as otherwise with light loads or moderate loads pressure will not be generated within the tube of a sufficient strength to effect the blow-out of the cap 14, resulting in the destruction of the tube. The screw cap 36 which secures the disc 25 to the ferrule 11 seals the lower end of the tube. When the fuse blows, not only is sufficient pressure generated to expel forcibly cap 14, but the close fit of this cap over the upper end of the fuse tube 13 is well adapted to give this cap a high velocity to assist it in actuating forcibly any required trip mechanism. When the fuse element is expelled from the tube, conductor 29, cap 30 and blow-out cap 14 are all forcibly driven out with great violence, providing an essential feature for rupturing effectively the circuit. I utilize this expulsion force to effect the means for liberating the fuse tube from clip 15.

When the fuse blows, there is generated within the tube a pressure sufficient to overcome the frictional adhesion between the cap 14 and the ferrule 12. Also, since cap 14 fits closely over a material length of the end of the tube 13, it too is subjected to endwise pressure during its travel, acting in this respect like the bullet in a gun, until it clears the end of the fuse tube. The metal buttons 27, 28 will provide ample material to obtain any requisite pressure for operating the blow-out cap. It is an advantage to provide the member 29 of a material which will not be readily volatilized on the blowing of the fuse, so that the heat may be all generated adjacent to the bottom ferrule, thus protecting the inner wall of the tube from burning.

This fuse construction stores abundant energy

in the blow-out cap, which is ample to provide the necessary power to operate a trip means for causing the fuse tube to be disconnected from its clip.

The additional gap inserted in the circuit when the fuse blows may be entirely independent of the fuse tube and connections. Thus, for example, if an independent switch were located in series with the fuse actuated by a spring which would cause it to open, the blowing of the end cap of the fuse would be used to trip the latch holding this switch closed. However, it is generally preferable to have the additional rupture in the circuit take place between the fuse and the ferrule rather than through an auxiliary switch.

Figure 13 illustrates the method of causing blowing of a fuse to open at the same time an independent switch connected in series with the fuse. 37 is a base with insulators 55, 56 on which clips 38 and 39 are mounted. Blade 40, which is pivoted in clip 38, engages clip 39. It is actuated by a spring, 41, tending to cause it to open. 42 is a bell crank lever mounted on pin 43, which normally prevents the blade 40 from opening. The switch is connected in series with the fuse, comprising tube 13 and blow-off cap 14 mounted thereon. When the fuse blows, the blow-off cap 14 strikes the lever 42 and frees the blade 40, allowing the spring 41 to open the switch.

In order to get effective blow-out action, it is desirable to have the fuse tube properly sealed, and to have the cap member, which releases when the fuse blows, hermetically sealed. This I accomplish by the use of a thin metal cap with imperforate walls in frictional contact with the ferrule.

Other closure means adapted to be released by pressure within the tube may be used, but it is desirable to have the fuse build up a pressure within before the trip operates, to ensure powerful action.

In my preferred construction, the fuse wire is not subjected to any mechanical strain, an important consideration for proper and accurate operation.

Moreover, the power to effect the fuse liberations from the clip or clips is furnished by energy developed in the fuse tube preferably obtained from the blowing of the fuse.

While pieces 27, 28 are shown of fusible material, any other substance, solid or liquid, may be used adjacent to the arc formed when the fuse melts, to generate gas pressure within the tube.

While the trip release is preferably operated by the expulsion of a sealing closure such as a cap, it may be effected by a tube, with one end of the tube open, the reaction of the blow-out power generated when the fuse blows serving to operate the trip, as gas is generally strongly expelled from the tube when the fuse blows.

The expulsion of the fuse from the tube either with the tube open on one end, or with that end closed by a blow-out cap, will cause a reaction on the tube forcing it in the opposing direction, and this motion of the tube can be used to effect the trip of the trigger release. The force for operating the trip comes through gas pressure generated by the blowing of the fuse.

In housed cutouts, enclosed in a box, the fuse tube is commonly carried by the lid of

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the box, and hence this can be arranged to open when the fuse blows, by trigger release.

Figure 14 shows in principle the operation of the closed cutout. 43 is a fuse box with cover 5 44 pivoted on pin 45. 46 is a spring which tends to force the cover open. 47 is an insulator on which latch lever 49 is pivotally mounted, and is trunnioned on pin 50. 48 is a latch on the cover engaging latch lever 49. 51 and 10 52 are insulators in the box on which clips 12, 12 are mounted which support the fuse tube 13 engaging the ferrules thereon. 53 is an insulator carried by the cover on which fuse support 54 holding the fuse is mounted. When the fuse 15 blows the end cap 14 impinges on the lever 49 and allows latch 48 to open, causing spring 46 to open the box and disconnect the fuse which is pulled out with the cover.

What I claim is—

20 1. In an electric cutout, an enclosed tubular fuse, a fuse element, an end cap closing said fuse to the atmosphere, clips for conveying current to and from said fuse, means for expelling said cap when said fuse element melts, and 25 means operated by said cap for disconnecting said fuse from one of said clips.

2. In an electric cutout, an enclosed tubular fuse, terminals on said fuse for conveying current to and from said fuse, contacts on said cutout for engaging said terminals, the first of said 30 terminals being mounted externally to said tube, a fixed insulating barrier between said first terminal and the interior of the adjacent fuse tube end, a fuse element within said tube, electrical connections between said fuse element and said 35 terminals, closure means consisting of a cap in frictional engagement with one of said terminals and adapted to close to the atmosphere the end of said tube near said first terminal, said closure means being adapted to open under pressure 40 within said tube and thereby allowing the forcible ejection of said closure means on the melting of said fuse element, and release means actuated by the blowing out of said closure means 45 for disconnecting one of said terminals from one of said contacts.

3. In an electric cutout, an enclosed tubular fuse, a fuse element, means of closing one end of said tube to the atmosphere, a cap in frictional 50 engagement for closing the other end of said fuse tube to the atmosphere, contacts for said fuse tube to convey currents to and from said tube, connections on said cutout for said contacts, means for utilizing the expulsion of said 55 cap to actuate the releasing of said fuse tube from one of said contacts when said fuse element melts.

4. In an electric cutout, an enclosed tubular fuse, a fuse element, terminals for conveying 60 current to and from said fuse, contacts on said cutout for engaging said terminals, means for closing the ends of said fuse tube to the atmosphere, one of said closing means consisting of a cap closely fitting said fuse tube over a material length, said cap being released by interior 65 pressure when said fuse element melts and being subjected to interior pressure resulting from the blowing of said fuse element while its expulsion takes place, and means actuated by the motion 70 of said cap for disconnecting one of said terminals from one of said contacts when said fuse element melts.

5. In an electric cutout, an enclosed tubular

fuse, a fuse element, terminals on said fuse for conveying current to and from said fuse, contacts for engaging said terminals, closure means adapted normally to close hermetically said fuse 80 tube to the atmosphere, means through the forcible expulsion of one of said closure means for disconnecting one of said terminals from one of said contacts when said fuse element melts.

6. In an electric cutout, an enclosed tubular fuse, a fuse element, terminals on said fuse for 85 conveying current to and from said fuse, contacts for engaging said terminals, closure means adapted normally to close hermetically said fuse tube to the atmosphere, means through the forcible expulsion of said closure means and its 90 action upon a pivoted lever for disconnecting one of said terminals from one of said contacts when said fuse element melts.

7. In an electric cutout, an enclosed tubular fuse, a fuse element, terminals on said fuse for 95 conveying current to and from said fuse, contacts for engaging said terminals, closure means adapted normally to close hermetically said fuse tube to the atmosphere, means by which the forcible expulsion of one of said closure means 100 causes the tripping of a latch whereby a spring-actuated member and a release trigger adapted to be operated through the energy of the discharge of said closure means allow the said 105 spring-actuated member to disconnect one of said terminals from one of said contacts when said fuse element melts, said spring and latch being adapted to be reset by the insertion of said fuse tube terminals into said contacts.

8. In an electric cutout, a fuse tube, a fuse 110 element, terminals on said fuse, contacts on said cutout for engaging therewith, closure means adapted to close said tube hermetically sealed to the atmosphere, a fuse element within said 115 tube, a mass of material readily volatilizable adjacent to said fuse element, said mass being adapted to be volatilized when said fuse element melts, and means for releasing one of said 120 contacts through the forceful expulsion of said closure means.

9. In an electric cutout, a fuse tube, terminals on said fuse, contacts on said cutout for engaging therewith, closure means adapted to close 125 said tube hermetically sealed to the atmosphere, a short fuse element within said tube, a conductor in series with said fuse element, a mass of material adjacent to said fuse element and adapted to be readily volatilized when said fuse 130 element melts, said conductor being adapted to be expelled when said fuse element blows.

10. In an electric cutout, an enclosed tubular fuse, a fuse element, an end cap closing said 135 fuse to the atmosphere, clips for conveying current to and from said fuse, means for expelling said cap when said fuse element melts, said cap when expelled being free to move independently, means operated by said cap for disconnecting 140 said fuse from one of said clips.

11. In an electric cutout, an enclosed tubular fuse, a fuse element, end closing means for closing 145 said tubular fuse to the atmosphere, clips for conveying current to and from said fuse, means for expelling said closing means from said fuse when said fuse element melts, and means operated by the expulsion of said closure means 145 for disconnecting said fuse from one of said clips.

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