

Feb. 4, 1941.

T. F. JOHNSON

2,230,955

DROP-OUT FUSE

Filed April 24, 1939

2 Sheets-Sheet 1

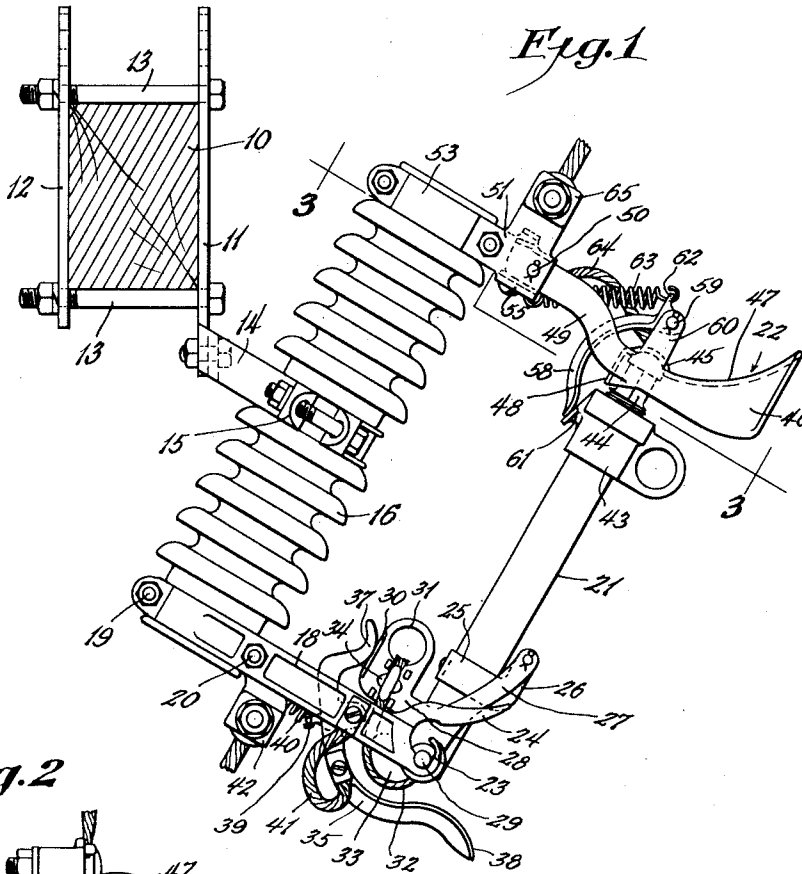


Fig. 2

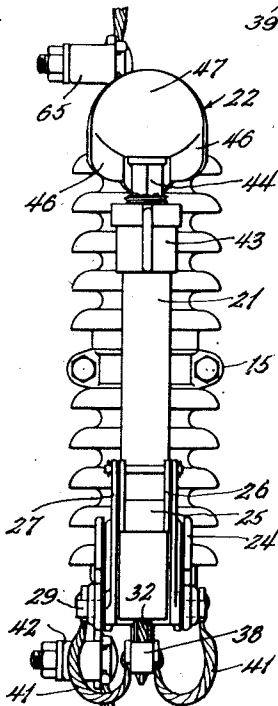
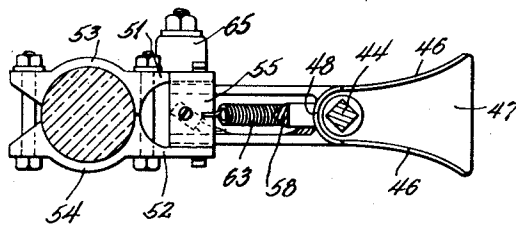


Fig. 3



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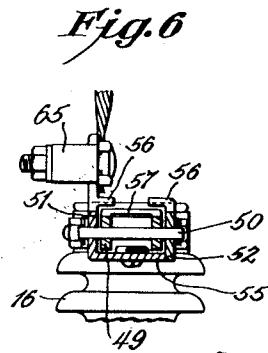
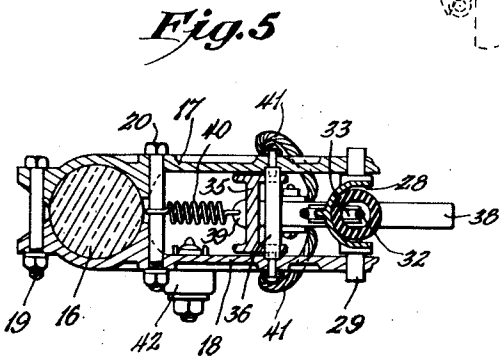
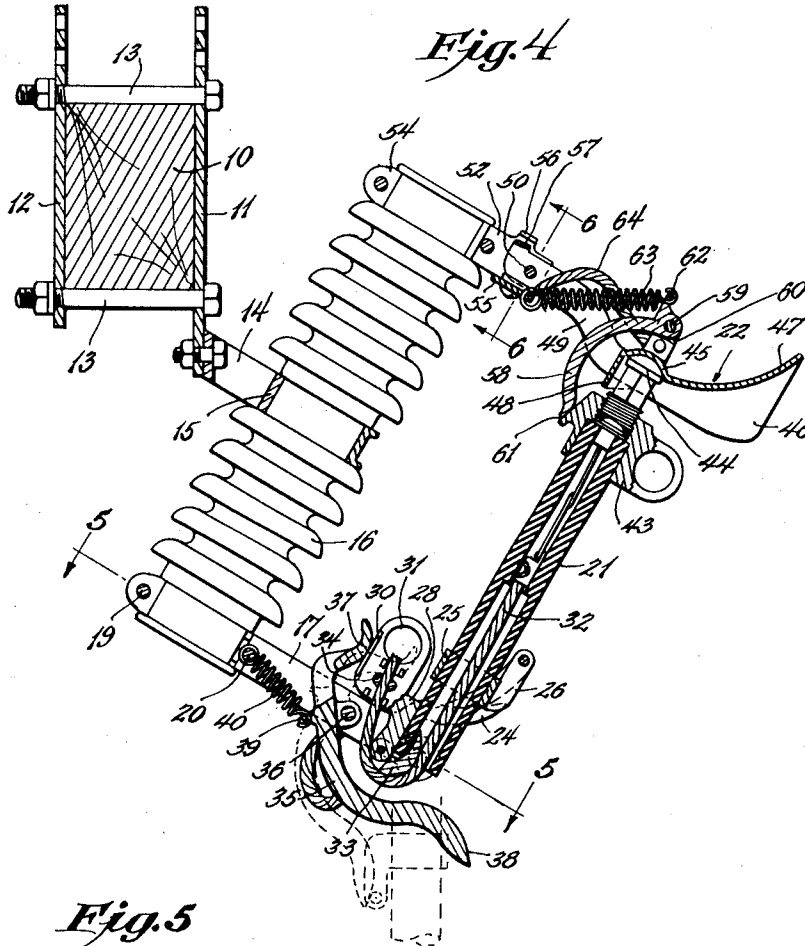
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UNITED STATES PATENT OFFICE

2,230,955

DROP-OUT FUSE

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Application April 24, 1939, Serial No. 269,712

11 Claims. (Cl. 200—114)

This invention relates to drop-out fuses for high tension transmission lines and, among other objects, aims to provide a greatly improved fuse assembly of the general type shown in Patent No. 2,074,913 embodying novel means to support the fuse unit and cause it to drop out and swing to a substantially vertical position. Another aim is to provide in a fuse assembly of this type a spring biased combination contact element and bumper coacting with the lower end of the fuse unit and a spring biased contact arm carrying a flip-out element coacting with the upper fuse terminal.

Other aims and advantages of the invention will appear in the specification, when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a side elevation of a fuse assembly embodying the invention;

Fig. 2 is a front elevation;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view; and

Figs. 5 and 6 are sectional views taken on the lines 5—5 and 6—6, respectively, of Fig. 4.

Referring particularly to the drawings, the preferred embodiment of the invention is applied to a drop-out fuse of the type shown and claimed in my patent No. 2,074,913, it being understood that it is applicable to many other types of drop-out fuse units, either single or multiple.

Herein, the drop-out fuse assembly is shown as being applied to a cross arm 10 of an ordinary pole type transmission line, although it is to be understood that it may be mounted on any supporting structure. In this instance, it is supported by a strap metal bracket 11 depending from the cross arm and having a clamping plate 12 for securing it on one side of the cross arm by means of bolts 13. The bracket 11 is here shown as being bolted at its lower end to a bracket extension 14 on one part of a two piece clamp member 15 which is secured to the middle of a single bushing type insulator 16 and the insulator is supported at an acute angle to the vertical, the bracket extension 14 having an angular seat for that purpose.

In this instance, the lower end of the insulator carries a pair of fuse supporting arms 17 and 18 shaped at their rear ends to embrace opposite sides of the insulator and to be clamped thereon by bolts 19 and 20. In the present example, a fuse unit 21 is pivotally carried by the outer ends of the arms 17 and 18 to be swung into engagement with an upper contact 22 so that it can drop out initially and then swing downwardly.

For this purpose, the arms have notched hinge bearings 23 and integral guide fingers 24.

As shown in my copending application, Ser. No. 180,423, filed December 13, 1937, the fuse unit comprises an ordinary fuse tube having a clamping collar 25 secured near its lower end and presenting a pair of spaced upstanding arms 26 to which are pivoted a pair of arms 27 of a hinge or toggle element 28 shaped at its lower end to straddle the lower rear portion of the fuse tube. The hinge or toggle element has integral trunnions 29 journaled in the bearings 23 and also carries an upstanding terminal 30 having a hook eye 31. The flexible fuse lead wire 32 is trained around a pivoted cam-shaped guide element 33 on the toggle member 28 extending into the lower end of the fuse tube and the wire is secured under tension to the terminal 30 by a clamping bolt 34.

In the closed position of the fuse the back face of the terminal 30 engages a combination contact member and bumper 35 pivoted on a spacer rod or shaft 36 between the arms 17 and 18. This member has an upper contact pad or face 37 and a bent lower end 38 and is biased to push out the fuse unit and also to act as a buffer for the unit after it falls out. For this purpose, the member has an ear 39 behind the pivot rod or shaft 36 and a tension spring 40 is connected between the clamping bolt 20 and the ear. Referring to Fig. 4, the contact member places the spring under tension when the fuse unit is closed. After the fuse unit swings out and strikes the bumper end 38 the member swings clockwise and places the spring under tension after the spring passes the dead center so that the member acts as a buffer to stop the drop-out movement of the fuse unit and the fuse unit will be permitted to hang in a substantially vertical position with the hook eye 31 exposed to be engaged by an ordinary switch hook for removing the unit.

A pair of flexible conductors 41 connect the member 35 to the arms 17 and 18 and the arm 18 is shown as having an integral tap lug 42 to which a line conductor is adapted to be connected in the usual manner.

The upper end of the fuse tube is shown as having a ferrule 43 carrying the usual hook eye to enable the fuse unit to be swung to its closed position by a switch hook. A terminal 44 in the form of a screw plug is connected to the ferrule and has a ball end cooperating with a socket 45 in the contact member 22. In this instance, the contact member is in the form of a flared channel-shaped hood having side flanges 46 which

serve to guide the fuse terminal into its socket. It has an upwardly curved wall 47 which the ball end of the terminal engages as the fuse unit is swung to its closed position and a rear wall 48 serves to limit the rearward swinging movement of the fuse unit. A pair of arms 49 extend rearwardly from the hood and are pivotally connected by a shaft 50 between forwardly projecting arms 51 and 52 on a pair of collar members 53 and 54, respectively, bolted to the upper end of the bushing insulator. The arm 51 is shown as having a horizontal ledge 55 at its lower edge to serve as a spacer member between the forwardly projecting arms. The two forwardly projecting arms 51 and 52 also have inwardly projecting lugs 56 overhanging the inner ends of the two pivoted arms 49 behind the shaft 50 and these arms are connected by an integral web or bar 57 so that the lugs serve as stop shoulders to limit the downward swinging movement of the upper contact 22.

To exert downward or drop-out pressure on the fuse unit through the terminal and to impart flip-out pressure to the upper end of the tube, there is shown a flip-out finger 58 pivoted on a shaft 59 between two upstanding ears 60 on the upper wall of the contact member 22 and extending between the rearwardly projecting arms 49. The lower end of this finger engages a boss 61 having a flat face at the rear of the ferrule 43. The upper end of the finger above the shaft 59 has an ear 62 to which one end of a tension spring 63 is connected and the other end of the spring is secured to the spacer ledge 55 on the arm 51. The spring serves not only to exert flip-out pressure through the finger on the upper end of the fuse unit, but also to exert downward pressure on the upper contact so that good contact is established between the fuse terminal and the contact member. A flexible conductor 64 is connected to one of the upstanding ears on the contact 22 and also to the ledge 55. The forwardly projecting arm 51 with which the ledge is integral also has an upstanding terminal lug 65 to which a line conductor is adapted to be connected.

Referring to the operation of the fuse assembly, the fuse tube is adapted to drop out and swing downwardly when the fuse is blown and the lead wire releases the hinge or toggle at the lower end so that the lower contact member can exert push-out pressure on the lower end. Simultaneously, the upper contact exerts downward pressure and the flip-out finger outward pressure on the upper end so that the fuse unit drops out rapidly and its upper end cannot fall backward or toward the insulator. The upper contact then swings downwardly through an angle of a few degrees until it is stopped by the limiting stop shoulders or lugs 56 on the forwardly projecting arms of the collar members. Also, the flip-out finger is limited in its forward movement by striking the rear wall 48 of the upper contact. It will remain in this position until the fuse is replaced and closed. After the fuse falls out and approaches its pendent or vertical position, it strikes the end of the bumper arm 38 and swings the bumper arm to a position shown in dotted lines in Fig. 4, in which position the fuse is approximately in a vertical position and the eye 31 on the terminal member 30 is easily accessible to be engaged by a switch hook for removal of the fuse unit. When the fuse unit is refused or replaced, it is swung back to its closed position and the ball end of the

upper terminal wipes against the curved cam face of the hood shaped contact and raises it to the position shown in Fig. 4, at the same time pushing the flip-out finger 58 back to its spring biasing position when the ball snaps into its socket.

From the foregoing description, it will be seen that the improved drop-out fuse assembly is relatively simple in its construction, rugged in its design and dependable in operation. It has no delicate parts which require adjustment or replacement. It can be manufactured and sold at a relatively low cost and it has demonstrated its commercial practicability in connection with electrification projects.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and sub-combinations.

What is claimed is:

1. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit carried by the insulator and biased to exert drop-out pressure on the unit; and a combined spring biased contact and bumper member coacting with said lower fuse terminal to exert push-out pressure on the fuse unit.

2. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit carried by the insulator and biased to exert drop-out pressure on the unit; a pivoted spring biased contact member coacting with the lower fuse terminal exerting push-out pressure on the fuse unit; and a depending bumper extension on said contact member in the path of the fuse unit to stop it in a substantially vertical hanging position.

3. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit carried by the insulator and biased to exert drop-out pressure on the unit; a spacer rod between said lower arms; and a combined contact and bumper member pivoted intermediate its ends on said spacer rod and coacting with the lower fuse terminal and the fuse unit when it drops out; and a single spring connected to said member to exert push-out pressure through said terminal to the fuse unit and also imparting resiliency to the bumper.

4. In a drop-out fuse assembly of the class

described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit carried by the insulator and biased to exert drop out pressure on the unit; a combined spring biased contact and bumper member coacting with said lower fuse terminal to exert push-out pressure on the fuse unit; and a spring biased flip-out member on the upper contact coacting with the upper end of the fuse unit to impart initial swinging movement to the unit when the fuse blows.

5. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit carried by the insulator and biased to exert drop out pressure on the unit; a combined spring biased contact and bumper member coacting with said lower fuse terminal to exert push-out pressure on the fuse unit; a flip-out member on the upper contact coacting with the upper end of the fuse unit to impart initial swinging movement to the unit; and a spring connected to bias both the upper contact and said flip-out member.

6. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit carried by the insulator and biased to exert drop out pressure on the unit; a combined spring biased contact and bumper member coacting with said lower fuse terminal to exert push-out pressure on the fuse unit; a flip-out member pivoted on the upper contact acting on the upper end of the fuse unit; and a single tension spring connected to the flip-out member and also exerting drop-out pressure on the upper contact.

7. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a supporting member connected to the insulator; a bearing bracket on the lower end of the insulator; a fuse unit removably journaled in said bracket and having a toggle-like hinge at its lower end; a bracket on the upper end of said insulator; a hood shaped contact member pivoted on said bracket and having a terminal socket; a ball terminal on said fuse unit adapted to be seated in said socket; a spring connected between said upper bracket and said contact member to exert endwise drop-out pressure on the fuse unit; and means also connected to said spring to exert flip-out pressure against the upper end of said fuse unit.

8. In a drop-out fuse assembly of the class

described, an elongated upstanding insulator; a supporting member connected to the insulator; a bearing bracket on the lower end of the insulator; a fuse unit removably journaled in said bracket and having a toggle-like hinge at its lower end; a bracket on the upper end of said insulator; a hood shaped contact member pivoted on said bracket and having a terminal socket; a ball terminal on said fuse unit adapted to be seated in said socket; a flip-out finger pivoted on the contact member and coacting with the upper end of the fuse unit; and a spring connected to said finger to impart flip-out pressure to it and also drop-out pressure to the contact.

9. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit in the form of a hood having a curved upper guide wall and pivotally carried by the insulator; a spring biasing said contact member to exert drop-out pressure on the unit; and a combined spring biased contact and bumper member coacting with said lower fuse terminal to exert push-out pressure on the fuse unit when the fuse blows.

10. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit in the form of a hood having a curved upper guide wall and pivotally carried by the insulator; a spring biasing said contact member to exert drop-out pressure on the unit; a pivoted spring biased contact member coacting with the lower fuse terminal exerting push-out pressure on the fuse unit; and a depending, curved bumper extension on the contact member in the path of the fuse unit to stop it in a substantially vertical hanging position after it drops out.

11. In a drop-out fuse assembly of the class described, an elongated upstanding insulator; a pair of spaced rigid arms secured to the lower end of the insulator and having notched bearings at their forward ends; a fuse unit having a toggle-like hinge member near its lower end journaled in said bearings; a lower fuse terminal on said hinge member to which the fuse lead is connected; an upper contact member for the fuse unit in the form of a hood having a curved upper guide wall and pivotally carried by the insulator; a spring biasing said contact member to exert drop-out pressure on the unit; means to limit the downward swinging movement of said contact member so that the upper fuse terminal will engage the guide wall upon closing; and a combined spring biased contact and bumper member coacting with said lower fuse terminal to exert push-out pressure on the fuse unit when the fuse blows.

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