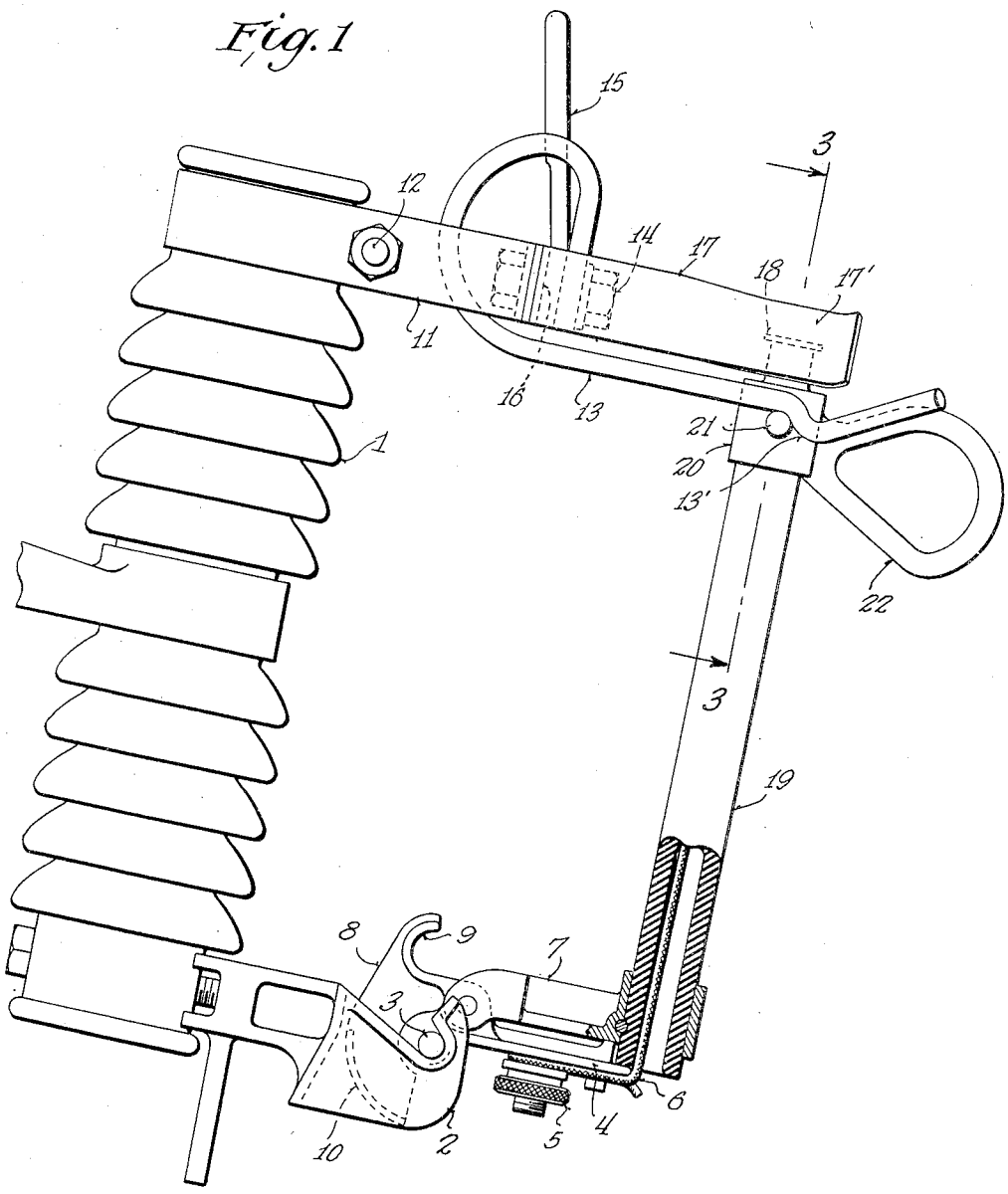
Oct. 12, 1943. R. D. NELSON ET AL 2,331,843

FUSE DEVICE

Filed June 4, 1942 3 Sheets-Sheet 1

Fig. 1



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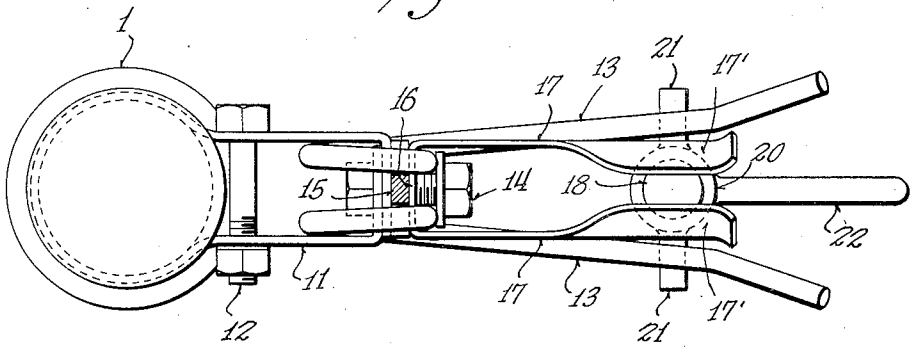
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Oct. 12, 1943. R. D. NELSON ET AL 2,331,843

FUSE DEVICE

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Fig. 2



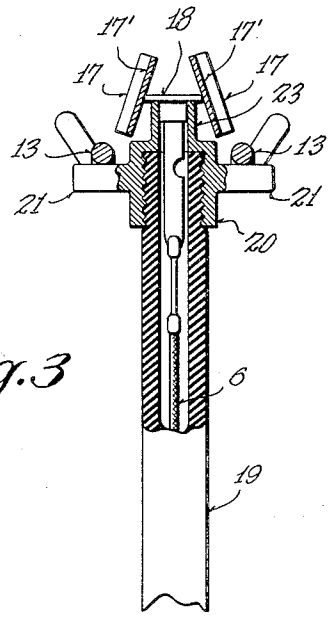


Fig. 3

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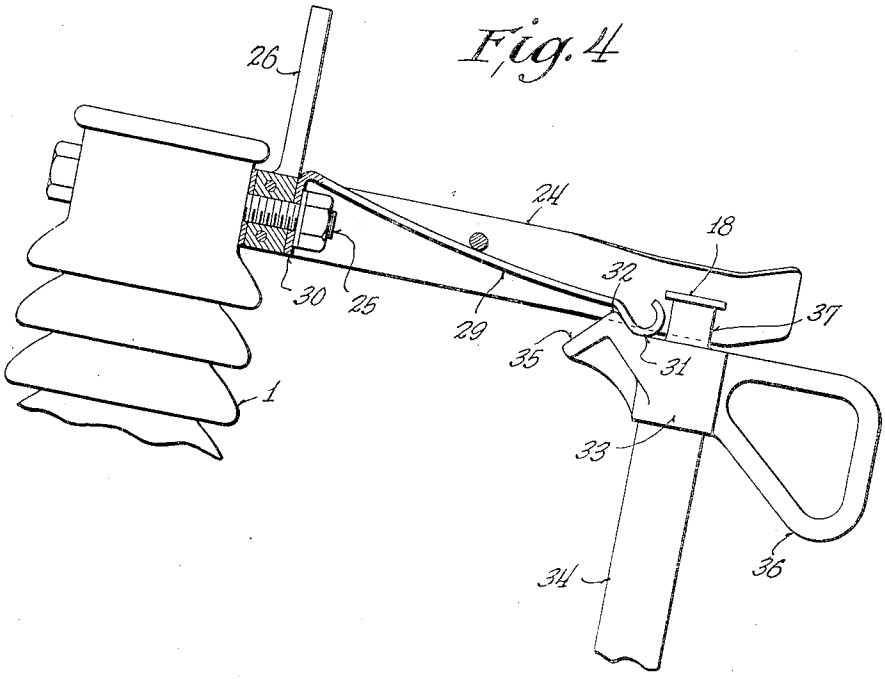
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Oct. 12, 1943. R. D. NELSON ET AL 2,331,843

FUSE DEVICE

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Fig. 4



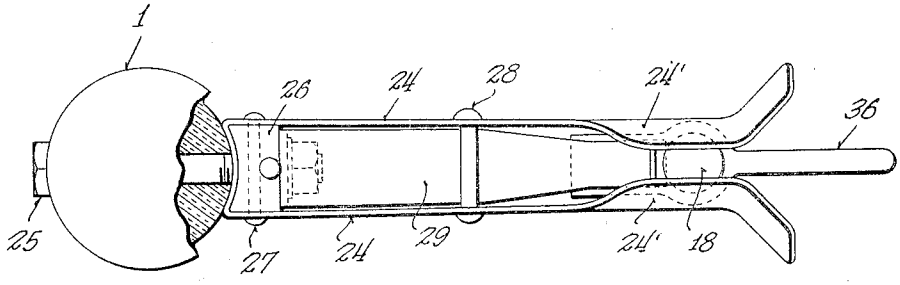


Fig. 5

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UNITED STATES PATENT OFFICE

2,331,843

FUSE DEVICE

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Application June 4, 1942, Serial No. 445,748

10 Claims. (Cl. 200—114)

This invention relates to fuse devices.

Objects of this invention are to provide a fuse device which employs a fuse tube open at both ends and which has a headed fuse link so arranged that the head of the fuse link closes one end of the fuse tube, and in which the head of the fuse link is adapted to be blown directly away from the end of the fuse tube in the event of a violent evolution of gas upon rupture of the fuse link so that the fuse tube will be vented at both ends.

Further objects are to provide an expulsion fuse device in which a fuse tube is provided which is open at both ends and in which a fuse link is positioned within the fuse tube and is provided with a head normally closing one end of the fuse tube, and in which stationary contacts are electrically connected under normal conditions by means of the fuse link, and in which provision is made for the free travel of the head of the fuse link away from the end of the fuse tube without engaging the adjacent stationary contact so that even under violent overload conditions no damage will be caused the stationary contact by the violent projection of the head of the fuse link outwardly away from the end of the fuse tube, and to provide a construction having the characteristics enumerated above in which the head of the fuse link has good and positive electrical contact with the adjacent electrically conducting portion of the fuse device.

A further specific object of this invention is to provide an expulsion fuse device in which the fuse tube is open at both ends, one end being closed by the head of the fuse link and the head of the fuse link being gripped in such a manner that under light overloads the head of the fuse link will not be blown off and the action of the fuse tube will be that of a fuse tube open at one end only to thereby assist in the speedy clearing of the circuit inside the fuse tube, the construction being such that under heavy overloads the head of the fuse link is blown from the fuse tube to thereby provide venting of the fuse tube at both ends, the device therefore having both the characteristics of an expulsion fuse tube open at one end only for light overloads and vented at both ends for heavy overloads, whereby the safe rupturing capacity of the apparatus is materially increased.

Further objects are to provide a fuse construction in which upper and lower stationary terminals are provided, the upper stationary terminal being provided with a pair of outwardly and downwardly flaring resilient contact arms which are adapted to directly engage the head of a headed fuse link extending through the fuse tube and normally electrically connecting the stationary terminals, the lower portion of the structure being provided with means under the control of the fuse link for releasing the fuse tube upon rupture of the fuse link and allowing the fuse tube to drop downwardly and outwardly to inoperative position.

Further objects are to provide a fuse tube construction in which the fuse tube is mounted between upper and lower stationary terminals and is provided with a fuse link having a head at its upper end, the upper terminal including a latching means for normally latching the tube in circuit closing position and a pair of downwardly divergent spring arms which are so arranged that they normally directly engage opposite sides of the head of the fuse link and are adapted to be spread apart when the head of the fuse link is projected outwardly upon heavy overloads, the construction providing a free passage for the head of the fuse link without damage to any portion of the upper stationary terminal.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a side elevation, partly broken away and partly in section, showing one form of the invention.

Figure 2 is a view looking down on the top of the structure shown in Figure 1 with a portion sectioned off.

Figure 3 is a sectional view on the line 3—3 of Figure 1.

Figure 4 is a view partly in section showing the upper portion of a further form of the invention.

Figure 5 is a view partly in section looking down on the structure shown in Figure 4.

Referring to the form of the invention shown in Figures 1 through 3, it will be seen that the device comprises an elongated insulator 1 which may be suitably supported as shown and which is provided with upper and lower contacts. The lower contact comprises a pair of spaced hook like members 2 which normally receive the trunnions 3 of a fuse extracting and releasing lever 4. This lever 4 is provided with a thumb nut 5 which clamps the flexible leader 6 of the fuse tube in place. The lever 4 is pivoted between the bifurcated ears of an arm 7 rigid with the lower portion of the fuse tube.

It is preferable to provide a web like member

8 integral with the lever 4, such web like member having a curved portion, as shown in dotted lines, which prevents inadvertent detachment of the trunnions 3 from the hook like members 2 until the fuse tube is rocked to its lowermost position. In its lowermost position the fuse tube may be lifted from the hooks 2 by means of a switch stick engaging in the hook like portion 9 of the web 8.

If desired, the web 8 may be provided with curved, laterally extending flanges as shown in dotted lines and indicated by the reference character 10 to assist in the positioning of the device within the look like member 2. The lever 4 is normally held in place by the fuse link and upon rupture of the fuse link, the lever 4 rocks downwardly and extracts any remaining portion of the fuse link and also lowers the fuse tube so that its upper end is unhooked from the upper stationary terminal and the tube may then rock outwardly and downwardly to inoperative position.

The upper terminal may comprise a strap like member 11 which may encircle the upper reduced end of the insulator 1 and which is held clamped in place by means of the bolt 12. The ends of the strap like member 11 are inturned and the looped portion of resilient arms 13 may be clamped in place by means of a bolt 14. The bolt 14 also passes through the lower end of a connector 15 and through the rear portion 16 of a pair of relatively flat spring contact arms 17 so that the flat resilient arms 17 and the round resilient arms 13, as well as the connector 15, are securely bolted to the strap like member 11.

The arms 17 extend outwardly and their upper edges are drawn towards each other so as to provide a pair of downwardly slanting contact members 17' which are adapted to engage the button head 18 of the fuse link, as shown most clearly in Figure 3. The outer ends of the flat arms 17 are outwardly flared to facilitate guiding of the upper end of the fuse tube and the button head of the fuse link into place when the fuse tube is rocked into operative position.

The fuse tube 19 is provided with an upper terminal member 20 which has a pair of outwardly projecting pins 21 which engage beneath the spring arms 13. These spring arms 13 are provided with downwardly depressed portions 13' which act as latching means to secure the pins 21 in place when the device is rocked into operative position. The arms 13 continue outwardly and diverge upwardly and outwardly to also assist in the guiding action of the upper end of the fuse tube when the fuse tube is rocked into operative position. The upper contact 20 of the fuse tube is provided with a manipulating eyelet portion 22 which is adapted to be engaged by a switch stick so that the tube may be rocked into position and rocked out of position by means of the switch stick as required.

It is to be noted, particularly from an examination of Figure 3, that the marginal edges of the button head 18 of the fuse link are engaged by the downwardly slanting portion 17' of the contact spring arms 17 and thus the button head is held firmly in electrical contact with these arms and also in firm electrical contact with the upper face of the reduced portion 23 of the upper contact 20 of the fuse tube. In addition to this, the spring arms 13, which constitute latching arms, also have firm electrical contact with the pins 21.

When the fuse link blows under light overloads, the action is that of an expulsion fuse as the button head 18 is held in place. However, under heavy overloads the gas pressure within the fuse tube will cause the fuse tube to vent itself at the top as well as at the bottom and will blow the button head 18 directly upwardy from between the spring arms 17 without damage to any portion of the upper stationary terminal, it being noted that the fuse tube opens directly outwardly through its upper terminal 20.

Thus the device is able to handle larger overloads than where a permanently closed upper end is provided. In addition to this, after the circuit has been cleared within the fuse tube, the fuse tube is released as described and drops downwardly and outwardly to inoperative position.

In the form of the invention shown in Figures 4 and 5 the spring contact arms are indicated by the reference character 24 and have the downwardly and outwardly slanting portions 24' which engage the button head 18 of the fuse link. These spring arms 24 are longer than the spring arms shown in the first form of the invention and may be clamped directly against the upper end of the elongated insulator 1, the bolt 25 also securing the connector 26 in place. If desired, a rivet 27 may be passed through the base of the connector 26 and the spring arms. It is preferable to provide a rivet 28 intermediate the ends of the arms 24. This rivet prevents spreading of the arms and additionally forms a bearing against which the latching spring 29 is adapted to press, such latching spring having its rear portion downwardly turned as indicated at 30 and clamped in place by means of the bolt 25. The latching spring 29 may have a tapered forward end as shown most clearly in Figure 5 and is provided with a rounded, downwardly projecting, rolled portion 31. The portion 31 is adapted to latch in front of an upwardly protruding part 32 formed integrally with the upper terminal 33 of the fuse tube 34. The rear face of the protuberance 32 is downwardly slanted to provide a cam face 35 upon which the rounded portion 31 is adapted to ride when the fuse tube is rocked into closed position. The upper contact 33 of the fuse tube is provided with a manipulating eyelet portion 36.

The arms 24 are resilient as well as the spring 29 and the arms 24 firmly grip the marginal edges of the button head 18 of the fuse link and secure a firm electrical contact therewith. They also urge the button head 18 downwardly into firm engagement with the upper face of the reduced neck 37 of the upper contact 33 of the fuse tube. The latching spring 29 also forms a firm electrical contact with the terminal 33 though the arms 24 are intended to carry the major part of the current as in the form previously described.

Upon rupture of the fuse link, the button head is held down, thus closing the upper end of the fuse tube on light overloads so that a straight expulsion action occurs. Thereafter the fuse tube drops downwardly and outwardly to inoperative position as previously described. However, on heavy overloads the button head is blown off from the fuse tube and freely passes from the spring arms 24, expanding the arms and traveling outwardly without damage to any portion of the upper stationary contact structure.

It will be seen that a novel form of fuse construction has been provided in which a larger overload can be handled than if the upper end of

the fuse tube were closed. It will also be seen that under small overloads a full expulsion action occurs, whereas under heavy overoads the fuse tube is vented both at its upper and at its lower end, thus avoiding excessive pressures and enabling the device to handle relatively large overloads with safety.

It will be seen further that direct engagement is made between the upper contact and the button head of the fuse link and that this electrical contact between the button head and the upper stationary contact is effective in providing a direct current path from the fuse link to the upper stationary contact.

It will also be seen that the construction is such that fuse links with different sized button heads could be employed as the resiliency of the arms 24 is such that they will spread sufficiently to take larger sized button heads as required.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

We claim:

1. In a fuse construction, stationary terminals, a fuse tube open at both ends and having a terminal at one end, and a fuse link having a head normally closing one end of the fuse tube and extending through said fuse tube and electrically connecting the stationary terminals, one of said stationary terminals having a pair of downwardly divergent yielding members bearing on opposite sides of the head of said fuse link, whereby the head of the fuse link may be blown outwardly between the said yielding members upon rupture of the fuse link on heavy overload.

2. In a fuse construction, stationary terminals, a fuse tube open at both ends and having a terminal at one end, and a fuse link having a head normally closing one end of the fuse tube and extending through said fuse tube and electrically connecting the stationary terminals, one of said stationary terminals having a pair of downwardly divergent yielding, flat, outwardly extending members bearing on opposite sides of the head of said fuse link, whereby the head of the fuse link may be blown outwardly between the said yielding members upon rupture of the fuse link on heavy overload.

3. In a fuse construction, stationary terminals, a fuse tube open at both ends and having a terminal at one end, and a fuse link having a head normally closing one end of the fuse tube and extending through said fuse tube and electrically connecting the stationary terminals, one of said stationary terminals having a pair of downwardly divergent yielding members bearing on opposite sides of the head of said fuse link, whereby the head of the fuse link may be blown outwardly between the said yielding members upon rupture of the fuse link on heavy overload, said yielding members holding the head of the fuse link in tube closed position under light overloads.

4. In a drop-out fuse construction, an upper and a lower stationary terminal, a fuse tube open at both ends and having a terminal at its upper end and normally latched to the upper stationary terminal, a fuse link provided with a head at its upper end closing the upper end of said fuse tube and extending downwardly through said fuse tube, means adjacent the lower end of said fuse tube controlled by said fuse link for releasing said fuse tube upon rupture of said fuse link to allow said fuse tube to drop downwardly and outwardly to inoperative position, said upper terminal having a pair of spring arms projecting outwardly therefrom engaging opposite sides of the head of said fuse link, said pair of spring arms being sufficiently flexible to allow the passage of the head of the fuse link therebetween upon heavy overloads.

5. In a drop-out fuse construction, an upper and a lower stationary terminal, a fuse tube open at both ends and having a terminal at its upper end and normally latched to the upper stationary terminal, a fuse link provided with a head at its upper end closing the upper end of said fuse tube and extending downwardly through said fuse tube, means adjacent the lower end of said fuse tube controlled by said fuse link for releasing said fuse tube upon rupture of said fuse link to allow said fuse tube to drop downwardly and outwardly to inoperative position, said upper terminal having a pair of flat spring arms engaging opposite sides of the head of the fuse link.

6. In a drop-out fuse construction, an upper and a lower stationary terminal, a fuse tube open at both ends and having a terminal at its upper end and normally latched to the upper stationary terminal, a fuse link provided with a head at its upper end closing the upper end of said fuse tube and extending downwardly through said fuse tube, means adjacent the lower end of said fuse tube controlled by said fuse link for releasing said fuse tube upon rupture of said fuse link to allow said fuse tube to drop downwardly and outwardly to inoperative position, said upper terminal having a pair of flat, downwardly diverging spring arms engaging opposite sides of the head of the fuse link and urging the head of the fuse link downwardly to tube closed position.

7. A fuse construction comprising an upper and a lower stationary terminal, a fuse tube pivotally supported from the lower stationary terminal and adapted to be rocked upwardly into latching engagement with the upper stationary terminal, said upper stationary terminal having latching means cooperating with said fuse tube, said fuse tube having a reduced neck portion, said upper stationary terminal having a pair of flat contact arms positioned on opposite sides of said neck portion, and a fuse link provided with a head normally resting upon said neck portion and engaged by the said flat arms of the upper stationary terminal, said fuse link extending downwardly through said fuse tube and being electrically connected to the lower stationary terminal.

8. A fuse construction comprising an upper and a lower stationary terminal, a fuse tube pivotally supported from the lower stationary terminal and having an upper terminal, the upper stationary terminal having a pair of spaced spring arms adapted to engage the upper terminal of said fuse tube, to normally hold said fuse tube in operative position, said fuse tube being open at both ends, a fuse link having a head normally closing the upper end of said fuse tube and extending through said fuse tube and electrically connected to the lower stationary terminal, means controlled by said fuse link adjacent the lower end of said fuse tube for releasing said fuse tube upon rupture of said fuse link for outward and downward motion to inoperative position with the upper terminal of said fuse tube out of engagement with said pair of spring arms, said upper stationary terminal having a second pair of spring arms projecting outwardly therefrom and engaging the

head of said fuse link on opposite sides thereof, said second pair of spring arms being located above the first mentioned pair of spring arms of said upper stationary terminal.

9. A fuse construction comprising a pair of stationary terminals, a fuse tube having a terminal at one end provided with a reduced tubular neck portion, said fuse tube being open at both ends, a fuse link having a head normally closing one end of said fuse tube and resting against the end of the tubular neck of the terminal of said fuse tube and extending through said fuse tube and electrically connected to one of said stationary terminals, the other of said stationary terminals having a pair of outwardly projecting spring arms out of contact with the neck portion of said upper terminal and engaging opposite sides of the head of said fuse link.

10. In a drop-out fuse construction, an upper and a lower stationary terminal, a fuse tube pivotally supported from the lower stationary terminal and open at both ends, said fuse tube having a terminal at its upper end provided with a latching portion, said upper stationary terminal having a downwardly urged spring arm provided with latching means for cooperation with the latching portion of the terminal of said fuse tube, a fuse link extending through said fuse tube and electrically connected to the lower stationary terminal and having a head normally closing the upper end of said fuse tube, said upper stationary terminal having a pair of downwardly divergent spring arms normally engaging opposite sides of the head of said fuse link and adapted to deflect and allow the head of the fuse link to pass therebetween on heavy overload, and means controlled by said fuse link adjacent the lower end of said fuse tube, said means releasing said fuse tube upon rupture of said fuse link for outward and downward motion to inoperative position.

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