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FUSED SWITCH

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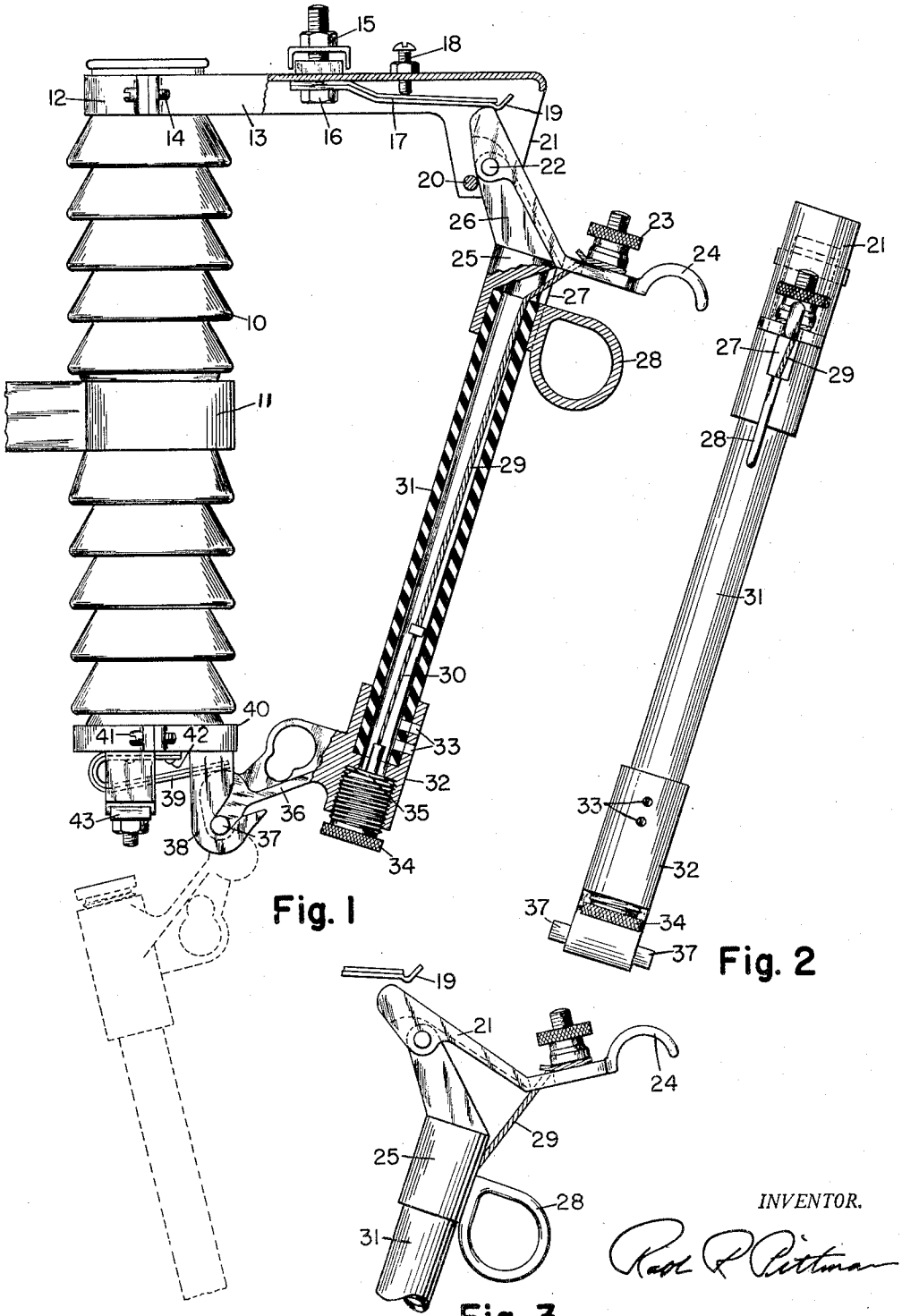


Fig. 1

Fig. 2

Fig. 3

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FUSED SWITCH

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This invention relates to fused switches of the character used in connection with electric distribution systems for over-current protection.

An object of the invention is the provision of a construction of the expulsion fuse type in which the incandescent gas and metal parts of the fuse link are discharged in a direction away from the operator of the switch, in a direction such that grass and timber fires are not started when the fusible element functions under short-circuit conditions, and in addition, in a direction away from energized conducting members. Fused switches heretofore generally used discharge the gas and heated metal parts blown out of the tube in endwise direction either downwardly toward the operator and ground, or upwardly toward live parts on the supporting structure, or both. More specifically, an objective is a construction in which discharge from the tube is blocked in both endwise directions.

Another object is to provide an expulsion fuse device wherein the predominating discharge blast is in such lateral direction with respect to and so impinged upon a portion of the fuse link that under the conditions of operation release of the fuse tube is prevented during the blast while the latter concurrently assists, through its impingement against the link, in quick extraction of the fuse link from the tube.

A further object is the provision of a construction wherein the lower end of the fuse tube is fixedly closed and the fusible element positioned near the lower end of the tube, together with an arrangement whereby a chimney effect is produced for normally ventilating the tube and avoiding attainment by the fuse tube of the higher normal temperature of the fusible element, which might otherwise char the inner surface of the fuse tube.

With these and other objects in view which will appear as the description proceeds, the following specification will set forth the organization, method of operation and further advantages of the invention.

Fig. 1 of the drawing is a side elevational view of the invention, shown partly in section; Fig. 2 is an angular front elevation of the fuse tube assembly of the invention; and Fig. 3 is a fragmentary side elevation illustrating an unlatched position of the upper contact.

As shown in Fig. 1, a bracket 11, partially shown, is attached to an intermediate portion of the insulator 10, and supports the latter in upstanding position. The outwardly extended conducting upper contact housing 13 is fastened to

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the upper end of the insulator 10 by the clamping screws 14, in cooperation with the half ring 12, and is formed somewhat in the shape of an inverted channel. Between the ends of the contact housing 13, a line terminal bolt 16 extends upwardly therethrough, the upper end being fitted with the line terminal 15. One end of the resilient conducting double leaf spring contact 17 is clamped between the head of the bolt 16 and the lower flat surface of the contact housing 13, extending first downwardly and then outwardly therefrom to a point near the end of the housing 13, at which point the lower leaf is bent downwardly and then upwardly to form the latch portion 19 of the upper contact. The adjusting screw 18 extends downwardly through the contact housing 13 in threaded engagement therewith and against the upper surface of the contact 17, to enable convenient adjustment of the position of its free end, and a stop pin 20 is extended transversely between the flanges of the channeled housing 13 to fix the limit of travel of a contact moved therein.

At the lower end of the insulator 10, the split conducting cup 40 embraces the lower end of the insulator 10, being rigidly held thereon by the clamping screws 41. To the bottom of the cup is riveted, by means of the rivets 42, one end of the lower resilient conducting contact 39, which extends first inwardly, thence downwardly and then outwardly, so that the other and unfastened end thereon is free to move up and down when engaged and disengaged respectively by a cooperating movable contact. A pair of hooks 38 extend downwardly from the cup 40 with their openings toward the front of the insulator 10, and are rigidly fastened to the cup 40 by welding, or other suitable means. Toward the rear of the insulator 10 a load terminal 43 extends downwardly from the cup 40, being rigidly fastened thereto by the rivets 42.

One view of the fuse tube assembly is shown at Fig. 2, and the assembly as illustrated in Fig. 1 is shown principally in section. The fuse tube 31 is the usual type of expulsion fuse tube, having an inner layer of fiber or other material having gas evolving, arc extinguishing quality, and may, if desired, be provided with an outer tube having weather-resistant and insulating properties, such as Bakelite impregnated paper.

At the lower end of the fuse tube 31 is fastened the lower terminal member 32 of the fuse tube, which is provided with the integral inwardly extending portion 36. A pair of sidewise extending pintles 37 are rigidly secured at

the inwardly extended end of the portion 36, to provide a pivotal mounting of the assembly through the engagement of the pintles 37 with the hooks 38. A removable fuse link terminal plug 34 threadedly engages a downwardly extending portion of the lower terminal member 32, and these members are arranged to clamp therebetween the button head 35 of the inwardly extending fuse link 29. A pair of inwardly extending openings 33 communicate with the bore of the tube 31 at a point adjacent the fusible element 30 of the fuse link 29.

At its upper end the fuse tube 31 has rigidly secured thereto the upper terminal member 25, which extends over the upper end of the fuse tube 31, and is provided with the upwardly and inwardly extending integral portion 26. The pivoted contact 21 is mounted on the upper end of the portion 25 for pivotal movement about the contact pivot 22, and normally extends upward to engage the resilient upper contact 19, and downwardly along the portion 26 and thence outwardly beyond the upper terminal member 25. The fuse link 29, fastened at its lower end as previously described, extends upwardly through the fuse tube 31 and laterally outwardly through and across the exhaust vent 27 of the upper terminal member 25, and thence to its normally fastened position on the fuse link terminal 23 at the outwardly extended portion of the pivoted contact 21.

For convenience in operating the switch, a manipulating eye 28 may be provided as an integral part of the upper terminal member 25, and the pivoted contact 21 may be provided with a switch hook engaging portion 24 at the outer end thereof, so arranged that upward movement of the portion 24 will mechanically stretch the fuse link 29 to rupture, thus insuring that the circuit-interrupting arc occurs within the fuse tube instead of externally thereof.

In normal operation, the current path through the switch is from the line terminal 15 to the upper resilient contact 17, thence through the pivoted contact 21 to the fuse link terminal 23, thence through the fuse link 29 including the fusible element 30 at the lower end of the fuse tube 31, thence through the lower terminal member 32 to the lower resilient contact 39, and then to the load terminal 43.

Movement of the fuse tube assembly from the closed position to the open position, partially shown by the dashed lines in Fig. 1, is normally restrained by the tension on the fuse link 29 reacting against the downward pressure of the resilient upper contact 19 about the pivot 22, this pressure urging the fuse link terminal 23 in upward direction, but normally prevented from so doing by the fuse link 29 fastened thereto.

If the fuse link 29 is ruptured for any reason when current is passing therethrough, either by fusing of the fusible element 30 or mechanically by forcing the switch hook engaging portion of the pivoted contact 21 in upward direction, the fuse tube assembly is unlatched from the upper shown fragmentarily at Fig. 3 to the fully open contact 19 and moves through the position position indicated by the dashed lines of Fig. 1.

Fused switches of this type are as a matter of usual practice operated by a workman positioned below the switch. Under heavy short-circuit conditions, parts of the fuse link are shot at high velocity from the fuse tube, accompanied by considerable flame. The openings 33 are too small to permit discharge of large portions of

the fuse link, and in any event are so directed that any material, either gaseous or solid, which discharges through the opening 33 is in a direction normally away from the workman, and so small and finely divided that it is sufficiently cooled before reaching the ground to preclude ignition of dry grass or leaves. The principal vent is at 27, and gas discharged through this vent impinges upon the portion of the fuse link which traverses the vent, thus assisting in the rapid extraction of the upper tail of the fuse link 29 and thereby quickly lengthening the arc within the tube to extinction.

When gas is discharging through the vent 27, it is directed outward and normal to the axis of the fuse tube 31, so that the reaction is in the direction to prevent outward movement of the fuse tube assembly toward the open position until gas discharge ceases, the latter condition following arc extinguishment. This precludes arcing at the upper contacts 19 and 21, and attendant damage.

The upper or line terminal 15 of the switch is normally connected to one of two or three line conductors mounted above the switch. Because the gas discharged from the fuse tube 31 under the conditions of operation may be highly conducting, it is desirable that no contact of such gas be made with live conductors, and the outwardly directed vent 27 effectively prevents such contact.

For the reasons above mentioned, it is desirable that no gas or incandescent metal parts be discharged endwise from either end of the fuse tube 31, and it will be clear that the construction herein described adequately provides for effective operation in a fused switch of the expulsion type without the necessity for discharging gas either upwardly or downwardly from the fuse tube. In addition, normal heating of the fusible element 30 causes surrounding air to rise through the tube to exhaust at the vent 27, and fresh air to be drawn into the tube at the openings 33, to thereby prevent charring of the inner surface of the fiber tube 31.

I claim:

1. A drop-out fuse construction comprising insulated means supporting spaced upper and lower contacts, an inclinatory fuse tube assembly including a fuse tube normally spanning said contacts, upper and lower terminal members mounted at the respective ends of said fuse tube, the upper member covering the upper end of said tube and completely blocking egress of gas therefrom in endwise direction and the lower member fixedly closing the lower end of said tube, an exhaust opening in the upper terminal member and a vent opening in the lower terminal member, the openings extending inwardly in transverse direction with respect to and in communication with the bore of said tube, a fuse link fastened at its lower end within said lower terminal member and extending upwardly through the bore of said tube and outwardly through and transversely across the exhaust opening of the upper terminal member, means controlled by said fuse link for normally latching said fuse tube assembly in closed position to said upper contact and releasing said assembly for swingable movement to open position in response to rupture of said fuse link, said exhaust opening being positioned to discharge gas from said tube laterally against said fuse link and in the direction of motion of said upper

terminal member when said fuse tube assembly moves from closed to open position.

2. A drop-out fuse construction comprising insulating means supporting spaced upper and lower contacts, an inclinatory fuse tube assembly including a fuse tube normally spanning said contacts, upper and lower terminal members mounted at the respective ends of said fuse tube, the upper member covering the upper end of said tube and completely blocking egress of gas therefrom in endwise direction and the lower member fixedly closing the lower end of said tube, an exhaust opening in the upper terminal member and a vent opening in the lower terminal member, the openings extending inwardly in transverse direction with respect to and in communication with the bore of said tube, a fuse link fastened to said lower terminal member and extending upwardly through the bore of said tube and outwardly through and transversely across the exhaust opening of the upper terminal member, means controlled by said fuse link for normally latching said fuse tube assembly in closed position to said upper contact and releasing said assembly for swingable movement to open position in response to rupture of said fuse link, said exhaust opening being positioned to discharge gas from said tube laterally against said fuse link and in the direction of motion of said upper terminal member when said fuse tube assembly moves from closed to open position.

3. A drop-out fuse construction comprising insulating means supporting spaced upper and lower contacts, an inclinatory fuse tube assembly including a fuse tube normally spanning said contacts, upper and lower terminal members mounted at the respective ends of said fuse tube, the upper member covering the upper end of said tube and completely blocking egress of gas therefrom in endwise direction and the lower member fixedly closing the lower end of said tube, an exhaust opening in the upper terminal member, said exhaust opening extending inwardly in transverse direction with respect to and in communication with the bore of said tube, a fuse link fastened to said lower terminal member and extending upwardly through the bore of said tube and outwardly through and transversely across the exhaust opening of the upper terminal member, means controlled by said fuse link for normally latching said fuse tube assembly in closed position to said upper contact and releasing said assembly for swingable movement to open position in response to rupture of said fuse link, said exhaust opening being positioned to discharge gas from said tube laterally against said fuse link and in the direction of motion of said upper terminal member when said fuse tube assembly moves from closed to open position.

4. A drop-out fuse construction comprising insulating means supporting spaced upper and lower contacts, an inclinatory fuse tube assembly including a fuse tube normally spanning said contacts, upper and lower terminal members mounted at the respective ends of said fuse tube, the upper member covering the upper end of said tube and completely blocking egress of gas therefrom in endwise direction and the lower member fixedly closing the lower end of said tube, an exhaust opening in the upper terminal member and a vent opening in the lower terminal member, said exhaust opening extending inwardly in transverse direction with respect to and in communication with the bore of said tube, a fuse link having a fusible element, said fusible element being positioned in the bore of said fuse tube, said fuse link being fastened to said lower terminal member and extending upwardly through the bore of said tube and outwardly through and transversely across the exhaust opening of the upper terminal member, means controlled by said fuse link for normally latching said fuse tube assembly in closed position to said upper contact and releasing said assembly for a swingable movement to open position in response to rupture of said fuse link, said exhaust opening being positioned to discharge gas from said tube laterally against said fuse link and in the direction of motion of said upper terminal member upon movemnet of said fuse tube assembly from closed to open position.

5. A drop-out fuse construction comprising insulating means supporting spaced upper and lower contacts, an inclinatory fuse assembly including a fuse tube normally spannnig said contacts, upper and lower terminal members mounted at the respective ends of said fuse tube, the upper member covering the upper end of said tube and completely blocking egress of gas therefrom in endwise direction and the lower member fixedly closing the lower end of said tube, an exhaust opening in the upper terminal member, said exhaust opening extending inwardly in transverse direction with respect to and in communication with the bore of said tube, a fuse link fastened at its lower end to said lower terminal member and extending upwardly through the bore of said tube and outwardly through and transversely across the exhaust opening of the upper terminal member, said fuse link being fastened at its upper end at a point above said exhaust opening, means controlled by said fuse link for normally latching said fuse tube assembly in closed position to said upper contact and releasing said assembly for a swingable movement to open position in response to rupture of said fuse link, said exhaust opening being positioned to discharge gas from said tube laterally against the outwardly extended portion of said fuse link and in the direction of motion of said upper terminal member when said fuse tube assembly moves from closed to open position.

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