Aug. 9, 1966 O. ACKERMANN 3,265,838

GAS PROPELLED FUSE LINK

Filed Nov. 14, 1963 4 Sheets-Sheet 1

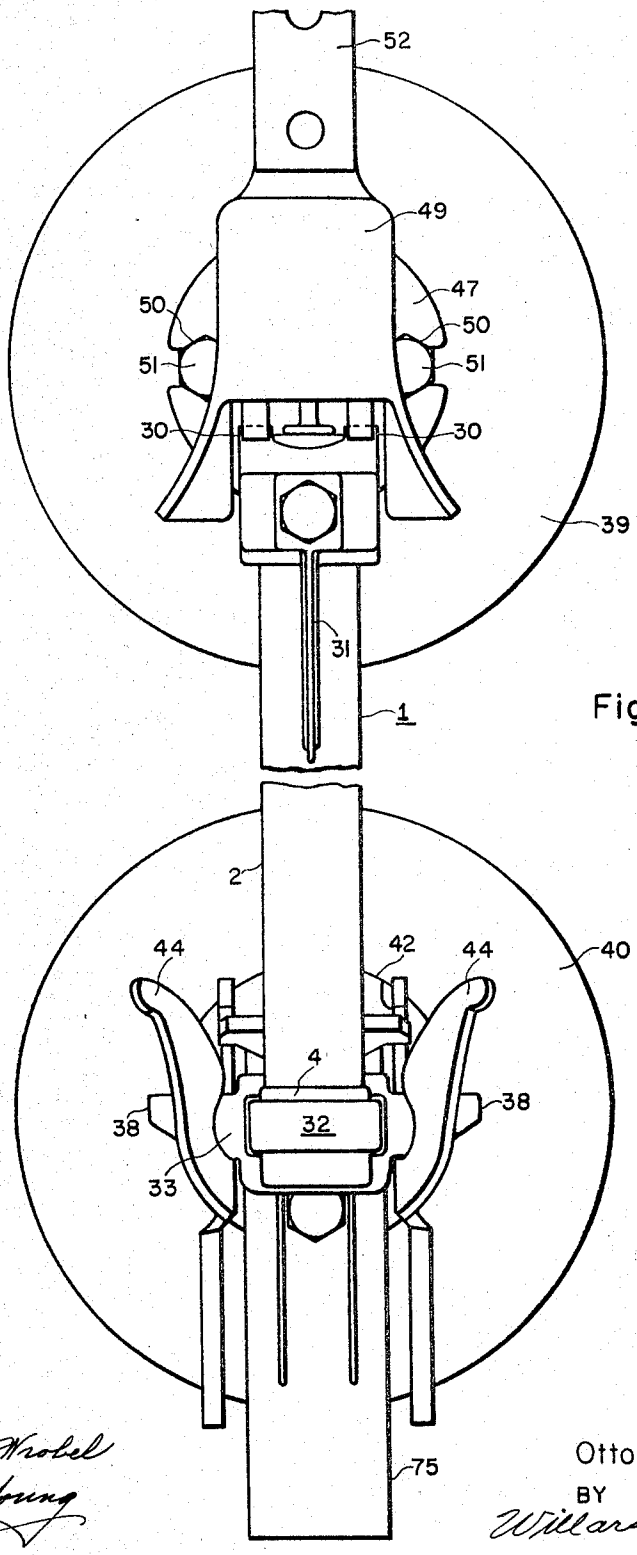


Fig. 1.

WITNESSES

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GAS PROPELLED FUSE LINK

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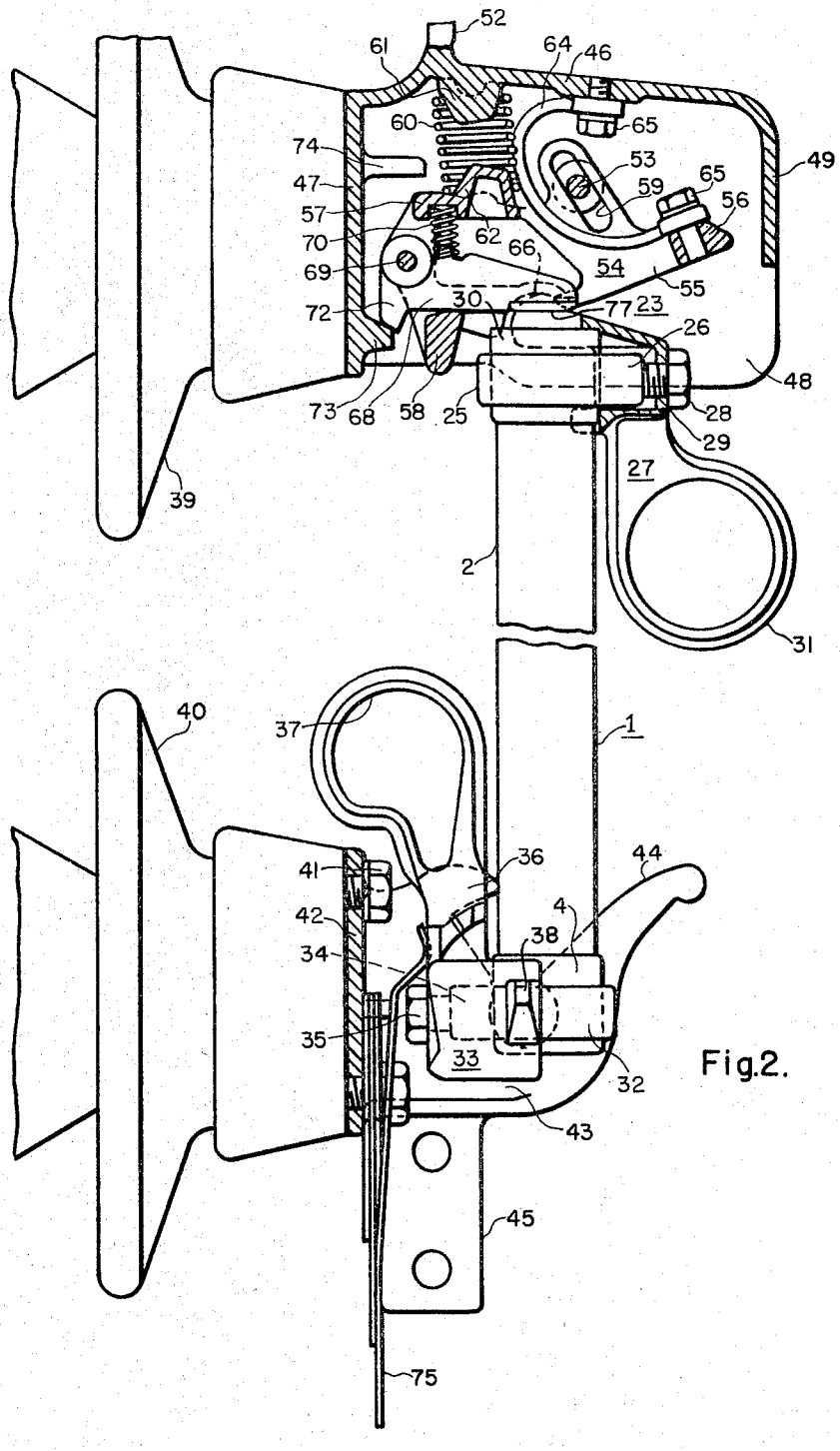


Fig.2.

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GAS PROPELLED FUSE LINK

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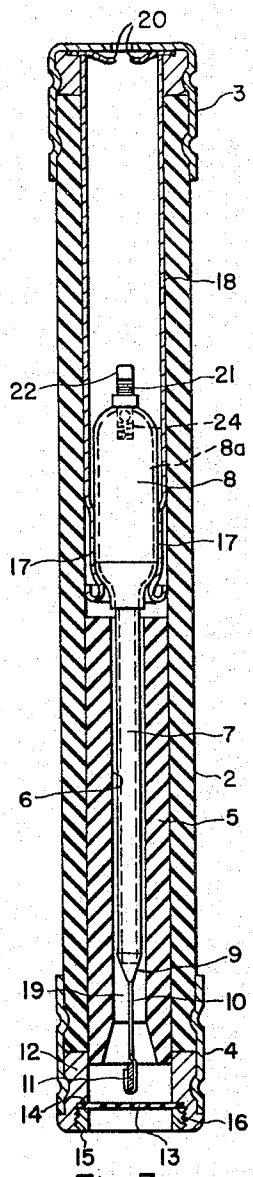


Fig. 3.

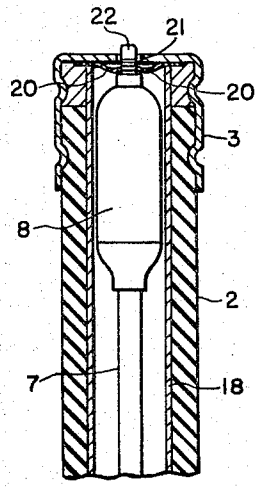


Fig. 5.

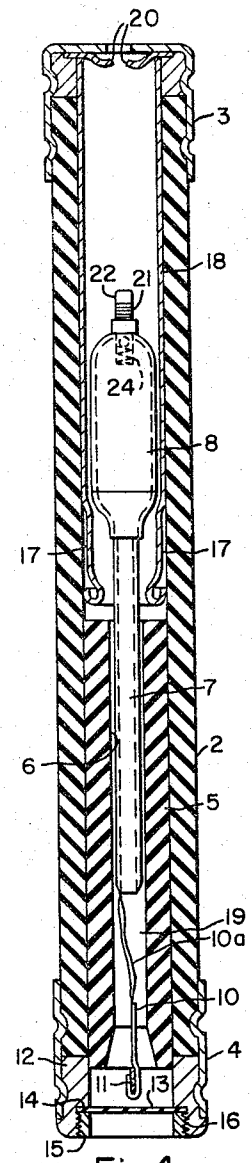


Fig. 4.

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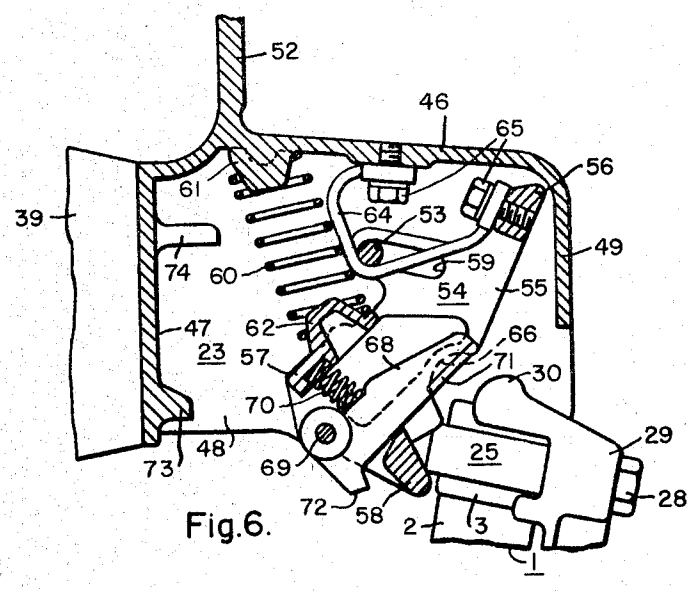


Fig.6.

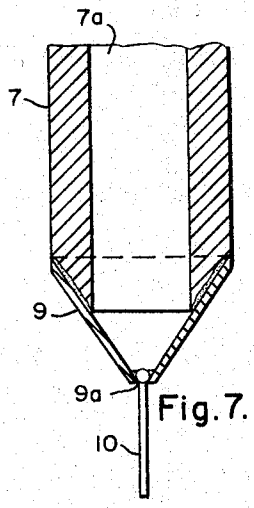


Fig.7.

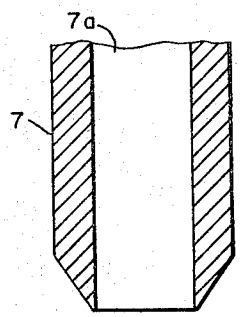


Fig.8.

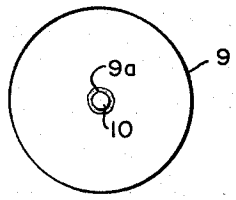


Fig.10.

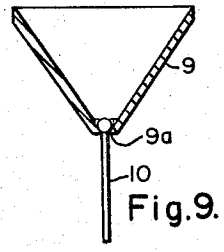


Fig.9.

United States Patent Office 3,265,838 Patented August 9, 1966

3,265,838

GAS PROPELLED FUSE LINK

Otto Ackermann, Irwin, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Filed Nov. 14, 1963, Ser. No. 323,680
10 Claims. (Cl. 200—120)

This invention relates to fuse constructions in general and, more particularly, to fuse constructions having associated therewith a cartridge containing a compressed dielectric, fluid, such as a compressed gas or liquid.

A general object of the present invention is to provide an improved and highly efficient fuse construction suitable for interrupting currents over a wide voltage and current range.

Still another object of the present invention is the provision of an improved fusible structure in which a cartridge of a compressed dielectric fluid is utilized not only for assisting in arc extinction, but also in assisting in effecting separation of the fused ends of the associated fuse link.

Still a further object of the present invention is the provision of a novel gas-blast type of fuse of compact dimensions and of simplified construction.

Still a further object of the present invention is the provision of an improved fuse, particularly of the power type, in which extremely rapid separation of the fusible terminals is effected.

Yet a further object of the present invention is the provision of an improved electrical fuse in which escape of a dielectric fluid from a capsule, or cartridge containing such fluid not only effects arc extinction, but also, by jet action, effects actual movement of the cartridge to a remote position, not only thereby effecting rapid separation of the fusible terminals but also where desired effecting unlatching of an associated dropout mechanism.

Still a further object of the present invention is the provision of an improved cartridge or capsule for containing a compressed dielectric fluid in which the filling means for the capsule, or cartridge also constitutes a latching means for maintaining the cartridge in the open-circuit position following fuse rupture.

Still a further object of the present invention is the provision of an improved fuse tube of substantially enclosed construction, in which diaphragm means are associated with one end of said fuse tube to result in a buildup of pressure interiorly of the fuse tube, whereby the cartridge containing the compressed dielectric fluid may be ejected in a piston-like manner toward a remote end of the fuse tube, and thereby quickly effect rapid separation of the fusible terminals.

Yet a further object of the present invention is the provision of an improved fuse tube as set forth in the immediately preceding paragraph, in which generally cylindrical gas-evolving means are positioned lengthwise of the separating fusible terminals to evolve gas by the intimate association of the arc with the interior wall of such gas-evolving means.

Another object of the invention is the provision of an improved triggering mechanism for a dropout type of fuse structure.

In United States Patent application filed October 11, 1963, Serial No. 315,490 by Russell E. Frink and Andrew Frey, and assigned to the assignee of the instant application, there is disclosed and claimed a novel fuse structure incorporating a compressed-fluid capsule secured to one end of fusible link means. Upon fusion of the fuse link means, the heat of the established arc is sufficient to melt a stopper closing one end of the capsule and release an ejected blast of high-pressure fluid toward the established arc. In addition, means biases the compressed-fluid capsule of the aforesaid patent application along a gas-evolving fuse bore to lengthen the established arc along such gas-evolving fuse bore to assist in arc extinction. It is an additional object of the present invention to improve upon the fuse structures of the aforesaid patent application, and to utilize the ejection pressure to expel the capsule along a guide cylinder to expedite rapid lengthening of the arc.

Still a further object of the present invention is to provide an improved fusible closure-cap assembly for the compressed-fluid capsule of a fuse device.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawings, in which:

FIGURE 1 is a front elevational view of a fuse constructed in accordance with the present invention;

FIGURE 2 is a side elevational view of the fuse shown in FIGURE 1, with the upper and lower contacts shown in section;

FIGURE 3 is a detailed longiutdinal sectional view taken through the improved fuse tube of the present invention;

FIGURE 4 is a detailed longitudinal sectional view, similar to that of FIGURE 3, but with the parts shown in the fused position;

FIG. 5 is a fragmentary view of the fuse structures of FIGS. 3 and 4 with the parts in the fully open-circuit position, and the dropout actuating pin protruding from the fuse tube;

FIGURE 6 illustrates a cross-sectional view taken through the associated kickout, or ejector mechanism carried by the upper terminal of the fuse structure, illustrating the kickout position of the several elements;

FIGURE 7 fragmentarily illustrates, in vertical cross-section, and to an enlarged scale, the upper extremity of the fuse link, and the attachment thereof to the lower cap-portion assembly of the compressed-fluid capsule;

FIGURE 8 is a detailed fragmentary view, also drawn to an enlarged scale, of the lower end of the capsule blast tube;

FIGURE 9 is a detail fragmentary sectional view, drawn to an enlarged scale, of a sub-assembly of the blast-tube assembly; and,

FIGURE 10 is a top plan view of the fuse subassembly illustrated in FIGURE 9.

Referring to the drawings, and more particularly to FIGURE 1 thereof, the reference numeral 1 generally designates a dropout-type fusible structure. It will be observed that there is provided a fuse tube 2 of insulating material, such as fiber, synthetic resin, or the like, and the opposite ends of the fuse tube 2 are adapted to be closed by end terminal caps 3, 4. The lower portion of the fuse tube 2, as viewed in FIGURE 3, is provided with a gas-evolving liner 5 having a longitudinally-extending bore 6. Extending longitudinally and generally centrally of the bore 6 is a tubular blast tube 7 which communicates with a capsule or cartridge 8, containing a suitable dielectric fluid 8a under pressure. The dielec-

tric fluid 8*a* may be compressed carbon-dioxide gas, or compressed sulfur-hexafluoride gas, or even a compressed liquid. The compressed fluid 8*a* may be both in the liquid and gaseous phases within the capsule 8. The upper end of the blast tube 7 is hermetically sealed with the lower apertured end of the cartridge 8 and forms an elongated outlet therefor.

Fixedly secured to the lower extremity of the blast tube 7 is a fusible stopper means, or cap 9, to which is fixedly secured, as by soldering, or the like, a fusible link 10. More specifically, the tubular section, or blast tube 7, should preferably comprise material of the highest electrical conductivity which is also economical. Copper is such a suitable material, for example, and its wall thickness should preferably be as heavy as is compatible with other requirements of the fuse of my invention. For example, the bore 7*a* should preferably be of the order of 3/16" to 1/4" in diameter, and the fusing of the cap 9 should preferably produce an opening in the blast tube 7 of generally similar dimensions, in order to produce a sufficient jet force to move the capsule 8 upwardly, as shown in FIG. 5. If, for example, the pressure of the fluid 8*a* within the capsule 8 is 300 p.s.i., then the reaction force released by opening a 3/16 inch diameter circular area (.028 in.^{2}) is $300 \times .028 = 8.4$ lbs. of force in the suggested example.

The wall thickness of the blast tube 7 should be as great as is compatible with the selected fuse-liner bore 6. At any rate, it should be made heavy enough to reduce to a minimum the heating by overload currents of magnitudes that come close to, but are not supposed to actually produce, melting of the fuse link 10. The heating of the blast tube 7 under permissible overload currents is a critical feature inasmuch as normal operation temperature fluctuations of the fluid contained within the capsule 8 must be controlled so as not to result in undesired rupture of the terminal cap 9.

The terminal cap 9 should preferably be of thinnest possible wall thickness, for the arc 10*a* produced upon melting of the calibrated fusible link 10 must be able to also melt the cap 9. This will set a lower limit to the current at which the fuse 1 will be able to operate, for heat is carried away from the cap 9 rather efficiently by the liquid or fluid 8*a* with which it is filled, and by the blast tube 7 to which it is joined. It is estimated that the lowest current at which the fuse 1 can be expected to operate is roughly of the order of 20 amps.

For such low current fuse ratings the wall thickness of the conical cap 9 must be reduced to a practical minimum which may be of the order of three-thousandths of an inch if consisting of Nichrome. The tip 9*a* of the cone 9 is opened just enough to pass the fuse wire 10, which might be of as little as 15 mil diameter Nichrome. The attached end of the fuse wire 10 may be upset, or in some manner made heavier than its calibrated diameter and is to be suitably secured, such as by brazing, for example, into the tip, or apex portion 9*a* of the conically-shaped cap 9. The seal must be hermetic in order to retain the fluid under pressure within the blast tube 7 and capsule 8.

At the higher range of current ratings, the cap 9 will have to be of different material, e.g. silver, and of heavier wall thickness, but always subject to the general requirements outlined in the foregoing.

The upward movement of the capsule 8 is caused first, by the unidirectional force released by, and proportional to, the opening secured in the pressure vessel (jet action). The opening, however, may under certain conditions be too small to overcome the forces which hold the capsule 8 in place. The latter are contact friction and weight. Combined, these forces may well amount to 5 lbs. to 10 lbs. In such a case, the escaping gas will more slowly fill the whole fuse bore 6 and finally exert direct piston pressure upon the capsule 8, said pressure being proportional to the capsule diameter. This force is greater than the first-mentioned jet force, because of the much greater area upon which pressure is developed. At low currents, it may well be the more dependable force for moving the capsule provided the fit between guide tube 18 and the capsule 8 is such that not too much gas is lost through leakage.

As shown in FIG. 3, the lower extremity of the fusible link 10 is anchored by a cross-strap 11, in turn supported by a lower apertured end contact 12. A rupturable diaphragm 13 is positioned between a shoulder portion 14 of the end contact 12 and a positioning ring 15, which is preferably threaded, as at 16, to the contact ring 12.

As shown in FIGURE 3, the cartridge 8 makes flexible contacting engagement with a plurality of contact fingers 17, which may constitute slotted extensions of a conducting metallic guide tube 18, within which the cartridge 8 makes a relatively tight fit, constituting thereby a generally piston-and-cylinder-like arrangement. In other words, the upward retracting movement of the cartridge 8 relative to the guide cylinder 18 may be effected by the generation of gas pressure within the lower end of the fuse tube 2, as more fully described above.

Preferably, it is desired to effect arc extinction, upon rupture of the fuse link 10, by the injection of a deionizing gas, or liquid, such as sulfur-hexafluoride (SF_6) gas into the arcing chamber 19. The generation of pressure within the arcing chamber 19, caused by melting of the cap means 9 and consequent ejection of the dielectric fluid 8*a* will effect upward piston-like retraction of the cartridge 8. In addition, the jetting and turbulent effect of the released compressed fluid 8*a* from the capsule 8 past the opened cap 9 will greatly assist in arc extinction. Finally, the arc 10*a*, lengthened axially along bore 6 and thus contacting the gas evolving liner 5, will by this evolution of arc-quenching gas further contribute to its own extinction.

As hereinbefore noted, the upward movement of the cartridge 8 not only effects rapid separating movement between the ends of the fused terminals, to thereby bring about rapid arc elongation 10*a*, but also the upward open position of the cartridge 8 is maintained by the engagement of a plurality of spring fingers 20 with grooves 21 of a filler plug stem portion 22. FIGURE 5 more clearly shows the relative position of the several parts in their open-circuit position.

From the foregoing it will be observed that arc interruption is accomplished primarily by the injection of a deionizing gas, or liquid 8*a*, such as (SF_6), into the arc chamber 19, the container 8 of the liquid and/or gas 8*a* being opened by the melting action of the arc 10*a*. Preferably, the container 8, which holds the arc-quenching medium 8*a* under pressure, comprises comparatively large-diameter vessel 8 joined to a smaller diameter tubular blast section 7, with the latter terminating in the cap portion 9 of minimum tolerable wall thickness, whose tip is attached to the fusible element 10. The fusible element 10, as explained hereinbefore, is calibrated to melt at a predetermined minimum current. The arc 10*a*, formed upon melting of the fusible element 10, will also melt all, or a part of the cap 9, and thereby open the container 8 and release the arc-extinguishing medium 8*a*. The latter, now being in the form of an expanding vapor, will fill the arc chamber 19 and the space around the tube 7 up to the vessel 8. It will push, or project the latter out of engagement with the contact fingers 17 and move the entire vessel 8 along the axis of the cylinder 18. The amount and pressure of the extinguishing medium 8*a* are selected so that when exhausting into the arc chamber 19 it forces the vessel 8 into the extreme upper position in which it is stopped by the ferrule 3, as shown in FIGURE 5. It is retained in this position by the spring fingers 20, of the ferrule 3, which engage in grooves 21 of the filler pin 22, which functions as a trigger plunger. When projecting beyond the ferrule 3, this pin 22 may preferably trigger a fuse dropout ejector mechanism 23, as more fully described hereinafter. The pin

22 is part of the plug which seals the valve 24, through which the vessel 8 is filled with the arc-extinguishing medium 8*a*.

It will be noted that the arc 10*a* and the arc-extinguishing medium 8*a* are at first confined to the arc chamber 19 and adjacent space by the diaphragm 13, which is designed so as to rupture only after sufficient pressure has been built up within the arcing chamber 19 to cause the movable vessel 8 to move the full length of its stroke. The gas-evolving liner 5, which surrounds the blast tube 7, is preferably made of horn fiber, boric acid, or another insulating gas-evolving material, which evolves some gas so as to assist in arc interruption and desirably to be essentially non-tracking under the presence of the arc 10*a*.

Referring now to FIGURE 2, it will be observed that for the purpose of mounting on circuit contacts, the fuse structure 2, described above, is adapted to have handling and mounting fixtures applied to the terminal caps 3, 4 thereof. Thus, terminal cap 3 is provided with a clamping ring 25 generally circular in form but provided on one side with a non-circular extension 26, and over this extension is provided a hook eye and latch fixture 27 having a supporting portion substantially channel-shaped in section to fit over the extension 26 of the clamping ring 25. A screw 28 passes through an aperture in the base of fixture 27 and is adapted to be threadedly engaged with the clamping ring to cause engagement of the U-shaped channel section 29 of the fixture with end terminal cap 3. Extending outwardly beyond end terminal cap 3, fixture 27 is provided with integral latch engaging extensions 30 on each side of terminal cap 3, for a purpose to be referred to. A hook eye portion 31 is also formed integral with the fixture and depends from channel section 29 thereof to be located in front of the fuse as shown in FIGURE 2, to permit manipulation of the fuse about its lower pivotal mounting.

Lower end terminal cap 4 of the fuse is also provided with a clamping ring 32 similar to clamping ring 25 for the upper end of the fuse, and a hook eye contact fixture 33 of semi-circular shape end of channel form in cross-section is adapted to be mounted over extension 34 of the clamping ring and be secured in firm engagement with terminal cap 4 by a screw 35 passing through the web of fixture 33, to be threadedly engaged with extension 34 of the clamping ring. The fixture 33 is provided with an integral upwardly extending projection 36, having a hook eye 37 formed therein generally circular in form. Adjacent each end of U-shaped fixture 33, there is provided an outwardly laterally-extending trunnion 38 for pivotally supporting the fuse.

The fuse is adapted to be supported upon a pair of vertically spaced insulating supports, such, for example, as the insulators 39 and 40. The lower insulator 40 is provided with a generally U-shaped contact secured thereto as, for example, by machine screws 41 extending through the base portion 42 of the contact. The legs 43 of the pivot contact are formed adjacent their outer ends with upwardly flaring notches 44. Each leg is also provided with an integral, downwardly extending terminal leg portion 45 for connection of a line conductor thereto.

The upper supporting insulator 39 has secured thereto a generally rectangularly-shaped contact supporting and enclosing hood which includes a top wall 46, a rear end wall 47, opposite side walls 48 flared outwardly adjacent the free corners thereof, and a partial front end wall 49 joined to top wall 46. Rear end wall 47 is substantially circular in form, as shown in FIGURE 1, and has opposed notches 50 formed in portions thereof beyond side walls 48 for receiving mounting screws 51, for securing rear wall 47 of the hood to supporting insulator 39. The top wall 46 of the contact hood is provided with an integral upwardly extending terminal lug 52 for the connection of a line conductor thereto. Interiorly of the contact housing there is provided a supporting pin 53, extending transversely of and mounted in side walls 48, for supporting a floating contact and latch member 54 for movement within the housing. The floating contact and latch member 54 may be in the form of a casting, and, as shown, is substantially rectangular in form, including opposite side members 55 secured together by an integral front connecting member 56, a rear top connecting member 57, and a rear bottom connecting member 58. The side legs 55 of the floating contact are provided with integral extensions having elongated slots 59 therein for receiving supporting pin 53, so that the contact may move in a plurality of different directions within the housing. A coil compression spring 60 engages between a supporting lug 61 on the top wall 46 of the housing and a similar supporting lug 62 formed integral with transverse connecting member 57 of the floating contact to bias the floating contact 54 in a counter-clockwise direction relative to pin 53. The floating contact 54 is electrically connected with top wall 46 of the housing by a flexible shunt 64, secured to the top wall of the housing and to cross-member 56 of the contact, for example, as by machine screws 65. The lower edges of side legs 55 of the floating contact, are provided intermediate their ends with notches 66 adapted to receive latch engaging projections 30 on the fuse. A releasable supporting lever 68 is pivotally mounted between side legs 55 of the floating contact by means of a pivot pin 69, and this lever is biased for movement in a clockwise direction relative to floating contact 54 into engagement with cross-member 58 of the contact, by a coil compression spring 70 engaging between lever 68 and cross member 57 of the contact. The forward end of lever 68 is provided with a flattened portion 71 positioned, when a fuse is engaged in notches 66, so as to be directly over the top of the fuse. A supporting lug 72 is also formed integral with lever 68 for cooperation with an integral supporting lug 73 formed on the rear wall of the contact housing. Stop lugs 74 are also formed integral with rear wall 47 of the contact housing, for engagement with cross-member 57 of the floating contact to limit movement thereof towards the top wall 46 of the housing.

When a fuse is moved pivotally in a counterclockwise direction into engagement with the floating contact, it may cause counterclockwise pivoting of the contact about lugs 72, 73 by engagement of latching lugs 30 on the fuse with the lower edges of legs 55 of the floating contact while stressing coil spring 60, until the latch lugs are received in notches 66 formed in legs 55 of the floating contact. At this time the parts will have assumed the position shown in FIGURE 1, and it will be noted that spring 60 has been stressed to the extent that supporting pin 53 is now intermediate the ends of slot 59 on the floating contact. This will provide a good contact pressure between the lugs 55 of the floating contact and fixture 27 associated with upper fuse terminal 4.

Now, with the fuse in the closed circuit position shown in FIGURE 1, in the event an overload appears on the circuit causing the melting of fusible link 10, the compressed-fluid cartridge 8 is moved upwardly as previously described. When extension 22 is projected through the top of the fuse as shown in FIG. 5, it will engage the outer end of releasable supporting lever 68, and cause movement of this member in a counterclockwise direction about its pivot 69 to thereby move lug 72 off fixed supporting lug 73 so that the inner end of the floating contact is no longer supported, thereby permitting spring 60 to move the contact in a counterclockwise direction about supporting pin 53. Counterclockwise movement of floating contact 54 about supporting pin 53 will cause movement of the upper end of the fuse outwardly, relative to insulator 39, and in a clockwise direction about trunnions 38. When the parts have attained this position, and even before, it will be obvious that the fuse will have reached an unstable position so that the action of gravity will

cause the fuse to drop downwardly to a depending position into engagement with bumper 75.

From the foregoing description of the invention, it will be apparent that there is provided an improved and self-contained fusible structure adaptable for interrupting currents and voltages over a wide range. Not only is the cartridge 8 adaptable for movement to an open-circuit position to quickly effect arc elongation, but also the movement of the cartridge 8 may serve to release a drop-out latch mechanism 23.

Although there has been illustrated and described a specific structure, it is to be clearly understood that the same was merely for the purpose of illustration, and that changes and modifications may readily be made therein by those skilled in the art, without departing from the spirit and scope of the invention.

I claim as my invention:

1. A fuse unit comprising a fuse tube having a tubular, conducting guide cylinder disposed inside the fuse tube adjacent one end and a relatively smaller fuse bore adjacent the other end, a fuse link disposed adjacent said fuse bore and adaptable to be fused by a predetermined current, a capsule disposed within said guide cylinder and containing a compressed dielectric fluid, said capsule being secured to one end of said fuse link, fusible stopper means for said capsule adaptable to be fused by the heat of the arc which results when the fuse link fuses, whereby the compressed dielectric fluid may be released toward the arc to effect arc extinction, and means utilizing the pressure released by said capsule to cause propulsion ejection movement of said capsule axially along and within the guide cylinder toward said one end of the fuse tube.

2. A fuse unit comprising a fuse tube having a tubular conducting guide cylinder disposed inside the fuse tube adjacent one end and a relatively smaller gas evolving fuse bore adjacent the other end, a fuse link disposed adjacent said fuse bore and adaptable to be fused by a predetermined current, a capsule located within said conducting guide cylinder and containing a compressed dielectric fluid, said capsule being secured to one end of said fuse link, fusible stopper means for said capsule adaptable to be fused by the heat of the arc which results when the fuse link fuses, whereby the compressed dielectric fluid may be released toward the arc to effect arc extinction, and means utilizing the pressure released by said capsule to cause propulsion movement of said capsule axially along and within the guide cylinder toward said one end of the fuse tube, and a trigger plunger carried by the capsule to trigger an associated dropout mechanism when the capsule is propelled to said one end of the fuse tube.

3. In combination, an expulsion-type fuse including tube means defining a guide bore and fuse bore, fusible means adjacent one end of the fuse bore including a fuse link and a capsule mechanically connected thereto, the capsule located within the guide bore and capable of ejection movement therealong, the capsule containing a compressed dielectric fluid and having a tubular extension which projects into the fuse bore and is secured to one end of said fuse link, fusible stopper means for the tubular extension of said capsule adaptable to be fused by the heat of the arc which results when the fuse link fuses, whereby the compressed dielectric fluid may be released toward the arc to effect arc extinction, and pressure-confining means for causing propulsion of the capsule axially along and within the guide bore when the dielectric fluid is released.

4. In combination, an expulsion-type fuse including tube means defining a guide bore and a gas evolving fuse bore, fusible means adjacent one end of the fuse bore including a fuse link and a capsule mechanically connected thereto, the capsule located within the guide bore and containing a compressed dielectric fluid, said capsule having a tubular extension which projects into the fuse bore and is secured to one end of said fuse link, fusible stopper means for the tubular extension of said capsule adaptable to be fused by the heat of the arc which results when the fuse link fuses, whereby the compressed dielectric fluid may be released toward the arc to effect arc extinction, and rupturable diaphragm means disposed adjacent the fuse bore to assist in building up the pressure and to thereby assure the propulsion of the capsule only along the guide bore when the dielectric fluid is released.

5. A fuse unit holder comprising a fuse tube having a tubular conducting guide cylinder disposed inside the fuse tube adjacent one end and a relatively smaller gas evolving fuse bore adjacent the other end of the fuse tube, a fuse link disposed adjacent said fuse bore and adaptable to be fused by a predetermined current, a capsule disposed within the conducting guide cylinder and containing a compressed dielectric fluid, said capsule being secured to one end of said fuse link, a fusible stopper means for said capsule adaptable to be fused by the heat of the arc which results when the fuse link fuses, whereby the compressed dielectric fluid may be released toward the arc to effect arc extinction, and gas confining means for propelling the capsule toward said one end of the fuse tube axially along and within the guide cylinder to quickly lengthen the arc by the released dielectric fluid.

6. An expulsive-type dropout fuse including supporting means for supporting a pair of stationary contact means, a pivotally-mounted fuse holder pivotally mounted upon one stationary contact means, a kickout mechanism associated with the other stationary contact means, said fuse unit comprising a fuse tube having a tubular, conducting guide cylinder disposed inside the fuse tube adjacent one end and a relatively smaller fuse bore adjacent the other end, a fuse link adaptable to be fused by a predetermined current, a capsule located within the conducting guide cylinder and containing a compressed dielectric fluid, said capsule being secured to one end of said fuse link, fusible stopper means for said capsule adaptable to be fused by the heat of the arc which results when the fuse link is fused, whereby the compressed dielectric fluid may be released toward the arc to effect arc extinction and gas confining means to eject the capsule axially along and within the guide cylinder, and a trigger plunger carried by the capsule to trigger said kickout mechanism.

7. A fuse structure including a fuse tube of insulating material having terminals adjacent opposite ends thereof, a conducting guide cylinder having contact means adjacent one end thereof, said guide cylinder disposed within the fuse tube adjacent one end thereof, a conducting compressed-fluid capsule having the wall portions thereof making contact with said contact means and having an elongated tubular extension with a fusible closure, means disposed within the fuse tube defining a gas-evolving fuse bore, said tubular extension being positioned along said fuse bore, a fuse link secured to the extremity of said tubular extension and disposed adjacent one end of the fuse bore, the other end of the fuse link being electrically connected to the associated fuse terminal adjacent the other end of the fuse tube, whereby the melting of the fuse link and the subsequent melting of said fusible closure will release a blast of compressed fluid out of the capsule and assist in arc extinction.

8. The combination of claim 7, wherein the capsule contains a trigger rod which is ejected externally of the fuse tube to initiate the actuation of an associated kickout mechanism.

9. The combination of claim 7, wherein rupturable diaphragm means are disposed adjacent said other end of the fuse tube to confine the pressure and cause expulsion of the capsule along the conducting guide cylinder.

10. A compressed-fluid capsule assembly for a fuse device comprising, in combination, compressed-fluid capsule means having a fluid-ejecting opening associated therewith, and fusible closure means for said opening including a generally conically-shaped relatively thin fusible cap for closing said opening, and a fuse link secured

to the apex portion of said generally conically-shaped fusible cap, said cap having a small opening at the apex portion thereof, said fuse link having an enlargement at the extremity thereof to prevent passage of the fuse link out through the opening in the cap.

References Cited by the Examiner

UNITED STATES PATENTS

2,343,422	3/1944	Rawlins	200—120
2,429,347	10/1947	Earle et al.	200—120.1
2,846,544	8/1958	Wood	200—127
3,032,630	5/1962	McCloud et al.	200—120.1

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