Nov. 21, 1944. A. P. STROM 2,363,370

CIRCUIT INTERRUPTER

Filed July 12, 1940

Fig. 1.

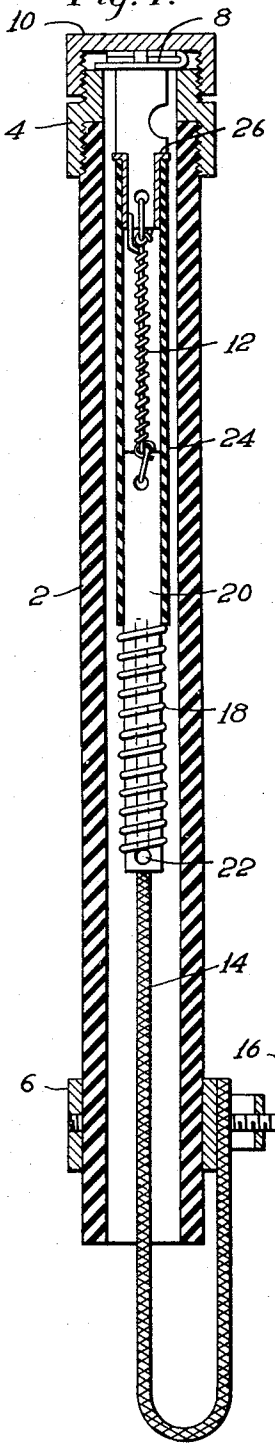


Fig. 2.

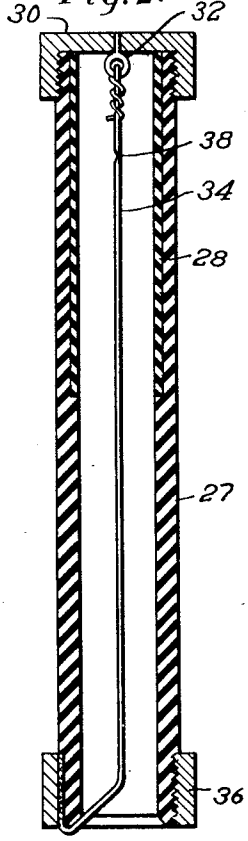


Fig. 3.

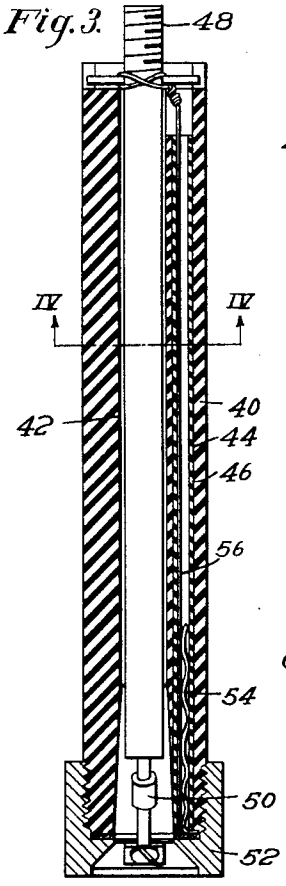


Fig. 4.

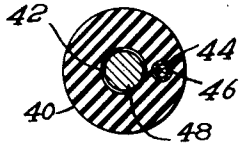
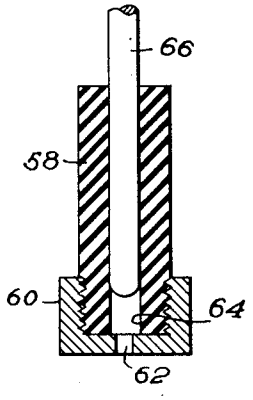


Fig. 5.



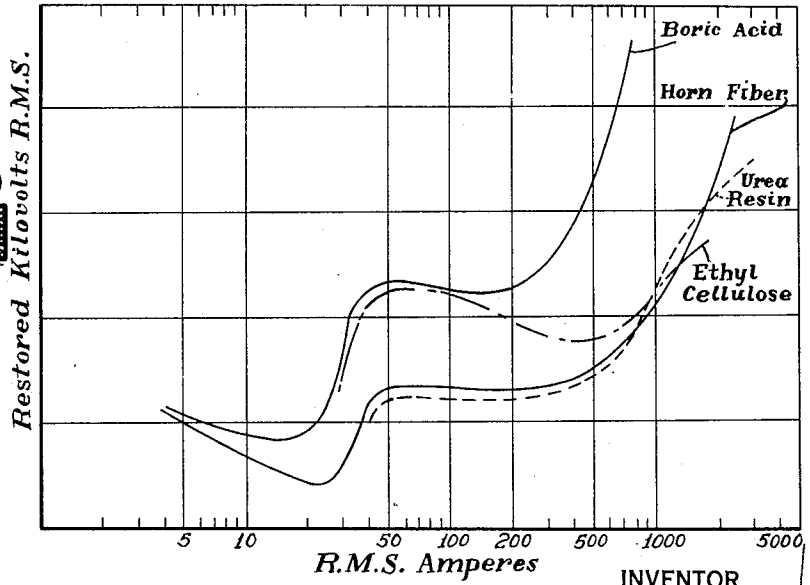


Fig. 6.

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2,363,370

CIRCUIT INTERRUPTER

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Application July 12, 1940, Serial No. 345,049

22 Claims. (Cl. 200—120)

My invention relates generally to electric circuit interrupting devices, and more particularly to novel means and methods of extinguishing the arc formed upon an interrupting operation of such devices.

In circuit interrupters of the type wherein the arc established upon a circuit interrupting operation is extinguished by a blast of unionized gas generated by the action of the arc on a gas evolving material, various types of gas evolving material have been proposed with varying degrees of success. It is desirable that such materials possess a plurality of widely varying qualities, all of which seldom occur in any given material.

Interrupters of the above mentioned type are commonly known as the "self-generated gas blast" type, and the evolution of arc extinguishing gas from the gas evolving material may be due either to the direct action of an arc on the material, or to the effect of the heat developed by the arc on the material. Such materials therefore must be located in proximity to the arcing zone of an interrupter, and in addition to the requirement that they be capable of evolving relatively large quantities of unionized gas to effect extinguishment of the arc, they should have a high resistivity and dielectric strength both before and after gas evolution to prevent flashovers following a circuit interrupting operation.

Furthermore, when an electric arc is confined between walls of a gas evolving material, relatively high gas pressures may be developed between such walls, and it is therefore desirable that such gas evolving material be relatively tough and of good mechanical strength to resist such gas pressures without requiring any reinforcement. In a fuse type of circuit interrupter, the arc formed upon blowing of the fuse is generally confined in a fuse tube having inner walls of gas evolving material. It is desirable that such fuse tubes be of a material which does not require additional reinforcement, and therefore if constructed of a gas evolving material, such material must be also strong enough to serve as a support for the fuse, inasmuch as the mounting fixtures for the fuse and fuse link are commonly mounted directly on and adjacent the ends of the fuse tube.

Some types of circuit interrupters, such as fuses, are commonly mounted out-of-doors either exposed to, or accessible by the atmospheric elements. Consequently another important property for gas evolving materials is that they be substantially impervious to moisture, so as not to impair the dielectric characteristics thereof, particularly when exposed to atmospheric moisture conditions.

Accordingly, one object of my invention is to provide a material which is capable of evolving relatively large quantities of arc extinguishing gases when in proximity to an electric arc, and which further has all of the above mentioned desirable qualities.

Of the known gas evolving materials having the properties set forth above, horn fiber and certain forms of boric acid have thus far proven the more practical. Both of these substances have suitable insulating and dielectric properties, however, boric acid has been found to be much superior to fiber with respect to gas evolution and hence in arc extinguishing ability, whereas fiber has a much greater mechanical strength, but is somewhat hygroscopic. One reason for the greater arc extinguishing ability of boric acid is that the gas evolved by fiber is largely hydrogen and carbon monoxide which is inflammable, whereas boric acid evolves water vapor or steam which, of course, is non-inflammable and capable of exerting a cooling action on the arc to further enhance its arc extinguishing ability.

According to my invention I have found that a cellulose derivative such as ethyl cellulose has all of the desired properties of a gas evolving material enumerated above, and furthermore combines a relatively high mechanical strength comparable to that of fiber, with a gas evolving ability much better than fiber and comparable to that of boric acid, especially for low current arcs. Ethyl cellulose furthermore is substantially non-hygroscopic.

Such a material which has relatively high gas-evolving properties at low currents, is especially adapted for use in interrupters of the type wherein separate passages are provided for interrupting large and small current arcs. This type of interrupter generally includes a small passage or bore for interrupting small currents, and a large bore for interrupting large currents. In nearly all arc extinguishing structures of the self-generated gas blast type, the quantity of gas generated is dependent upon the current value of the arc formed, and hence to extinguish low current arcs it has been found desirable to provide a separate small arc passage to bring the arc into closer proximity to the gas evolving material.

Accordingly it is another object of my invention to provide, in an interrupter of the type having different passages for interrupting arcs of

different current magnitudes, different gas evolving materials in the passages, respectively, with each of the particular gas evolving materials being especially adapted for extinguishing arcs of the current magnitude for which its associated arc passage is designed.

In high voltage fuses, it has in the past been common practice to provide a small tube of fiber about the fuse link to aid in extinguishing small current arcs, with high current arcs operating to burst the small tube and be extinguished within the fuse tube proper. Such a structure is disclosed in the patent to J. Sandin, No. 1,944,762, and issued to the assignee of this invention.

Another object of my invention is to provide a fuse of the type described, having an inner tube of a gas evolving material particularly suited for the extinction of small current arcs.

Another object of my invention is to provide a high voltage fuse of the above type, wherein the inner tube is of a gas evolving material particularly adapted for extinguishing small current arcs, and the outer tube is of a material particularly adapted for the extinguishing of large current arcs.

Another object of my invention is to provide in an interrupter of the type wherein an arc is drawn out in an elongated arc passage, with material along the passage capable of evolving an arc extinguishing gas when in proximity to an electric arc, with at least the material adjacent the point of initiation of the arc being more effective in extinguishing small current arcs, and at least the material remote from said point being more effective in extinguishing large current arcs.

These and other objects of my invention will become more apparent upon consideration of the following detailed description of preferred embodiments thereof, taken in connection with the attached drawing, in which:

Figure 1 is a longitudinal sectional view through one type of fuse constructed in accordance with my invention;

Fig. 2 is a longitudinal sectional view through a fuse embodying another form of my invention;

Fig. 3 is a longitudinal sectional view through a refill unit for another type of fuse with my invention embodied therein;

Fig. 4 is a transverse cross-sectional view taken substantially on the line IV—IV of Fig. 3;

Fig. 5 is a longitudinal sectional view through a circuit interrupter embodying my invention; and

Fig. 6 is a diagrammatic view showing characteristic interruption curves for different types of gas evolving materials.

Referring to Fig. 1 of the drawing, I have illustrated my invention as being embodied in a fuse substantially the same as that shown in the copending application of James M. Wallace, Serial No. 294,073, filed September 9, 1939, now Patent No. 2,343,723, issued March 7, 1944, and assigned to the assignee of this application. For complete details of the construction and operation of the fuse shown in Fig. 1 therefore, reference may be had to the above mentioned copending application.

In general, the fuse shown in Fig. 1 comprises an outer insulating fuse tube holder 2 which may be made of any desired insulating material which is capable of evolving an arc extinguishing gas when in proximity to an electrical arc, particularly effective in extinguishing high current arcs, and which has sufficient mechanical strength and resistance to moisture to enable it to perform its supporting function, such, for example, as fiber or the like. The fuse tube 2 is provided with an upper end terminal ferrule 4 threadedly engaged with the upper end of the fuse tube 2. A removable fuse link unit is adapted to be removably secured in the fuse tube 2 by having a terminal head portion 8 thereof clamped to the outer end of the terminal ferrule 4, as by the end cap 10 which is threadedly engaged with the ferrule 4. In general, the fuse link unit within the fuse tube 2 includes fusible and strain means 12, connecting the fuse link terminal button 8 to the fuse link terminal 20, which in turn is provided with a flexible conductor or tail 14 suitably secured thereto as by soldering or the like. The tail 14 extends downwardly out of the fuse tube 2 to be connected to a lower fuse ferrule 6 secured adjacent the lower end of the fuse tube 2, as by the thumb screw 16. The lower conducting terminal strip 20 is provided adjacent its lower end with an aperture 22 for receiving a pin against which the lower end of a coil compression spring 18 is adapted to seat. The upper end of the coil compression spring 18 seats against the lower end of a small insulating tube 24 provided about the fusible and strain means 12, and which has its upper end seated on the shoulder 26 on the upper fuse link unit terminal integral with the terminal button 8.

The small inner insulating tube 24 according to my invention comprises a material capable of evolving an arc extinguishing gas when in proximity to an electric arc, and the arc extinguishing characteristics of which are better than those of fiber which heretofore has been used for this purpose, especially for interrupting low current arcs. The main function of the small insulating tube 24 is to confine low current arcs so that they may be in closer proximity to walls of gas evolving material to more efficiently extinguish this arc. Upon the interruption of relatively high currents of the order of short circuit currents, the small inner tube 24 should burst to relieve the pressure within the tube and permit the gases to expand in the larger volume of the fuse tube holder 2. As a preferred material for this small inner tube 24, I have found that a cellulose derivative and especially ethyl cellulose is particularly suitable inasmuch as I have found that its arc extinguishing ability is much greater than that of fiber, especially for low current arcs, and for a certain low range of currents its arc extinguishing ability is substantially the same as that of boric acid. Ethyl cellulose, $[C_6(H_2O)_5]_x.C_2H_5$, when in proximity with an electric arc evolves gases, the major portion of which on low currents, comprises water vapor. Hydrogen gas is also evolved and carbon is released; however, on low current operation, the amount of hydrogen and carbon freed is relatively insignificant since the water vapor is much more easily liberated, which undoubtedly accounts for the excellent performance of this material in extinguishing small current arcs.

Referring to Fig. 6 of the drawing, I have shown characteristic curves of the arc extinguishing abilities of certain known materials compared to ethyl cellulose, with restored RMS kilovolts plotted against RMS amperes on a logarithmic scale. The upper and lower full line curves for boric acid and horn fiber, respectively, clearly show the superiority of boric acid over horn fiber with respect to arc extinguishing ability. The dash-line denotes the characteristics of urea resin which has been proposed as a substitute for fiber, and it can readily be seen that this material closely ap-

proximates the curve of horn fiber. The dot-dash curve shows the characteristics of ethyl cellulose and it will be noted that the arc extinguishing ability of this material on low currents closely approximates the boric acid curve up to about 150 amperes. The arc extinguishing ability of ethyl cellulose drops off relative to that of boric acid up to about 1300 amperes, but is still better than that of horn fiber. As pointed out above, ethyl cellulose is relatively mechanically strong, is for all practical purposes non-absorbent, and has a high dielectric strength and resistivity. Therefore it can be seen that at least for the interruption of low current arcs ethyl cellulose closely approaches the arc extinguishing ability of boric acid while having a greater mechanical strength than any form of boric acid used heretofore, and at the same time is nearly twice as good as fiber.

Other materials, in addition to those depicted in Fig. 6 were tested and included cellulose acetate, thiourea resin ($CS(NH_2)_2$), oxalic acid and Lucite (methyl methacrylate). Cellulose acetate, oxalic acid and Lucite all proved to have interrupting characteristics definitely inferior to ethyl cellulose, although for certain low current ranges they were somewhat better than fiber. Of these latter materials, oxalic acid would be unsuitable for many uses as an arc extinguishing material in view of its low resistivity of about 2.3×10^6 ohms per centimeter cube, which is about one three-hundredth as great as that of boric acid. It can readily be seen therefore that E^2/R losses with this material would be relatively high, and probably for the same reason it was found that at 6900 volts and above that the material breaks down inmmediately upon interrupting the circuit.

The interrupting characteristics of the materials mentioned above are substantially the same or slightly better than that of fiber at least on low currents. On high currents they will drop below the interrupting ability of fiber. Thio resin was found to be no better than, and possibly inferior to, urea resin, the curve of which is shown in Fig. 6.

It can, therefore, be seen that the characteristics of a fuse such as that shown in Fig. 1 will be greatly improved on low current operation with the use of a material such as ethyl cellulose for the inner fuse tube 24 for extinguishing low current arcs. On high current arcs the thickness of the tube walls is designed so that the tube will burst, and such high current arcs will be extinguished within the larger outer insulating tube 2. Again referring to Fig. 6, it will be observed that above 1300 amperes the fiber curve rises abruptly indicating that the arc extinguishing ability of this material improves on higher currents. Mainly because of the good mechanical strength of fiber therefore, and its increasingly good ability to extinguish high current arcs, it is readily seen that this material is particularly suitable for the fuse tube 2, the arc extinguishing function of which is concerned mainly with high current arcs. In operation, of course, upon the occurrence of an overload, the fusible and strain means 12 will be melted and the arc struck between the fuse link terminals and within the small inner tube 24.

One reason for the superior arc extinguishing ability of ethyl cellulose as compared to fiber is that at least for low current arcs the major portion of the gases evolved from ethyl cellulose comprises water vapor or steam, being in that respect similar to boric acid, whereas fiber, in general, emits an inflammable gas so that the arc extinguishing ability thereof relies mainly upon the blasting action of such gases on the arc, whereas with water vapor not only blasting action is obtained, but also a cooling action on the arc which further acts in extinguishing it.

Referring to Fig. 2 of the drawing, I have shown an insulating fuse tube 27 which may be of a material similar to that of the fuse tube 2 shown in Fig. 1 and having a tubular lining 28 adjacent one end thereof, which end is closed by a terminal cap 30 threadedly engaged with the end of the tube 27. The terminal cap 30 is provided with an eyelet 32 to which may be secured one end of a fuse wire 34, the lower end of which is secured between the opposite end of the fuse tube 27 and a terminal ferrule 36 threadedly engaged therewith. The fuse wire 34 is provided with a reduced portion 38 adjacent the closed end of the fuse tube 27 and the lining material 28, so that upon the occurrence of an overload the arc will be initially formed at this point.

The lining material 28 in this form of my invention again may advantageously be ethyl cellulose to aid in the extinguishment of small current arcs inasmuch as such arcs will be confined substantially to adjacent the closed end of the tube and the region of lining 28. Upon the occurrence of large current arcs the arc may extend throughout the length of the tube and accordingly will not only be acted upon by gases emanating from the ethyl cellulose lining 28, but also the material of tube 27.

In Fig. 3 of the drawing, I have illustrated a refill element adapted to be used with a fuse of the type shown in the patent to H. L. Rawlins, No. 1,976,634, issued October 9, 1934, to the assignee of this application. Therefore, for complete details of the construction of this type of fuse, together with a full description of the general operation thereof, reference may be had to the above mentioned patent.

For the purposes of my invention it is believed sufficient to state here that the refill unit comprises in general a substantially cylindrical block 40 of suitable gas evolving material such, for example, as fiber or the like which is capable of efficiently extinguishing large current arcs. The tubular block 40 is provided with a central bore 42, and an eccentric smaller bore 44 having a lining 46 of ethyl cellulose or other material having a good mechanical strength and relatively high arc extinguishing characteristics on low currents. An arcing rod 48 is positioned within the large bore 42 of the insulating block 40 and is connected to a terminal ferrule 52 secured at the lower end of the block, by fusible and strain means 50. A shunt between the upper end of the arcing rod 48 and the terminal ferrule 52 is provided by wires 54 and 56 secured respectively to the arcing rod 48 and terminal ferrule 52, and positioned in the small bore 44 in overlapping relation.

The general operation of this type of fuse unit is as follows: When the fusible means 50 blows on relatively low currents, a spring or other means is employed to move the arcing rod 48 upwardly in the bore 42 to elongate the arc. On small current arcs obviously as soon as the fusible means 50 blows the overload is transferred to the small wires 54 and 56 in the small bore 44. Continued movement of the arcing rod 48 out of the bore 42 will separate the wires 54 and 56 and the arc will be extinguished within the

small bore 44 by the gases evolved from the lining 46 thereof. Hence it can be seen that the small bore 44 is for the purpose of extinguishing small current arcs and hence a material such as ethyl cellulose is particularly suited for use as a gas evolving material in this bore to improve the interrupting characteristics of this type of fuse on low current interruptions. When the fusible means 50 blows on high currents, the current is again transferred to the small wires 54 and 56, but such high currents act to immediately fuse these wires and so that current is immediately transferred in the form of an arc between the arcing rod 48 and the lower terminal ferrule 52, this arc is drawn out in the large central bore 42 and extinguished in this bore by attenuation, and by the action of the gases evolved from the material of the cylindrical block 40.

The interrupting characteristics of ethyl cellulose may be improved on high currents by combining it with other materials which have good high current, arc extinguishing characteristics. Ethyl cellulose will readily combine with a number of synthetic resins such as urea resin, for example, and waxes as well as nitrocellulose, cellulose acetate and other cellulose derivatives. Ethyl cellulose may also be combined to some extent with oils. Also boric acid, nickel sulphate or oxalic acid may be combined with ethyl cellulose to improve its high current interrupting characteristics by mixing the same mechanically with or without the application of heat in a subsequent pressure operation. Consequently, I contemplate the use of ethyl cellulose either alone for low current applications, or combined with materials having better arc extinguishing characteristics on high current for improving its high current arc extinguishing ability for applications where both high and low current arcs may be encountered, or solely for high current applications. Thus such combinations with ethyl cellulose may be utilized for the material of the outer fuse tube 2, fuse tube 27 and cylindrical block 40 in the embodiments of my invention shown in Figs. 1, 2 and 3, respectively.

In Fig. 5, I have shown a circuit breaker having a terminal 60 with a central aperture 62 therein, which terminal is threadedly engaged or otherwise suitably secured to one end of a cylindrical block 58 of insulating material which is capable of evolving an arc extinguishing gas when in proximity to an electric arc. This material again may comprise ethyl cellulose, or a combination thereof, with any of the materials mentioned above, depending upon the particular current conditions to be met by the interrupter in service. The insulating block 58 is provided with a central bore 64 for the reception of a removable contact 66 adapted to move into and out of engagement with respect to the contact terminal 60. The aperture 62 in the contact terminal 60 is for the purpose of venting the gases evolved from the material 58 when the moving contact 66 is moved away from the contact terminal 60 to strike an arc in passage 64.

It should be apparent from the foregoing that I have provided a new material for use as gas evolving material in a self-generated gas blast type of circuit interrupter, which combines all the desired characteristics of gas evolution, mechanical strength, high resistivity, and non-absorbency, which are necessary in a material of this type to a greater degree, collectively, at least for a certain range of currents than any material known heretofore. Inasmuch as ethyl cellulose is a plastic, it may be readily and economically made in any desired shape or form.

From another aspect, my invention also includes means for improving the characteristics of a circuit interrupter which is called upon to interrupt both high and low current arcs, by the provision of two different gas evolving materials, one especially adapted for the extinguishing of high current arcs, and the other of which is especially adapted for extinguishing low current arcs.

Having described preferred embodiments of my invention in accordance with the patent statutes, I wish it to be understood that my invention is not limited to the particular embodiments disclosed herein, inasmuch as it will be obvious, particularly to persons skilled in the art, that many changes and modifications may be made in these particular structures without departing from the broad spirit and scope of my invention. Therefore, I desire that my invention be interpreted as broadly as possible and that it be limited only by the prior art and by what is expressly set forth in the following claims.

I claim as my invention:

1. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage including a cellulose derivative capable of evolving relatively larger quantities of arc extinguishing gas when in proximity to an electric arc than horn fiber, at least at currents below a predetermined value.

2. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage including ethyl cellulose.

3. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage being of a material capable of evolving relatively larger quantities of arc extinguishing gas when in proximity to an electric arc than fiber, at least at currents below a predetermined value, said material including a cellulose derivative combined with other gas-evolving material.

4. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage being of a material capable of evolving relatively large quantities of arc extinguishing gas when in proximity to an electric arc, said material including a cellulose derivative combined with another gas evolving material more effective than said cellulose derivative in extinguishing high current arcs.

5. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage including a quantity of a cellulose derivative capable of evolving relatively larger quantities of arc extinguishing gas when in proximity to an electric arc, than horn fiber, at least at currents below 1300 amperes.

6. In a circuit interrupter having a plurality of arc passages of different cross sectional areas for interrupting arcs of different current values, inner wall portions of said passages being of a material which is capable of evolving an arc extinguishing gas when in proximity to an electric arc, with said material constituting inner wall portions of the passage of lesser cross sectional area comprising ethyl cellulose.

7. In a circuit interrupter having a plurality

of arc passages of different cross sectional areas for interrupting arcs of different current values, inner wall portions of said passages being of a material which is capable of evolving an arc extinguishing gas when in proximity to an electric arc, with said material constituting inner wall portions of the passage of lesser cross sectional area being of ethyl cellulose and said material constituting inner wall portions of an arc passage of larger cross sectional area, being less effective than ethyl cellulose in extinguishing small current arcs, but being more effective for extinguishing large current arcs.

8. A fuse link including, in combination, conducting means having a fusible portion, and a tube composed mainly of ethyl cellulose supported on said link at least over said fusible portion.

9. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage comprising ethyl cellulose.

10. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, at least inner wall portions of said passage including ethyl cellulose and another material capable of evolving an arc extinguishing gas when in proximity to an electric arc, and said other material being more effective than ethyl cellulose in extinguishing high current arcs.

11. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, at least inner wall portions of said passage including ethyl cellulose in intimate association with another material capable of evolving an arc extinguishing gas when in proximity to an electric arc, and said other material being more effective than ethyl cellulose in extinguishing high current arcs.

12. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage including ethyl cellulose in intimate association with boric acid.

13. In a circuit interrupter, an arc passage, means for establishing an arc in said passage, and at least inner wall portions of said passage including ethyl cellulose and a synthetic resin which is more effective than ethyl cellulose in extinguishing high current arcs.

14. In a circuit interrupter having a plurality of arc passages interrupting arcs of different current values, respectively, inner wall portions of said passages being of a material which is capable of evolving an arc extinguishing gas when in proximity to an electric arc, with said material constituting inner wall portions of the passage for interrupting relatively small current arcs comprising ethyl cellulose.

15. In a fuse, a fuse tube having a terminal adjacent one end thereof, a fuse link in said tube connected at one end to said terminal, said link including a fusible portion, a small tube within said fuse tube and enclosing at least said fusible portion of said fuse link; and at least inner wall portions of said tubes being of materials capable of evolving an arc extinguishing gas when in proximity to an electric arc, with the material of said small tube being of ethyl cellulose.

16. In a fuse, a fuse tube having a terminal adjacent one end thereof, a fuse link in said tube connected at one end to said terminal, said link including a fusible portion, a small tube within said fuse tube and enclosing at least said fusible portion of said fuse link; at least inner wall portions of said tubes being of materials capable of evolving an arc extinguishing gas when in proximity to an electric arc, with the material of said small tube being of ethyl cellulose, and said small tube being frangible in response to interruption of large currents by said fusible portion.

17. In a fuse, a fuse tube having a terminal adjacent one end thereof, a fuse link in said tube connected at one end to said terminal, said link including a fusible portion, a small tube within said fuse tube and enclosing at least said fusible portion of said fuse link; said tubes being of materials capable of evolving an arc extinguishing gas when in proximity to an electric arc with the material of said small tube being of ethyl cellulose, and the material of said fuse tube having substantially the same arc extinguishing ability as fiber.

18. In a circuit interrupter, an arc passage, means for striking an arc adjacent one end of said passage and drawing it out along said passage, inner wall portions of said passage being of material capable of evolving an arc extinguishing gas when in proximity to an electric arc, with at least the portion of said material adjacent said one end of said passage being of ethyl cellulose.

19. In a circuit interrupter, an arc passage, means for striking an arc adjacent one end of said passage and drawing it out along said passage, inner wall portions of said passage being of material capable of evolving an arc extinguishing gas when in proximity to an electric arc, with at least the portion of said material adjacent said one end of said passage being of ethyl cellulose, and the portion of said material remote from said one end of the passage being more effective than ethyl cellulose in extinguishing high current arcs.

20. In a circuit interrupter, means for establishing an arc, and arc extinguishing material positioned along the path of said arc from which an arc extinguishing medium is evolved due to the heat of the arc for extinguishing the same, said arc extinguishing material comprising a mixture of a cellulose resin and another material having the characteristic of evolving a relatively large quantity of water vapor when heated by the arc.

21. In a circuit interrupter, means for establishing an arc, and arc extinguishing material positioned along the path of said arc from which an arc extinguishing medium is evolved due to the heat of the arc for extinguishing the same, said arc extinguishing material comprising a mixture of a cellulose ether and another material having the characteristic of evolving a relatively large quantity of water vapor when heated by the arc.

22. In a circuit interrupter, means for establishing an arc, and arc extinguishing material positioned along the path of said arc from which an arc extinguishing medium is evolved due to the heat of the arc for extinguishing the same, said arc extinguishing material including a binder of a cellulose ether which is itself capable of evolving an arc extinguishing medium due to the heat of the arc.

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