Sept. 22, 1942. G. R. BROWN 2,296,627

TIME LAG FUSE

Filed Oct. 30, 1937

Fig. 1.

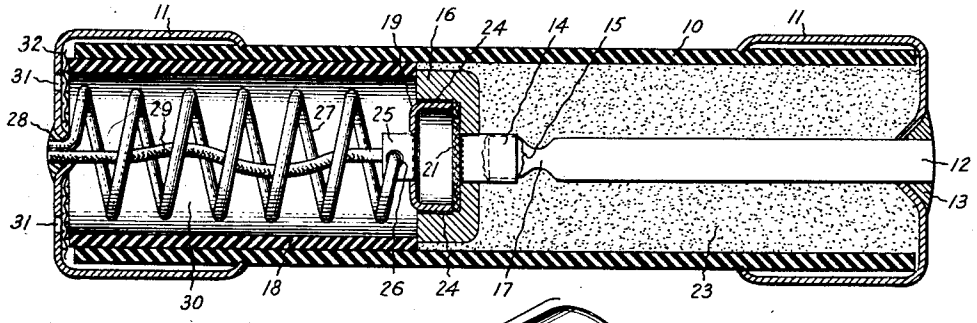


Fig. 2.

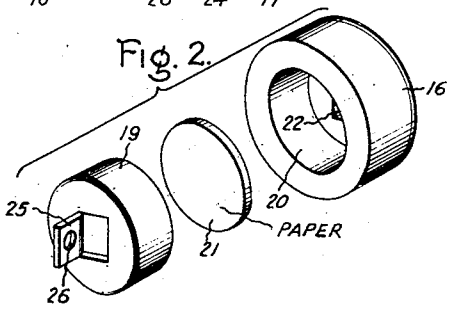
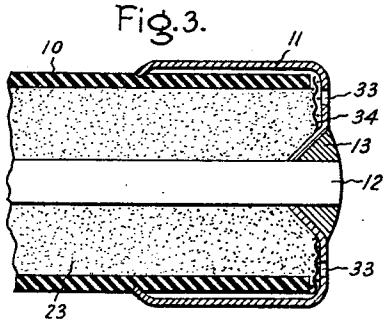


Fig. 3.



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TIME LAG FUSE

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6 Claims. (Cl. 200—123)

This invention relates to time lag fuses for use in circuits which are subject to a partial overload for a brief period of time.

It is an object of the invention to provide a time lag fuse which will withstand for a brief period a partial overload of the circuit with which it is connected, but which will blow if the overload is continued beyond this brief period, and which, in addition, will blow immediately if subjected to a heavy overload such as that produced by a short circuit.

Referring to the drawing, Fig. 1 is a longitudinal section through the fuse; Fig. 2 is an exploded view of some of the fuse parts, and Fig. 3 shows a modified form of construction of one end of the fuse.

The fuse comprises a tubular insulating casing 10 which may be formed of fiber, or the like, and carries at each end metal ferrules 11 which are clamped to the ends of the tube and serve to make contact with the circuit in which the fuse is inserted. A fuse link 12 is inserted within the casing and occupies the right-hand portion thereof as shown by Fig. 1. The fuse link is fastened at one end to the ferrule 11 by solder 13 and at the other end to a tab 14 by means of solder 15 having a relatively high melting point, for example, 360° F. The tab 14 is lanced from a plug 16 which may be formed of copper, or the like, and which has a relatively large mass formed with large radiating surfaces. The fuse link has a blow point 17 formed immediately adjacent the copper plug, so that as it is heated by a partial overload the heat will be absorbed by the copper plug 16 to prevent melting of the fuse link at the blow point. The heat absorbed by the copper plug is dissipated by virtue of its large mass and radiating surfaces.

The plug 16 rests against an inner tube 18 of insulating material, the inner tube being nested within the tube 10 at its left-hand portion as shown by Fig. 1, and being retained therein by the other ferrule 11. A brass cup 19 is inserted within a recess 20 forming part of the copper plug 16 and holds a disk 21 in the bottom of the recess 20 where it covers an opening 22 formed in the wall of the copper plug at the point where the tab 14 is lanced therefrom. The disk 21 is formed from asbestos paper, or the like, and is adapted to hold a filler material 23 confined about the fuse link 12 and prevent its sifting past the plug 16. The brass cup 19 is fastened to the copper plug 16 by solder 24 having a relatively low melting point, for example, 220° F. The solder is disposed about the entire periphery of the cup 19 and recess 20, in the manner shown by Fig. 1 and holds the cup 19 securely within the recess 20 where it retains the disk 21 in the bottom of the recess.

The brass cup 19 has a tab 25 lanced from the end wall thereof which is provided with an opening 26 adapted to receive one end of a coil spring 27, the other end of the spring being secured to the ferrule 11 by means of solder 28. The spring is placed under tension and acts to hold the plug 16 tightly against the inner tube 18. A conducting cable 29 is soldered to the tab 25 at one end and to the ferrule 11 at the other end. This cable is formed of stranded copper wire which has a low resistance and, consequently, there is a low voltage drop or watt loss through the fuse circuit. The inner tube 18 forms an expansion chamber 30 which houses the spring 27 and cable 29 and which is closed at its outer end by the ferrule 11. The ferrule 11 is provided with openings 31 to permit the gases in the expansion chamber incident to blowing of the fuse to escape from the interior of the fuse body. The openings 31 are covered by a screen 32 which acts to retain the flame consequent to the blowing of the fuse while, at the same time, permitting the gases to escape.

In the modification shown by Fig. 3 the ferrule in the link end of the fuse is likewise provided with openings 33 protected by a screen 34 which confines the filler material within the tubular casing yet permits the gases formed by blowing of the fuse to escape through the opening 33 from the interior of the casing.

When the fuse is subjected to a partial overload, for example, as in motor starting, the fuse link 12 will heat up at the blow point 17, but the large plug 16 will prevent the heating action from melting the fuse link at the blow point because it will absorb the heat from the fuse link and dissipate it over its radiating surface. However, if the overloading is continued for more than a brief period, the plug will be unable to dissipate the heat as fast as it absorbs it from the fuse link and consequently the plug will heat up, and the low melting point solder 24 which unites the brass cup to the copper plug will melt, permitting the spring 27 to separate the cup from the disk and thereby opening the circuit through the fuse. The spring 27 acts to separate the cup from the plug quickly and completely and retains the cup at a considerable distance from the plug so that arcing between the plug and cup is prevented. In the event of a short circuit both the fuse link 12 and the low melting point solder 24 will melt giving an instantaneous interruption of the circuit by sepa-

ration of the cup and plug and by rupture of the fuse link 12. The gas formed by blowing of the fuse link 12 will be absorbed to some degree by the inner filler material 23, but the excess gas pressures will rupture the frangible disk 21 permitting the gases to escape into the expansion chamber 30 and thence through the screen 32 and openings 31 to the atmosphere. The disk is designed so that it will break immediately upon blowing of the fuse thereby liberating the gas pressures and preventing possible rupture of the casing 10. In some instances, for example, with a very high current occurring over a short time interval the link 12, only, will blow, in which case the resultant gas pressures will rupture or move the disk 21 so that the gases will escape to the chamber 30 through the openings in the plug 16 and the cup 19. The screen 32 will catch any filler which may be blown through the opening 22 and retain it in the expansion chamber 30. In the modification shown by Fig. 3, the gas pressure may escape from the filler end of the tube, as well as from the expansion chamber, the openings 33 permitting passage of the gas while the screen 34 retains the filler within the casing 10.

It should be noted that different ratings of the fuse may be obtained by varying the radiating surface and mass of the plug 16, the melting point of the solder 24 and the area of the blow point 17 of the link. For example, a higher partial overload could be sustained by raising the melting point of the solder 24, or by increasing the radiating capacity of the copper plug 16. It will be apparent to one skilled in the art that the three variables mentioned may be varied at will to design a fuse of any desired capacity wherein the plug acts to prevent partial overload from blowing the fuse link.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a fuse structure, a casing, a fuse link in said casing, a plug having an opening therein, said plug holding said fuse in one end of said casing, and a disk covering said opening, said disk being moved by the gas pressure formed by blowing of said link to release said pressure from said one end of the casing.

2. In a fuse structure, a casing, a fuse link in said casing, filler material surrounding said link, a plug having an opening therein holding said fuse and filler at one end of said casing and a disk covering said opening to prevent passage of filler material through said opening, said disk being moved by gas pressures incident to blowing of said fuse to release said pressure from said one end of the casing.

3. In a time lag fuse, a casing, a perforated plug separating said casing into two compartments, a fusible link in one compartment fastened to said plug, a cup in the other compartment, fusible material uniting said cup and plug, a disk covering said perforation and disposed between said cup and said plug, and spring means acting to separate said cup and plug upon volatilization of said link and melting of said material under overload of said fuse whereby said cup and plug are separated and said disk is released to permit gas pressure in said one compartment to be released into said other compartment.

4. A time lag fuse comprising a casing, ferrules closing the ends of said casing, there being openings in the ferrule at one end of said casing, a screen covering said openings, a tension spring, a cup, said spring being connected at one end to said vented ferrule and at the other end to said cup, a perforated element soldered to said cup and forming a plug in said casing, a disk positioned between said cup and said plug to cover said perforation, a fusible link connected to said plug and to the ferrule at the other end of said casing, and filler material surrounding said link, said solder being adapted to melt upon heating of said plug and link under prolonged overload to permit said spring to retract said cup from engagement with said plug.

5. In a fuse structure, a casing, ferrules closing the ends of said casing, there being vent openings in said ferrules, screens covering said openings, a fuse link connected at one end to one of said ferrules, a plug of relatively large mass connected to the other end of said link, a cup soldered to said plug, an electrical connection between said cup and the other ferrule, and a spring connected to said cup and said other ferrule, said spring separating said cup and plug upon melting of said solder and said vents liberating the gas pressures in said casing caused by blowing of said fuse link.

6. In a time lag fuse, a casing, a perforated element in said casing, a fusible link connected to one side of said element, a member secured by fusible material to the other side of said element, a disk of frangible material covering said perforation, and means acting to separate said member and element upon volatilization of said link and melting of said material upon overload of said fuse whereby said member and element are separated and said disk is shattered to release the gas pressure incident to blowing of said fuse.

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