March 9, 1926. 1,576,165

A. F. WEISE

ELECTRIC FUSE AND METHOD OF MAKING SAME

Filed Sept. 10, 1924

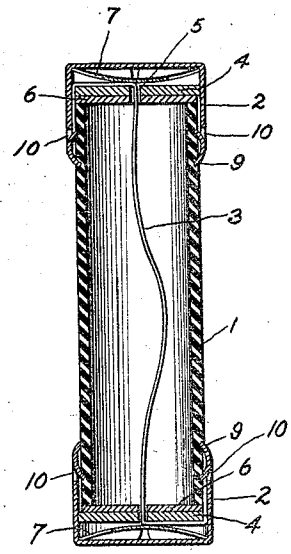


Fig. 1.

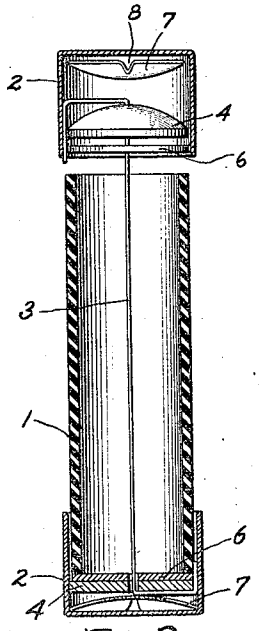


Fig. 2.

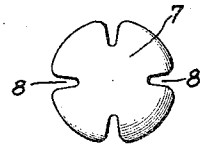


Fig. 3.

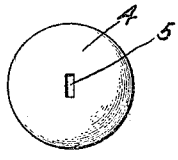


Fig. 4.

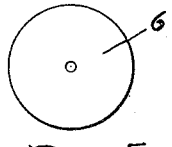


Fig. 5.

Inventor:
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His Attorney.

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UNITED STATES PATENT OFFICE.

ALBERT F. WEISE, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC FUSE AND METHOD OF MAKING SAME.

Application filed September 10, 1924. Serial No. 736,982.

To all whom it may concern:

Be it known that I, ALBERT F. WEISE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Electric Fuses and Methods of Making Same, of which the following is a specification.

The present invention relates to protective devices and method of making them for electric circuits and apparatus connected thereto, and more especially it relates to enclosed cartridge fuses adapted when intercalated in an electric circuit to constitute a calibrated weak link in the conductive chain by the breaking or blowing of which the circuit is interrupted whenever a current of sufficient volume to cause injury to the circuit or devices connected therewith flows therein, the cartridge part of a fuse constituting a housing for the fusible link to protect it from injury under ordinary conditions and to prevent injury to surrounding objects from flying particles of molten metal upon blowing of the fuse link.

One of the common faults experienced in the behavior of cartridge fuses is the inability to carry their rated amount of current, and the degree of such inability to stand up, it has been observed, corresponds more or less directly to the length of time they have been made or have been in service.

This apparent aging of a cartridge fuse is believed to be due to a diminution of its current carrying cross section by oxidation or other causes. Where the ends of a link are joined to their terminals by solder, soldering fluxes are necessarily used and any small amount of free flux remaining on the link readily attacks the oxidizable metal, usually zinc or aluminum. Where the joints are made by mechanical means, there often appears to be a galvanic action that takes place therein; also on account of differences in degree of expansion and contraction of the different metals in contact, there is a progressive tendency to loosening of the contact between the fuse link and its terminals so that the link blows below its capacity rating at the joint.

The object of my invention is the provision of an electric fuse of improved construction which will not deteriorate with age and which can be manufactured at low price and without the exercise of special skill.

One embodiment of the invention is shown in the accompanying drawing, in which Fig. 1 is a longitudinal section of a complete cartridge fuse; Fig. 2 is a similar section with the parts of the upper terminal separated; Fig. 3 is a plan of a spring contact; Fig. 4 is a similar view of a cupped disk, and Fig. 5 is a similar view of a foundation washer.

The main portion of the housing consists of a length of insulating tube 1, such as indurated fibre, with its ends normally closed by the terminal caps 2 of sheet brass or other springy metal.

The fusible link 3 is a thin wire or ribbon of soft metal, such as zinc or aluminum, adapted to melt or fuse at a relatively low temperature. In order to connect each of the ends of the links 3 securely, permanently and in good conductive relation to its brass cap terminal 2 without the use of solder, I employ a substantial plug in the form of a disk 4 of lead, or other metal as soft or softer than the metal of which the link 3 is composed, and force it against the inner side walls of the brass cap 2 with the end of the fusible link in position to be gripped between them. On account of the disk 4 being as soft or softer than the link 3, the latter will under pressure merely imbed itself in the former without loss of cross section Moreover, by employing a lead disk 4 of sufficient thickness, the degree of pressure exerted thereby upon the inside of the brass cap may be made as great as desired, of course within the elastic limit of the brass part. By springing the brass cap outwardly a relatively small amount, its springy action is made available to exert constant yielding pressure upon the periphery of the lead disk 4 and upon the end portion of the link 3 bound between them throughout all conditions of expansion and contraction of the parts incident to temperature changes.

In order conveniently to assemble the lead disk 4 in desired position, I make it somewhat spherical or cup-shaped, as shown at the upper end of Fig. 2, and thread the end of the link 3 through a central aperture 5 therein and between it and the end

of the tube 1, I insert a steel washer 6 to serve as an anvil, while the disk 4 is being flattened into the position shown in Fig. 1 and thereby effecting the expansion of its periphery against the inner side wall of the cap 2. The flattening of the lead disk may be accomplished by directly forcing the cap home on the tubing 1, but I prefer to provide extra assurance of contact between the fusible link 3 and the cap 4 by the insertion therein of a cupped up phosphor bronze disk 7 rendered flexible by radial slits 8. This bronze disk 7 bears near its periphery against the flat inner wall of the cap 2 and at its central portion presses against the fusible link 3 as it lies across the face of the lead disk 4 and insures good yielding contact between the several parts.

In order to improve the contact surface of the lead disk, I plate it with copper or other metal of high conductivity and high resistivity to oxidation.

After the terminal caps 2 have been forced home, as roughly indicated in Fig. 1 and at the lower end of Fig. 2, they are anchored to the fibre tube 1 by any of the usual expedients, such as depressing edges 9 thereof into the surface of the tube and by striking spurs 10.

While I have shown and described herein the best embodiment of the invention known to me, I do not desire to be restricted thereto.

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

1. An electric fuse comprising an insulating housing provided with terminal caps having elastic side walls embracing the end portions of said housing, a link of fusible metal within said housing and mechanically connected at its ends to said caps, said mechanical connection being made by a soft metal disk expanded within said caps so as to bind the link ends to and initially tension the side walls of said caps.

2. An electric fuse comprising an insulating housing provided with end caps having elastic side walls, apertured metal disks within and flexing the elastic side walls of said caps, a link of fusible metal extending at its ends through said disks radially across their outer surfaces and bound between the peripheries thereof and the inner side walls of said caps.

3. An electric fuse comprising an insulating housing provided with end caps, apertured metal disks within and exerting pressure upon the side walls of said caps, fusible links extending at its ends through and over the outer sides and peripheries of said disks, and springs between the inner surfaces of said caps and the outer surfaces of said metal disks and operating to press said link ends against said disks.

4. The method of connecting a fusible link to the terminal cap of an electric fuse consisting in entering an end of the link within the side walls of said cap, inserting a cupped up metal disk within said cap and flattening said disk in place to effect the expansion of its periphery against the end of said link and the inner wall of said cap.

5. The method of connecting a fuse link to the terminal cap of an electric fuse consisting in threading an end of said link through a rigid flat washer and through an apertured cupped up disk of soft metal, bending the said link end over the periphery of said cupped disk, inserting within said terminal cap and pressing said parts therein to flatten said cupped up disk and thereby effect the expansion of its periphery and the end of the link into intimate contact with the inner side wall of said cap.

In witness whereof, I have hereunto set my hand this eighth day of September, 1924.

ALBERT F. WEISE.