R. C. COLE.

ELECTRIC SAFETY FUSE.

APPLICATION FILED JULY 28, 1920.

1,407,785. Patented Feb. 28, 1922.

Fig. 1

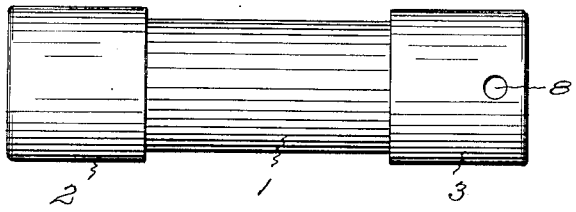


Fig. 2

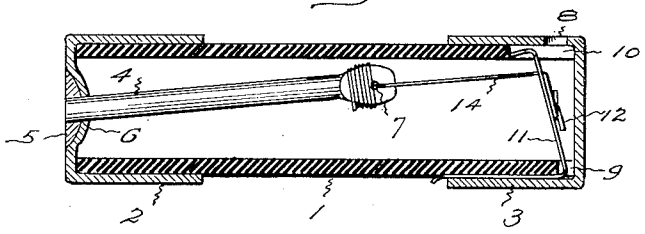


Fig. 3

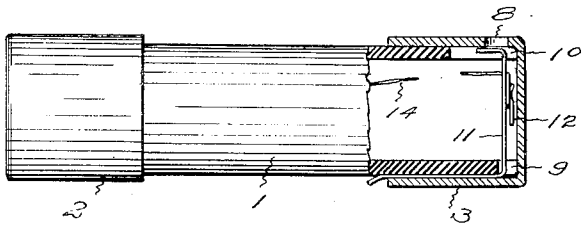
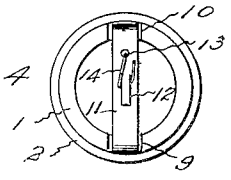


Fig. 4



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UNITED STATES PATENT OFFICE.

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ELECTRIC SAFETY FUSE.

1,407,785. Specification of Letters Patent. Patented Feb. 28, 1922.

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To all whom it may concern:

Be it known that I, ROBERT C. COLE, a citizen of the United States, residing at Hartfort, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Electric Safety Fuses, of which the following is a specification.

The invention relates to the construction of sensitive, small capacity, enclosed electric fuses. Commercial demands for some classes of delicate instruments and apparatus, for example cash register motors, which utilize but a very small amount of current and would be injured or rendered inoperative by larger currents, require protecting fuses that will carry ninety per cent. of their rated capacity indefinitely and that will open in from ten to thirty seconds after their rated capacity has been exceeded. Thus with the small currents used there is very little leeway between carrying capacity and blowing current. For instance, if a fuse is rated at 4 a. it must carry 3.6 a. indefinitely and open in a few seconds after the current reaches 4 a. In other words the fuse must operate on a change of only .4 a. or it will not afford proper protection.

The object of this invention is to produce a delicate fuse of this character which is simple and cheap to manufacture in quantities and which can be relied upon to act according to the predetermined fixed conditions.

This object is attained by providing casings of standard length, diameter, strength and materials, with short fusible links of fine metallic wire of fairly great resistance and relatively high melting point that is cheap and can be obtained practically pure so as to have a definite carrying capacity. Such links are connected between terminals of ample capacity, one of which terminals in each fuse being in the form of a spring finger of low electrical resistance and high heat conductivity, that will keep a uniform tension on the link under normal conditions but pull the link apart when heated to the predetermined degree by the excess current, and indicate the fact that the link is severed.

In the accompanying drawings Fig. 1 shows on enlarged scale a side view of a fuse that embodies the invention. Fig. 2 shows a central section of the same with the fusible link intact. Fig. 3 is a side view with a portion of the casing broken away showing the link severed. Fig. 4 is an end view of the fuse with the cap removed.

The casing of the fuse is formed of a tube 1 of insulating material and end caps 2 and 3 of conducting metal. Fixed to one end cap is a terminal 4. This terminal is desirably formed of a piece of brass wire and is secured by solder 5 in an opening in the recessed end 6 of the cap. The inner end of this terminal is flattened and provided with a small hole 7. The other end cap has a hole 8 in one side and the insulating tube at the end covered by this cap has on one side a slot 9, and diametrically opposite a slot 10.

The terminal 11 is formed of a strip of spring metal of relatively low electrical resistance and high heat conductivity, for instance, phosphor bronze. This terminal strip is bent at substantially right angles near its middle and one section lies along the side of the tube under the cap, while the other section extends through the slot 9 and across the tube into the slot 10. The free end of the spring terminal is bent inward so that when the terminal is in normal position this bent end will lie opposite the hole 8 in the cap. A small tongue 12 is stamped out from the terminal so as to form a cleat, and between the cleat and bent end of the terminal is a small hole 13.

The link 14 is desirably formed of a short length of fine wire of relatively high electrical resistance and melting point, as iron. One end of the link is passed through the hole 7 and wound about the end of the terminal 4, while the other end is passed through the hole 13 in the free end of the spring finger terminal and is caught under and held by the tongue-shaped cleat on the terminal.

In assembling the parts the link wire is secured to the terminal 4 then to the terminal 11, with the exact predetermined length between the terminals. After this element is placed in the tube and the caps put on, the terminal 4 is drawn out as far as it can be, that is, until the bent end of the terminal 11 engages the end of the slot 10, and then the terminal 4 is soldered to the cap 2. This keeps the fine wire fusible link of exact length under a definite tension until the excess current raises the metal of the link to such a temperature that it melts and is pulled open

by the terminal which then springs back until its bent end stands beneath the hole in the cap and indicates that the link is severed.

The link is easily connected to the terminals and is kept under a uniform tension originally or when it is desired to renew a fuse after it has been blown. It is of comparatively high electrical resistance but is short so that the resistance relative to the circuit is negligible, and yet it yields to the pull of the spring and is severed when the predetermined temperature is reached. The terminals are of ample current carrying capacity to conduct away heat from the link under normal conditions and the temperature of the spring terminal never becomes sufficiently high to cause it to lose its spring temper.

The invention claimed is:

1. An enclosed electric safety fuse comprising an insulating casing with metallic end caps, a rigid terminal within the casing electrically connected with one end cap, a spring finger terminal extending within and across the casing and electrically connected at one end with the other end cap, and a fusible link connected between the rigid terminal and the free end of the spring terminal.

2. An enclosed electric safety fuse comprising an insulating casing with metallic end caps, a rigid terminal within the casing electrically connected with one end cap, a spring finger terminal extending within and across the casing and electrically connected at one end with the other end cap, and a short fusible link of relatively high electrical resistance and melting point connected between the rigid terminal and the free end of the spring terminal.

3. An enclosed electric safety fuse comprising an insulating casing with metallic end caps, a rigid terminal within the casing electrically connected with one end cap, a spring finger terminal extending within and across the casing and electrically connected at one end with the other end cap, said end cap having a hole through its side and the spring finger having a bent end adapted when the finger is relaxed to lie opposite the hole in the cap, and a fusible link connected between the end of the rigid terminal and the free end of the spring terminal.

4. An enclosed electric safety fuse comprising an insulating casing with metallic end caps, a rigid terminal within the casing electrically connected with one end cap, a spring finger terminal extending within and across the casing and electrically connected at one end with the other end cap, said spring terminal having a tongue formed in its outer face and a perforation between the tongue and its free end, and a fusible link extending from the end of the fixed terminal through the hole in the spring terminal and about said tongue.

5. An enclosed electric safety fuse comprising an insulating casing with metallic end caps, a spring terminal with a section lying between an end cap and the wall of the casing and a section extending across the end of the casing inside of said cap, and a fusible link with one end connected with the free end of the spring terminal and electrically connected with the cap at the other end of the casing.

6. An enclosed electric safety fuse comprising an insulating casing with metallic end caps, a metallic spring finger extending within and across the casing and connected at one end with one end cap, and a fusible link connected with the free end of said spring finger and holding it under tension.

7. An enclosed electric safety fuse comprising a tubular casing with diametrically opposite slots in one end, metallic caps closing the ends of the casing, a fixed terminal electrically connected to one end cap, a spring finger terminal extending along the wall of the insulating casing beneath the other end cap, through one of said slots and across the casing into the other of said slots, and a fusible link connecting the fixed terminal with the free end of said spring terminal.

ROBERT C. COLE.