S. F. ESTELL.

ELECTRICAL FUSE.

APPLICATION FILED NOV. 2, 1910.

1,022,834. **Patented Apr. 9, 1912.**

Fig. 1.

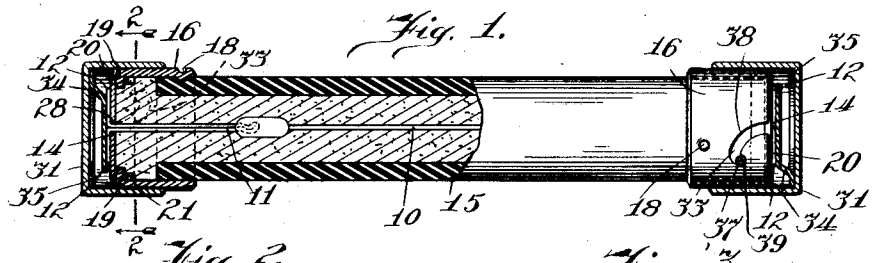


Fig. 2.

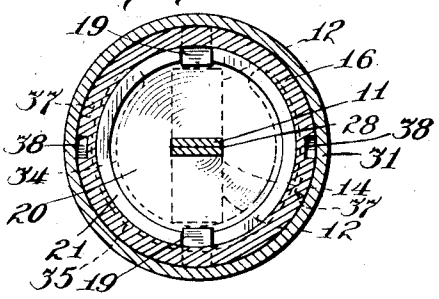


Fig. 3.

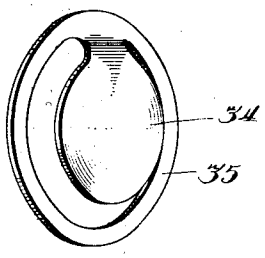
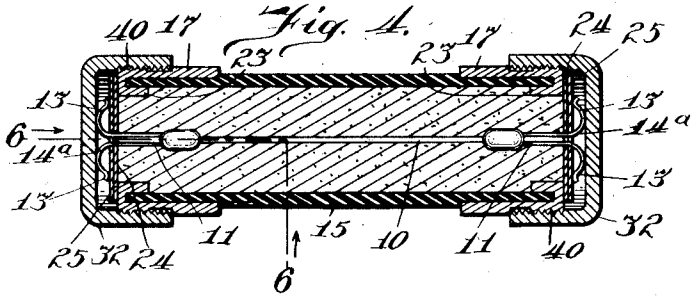


Fig. 4.



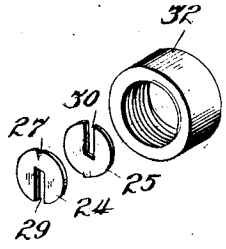


Fig. 5.

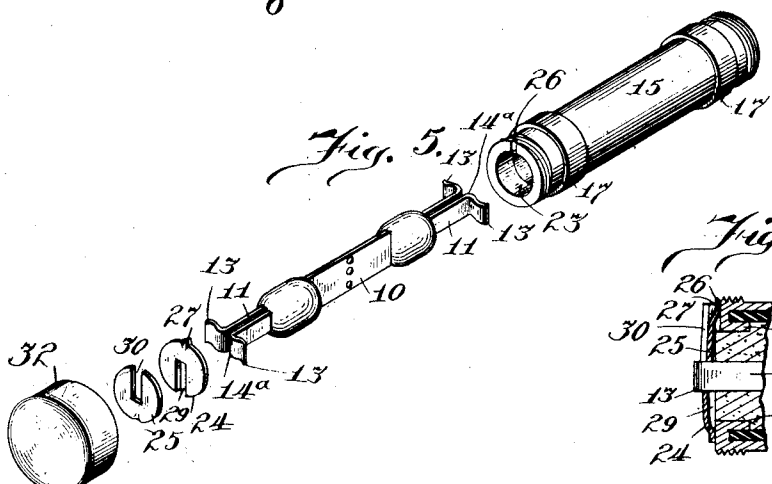


Fig. 6.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL FUSE.

1,022,834. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed November 2, 1910. Serial No. 590,320.

To all whom it may concern:

Be it known that I, SAMUEL F. ESTELL, a citizen of the United States, and resident of Florence, county of Los Angeles, and State of California, have invented certain new and useful Improvements in Electrical Fuses, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to fuses for electrical circuits, and particularly to those provided with a protective covering or casing having electrical contacts at its ends for engaging suitable terminals of the circuit into which the fuse is to be inserted.

In carrying out the invention the protective covering or casing preferably comprises a tubular shaft through which the fuse extends, and the bore of the shaft about the fuse is packed with a non-inflammable filling material, such, for example, as a granulated form of asbestos.

The object of the invention is to provide a device of the kind described which shall be of such improved construction, that the fuse within the casing may be conveniently replaced when destroyed by use, and that effective electrical connection between the ends of the fuse within the casing and the contacts or terminals employed upon the ends of the casing shall be insured.

The invention therefore contemplates the use of disks for closing the ends of the tubular shaft of the casing to retain the filling material therein. The ends of the fuse strip preferably protrude through these disks, but are anchored to them, whereby the disks are held to their seats upon the opposite ends of the tubular shaft by being tied together by the fuse strip itself so long as the fuse strip remains intact. When, however, the fuse has been destroyed by use, the disks are readily separated from the ends of the casing, bringing with them the remnants of the destroyed fuse and leaving the tubular shaft of the casing open at its ends in order that the filling material may be readily emptied out and replaced.

The firmness with which the disks are held in place upon the ends of the tubular shaft of the casing, and their ready separation from the ends of the casing when the fuse has been destroyed, thereby serves as an indication of the condition of the fuse. Usually the body of the tubular shaft of the casing will be formed of a non-conducting material, whereas the seats for the disks upon the ends of the shaft will take the form of metallic ferrules permanently secured to the non-conducting tubular body. Moreover, removable covers or caps applied to the ferrules over the said disks, and having a yielding engagement with the protruding ends of the fuse strip, will also be employed to insure an effective electrical contact with the terminals of the electric circuit.

In the accompanying drawings,—Figure 1 is a side elevation of an electrical fuse embodying the features of improvement provided by the invention, some of the parts being shown in section; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a perspective view showing a form of spring used for providing a yielding contact between the cap and the end of the fuse strip; Fig. 4 is a central longitudinal sectional view showing a modified form of construction; Fig. 5 is a perspective view showing the parts of the fuse illustrated in Fig. 4 in separate relation; and Fig. 6 is a detail sectional view taken on the line 6—6 of Fig. 4.

The fuse comprises an intermediate strip 10 of fusible material, and terminal portions 11, preferably of two-ply material, adapted to be folded in opposite directions at their ends, as shown at 12, 12, in Figs. 1 and 2, and at 13, 13, in Figs. 4, 5 and 6. The terminal portions 11 of the fuse are conveniently formed of a copper strip folded or doubled upon itself at its center. The outturned end portions 12, 12, and 13, 13, provide a T-head 14 or 14^a at each end of the fuse strip, the head 14^a, shown in Figs. 4, 5 and 6 of the drawings, being yielding or elastically compressible. In practice the fuse strip 10, 11, is inclosed within a tubular shaft having a body portion 15 of non-conducting material, such as indurated fiber, and metallic end portions or ferrules, designated 16, 16, in Figs. 1 and 2 of the drawings, and 17, 17, in Figs. 4, 5 and 6.

In Figs. 1 and 2 of the drawings the ferrules 16 are permanently secured to the wall of the shaft 15 by striking lugs 18 into the metal of the ferrules after they have been applied to the ends of the soft body portion of the shaft. In this form of construction the ferrules 16, 16, preferably project beyond the ends of the body portion 15, and are there provided with a plurality of

inwardly-projecting lugs, as 19, adapted to form seats for a removable cap-plate or disk 20, which serves as a closure for the end of the tubular shaft 15. To prevent rotation of the disk 20 it is provided with a flange 21, having notches 22 for receiving the lugs 19.

In the form of construction illustrated in Figs. 4, 5 and 6 of the drawings, the ferrules 17, 17, are permanently secured to the ends of the body portion 15 of the shaft by flanging or turning in the ends of the ferrules, as indicated at 23, to grip the ends of the non-conducting body portion 15. In this instance the cap plate at each end of the shaft comprises a pair of disks 24, 25. One of these disks, as 24, at each end of the shaft is seated directly upon the overturned end 23 of the ferrule, and rotation of the disk on the ferrule is prevented by providing the ferrule with a notch 26 and by striking a lug 27 upon the disk to engage the notch.

In both forms of construction illustrated, the disks, as 20, shown in Figs. 1 and 2 of the drawings, or as 24, 25, shown in Figs. 4, 5 and 6, are held to their seats upon the ferrules, as 16, 16, and 17, 17, by the T-head 14 or 14^a of the fuse strip.

In the form of construction illustrated in Figs. 1 and 2, the disk 20 is provided with a central slotted aperture 28, whereby the disk is adapted to be threaded upon the terminal portion 11 of the fuse strip, the ends 12, 12, of this portion of the fuse strip then being bent outwardly in opposite directions to form the T-head 14 for holding the disk to its seat upon the lugs 19, 19.

In the form of construction illustrated in Figs. 4, 5 and 6 of the drawings, the disks 24, 25, have slots 29, 30, extending to their edges, in order that they may be seated upon the ferrules 17, 17, beneath the T-heads 14^a of the fuse strip after the latter have been formed. Preferably the disks 24, 25, are applied to the fuse strip from opposite sides, whereby the continuous or unslotted portion of one serves as a covering for the slotted or open portion of the other.

A protecting cover or cap, as 31, 32, is preferably applied to each end of the casing over the disks, as 20 or 24, 25, respectively, and the protruding end of the fuse strip, by being screwed upon the ferrule, as 16 or 17. To insure an effective electrical contact, this cap has a yielding engagement with the T-head 14 or 14^a, with which the fuse strip is provided.

In the form of construction illustrated in Figs. 1 and 2 of the drawings, the cap 31 has a bayonet joint connection 33 with the ferrule 16, and has an inwardly projecting spring tongue 34 for engaging the T-head 14 of the fuse strip 10, 11. As shown, the spring tongue 34 has a marginal band or ring 35, adapted to be seated upon the inside face of the end wall of the cap, where it is held in place by frictional contact with the side walls of the cap. Most conveniently the bayonet joint connection 33 between the cap 31 and ferrule 16 comprises a pair of inwardly-projecting lugs 37, carried by the cap, and a pair of curved slots or grooves 38, formed in the ferrule 16 and extending inwardly from its outer end. Most desirably a notch 39 is provided at the inner end of each of the grooves 38 in order that when the cap 31 has been completely turned to its seat it cannot be removed without first pressing inwardly upon it against the effort of the spring tongue 34 to disengage the lugs 37 from the notches 39.

In the form of construction illustrated in Figs. 4, 5 and 6 of the drawings, the caps 32 have a screw-threaded connection 40 with the ferrules 17, and when completely turned to their seats they have a yielding connection with the ends of the fuse strip by reason of the yielding or elastically compressible character of the T-heads 14^a.

With either form of construction the condition of the fuse within the casing may be readily determined by removing one of the caps, as 31 or 32, and then pulling outwardly on the disks, as 20 or 24, 25. If the fuse strip is intact the disks cannot be removed; but if the fuse has been destroyed the disks will fall away from the ends of the casing as soon as the protecting cap or covering has been removed.

I claim as my invention—

1. In an electrical fuse, in combination, a tubular casing, a fuse strip extending through the casing, one end of the strip being anchored and the other end of the strip being headed, a loose non-combustible filling for the chamber of the casing about the fuse strip, a disk loosely seated upon the end of the casing beneath the headed end of the fuse strip, said disk serving as a closure for the end of the casing and being held to its seat only by the head of the fuse strip, and a metallic terminal cap detachably applied to the end of the casing over the said disk and headed end of the fuse strip, said cap having elastic engagement with the headed end of the fuse strip.

2. In an electrical fuse, in combination, a tubular shaft of insulating material, a metallic ferrule fixed upon each end of the shaft, a disk loosely seated against each of the ferrules, a fuse strip extending through the shaft and having its ends anchored to the disks, whereby the disks are held to their seats to close the ends of the shaft so long as the fuse strip remains intact, and a loose non-combustible packing filling the bore of the shaft about the fuse strip.

3. A rechargeable electric fuse comprising a shell of insulating material provided

with a metallic ferrule at each end, a disk resting on said ferrule at each end of the shell, said disk being slotted, a fuse strip provided with longitudinally extending terminal strips at each end thereof, said terminal strips extending within the slots of said disks and being bent over at the ends, and terminal caps screwing on the end ferrules aforesaid and bearing on the bent over portions of said terminal strips of said fuse strip to make contact therewith.

4. A rechargeable electric fuse comprising a shell of insulating material provided with a metallic ferrule at each end, a disk resting on said ferrule at each end of the shell, said disk being slotted, a strip provided with longitudinally extending terminal strips at each end thereof, said terminal strips extending within the slots of said disks and being bent over at the ends, and terminal caps screwed on the end ferrules aforesaid and elastically bearing on the bent over portions of said terminal strips of said fuse strip to make contact therewith.

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