Dec. 26, 1922. 1,439,870

F. N. CONANT.
ELECTRIC FUSE.
FILED JUNE 1, 1920.

2 SHEETS-SHEET 1

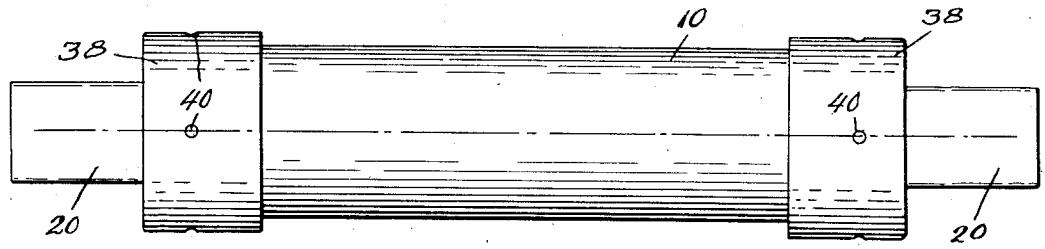


Fig. 1.

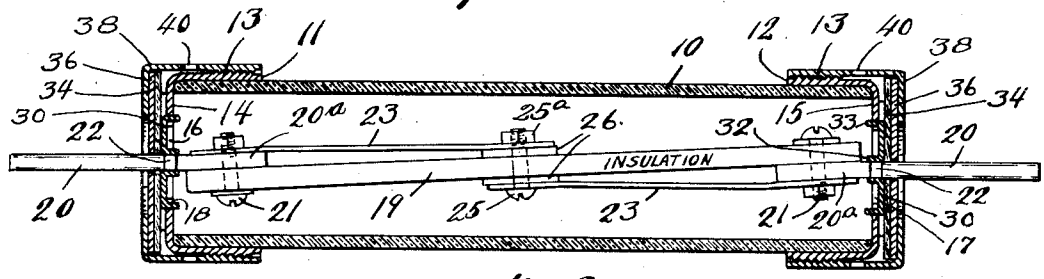


Fig. 2.

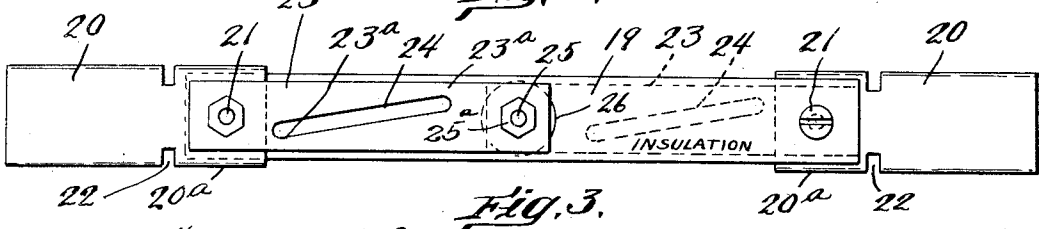


Fig. 3.

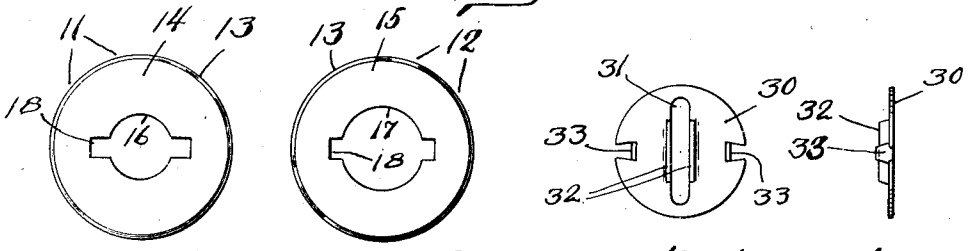


Fig. 4. Fig. 5. Fig. 6. Fig. 7.

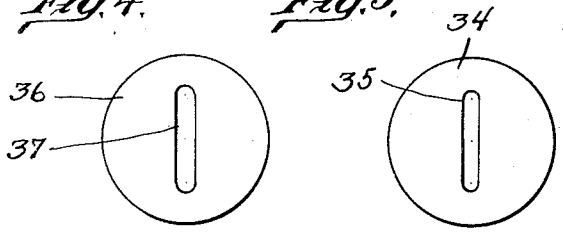


Fig. 8. Fig. 9.

Inventor.
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2 SHEETS-SHEET 2

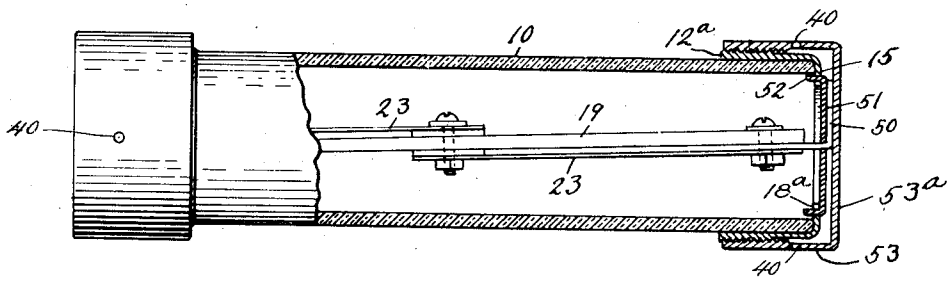


Fig. 10.

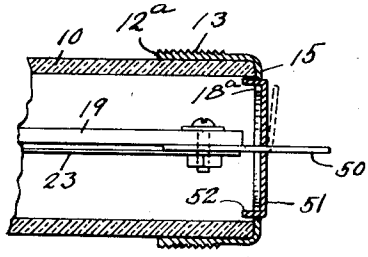


Fig. 11.

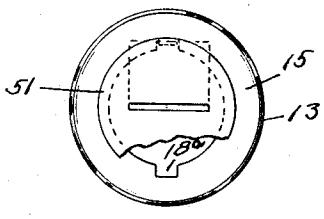


Fig. 12.

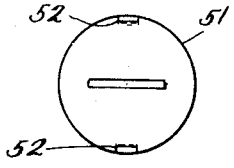


Fig. 13

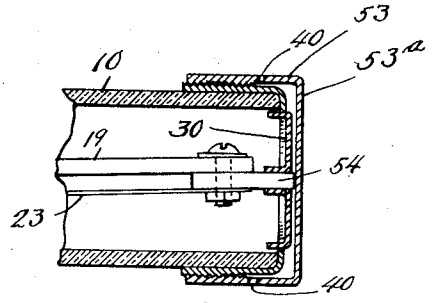


Fig. 14.

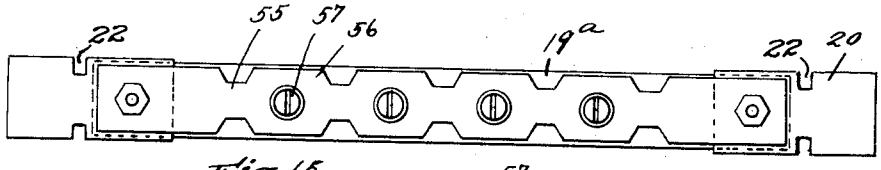


Fig. 15.

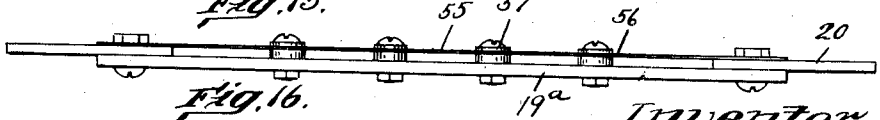


Fig. 16.

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by
T. T. Greenwood Atty

Patented Dec. 26, 1922. 1,439,870

UNITED STATES PATENT OFFICE.

FRANKLIN N. CONANT, OF NEWBURYPORT, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CHASE-SHAWMUT COMPANY, A CORPORATION OF MASSACHUSETTS.

ELECTRIC FUSE.

Application filed June 1, 1920. Serial No. 385,416.

To all whom it may concern:

Be it known that I, FRANKLIN N. CONANT, a citizen of the United States, residing at Newburyport, in the county of Essex and State of Massachusetts, have invented an Improvement in Electric Fuses, of which the following is a specification.

This invention relates to electric fuses and has particular reference to enclosed fuses of the cartridge type although valuable for open fuses, and has for its object to improve the construction and operation of such fuses.

Fig. 1 is a side elevation of a renewable electric fuse of the cartridge type in which my invention is incorporated.

Fig. 2 is a sectional longitudinal elevation of the fuse of Fig. 1.

Fig. 3 is a plan view of the current-carrying elements of the fuse.

Figs. 4 and 5 are end views of the left and right end caps respectively of the fuse.

Fig. 6 is a plan view of a fuse-locking plate.

Fig. 7 is a side view of the plate of Fig. 6.

Fig. 8 is a plan view of a pressure plate.

Fig. 9 is a plan view of a packing disc.

Fig. 10 is a side elevation, partly broken away of a modified form of renewable electric fuse embodying my invention.

Fig. 11 is a sectional detail of an end of the fuse illustrating one arrangement for connecting the fusible element to the end ferrule.

Fig. 12 is an end view of Fig. 11.

Fig. 13 is a plan view of a fuse-locking plate employed in the modification illustrated in Fig. 10.

Fig. 14 is a sectional detail illustrating a modified arrangement by which the fusible element is connected with the end ferrule.

Figs. 15 and 16 are plan and side views respectively of a modified form of fusible element.

As here shown, the fuse with which my invention is associated includes the tubular casing 10 of insulating material, as fibre, having the end-ferrules 11 and 12 secured thereon by suitable means. Said end-ferrules are formed with the screw-threaded side-walls 13 adapted to removably receive end-caps, and the end-walls 14 and 15. Said end-walls are formed with the centrally disposed more or less circular apertures 16 and 17 therein having the opposed fuse-terminal receiving slots 18. It will be noted that the aperture 17 in the right-hand end-ferrule is larger than the aperture 16 in the left-hand end-ferrule, and the fusible elements are adapted to be withdrawn from and inserted in the casing from the right-hand end, through said aperture 17. The distance between the bottom of the opposed slots 18, in both end-ferrules is the same however.

The fusible element is carried by the rigid strip 19 of insulating material comprising a fuse holder. Knife-blade fuse terminals comprising copper plates 20 are fixed by the bolts 21 to opposite faces of said insulating strip and said terminals have their inner and strip-engaging end-portions 20^a slightly reflexed whereby to admit of said terminals being in axial alignment in the enclosing casing. Said terminals 20 are formed with the opposed notches 22 therein adapted to engage the end-walls of the end-ferrules for centering and maintaining them in correct position in the fuse casing.

The fusible element preferably comprises the separate flat fuse strips 23 each having the oblong perforations 24 providing the strips with central readily fusible portions of similar resistance. These are secured at one end to the fuse terminals 20 by said bolts 21 and extended toward each other on opposite sides of said insulating strip 19. A relatively massive bolt 25, preferably of copper, is extended through said strip and is held in place by a relatively massive nut 25^a; also preferably of copper, whereby electrically to connect the ends of said fuse strips in series with the fuse terminals and secure the ends thereof to the insulating strip 19. Relatively massive washers 26, also preferably of copper, disposed over said bolt between said fuse strips and insulating strip serve to support said fuse strips above and free from contact with said insulating strip.

The fusible element thus connected forms in effect two fuses in series connected by permanent contact posts which are, in effect, intermediary terminals and are, in practice, infusible with the portion of the fusible elements between the readily fusible portions supported. The current-carrying components of the fuse are thus united in a unitary structure by this arrangement which can be sold as a separate article of manu-

facture from which the knife blade terminals may be omitted.

In assembling the fuse, the unitary structure formed by the strip 19 with assembled fuse strip and fuse terminals, is inserted through the aperture in the end-wall of the right-hand end-ferrule, and the slots in the fuse terminals are brought into alignment with the end-walls of said end-ferrules, the fuse-terminals are then angularly rotated about ninety degrees, causing the end-walls to enter the slots in said terminals, thereby locking the structure against axial displacement. Locking-plates, comprising the discs 30 having the central elongated slot 31 formed with the struck-out flanges 32 and the opposed ears 33 struck out and reflexed from the periphery of the disc, are slipped over the fuse terminals and the ears 33 enter the slots in the end-walls, thereby locking the fuse terminals against rotation. Packing washers comprising the discs 34 formed of leather or other soft and flexible material having the elongated slots 35 therein are received on the fuse terminals and bear against the locking plates 30; and the slots in said discs are such that the discs snugly engage the terminals to prevent escape of gas therebetween. Pressure plates 36 having the terminal-receiving slots 37 therein are placed on the terminals and the interiorly threaded end-caps 38 are then screwed on the end-ferrules thereby locking the fuse elements in position. The side walls of the end-caps may be provided with perforations 40 therein to admit of the expulsion of gas from the fuse casing upon the blowing of the fuse.

Whereas I have above set forth a renewable fuse of the cartridge type having knife-blade terminal-portions, in which my invention is embodied, yet the invention is applicable to other types of fuses, and in Figs. 10 through 16, I have illustrated the invention embodied in another type of fuse, and specifically, in a renewable fuse having end-caps by which the fuse is connected to an electric circuit instead of by the knife-blade terminals.

In this modification, the fusible elements, comprising the fusible strips 23 and the insulating supporting bar 19, may be as before, and the relatively inflexible knife-blade fuse terminals 20 are replaced by the relatively thin conducting terminal-portions 50 admitting of being reflexed over the locking plate 51 in the manner illustrated in Figs. 10 and 11.

The locking plate 51 comprises a disc similar to the plate 30 of Fig. 6, having the locking ears 52 adapted to enter the slots 18^a in the end ferrule 12^a and the central slot through which the terminal-portion 50 is adapted to be extended. The end-caps 53, in this modification, having the solid end-wall 53^a is received over the end ferrule and compresses the reflexed portion of the terminal between the locking-plate and its end-wall thereby firmly securing the terminal in place and providing a good electrical contact between it and the end-cap.

In the modification illustrated in Fig. 14, the fuse terminals 54 are very similar to the terminals illustrated in Figs. 1, 2 and 3 with the difference that the slots 22 are omitted and are shortened in length so that they but slightly protrude beyond the locking-plates 30 when the fusible element is in place within the enclosing tube. The end caps 53^a engage the protruding ends between them and thereby lock the fusible element and the locking-plates in place.

A modified form of fusible element which embodies some of the features incorporated in the fusible element illustrated in Figs. 2 and 3, is illustrated in Figs. 15 and 16.

Instead of forming the fusible element of a plurality of separate fusible strips, each having one or more readily fusible portions, and connecting all of the strips in series between the fuse-terminals, I may herein utilize a single fuse strip having a plurality of more readily fusible portions 55 separated by the less readily fusible portions 56 and secure the whole or part of the less readily fusible portions 56 to the insulating bar or strip 19^a by the bolts 57. For some purposes this construction may be used instead of that above set forth.

I claim:

1. An enclosed electric fuse of the cartridge type comprising a single tubular enclosing casing, and a plurality of fusible elements of similar resistance arranged therein in series.

2. An enclosed electric fuse of the cartridge type comprising a single tubular enclosing casing, knife-blade terminals extended from the ends thereof, and a plurality of fusible elements of similar resistance arranged within said casing connected in series between said terminals.

3. A renewable electric fuse of the cartridge type comprising a tubular enclosing casing, end caps removably arranged on the ends of said casing, and a plurality of fusible elements of similar resistance arranged within said casing connected in series between said end caps.

4. A renewable electric fuse of the cartridge type comprising a tubular enclosing casing, end caps removably arranged on the ends of said casing, knife-blade terminals detachably extended from said end caps, and a plurality of fusible elements of similar resistance arranged within said casing connected in series between said terminals.

5. A renewable electric fuse of the cartridge type comprising an enclosing casing, end-caps removably arranged thereon, knife-

blade terminals detachably extended from said end-caps, a fuse-supporting insulating strip arranged within said casing connecting said terminals, and a plurality of fusible elements supported by said strip connected in series between said terminals.

6. A renewable electric fuse of the cartridge type comprising an enclosing casing, end-caps removably arranged thereon, fuse terminals removably supported by said end-caps, a fuse-supporting insulating strip arranged within said casing supporting said terminals at its ends, and a plurality of fusible elements carried by said strip on opposite sides thereof connected in series with said terminals.

7. A renewable electric fuse of the cartridge type comprising an enclosing casing, end-caps removably arranged thereon, fuse terminals removably supported by said end-caps, a fuse-supporting insultaing strip arranged within said casing supporting said terminals at its ends, a plurality of fusible elements carried by said strip on opposite sides thereof electrically connected with said terminals, and means extended through said strip electrically connecting said fusible elements.

8. In an electric fuse of the cartridge type, a fuse holder comprising a fuse-supporting strip of insulating material, fuse terminals secured to the ends of said strip, a plurality of fusible elements of similar resistance supported by said strip and connected with said terminals, and means having high melting point and low resistance electrically connecting said fusible elements in series.

9. A fuse holder for a renewable electric fuse of the cartridge type comprising a fuse-supporting strip of insulating material, fuse terminals secured to the ends thereof, and a fusible element having a plurality of more readily fusible portions of similar resistance in series connected to said strip in electrical connection with said terminals.

10. An electric fuse of the cartridge type comprising an enclosing casing, fuse terminals carried by the ends thereof, a fusible element arranged within said casing electrically connected with said terminals, said fusible element having a plurality of more readily fusible portions of similar resistance in series, and means engageable with said fusible element between said more readily fusible portions to support and hold it.

11. A fuse link, consisting of a strip of insulating supporting material, and a current carrying element, consisting of strips of readily fusible material of similar resistance, centrally connected to said supporting material by connections of high melting point and low resistance compared to the fusible element, which connections also serve to electrically connect said fusible elements in series.

12. A fuse link, consisting of a strip of insulating supporting material, and a current carrying element, consisting of strips of readily fusible material of similar resistance, carried by said strip on opposite sides thereof, centrally connected electrically to each other by material of high melting point and low resistance compared to the fusible element, said connections passing through said supporting strip and connecting the same firmly to the supporting material in series.

In testimony whereof, I have signed my name to this specification.

FRANKLIN N. CONANT.