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G. F. LAING

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RENEWABLE FUSE

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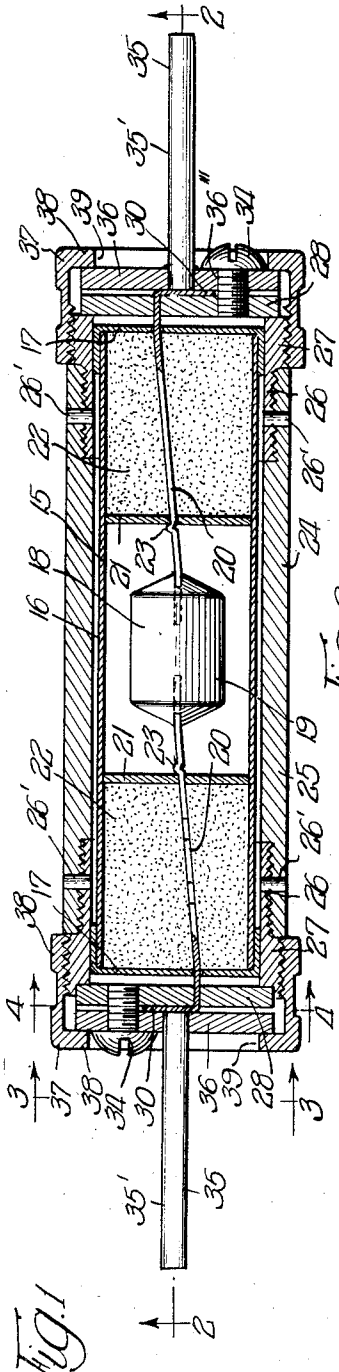


Fig. 1

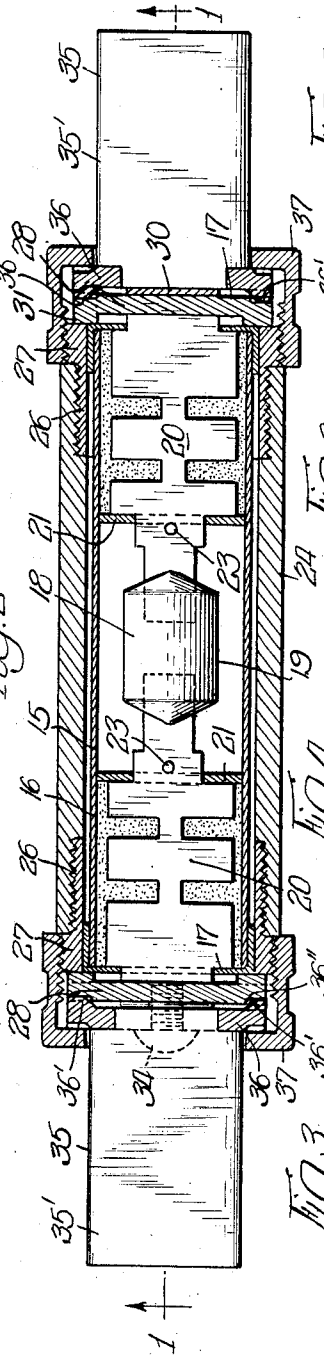


Fig. 2

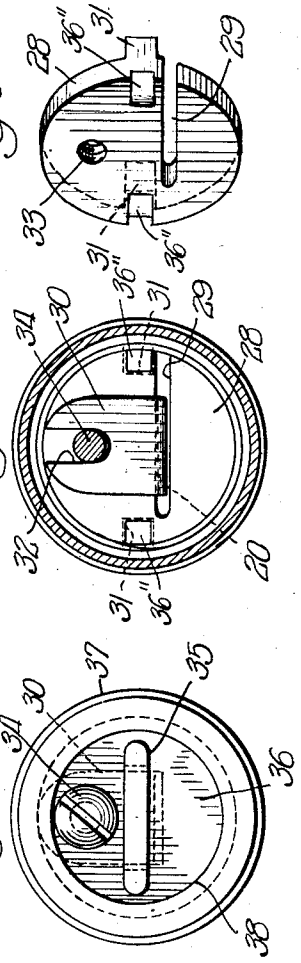


Fig. 3

Fig. 4

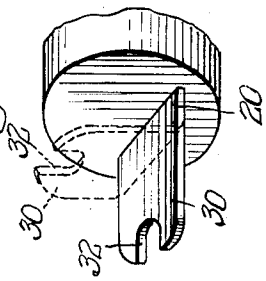


Fig. 5

Fig. 6

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RENEWABLE FUSE

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6 Claims. (Cl. 200—132)

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The present invention relates to improvements in renewable fuses.

The present invention is particularly applicable to renewable lag fuses, although the invention is not limited thereto. In lag fuses as at present known and used, it has not been practicable to provide a renewable unit which may be removed from the casing when blown, a new fuse being inserted into that casing. Expressed in other language, in renewable fuses as now known and used, it has not been practicable to provide a renewable cartridge with lag characteristics because there is not sufficient room within the casing for a renewable lag fuse element. It is very desirable from an economy standpoint to save the relatively expensive fiber casing, the heavy copper or brass ferrules, or the heavy contact blades and the holding means therefor, which form parts of the usual types of fuse.

An object of the present invention is to provide an improved fuse combining a renewable cartridge having fuse elements therein and a casing therefor having operative contact members in the form of ferrules or contact blades.

A further object is to provide an improved renewable lag fuse having sturdy enclosing elements and contact elements, in combination with a lag fuse element of relatively light and inexpensive construction, which lag fuse element may be readily removed and replaced when desired.

A further object is to provide a sturdy casing having contact terminals well adapted to releasably hold a relatively light and inexpensive fuse element and to provide good electrical connection between said fuse element and said terminals.

A further object is to provide an improved renewable fuse element of relatively light and inexpensive construction which may be readily mounted in or disassembled from a casing of sturdy construction.

Further objects will appear as the description proceeds.

Referring to the drawings—

Figure 1 is a sectional view illustrating one embodiment of the present invention, said view being taken along the plane indicated by the arrows 1—1 of Figure 2;

Figure 2 is a sectional view of the construction illustrated in Figure 1, Figure 2 being taken along the plane indicated by the arrows 2—2 of Figure 1;

Figure 3 is an end view of the construction shown in Figures 1 and 2, said view being taken in the direction of the arrows of Figure 1;

Figure 4 is a sectional view taken along the plane indicated by the arrows of Figure 1;

Figure 5 is a fragmentary view in perspective showing one end of a renewable lag fuse cartridge, such as illustrated in Figures 1 and 2; and

Figure 6 illustrates a detail of construction.

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Referring to Figures 1 to 6 inclusive, the numeral 15 indicates a cartridge of tubular form made up of the tube 16, which may be of paper or other light and inexpensive material, provided with the end caps 17, 17, which receive the ends of the tube 16. Said end caps 17, 17 will ordinarily, although not necessarily, be made of metal and may be relatively light and inexpensive.

Located within the cartridge 15 is a fuse assembly indicated as a whole by the numeral 18, said fuse assembly 18 being made up of the slug 19 of fusible metal which provides a heat reservoir and will preferably be a eutectic alloy.

Physically and electrically connected to the two ends of the slug 19 are the fuse links 20, 20, which operate also as heaters for the slug 19. The fuse links 20, 20 extend through apertures in the caps 17, 17 and are of sufficient length to project well beyond the ends of the cartridge 15. Disposed within the tube 16 are the diaphragms 21, 21, providing a pocket for the slug 19, and between said diaphragms and the caps 17, 17 are pockets containing inert powder indicated by the numerals 22, 22. The diaphragms 21, 21 may be held apart by means of dimples 23, 23 struck out of the links 20, 20.

The cartridge 15 with its contents is removably mounted within a casing indicated as a whole by the numeral 24. The casing 24 includes the tube 25, which may be of relatively sturdy fiber. Disposed within each end of the tube 25 is a collar 26, having a bore coinciding with the interior wall of the tube 25. Pins 26', 26' hold the collars 26, 26 against turning after said collars have been turned home. The outer end of each of the collars 26, 26 is provided with an externally threaded enlarged portion 27. Disposed in abutting relationship with the outer ends of the portions 27, 27 of the collars 26, 26 are the slotted plates 28, one of which is shown in perspective in Figure 6.

Each of the plates 28, 28 is provided with a slot 29 communicating with the periphery thereof and extending across said plate a sufficient distance to receive the bent-over end of a corresponding link 20. Each of the plates 28 is provided with a pair of lugs 31, 31 adapted to fit within corresponding slots in the ends of the portions 27, 27 of the collars 26, 26, whereby to hold the plates 28, 28 against turning movement, so as to definitely locate said plates circumferentially with respect to the tube 25.

Each of the bent-over ends 30, 30 of the links 20, 20 is provided with an open-ended slot 32. Each of the plates 28, 28 is provided with a screw-threaded hole 33 extending therethrough in a direction parallel with the axis of the corresponding plate 28.

Located at each end of the fuse is a terminal

35 including a blade 35' and a circular plate 36 positioned to co-operate with the corresponding plate 28 to clamp the end 30 of the corresponding fuse link 20. Each plate 36 is provided with projections 36', 36' adapted to fit within corresponding depressions 36'', 36'' in the corresponding plates 28, 28, whereby to definitely locate said plates 36, 36 circumferentially with respect to their corresponding plates 28, 28. Each plate 36 is provided with a hole 36'' extending therethrough of sufficient size to receive the shank of a corresponding machine screw 34, which is adapted to be threaded into the hole 33 of the corresponding plate 28 and to be located within the slot 32 of the corresponding bentover end 30 of each corresponding link 20, whereby to hold the plate 36 of the corresponding terminal 35 in clamping relationship with the corresponding plate 28 to grip the end 30 of the corresponding fuse link 20. The slots in the ends of the collars 26, 26 for receiving the lugs 31, 31 of the plates 28 will have their center lines in a single diametrically disposed plane of the casing 24 and the projections 36', 36' in the plates 36 will be so related to the depressions 36'', 36'' in the plates 28, 28 that the terminal blades 35', 35' will be definitely positioned in alignment with each other.

Located at each end of the fuse is a cap 37 which may be made of relatively sturdy material. Each of said caps is provided with the skirt portion 38 internally threaded to engage the external threads on the enlarged portion 27 of the corresponding collar 26. Each of said caps 37 has an end portion 38 provided with a circular hole 39 of sufficient diameter to receive the head of the corresponding machine screw 34 and the blade 35a of the corresponding terminal 35.

In the embodiment of the invention illustrated in Figures 1 to 6 inclusive, the cartridge 15 embodies lag characteristics due to the mass of the fusible slug 19, whereby reasonable overloads may be carried for determinable periods of time. The links 20, 20 will fuse under conditions approximating short circuit conditions.

The cartridge 15 may be of relatively light and inexpensive construction and may be readily mounted within the casing 24 according to the following procedure: The cartridge 15 will be slipped into the casing 24 and a plate 28 will be mounted on the end 30 of each link 20, said ends 30 being located within the slots 29 of the plates 28. By reason of the lugs 31, 31 the plates 28 and consequently the cartridge 15 will be held against turning movement. The ends 30, 30 having been bent over into right angular relationship with the axis of the cartridge 15, the machine screws 34 may be inserted and screwed home to hold each bent-over end 30 securely between the plates 28 and 36, thereby providing electrical communication between the links 20, 20 and the terminals 35, 35. The caps 37 may then be turned home to provide a rigid assembly.

When the fuse blows either due to the fusing of the links 20, 20 or to the fusing of the slug 19, the cartridge 15 may be readily removed by reversing the procedure above outlined and a new cartridge 15 may be readily inserted.

Though certain preferred embodiments of the present invention have been described in detail, many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

I claim:

1. A renewable fuse comprising an inner cartridge having deformable terminal links extending from its opposite ends, a tubular casing enclosing said cartridge including an end closure for said casing including a pair of clamping members, the innermost clamping member being fixed in non-rotatable relation with respect to said casing and having an aperture through which one of said terminal links extends and turns down against said innermost member, the outermost member being disposed against said innermost member so as to confine the turned-down portion of the terminal link between them, and means for clamping the outermost member to the innermost member in non-rotating relation thereto so as to compress and grip the confined portion of said terminal link therebetween, said outermost member comprising an electric terminal end plate for the assembled fuse.

2. The invention as defined in claim 1, in which said outermost member has a knife-blade terminal projecting therefrom.

3. The invention as defined in claim 1, in which said clamping means comprises a threaded element screwed into both of said members through the confined portion of said terminal link.

4. The invention as defined in claim 1, in which said clamping means comprises an internally threaded end cap screwed upon said casing.

5. A renewable fuse comprising an inner replaceable cartridge having axially extending terminal links at each of its ends, an open-ended tubular casing within which said cartridge is enclosed, a threaded periphery at the open end of said casing, a keyway extending transversely of said periphery, an end plate closing the open end of said casing having projections engaged in said keyway so as to preclude relative turning movement therebetween, an opening in said end plate through which a terminal link of said cartridge extends, said link being turned to lie against the outer face of said plate, a clamping plate overlying said end plate to confine and clamp the extremity of the terminal link therebetween, both plates and the confined extremity of the terminal link having aligned openings through which screwthreaded means passes to fasten said plates non-rotatably together, a knife-blade terminal projecting outwardly in normal relation to said clamping plate, an internally-threaded cap engaged upon the threaded periphery of said casing having means to secure said plates thereto, and a circular opening in said cap to accommodate said knife-blade terminal in free turning relation thereto.

6. The invention as defined in claim 5, in which opposite ends of the fuse are identically constructed with the knife-blade terminals in axial and planar alignment.

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