Aug. 25, 1953 F. G. VON HOORN 2,650,283

RESILIENT END WASHER RENEWABLE FUSE

Filed April 4, 1951

Fig. 1.

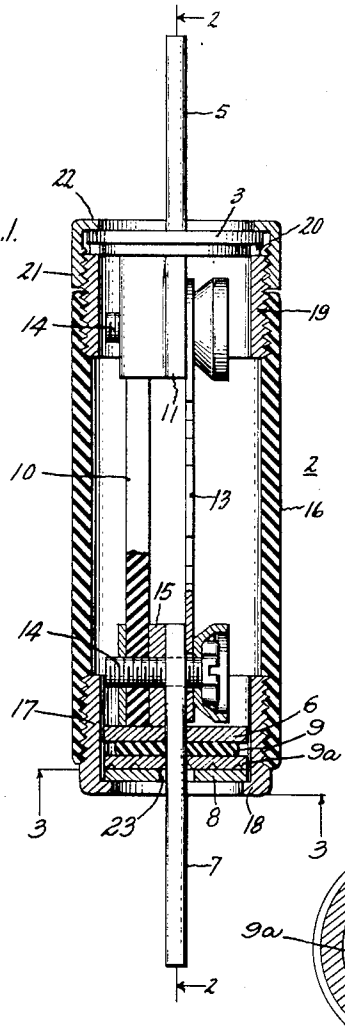


Fig. 2.

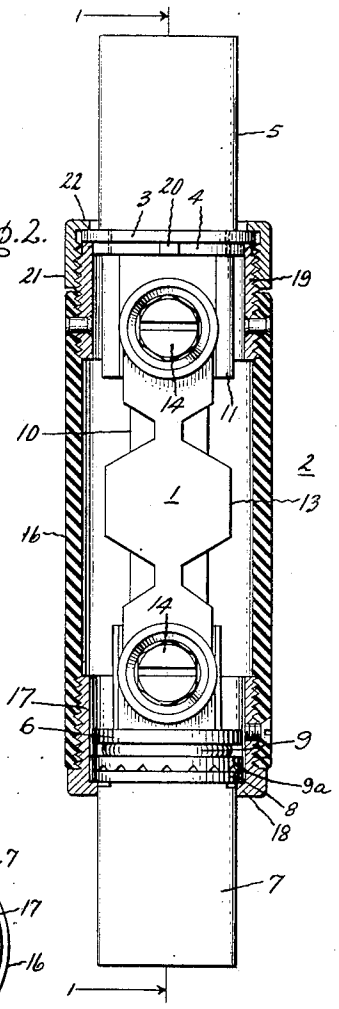
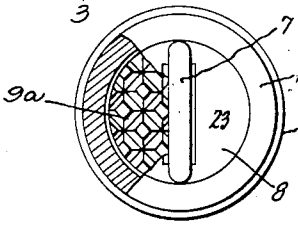


Fig. 3.



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RESILIENT END WASHER RENEWABLE FUSE

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3 Claims. (Cl. 200—131)

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My invention relates to renewable electric fuses of the cartridge type and, particularly, to a resilient end washer for such a fuse.

This application is a continuation-in-part of my abandoned application Serial No. 176,030, filed July 26, 1950, and assigned to the same assignee as the present application.

Renewable electric fuses of the cartridge type commonly comprise a pair of spaced terminal strips supported by a bar of insulating material and interconnected by a fusible strip, or fuse link, as it is generally called. This assembly is then inserted into a cartridge of insulating material having at least one removable end to form a gas-pressure resisting cylinder with a portion of the terminal strips extending from each end. One or both ends of the cartridge are provided with closures providing only a restricted escape path for gases generated by blowing of the fuse link.

In this type fuse, difficulty is encountered in securing cartridges and insulating bars of the proper relative length; that is, due to the manufacturing tolerances the cartridge may be too short for the bar in one instance to produce a buckling or twisting of the bar; or the cartridge may be too long for the bar to produce a loose fit and an insufficiently restricted seal against internal gas pressures.

It is an object of this invention to provide a cartridge type, renewable fuse structure having a compensating member to offset manufacturing tolerances while simultaneously sealing the structure to force escaping gases produced by a blown link to follow a circuitous path effective to cool them before they escape from the fuse cartridge.

Briefly, this invention comprises the combination of a compressible, heat resistant sealing member with metal end closure members mounted on a renewable fuse structure before it is inserted into its cartridge housing. The compressible sealing member compensates for the difference in length of cooperating fuse link supporting members resulting from manufacturing tolerances. It simultaneously insures a tight fit between cooperating end closure members to direct escaping gases through a predetermined circuitous path, thereby cooling them before they escape from the fuse cartridge.

My invention will best be understood from the following description in connection with the accompanying drawing in which Fig. 1 is a cutaway view of a renewable fuse assembly enclosed in a cartridge with parts of the fuse link assembly cut away; Fig. 2 is a view along line 2—2 of Fig. 1 looking in the direction of the arrows and Fig. 3 is an end view of Fig. 1.

Referring to Figs. 1, 2 and 3 as amended, a

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renewable fuse assembly 1 is enclosed within a cartridge 2. Washers 3 and 4 form the closed end of cartridge 2 having diametral slots of the configuration of the narrow portion of a knife blade terminal 5 which projects through the slots. Washer 3 is secured against shoulders of blade 5 by washer 4 which is caulked to blade 5. A flat washer 6 is provided with a diametral slot having the configuration of the narrow portion of a knife blade terminal 7 projecting through the slot and the joint between washer 6 and blade 7 is caulked to be gas-tight. The diameter of the washer 6 is somewhat smaller than the inside diameter of that part of the cartridge 2 within which it is positioned to permit gases escaping from the interior of the cartridge to flow around the washer edges toward the lower end of the fuse assembly. The blade 7 also projects through a loose fitting diametric slot in a flat lower washer 8 and through intermediate washers 9 and 9a, the intermediate washers also having diameters smaller than the inside diameter of the cartridge. Washer 9 is made of a resilient material, preferably a compressible, heat resisting, elastomeric material such as silicone rubber or other suitable material, and washer 9a is suitably made of metal and provided with a waffle surface bearing against the upper surface of the flat washer 8 and a flat surface engaging the resilient washer 9. Together the washers 6, 8, 9 and 9a form a resilient end assembly for the cartridge 2.

A supporting bar 10 of non-conducting material held in clamps 11 and 12 extending around bar 10 and engaging projections on the sides of terminals 5 and 7 is secured with a fuse link 13 to terminals 5 and 7, respectively, by bolts 14 to form fuse link assembly 1. Spacers 15 separate bar 10 from blades 5 and 7.

To hold the end washer assembly in position, the cartridge 2 is suitably constructed with a cylindrical insulating casing 16 having its lower end internally threaded and engaging one end of an externally threaded metal ferrule 17 having an inwardly extending flange 18 against which the edges of the flat washer 8 are biased when the ferrule is threaded into the casing 16 far enough to compress the resilient washer 9. A similar ferrule 19 is in threaded engagement with the inside of the opposite end of casing 16 and is provided with a threaded portion protruding from casing 16. The inside surface of ferrule 19 is provided with axially extending notches corresponding to projections 20 on the periphery of washer 4 to prevent ferrule 19 from rotating with respect to blade 5.

A cap 21 is in threaded engagement with ferrule 19 and is provided with an inwardly projecting flange 22 to restrain washer 3 against the

end of the ferrule 19 to seal that end of the cartridge. As cap 21 is threaded on ferrule 19, blade 5 moves into ferrule 19. Washer 8 moves along blade 7 forcing washers 9 and 9a into engagement with washers 6 which is prevented from movement with respect to blade 7 by engagement with clamp 12. Cap 21 is further tightened on ferrule 19 to within a slight clearance distance of casing 16, compressing the resilient washer 9. When the resilient washer 9 is compressed, cartridge 2 is firmly secured to fuse link assembly 1. Thus, the length of casing 16 may be allowed a manufacturing tolerance equal to the maximum depression of washer 9.

As shown in detail in Fig. 3, the waffled lower source of the washer 9a, which surface may also be described as having a plurality of perpendicular intersecting grooves as in a waffle iron, provides a number of small cross-sectional area paths from its periphery to the blade 7 when in contact with the upper flat surface of washer 8. Consequently, when the washers are tightened into engagement, gases produced by a blown fuse must pass around the outer peripheries of washers 6, 9, and 9a, and then along the waffled surface of washer 9a between it and washer 8 to escape through the clearance slot 23 of washer 8. This combination of elements provides a predetermined cooling path for the escaping gases thereby reducing the temperature of the emitted gases.

Washer 9 in being formed from silicone rubber or other suitable heat-resistant, compressible material, provides an element not heretofore recognized in the art. Washer 9 in addition to effecting a predetermined path for the cooling gases provides a low cost means for compensating for relative length differences in the cartridge 2 and insulating bar 10, which differences are a natural result of allowable mass production manufacturing tolerances.

With this structure, the fuse assembly 1 when inserted into cartridge 2 has the resilient washer 9 to compensate for relative length differences of the cooperating members. When cap 21 is tightened into engagement with ferrule 19, washer 9 is compressed to effect a gas-tight seal between the engaging surfaces of washers 6, 9, 9a, and 8. This end is accomplished and a tight fit is effected between the fuse assembly 1 and the cartridge 2 irrespective of the relative lengths of the cooperating members as governed by allowable manufacturing tolerances.

Modifications of this invention will occur to those skilled in the art and it is desired to be understood, therefore, that this invention is not to be limited to the particular embodiment disclosed, but that the appended claims are meant to cover all the modifications which are within the true spirit and scope of this invention.

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

1. In a renewable fuse having aligned axially spaced apart terminal blades, a link electrically interconnecting said blades, a cylindrical casing having means including an inturned flange partially closing one end, and a threaded collar for closing the opposite end, a closure for said flange end of said casing for directing escaping gases through predetermined fixed paths, said end closure comprising a plurality of washers positioned in parallel juxtaposition, each of said washers having a diameter smaller than that of said casing, and each of said washers further having a central slot to permit a terminal blade to pass therethrough, the axially outer one of said washers being positioned to engage the periphery of said casing inturned flange, means forming a gas tight seal between the axially inner one of said washers and said terminal blade to force gases about its peripheral edges, and a pair of washers lying between said axially inner and outer ones, one of said pair being of resilient material and the other of said pair having one waffled face to provide with said axially outer washer circuitous radially inwardly directed passageways to effect a cooling of gases as they pass out of said casing.

2. In a renewable fuse having a casing, one fixed end collar, one removable end collar, a pair of axially aligned knife blades extending one through either end collar with one of said blades having an integral shoulder at its axially inner end and an insulating bar interconnecting the axially inner ends of said knife blades, a venting means for conducting high pressure gases from the fuse casing, said venting means comprising at one end of said casing a first pair of centrally slotted axially spaced washers positioned on one of the knife blades between its integral shoulder and the insulating bar, means forming a gas tight seal between said knife blade and the inner one of said washers, an escape aperture defined between the outer one of said washers and said knife blade to provide for conducting gases from said fuse casing, and a second pair of washers axially positioned between said first pair, the outer one of said second pair having a waffled face contiguous with the outer washer of said first pair to conduct gases radially inwardly to said escape aperture, the other washer of said second pair being made of elastomeric material to act as a seal between the inner washer of said first pair of washers and said waffled face washer, said elastomeric washer being axially compressible to compensate for manufacturing tolerances in said fuse parts.

3. In a renewable fuse structure having a cylindrical casing, a pair of terminal blades, an insulating bar, clamping means for positioning said terminal blades in spaced part axially aligned relationship, a fuse link for electrically interconnecting said terminal blades, and caps at least one of which is removable for partially closing the ends of said fuse structure while permitting portions of said terminal blades to extend one from either end, an end closure for providing a predetermined cooling path for the escape of gases under pressure from said casing, said end closure comprising a plurality of washers axially arranged in parallel juxtaposition with all of said washers having both a diameter smaller than that of said casing and a central diametrical slot to permit the passage of a portion of one of said terminal blades therethrough, the axially outer washer means defining a radial path to permit the escape of gases out of said tube, a resilient washer made of an elastomeric composition positioned axially inwardly from said outer washer means to compensate for length variances in the fuse parts, and clamping means for effecting a fuse assembly.

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