June 15, 1954 L. DETCH 2,681,399

THERMAL FUSE

Filed Sept. 26, 1952

FIG. 1

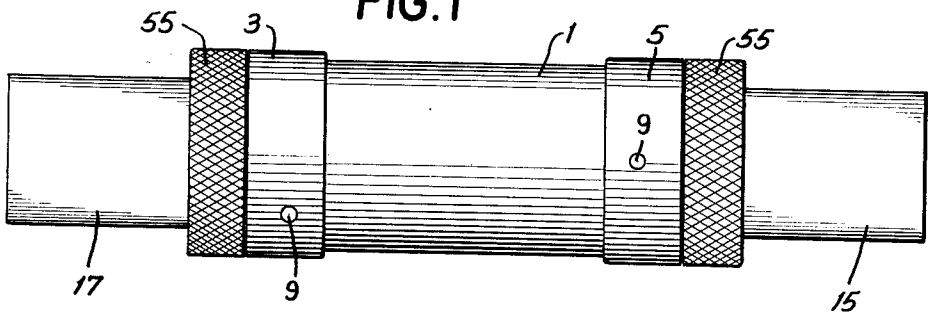


FIG. 2

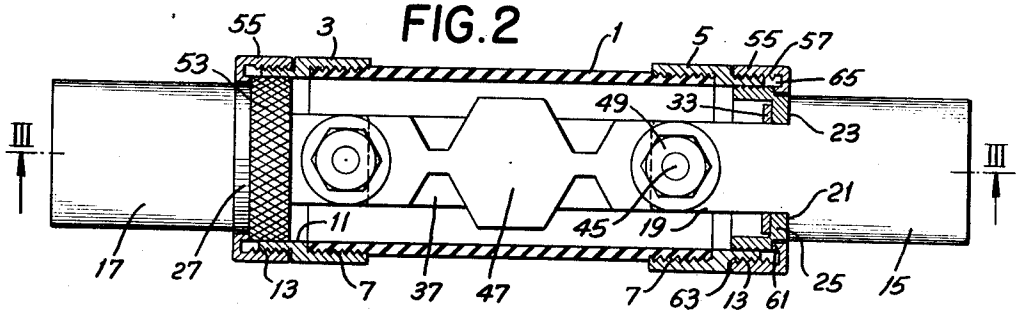


FIG. 3

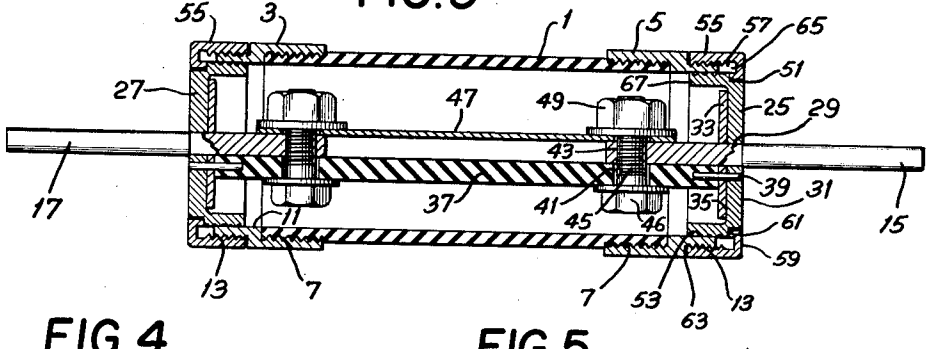


FIG. 4

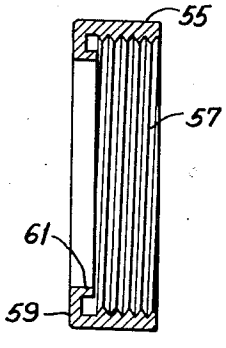
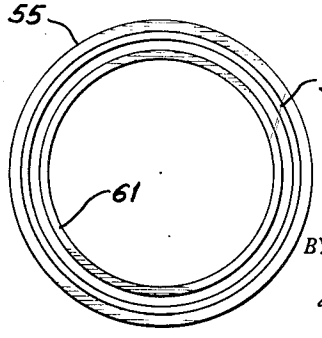


FIG. 5



INVENTOR.
Lewis Detch
BY
Lyman E. Dodge
ATTORNEY

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THERMAL FUSE

Lewis Detch, Pittsburgh, Pa.

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3 Claims. (Cl. 200—131)

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This invention relates to electricity-circuit makers and breakers, especially to thermal current heater cartridge fuses.

This invention is an improved knife blade cartridge electric fuse.

This invention appertains more directly to the knife blade assembly constituting the interior mechanism of the fuse and its over all proportioning in relation to the internal diameter and over all length of the containing cartridge of conventional form. The assembly is particularly characterized by the use of two externally knurled metallic cups, one at each end of the assembly, also a symmetrical construction which permits the introduction or removal of the assembly from either end of the containing cartridge.

A principal object of the invention is the production of a knife blade cartridge electric fuse so constructed that improved venting is secured when the fuse strip therein is vaporized, to the end that the cartridge will not be destroyed or adjacent materials ignited.

A further object of the invention is the production of a fuse, of the type specified, which is so constructed that fuse strip vapor issuing therefrom will be substantially reduced in temperature from that issuing from commonly used conventional knife blade cartridge fuses to the end that there will be less danger of igniting nearby combustible materials.

A further object of the invention is the production of a fuse, of the type specified, which will be so constructed that the danger of soldering together closely adjacent metallic parts along the path of issuing fuse strip vapor will be minimized.

Other objects and advantages will appear as the description of the particular physical embodiment selected to illustrate the invention progresses and the novel features will be particularly pointed out in the appended claims.

In describing the invention in detail and the particular physical embodiment selected to illustrate the invention, reference will be had to the accompanying drawings and the several views thereon, in which like characters of reference designate like parts throughout the several views, and in which:

Figure 1 is a side elevational view of a device embodying my invention;

Fig. 2 is a cross sectional view of the device as shown by Fig. 1;

Fig. 3 is a cross sectional view of the device as shown by Fig. 2 on the plane indicated by the line III—III viewed in the direction of the arrows at the ends of the line;

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Fig. 4 is a sectional view of a cap used in connection with my invention;

Fig. 5 is an end view of the device as shown by Fig. 4 viewed from the right hand side as shown in Fig. 4.

Those familiar with the art of knife blade cartridge fuses are well aware that a knife blade cartridge fuse in order to pass Underwriter's inspection must be capable of having its enclosed fusible strip destroyed by a large excess of current over the rated carrying capacity of the fuse without exploding or allowing hot vapors to escape therefrom so as to ignite closely adjacent combustible matter.

Not only must a fuse meet the requirements of the Underwriters, but must meet the requirements of the users. The users demand a knife blade cartridge fuse with a minimum of parts and capable of disassembly from either end. Further, the disassembly must not result in a large number of small parts.

My present invention meets the requirements of the Underwriters and also the requirements of the users.

Numeral 1 designates a hollow cylindrical body formed of insulating material such as hard horn fibre. On each end of the cartridge 1 there is a collar or ferrule, 3 and 5. This ferrule may be attached to the cartridge 1 in any suitable or appropriate manner. I have shown it as attached by a thread, as 7, and also by a pin, as 9. The ferrule 3 has a portion 11 projecting beyond the end of the cartridge 1 which is of the same internal diameter as the internal diameter of the cartridge. This extension is screw-threaded as at 13. All of the constructions hereinbefore described are old and conventional.

Within the fuse is a unitary structure which I designate as the knife blade assembly. This knife blade assembly includes metallic knife blades 15 and 17 at each end thereof. Each knife blade is substantially rectangular in shape and thin relatively to the length of the knife blade. Each knife blade is formed with a tang end 19 which is also rectanglular in shape but reduced in size so as to form shoulders as at 21 and 23.

I provide metallic cups, 25 and 27, preferably of brass, one at each end of the knife blade assembly. These metallic cups are formed with a slot as 29 through which the tang 19 extends so that the outer bottom 31 of the cup abuts the shoulders, as 21 and 23. Within each metallic cup, as 25 and 27, there is a metallic washer, as 33, also preferably formed of brass. This washer is formed with a slot and receives the tang 19

and rests against the inside bottom 35 of the cup 25.

Abutting washer 33 is an insulating bar 37, formed, preferably, of hard horn fibre. This bar 37 also rests against a face of the tang 19 and is preferably positioned by a pin, as 39, passing through the bottom of the cup 25 and the washer 33 and extending into the bar 37. The bar 37 is formed with a through bore 41 to receive a bolt.

Tangs 19 are pierced by a through bore, as 43, formed screw threaded.

A bolt 45 having a head 46 resting upon the bar 37 passes through the bore 41 and through the bore 43 being screw-threaded in the latter.

Above the tang 19, as viewed in Fig. 3, a fusible strip 47 rests on the tang and is secured in position by a nut 49 on the bolt 45 which nut when tightened firmly binds the fusible strip, the tang 19 and the bar 37 together.

The cup 25 is formed for a portion of its outer periphery with a reduced portion 51 forming a shoulder. The outer periphery 53 of the cup 25 is heavily knurled.

A cap 55 is provided which is internally threaded at 57 to cooperate with the external thread 13 on the ferrule, as 5. This cap 55 is formed with a flange 59 extending inwardly. The flange has a rim 61 extending inwardly. The center of rim 61 corresponds with the center of the cap 55 and the external diameter of the down turned rim 61 corresponding to the external diameter of the reduced portion 51 of the cup 25 and the external diameter of the rim 61 corresponds with the external diameter of the cup 25.

When the cap 55 is screwed down upon ferrule 5, the rim 61 engages the reduced portion 51 of the cup 25 and holds it firmly inwardly and at the same time centers it, so that the knurling 53 is equidistant all around from the internal surface of the ferrule.

Both the right hand and the left hand ends of the fuse, as shown in Figs. 1, 2, and 3, are identical, and the distance from the shoulder on one metallic cap to the shoulder on the other metallic cap is greater than the distance between the ends of the ferrules, and the length of the caps is made such that they may be screwed down firmly before the inner ends of the cap abut a shoulder as 63 on a ferrule, so that a user can always be certain that the knife fuse assembly is firmly and properly secured within the cartridge.

Although I have shown the knife blade assembly as having identical ends I do not mean to exclude the use of my improved metallic cup 25 on one end only of the assembly.

From the hereinbefore given description it will be understood that the fuse of my invention is symmetrical, in that it has identical ends, so that when one desires to open the fuse to replace a fusible strip either end cap may be unscrewed and the assembly thereby removed.

The fuse of my invention gives a maximum of cooling. When the fusible strip 47 is vaporized the hot arc and gases flow into the inner portion of the cup 25 which provides a very large superficial area for cooling vapors and gases and allows some metal to be deposited thereon. The vapors and gases after contacting the inner face and inner bottom of metal cup, as 25, then flow out through the joint between the inner surface of ferrule 5 and the periphery of the cup. In so doing, the vapors and gases encounter the multitude of points of metal formed by the knurling on the periphery of the cup, as 25, so that the arcs are broken up into small arclets and the vaporized metal is deposited in the depressions. The tortuous path followed by the vapors and gases in thus issuing along the periphery of the cap 25, quite thoroughly cools the vapors and gases. After the gases pass along the knurling they are received within the chamber 65 where they are further in contact with metallic surfaces which further cool them and they then issue along the joint between the rim of the cap 55 and the reduced portion of the cup 25.

Some of the gases and vapors may also pass out through the joint between washer 33 and the inside bottom of the cup 25 and then along the joint between the tang 19 and the bottom wall of the cup 25, then issuing along the knife blade. This tortuous path brings the vapors and gases into very close and intimate contact with broad metallic surfaces which thoroughly cool the gases so that there is no danger of their issuing from the fuse at too high a temperature.

The metallic cup 25 with its long side 67 provides a most ample and expansive superficial area for the cooling of vapors and gases.

The extension of the bar 37 within the cup 25 is also advantageous because arcs contacting the bar 37 are quenched, as the bar has quenching properties toward electric arc.

Although I have particularly described one particular physical embodiment of invention and explained the construction and principle thereof, nevertheless, I desire to have it understood that the form selected is merely illustrative, but does not exhaust the possible physical embodiments of the idea of means underlying my invention.

What I claim as new and desire to secure by Letters Patent is:

1. A knife blade cartridge fuse, including, in combination, an electric insulating cartridge formed as a hollow cylinder, two metallic collars, one on each end of the cartridge, each collar including means for attaching it rigidly to the cartridge, each collar having the same internal diameter for a portion of its length remote from the cartridge as the internal diameter of the cartridge and the remaining portion of the collar an internal diameter the same as the external diameter of the cartridge, the collar formed with a reduced external diameter for a portion of its length remote from the cartridge forming a shoulder, the said reduced external diameter portion being formed with a screw thread, two metallic cups, one positioned in each of the collars largely in that portion of the same internal diameter as the internal diameter of the cartridge, each cup protruding beyond the outer end of a collar, each cup having its open end facing the open end of the other cup, each cup having its outer end formed with a reduced diameter portion forming a shoulder, two caps, one at each end of the cartridge, each cap being formed as a hollow cylinder with an inwardly directed flange at one end, said flange formed with a depending circular rim, the center of which corresponds with the center of the cap, the internal diameter of the rim being the same as the external diameter of the portion of reduced external diameter on a cup and the external diameter of the rim being the same as the external diameter of a cup, the depth of the rim being equal to the length of the reduced external diameter portion of a cup, the cap formed with an

internal screw thread matching the external thread on a collar, knife blades, one at each end of the cartridge, each knife blade protruding from a cup, means for spacing the cups one from the other and spacing and supporting the knife blades and a fuse strip between the knife blades.

2. A cartridge knife blade assembly, including, in combination, two metallic cups, each cup having its open end facing the open end of the other cup, each cup having its outer end formed with a reduced diameter portion forming a shoulder, two metallic washers, one at the bottom of each cup, two knife blades, one passing through each cup and each washer and extending therebeyond, an insulating bar extending from one washer to the other washer, a fusible strip extending from the inner end of one knife blade to the inner end of the other knife blade and means for firmly securing together the bar, the knife blade and the fusible strip.

3. A cartridge fuse knife blade assembly end, including, in combination, a metallic knife blade of substantially rectangular shape and relatively thin in comparison to its length, said knife blade

formed with a reduced tang end forming a shoulder, a metallic cup formed with a slot through which the tang is passed, the outer bottom of said cup abutting said shoulder, said cup formed with a knurled periphery, a washer formed with a slot receiving the said tang and abutting the inside bottom of said cup, said cup formed with a reduced diameter portion adjacent its outer bottom adapted for the reception of a cartridge cap flange rim, a threaded transverse through bore in said tang adapted for the reception of a threaded bolt, and means for rigidly connecting said end with a cooperating opposite end, said bolt also adapted to secure one end of a fusible strip.

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