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H. R. COOK ET AL

1,912,431

FUSE

Filed May 20, 1930

Fig. 1.

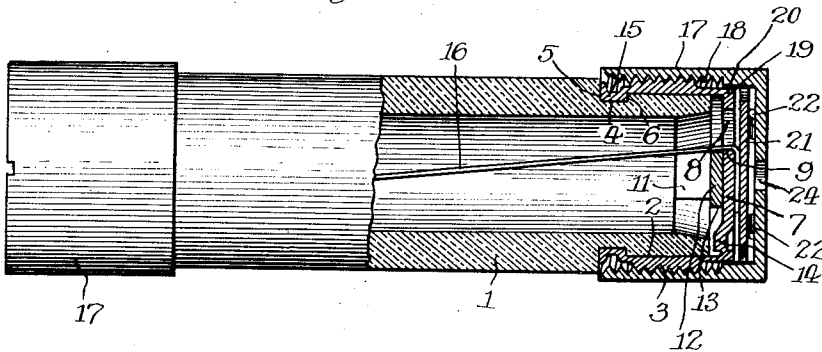


Fig. 2.

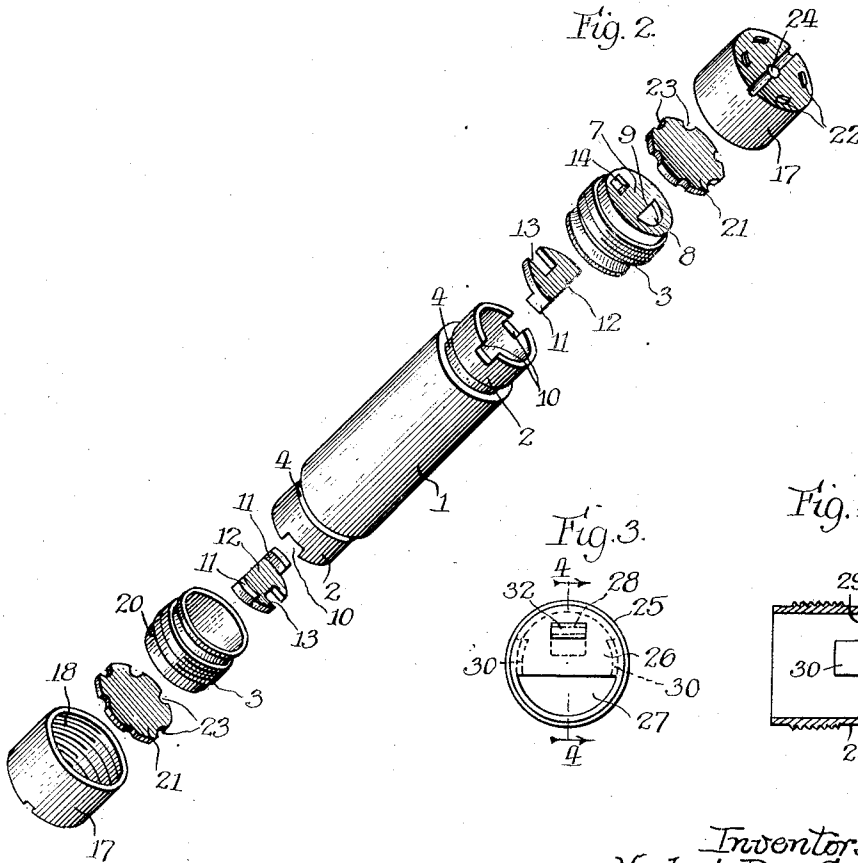


Fig. 3.

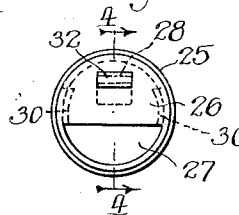
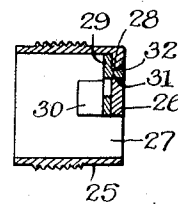


Fig. 4.



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UNITED STATES PATENT OFFICE

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FUSE

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More particularly the invention relates to a renewable ferrule type of fuse, the general object being to provide a new and improved fuse of this character, simple and rugged in construction and efficient in operation.

Another object is to provide a new and improved ferrule fuse which is economical in construction and comprises parts which are readily assembled.

Another object is to provide an improved fuse embodying a novel means for attaching metal ferrules to a tubular insulating casing adapted effectively to secure the ferrules to the casing against rotational or longitudinal movement.

Another object is to provide a ferrule fuse comprising an insulating casing and a pair of metal ferrules rigidly secured to the ends of the casing in a manner such that they will not loosen due to changes in the fiber casing caused by atmospheric conditions or by the forces exerted upon the blowing of a fusible element.

A further object is to provide a novel end construction for ferrule fuses having efficient and rigidly supported clamping means for the fusible element.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a view partly in longitudinal central section of the preferred form of the invention.

Fig. 2 is a perspective view of the fuse showing the parts disassembled.

Fig. 3 is an end view of a modified form of ferrule and bridge member.

Fig. 4 is a section along the line 4—4 of Fig. 3.

For purposes of disclosure we have illustrated in the drawing and shall hereinafter describe in detail the preferred embodiment of the invention with the understanding that we do not intend to limit our invention to the particular construction and arrangement shown, it being contemplated that various changes may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

As illustrated in the drawing, the invention in the exemplary form chosen for purposes of disclosure comprises a tubular casing 1 of suitable insulating material, the ends of which are turned down or otherwise reduced to a smaller diameter as at 2 to receive metal ferrules 3. Annular grooves 4 are formed in the casing at the inner end of the reduced portions 2, these grooves or recesses having end walls in planes substantially transverse to the axis of the casing providing opposing shoulders 5 and 6. The internal surfaces of the ferrules 3 are smooth so as to fit snugly over the reduced portions 2 of the casing.

In the exemplary form of the invention the ferrules are provided with transversely extending end walls 7 having apertures 8 therethrough provided with a straight side 9. The ferrules are shown positioned upon the casing so that the straight sides 9 of the ferrules on the two ends will be parallel but with the apertures 8 oppositely disposed and means is provided for positioning the ferrules in such alinement and for securing each ferrule against rotation relative to the casing. This means is preferably in the form of devices, one at each end of the casing, which devices are connected to the casing by means preventing relative rotation therebetween and are also connected to the ferrule by means preventing relative rotation therebetween. As disclosed herein, the ends of the casing are provided with pairs of diametrically opposed slots 10 arranged to receive portions or prongs 11 on a pair of such devices in the form of somewhat semi-circular bridge members or plates 12. The plates 12 are preferably positioned extending transversely of the ends of the casing with the prongs 11 fitting snugly into the slots 10 so as effectively to prevent relative rotation between the plates and the casing.

The means for connecting the members 12 to the ferrules may assume various forms, two of which are disclosed herein. Thus as illustrated in Figs. 1 and 2, the members 12 are provided with eccentrically disposed recesses 13 which are adapted to receive and interengage with lugs 14 punched inwardly

from the end wall 7 of the ferrules. The engagement of the lugs 14 in the recesses 13 and that of the prongs 11 in the slots 10 effectively prevent rotational movement of the ferrules on the casing, the interengaging parts being located so that when the parts are assembled and the ferrules are secured to the casing the straight edges 9 of the end apertures 8 will be oppositely positioned and parallel.

The ferrules are secured to the casing against longitudinal movement in a manner adapted to resist effectively the large forces tending to blow the end structures off of the casing when a fusible element is disrupted. As illustrated herein the ferrules are slipped as far as they will go over the reduced portions 2 of the casing, with the intermediate bridge plates 12 properly positioned therebetween, and are then secured to the casing by U-shaped ribs 15 crimped or rolled therein. This crimping operation bends portions of the ferrules around and into engagement with the shoulders 3. This, together with the abutment of the end walls of the ferrules against the bridge plates prevents movement of the ferrules longitudinally of the casing. Preferably the metal is actually drawn into the recesses 4 and expanded against the opposed shoulders 5 and 6 so as to leave the metal intermediate the shoulders in compression and the metal between the shoulders 6 and the outer ends of the casing 1 in tension. In this way the ferrules are effectively secured to the casing against longitudinal movement.

By securing the ferrules on the opposite ends of the casing with the apertures 8 on opposite sides of the center of the casing, a fusible element 16 extending through the casing may have its ends bent in reverse directions to overlie the outer surfaces of the ferrule end walls 7. To clamp the ends of the fusible element to said end walls, a pair of end caps 17 are provided adapted for screw threaded engagement with the outside of the ferrules. The screw threaded portions 18 of the end caps stop short of the bottoms of the caps to leave portions 19 of smaller internal diameter which fit somewhat snugly on the unthreaded end portions 20 of the ferrules. As illustrated herein, washers 21 are positioned intermediate the inner walls of the end caps and the bent over ends of the fusible element. In order to ventilate the fuse and prevent a direct discharge of the gases upon the blowing of a fusible element, these washers are preferably spaced from the inner wall of the end cap by means of a plurality of inwardly punched lugs 22 and are provided with a plurality of peripherally spaced recesses 23 which connect the chamber so formed with the interior of the casing. A passage for the expanding gases is therefore provided extending

through the apertures 8, between the end walls 7 of the ferrules and the plates 21, through the recesses 23, and between the plates 21 and the inner end walls of the caps to vent 24 positioned centrally in the caps.

By providing metallic members such as the bridge members 12 for locking the ferrules to the casing against rotation, the ferrules are not only held effectively to the casing but furthermore the end walls 7 thereof are reinforced against dishing when the end caps are tightened to clamp the fusible element. Preferably the bridge members are formed so that the straight sides thereof coincide with the straight sides 9 of the ferrule end apertures to obtain this reinforcing effect. It is apparent that with the slots 10 in the casing and the integral prongs 11 on the bridge members relative rotation therebetween is prevented and similarly by the engagement of the integral lugs 14 on the ferrules with the recesses 13 in the bridge members relative rotation therebetween is also prevented. In addition, the provision of such means for preventing relative rotation of the members permits the parts to be independently formed and yet insures perfect alinement of the ferrule aperture sides 9 by a simple assembly of the parts. This construction in combination with the expansion of the ferrule metal into the grooves 4 provides an extremely rigid construction, the expanded metal as mentioned hereinbefore pressing against the opposed shoulders 5 and 6 formed on the casing to prevent longitudinal movement of the ferrules on the casing.

Preferably the washers 21 are pressed into the end caps into abutment with the lugs 22, the fit between the washers and the end cap side wall being sufficiently tight to retain the washers therein. Here again, dishing of the fuse clamping means is effectively minimized by placing the lugs 22 inwardly from the side walls of the caps so as more effectively to support the central portions of the washers. At the same time a tortuous path is provided for the gases which path guides the gases around the washers and along the end walls of the end caps to cool the gases and prevent any direct discharge of hot gases from the casing.

In Figs. 3 and 4 we have shown a modified form of ferrule and bridge member. As illustrated a ferrule 25 is provided with a transverse end wall 26 having a fuse aperture 27 therethrough and a relatively small eccentrically positioned recess 28. A bridge member 29 is provided having prongs 30 which are adapted to engage the slots in the casing. With this form of construction the bridge member is preferably rigidly or permanently attached to the ferrule as by riveting. As shown in the drawing the end wall of the bridge member is pro-

vided with an outwardly punched lug 31 which is adapted to extend through the recess 28. After the bridge member is so positioned the end of the lug 31 is bent or
 5 riveted as at 32 so as to secure the bridge member to the ferrule. This permits of assembly of the bridge member and ferrule separate from the casing and secures them rigidly together so that there will be no
 10 tendency for the interengaging portions of the bridge member and ferrule to disengage should the parts tend to become loose upon shrinkage of the fiber tube, and effectively prevents rotation of the ferrule relatively
 15 to the casing.

We claim as our invention:

1. In a ferrule fuse, in combination, a tubular casing of insulating material having an end portion of reduced diameter and
 20 an annular recess in said end portion, the end of said casing having a slot therein, a substantially semicircular bridge member extending transversely across the end of the casing and having a portion entering
 25 said slot to prevent relative rotary movement therebetween, a ferrule arranged to slip snugly over said end portion and having an apertured end wall abutting said bridge member, and means to prevent relative
 30 rotary movement between said ferrule and bridge member comprising a portion of one part engaging in a recess of the other, said ferrule having a U-shaped rib crimped thereon positioned in the annular recess of
 35 the casing to secure the ferrule against longitudinal movement relatively to the casing.

2. In a ferrule fuse, in combination, a tubular casing of insulating material having an end portion of reduced diameter and
 40 an annular recess in said end portion providing opposing shoulders, a ferrule arranged to slip snugly over said end portion and having an apertured end wall and means coacting with the end wall of the ferrule
 45 and casing arranged to prevent relative rotary movement therebetween, said ferrule having a U-shaped rib crimped thereon positioned in the annular recess of the casing and abutting the two shoulders formed
 50 thereby to secure the ferrule against longitudinal movement relatively to the casing.

3. In a ferrule fuse, in combination, a tubular casing of insulating material having an end portion of reduced diameter and an
 55 annular recess in said end portion, a bridge member abutting the end of the casing, means to prevent relatively rotary movement between the bridge member and casing, and a ferrule arranged to slip snugly over said end portion and having an apertured end wall abutting said bridge member, means to prevent relative rotary movement
 60 between the ferrule and bridge member, said ferrule having a rib crimped there-

on engaging in the annular recess of the casing to secure the ferrule against longitudinal movement relatively to the casing.

4. In a ferrule fuse, in combination, a tubular casing of insulating material having an end portion of reduced diameter and an
 70 annular recess in said end portion, a ferrule arranged to slip over said end portion, a metallic member adjacent the end of the casing arranged to prevent relative rotary movement between the ferrule and casing, said
 75 ferrule having a portion thereof positioned in the annular recess of the casing to secure the ferrule against longitudinal movement relatively to the casing.

5. A ferrule fuse comprising, in combination, a tubular casing of insulating material having a slot in each end thereof, a pair of ferrules arranged to fit over the end portions of the casing and having apertured
 85 end walls extending transversely of the casing, means to secure said ferrules to the casing, a fusible element extending through the casing and ferrules having its ends bent over against the end walls of the ferrules, means
 90 to clamp said fusible element against the end walls of the ferrules, a pair of members interposed between the ends of the casing and the walls of the ferrules to reinforce the end walls on one side of the apertures therein, said members having lugs arranged to engage in said slots, and means to prevent relative rotation between the ferrules and members.

6. A ferrule fuse comprising, in combination, a tubular casing of insulating material having a pair of diametrically opposed slots in each end thereof, a pair of ferrules arranged to fit over the end portions of the casing and having apertured end walls extending transversely of the casing, means to secure said ferrules to the casing, a fusible element extending through the casing and ferrules having its ends bent over against the end walls of the ferrules, means to clamp
 110 said fusible element against the ferrules and a pair of substantially semi-circular bridge members interposed between the ends of the casing and the walls of the ferrules and in abutment therewith to reinforce the ferrules on one side of the apertures therein.

7. A ferrule fuse comprising, in combination, a tubular casing of insulating material, a pair of ferrules arranged to fit over the end portions of the casing and having apertured end walls extending transversely of the casing, means to secure said ferrules to the casing, a fusible element extending through the casing and ferrules having its ends bent over against the end walls of the ferrules, means to clamp said fusible element against the end walls of the ferrules and a pair of bridge members interposed between the ends of the casing and the walls of the ferrules to reinforce the end walls.

8. In a fuse, in combination, a tubular casing of insulating material, a pair of metallic ferrules secured to the opposite ends of said casing and having apertured end walls through which a fusible element may project, a fusible element extending through the casing and having its ends overlapping said end walls, and means to clamp said fusible element to the ferrules comprising a pair of end caps having screw threaded engagement with the ferrules and vent apertures in the end walls thereof and a pair of washers respectively positioned in said caps and bearing against the bent over ends of the fusible element and the end walls of the caps, said end caps having a plurality of lugs integral with and pressed inwardly from the end walls thereof to directly engage and space said washers and reinforce the central portions thereof, the gas passing to said vent apertures around the peripheries of said washers.

9. In a fuse, in combination, a tubular casing of insulating material having an end portion of reduced diameter and an annular recess in said end portion rectangular in cross-section to provide opposed shoulders, a ferrule arranged to slip over said end portion, said ferrule having an annular rib rectangular in cross-section positioned in the annular recess of the casing and abutting the two shoulders formed thereby to secure the ferrule against longitudinal movement and means to prevent relative rotary movement between the ferrule and casing.

10. In a ferrule fuse, in combination, a tubular casing of insulating material having end portions of reduced diameter and recesses in said end portions providing shoulders, ferrules arranged to slip over said end portions, said ferrules having end walls preventing movement of the ferrules in one direction longitudinally of the casing and having portions pressed inwardly and into engagement with said shoulders to prevent longitudinal movement of the ferrule in the opposite direction on the casing, and metallic members coacting with the end walls of said ferrules and the casing arranged to prevent relative rotary movement between the ferrules and casing.

11. In a ferrule fuse, in combination, a tubular casing of insulating material having an end portion of reduced diameter with a pair of end slots therein, a ferrule arranged to slip over said end portion, means to secure the ferrule to the casing against longitudinal movement and means to prevent relative rotary movement between the ferrule and casing including a bridge member extending transversely across the end of the casing and having a pair of longitudinally extending prongs fitting in said slots.

12. In a ferrule fuse, in combination, a tubular casing of insulating material having

a slot in one end thereof, a ferrule arranged to slip over the end of the casing having said slot, means to secure the ferrule to the casing against longitudinal movement and means to prevent relative rotary movement between the ferrule and casing comprising a member extending transversely of the casing having a portion fitting in said slot and means to secure said member to said ferrule arranged to prevent relative rotation therebetween.

13. In a ferrule fuse, in combination, a tubular casing of insulating material having a slot in one end thereof, a ferrule arranged to slip over said end of the casing, means to secure the ferrule to the casing against longitudinal movement and means to prevent relative rotary movement between the ferrule and casing comprising a member extending transversely of the casing having a prong fitting in said slot and interengaging means on said member and said ferrule arranged to prevent relative rotation therebetween.

14. In a ferrule fuse, in combination, a tubular casing of insulating material having a slot in one end thereof, a ferrule arranged to slip over the end of the casing having said slot, means to secure the ferrule to the casing against longitudinal movement and means to prevent relative rotary movement between the ferrule and casing comprising a member extending transversely of the casing having a prong fitting in said slot and means to prevent relative rotation between said member and said ferrule.

15. In a ferrule fuse, in combination, a tubular casing, a fusible element extending through said casing and means to secure said element in said casing including an end cap having a transverse integral wall closing the end of the casing and provided with a centrally disposed vent aperture, a single washer positioned within said end cap spaced from said end wall and arranged to bear against said element and a plurality of lugs pressed inwardly from and integral with the end wall of said cap and directly bearing against said washer for spacing said washer from said end wall and reinforcing the central portion thereof, the gas passing around the periphery of said washer to said vent aperture.

In testimony whereof we have hereunto affixed our signatures.

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