

Nov. 10, 1931.

J. H. HICKEY

1,831,002

FUSE

Filed June 24, 1929

Fig. 1.

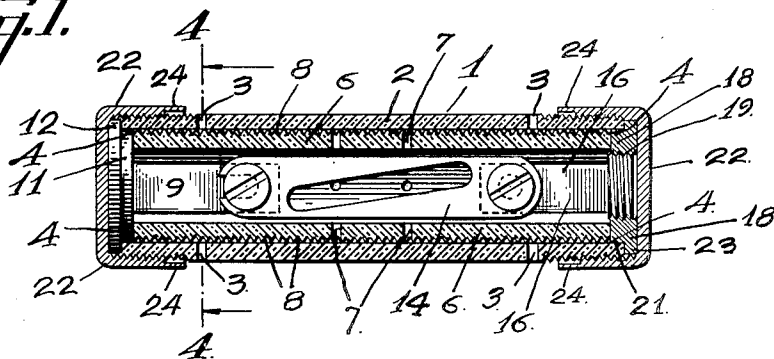


Fig. 2.

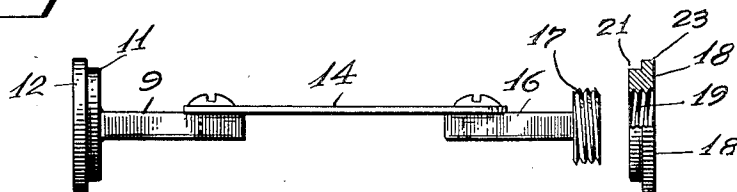


Fig. 3.

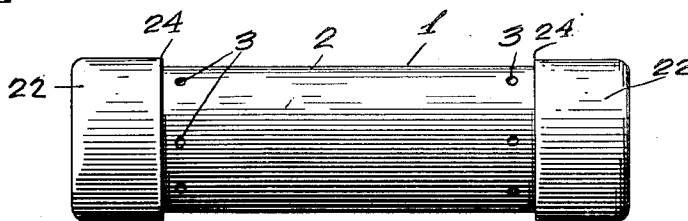


Fig. 4.

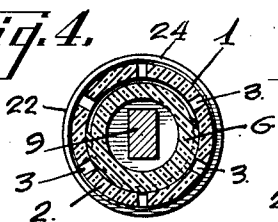


Fig. 5.

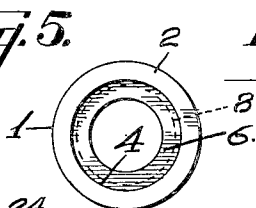


Fig. 6.

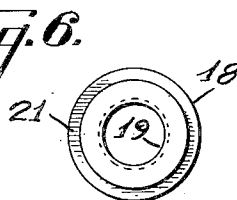
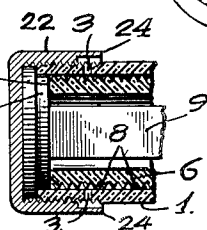


Fig. 7.



INVENTOR.
JOHN H. HICKEY.
By *Arthur L. Slee.*
HIS ATTORNEY.

UNITED STATES PATENT OFFICE

JOHN H. HICKEY, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO HICKEY FUSE & MANUFACTURING COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA

FUSE

Application filed June 24, 1929. Serial No. 373,381.

My invention relates to improvements in electric fuses of the refillable type wherein a casing is provided with annular shoulders within each end thereof to receive annular flanges of terminals supporting a fusible element within the casing, said shoulders being formed by a shorter tubular member apertured intermediately and threaded exteriorly to provide a tortuous channel or vent passage with the interior of a longer outer apertured tubular member within which said shorter member is seated midway to form said annular shoulders at the ends of said casing.

The primary object of the present invention is to provide a new and improved refillable electric fuse.

Another object is to provide a new and improved refillable fuse of simple and economic structure having improved means for receiving and seating fusible element supporting terminals.

A further object is to provide improved means for facilitating the refilling or renewal of fusible elements within a blown fuse which may be easily and readily operated.

A still further object is to provide an improved seating arrangement for fuse terminals which will also facilitate a venting structure whereby the fuse may be effectively vented when blown.

A still further object of the invention is to provide a new and improved refillable fuse which will present a neat, attractive and compact structure when assembled, of economic structure and maximum sealing efficiency.

I accomplish these and other objects by means of the improved device disclosed in the drawings forming a part of the present application, wherein like characters of reference are used to designate similar parts throughout the specification and drawings, and in which—

Fig. 1 is an enlarged longitudinal sectional view of my improved refillable fuse;

Fig. 2 is a side elevation of the terminals supporting the fusible element, with the detachable flanged washer shown slightly separated or detached from the remaining parts;

Fig. 3 is a full elevation of the fuse dis-

closing its compact outer appearance and arrangement of the sealing caps;

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 1 in the direction indicated;

Fig. 5 is an end elevation of the casing with the other parts removed and disclosing the annular shoulders;

Fig. 6 is a view of the inner side of the annularly flanged washer; and

Fig. 7 is a broken sectional view of a modification.

Referring to the drawings the numeral 1 is used to designate in general a casing, of any suitable insulating material, preferably fibre, composed of an outer tubular member 2 having a plurality of circumferentially disposed venting apertures 3 arranged adjacent the ends of said tubular member 2.

Seated within the outer tubular member 2, and midway of the ends thereof, to form annular shoulders 4, is a shorter inner tubular member 6, provided with a plurality of intermediately arranged or disposed apertures 7 communicating with an exterior thread 8 extending the length of the inner tubular member 6, which thread 8, operating in conjunction with the interior surface or bore of the outer and longer tubular member 2, provides a tortuous passage communicating with the interior of the casing 1 by means of the apertures 7 of said inner tubular member 6 and with the exterior of the casing 1 by means of the apertures 3 thereby forming a vent for the fuse when blown.

A suitable terminal 9 is provided with an annular flange 11 which rests or seats within the adjacent annular shoulder 4 of the casing 1 and is also provided with a second flange 12 which rests upon one end of the outer tube 2. The terminal 9 extends inwardly of the casing 1 and said inner end has detachably mounted thereon one end of a fusible element 14, which fusible element 14 extends through the said casing 1. To the other end of said fusible element 14 is detachably secured a second terminal 16 extending to the opposite end of the casing 1 and terminating in a threaded portion 17 of lesser diameter than the internal diameter of the casing 1.

whereby an assembly, as disclosed in Fig. 2 of the drawings, of the first mentioned terminal 9, fusible element 14 and second terminal 16, with its threaded portion 17, may be readily inserted and passed through the casing 1 from the end adjacent said first mentioned terminal 9.

A washer 18, having a threaded centrally disposed aperture 19 to engage the threaded portion 17 of the terminal 16, forms an annular flange 21 arranged to seat within the annular shoulder 4 of the adjacent end of the casing 1, as disclosed in the right end of Fig. 1 of the drawings.

The washer 18 is also provided with a second annular flange 23 which seats against the adjacent end of the outer tubular member 2.

Internally threaded cups or caps 22 are screw threaded upon each end of the casing and when screwed into position tightly engage the flange 12 of the terminal 9 and also the washer 18 and tightly seat them upon or within their respective annular shoulders 4, thereby sealing the ends of said casing whereby the same may be vented only through the vents 7, tortuous passage formed by the external thread 8 of the inner tubular member 6 and the apertures 3 of the outer tubular member 2 when the fusible element is blown.

The caps 22 are provided with shrouded portions which form annular spaces between the edges of said caps 22 and the casing 1, so that when the apertures 3 are placed nearer the end of the outer casing 2 and within said shrouded portions 24, as disclosed in Fig. 7 of the drawings, the vent must traverse a greater length of tortuous passage, as formed by the external thread 8, and any expansion of hot gases resulting from a blown fusible element 14 will be directed by said shrouded portions 24 along the sides of the casing 1 instead of laterally against any adjacent fuse or other object.

In operation, the terminal 9, fusible element 14 and terminal 16 are assembled, as disclosed in Fig. 2 of the drawings, and the said terminal 16 and threaded portion 17 thereof are inserted within the casing 1 until the annular flange of the terminal 9 is seated within the annular shoulder 4 adjacent to said terminal 9. The washer 18 is then screwed onto the threaded portion 17 of the terminal 16 until the annular flange 21 of said washer 18 is seated upon its adjacent annular shoulder 4. A continued rotation or screwing up of the washer 18, through tension on the terminals and fusible element 14, will cause the annular flanges to be more rigidly engaged with their respective annular shoulders, thus tightly and securely sealing the ends of the casing 1 to prevent venting of said fuse or casing at the ends thereof when the fusible element is blown.

If the length of the assembled terminals and fusible element is too great to allow the

flanges to be tightly drawn into their respective annular shoulders or seats, such deficiency is readily remedied and overcome when the caps 22 are screwed into position as said caps 22 will readily engage the outer ends of the terminal and washer and force the same tightly onto their respective annular shoulders 4, the fusible element being of soft material, readily and easily bending under such pressure, to shorten the assembly and thereby permit the proper and effective seating of the terminals and the consequent effective sealing of the ends of the casing 1.

When assembled the entire structure presents a compact, clean, and simple structure devoid of projections, slots or other devices so that the fuse may be readily inserted in position.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is—

1. An electric fuse comprising a casing; a fusible element; a pair of terminal members connected to the ends of the fusible element one of said terminal members being insertible through the casing to a position adjacent the opposite end and being provided with an axial threaded extension, and the other terminal member being provided with an annular flange seating upon the adjacent end of the casing; a washer threaded onto the threaded terminal extension and movable axially thereon to seat upon the adjacent end of the casing; and ferrules separable from the terminals and washer and threaded onto the ends of the casing to form electrical contact with the washer and the opposite terminal flange respectively to secure the same in sealing relation to the ends of the casing.

2. An electric fuse comprising a casing having internal annular shoulders formed at the ends thereof; a fusible element; a pair of terminal members connected to the ends of the fusible element, one of said terminal members being insertible through the casing and having a threaded axial extension normally disposed adjacent one end of the casing, and the other terminal member being provided with an annular flange having a reduced shoulder to seat within the shoulder at the adjacent end of the casing; a washer threaded to engage the terminal extension and rotatable onto said extension when said extension is in normal operative position, said washer being provided with an annular shoulder seating in the adjacent shoulder of the casing; and a pair of ferrule caps separable from the terminals and washer and independently threaded onto the ends of the casing to form electrical contact with the washer and the opposite terminal flange respectively and to bind the same in sealing relation upon the shoulders of the casing.

3. An electric fuse comprising a casing consisting of inner and outer tubular casing

members, the inner casing member being fitted in proximate contact with the inner surface of the outer casing and having its ends spaced inwardly from the ends of the outer casing to form internal annular shoulders within the ends of the casing; a fusible element; a pair of terminal members connected to the ends of the fusible element, one of said terminal members being insertible through the casing to a normal operative position adjacent the shoulder at one end of the casing and having a threaded axial extension extending past said shoulder, and the other terminal member being provided with an annular flange seating upon the end of the casing and having an annular shoulder seating upon the adjacent shoulder of the casing; a washer threaded to engage the threaded terminal extension and movable onto said extension when the same is in normal operative position, said washer having a flange to seat against the adjacent end of the casing and having a shoulder to seat upon the adjacent shoulder of the casing; and a pair of end caps separable from the terminals and washers and independently threaded onto the ends of the casing to form electrical contact with the washer and the opposite terminal flange respectively and to bind the same in sealing relation to the ends of the casing.

4. An electric fuse comprising a casing consisting of a tubular inner casing member and an outer tubular casing member fitted over the inner casing member in proximate contacting relation thereto along the full length thereof, said members having a tortuous passage formed therebetween and having inlet and outlet openings formed through the inner and outer casing members respectively and opening into said tortuous passage at points longitudinally spaced from each other to permit a retarded escape of gas from the fuse when blown; terminal members detachably mounted upon the ends of the casing; a fusible element having its ends connected to the terminal members; and means forming electrical contact with the terminal members and sealing the ends of the casing.

5. In an electric fuse, a casing consisting of a tubular inner casing member and an outer tubular casing member fitted over the inner casing member in proximate contacting relation thereto along the full length thereof, said members having a tortuous passage formed therebetween and having inlet ports formed in the inner casing member to communicate between the passage and the interior of the casing and having outlet ports formed in the outer casing member to open outwardly from the passage to the atmosphere, said outlet openings being longitudinally spaced from the inlet openings.

6. In an electric fuse, a casing consisting of a tubular inner casing member and an

outer tubular casing member fitted over the inner casing member in proximate contacting relation thereto along the full length thereof, said members having a tortuous passage formed therebetween and having inlet ports formed in the inner casing member to communicate between the passage and the interior of the casing at points intermediate the ends thereof, and having outlet ports formed in the outer casing member to open outwardly from the passage to the atmosphere at points longitudinally spaced from the inlet openings toward the ends of the casing.

7. In an electric fuse, a casing consisting of a tubular inner casing member and an outer tubular casing member fitted over the inner casing member in proximate contacting relation thereto along the full length thereof, one of said members having a tortuous groove formed in the surface thereof and covered by the other casing member, the inner casing member having a plurality of inlet openings formed therein to open into the groove, and the outer casing having a plurality of outlet openings opening outwardly from the groove to the atmosphere, the outlet openings being longitudinally spaced from the inlet passages whereby gases escaping from the casing must traverse an extended length of tortuous passage between the inlet and outlet openings.

8. An electric fuse comprising a casing consisting of a tubular inner casing member and an outer tubular casing member fitted over the inner casing member in proximate contacting relation thereto along the full length thereof, one of said members having a tortuous groove formed in the surface thereof and covered by the other casing member, the inner casing member having a plurality of inlet openings formed therein to open into the groove, at points near the middle of said casing, and said outer casing members having outlet openings formed therein adjacent the ends thereof to open outwardly from the tortuous passage to the atmosphere; terminal members mounted upon the ends of the casing; a fusible element connected at its ends to the terminal member; and ferrules forming electric contact with the terminal members and threaded onto the ends of the outer casing member to secure the terminals in sealing relation to the ends of the casing whereby gases may escape from the casing only through the tortuous passage when a fusible element is blown.

9. An electric fuse comprising a casing consisting of a tubular inner casing member and an outer tubular casing member fitted over the inner casing member in proximate contacting relation thereto along the full length thereof, one of said members having a tortuous groove formed in the surface

thereof and covered by the other casing member, the inner casing member having a plurality of inlet openings formed therein to open into the groove, at points near the middle of said casing, and said outer casing members having outlet openings formed therein adjacent the ends thereof to open outwardly from the tortuous passage to the atmosphere; terminal members mounted upon the ends of the casing; a fusible element connected at its ends to the terminal member; ferrules forming electric contact with the terminal members and threaded onto the ends of the outer casing member to secure the terminals in sealing relation to the ends of the casing whereby gases may escape from the casing only through the tortuous passage when a fusible element is blown; and shrouds formed upon the ferrules to extend over the outlet openings to deflect gases escaping therethrough.

10. An electric fuse comprising a casing formed from a pair of closely fitting inner and outer tubular casing members, the inner casing member having its ends spaced inwardly from the ends of the outer casing member to form internal annular shoulders within the ends of the casing; a tortuous groove formed upon one of the casing members and covered by the other casing member, the inner casing member having inlet openings formed therein and opening into the tortuous groove, and the outer casing member having outlet openings formed therein in longitudinally spaced relation to the inlet openings and opening outwardly from the tortuous groove to the atmosphere; a fusible element; terminal members connected to the ends of the fusible element, one of said terminal members being insertible through the casing to a normal operative position adjacent the shoulder at one end of the casing and having a threaded axial extension extending past said shoulder, and the other terminal member being provided with an annular flange seating upon the ends of the casing and having an annular shoulder seating upon the adjacent shoulder of the casing; a washer threaded to engage the threaded terminal extension and movable onto said extension when the same is in normal operative position, said washer having a flange seating upon the adjacent end of the outer casing member substantially flush with the periphery thereof and having an inwardly extending shoulder seating upon the adjacent shoulder formed by the adjacent end of the inner casing; and a pair of end caps separable from the terminals and washer and independently threaded onto the ends of the casing to form electrical contact with the washer and the opposite terminal flange respectively and to bind the same in sealing relation to the ends of the casing.

11. In an electric fuse, a terminal member

insertible longitudinally through a fuse casing and provided with a threaded axial extension normally disposed in an operative position within one end of the casing; a sealing washer threaded onto the extension and movable onto the extension when in normal operative position to seat upon the adjacent end of the casing; and a member threaded onto the end of the casing and engaging the washer to secure said washer in sealing relation to the end of the casing.

12. In an electric fuse, a terminal member insertible longitudinally through a fuse casing and provided with a threaded axial extension normally disposed in an operative position within one end of the casing; a sealing washer threaded onto the extension and movable onto the extension when in normal operative position to seat upon the adjacent end of the casing, said washer being provided with a shoulder engaging the end of the casing and forming an annular flange of a diameter substantially equal to the diameter of the casing whereby the washer may be turned upon the threaded extension and into sealing relation to the end of the casing.

13. An electric fuse comprising a tubular casing having an annular shoulder formed in each end thereof; a terminal mounted within one end of said casing and provided with an annular flange to engage the adjacent annular shoulder of the casing; a washer having an annular flange engaging the annular shoulder of the opposite end of said casing and provided with a centrally disposed threaded aperture; a second terminal mounted within said opposite end of said casing and screw threaded into the washer; a fusible element connected between the inner ends of said terminals whereby rotation of the washer will move the annular flanges, by means of said fusible element, into rigid engagement with their respective annular shoulders; and a cap threaded upon each end of the casing to rigidly hold the annular flanges in engaging relation with their respective shoulders to seal said casing.

14. An electric fuse comprising a casing formed of an outer tubular member provided with a set of apertures near each end thereof and a shorter inner tubular member threaded exteriorly and having apertures intermediate the ends thereof and communicating with the said thread to form a vent for said casing, said shorter member being positioned midway within the longer outer member to provide annular shoulders on each end of said casing; a terminal mounted within one end of said casing and extending inwardly in said casing and provided with an annular flange engaging the annular shoulder within the adjacent end of the casing; a fusible element having one end connected to said inner end of said terminal and extending toward the opposite end of said casing; a second terminal

connected to the other end of said fusible element and having an annular flange detachably connected thereto and engaging the adjacent annular shoulder to support said fusible element within said casing.

15. An electric fuse comprising a casing formed of an outer tubular member provided with a set of apertures near each end thereof and a shorter inner tubular member threaded exteriorly and having apertures intermediate the ends thereof and communicating with the said thread to form a vent for said casing, said shorter member being positioned midway within the longer outer member to provide annular shoulders on each end of said casing; a terminal mounted within one end of said casing and extending inwardly in said casing and provided with an annular flange engaging the annular shoulder within the adjacent end of the casing, a fusible element having one end connected to said inner end of said terminal and extending toward the opposite end of said casing; a second terminal connected to the other end of said fusible element and having an annular flange detachably connected thereto and engaging the adjacent annular shoulder to support said fusible element within said casing; and a cap screwed upon each end of said casing and enclosing the outer ends of the terminals and their respective flanges to seal said casing whereby the same may be vented only through the vent formed by the exterior threads of the inner tubular member.

16. An electric fuse comprising a casing formed of an outer tubular member provided with peripherally disposed apertures adjacent the ends thereof and a shorter inner tubular member arranged midway between the ends of the outer tubular member to provide annular shoulders at each end of said casing, said inner member being threaded exteriorly to provide a tortuous channel with the inner surface of said outer member, and also provided with intermediate apertures connecting said channel with the interior of said inner member; a terminal provided with an annular flange engaging one of the annular shoulders of the casing, said terminal extending inwardly within said casing; a fusible element having one end connected to said inner end of said terminal and extending toward the opposite end of said casing; a second terminal mounted upon the other end of said fusible element and provided with a threaded portion of smaller diameter than the interior of the inner tubular member whereby an assembly of the first terminal, fusible element and second terminal may be inserted through said casing; and a threaded washer screwed upon the threaded portion of the second terminal and having an annular flange to engage the adjacent annular shoulder of the casing whereby said fusible element may be supported within said casing.

17. An electric fuse comprising a casing formed of an outer tubular member provided with peripherally disposed apertures adjacent the ends thereof and a shorter inner tubular member arranged midway between the ends of the outer tubular member to provide annular shoulders at each end of said casing, said inner member being threaded exteriorly to provide a tortuous channel with the inner surface of said outer member, and also provided with intermediate apertures connecting said channel with the interior of said inner member; a terminal provided with an annular flange engaging one of the annular shoulders of the casing, said terminal extending inwardly within said casing; a fusible element having one end connected to said inner end of said terminal and extending toward the opposite end of said casing; a second terminal mounted upon the other end of said fusible element and provided with a threaded portion of smaller diameter than the interior of the inner tubular member whereby an assembly of the first terminal, fusible element and second terminal may be inserted through said casing; a threaded washer screwed upon the threaded portion of the second terminal and having an annular flange to engage the adjacent annular shoulder of the casing whereby said fusible element may be supported within said casing; and a cap screwed upon each end of the casing and contacting with the flanged member in each annular shoulder to enclose and seat said flange on said shoulders and thereby seal said casing.

In witness whereof, I hereunto set my signature.

JOHN H. HICKEY.