

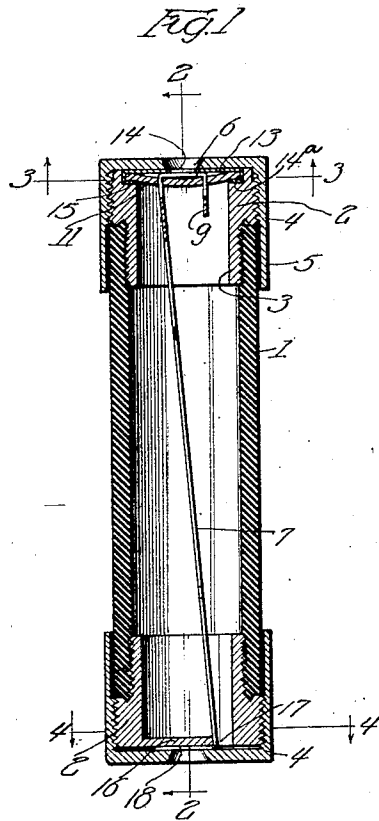
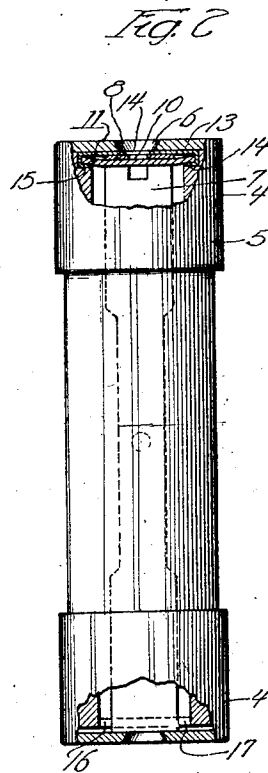
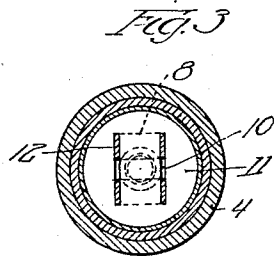
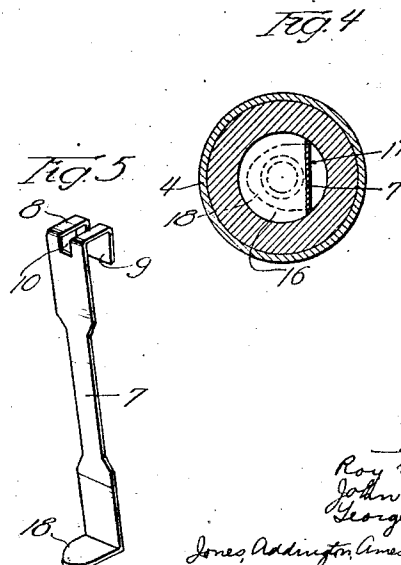
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Jan. 30, 1923.

R. G. SANDS, ET AL.
FUSE.
FILED OCT. 10, 1919.

1,443,887

3 SHEETS-SHEET 1



Inventor:
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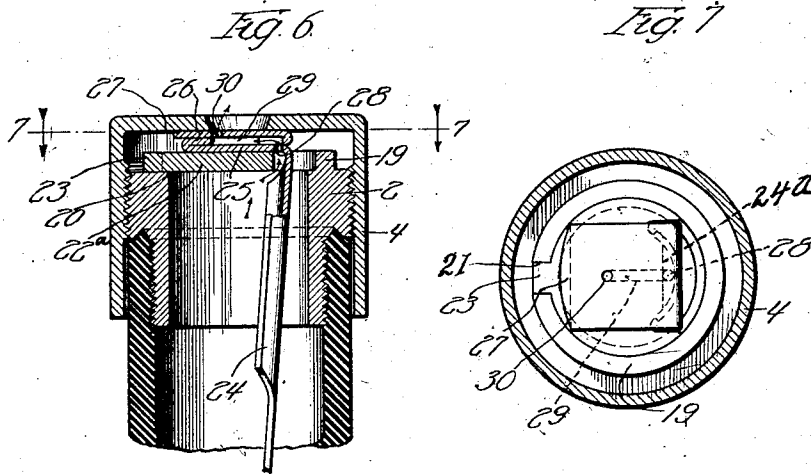
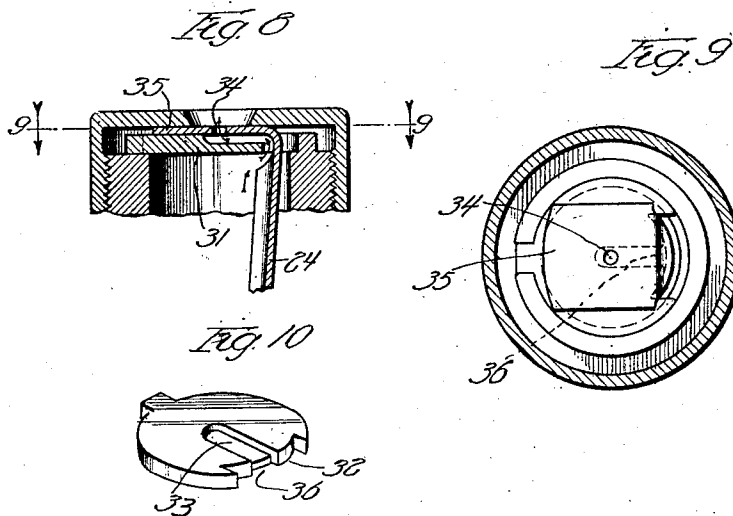
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3 SHEETS-SHEET 2



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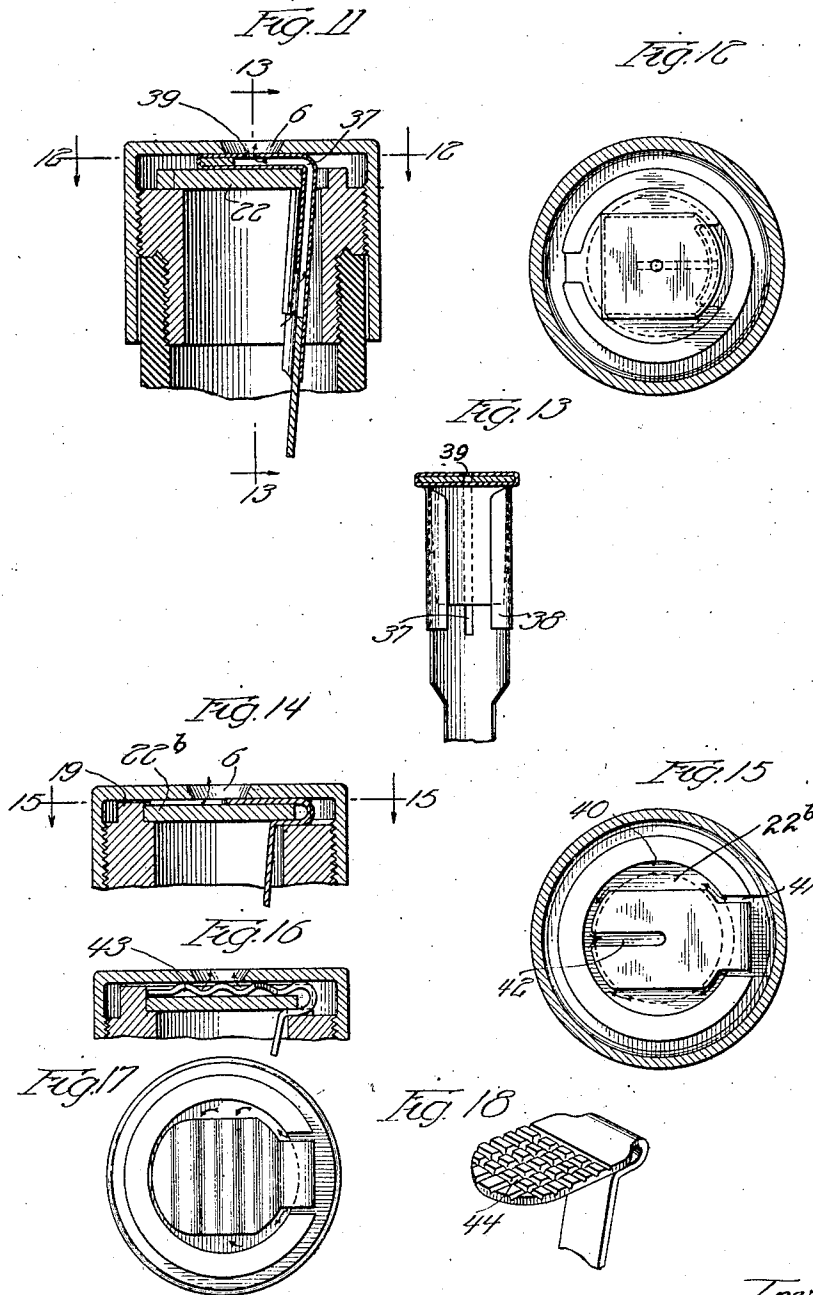
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R. G. SANDS, ET AL.
FUSE.
FILED OCT. 10, 1919.

3 SHEETS-SHEET 3



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UNITED STATES PATENT OFFICE.

ROY G. SANDS, OF WAUKEGAN, JOHN C. BOGLE, OF OAK PARK, AND GEORGE R. FOLDS, OF EVANSTON, ILLINOIS, ASSIGNORS TO FRANK B. COOK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

FUSE.

Application filed October 10, 1919. Serial No. 329,794.

To all whom it may concern:

Be it known that we, ROY G. SANDS, JOHN C. BOGLE, and GEORGE R. FOLDS, citizens of the United States, residing, respectively, at Waukegan, county of Lake, Oak Park, county of Cook, Evanston, county of Cook, and State of Illinois, have invented new and useful Improvements in Fuses, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates to improvements in fuses, and particularly that type of fuse known as a renewable fuse. One of the objects of our invention is to provide a fuse of the above type wherein a proper venting of the pressure and products of combustion caused by the blowing of the fuse may be accomplished without the danger of the flame following the vent.

Another object of our invention is to provide a fuse of the above character which, while properly venting the products of combustion, will at the same time reduce to the minimum the sealing of the renewable parts to the permanent parts by the melted portion of the fuse when the fuse is blown.

For the purpose of disclosing our invention we have illustrated certain embodiments of the same in the accompanying drawings. In said drawings—

Fig. 1 is a longitudinal sectional view of a fuse embodying our invention;

Fig. 2 is an elevation of the fuse illustrated in Fig. 1, parts of the same being shown broken away substantially on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a perspective view of the fuse link used in the structure shown in the above-mentioned figures;

Fig. 6 is a sectional view illustrating a modification of our proposed invention;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 is a detail sectional view of still another modification of our invention;

Fig. 9 is a section taken on the line 9—9 of Fig. 8;

Fig. 10 is a detail of the clamping washer used in connection with the structure illustrated in Fig. 8;

Fig. 11 is a detail section of still another form in which our invention may be embodied;

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 11;

Fig. 13 is a sectional view taken on the line 13—13 of Fig. 11;

Fig. 14 is a detail section of another form in which our invention may be embodied;

Fig. 15 is a sectional view taken on the line 15—15 of Fig. 14;

Fig. 16 is a detail section illustrating still another modification of our invention;

Fig. 17 is a plan view with the cover removed; and

Fig. 18 is a detail perspective of a form of fuse which may be substituted for the fuse illustrated in Fig. 16.

Referring first to the embodiment illustrated in Figs. 1 to 5, in this structure as well as the other structures we provide an enclosing casing which preferably comprises a tubular shell portion 1 formed of fibre or other insulating material. Secured at each end of this shell is a metallic ferrule 2 having a reduced portion 3, which is externally screw-threaded and engages internal threads on the fibre portion 1 to secure the ferrule in position. Above the edge of the fibre portion the ferrule is enlarged and is provided with external threads adapted to engage the internal threads of a cap 4 screwed thereon for closing the ends of the shell. The cap is cup-shaped and is provided with a petticoat 5 which fits down over the end of the fibre material. The top of the cap is provided with a circular window 6 through which the fuse may be observed. The fuse proper pref-

erably consists of a link 7 of fusible material reduced in size at its center. One end of this link, as illustrated more clearly in Fig. 5, is bent transversely, as at 8, and then back upon itself, as at 9, and formed in the end of the link is a slot 10 which embraces not only the horizontal portion 8 but a portion of the body of the link and a portion of the folded-back end 9. This end of the link is passed through a washer 11, which is provided with a pair of slots 12 just sufficiently large to receive the link, which washer lies within a cup 13 having its edge 14 crimped over the washer to clamp the washer and cup together, and this cup, at a point where it will register with the window 6, is provided with a vent opening 14. The washer member with the fuse secured thereto is adapted to rest on the countersunk shoulder 15 within the ferrule 2 and is clamped and secured in position by the top of the cap 4. The fusible link 7 is first assembled with the washer 11 together with the cup 13 before it is inserted in the enclosing casing of the fuse.

The opposite end of the fuse may be secured in any suitable manner. One means for securing the same in position we have illustrated in the drawings. As shown, the bottom ferrule 2 has a closed end portion 16 which on one side is provided with a slotted opening 17. The end of the fuse, which is preferably rounded, as at 18, to assist in threading the same in, is passed through the slotted opening and turned over the top of the closure member, being clamped between the top and the cap 4. In assembling, the fuse member having attached thereto the washer member is passed into the shell, the end 18 being passed through the opening 17 and turned over on the closure portion 16. The cap is then screwed in position, clamping this end in place. The washer member is fitted within the ferrule at the opposite end, this washer member resting on the shoulder 15 and the cap screwed in position, clamping the washer member in. The fuse is thus assembled and ready for use. When the fuse blows, the gases formed thereby will vent through the tortuous path formed by the channel or slot 10, passing along the outer face of washer 11 from each end of the slot and thence out through the opening 14 and through the window 6. It is thus seen that while a vent for the products of combustion is provided, at the same time the path of this vent is tortuous and long enough and surrounded by a sufficient cooling surface, so that the gases are cooled and danger of a flame, caused by the blowing of the fuse, following or escaping to the exterior is prevented. At the same time, the molten portion of the fuse, which will tend to follow through the vent, coming in contact with the chilled surfaces and thereby solidi-

fying, will not solidify on any non-renewable portion of the fuse.

In the structure illustrated in Figs. 6 and 7, the tortuous channel is formed in a modified manner. In this structure the ferrule 2 at its top is provided with an annular flange 19, within which is formed an annular shoulder 20. This flange has at one point a notch 21, and arranged within the flange 19 and resting on the shoulder 20 is a washer 22* having a transversely extending projection 23 fitting in the notch 21 and positioning the washer. One side of this washer is notched to permit the passage therethrough of the fuse link. The fuse link in this form has the upper portion thereof concaved, as at 24, and the edge of the notch in the washer against which the fuse link lies is also concave, except for a straight portion 24* shown in dotted lines in Fig. 7, so that the two portions will lie in close proximity. The fuse link above the washer is turned over at 25, then doubled back at 26 and again turned over at 27, so that the fuse link at this point is provided with a double fold. In the portion 25 adjacent the vertical portion of the link there is provided a small opening 28. This opening communicates with one end of an elongated slot 29 formed in the folded portion 26, and the opposite end of this elongated slot communicates with an opening 30 formed in the top fold 27. The cap 4, when screwed on, clamps this folded end of the fuse link between it and the washer 22. It will be noted that due to the oppositely disposed openings 28 and 30 and the elongated slot 29 a tortuous path for the escape of the gases and products of combustion from the interior of the fuse shell to the exterior is provided, so that while the gases and pressure created by the blowing of the fuse may escape to the atmosphere, they escape through a vent which is tortuous and which, therefore, prevents the flash of fire.

In the structure illustrated in Figs. 8 to 10, the end of the fuse link is turned over a washer 31. This washer is supported in position in the same manner as the washer 22*. The washer 31, however, is provided with a peripheral notch 32, against which fits the curved portion 24 of the fuse link. The upper turned-over end 35 of the fuse link is provided with an opening 34 coinciding with the opening 6 in the cap, and the top face of the washer 31 is provided with a transverse groove 33, which toward the center of the washer communicates with the opening 34. This groove also communicates with a recess 36 in the periphery of the notch 32, so that when the fuse is blown the passage of the products of combustion will be first through the opening formed by the recess 36, then transversely along the groove 33, and then through the opening in

the fuse link 34, out through the window in the cap. This passage, it will be noted, is tortuous, and the flame resulting from the blowing of the fuse will not flash to the atmosphere.

In the structure illustrated in Figs. 11 to 13, the end of the fuse link is folded or bent over a washer, similar to the washer 22^a having a notch in its periphery to permit the link to pass therethrough. In this form, however, the link is provided with a longitudinal slot 37, which extends from a point well down on the link up to a point near the end of the folded portion. Covering the link at its upper end is a sheath 38 of material which is not readily fusible, such, for instance, as thin copper or the like, and this sheath at the top and coinciding with the window 6 in the cap is provided with an opening 39. It is thus seen that a tortuous path formed by the slot and beginning at the lower end of the sheath is formed in the link, this path communicating to the atmosphere through the window and through the opening 39 in the sheath.

In the structures illustrated in Figs. 14 and 15 the washer or disk 22^b is cylindrical and the fuse link is bent back into the notch 41 in the flange 19 to pass the edge of the washer or disk 22^b. A passage 40 is thus formed between the inner wall of the annular flange 19 and the enlarged bent over end of the link. The end of the fuse link is slotted, as at 42, so that in passing out the products of combustion will pass up through the notch 41 around the passage formed between the edge of the end of the link and the annular flange 19, thence by the way of the slot 42 and out through the view opening 6 in the cap.

In the structure illustrated in Fig. 16 the end of the link is corrugated where it is bent over the cap, as at 43, thereby forming a plurality of transverse passages through which the products of combustion can escape from the path formed between the edge of the turned-over portion of the link and the annular flange.

In Fig. 18 we have illustrated a different means of forming the corrugations. Instead of bending the metal, as is illustrated in Fig. 16, longitudinal and transverse corrugations 44 are formed in the top face of the bent-over portion by stamping. These corrugations or channels form, however, a tortuous channel for the gas.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In a fuse, the combination with an enclosing casing comprising a shell, terminals secured to the shell, a link passing through said shell and engaging said terminals, said casing having a tortuous vent opening communicating with the interior thereof and

having at least a portion of said tortuous vent formed in the fuse link.

2. In a fuse, the combination with a permanent portion including a casing comprising an insulating shell, and terminal members secured to the insulating shell, of a renewable portion comprising a fuse link, said casing having a tortuous vent opening from the interior thereof to the atmosphere and said vent opening having a path through said renewable portion and independent of the shell of the fuse.

3. In a fuse, the combination with an insulating shell, terminals secured to the insulating shell, a fusible link passing through said shell and engaging said terminals, and means independent of the shell for venting the interior of the shell through said fusible link.

4. In a fuse, the combination with an insulating shell having a vent opening, terminals secured to said shell, a fusible link passing through said shell and engaging said terminals, and a passage in said link forming at least a portion of the vent opening for said shell.

5. In a fuse, the combination with an insulating shell, terminals secured to said shell, a fusible link passing through said shell and deformed to form a tortuous passage communicating between the interior and exterior of the shell.

6. In a fuse, the combination with an insulating shell, of contact members secured on said shell, a fusible link extending through said shell having an opening in at least one end thereof, a covering member for one end of said link also having an opening therein, said opening in the covering member and opening in the fusible link constituting a tortuous passage communicating with the interior of the shell and extending to the exterior.

7. An enclosed vented fuse comprising a shell member, end caps therefor, a washer for one end of the shell and contained in one of said end caps, and a fusible link having one of its end portions inserted intermediate said washer and the associated end cap, a tortuous vent for venting the fuse extending through said end cap and said fusible link.

8. An enclosed vented fuse comprising a shell member, a removable terminal member for one end thereof, a washer for said terminal member, and a fusible link contained in said shell member and having one of its end portions bent over and placed intermediate said washer and said terminal member, the fuse being vented through a tortuous passageway which is formed, in part, through the bent-over end portion of said fusible link.

9. An enclosed vented fuse comprising a shell member, a terminal member therefor, a

65 fusible link received in said shell member and having one of its ends in contact with said terminal member, the fuse being vented through a tortuous path at least a portion thereof being formed in said fusible link. member, the fuse being vented through a 10 tortuous path at least a portion of which is formed in said fusible link.

In witness whereof, we have hereunto subscribed our names.

10. An enclosed vented fuse comprising a shell member, a terminal member therefor, and a fusible link received in said shell

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