A. H. TRUMBULL AND T. A. BOTH.

RENEWABLE CARTRIDGE FUSE.

APPLICATION FILED JULY 27, 1918.

**1,334,572.** Patented Mar. 23, 1920.

Fig. 2

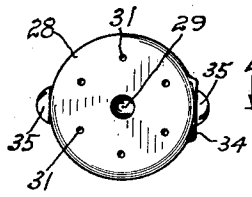



Fig. 1

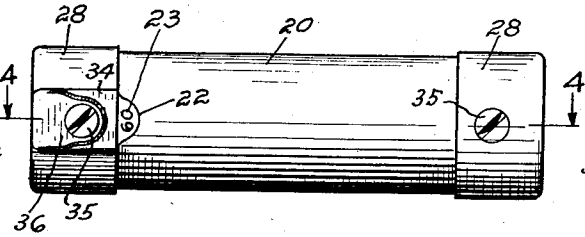



Fig. 3

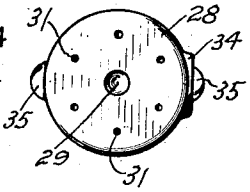



Fig. 4

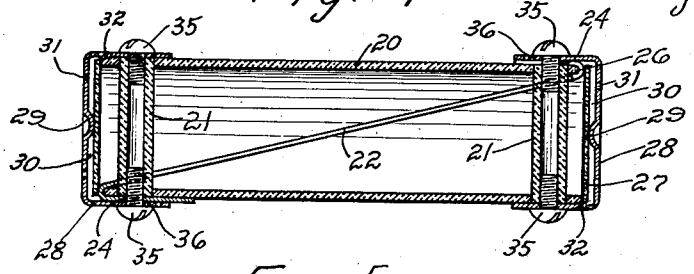



Fig. 6

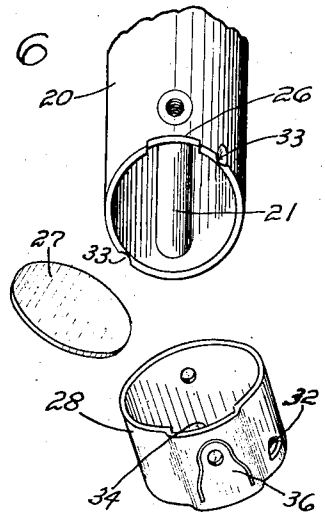



Fig. 5

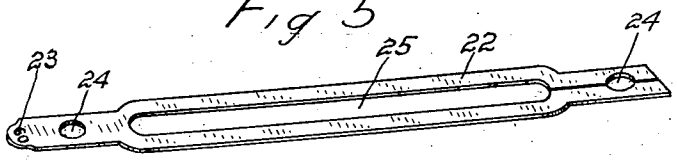



Fig. 7

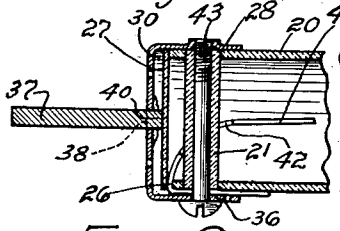



Fig. 7a

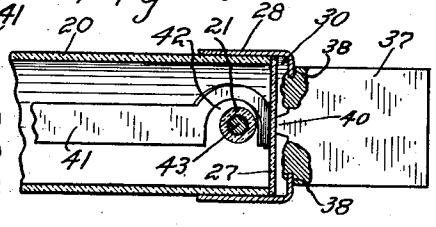



Fig. 8

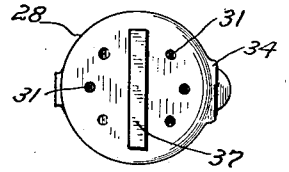



Fig. 9

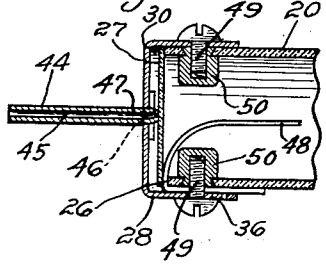



Fig. 9a

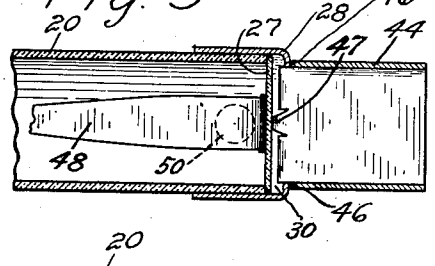



Fig. 10

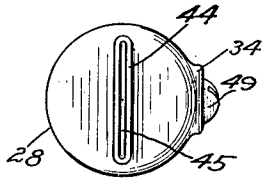
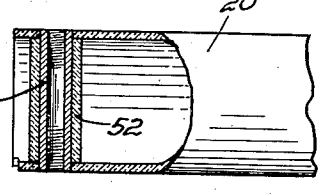



Fig. 11




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# UNITED STATES PATENT OFFICE.

ALEXANDER H. TRUMBULL AND TONJES A. BOTH, OF STRATFORD, CONNECTICUT, ASSIGNORS TO THE CONNECTICUT ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF CONNECTICUT.

## RENEWABLE CARTRIDGE-FUSE.

1,334,572. Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed July 27, 1918. Serial No. 247,071.

*To all whom it may concern:*

Be it known that we, ALEXANDER H. TRUMBULL and TONJES A. BOTH, citizens of the United States, residing at Stratford, county of Fairfield, State of Connecticut, have invented an Improvement in Renewable Cartridge-Fuses, of which the following is a specification.

This invention relates to renewable cartridge fuses of both the ferrule and blade types, it being understood of course that fuses for 60 amperes and under are usually of the ferrule type and fuses for 100 amperes and upward of the blade type, and the invention has for its object to provide a safety fuse in which the cost of construction shall be reduced to the minimum, special objects in view being to prevent injury to a switch base through bursting of the body or blowing off of a head in the event of a blow out, to prevent arcing, and to do away with all danger of the fusing of metallic connecting parts which has heretofore rendered many so called renewable fuses useless after a blow out.

With these and other objects in view, we have devised the novel renewable fuse of which the following description in connection with the accompanying drawing is a specification, reference characters being used to indicate the several parts.

Figure 1 is a side elevation of one of our novel fuses of the ferrule type;

Figs. 2 and 3 are end elevations as seen respectively from the left and right in Fig. 1;

Fig. 4 a longitudinal section on the line 4—4 in Fig. 1;

Fig. 5 a perspective view of the fuse strip detached;

Fig. 6 a perspective view of one end of a fuse of the ferrule type showing the parts disassembled;

Fig. 7 a longitudinal section of one end of a fuse of the blade type;

Fig. 7ª a longitudinal section of the other end of the fuse, which has been given a quarter turn;

Fig. 8 an end elevation as seen from the right in Fig. 7ª;

Fig. 9 a longitudinal section of one end of another form of blade fuse;

Fig. 9ª a longitudinal section of the other end of the fuse, which has been given a quarter turn;

Fig. 10 an end elevation as seen from the right in Fig. 9ª; and

Fig. 11 is a view, partly in elevation and partly in section, illustrating a modification applicable to either type of fuse.

20 denotes the insulating body which is ordinarily a fiber tube and is provided near its ends with anchorages for engagement by screws, in the present instance with insulating cross tubes 21, which may also be of fiber and the ends of which extend through the body and are internally threaded. 22 denotes the fuse strip which is provided with an indication 23 which shows the safety amperage of the fuse, and near its ends with holes 24. In the form illustrated in Fig. 5 the fuse strip is widened between its ends, a central longitudinal piece is blanked out leaving an elongated opening 25, and one end of the strip is split longitudinally, the split intersecting the opening and hole 24, so as to permit the parts to be separated in assembling, as will be more fully explained. Recesses 26, diametrically opposite to each other, are provided in the ends of the body to receive the respective ends of the fuse strip, which after being seated in the recesses are bent over the ends of the body and against the outer sides thereof. These recesses locate the fuse strip and prevent displacement thereof. 27 denotes relatively light insulating washers which close the ends of the body and contact with the ends of the body and the respective ends of the fuse strip. 28 denotes the ferrules which may or may not be end ventilating and are preferably provided with central bosses 29 which contact with the washers leaving gas chambers 30 between the washers and the heads of the ferrules. In the event of a blow out the edges of the relatively light washers will be lifted thereby away from the ends of the body and the gas will pass into the chambers and out through holes 31 in the heads of the ferrules. The insulating washers are retained in the ferrules by means of a plurality of lugs 32 which are struck inward from the metal of the ferrules and against which the washers rest, grooves 33 being

provided in the ends of the body to receive the lugs.

In order that the ferrules may fit the ends of the body closely and still provide space for the fuse strip, the metal of one side of each ferrule is pressed outward to form an enlargement 34 which just receives the strip. The ferrules are secured to the body by screws 35 which pass through holes in the ferrules and through holes 24 near the ends of the fuse strip and engage the threaded ends of the cross tubes. In order to insure that both sides of the ferrules will grip closely, we preferably blank out spring tongues 36 from the metal of the enlargements, leaving one end attached and the other end and the sides free to spring, and pass one of the screws 35 through the free end of each tongue.

In assembling the cross tubes are first seated in the walls of the body and become a permanent part thereof. The split end of the fuse strip is separated and passed on opposite sides of the cross tube at one end of the body, then through the body and on opposite sides of the other cross tube, the cross tubes now lying at the ends of the elongated opening in the fuse strip. The ends of the fuse strip are now placed in the recesses 26 on opposite sides of the ends of the body and then bent over the outer side of the body. The ferrules with the insulating washers in place are then slipped over the ends of the body and secured by screws 35. Indications may be placed at both ends of the fuse strip if preferred. We have, however, shown an indication at the solid end only of the strip, this end of the strip being made long enough to extend below the ferrule and thus show the indication clearly, as in Fig. 1. The split end of the fuse strip is preferably left only long enough to lie flush with the edge of the ferrule, as shown at the right in Fig. 4.

In Figs. 7 to 11 inclusive, we have shown the invention as applied to the blade type of fuses and have also illustrated variations in the details of construction. In Figs. 7, 7ª and 8, we have illustrated a form in which solid blades 37 are used which are riveted to the heads of the ferrules. The attaching ends of the blades are provided with shoulders 38 which rest against the outer sides of the ferrule heads. The ends of the blades are passed through slots in the heads of the ferrules which just receive them and are headed down upon the inner side. Projecting central bosses 40 are left on the ends of the blades which contact with the insulating washers and serve the same purpose as the bosses 29 in the other form. In this form we have shown a fuse strip 41 provided near each end with an offset having an opening 42 to receive the corresponding cross tube. A single long screw 43, threaded near its end only, is passed through each tube and has threaded engagement with the ferrule, as clearly shown in Fig. 7.

In Figs. 9, 9ª and 10, we have illustrated a form in which ventilating blades, indicated by 44, are used. These blades are formed from metal tubing flattened to place the sides in parallelism but not in contact, the object being to leave a passage 45 between the sides of the flattened tube for the escape of gas through the blade itself from chamber 30, in the event of a blow out. The attaching ends of the blades are provided with shoulders 46 which rest against the outer sides of the ferrule heads. The ends of the blades are passed through slots in the heads of the ferrules which just receive them, and the sides of each flattened tube are bent outward at right angles to the blade on the inner side of the ferrule head. Projecting central lugs or bosses 47 are left on the ends of the blades which contact with the insulating washers and serve the same purpose as in the form last described, that is, they hold the central portions of the relatively light washers while permitting the edges of the washers to be lifted in the event of a blow out, so that the gas will pass into the chamber and out through the passage in the blade. The fuse strip 48 in this form is simply a plain strip of the ordinary type shown as made narrowest at its midlength. The cross tubes are dispensed with in this form and the screws 49 by which the ferrules are retained in place engage internally threaded hubs 50 which are firmly seated in the walls of the body.

In Fig. 11 we have illustrated the use of metal cross tubes 51, in lieu of insulating tubes, for engagement by the ferrule attaching screws, said metallic tubes being seated in the walls of the body and being insulated by outer fiber tubes 52 which extend across between the inner walls of the body but do not extend through the body.

Having thus described our invention, we claim:

1. In a fuse of the character described, a body, a fuse strip bent over the ends of the body and against the outer sides thereof, end ventilating ferrules covering the ends of the body, insulating washers in the ferrules, and central bosses on the ferrules contacting with the washers and leaving chambers between the washers and the heads of the ferrules, the edges of the washers being lifted by a blow out and permitting escape of gas.

2. In a fuse of the character described, a body, a fuse strip bent over the ends of the body and against the outer sides thereof and having an end indication, end ventilating ferrules covering the ends of the body, the indication on the strip extending below the edge of one ferrule, insulating washers

in the ferrules, and central bosses on the ferrules contacting with the washers, for the purpose set forth.

3. In a fuse of the character described, a body provided with screw anchorages, a fuse strip bent over the ends of the body and against the outer sides thereof, ferrules covering the ends of the body, said ferrules being provided with enlargements which receive the strip and with spring tongues in the enlargements, and screws carried by said tongues and engaging the corresponding anchorages.

4. In a fuse of the character described, a body provided with screw anchorages, a fuse strip bent over the ends of the body and against the outer sides thereof, ferrules covering the ends of the body, said ferrules being provided with enlargements which receive the strip and the enlargments being provided with spring tongues, and screws passing through the tongues and engaging the anchorages.

5. In a fuse of the character described, a body provided with cross tubes, a fuse strip bent over the ends of the body and against the outer sides thereof, ferrules covering the ends of the body, said ferrules being provided with enlargements which receive the strip and the enlargements being provided with spring tongues, and screws passing through the tongues and engaging the cross tubes.

6. In a fuse of the character described, a body provided with cross tubes, a fuse strip bent over the ends of the body and against the outer sides thereof and having means for locating the strip with relation to the cross tubes, ferrules covering the ends of the body, said ferrules being provided with enlargements which receive the strip and the enlargements being provided with spring tongues, and screws passing through the tongues and engaging the cross tubes.

7. In a fuse of the character described, a body provided with cross tubes, a fuse strip bent over the ends of the body and against the outer sides thereof and having an elongated opening which receives the cross tubes, one end of the fuse being split for convenience in assembling, ferrules covering the ends of the body, said ferrules being provided with enlargements which receive the strip and the enlargements being provided with spring tongues, and screws passing through the tongues and engaging the cross tubes.

8. In a fuse of the character described, a body, a fuse strip bent over the ends of the body and against the outer sides thereof, end ventilating ferrules covering the ends of the body, said ferrules being provided with enlargements to receive the strip and with internal lugs, insulating washers which rest against the lugs, and central bosses with which the opposite sides of the washers contact.

9. In a fuse of the character described, a body provided with screw anchorages, a fuse strip bent over the ends of the body and against the outer sides thereof, end ventilating ferrules covering the ends of the body, said ferrules being provided with enlargements to receive the strips and with internal lugs, insulating washers which rest against the lugs, central bosses with which the opposite sides of the washers contact, and screws engaging the anchorages to secure the ferrules to the body.

10. In a fuse of the character described, a body provided with screw anchorages, a fuse strip bent over the ends of the body and against the outer sides thereof, end ventilating ferrules covering the ends of the body, said ferrules being provided with enlargements to receive the strips, with internal lugs and with spring tongues, insulating washers which rest against the lugs, central bosses with which the outer sides of the washers contact, and screws passing through the tongues and engaging the anchorages.

11. In a fuse of the character described, a body provided with screw anchorages, a fuse strip bent over the ends of the body and against the sides thereof, end ventilating ferrules covering the ends of the body, said ferrules being provided with enlargements which receive the strip and the enlargements being provided with tongues, insulating washers in the ferrules, central bosses with which the washers contact leaving chambers between the washers and the heads of the ferrules, and screws passing through the tongues and engaging the anchorages.

12. In a fuse of the character described, a body, a fuse strip bent over the ends of the body and against the outer sides thereof, end ventilating ferrules covering the ends of the body and having slots, blades having shoulders which rest against the ferrule heads, the ends of the blades passing through the slots and being headed down on the inner side leaving central bosses, and insulating washers in the ferrules which contact with the bosses.

13. In a fuse of the character described, a body provided with screw anchorages, a fuse strip bent over the ends of the body and against the outer sides thereof, end ventilating ferrules covering the ends of the body, said ferrules being provided with enlargements to receive the strips and the enlargments being provided with spring tongues, blades riveted in the ferrule heads, their inner ends having central bosses, insulating washers in the ferrules which contact with the bosses, and screws passing through the tongues and engaging the anchorages.

14. A cartridge fuse ferrule having an enlargement to receive a fuse strip, and a spring attaching tongue in the enlargement.

15. A cartridge fuse ferrule having an enlargement to receive a fuse strip, a spring attaching tongue in the enlargement, and means opposite the tongue for engagement by a screw.

16. In a fuse of the character described, a body, a fuse strip, ferrules at the ends of the body, tongues in the ferrules, and attaching screws engaging the tongues and ferrules and the body.

17. In a fuse of the character described, a body, a fuse strip, ventilating ferrules on the ends of the body, said ferrules being provided with central bosses, insulating washers secured in the ferrules and engaging the bosses and leaving chambers between the washers and the heads of the ferrules, and means for detachably securing the ferrules to the body.

In testimony whereof we affix our signatures.

ALEXANDER H. TRUMBULL.
TONJES A. BOTH.