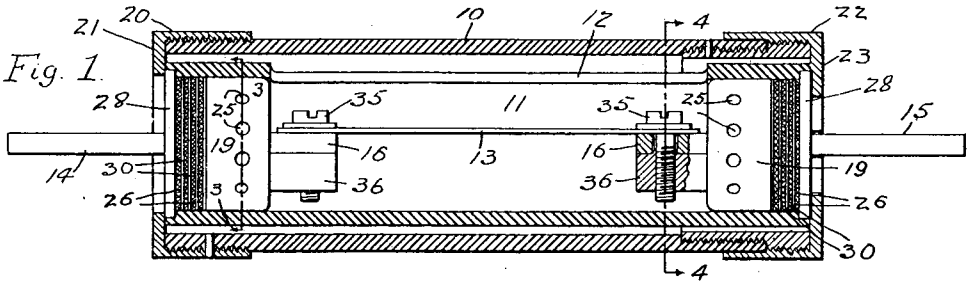
Sept. 18, 1928. 1,684,432

J. G. CLEMENS

RENEWABLE FUSE

Filed Oct. 1, 1926

Fig. 1.



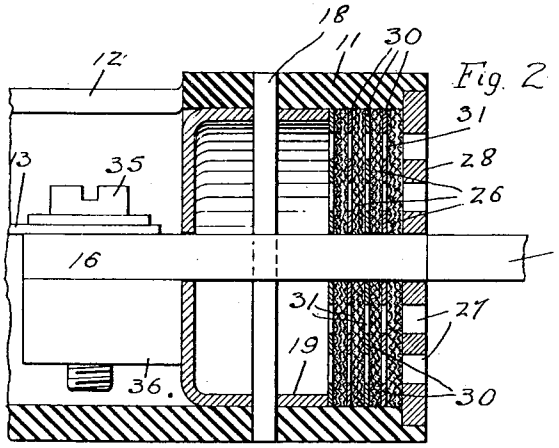


Fig. 2.

Fig. 3.

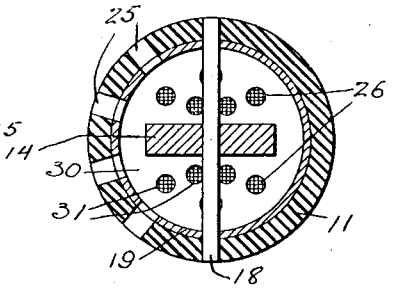


Fig. 4.

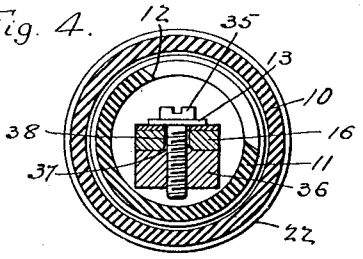


Fig. 6.

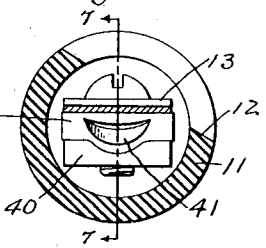


Fig. 8.

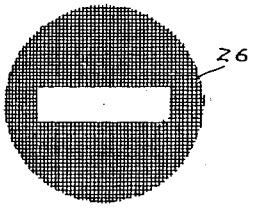
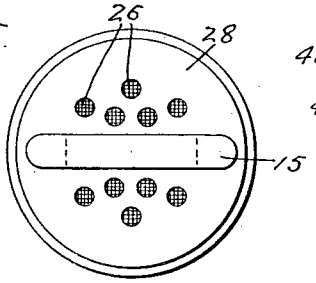


Fig. 5.



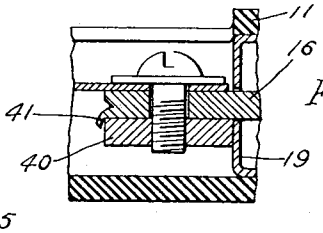


Fig. 7.

INVENTOR.
John G. Clemens
By Parker & Prochnow
ATTORNEYS.

Patented Sept. 18, 1928. 1,684,432

UNITED STATES PATENT OFFICE.

JOHN G. CLEMENS, OF EGGERTSVILLE, NEW YORK, ASSIGNOR TO PIERCE RENEWABLE FUSES, INC., OF BUFFALO, NEW YORK.

RENEWABLE FUSE.

Application filed October 1, 1926. Serial No. 138,978.

This invention relates to improvements in electric fuses of the kind in which a fuse link, after having been fused or burnt out, may be removed and replaced by another link.

The objects of this invention are to provide a fuse of this kind with means of improved construction for ventilating the interior of the fuse housing; also to improve the construction of renewable fuses in other respects hereinafter specified.

In the accompanying drawings,

Fig. 1 is a longitudinal, sectional elevation of a renewable fuse embodying this invention.

Fig. 2 is a fragmentary, longitudinal, sectional view on an enlarged scale of one end of the inner housing or frame of the fuse, the ferrule for connecting the inner housing with the outer housing being omitted.

Fig. 3 is a transverse, sectional elevation thereof on line 3—3, Fig. 1, on an enlarged scale.

Fig. 4 is a transverse section thereof on line 4—4, Fig. 1.

Fig. 5 is an end view of the inner housing of the fuse.

Fig. 6 is a transverse, sectional elevation similar to Fig. 4, but showing a fuse of somewhat modified construction.

Fig. 7 is a sectional view thereof on line 7—7, Fig. 6.

Fig. 8 is a face view of one of the disks of wire gauze screen material used in the fuse.

The fuse to which the improvements embodying my invention are applied may be of any suitable or desired construction, that shown in the drawings including an outer shell or housing 10 of hard fiber or other insulating material and an inner shell or frame 11 of similar material which may be open at one side thereof as indicated at 12 through which opening in the frame a removable fuse link 13 may be inserted or removed from the frame and through which opening the products of combustion resulting from the fusing or burning of the link may pass into the space between the housing 10 and the frame 11. 14 and 15 represent the usual blades of the fuse, which extend into the interior of the inner frame or shell 11 and the inner portions of which form terminals 16 to which the fuse link 13 may be secured. While the invention is herein illustrated as used in connection with a knife blade type of fuse, it is not intended to limit the invention to use on fuses of this kind, since my improvements may be used in connection with fuses of the ferrule or other types. The blades 14 and 15 are suitably secured to the ends of the frame or inner shell 11 by any suitable means such as pins 18 extending through the frame 11 near the ends thereof and through the blades 14 and 15 and also through a cup-shaped member 19 arranged within each end of the frame or inner shell 11 of the fuse. The outer housing 10 is provided at one end with a ferrule 20 rigidly secured thereto in any desired manner, which ferrule is provided at its end with an inwardly extending flange 21 having a hole therein large enough to permit the blades 14 to pass therethrough and to permit the ferrule 20 to be rotated about its axis relatively to the blade. At the other end of the outer housing 10 a ferrule 22 is provided having an inwardly extending flange 23 which is suitably connected rigidly to the blade 15 so that there is no relative movement between the blade 15 and ferrule 22, and this ferrule 22 has an internal screw thread adapted to engage with a screw threaded part on the end of the outer housing 10. Consequently the ferrule 22 is secured on the inner frame 11 of the fuse and the ferrule 20 is secured to the outer housing or shell 10. When the ferrule 22 is turned with reference to the outer housing 10 to disconnect these two parts, the entire inner housing or frame 11 can be removed from the outer housing or tube 10 lengthwise thereof, and when the ferrule 22 is screwed tightly upon the threaded end of the outer housing or shell 10, the inner frame 11 is securely clamped between the inwardly extending flanges of the two ferrules 20 and 22.

When the fuse link 13 blows, the products of combustion pass from the frame 11 of the fuse out through the opening 12 thereof into the annular space between this frame and the outer shell 10 of the fuse, and then pass into the cup-shaped members 19 through a series of orifices 25, see particularly Figs. 1 and 3, which orifices extend through the wall of the frame 11 and of the cup-shaped members 19 so that the gases of combustion are expanded in the chambers 19 and cooled by this expansion. From the chambers 19 the gases flow through a plurality of disks or sheets 26 of any suitable reticulated material, such as fine wire mesh, gauze or perforated metal, or metallic screening material which further cools the gases. These gases then pass to the at-

mosphere through openings 27 in a disk 28 arranged at each end of the frame 11 of the fuse and thus pass out through the openings in the ferrules 20 and 22. All of these parts have heretofore been used in connection with fuses of this kind and of themselves constitute no part of this invention.

It has been found that in the use of fuses of this kind, particularly in fuses of large size, that a considerable number of disks or sheets of reticulated material are necessary in order to properly cool the gases before they are discharged through the openings 27 in the disks 28. It has also been found that when a large number of reticulated disks or sheets are packed together in contact with each other, the discharge of gases through the disks or sheets of reticulated material is obstructed to such an extent that the proper venting of the fuse is interfered with. This at times resulted in creating heavy pressures within the fuse which damaged or ruptured the fuse. It was also found that after each discharge of the products of combustion, the resistance to the flow of products of combustion by the reticulated mass was increased, due probably to the filling up of the openings in the reticulated material by small solid particles in the products of combustion. Since these fuses must be capable of being vented repeatedly in order to withstand the severe tests imposed by the insurance underwriters, the closing up of the discharge openings in the reticulated material made it impossible to have these fuses passed by the underwriters, and consequently rendered these fuses to a certain extent unmarketable.

I have found that these difficulties can be eliminated by arranging the reticulated material in layers, each layer consisting of a number of sheets or disks of the reticulated material, and in separating these layers from each other by any suitable means, such for example, as a plate provided with a number of relatively large holes or openings, or a plate or disk of coarse wire mesh, provided with openings considerably greater than those in the individual sheets or disks of the reticulated material 26. In the particular form shown in Figs. 1 and 2 the mass of reticulated material in the path of the products of combustion is separated into a plurality of layers, each layer consisting of a number of sheets or disks of the reticulated material, and each of these layers is separated by means of a plate 30 preferably made of sheet metal and having comparatively large holes or openings 31 therein. One of these plates 30 is also preferably arranged between the cup-shaped members 19 and the mass of reticulated material.

In the particular construction shown, see particularly Fig. 2, the holes 31 in all of the plates 30 are substantially in alinement with each other so that the products of combustion pass only through those portions of the sheets or disks of reticulated material arranged between the holes in adjacent disks. This arrangement increases the rate of flow of the products of combustion through the reticulated material and has been found to improve the cooling action of this material upon the products of combustion, and also the increased velocity of the products of combustion tends to clear the reticulated material of any obstructions lodged in the openings therein.

The fact that the perforations in the plate 30 are arranged in alinement so that the products of combustion pass only through those portions of the reticulated material disposed between the perforations does not in any way interfere with the cooling of the products of combustion passing through the recticulated material since the heat from the portions thereof lying between the perforations in the plate is readily conducted to other portions of the reticulated material.

By means of this arrangement an efficient cooling of the products of combustion is obtained and the openings in the several layers of reticulated material are not in any way obstructed by the repeated passage of the products of combustion therethrough.

In fuses of this kind the fuse links 13 are generally secured to the terminals or shanks 16 of the fuse blades 14 and 15 by means of screws or bolts 35 which pass through holes in the shanks or terminals 16 and the threaded ends of which engage in correspondingly threaded nuts 36. Trouble has frequently been experienced in that when the screws 35 are loosened to permit the removal of a burnt fuse link, and to replace a new fuse link 13, the nuts 36 become misplaced or sometimes fall out of the frame 11 and become lost. In order to prevent the displacement of the nuts 36 from their operative relations to the shanks or fuse terminals 16, cooperating parts are provided on the fuse terminals 16 and the nuts so that the displacement of the nuts out of their operative positions is prevented. In the construction shown in Figs. 1 to 4 inclusive, the nuts 36 are preferably provided with punched holes which are afterwards threaded to receive the threaded portions of the screws or bolts 35, and in punching the holes in the nuts, a burr 37 is formed around the hole in the nut. The holes 38 in the fuse terminals or shanks 16 are formed large enough to permit the burrs on the nuts to enter into the holes in the shanks or terminals 16 before these parts are assembled in the frame 11 of the fuse. The parts of the fuse are also so proportioned that the edges or corners of the nuts will be located adjacent to the inner wall of the tubular frame 11 of the fuse and consequently if the screw or bolt 35 is removed from the fuse, the nut will be held against movement away from the ter-

minal 16 sufficient to permit the burr to move out of engagement with the hole in the terminal, and the burr in turn prevents the nut from moving out of its operative position lengthwise of the frame 11 of the fuse. Consequently the screw or bolt 35 can readily be again placed into its operative position in the nut.

In the construction shown in Figs. 6 and 7 the nuts 40 are held in place by means of a turned over portion 41 of the end of the shank or terminal 16, so that this bent over portion 41, together with the adjacent portion of the frame 11 of the fuse, will prevent the nut 40 from getting out of its operative position.

By means of either of these two constructions the removal and replacing of a fuse link is greatly facilitated and the losing of a nut is prevented and also the nut is forced to remain in an operative position so that the threaded hole in the nut is substantially in alinement with the hole in the shank or terminal 16, so that the replacing of the screw or bolt 35 can be quickly effected.

I claim as my invention:—

1. A fuse having a passage for products of combustion, a plurality of successive layers of reticulated metallic material in said passage, and spacing members between layers of said reticulated material and spacing two adjacent pieces of said reticulated material from each other, said spacing members having apertures of known and invariable size to permit passage therethrough of the products of combustion.

2. A fuse having a passage for products of combustion, a plurality of successive layers of reticulated metallic material in said passage, and metallic spacing members arranged between adjacent layers of reticulated material and having openings therein greater than the openings in said reticulated material.

3. A fuse having a passage for products of combustion, sheets of reticulated material in said passage and arranged in layers, each layer comprising a plurality of sheets, and spacing means arranged between said layers and provided with openings of known and invariable size through which products of combustion can readily pass from one layer to the next.

4. A fuse having a passage for products of combustion, sheets of reticulated material in said passage and arranged in layers, each layer comprising a plurality of sheets, and metal plates arranged between adjacent layers of reticulated material and having perforations therein of sufficient size to permit products of combustion to pass freely from one layer to another.

5. A fuse having a passage for products of combustion, sheets of reticulated material in said passage and arranged in layers, each layer comprising a plurality of sheets, and metal plates arranged between adjacent layers of reticulated material and having perforations therein of sufficient size to permit products of combustion to pass freely from one layer to another, said plates being arranged with their perforations substantially in alinement.

6. A fuse having a passage for products of combustion, sheets of reticulated material of good heat conducting properties arranged in layers across said passage, plates arranged between adjacent layers of reticulated material and having imperforate and perforate surface zones for directing the products of combustion solely through certain surface zones of said layers, whereby the movement of the products of combustion through the layers will be sufficiently rapid to prevent clogging of said layers by congealing and solid products of combustion.

JOHN G. CLEMENS.