F. B. COOK.

NON-EXPLOSIVE FUSE.

APPLICATION FILED MAY 3, 1906.

905,503.

Patented Dec. 1, 1908.

Fig. 1.

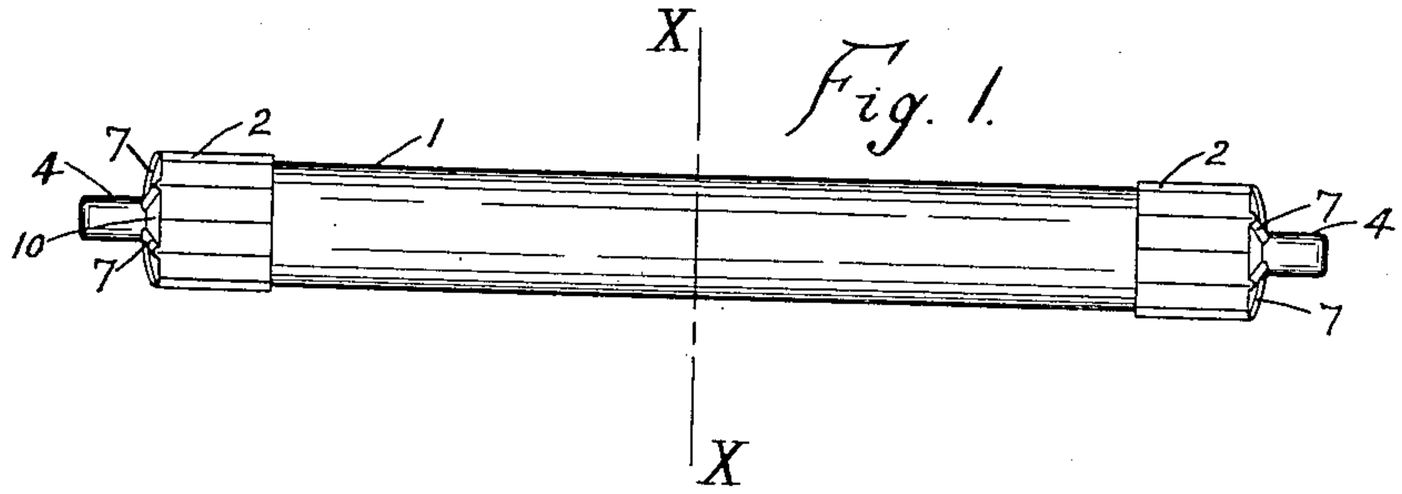


Fig. 2.

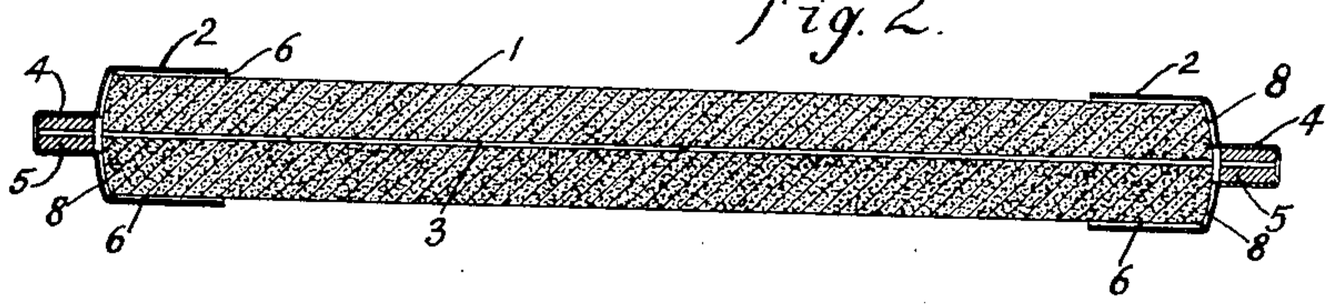


Fig. 3.

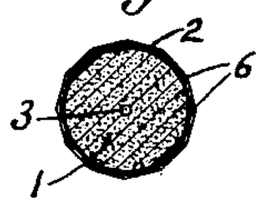
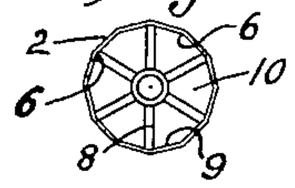


Fig. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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NON-EXPLOSIVE FUSE.

No. 905,503. Specification of Letters Patent. Patented Dec. 1, 1908.

Application filed May 3, 1906. Serial No. 315,016.

To all whom it may concern:

Be it known that I, FRANK B. COOK, a citizen of the United States of America, residing at Chicago, in the county of Cook, and State of Illinois, have invented a new and useful Non-Explosive Fuse, of which the following is a specification, reference being had to the accompanying drawings, illustrating same.

My invention relates to fuses for electrical circuits, and more particularly to inclosed or tubular fuses.

The principal objects of my invention are to provide improved means for taking care of the gases formed in such a fuse when same is blown; to provide improved means for properly venting the fuse; to provide improved means for reducing the gases formed in such a fuse, by the blowing of same, to a minimum; to provide improved means for preventing a flash from occurring outside of the fuse when same is blown; and to provide simplicity of construction and durability therein.

Other objects will be apparent from the following specification.

In fuses of the inclosed type it is the general practice to provide a rather large bore therein through which the fuse wire is placed. With such a large bore the quantity of air surrounding the fuse wire is considerable. This air when heated by the blowing of the fuse is expanded and consequently a high pressure is produced which generally disrupts the casing of the fuse and causes an explosion. When such a fuse explodes, under a very high voltage, the arc generally continues, due to the fact that it has been started between the terminals of the fuse by the disruption in the air. Therefore it is very essential in fuses of this character to prevent an explosion when the fuse is blown. It is found that when an inclosed fuse with an ordinary bore is sealed up tightly, the explosion which takes place is harder, on account of the gases in the tube being confined so as to produce a higher pressure. When such a fuse is vented in order to allow the gases to escape and thereby prevent the explosion, there is generally a streak of fire produced at the fuse when same is blown, which streak may shoot out quite a distance from the fuse. It is also very desirable in such fuses to eliminate this streak of fire, or flash, as same is very dangerous under certain conditions.

In the fuse of my present invention I preferably provide a very small bore through which the fuse wire extends, so as to reduce the amount of air therein to a minimum and thereby reduce the total force in the tube tending to cause an explosion when the fuse blows. Then I provide a tube or casing for the fuse which is somewhat porous and adapted to absorb a considerable quantity of the gases formed by the blowing of the fuse. I also preferably provide a number of small vents at each end of the fuse to take care of the small amount of gases which are not absorbed by the fuse casing.

Referring to the accompanying drawings illustrating the preferred form of my invention, Figure 1 is a side elevation of the complete fuse of the invention; Fig. 2 is a longitudinal cross-sectional view of Fig. 1, without the fuse wire; Fig. 3 is a transverse cross-sectional view of Fig. 1, taken on line X X, showing the vents at the end of the fuse; and Fig. 4 is a view of one of the end caps for the fuse, showing the interior of same.

Like characters refer to like parts in the several figures.

The fuse casing 1 is provided with end caps 2 2 suitably secured to the ends thereof as shown. A small bore 3 extends lengthwise through the casing and end caps and is adapted to receive the fuse wire which is preferably soldered to the outer ends of caps 2 2. The bore 3 is preferably very small, so as to eliminate the air from the tube 1 as much as possible. I have found that with a 5 ampere fuse a bore 25/1000ths of an inch in diameter gives good results. With this size bore, the 5 ampere fuse wire practically fills same and thereby displaces most of the air therefrom.

For the tube or casing 1 I use a composition which is somewhat porous, and which is also strong enough to withstand considerable pressure in the bore 3. A material which I have found to be well adapted for this tube is a complex anhydrous bisilicate, for example such a bisilicate as that described in United States Letters Patents Nos. 816,270, and 816,271, issued March 27, 1906.

Each end cap 2 is provided with a projecting portion 4 which is adapted to receive suitable clamping means to hold the fuse in circuit, and which is preferably filled with a plug of solder 5. The end caps 2 2 are preferably drawn out of sheet metal,

but it is not essential that they be made in this manner. Before the caps 2 2 are placed on the tube 1 a hollow solder plug 5 is placed in the portion 4 thereof. After the caps 2 2 are placed upon the tube 1 the fuse wire may be inserted through the bore 3 and the hollow plugs 5 5 and secured to the portions 4 4 by heating the solder 5 5 which melts and solders the fuse wire to the portions 4 4 and at the same time fills the latter so as to exclude the air therefrom. The amount of solder 5 for each end cap 2 is preferably sufficient to just nearly fill the hollow portion 4 so as to leave a slight space between the solder 5 and the end of the tube 1. Each end cap 2 is preferably polygonally formed, preferably in the form of a dodecagon, and is forced on the cylindrical end of the tube 1 so that the several inner flat portions 9 9 of the cap 2 engage the tube 1, as shown in Fig. 3, and thereby securely hold the cap to the tube.

The end portions of the tube 1 are preferably formed to snugly fit the inner surface of the end portions 10 10 of the caps 2 2. The polygonally formed cap 2 engaging the cylindrically formed end portion of tube 1 provides a number of openings or vents 6 6 between the cap 2 and the side portion of tube 1, extending lengthwise of the latter. Each end cap 2 has provided across its end portion several radial ridges 7 7 which extend from the portion 4 to several of the vents or corner portions 6 6. These ridges provide radial channel portions 8 8 on the inside of the end of cap 2, which channels connect the opening at the end of bore 3 with the vents 6 6. Thus it will be seen that the gases formed in the bore 3 by the blowing of the fuse have several passages of escape at each end of tube 1, across the ends thereof and along portions of the side thereof toward the middle. Thus the gases escaping from the bore 3 are caused to traverse curved paths, practically U-shaped, which change the direction of the gases and thereby kill the effect of any flame which might be emitted from the tube if the gases were allowed to pass directly out at the ends thereof. I find that with this arrangement of venting the fuse, there is never any flash produced when the fuse is blown. In some instances there is a slight amount of smoke only ejected from the vents 6 6.

The tube 1 being somewhat porous absorbs a part of the gases which are formed in the bore 3 when the fuse wire blows and thereby reduces the amount of gases which have to be ejected from the vents 6 6. When the air in bore 3 is suddenly heated by the arc, it is suddenly expanded, which expansion produces a sudden high pressure in the tube. This pressure forces some of the gases through the pores in tube 1, and some out at the vents 6 6. If the tube 1 were not porous, the pressure of the gases formed could not force a portion thereof through the material of the tube and all of the gases would then have to be forced out at the vents 6 6. This combination of the porous tube 1 and the vents 6 6 distributes the injurious effects produced in the fuse and thereby prevents any explosion, any flash from the fuse, or the continuance of an arc.

I do not wish to limit this invention to the particular details of construction as herein shown, as many modifications in same may be made without departing from the scope of the appended claims.

What I claim as my invention and desire to secure by Letters Patent, is:

1. A fuse of the character described comprising a suitable casing for the fusible conductor, polygonally formed end caps suitably secured thereto, and radial channels formed across the end portions of the end caps to meet the corner portions of the polygonally formed caps and thereby provide vents for the fuse.

2. A tubular casing for inclosed fuses, an end cap therefor provided with a projecting portion adapted to be suitably held in the circuit, suitable vents in the end cap extending across the end and down the sides thereof, and solder securing the fusible conductor to the said projecting portion and filling same.

3. An inclosed fuse having end caps, a hollow projecting portion on each end cap providing means for connecting the fuse in circuit, and solder securing the fusible conductor to the said projecting portions and substantially filling same to exclude the air therefrom.

4. A fuse of the character described comprising a casing for the fusible conductor, end caps fitted on the ends of the casing, said caps having channels formed therein across the ends thereof and down the sides thereof whereby the caps may be fitted closely to the ends of the casing and at the same time provide vents for the fuse.

As inventor of the foregoing I hereunto subscribe my name in the presence of two subscribing witnesses, this 30th day of April, 1906.

FRANK B. COOK.

Witnesses:

FREDERICK R. PARKER,

F. W. PARDEE.