Jan. 18, 1927. 1,614,646

A. J. BOWIE

ELECTRIC FUSE AND FUSE HOLDER

Filed May 19, 1921

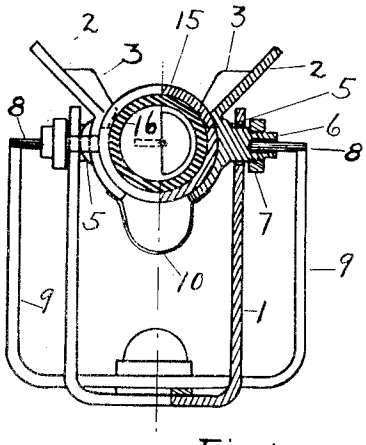


Fig 1

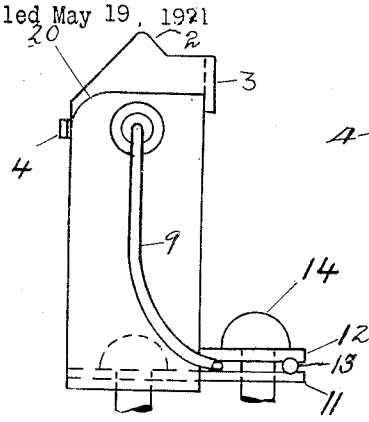


Fig 2

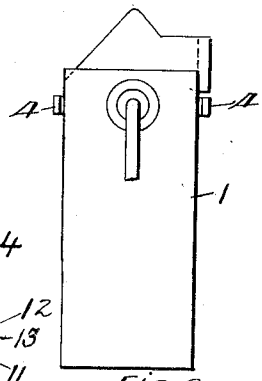


Fig. 8.

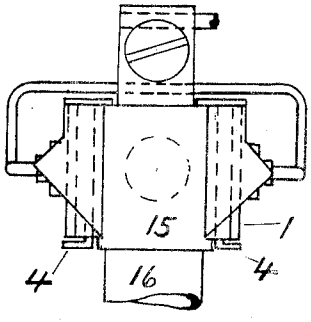
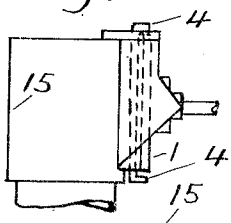


Fig 3

Fig. 9



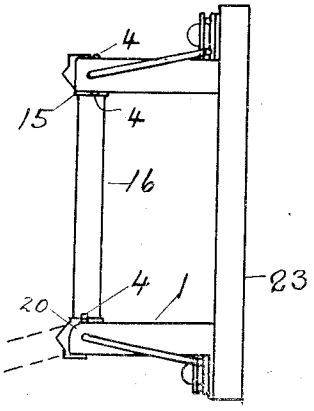
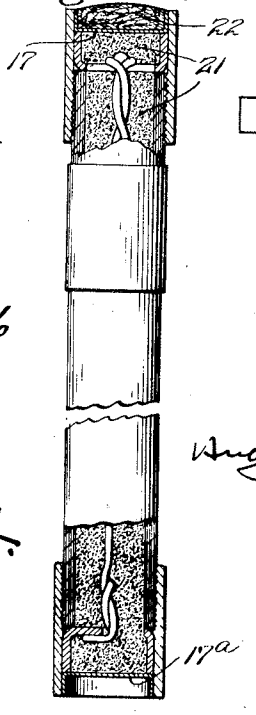


Fig 4

Fig. 10.



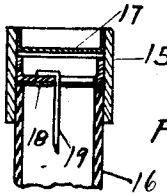


Fig 5

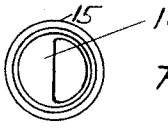


Fig 6

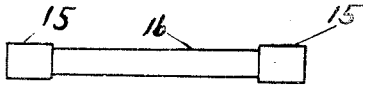


Fig 7

WITNESS

Henry B. Truett.

H.W. Crozier.

Augustus Jesse Bowie

INVENTOR

Patented Jan. 18, 1927. 1,614,646

UNITED STATES PATENT OFFICE.

AUGUSTUS JESSE BOWIE, OF SAN FRANCISCO, CALIFORNIA.

ELECTRIC FUSE AND FUSE HOLDER.

Application filed May 19, 1921. Serial No. 470,769.

It is the object of this invention to provide important improvements in fuses and fuse holders. According to present practice fuses generally consist of an insulating tube in which the fuse is inserted, and of a non-combustible powder surrounding the fuse. The fuse tubes are provided with metal ends for making contact in suitable clips. For low current capacities, up to about sixty (60) amperes, the metal ends consist of ferrules adapted to be inserted in circular clips which partly surround the ferrules. These clips are of pressed metal and owing to their rigidity but an indifferent contact is secured. For higher amperage, ferrules with knife blade ends are provided, adapted for insertion in a knife blade type of clip. Contacts of this nature, unless of very high grade construction, and hence rigid, are not likely to be good. In either case a poor contact is liable to cause premature blowing of the fuses. Rigid connections of either of the above types are suitable for indoor use only, and even then require considerable pressure to insert or remove the fuse.

While my fuse is primarily designed for high voltage use the same principles may be employed in low voltage work. For high voltage fuses it is essential that the tube be inserted and removed with a small mechanical effort, as the fuses have often to be handled when the line is alive, and hence a long fuse rod is used for handling the tube. Under these conditions a heavy mechanical pull would be objectionable.

One of the objects of my invention is to provide a fuse tube which may be removed with a small mechanical effort, and to provide a clip which will make excellent contact, and thus prevent any undue blowing of the fuses.

Another important function of a high tension fuse in event of a severe blow is to relieve the pressure caused by the blowing of the fuse in a safe manner, and to dispose of the ensuing arc in a satisfactory manner. In my invention this is handled in a very effective manner.

Fig. 1 shows in end section and elevation the clip. The half view to the right shows a section through the center of the clip and ferrule, while the left half shows a section through the fuse tube, the clip part being shown in projection.

Fig. 2 shows a side elevation of the clip.

Fig. 3 shows a plan view of the clip and fuse tube end.

Fig. 4 shows in side elevation the fuse tube, clips and base whereon the clips are mounted.

Fig. 5 shows a longitudinal section of one end of the fuse tube and ferrule, with the fuse in place.

Fig. 6 shows an end view of the ferrule.

Fig. 7 shows a plan view of the fuse tube.

Fig. 8 is a side view of a stationary type of clip.

Fig. 9 is a plan view of same showing only half the clip.

Fig. 10 shows a longitudinal section of the fuse.

The fuse tube (16) is of insulating material provided at each end with metal ferrules, (15, 15). The fuse is adapted to make contact as hereinafter described with the ferrules (15), which contact with the clips in turn, in the usual manner. For fuses of moderate amperage ferrules (15) are circular in section. (23) is an insulating base on which the fuse clips are mounted. For high pressure work base (23) is generally replaced by two line type of insulators with suitable means of support. This construction is not shown, as the principles embodied in this invention do not involve the details of mounting the clips.

(1) is a U shaped spring carrying clip faces (2, 2) which contact with ferrules (15, 15), (3, 3) are limit flanges on clips (2) which serve to center the fuse longitudinally in the clips and which also serve in the vertical fuse as a shelf for the ready insertion of the fuse tube, the lower end of the ferrules first resting on the shelf on the lower clip, after which the fuse tube is readily inserted between the clip faces.

The circular rod (6), is a continuation of the clip face (2) and carries the current thru flexible conductors (8) and conductors (9), the latter being in turn connected to a suitable base adapted to provide connection for the incoming wires.

In the drawing, Fig. 2, conductor (9) is clamped between plates (11) and (12) and the line conductor (13) is clamped between the same two plates by means of screw (14) adapted to secure said plates to the base on which the clip is mounted.

(5) is a spherical shaped boss on clip (2), adapted to allow the latter to be self-align-

ing and to seat itself properly on the ferrule (15).

(4, 4) are projecting lugs from the clip face (2), adapted to hold the clip face in position. For a stationary type of clip, lugs (4, 4) are provided on each end of each clip face and the spring (1), is made square on top. Fig. 8 shows in side elevation the stationary type of clip, and Fig. 9 shows the same in plan, only half the clip being shown.

(10) is a flexible strap adapted to hold the clip faces (2, 2), in appropriate alignment, which is, however, flexible enough to allow each face to align itself properly to ferrules (15).

It is one of the most important features of my invention to provide self-aligning clips for contacting with the fuse tube ends, this construction allowing safely considerably higher current carrying capacity than would otherwise be permitted.

(7) is a nut screwed up against the shoulder of the inner end of rod (6) and adapted to allow slight end play of the clip face, which is held flexibly in the spring (1), the flexible conductors (8) allowing the ready seating of the clip faces in their proper position.

Owing to the excellent contact available with self-aligning clip faces, comparatively light spring pressure is required, and the arrangement shown allows the insertion of the fuse with little mechanical effort.

Another important feature of this invention is the use of a combined switch and fuse in a single piece of apparatus. To attain this result but a single lug, (4), is used on each clip face, as shown in Figures 2 and 3, and the corresponding corners, (20) of the spring (1), are rounded. This allows rotation of the clip faces, (2, 2), thru slightly more than a right angle, the lug (4), forming a limit against the upper end of the spring (1), when the switch is open.

The dotted lines in Fig. 4 show the position of the fuse when operated as a switch. In this case the lower spring clip is made rotatable, as in Figures 2 and 3, while the upper clip is in general fixed in position, as in Figures 8 and 9, except for a small amount of flexibility required for the self-aligning features. The upper clip for this service is provided with double lugs (4), on each side of the U spring, and the corners (20) are square instead of round. With the construction shown in Figures 8 and 9, piece (10) would be necessary, as the clip faces would be held in sufficiently close alignment without piece (10). The rotatable type of clip being provided with flexible conductor (8), can very readily allow a rotation thru the necessary right angle by a small twist in the conductor (8), which is in line with the axis of rotation. I have shown the self-aligning cylinder type of contacts, but the same principle would, of course, apply to a flat self-aligning contact.

The arrangement for pivoting the clip face with the spring (1) pressing against the boss (5), is of particular advantage with a cylindrical contact, as the clip faces may roll against this boss, and in this manner greatly lessen the mechanical power to insert or remove the fuse.

Another important feature of my invention is the construction of the fuse tube and ferrules, shown in Figures 5 and 6. The ferrule (15) is provided with a cup shaped metal piece (18). About half of the bottom area of (18) is cut out, thus providing a passage equal in area to about half the area of the tube. The fuse wire (19) is secured to face (18), preferably by solder which eliminates the possibility of defective contact. After the fuses are soldered in place the tube is filled with an insulating powder (21) and the ends are closed by cup-shaped compression caps, (17). These caps (17), are of much lighter metal than contact cups (18). Also preferably the cap (17), for the upper end of the fuse is made of considerably heavier metal than the corresponding cap (17^A) of the lower end of the fuse. The upper cap (17), is filled with any filling material (22) which will readily adhere, such as wax, thus avoiding the formation of a receptacle which would collect water and also distinguishing between the two ends of the tube. When the fuse blows, if the pressure generated be not too great, the fuse will disrupt without disturbing the end caps. However, in the event of a severe blow causing an undue pressure, the lower cap (17^A), being much lighter than the upper cap, would blow out. This is desirable, as it would be inadvisable to have the upper cap blow out first and in time of rain allowing moisture to collect in the tube.

In the event of a very severe blow out, both the top and bottom caps (17) and (17^A) would be blown out, allowing the arc to be readily extinguished, whereas, in the extreme case of an unusually severe blow out the cups (18), will also be blown out, thus giving an absolutely free passage thru the tube and readily extinguishing the arc. This differential feature of end cap construction, and also the feature allowing the entire area of the tube to be open to discharge are both novel, and of considerable importance in practical operation of fuses. The caps 17 and 18 may be made of resilient metal and when pressed into the ferrules cause their annular walls to yieldably and frictionally engage with the ferrules throughout the entire circumference of said annular walls.

One of the important features of the end caps is the fact that it is practical, with a compression type of cap to render the tube

absolutely air tight, and this is very important since no moisture can enter the tubes, unless the caps should blow out.

The compression type cap consisting generally of a light weight pressed metal cap is especially well adapted to serve as an end closing cap for the fuse. Its light weight allows it to conform to the ferrule in which it is inserted making not only a positively air tight and water tight joint, but also will blow out at moderate pressures. Heavier caps for the contact are preferably obtained by the use of heavier compression caps ensuring good contact.

These caps are in the nature of cup shaped plugs and are inserted in the ends of the fuse tube or to be exact in the ferrules 15 with their concave sides outermost and so that the entire outer side of the annular wall or flange thereof is disposed in close frictional engagement with the inner side of the ferrule or tube end. This tight fitting of the cap of this shape so that it is flush with the outer end of the ferrule or tube as the case may be, provides for a water and air tight sealing of the tube and also causes the cap to blow at a definite predetermined pressure. The frictional joint between the cap and ferrule is itself entirely protected from the elements due to the provision of the flange on the cap and the tight engagement of the flange with the inner wall of the ferrule. Thus, after predetermining the pressure at which the cap will blow, and fitting the cap in place, it will always blow at the predetermined pressure and this makes for the desired accuracy of fuse performance such as not obtainable with fuses such as heretofore constructed.

What I claim is:

1. A fuse tube comprising a hollow insulating tube, a fusible element therein, terminal connections on said tube for conveying current to and from said fusible element, said fuse tube having an opening to the atmosphere, and a cup shaped cap mounted in and closing said opening to the atmosphere with the concave side of said cap outermost and the outer edge of the annular portion of the cap substantially flush with the outer end of the fuse tube.

2. In a fuse tube consisting of an insulating tube with end ferrules, cup-shaped caps adapted to be inserted in said ferrules, to close said tube to the atmosphere, said caps having their open sides exposed at the outer ends of the tube and the annular portions thereof in close frictional engagement with the inner side of said ferrules and substantially flush at their outer ends with the outer ends of the ferrules.

3. In a fuse tube consisting of an insulating tube with end contacts, means of closure of said tube at each end from the atmosphere, said means being adapted to be released by pressure within said tube, one end being adapted to release at a lower pressure than the other end.

4. In a fuse tube consisting of an insulating tube with end ferrules, compression caps in said ferrules, said caps in the respective ends being adapted to blow out at different pressures.

5. A fuse tube, a fusible element therein, terminal connections for said tube for conveying current to and from said fusible element and a cup shaped resilient cap mounted in one end of the tube and having an imperforate annular wall yieldably and frictionally engaged throughout its entire circumference with the inner surface of the tube.

6. A fuse tube, a fusible element within the tube, terminal connections on the tube for conveying current to and from said fusible element, a ferrule on one end of the tube and a resilient cup shaped imperforate cap mounted in one end of the ferrule and having its annular wall frictionally and yieldably engaged throughout its entire circumference with the inner surface of the ferrule.

7. A fuse tube, a fusible element therein, terminal connections for said tube for conveying current to and from said fusible element and a cup shaped resilient cap mounted in one end of and hermetically sealing the tube, the annular wall of said cap yieldably and frictionally engaging throughout its circumference with the inner surface of the tube.

In testimony whereof, I affix my signature.

AUGUSTUS JESSE BOWIE.