

March 26, 1935.

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1,995,737

LIGHTNING ARRESTER

Filed Aug. 15, 1929

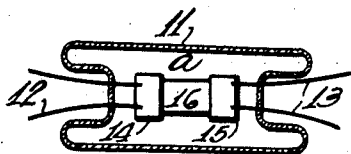


Fig. 1

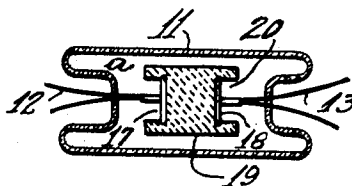


Fig. 2

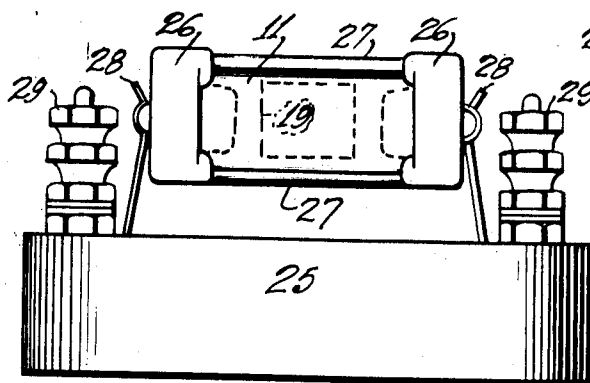


Fig. 4

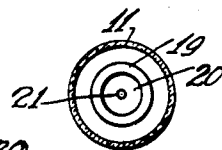


Fig. 3

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1,995,737

LIGHTNING ARRESTER

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Application August 15, 1929, Serial No. 386,159

3 Claims. (Cl. 175—30)

This invention relates to lightning arresters and particularly to a combination of a spark gap arrester and a neon tube arrester and has for an object to increase the efficiency of the arrester when used in low voltage circuits; to dissipate the heat caused by a lightning discharge and to prevent arcing within the arrester tube. Another object of the invention is to provide a resistant material between the electrodes of the arrester enclosed in a vacuum tube whereby this material is protected against weather conditions and maintains a substantially uniform condition to lightning dischargers; other objects of the invention will appear from the following specification and the accompanying drawing, in which, Fig. 1 is an elevation of a form of vacuum tube shown in section with arrester elements according to the present invention; Fig. 2 is another form of arrester elements in a vacuum tube shown in section and embodying the features of this invention; Fig. 3 is an end view of the construction in Fig. 2 with the tube shown in section and Fig. 4 is one form of mounting that may be used for mounting the arrester tube.

In my co-pending application Serial No. 328,270, filed December 24, 1928, a form of neon tube arrester is disclosed with a spark gap arrester connected in multiple circuit therewith. It has been found by experiment that it is possible to embody the resistant element of the arrester within the neon tube itself and a number of important advantages are obtained in this construction. The glass tube is evacuated and neon gas is applied in the usual way whereby the tube discharges lightning between its electrodes by the ionization of the inert gas. When the electrodes of the tube are spaced by a gap it is found that the heat generated at these electrodes by a lightning discharge is liable to injure the tube and in severe cases may cause it to fracture thereby eliminating this part of the arrester.

In the present invention a resistant material, preferably made from the composition disclosed in U. S. Patent 1,818,184, issued August 11, 1931, is placed between the electrodes within the tube. This composition is made from Portland cement and a conducting material moulded under pressure. It can be made with any degree of resistance, does not fuse and maintains its characteristics in service. This material of itself, forms a lightning arrester by discharging the lightning between the minute particles of conducting material forming the composition, thereby avoiding the tendency to arc between the

electrodes and the normal resistance of the circuit is not impaired by the discharge.

In the present invention the resistant material is placed within a glass tube from which the air has been evacuated and the occluded gases in the material are also exhausted at the same time. When used in this way the resistant material is protected from the weather and from dust and foreign matter and maintains its characteristics with greater precision thereby increasing its life.

The present invention further contemplates the addition of neon or other inert gases to the evacuated tube. The tube is preferably, evacuated as completely as possible by bombardment before the application of the inert gases which may be applied to a pressure of one atmosphere. This form of tube is herein referred to as an evacuated tube without regard to the extent to which it may be filled with inert gas. In practice, the resistant material appears to become impregnated with the inert gases which are ionized so that these gases distribute the discharge through the resistant material and a tube constructed in this way can discharge lightning continuously for at least thirty minutes without any apparent injury.

The resistant material is preferably made cylindrical to a diameter that fits the cylindrical tube with a clearance. The ends are recessed to receive the electrodes, the recesses being deeper than the width of the electrodes, and the lead-in wires upon which the resistant material is mounted. This increases the arcing distance between the electrodes and reduces any tendency to arc that may develop following a lightning discharge. The comparatively large cross-section of the resistant block increases the discharge area of the electrodes and prevents excess heat from developing within the tube from repeated lightning discharges thereby increasing the useful life of the arrester. It should be understood that this arrester discharges lightning by conducting it through the resistant block and by discharging the heavier surges in the form of an arc between the electrodes.

In the drawing, 11 is the evacuated glass tube enclosing neon or other inert gas as indicated by α . The electrodes 14 and 15 are mounted within the tube and are connected together by the resistant material 16. The electrode 14 is supported by the lead-in wires 12 and the electrode 15 is supported by the lead-in wires 13. These electrodes may be made in the form of cylindrical caps for the rod 16, or they may be made in any other form desired.

In Fig. 2 the resistant material 19 is cylindrical in form and is recessed on each end as indicated at 20, to receive the electrodes 17 and 18 which may be embedded in or cemented to the block 19. It will be observed that the recesses are deeper than the width of the electrodes so that the wall of the recess projects beyond the electrode, thus a comparatively large mass of the resistant material connects the electrodes 17 and 18. This modifies the extent to which the tube is heated by lightning discharges, provides a large mass for the absorption of the inert gases and practically eliminates the tendency to arc between the electrodes. Connections may be made to the plates 17 and 18 by the central stem as indicated at 21, Fig. 3.

A common form of mounting for the arrester described is illustrated in Fig. 4, in which 25 is a porcelain base provided with a pair of binding posts 29 and with spring clips at 28 connecting with these binding posts. The evacuated tube is provided with suitable caps 26 which are spaced by the bars 27, making a rigid construction which is removable in the mounting 25.

The drawing illustrates a preferred form of my invention but it should be understood that the invention is of general application and is not confined to the specific construction shown.

Having thus described my invention, I claim:

1. A lightning arrester comprising an evacuated tube enclosing an inert gas, a pair of electrodes in the form of discs in said tube, a porous resistant block subject to impregnation by said gas with recessed ends to receive said discs, the walls of the recesses projecting beyond said discs, whereby said block forms a parallel path between said electrodes shorter than the sparking distance around said block.

2. A lightning arrester comprising an evacuated tube, an inert gas in said tube, a pair of spaced electrodes forming a lightning discharge path in said tube, and a resistor subject to impregnation by said inert gas mounted between said electrodes and partly enclosing said electrodes, the surface distance on said resistor between said electrodes, being greater than the lineal distance between said electrodes.

3. A lightning arrester comprising a cylindrical glass tube, a cylindrical block of porous resistant material in said tube having recessed ends, electrodes located in said recesses with the edge of the recess projecting beyond the electrodes to increase the surface distance between the electrodes, a conductor connected with each electrode, said tube being evacuated and enclosing an inert gas to impregnate said resistant.

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