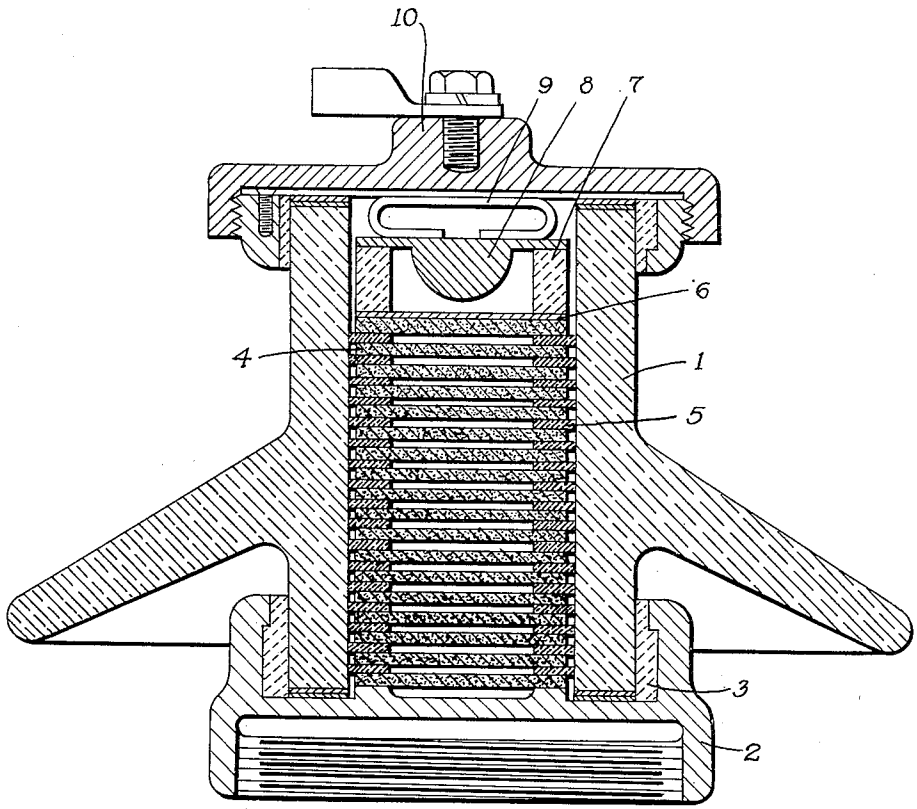
Jan. 10, 1928.

1,655,972

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LIGHTNING ARRESTER

Filed Feb. 23, 1922



WITNESSES:

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Patented Jan. 10, 1928. 1,655,972

UNITED STATES PATENT OFFICE.

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LIGHTNING ARRESTER.

Application filed February 23, 1922. Serial No. 538,765.

This invention relates to lightning arresters, and more particularly to means for increasing the efficiency of lightning arresters of the type described in the copending application of J. Slepian, Serial No. 535,810, filed Feb. 11, 1922, patented September 23, 1924, No. 1,509,493, and assigned to the Westinghouse Electric & Manufacturing Company.

In the above-identified application, is described a new type of lightning arrester comprising essentially plates of material having a high specific resistance placed in contact with each other. While the resistance plates or discs may be in contact, it has been found, as stated in my aforesaid application, that the contact is made at only a relatively few small-area contacting points, which, owing to the high specific resistance of the disc material, have such an extremely high resistance that the discs are practically insulated from each other, the major portion of the opposed surfaces of the discs being spaced a distance of the order of about 3 mils.

When a high voltage, above the breakdown voltage, is applied to a series of plates of this kind, a glow discharge, characterized by a voltage of the order of 300 volts per gap, passes therebetween from the line to the ground. Owing to the voltage across the plates, comparatively high electrostatic fields are produced which tend to draw out particles of the high-resistance materials, causing such particles to bridge the minute gaps between the plates and thus allow current to pass between said plates at too low a voltage.

The present invention is intended to overcome this disadvantage, it being among the objects thereof to provide plates of high-resistance material in which the particles of material shall be firmly united to the bodies of the plates so as to prevent the detachment or loosening of a material number of particles therefrom.

It is a further object of this invention to so treat plates of high-resistance material, with such material and in such manner as to render the gas or air between the plates capable of facilitating a glow discharge of high current density at a uniform voltage without deterioration of said plates.

In practising my invention, I apply a thin layer of a suitable cement to the surface of the plate to hold the fine particles of the high-resistance material in place. I preferably utilize an inorganic material such as water glass, barium sulphate, plaster of Paris, or the like, for this purpose.

As an example of the practice of my invention, I provide a very thin mixture or suspension of dehydrated plaster of Paris in water and dip the plates therein. The plates are then dried to remove the water, leaving a relatively thin coating or layer of plaster of Paris on the surfaces thereof. The layer of material is then wiped with a dry cloth to leave a very thin layer of plaster of Paris thereon. The layer is almost invisible, being less than 1 mil in thickness. I have found that excellent results are obtained when the layer of plaster of Paris is about 0.1 of a mil in thickness.

I have tested lightning-arrester plates made in this manner by subjecting them to very severe conditions which they withstood successfully. For instance, I built up a series of plates and passed discharges therethrough for eight hours, continuously. During this period, about 12,000 discharges, which are equal to 600 severe electrical storms of 20 discharges each, passed through the plates. At the end of this test, the plates were removed and examined.

It was found that only a few particles were detached from the main body of the high-resistance material, the number of particles being so few that they would not interfere with the proper functioning of the lightning arrester. The above test would not, in any way, indicate the maximum life of the arrester, although it did demonstrate that the minimum life thereof was greater than that necessary to withstand storms in a temperate climate for ten years or more.

In the accompanying drawing, constituting a part hereof, the single figure is a vertical cross-sectional view of a lightning arrester embodying my invention.

The insulating container 1 has its lower end closed by means of metal end-piece 2, which is held in position by insulating cement 3. A series of disks 4 of suitable high-resistance material, is stacked within the insulator 1 with alternate thin washers 5, of mica. A metal plate 6 is placed on the uppermost disk 4, and an insulating spacer or

cylinder 7 provides a series gap between the plate 6 and metal hemisphere 8. A spring 9, held in position by metal cover 10, holds the disks and spacers in their proper relative positions. Each of the disks 4 is provided with a thin coating of plaster of Paris, waterglass, barium sulphate, or the like.

The discs are made of a suitable composite material having the requisite resistivity. Discs giving very satisfactory results are obtained by molding a mixture of carborundum, lampblack and kaolin into the required shape and then hardening the molded articles by baking at high temperatures.

Although I have described my invention specifically, giving details of manipulation and specific materials used therein, it is to be understood that my invention is not limited to the details set forth. For instance, the plaster of Paris may be applied to the plates in a manner different from that described, it being merely necessary that the result of the process be a thin coat of the material on the plates.

The coating should be very thin in order that the resistance of the plate shall not become materially increased thereby, only sufficient cementing material being utilized to prevent small particles of the high-resistance material from becoming loose. The coating does not act as an insulator but allows contact of adjacent plates of high-resistance material to be made almost as perfectly as if no coating were placed upon the individual plates. It also prevents an abnormal cathode drop in the glow discharge between adjacent plates.

Furthermore, the coating increases the leakage resistance at all points where plates are in contact and, at the same time, does not increase the resistance of the plates during the passage of the current on over-voltage. It also causes the glow discharge to pass current at a much higher current density and more uniform voltage than without said coating.

In the description, I have stated that water glass, barium sulphate and plaster of Paris are adapted for my purpose. It is my intention that these materials shall be regarded as illustrative only and that other suitable materials may be employed within the scope of my invention. These and other changes in details of my invention may be made without departing from the spirit thereof, my invention being limited only by the claims appended hereto.

I claim as my invention:

1. A glow-discharge lightning arrester comprising closely spaced resistor discs severally composed of an inert body member and a finely divided conductor distributed throughout said body member, the spacing between said discs being of the order of 3 mils, the resistivity of the discs being of the order necessary to cause the discharges to take the form of a glow characterized by a voltage of the order of 300 volts per gap, the discharge surfaces being coated with a non-conducting film which is thin relative to the spacing between discs and which is sufficiently porous to permit glow discharges to occur without puncturing the film.

2. A glow-discharge lightning arrester comprising closely spaced resistor discs severally composed of an inert body member and a finely divided conductor distributed throughout said body member, the spacing between said discs being of the order of 3 mils, the resistivity of the discs being of the order necessary to cause the discharges to take the form of a glow characterized by a voltage of the order of 300 volts per gap, the discharge surfaces being coated with a non-conducting inorganic film which is thin relative to the spacing between discs and which is sufficiently porous to permit glow discharges to occur without puncturing the film.

3. A glow-discharge lightning arrester comprising closely spaced resistor discs severally composed of an inert body member and a finely divided conductor distributed throughout said body member, the spacing between said discs being of the order of 3 mils, the resistivity of the discs being of the order necessary to cause the discharges to take the form of a glow characterized by a voltage of the order of 300 volts per gap, the discharge surfaces being coated with a plaster of Paris film which is thin relative to the spacing between discs.

4. A glow-discharge lightning arrester comprising closely spaced resistor discs severally composed of an inert body member and a finely divided conductor distributed throughout said body member, the spacing between said discs being of the order of 3 mils, the resistivity of the discs being of the order necessary to cause the discharges to take the form of a glow characterized by a voltage of the order of 300 volts per gap, and a small quantity of a non-decomposable, non-conducting, porous substance disposed across the area of each of the discharge spaces between the several pairs of resistor discs, the said substance being sufficiently porous to permit glow discharges to occur without puncturing the same.

5. A glow-discharge lightning arrester comprising closely spaced resistor discs severally composed of an inert body member and a finely divided conductor distributed throughout said body member, the spacing between said discs being of the order of 3 mils, the resistivity of the discs being of the order necessary to cause the discharges to take the form of a glow characterized by a voltage of the order of 300 volts per gap, and a small quantity of a non-conducting,

inorganic, porous substance disposed across the area of each of the discharge spaces between the several pairs of resistor discs, the said substance being sufficiently porous to permit glow discharges to occur without puncturing the same.

6. A glow-discharge lightning arrester comprising closely spaced resistor discs severally composed of an inert body member and a finely divided conductor distributed throughout said body member, the spacing between said discs being of the order of 3 mils, the resistivity of the discs being of the order necessary to cause the discharges to take the form of a glow characterized by a voltage of the order of 300 volts per gap, and a small quantity of plaster of Paris disposed across the area of each of the discharge spaces between the several pairs of resistor discs.

In testimony whereof, I have hereunto subscribed my name this 17th day of February, 1922.

SOLOMON M. PINELES.