July 6, 1954 G. B. ROLOSON 2,683,235

LIGHTNING ARRESTER

Filed March 5, 1952

FIG. 1.

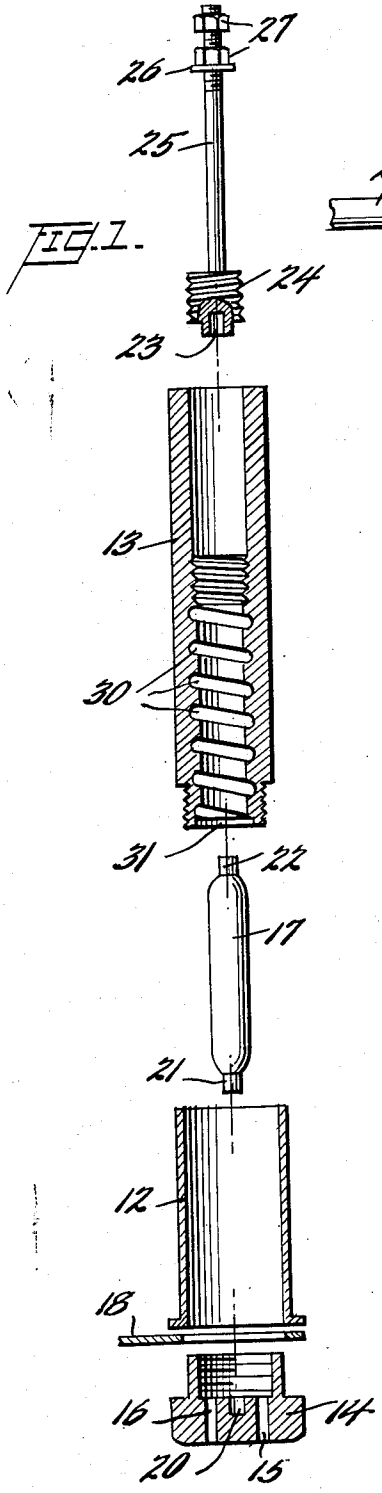
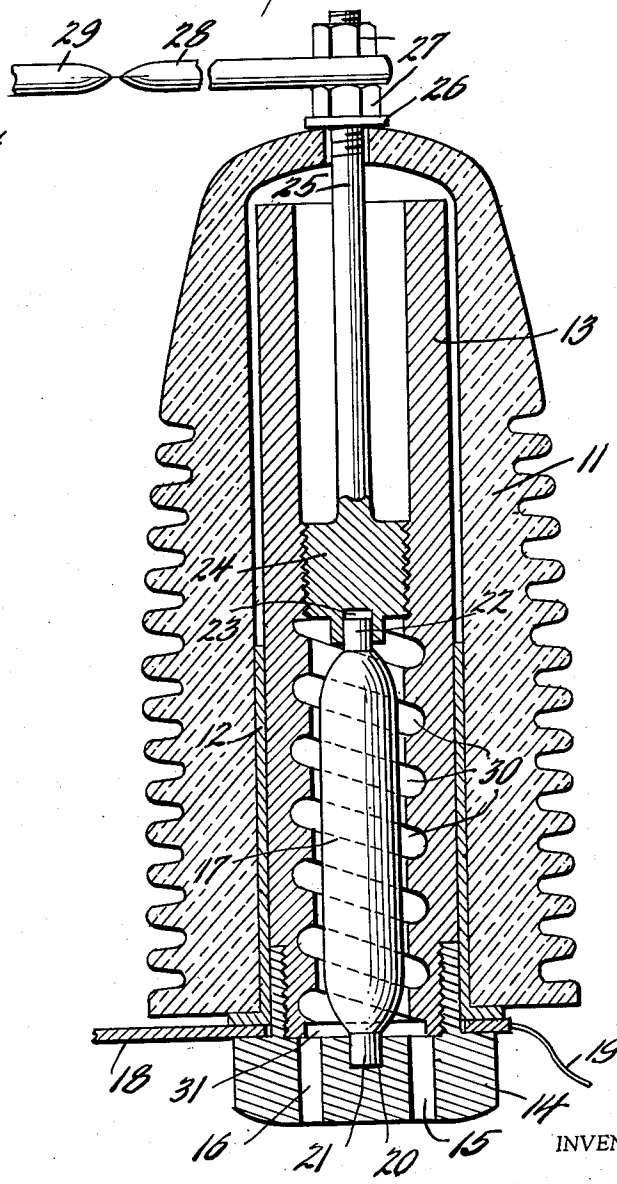


FIG. 2.



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LIGHTNING ARRESTER

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Application March 5, 1952, Serial No. 274,993

1 Claim. (Cl. 313—231)

(Granted under Title 35, U. S. Code (1952), sec. 266)

1

A non-exclusive, irrevocable, royalty-free license in the invention herein described, for all governmental purposes, throughout the world, with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States.

This application is a continuation of my prior co-pending application Serial No. 263,305 filed December 26, 1951, entitled Expulsion Type Lightning Arrester.

This invention relates to expulsion type lightning arresters and more particularly to ones where the arc is switched from a short direct path to a long helical path after the initial impact of the surge causing the spark-over.

In the art of expulsion type lightning arresters the main objective is to have a short path for the initial spark-over. The initial arc thus created ionizes the gases in the space between the electrodes, which space is usually bounded by fibre walls, and causes the fibre to emit gases which switches the path of the arc from a short straight line path to a long helical path. One of the factors resulting in extinguishment of the arc is the great length of the helical path. Devices embodying this principle are shown and described in my prior U. S. Patent 2,304,848 granted December 15, 1942, entitled "Lightning Arrester, Gas Deflector Type," and in the article "Spiral Arc Chokes Power Flow in New Arresters" by Otto Ackermann and E. J. DeVal, A. I. E. E. Technical Paper 51–189, published April 1951. My present invention is an improvement upon the devices described in the two references just mentioned, and has for its primary object to provide a longer and more effective helical path (in relation to the length of the original spark-over path) than has been heretofore provided.

In carrying out the foregoing object, I provide a smooth fibre rod extending inside of a tubular fibre member, with a small clearance space between the fibre rod and the inner wall of the tubular member. The inner wall of the tubular member defines a helical groove. The spark initially traverses the very narrow space between the rod and the inner wall of the tube but as soon as the arc causes the fibre to emit gases the latter switch the path of the arc to the long helical path.

While the material features of the combination claim appended hereto are recited in the claim themselves and while the scope of my invention is defined by the claim, it might be observed at this point in the specification that one of the features that distinguishes my present invention from the prior art is that concentric walls define

2

a ringshaped space for the passage of the initial arc, the outer wall having a helical groove into which the arc is diverted after it becomes established. Since the helical groove is in the outer wall the groove is of great length, and moreover the switching operation is more effective and efficient than when the groove is located elsewhere.

In the drawings:

Figure 1 illustrates several of the components of my invention in a disassembled condition.

Figure 2 is a cross-sectional view of a lightning arrester embodying my present invention.

Referring to the drawings, the lightning arrester has a porcelain body 11 and a cylindrical metal element 12 surrounding the fibre tube 13. The metal end closure element 14 defines a ring of six vertical vent holes 15 and 16 disposed about the central axis of the apparatus. The closure element 14 supports a fibre rod 17. Metallic strap 18 extends beyond the outline of the insulator body 11 and serves as a ground as well as a support for the entire apparatus. Closure element 14 has an indent 20 shaped to receive a complementary projection 21 at the lower end of fibre rod 17. The upper end of rod 17 has a projection 22 shaped to fit into indent 23 in the upper metallic electrode 24. The outer wall of electrode 24 is threaded, is screwed into fibre tube 13, and is carried by bolt 25 which is in turn carried by washer 26 and nuts 27. A metallic gap element 28 forms one element of an external gap and element 29 forms the other element of the external gap. Helical groove 30 is formed on the inside of fibre tube 13.

The rod 17 is held in place very accurately by the projections 21 and 22 which cooperate with indents 20 and 23 respectively. The axis of rod 17 is, therefore, very accurately aligned with that of fibre tube 13, and since the outer diameter of rod 17 is slightly smaller than the inner diameter of fibre tube 13 an air space on the order of a few hundredths of an inch (preferably not greater than one-tenth of an inch) exists around the wall of rod 17.

The gap element 29 may be connected to a power line carrying high voltage and capable of delivering heavy currents.

Operation

Prior to the surge which causes spark-over there is an electric field between electrode 24 and metal shield 12 which to some degree ionizes the air adjacent electrode 24 in the space between rod 17 and tube 13.

When a large surge occurs a spark first passes

vertically from electrode 24 along the side wall of rod 17 and substantially parallel to the axis thereof to the electrode 14 and thence to ground. The initial surge ionizes the gases in its path and allows an intense arc to follow, the power for the arc being supplied by the high voltage power line (which is of course connected to gap element 29) that is being protected by the lightning arrester. The intense heat of the arc causes fibre rod 17 to emit gas, in the well known way, which gas switches the course of the arc into the helical groove 30. This greatly lengthens the path of the arc and aids in its extinguishment. The fibre tube 13 may be made of gas evolving material, the same as the material for rod 17.

Since the lowermost end of groove 30 opens directly into annular passageway 31 which in turn opens into the ring of holes 15—16, it is clear that the lower end of groove 30 is efficiently vented to the atmosphere. This prevents explosive pressures from being built up inside of the lightning arrester.

I claim to have invented:

A lightning arrester comprising first and second electrodes, a smooth rod of gas-evolving material extending between said electrodes, a cylindrical insulating member concentric with the rod and forming a spark-over space between it and the rod, one of the electrodes being closest to the other one at a point closely adjacent to said rod, whereby the spark-over path of shortest length is along the surface of the rod, the electrodes and the rod including means whereby the electrodes accurately position the rod in the cylindrical member with a space between all parts of the inner surface of the cylindrical member and the outer surface of the rod greater than one-one hundredth of an inch and less than one-tenth of an inch, the cylindrical member having a helical groove extending from one terminal to the other into which the arc is switched by the evolved gases after the initial spark-over.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,304,848	Roloson	Dec. 15, 1942
2,591,370	Nelson et al.	Apr. 1, 1952