April 25, 1939. J. J. TAYLOR 2,155,848

INSULATOR

Filed Nov. 14, 1936

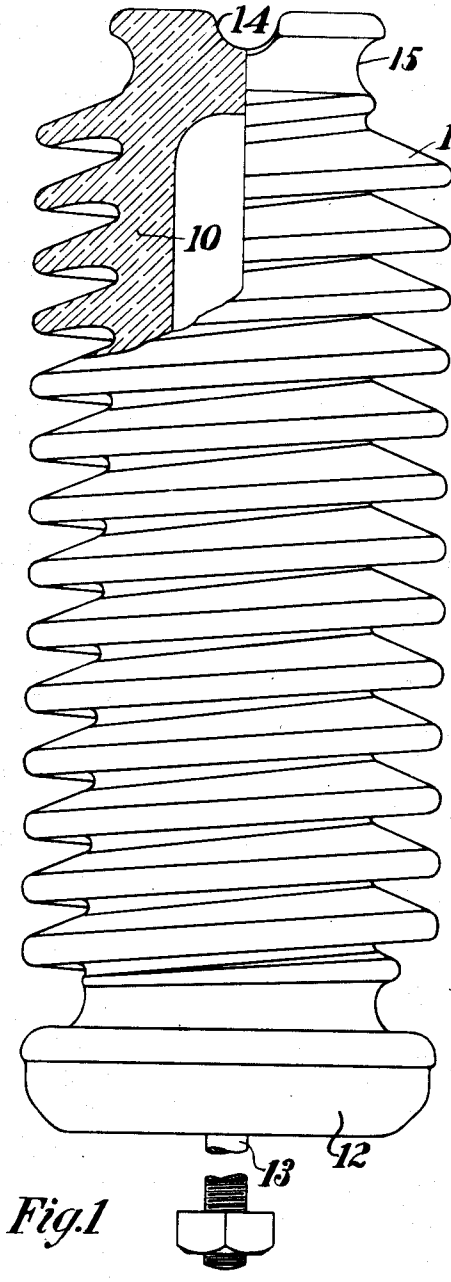


Fig. 1

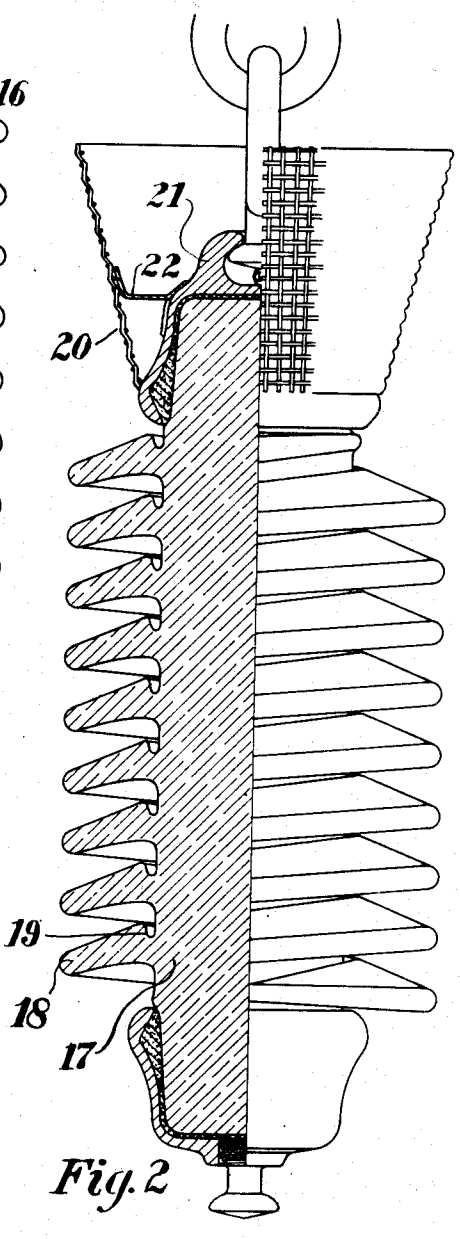


Fig. 2

INVENTOR
John J. Taylor.

BY Alpheus J. Crane

ATTORNEY

Patented Apr. 25, 1939

2,155,848

UNITED STATES PATENT OFFICE

2,155,848

INSULATOR

John J. Taylor, Wadsworth, Ohio, assignor to The Ohio Brass Company, Mansfield, Ohio, a corporation of Ohio

Application November 14, 1936, Serial No. 110,885

8 Claims. (Cl. 174—139)

This invention relates to electrical insulators, and has for one of its objects the provision of an insulator particularly well adapted for use where it is exposed to moisture, such as rain or fog.

A further object of the invention is to provide an insulator in which moisture on its surface will form a continuous leakage path of substantially uniform resistance from one insulator terminal to the other so as to effect a substantially uniform resistance gradient of the voltage drop over the insulator.

A further object of the invention is to provide an insulator which shall be of improved construction and operation, particularly under adverse weather conditions.

Other objects and advantages will appear from the following description.

The invention is exemplified by the combination and arrangement of parts shown in the accompanying drawing and described in the following specification, and it is more particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is an elevation with part broken away showing a post insulator having one form of the present invention applied thereto.

Fig. 2 is part elevation and part section of a suspension insulator, disclosing one embodiment of the invention.

In Fig. 1 the numeral 10 designates an insulating member of porcelain or other suitable dielectric material having a base fitting 12 and a bolt 13 for securing the insulator upon a suitable support. A conductor groove 14 and tie wire groove 15 or other suitable means is provided for securing a conductor at the top of the insulator. The insulator is provided with a continuous helical flange 16 extending from the top to the bottom of the insulator. The pitch of the outer periphery of the flange is such that water clinging to the outer edge of the flange will travel very slowly in a circumferential direction and excessive water will drip from the edge of the flange rather than run down the helix.

For a glazed porcelain insulator, I have found that where the outer periphery is 7½ inches in diameter, a pitch of 1⅛ inches will give satisfactory results in this respect. This is a pitch of approximately 1:20. The upper surface of the flange is considerably steeper than the circumferential pitch, an angle of about 22½ degrees being a satisfactory angle. The angle should be such that the water on the upper surface of the flange will run readily to the outer periphery and excess water will drip from the outer periphery but a sufficient amount will cling to the lower edge to form a continuous conductor from the top to the bottom of the insulator. It will be understood, of course, that the proportions and angles given above may be changed to suit varying conditions, such as various atmospheric conditions and different materials, as well as the voltage to which the insulator is subjected.

Heretofore insulators have been designed to give as nearly a uniform distribution of capacitance from one terminal to the other as possible in order to give a uniform voltage gradient over the insulator. As long as the insulator is dry, the voltage gradient will be controlled chiefly by the distribution of capacitance as the leakage current will be negligible; but as soon as the insulator becomes wet, the leakage current will begin to travel from one end of the insulator to the other and the voltage drop in the leakage path, instead of the capacitance distribution, will be the controlling factor in the voltage gradient over the insulator.

Insulators that have been designed to give a satisfactory voltage gradient under dry conditions have been found to be very unsatisfactory in this respect under wet conditions, due to the unequal distribution of the resistance in the wet leakage path. Usually the water will run off rapidly from the upper part of a porcelain insulator, producing a higher resistance over this part than over other portions of the leakage path. Since the heat generated in a conductor is proportional to the resistance, the surface from which the water runs most rapidly will also be subjected to the greatest heat effect, further drying the water from these portions of the insulator surface and consequently further increasing the resistance at these portions. The result is that the voltage will be concentrated over certain zones where the water runs off rapidly, thus overstressing these zones.

The present invention provides, under wet conditions, a leakage path which will remain substantially uniform from one end of the insulator to the other. Only a definite amount of water will cling to the outer edge of the helical flange as any excess will drop off, and since this ribbon of water extends from one end of the insulator to the other and is regulated as to amount so as to be uniform throughout its length, a substantially uniform leakage path is provided between the two terminals so that there are no high resistance portions to produce excessive heat, tending to dry up the leakage path and consequently no concentration of voltage over limited portions of the insulator. The slow movement of the water from the top toward the bottom of the insulator will insure a continuous conductor as the water will move on to any spot which might otherwise happen to be lacking in its supply of water. Since more water will strike on the upper flange than on the lower ones, there will always be a sufficient supply of water at the top of the insulator. The flange will be shaped so that the conductor ribbon extends to the upper terminal

as well as the lower terminal of the insulator. In some cases it may be desirable to coat a sufficient portion of the insulator at its top with metal to insure electrical connection with the upper end of the conductor ribbon of water. The lower end may be coated in a similar manner but this is usually unnecessary because of the fact that the supply of water will run over the lower end of the insulator and insure electrical connection between the lower end of the flange and the lower fitting. The bottom of the flange also slopes toward its outer edge so that the conducting ribbon will not tend to flow inwardly but will be concentrated at the outer edge of the flange.

Instead of depending upon a ribbon of water suspended from the outer edge of the flange by adhesion and surface tension, the flange may be provided with a helical groove extending from one end of the insulator to the other for retaining a sufficient amount of water to form a conductor path. Such a groove may be placed at various positions on the upper surface of the flange so as to intercept sufficient water to fill the groove and the amount of water may be regulated by the depth and size of the groove.

In the form of the invention shown in Fig. 2, a suspension insulator having a central body portion 17 and flanges 18 is provided with a groove 19 at the base of the flange 18 and next adjacent the body 17. There is one advantage in placing the groove 19 adjacent the inner edge of the flange because at this position the flange has a minimum radial distance from the axis of the insulator and any tilting of the axis of the insulator away from vertical will produce the minimum amount of variation in the slope of the groove 19. If the groove is tilted too much, the water might not fill the groove uniformly as it will tend to run from the high side to the low side and thus interfere with the uniform resistance of the conductor path.

In order to enable the grading resistance to operate under fog conditions, as well as rain, there is shown in Fig. 2 a collector 20 at the top of the insulator for condensing the fog from the atmosphere and directing it into the upper end of the groove 19. This collector may be a metal screen secured to the upper fitting 21 in any suitable manner, as by means of a bracket 22. The fog will condense and collect on the screen and run down into the upper end of the groove 19.

In practically all locations, atmospheric moisture, whether in the form of rain or fog, usually contains enough salts or other impurities in solution to form an electrolyte, rendering the water sufficiently conductive to operate in the manner described above. If the moisture in the atmosphere should ever chance to be of sufficient purity as to be non-conducting and if there were not sufficient impurities on the insulator surface to render it conductive, then of course there would not be sufficient current leakage over the insulator surface to destroy the capacitance gradient and consequently no need for resistance grading. It will be understood of course that where, in the specification and claims, water or moisture is mentioned, there is no intention to restrict the meaning to pure water but the expression includes atmospheric moisture containing sufficient impurities to render it conducting.

I claim:

1. The combination with an electrical insulator, of means for condensing moisture from the atmosphere surrounding said insulator and for directing said moisture onto the surface of said insulator, said insulator having means thereon for retaining said moisture in a substantially uniform conductor path from one terminal of said insulator to the other.

2. In combination an insulator having a helical groove adapted to retain moisture therein forming a conductor path from one terminal of said insulator to the other, and a moisture condensing device disposed at the upper end of said groove for directing moisture from the atmosphere into said groove.

3. An insulator having means for retaining moisture on the surface thereof in a helical path from one extremity of said insulator to the other, and means spaced from the surface of said insulator for directing moisture from the surrounding atmosphere into said path.

4. An insulator comprising an elongated body having a helical flange thereon, terminals at opposite ends of said body, said flange being arranged to slope outwardly and downwardly to cause water to run therefrom and drip from the edge of said flange, said flange having a helical groove in the upper surface thereof of less width than the total width of said flange to constrain a portion of the water disposed on said flange to follow said groove and form a leakage path of substantially uniform resistance from one end of said insulator to the other.

5. An insulator comprising a dielectric body having terminals at opposite ends thereof and having a helical flange thereon, the upper surface of said flange being inclined outwardly and downwardly to cause water to run from said flange radially of said insulator, the lower surface of said flange also being inclined outwardly and downwardly to provide a sheltered surface for maintaining dry surface resistance to leakage longitudinally of said insulator and means for constraining a stream of water in a helical path on said flange of less width than the total width of said flange, the opposite ends of said path being electrically connected with the terminals at the opposite ends of said insulator.

6. An insulator comprising an elongated dielectric member having a helical flange thereon, the pitch of said flange being such that water thereon will travel very slowly in a circumferential direction and excess water will drip from the edge thereof and not be thrown therefrom by centrifugal force, said flange being constructed and arranged to retain a limited stream of water thereon to provide a leakage path of substantially uniform resistance.

7. An insulator comprising an elongated dielectric body having a helical flange thereon, the upper surface of said flange sloping outwardly and downwardly to cause water to flow radially thereon and drip from the edge thereof, the radial pitch of said surface being greater than the helical pitch of said flange so that water will flow by gravity from the edge of said flange, and means for constraining a definite amount of water to flow in a helical path on the surface of said flange from one end of said insulator to the other to provide a leakage path of substantially uniform resistance.

8. An insulator comprising a dielectric body, means for directing a stream of water of definite cross section from the upper to the lower portion of said dielectric body and a metal screen condenser for collecting moisture and directing it into said stream at the upper end of said body.

JOHN J. TAYLOR.