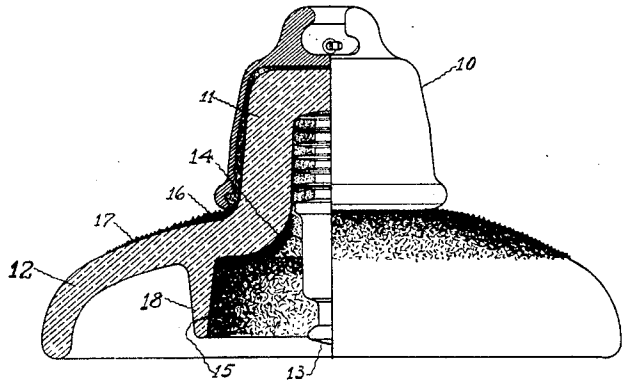
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MEANS AND METHOD FOR CONTROLLING SURFACE RESISTANCE OF INSULATORS

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MEANS AND METHOD FOR CONTROLLING SURFACE RESISTANCE OF INSULATORS

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This invention relates to insulators designed especially for high tension work and has for its object the provision of controlling means for the surface resistance thereof, which shall improve the operation and efficiency of insulators to which it is applied.

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

The figure of the drawing is an elevation partly in section showing one embodiment of the invention.

The insulator member shown consists of attaching members 10 and 13 cemented to a dielectric member 11. The flange 12 of the dielectric member provides a path for surface leakage between the attaching members, and also, increases the distance thru the air between these members, so that the high voltage may be carried without flash-over between the holding members.

When a high voltage is applied between the attaching members there is a tendency for charging current to flow out over the surfaces 14 and 16. These surfaces may be flooded with streamers which tend to reduce the drop in voltage along the same, particularly if the charging current in the streamer is large and combined with surface leakage current.

Owing to the relatively small diameter of the leakage path adjacent the attaching members the concentration of leakage current must necessarily be greater near the attaching members. This is due to the fact that the width of the leakage path at any distance from the attaching members is directly proportional to the diameter of the insulating member at that distance. From this it follows that the concentration of leakage and charging current may be relatively large on the zone such as 14 adjacent the attaching member 13. When this leakage current flows out in the form of streamers the potential drop is likely to vary considerably as the current in the streamers may be varied greatly by slight differences. A streamer which tends to start first charges a larger surface and draws more current, thereby cutting down its resistance. This will give the streamer a greater shunting effect on the surface and tend to lower the efficiency or carrying capacity of the surface or insulator.

If the surface 14 which is highly stresesd is roughened or covered with a porous material which may be made slightly conducting by impregnating with conducting material, the surface discharge may be eliminated and a varying surface resistance established, the surface resistance gradient or rate of change of surface resistance being regulated to suit the particular conditions. This graded surface may be produced by using a proper sanding applied in accordance with my prior Patent No. 1,284,975 or a porous layer, or body composition may be applied to the main dielectric member and burnt with the pieces. This porous layer may be easily produced by decreasing the fluxing material in the regular body composition, or by other means, or the material may be materially different from the main body composition, it simply being necessary to produce a material which is porous electrically.

Another method of producing the surface is by applying a layer of cement such as Portland cement by an air blast, or other means. This may be held to the main body member by means of a sanded surface such as disclosed in my previous patent referred to above.

There are several means of producing the graded resistance. One of the methods is to impregnate or coat the surface with a material which will reduce its resistance. This should be preferably conducting material which would tend to maintain a resistance under operating conditions, such as calcium chloride which would absorb water from the atmosphere. Another method of use is to simply provide the proper surface and allow the electrical discharge in the same to form nitrates which will lower its

resistance automatically where the stress is great.

Where this method is used the porous surface has a decided advantage, in that there is a strong tendency to break up any distinct streamer so that the shunting effect becomes negligible. This is due to the fact that any streamers forming on the surface will tend to be drawn down into the coating where the resistance will prevent spreading. In some cases the roughened surface is sufficient, in that, it will catch dirt which will lower the resistance of the same automatically.

Where the surface stress is high, there is a tendency to deposit conducting material from the air. This accumulation, particularly where a roughened surface for retaining same is provided will grade the surface materially.

Where a varying effect is to be produced by grading, the same may be accomplished by properly regulating the thickness of the coating as shown in 14, or by dividing the resistance grading surface into zones in series as 14 and 15, which may be made in different ways, or as 16 and 17 which may closely approximate each other.

Grading the surface is particularly effective where it is desired to increase the electro-static capacity so as to prevent over-stress in members which may be a part of a series of insulators as a member carrying the highest stress in a pin type insulator, or the end sections in a suspension string.

Where the surface resistance is high and the charging current is appreciable the heat generated may be used to advantage in drying off the insulator. This will tend to maintain the carrying capacity of an insulator in fogs, or other severe conditions. This is particularly applicable to radio insulators such as deck bushings, and insulators on the aerials which are used on board ships. Unless there is a dry zone the leakage tends to prevent efficient radiation, so that a limited amount of heating on the insulator which will produce a dry zone may be patricularly beneficial for it is evident that if the insulator is warm, and although the same may be covered by a spray, a zone would dry off very quickly.

The invention is not limited to the form shown, but is applicable to all surfaces where it is desired to control the electrical gradient due to charging or leakage current.

The method is beneficial in preventing a concentration of stress where a small electrode is in contact with a large surface which might otherwise cause a high concentration of stress at points of contact between electrode and dielectric.

I claim:—

1. An insulator having a dielectric member the surface of which presents a path of varying extent for leakage and charging currents and a coating on the surface path of said dielectric member of a nature to reduce the resistance thereof, said coating being arranged to produce a graded variation in the resistance per unit surface the resistance per unit surface increasing from the more restricted to the less restricted portions of said path.

2. An insulator comprising a dielectric member the surface of which provides a path for leakage and charging currents which varies in width, and a pervious coating for said surface path of a nature to reduce the surface resistance thereof, said coating being graded to decrease in thickness from the narrower to the wider portions of said path.

3. An insulator comprising a dielectric member having an attaching member secured thereto, and means immediately adjacent said attaching member and having graded conductivity per unit area decreasing away from said attaching member on the surface of said dielectric member adjacent said attaching member for reducing the surface resistance of said dielectric member, while said surface farther removed from said attaching member is substantially free from said resistance reducing means.

4. An insulator comprising a dielectric member having an attaching member secured thereto, and means immediately adjacent said attaching member on the surface of said dielectric member for producing a graded variation of the surface resistance thereof adjacent said attaching member so that said surface resistance per unit area increases outwardly from said attaching member.

5. An insulator comprising a dielectric member having attaching members secured to opposite sides thereof, the surface of said dielectric member being arranged to radiate outwardly from said attaching members and having pervious coatings on the portions of said surface adjacent said attaching members of a nature to retain material for reducing the surface resistance of said dielectric member on the restricted portions of the path of charging and leakage currents between said attaching members, while the portions of said surface farther removed from said attaching members are made smooth to shed foreign matter.

6. An insulator comprising a dielectric member having attaching members secured to opposite sides thereof, the surface of said dielectric member being arranged to radiate outwardly from said attaching members, said surface adjacent said attaching members being coated with material having openings therein for retaining matter of a nature to decrease the surface resistance of said dielectric member said coating being graded to decrease in thickness in an outward direction from said attaching members.

7. The method of grading the surface resistance of a dielectric member comprising

the steps of providing a retention coating for a portion of said surface where relatively low resistance is desired while other portions therof are smoothly coated to avoid deposits thereon and subjecting said surface to the action of electric currents passing thereover to cause a deposit of resistance reducing material on the portions of said surface where the current is most concentrated.

8. The method of grading the surface resistance of an insulator having a dielectric member and attaching members secured thereto comprising the steps of providing a retention coating on the surface of said dielectric member adjacent said attaching members while portions of said surface removed from said attaching members are free from such coating and subjecting said attaching members to high potential differences to cause charging and leakage currents to flow over the surface of said dielectric member, thus depositing resistance reducing material on said retention coating at places where said currents tend to concentrate.

9. The method of controlling the surface resistance gradient of an insulator having a dielectric member and attaching members secured thereto comprising the steps of providing a retention coating on the surface of said dielectric member adjacent said attaching members, said coating being varied in its ability to retain conducting material and having greater retentive ability where greater conductivity is desired and permitting the accumulation of resistance reducing material on said retention coating.

10. The method of controlling the surface resistance gradient of an insulator having a dielectric member and attaching members secured thereto comprising the steps of coating the surface of said dielectric member adjacent said attaching members with pervious material said coating decreasing in thickness outwardly from said attaching members and permitting the accumulation of resistance decreasing matter on said pervious coating.

In testimony whereof I have signed my name to this specification on this 13th day of October, A. D. 1921.

ARTHUR O. AUSTIN.