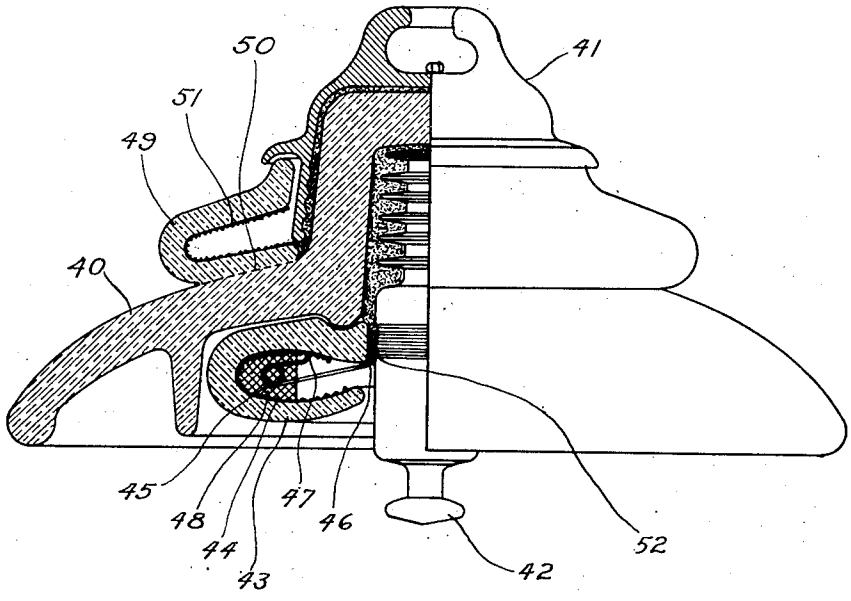
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HIGH TENSION INSULATOR CONSTRUCTION

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HIGH-TENSION INSULATOR CONSTRUCTION.

Application filed October 20, 1921. Serial No. 508,938.

This invention relates to insulators for high potentials and has for its object the provision of insulators having capacitance glands for improving the characteristics of the individual member of a string as well as the characteristics of the string and having heating means connected therewith for assisting in drying the surface of the insulator. Other objects will appear from the following description.

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

In the drawing:

The figure is a part elevation and part section showing one embodiment of the present invention.

In this invention it is desired to improve the efficiency or voltage distribution of the various sections in a suspension insulator string or chain. Owing to the electro-static capacity between the various sections and ground or surrounding objects there is an unequal electro-static distribution of stress set up in the series if all members have the same individual electro-static capacity or capacitance. Owing to the greater charging current which must pass over or through the sections nearest the conductor or line, these sections must necessarily carry a higher stress or voltage unless they have a larger electro-static capacity. This is due to the fact that the drop in voltage across a condenser will be inversely proportional to its electro-static capacity and directly proportional to the charging current flowing into or through same.

Several means have been used in the past to increase the electro-static capacity of the unit such as increasing the effective condenser area of the holding members so that they would increase the electro-static capacity, the holding members of the insulator acting as the plates of a condenser, and the head of the insulating member as the dielectric. Where this is accomplished by enlarging the inner holding member, the thickness and dielectric strength through the head of the dielectric member may be materially reduced. If the thickness of dielectric is maintained the holding members become quite large when a design having poor characteristics results. Where the electro-static capacity is increased by bare conductor surfaces extending laterally, the size or diameter of the insulator flange must be made very large in order to have sufficient insulation or ability to withstand voltage, as much of the normal insulation of the flange is shunted by the capacitance plates or surfaces.

In the present invention it is desired to so design and construct the insulator string that the factor of safety, based on the flash-over voltage of a section compared to the stress which it carries, will be approximately constant for all members in the string, and for a wide range of conditions.

Since all of the insulator sections of a string work in series, the efficiency or flash-over voltage of the string will be limited to a large extent by the lowest factor of safety for any member, particularly if this is an end member. If this factor of safety for a section is increased by lowering the voltage carried by that section, by increasing the capacitance of same, as has formerly been done the insulator is likely to have undesirable characteristics or to be unnecessarily large and expensive or to have a very low surface resistance as compared to the rest of the members in the series. In some former designs a distribution of stress which is very good when the insulator is dry or clean may be very poor when the insulator is dirty or wet, due to surface leakage current and the sacrifice of surface resistance on some of the sections in order to increase their capacitance to obtain electrostatic grading.

The higher the stress or voltage on an insulating member the greater the drying action due to leakage current. By having the capacity pockets formed by the members 43 and 49 of the drawing empty the end sections of a string may be made to carry a relative higher voltage during normal conditions so that their surface resistance will be higher to withstand abnormal conditions. The relation of the glands may be such that under the abnormal conditions, they will flood with streamers, approximating the condition where a conductor is placed in the glands or pockets. Where the separation between the two pockets is such that electro-static streamers will flow out over the adjacent surfaces of the glands from the holding members 41 and 42, it is possible to materially change the relative electro-static

capacity of the sections which are nearest the conductor with a small change in voltage.

These charging streamers produce heat which may be used to advantage in drying off the insulating surface and thereby increasing the surface resistance and the carrying capacity of the sections next the conductor. This may be of material advantage during severe atmospheric conditions such as where the insulator is subject to a fog. The streamers being confined in the pockets cannot lower the flash-over of the insulator as might be the case where they were on an outer surface.

Where it is desired to have the end members carry a high voltage under normal conditions in order to dry the surface but to regrade for severe conditions, same may be accomplished by separating the conducting surfaces or material from the holding members so that the air gap will not break down and charge the gland surfaces until a definite voltage or condition is reached.

Another method of drying the surface is to connect the gland coatings or electrodes to the holding members by a suitable resistance, so that the current flowing over the resistance member or surface will generate heat. The resistance element may be made by a high resistance wire placed in the pocket or gland or by a resistance material such as carborundum or the two surfaces may be connected by a suitable surface coating as disclosed in my co-pending application No. 508,937, filed October 20, 1921.

One arrangement of the heating resistance is shown at 45 in the drawing. This heating element is in the form of a high resistance coil, one end of which is connected to the adjacent holding member and the other end to the conducting coating of the gland. A similar arrangement can be used where the gland is an integral part of the main insulating member or disc.

Where the inner surface of the glands approximate the voltage of the holding members either by static streamers flowing over the surface or by filling or lining the surface of the gland with conducting material in contact with holding members, the tendency for charging current starting out over the leakage surfaces of the dielectric members from the holding members, will be very small. This is due to the fact that the surface charging current is supplied largely through the outer walls of the gland members 43 and 49.

The reduction or elimination of streamers starting from the holding members reduces or eliminates their shunting action, consequently the capacity pockets or glands are very beneficial in this respect. The reduction or elimination of the shunting streamers permits of a higher voltage being placed on an insulator of given size before flash-over will occur. In some designs the capacity gland may be so formed that the flash-over voltage of an insulator for a given size may be materially increased or if a given flash-over is desired the size of the insulator may be reduced.

The capacity glands do not sacrifice valuable surface resistance, for the outer walls of the glands 43 and 49 supply surface resistance which would otherwise be lost. This surface resistance is such that it is comparable to that of other sections in the string which do not have capacity glands, as the width of the leakage path or zone in insulators having capacity glands need be but little, if any, greater in width than that of other members in the series. This is important for the electrostatic grading should not be accomplished at the expense of an unbalanced gradient due to unequal surface resistance among the various insulator sections.

The capacitance glands may be made integral with the body of the dielectric member or may be made as separate members and fused or attached to the main flange, as shown in the drawing, in which the gland 49 is fused to the main body member during the burning of the piece along the line 50, providing an electric as well as a mechanical joint.

The capacitance gland 43, is made separate from the main flange 40 and is attached to the attaching member 42 by the cemented joint 52.

The gland 43 is shown with a heating resistance 45 held in place by insulating or very high resistance cement 48. The ends of the spiral resistance 45 are connected to the attaching member at one end by the lead 46 and to the gland coating at the other end by lead 47. In operation the charging current flowing between the attaching member and gland coating will flow through the very high resistance coil 45 which will generate a slight amount of heat and tend to prevent the lowering of surface resistance by condensation. The charging current and hence the loss in the resistance will increase with the frequency and is therefore beneficial as it will tend to dampen out line disturbances which commonly have a very high frequency as compared to the normal frequency of the power current in the line.

I claim:—

1. An insulator comprising a dielectric member having a radially disposed pocket-shaped capacitance gland therein and a heating element disposed in said gland.

2. An insulator comprising a dielectric member having radially disposed complementary pocket-shaped capacitance glands therein and a heating element disposed in one of said glands.

3. An insulator having an outwardly extending flange thereon, said flange having pockets formed on the opposite faces thereof with outer walls extending in the direction of the faces of said flange, conducting

material disposed in said pockets, and a heating element disposed in one of said pockets.

4. An insulator comprising a dielectric member having a radially extending flange, attaching members at opposite sides of said flange, dielectric material at opposite sides of said flange forming radially extending pockets open at the portions thereof adjacent said attaching members, and an electrical heating element in one of said pockets.

5. An insulator comprising a dielectric member having a radially extending flange, attaching members secured to said dielectric member at opposite sides thereof, separately formed rings of dielectric material surrounding said attaching members at opposite sides of said flange, said rings being U-shaped in cross section forming pockets open at the sides thereof adjacent said attaching members, conducting material in said pockets, and an electrical heating element disposed in one of said pockets.

6. An insulator comprising a dielectric member having a fitting secured thereto, dielectric material connected with said insulator and having a pocket therein extending outwardly from said fitting, conducting material in said pocket and spaced away from said fitting, and a high resistance coil electrically connected in series between said fitting and conducting material and forming a heating element within said pocket.

7. An insulator comprising a dielectric member having a fitting secured thereto, dielectric material forming a pocket extending away from said fitting in the path of leakage and charging currents over said insulator, said pocket being closed at the side thereof away from said fitting, conducting material in said pocket spaced from said fitting, and a high resistance element in said pocket and electrically connected between said fitting and conducting material to form a heating element energized by current flowing between said fitting and conducting material.

8. An insulator comprising a dielectric member having a radially extending flange thereon, fittings connected with said member at opposite sides thereof, dielectric material forming pocket-shaped capacitance glands at opposite sides of said flange and extending radially away from said fittings, said pockets being closed at their outer peripheries but open at the sides thereof adjacent said fittings, conducting material in said pockets, said material in one of said pockets being spaced from the fitting adjacent thereto, and a high resistance element electrically connected in series between said conducting material and fitting and constituting a heating element in said pocket.

In testimony whereof I have signed my name to this specification on this 15th day of October, A. D. 1921.

ARTHUR O. AUSTIN.