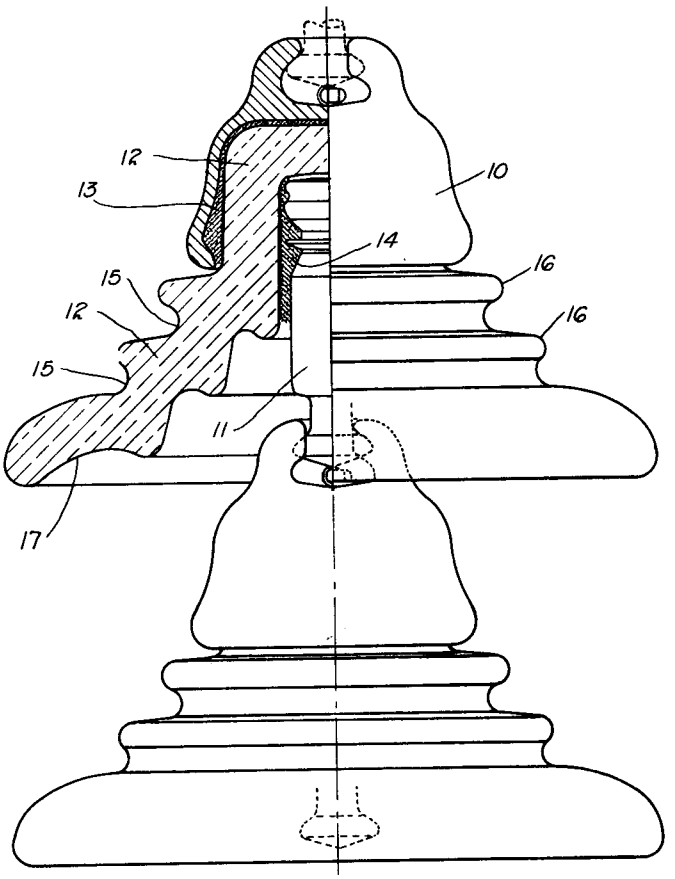
June 13, 1939. J. J. TAYLOR 2,162,288

INSULATOR

Filed March 9, 1938



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Patented June 13, 1939 2,162,288

UNITED STATES PATENT OFFICE

2,162,288

INSULATOR

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Application March 9, 1938, Serial No. 194,848

6 Claims. (Cl. 174—212)

This invention relates to electric insulators of the type commonly made of porcelain or other fragile dielectric material and provided with metallic fittings for connecting the insulator with its supporting structure and with a conductor, or for connecting several insulators together in a string.

One principal object of the invention is to provide a dielectric member having a surface contour which tends to prevent electrostatic discharges from the metallic fittings.

A second principal object of the invention is to provide a dielectric member which resists breakage due to the impact of missiles directed against its surface.

A further object of the invention is to provide a dielectric member which has an effective leakage surface and one in which atmospheric moisture does not seriously decrease the resistance to leakage and discharge over said surface.

A further object of the invention is to provide a dielectric member so shaped that the surface may be readily cleaned.

A further object of the invention is to provide an insulator of improved construction and operation.

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, the figure is an elevation with parts in sections showing two units in an insulator string embodying the present invention.

In the operation of electric insulators, and particularly those for high voltages, two principal difficulties have been experienced, the one being due to electrostatic discharges over the insulators, and the other due to breakage. A large percentage of the cases of breakage in some localities has been due to the fact that insulators provide alluring targets at which to throw stones or discharge firearms.

The present invention provides means for reducing both the danger of electrostatic discharge and the breakage from missiles since it comprises a contour for a dielectric member which not only resists electric discharge over its surface, but at the same time and by the same characteristics, offers greatly increased resistance to breakage by impact from missiles. Heretofore, effort has been made to shield dielectric members from being struck by missiles as by guards disposed below the insulators, such as that shown in the patent to Winslow, No. 517,634, dated April 3, 1894, and some effort has been made to avoid the effects of missiles by increasing the mass of dielectric material in the fragile member. The present invention aproaches the problem in a different way by so shaping the dielectric member that the more fragile portions are shielded and the part most exposed to impact will usually be struck in such a direction that the missile will be deflected or in such a position that the force of the impact will be directed longitudinally and not transversely of the principle dimension of the insulator, the shape, furthermore, being such that even if a part is broken off the damage will be relatively slight and not completely destroy the vital portions of the insulators.

In the drawing the invention is shown as applied to a suspension insulator having a usual form of cap 10 and pin 11, the dielectric member 12 being secured to the cap by cement 13 and to the pin by cement 14. The principal body of the flange 12 extends downwardly and outwardly from the head of the dielectric member at an oblique angle of approximately 45° instead of projecting radially as is usual in suspension insulators. The upper and lower surfaces of the flange, however, instead of being disposed in continuous curves are both arranged in step formation. The steps on the opposite surfaces are so related, as shown in the drawing, that the thickness of the flange is not materially impaired at any point, while at the same time a definite relation is maintained between the direction of the opposite portions of the surface such that discharge streamers tending to start from the metallic fittings on opposite sides of the dielectric member will not travel in parallel paths, but will be forced to diverge from one another so that the streamers on opposite sides of the dielectric member exert a retarding force on each other. For instance, a streamer emanating from the lower edge of the cap 10 will be forced to travel in a substantially horizontal direction for a considerable distance before it reaches the extremity in the first step on the upper surface of the dielectric member. A streamer on the lower surface of the dielectric member immediately opposite the lower edge of the cap will, however, be forced to travel downwardly along the first vertical step on the under surface of the dielectric member, so that the paths of these streamers will diverge from one

another at an angle of approximately 90°. This divergence is repeated along the second horizontal step on the upper surface of the insulator which is opposite the second vertical step on the lower surface of the insulator. This repeated divergence of the streamer paths has been found to reduce very materially the danger of discharge either in the form of corona or in complete flashover, so that an insulator of the contour shown will withstand a much higher voltage than one in which the flange is of the usual form. It will be noted that the steps on the upper surface of the insulator are slightly undercut as shown at 15. This not only increases the length of the leakage path on the upper surface of the insulator, but tends to break up the stream of water flowing over the surface when the insulator is wet, producing very thin portions in the film which helps to maintain the resistance to wet leakage or flashover. The ribs or flanges 16 produced by this contour are disposed on the upper surface of the insulator instead of on the lower surface as has been heretofore usual. One advantage of this arrangement is that these ribs or flanges are shielded from gun fire or stones thrown at the insulator, since such missiles are necessarily directed usually from the ground and will strike the under side rather than the upper side of the insulator. Because of the angular position of the flange 12, only the edge of the flange is presented in the direction in which the missiles are most apt to come, and if such a missile strikes adjacent the edge, it is ordinarily deflected from the surface 17 and usually does no damage.

It will be noted that the flange may be regarded as being formed from a series of flat rings of graded diameters, the lower surface of each ring substantially registering with the upper surface of the next lower ring and overlapping the next lower ring by an amount substantially equal to the thickness of the rings. There are three such rings forming the flange shown in the drawing. The lower ring is somewhat extended to protect the ribs formed by the projecting portions of the upper edges of the upper rings. The lower surface of the lower ring is inclined inwardly and upwardly and rounded to provide a deflecting surface for bullets which may strike this surface.

It will be observed that practically the entire body of the flange is disposed in the line of force exerted by the missile, so that there is very little danger of any breakage. If any breakage takes place, it will be usually confined to a slight portion of the outermost rim of the dielectric member which does not greatly interfere with the operation of the insulator and it has been found impossible with ordinary firearms or missiles to so fracture the dielectric member as to cause the parts to separate and drop the line. It will be noted from the relation of the two insulators in the string that all of the insulators except the lowermost one in the string are shielded from missiles aimed upwardly from directly below the string, and that the only position that the marksman can take is a position substantially in line with the principle direction of the flange 12. The lowermost insulator in the string is usually protected by the fitting which supports the transmission line or it may be equipped with some form of voltage gradient member or arcing device, such as that shown in the patent to Koontz, No. 1,215,549, dated February 13, 1917.

In practice it has been found that the particular form of dielectric member shown has not only greatly decreased the danger of breakage due to stone throwing and gun fire, but at the same time has also greatly improved the electrical characteristics of the insulator, particularly the resistance to corona streamers and flashover.

The stepped formation gives the effect of petticoats of the full thickness of the flange on both sides of the flange instead of relatively thin petticoats on one side only, as has heretofore been the practice. It, of course, would not be practical to provide petticoats of the full thickness of the flange, projecting from one side only in the conventional way, without so crowding them together as to make manufacture difficult or impossible, and even if they could be thus crowded together, the close proximity would augment the collection of dirt and prevent cleaning as well as leave too little air resistance between flanges. The formation of steps on both sides of the flange provides in effect twice the amount of space for petticoats and permits the use of insulators of smaller radii for a given surface resistance.

I claim:

1. An insulator comprising a dielectric member having a conical flange thereon, circumferential ribs on the upper surface of said flange forming steps, said steps comprising riser portions and upper surfaces, the upper surfaces being approximately normal to the axis of said conical flange, and circumferential ribs on the lower surface of said flange also forming steps having riser portions and lower surfaces, said flange having its main body portion extending in uninterrupted, straight line continuity in an inclined direction between the ribs on said upper and lower surfaces.

2. An insulator comprising a dielectric member having a conical flange, said flange having circumferential ribs on the upper surface thereof forming steps, the upper surfaces of said steps being approximately normal to the axis of said flange and the peripheries of said steps being radially overhanging, said flange also having ribs on the lower surface thereof forming steps, the lower surfaces of the steps on the lower side of said flange being substantially in horizontal registration with the upper surfaces on the upper side of said flange and the riser portions of the steps at opposite sides of said flange also being in substantial horizontal registration so that the main body of said flange extends in uninterrupted straight line continuity in an inclined direction between said ribs.

3. In an insulator, a dielectric member having a flange thereon comprising a plurality of steps, each step being formed by a substantially flat, ring-shaped portion of dielectric material, the lower surface of each ring being in substantial registration with the upper surface of the next lower ring and each ring overlapping the next lower ring by an amount substantially equal to the thickness of said rings, the overlapping portions of said rings being integrally joined to provide an integrally continuous conical flange.

4. An insulator comprising a dielectric member having a conical flange extending outwardly and downwardly in straight line continuity at an angle of approximately 45° to the axis of the insulator, the opposite surfaces of said flange being arranged in steps of approximately equal extent and disposed in registration so that an

approximately uniform thickness of flange is provided.

5. An insulator comprising a dielectric member having a conical flange thereon, the main body portion of which extends outwardly and downwardly in uninterrupted straight line continuity, ribs on the upper surface of said flange and a radial portion at the lower edge of said flange arranged in position to intercept missiles directed upwardly at said insulator at an angle of 45° to the horizontal or less so as to protect said ribs from said missiles, said radial portion extending outwardly beyond the lower edge of said straight line main body portion and having the outer portion of its lower surface inclined upwardly and inwardly toward the lower edge of said straight line main body portion.

6. An insulator comprising a dielectric member having a conical flange thereon, the main body portion of which extends outwardly and downwardly in uninterrupted straight line continuity, ribs on the upper surface of said flange and a radial portion at the lower edge of said flange extending outwardly beyond the lower edge of the straight line main body portion of said flange, the lower surface of said radial portion being upwardly and inwardly inclined toward the lower edge of said main body portion to deflect missiles which engage said surface toward said lower edge.

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