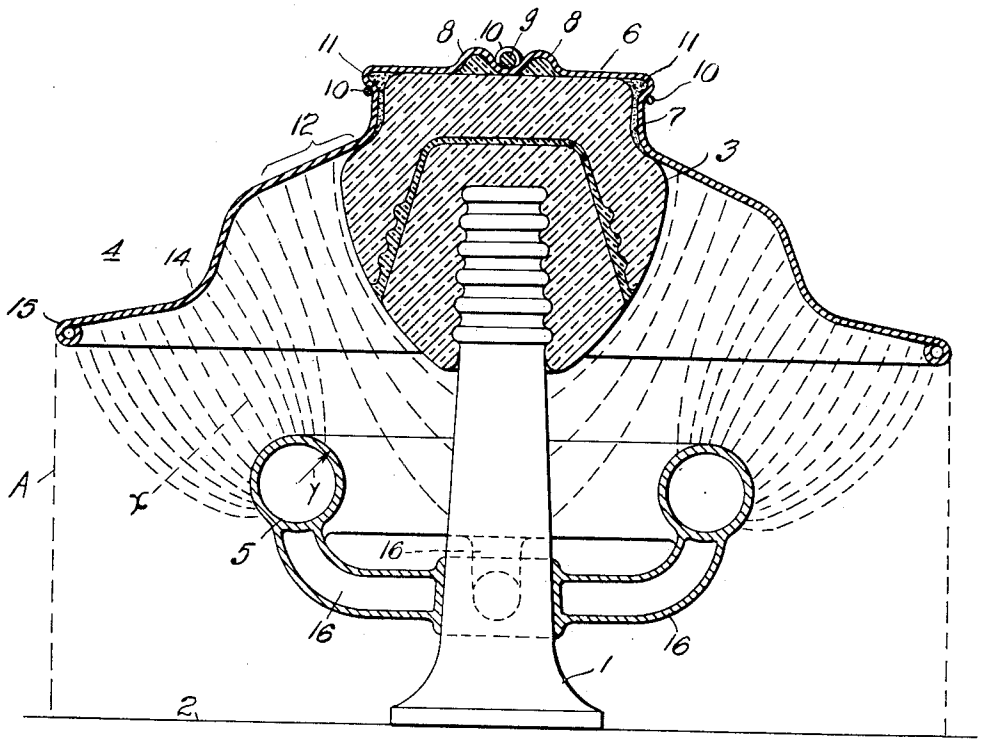
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INSULATOR

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INSULATOR

Application filed July 28, 1923, Serial No. 654,333. Renewed September 22, 1927.

My invention relates to insulators and particularly to insulators for supporting the conductors of high-potential circuits.

One object of my invention is to provide an insulator, of the above indicated character, that shall embody a metal pin or supporting member from which the electrostatic stresses are so withdrawn as to prevent arcover thereto and thereby prevent injury to an insulating member on the pin.

Another object of my invention is to provide an insulator comprising terminal members that shall be constructed and related to so widely distribute and definitely direct the electrostatic field as to permit the use of a usual form of insulating member having a surface to which the field substantially conforms and around which a zone of maximum potential gradient is disposed in spaced relation thereto.

A further object of my invention is to provide a high-potential insulator that shall be simple and durable in construction, economical to manufacture and effective in its operation.

In my copending application, Serial No. 548,818, Insulator, filed April 1, 1922, is set forth the feature of simultaneously widely distributing and definitely directing the electrostatic field of an insulator to have a zone or portion of maximum potential gradient surrounding the longitudinal axis of the insulator in spaced relation thereto and a weakened central or inner portion through which an insulating supporting pin or member extends. This construction, removes fracturing and corona-forming stresses and disrupts arcs from the insulating member and utilizes entirely the dielectric strength of air to determine the ultimate voltage limits of the insulator. In other words, there is an air path, for the maximum electrostatic stresses, which is not affected by electrostatic field-disturbing objects, wet creepage surfaces and other elements which frequently have caused break down in ordinary insulators of the prior art.

However, it was discovered that the above-described insulator could be improved for operation under wet conditions by the provision of a rain-drip portion disposed outside the zone of maximum potential gradient. This feature is fully disclosed in my copending application, Serial No. 559,743, Insulator, filed May 10, 1922.

The insulator of the latter application embodies both of the above-described features in combination and is very effective under both wet and dry conditions.

The above-described insulator or insulators, while comprehending certain broad features, are more particularly adapted for operation with pins or supporting members of insulating material. Accordingly, my present invention is an adaptation of the features thereof in an insulator employing a metal pin or supporting member which, is desirable for certain purposes within certain voltage values. Higher voltages may be advisably employed with a pin insulator employing these principles than has been found practicable with previous insulators of the metal-pin type.

In practicing my invention, I provide a metal pin or supporting member and an insulating member, both somewhat similar to insulators of the prior art but in which the insulating member is very materially simplified, in which the electrostatic field-distributing and directing feature, of the first mentioned co-pending application, and the rain-drip feature, of the second-mentioned copending application are embodied. This adaptation involves the reforming or redistribution of a portion of the electrostatic field, as well as changes in the distances and relations between certain parts, to attain an insulator embodying or retaining certain desirable features of insulators of the prior art and to provide an insulator which is free from many of the objections incident thereto.

The single figure of the accompanying drawing is a view, partially in side elevation and partially in section, of an insulator constructed in accordance with my invention.

In general, the insulator comprises a supporting member or pin 1 that is adapted for mounting on a cross arm or other supporting structure 2, an insulating member 3, an upper terminal member 4 and a lower terminal member 5.

The pin 1, while preferably constructed entirely of metal, may be constructed of insulating material having a conducting surface. The insulating member 3 is preferably constructed of refractory insulating material, such as porcelain or glass, and may comprise one member or a plurality of members joined by cement.

The upper terminal member 4, which may be constructed of insulating material having a conducting surface, is preferably constructed of sheet metal to be of substantially hood shape having a cup or socket portion 6, which is mounted on the insulating member 3 and secured thereto, as by a body of cement 7. The socket portion 6 may be provided with upper raised portions 8 between which a conductor 9 is disposed and secured in position by a tie-wire 10 that is wound around the conductor 9 and around the socket portion 6, in the usual manner, under an annular rib or flange 11 on the socket portion 6. However, a metal clamp or other suitable means may be provided to hold the conductor 9 in position.

The member 4 is further provided with a portion 12, adjacent to the socket portion 6, which is shaped to cause the electrostatic field between the member 4 and the pin 1 to be of substantially bowl shape, to which the outer surface of the insulating member 3 substantially conforms. This feature is more fully explained in Patent No. 1,374,998, Insulator, issued April 19, 1921, to C. L. Fortescue and G. I. Gilchrest, and assigned to the Westinghouse Electric & Manufacturing Company.

An intermediate portion 14 of the member 4 surrounds the portion 12 thereof and is downwardly relatively widely bowed, or curved, about a relatively long radius to be closer to the member 5 than any other part thereof. In other words, the portion 14 provides a maximum potential gradient adjacent to its surface surrounding the longitudinal axis of the insulator in spaced relation to the insulating member 3.

The outer perimeter 15 of the member 4 constituting a water-drip portion, is so related to the member 5 that moisture, descending in the direction of a dotted line A, shall be removed from the member 5 a greater distance than along a dotted line X which represents the shortest distance and the field of maximum electrostatic intensity between the members 4 and 5.

The member 5 is of substantially ring shape and surrounds the pin 1, in relatively widely spaced relation thereto, and is of relatively large radius in its dimension Y. This construction provides an annulus having a top surface of relatively great curvature descending by relatively widely curved surfaces on either side thereof, or in other words, joining the inner and outer perimeters of the ring 5 by a relatively widely curved surfa

The member 5 may be supported on the pin 1 by radially projecting arms 16 having relatively widely rounded surfaces to prevent the formation of corona and spaces therebetween to permit moisture to descend from the upper parts of the insulator.

As above constructed, the members 4 and 5 very widely distribute the electrostatic field therebetween and, at the same time, so definitely direct the same as to provide a portion of maximum potential gradient surrounding the longitudinal axis of the insulator in relatively widely spaced relation to the insulator 3. The inner portion of the electrostatic field, in which the pin 1 and the insulating member 3 are disposed, is materially weaker than the zone adjacent to the line X. The electrostatic field in this weakened inner portion is further directed, or reformed, by the relation between the portion 12 of the member 4 and the pin 1, to cause it to conform substantially to a preferred standard form of insulating member 3.

Further, the distance represented by the line X, is shorter than the distance along the surface of the insulating member 3, between the portion 12 of the member 4 and the pin 1, and is shorter than the distance between the member 5 and the water-drip portion 15. The distance represented by the line X is also shorter than the distance represented by the line A, between the support 2 and the water-drip portion 15. These relations ensure that ultimate breakdown will occur always between the member 5 and the portion 14.

By means of my invention, a standard metal pin and a refractory or other insulating member, free of petticoats and thereby of simple form and economical to manufacture, are provided together with relatively simple metal parts so shaped and related as to render the insulator very durable in construction and effective in operation.

While I have shown and described a particular form of my invention, changes may be effected therein without departing from the spirit and scope thereof, as set forth in the appended claims.

I claim as my invention:

1. An insulator comprising terminal members constructed to simultaneously widely distribute and definitely direct the electric field thereof to have a portion of maximum potential gradient surrounding an axis of the insulator, and a weakened portion inside said portion, one of said members having a portion projecting toward the other to reform a portion of said weakened portion of the field, and an insulating member having an end recess by which it is fitted over the end of said projecting terminal portion and an outer end portion on which said other terminal member is mounted, said insulating member also having a side surface substantially

conforming to said reformed weakened portion.

2. An insulator comprising terminal members constructed to simultaneously widely distribute and definitely direct the electric field thereof to have a portion of maximum potential gradient surrounding an axis of the insulator and a weakened portion inside said portion, one of said members having a portion projecting toward the other and operating to reform a portion of said inside portion of the field, and an insulating member mounted on said projecting portion and conforming to said reformed portion of the field.

3. An insulator comprising a terminal structure including a metal pin portion at one end, a second terminal structure at the other end of the insulator for causing a portion of the electric field between said pin portion and the second terminal structure to assume a predetermined substantially bowl shape, and an insulating member mounted on the pin portion for supporting said second terminal structure and having a surface conforming substantially to said field, said first and second terminal structures also being constructed and related to each other and to the insulating member to simultaneously widely distribute and definitely direct another portion of the field to occupy a zone of maximum potential gradient surrounding the axis of the insulator in spaced relation to said insulating member.

4. In an insulator, the combination with a vertically disposed metal pin and an insulating member mounted on the upper end thereof, of a lower terminal member surrounding the pin in spaced relation thereto and having inner and outer perimeters connected by a gradually curved surface, and an upper terminal member of substantially hood shape having an outer water-drip portion, an intermediate gradually curved portion surrounding the axis of the insulator and an inner portion for directing the field relative to said insulating member, the distance between portions of the gradually curved portions of the terminal members being less than the distance from the lower terminal member to said water-drip portion and less than the distance from the upper terminal member to the pin along the surface of the insulating member.

5. A high-potential insulator comprising an insulating member having longitudinal surfaces intercepting lines parallel to the longitudinal axis of the insulator, oppositely-disposed terminal structures therefor each embodying a widely-laterally-curved portion surrounding said axis in laterally-spaced relation thereto with the crest of said curved portion advanced toward the crest of the other to provide a tube-like field zone between the terminals in the portion of which corresponding to the wall of the tube the maximum field stresses of the insulator occur and inside of which wall-like portion the terminals are formed to provide a weakened field region in which electrostatic lines extend substantially parallel to said axis, said terminal structures also embodying portions to direct certain of the lines in said weakened-field region to conform substantially to said longitudinal surfaces of the insulating member.

6. A high-potential insulator comprising a lower terminal structure including a metal pin, an insulating member disposed over one end of the pin, an upper terminal structure embodying an intermediate annular portion which, in co-operation with the pin, directs a portion of the field therebetween to conform substantially to the longitudinal surface of said insulating member, said terminal structures each also embodying an outer widely-laterally-curved portion surrounding the longitudinal axis of the insulator in laterally-spaced relation to said insulating member and pin with the crest of said curved portion advanced toward the corresponding portion of the other and adapted to provide a tube-like electrostatic field zone between the terminals in the portion of which corresponding to the wall of the tube the maximum field stresses of the insulator exist.

7. An insulator comprising terminal members constructed to widely distribute and definitely direct the electrostatic field thereof to have a zone of maximum potential gradient within a locus surrounding an axis through said members and a weakened portion between said zone and said axis, one of said members including an element operating to reform a portion of said weakened field portion, and an insulating member conforming to said reformed field portion supported by said element.

8. An insulator comprising terminal members constructed to widely distribute and definitely direct the electrostatic field thereof to have a zone of maximum potential gradient within a locus surrounding an axis through said members and a weakened portion between said zone and said axis, one of said members having a portion projecting toward the other and operating to reform a portion of said weakened field portion, and an insulating member having a portion substantially conforming to said reformed field portion and a portion enclosing a portion of said projecting portion.

In testimony whereof, I have hereunto subscribed my name this tenth day of July, 1923.

HAROLD B. SMITH.