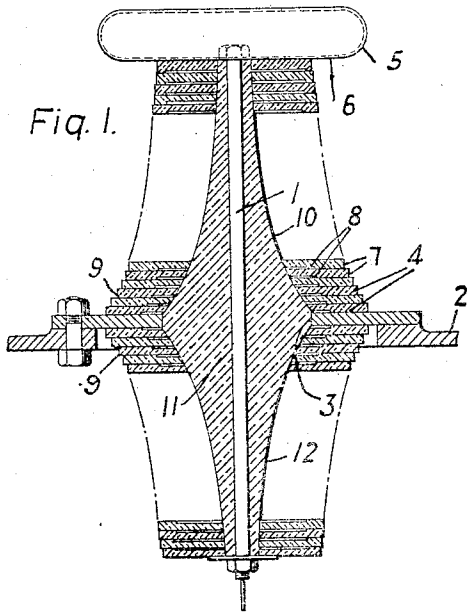
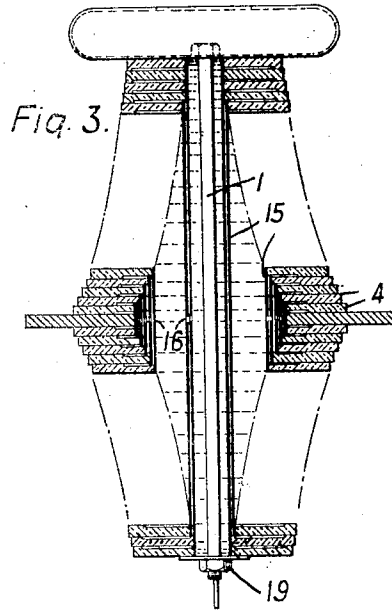
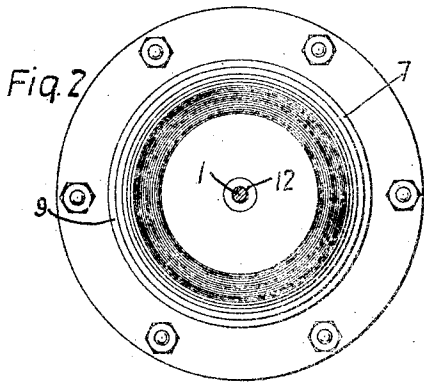
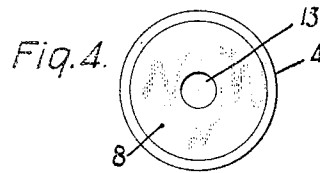
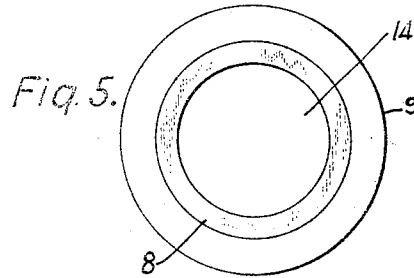
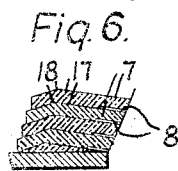


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ELECTRICAL TERMINAL.
APPLICATION FILED JUNE 4, 1919.

1,259,386.

Patented Mar. 12, 1918.



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ELECTRICAL TERMINAL.

1,259,386.

Specification of Letters Patent.

Patented Mar. 12, 1918.

Application filed June 4, 1915. Serial No. 32,184.

To all whom it may concern:

Be it known that I, CHARLES LE G. FORTESCUE, a subject of the King of Great Britain, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electrical Terminals, of which the following is a specification.

My invention relates to electrical insulators, and it has special reference to insulating terminals that may be employed as bushings to insulate high-potential conductors.

More particularly, my invention relates to insulating bushings of the condenser type in which electrostatic stresses are precluded from concentrating upon the surfaces of the bushing.

By means of my invention, a potential gradient may be established upon the outer surface of the bushing which will correspond to that resulting from an external uniform electrostatic field, the equipotential surfaces of which are at right angles to the axis of the bushing. Moreover, the potential distribution over the surface of the internal region of the terminal will correspond to a logarithmic potential, which, as is well known, insures an insulating structure of marked efficiency for insulating high-potential cylindrical bodies.

In accordance with the principles disclosed in my U. S. Patents Nos. 1,129,463 and 1,129,466, I utilize, in the present invention, electrostatic fields and their resultant potential distribution in order to enhance the insulating qualities of my present terminal. In employing condensers of equal capacity for an insulating structure, I have discovered that a particularly useful insulator may be constructed in which the condensers are of annular shape, the conducting and insulating elements thereof being disposed transversely of the axis of the insulator or terminal. By adjusting the electrical constants of this series of superposed condensers, and by varying the disposition of the conducting elements thereof, I may control, to a very large extent, the form of the internal and external electrostatic fields of the terminal.

For a better understanding of the nature and scope of my invention, reference may be had to the following description and the accompanying drawing in which Figure 1

is a view, partially in elevation and partially in section, of an insulating terminal embodying a form of my invention; Fig. 2 is a plan view of the terminal shown in Fig. 1; Fig. 3 is a modified form of the structure disclosed in Fig. 1; Figs. 4 and 5 are plan views of a top condenser and an intermediate condenser respectively, which are embodied in my terminal structure, and Fig. 6 is a cross-sectional view of a portion of a terminal embodying a form of my invention in which the condensers are so disposed with respect to one another as to preclude their being displaced transversely with respect to the axis of the terminal.

Referring to Fig. 1, a central conducting member 1, which it is desired to insulate from the body 2, extends through an opening 3 formed therein. It will be understood that the shortest path between the conducting member 1 and the member 2 is sufficiently long to preclude the occurrence of any electrical discharge therebetween. A series of annularly-shaped and superposed condensers 4 embrace the central conducting member 1 and constitute the insulating structure for said conducting member. A discoidal-shaped conducting body 5, having rounded edges and a lower surface 6 which is substantially parallel to the member 2, is disposed adjacent to the end portion of the bushing in order to insure the formation of a uniform electrostatic field external to the bushing. The action of the discoidal body 6 is fully disclosed in the above-mentioned patents.

Each of the condensers 4 comprises an insulating element 7 and a conducting element 8, the latter being made from any suitable thin sheet material, such as tinfoil. In order that the terminal may exercise, under certain conditions, its maximum insulating property, the condensers 4 are made of equal capacity, and, inasmuch as it is desired to insure a uniform potential gradient on the external surface of the terminal, the conducting elements 8 are so constructed as to have the same area, and the insulating elements 7 are so designed as to have equal thickness. It will be noted that the condensers 9, which are in proximity to the body 2, are provided with substantially large openings in order to preclude the occurrence of any electrical discharge between the central conducting member 1 and the conduct-

ing elements 8. In advancing toward the end portions of the bushing, the inner edges of the condensers are spaced, by progressively decreasing amounts, from the central conducting member 1, as shown in Figs. 1 and 3. The inner edges of the conducting elements 8 of the condensers terminate on a logarithmic curve 10 whereby the distribution of potential over the surface of the internal region of the terminal will correspond to a logarithmic potential, it being understood that the conducting member 1 and the inner edges of the conducting elements of the intermediate condensers 9 are initially spaced a sufficient distance from each other, depending upon the voltage of the central conductor 1. Since the insulating elements 7 of the condensers are of equal thickness, the conducting elements 8 are spaced equal distances from one another, and, in conjunction with the discoidal shaped body 6, insure the establishment of a uniform potential gradient upon the outer surface of the terminal, each conducting element 8 terminating upon the equi-potential surface which corresponds to its own potential. The inner region 11, which is inclosed by the built-up condensers, may be filled with a cement or insulating gum 12 which enhances the dielectric properties of the bushing.

In Figs. 4 and 5, I have illustrated a form which the condensers 4 may assume. As mentioned above the condensers are of equal capacity and the insulating elements thereof are of equal thickness. Therefore, it is essential that the conducting elements of the condensers shall be of equal area. In Fig. 4, the annular shaped conducting element 8 is provided with a relatively small central opening 13, thereby giving a sufficient area thereto. The conducting elements 8 may be embedded in recesses formed in one of the surfaces of the insulating elements 7, as shown in connection with the figures illustrating my terminal bushing.

Fig. 5, which represents an intermediate condenser 9, shows the conducting element thereof provided with a relatively large opening 14. The width of the rim of the annular member 8 is thus maintained relatively narrow in order to provide an area equal to that of the conducting element 8 of Fig. 4.

A modified form of the bushing shown in Fig. 1 is illustrated in Fig. 3, this particular type being adapted to provide an oil bath for the central conducting member 1. The condensers 4 are built up as mentioned above and are firmly connected together by means of nuts 19 which engage the threaded ends of the central conducting member. The conducting elements 8 of the condensers may be deposited in various ways in order to insure tight joints between the adjacently-disposed condensers. In order to preclude

the formation of "threads" in the oil bath which will affect the insulating properties of my terminal, I interpose a series of tubular insulating barriers 15. The barriers 15 are made in graded lengths of varying diameters and are centrally-disposed about the central conducting member 1 in such manner that the barriers of smaller diameter and greater length are embraced by the barriers of shorter length and greater diameter. The barriers 15 are so disposed that the inner edges of the conducting elements 8 of the condensers, are contained in separate compartments in order to preclude the formation of an oil thread between adjacently-disposed conducting elements 8. The barriers 15 are provided with openings 16 in order to permit the flow of oil into the various chambers provided by this arrangement of the barriers.

In Fig. 6, I have shown a modified form for the condensers 4. The insulating elements 7 are provided with inwardly extending recesses 17 in order that the condenser elements may be nested within one another. The recesses formed upon the lower surfaces of the insulating elements are adapted to receive ridges 18 formed upon the upper surfaces of the lower insulating elements. In this manner, the condensers are precluded from being displaced transversely of the axis of the terminal. The conducting elements 8 of the condensers are embedded in recesses formed upon the lower surfaces of the insulating elements 7, as previously explained. The inner edges thereof, preferably, terminate upon a logarithmic curve in order to provide a proper distribution of potential over the surface of the internal region of the terminal.

While I have shown and described several embodiments of my invention, it will be understood by those skilled in the art that many modifications may be made without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. An insulating terminal comprising a plurality of superposed condensers of equal capacity, the conducting elements thereof being disposed transversely of the axis of the terminal and having their inner edges terminating in a logarithmic curve to effect a logarithmic distribution of potential over the surface of the internal region thereof.

2. An electrical insulator comprising a built-up column of superposed flat disk-shaped insulating members and conducting elements interposed between adjacent insulating members thereby forming a series of condensers.

3. An electrical insulator comprising a built-up column of annular disk-shaped insulating members providing an unobstructed longitudinal opening through the insu-

lator and annular conducting elements interposed between adjacent insulating members.

4. An electrical insulator comprising a built-up column of disk-shaped condensers of equal capacity, the insulating elements thereof being of equal thickness in order to effect a uniform potential gradient on the exterior surface of the insulator and the conducting elements being mechanically supported on said insulating elements.

5. An electrical terminal comprising a centrally disposed conducting member and a built-up column of annular condensers embracing said conducting member, the conducting elements of said condensers being mechanically supported by the insulating dielectric elements thereof.

6. An electrical terminal comprising a centrally disposed conducting member and a built-up column of annular condensers of the same capacity that embrace said conducting member, said condensers having varying diameters in order that the built-up column may taper from an intermediate point toward both of its ends.

7. An insulating member comprising a plurality of superposed condensers, the conducting elements thereof being disposed transversely of the axis of the insulating member and having their edges terminating in predetermined curves to effect predetermined distributions of potential over the surfaces of said insulating member.

8. An insulating member comprising a built-up column of disk-shaped condensers, the conducting elements thereof extending transversely of the axis of the insulating member and having their inner and outer edges terminating in predetermined loci to effect a predetermined distribution of potential over the exposed surfaces of said insulating member.

9. An insulating member comprising a

plurality of superposed disk-shaped condensers of equal capacity, the conducting elements thereof being disposed transversely of the axis of the terminal and the insulating elements forming supports for said conducting elements and being of equal thickness, the edges of said conducting elements terminating in predetermined loci to preclude concentrations of electric stresses upon the surfaces of said insulating members.

10. An electrical terminal comprising a centrally-disposed conducting member and a built-up column of annular disk-shaped condensers of the same capacity embracing said conducting member, the inner edges of the conducting elements of the intermediate condensers being spaced greater distances from said conducting member than the inner edges of the conducting elements of the condensers adjacent to both ends of the terminal.

11. An electrical terminal comprising a centrally-disposed conducting member and a plurality of annular condensers having different diameters and the same capacity embracing said conducting member, the conducting and insulating elements of said condensers being disposed transversely of said conducting member and forming a built-up column that is tapered from an intermediate point toward its ends.

12. An electrical terminal comprising a centrally-disposed conducting member and a built-up column of annular disk-shaped condensers embracing said conducting member, the inner edges of the conducting elements being spaced progressively decreasing amounts from the axis of the terminal when advancing from an intermediate point toward both ends of the terminal.

In testimony whereof, I have hereunto subscribed my name this 26th day of May, 1915.

CHARLES LE G. FORTESCUE.