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R. HIGGINS
CAPACITANCE COUPLER
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2,135,338

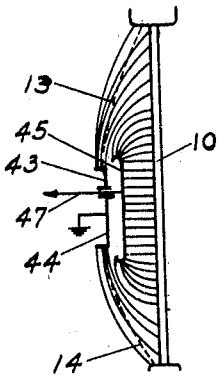


Fig. 2

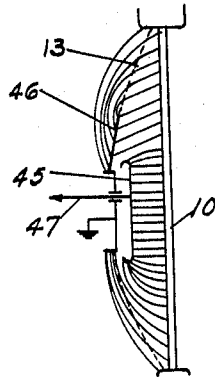


Fig. 3

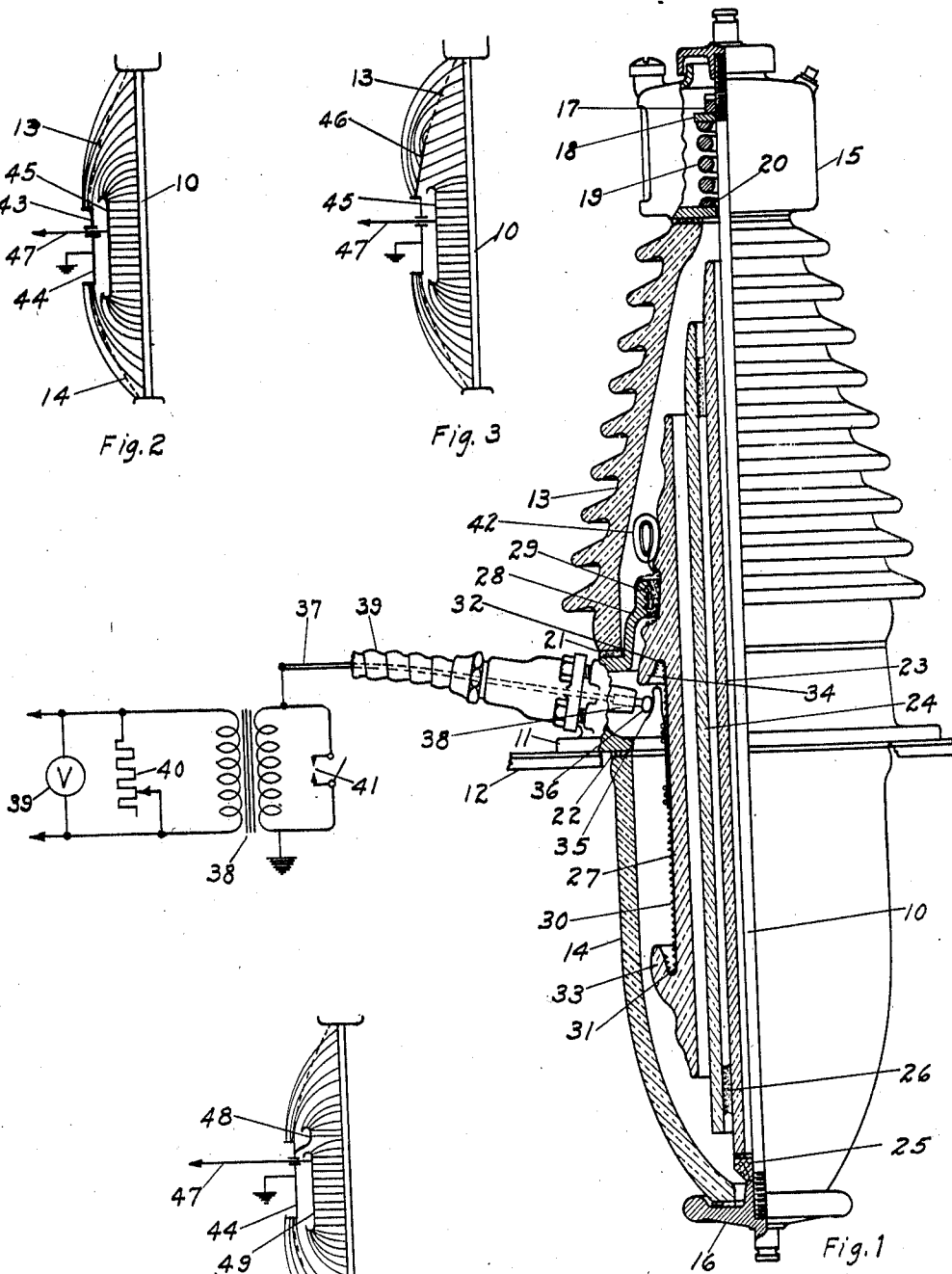


Fig. 1

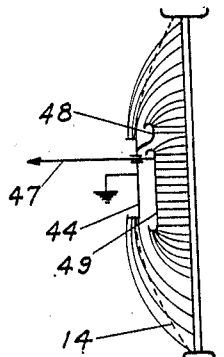


Fig. 4

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CAPACITANCE COUPLER

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2 Claims. (Cl. 175-41)

This invention relates to capacitance couplers for diverting current from an electrical conductor, and particularly to capacitance coupling means associated with bushing insulators.

One object of the invention is to provide a capacitance coupler which will not be materially affected by changes in the surrounding electrostatic field.

A further object of the invention is to provide a capacitance coupler which shall have substantially constant capacitance for varying weather conditions.

A further object of the invention is to provide a device of the class named which shall be 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:

Fig. 1 is an elevation with parts in section showing a bushing insulator having one embodiment of the present invention applied thereto.

Fig. 2 is a diagram representing the electrostatic field about a bushing insulator equipped with a capacitance coupler.

Fig. 3 shows the variation in this field due to moisture on the surface of the bushing insulator.

Fig. 4 illustrates the operation of the present invention in preventing variation in the electrostatic field.

In the operation of capacitance devices and particularly in the operation of capacitance couplers, it has been discovered that variations in weather conditions change the operation of such devices. Heretofore it has been the practice to provide bushing and other insulators with capacitance members for diverting energy from the conductor associated with the insulator.

One such device is shown in Fig. 1 of the drawing in which the numeral 10 designates an electrical conductor which extends through a metallic flange 11 surrounding an opening in the cover 12 of a housing for some form of electrical apparatus, such as a switch or transformer. The conductor 10 is insulated from the flange 11 by a bushing insulator comprising an upper cone or shell 13 and a lower shell or dome 14. An expansion chamber 15 is mounted on the upper end of the cone 13 and a terminal member 16 engages the lower end of the dome 14. The conductor 10 is connected to the terminal 16 and is

provided with a ring nut 17 screwed on the upper end of the conductor and bearing on the ring 18 which engages a helical spring 19 resting on the base 20 of the expansion chamber 15. By this arrangement, the conductor is insulated from the flange 11 and the two shell members are held together by means of the conductor and spring 17 and pressed against gaskets 21 and 22 which engage the flange 11.

Supplemental dielectric tubes 23 and 24 surround the conductor 10 and are supported from the terminal 16 by a collar 25 and cement 26. An outer dielectric tube or keg 27 surrounds the tube 24 and is supported by an extension 28 on the flange 11 to which the keg is secured by cement 29. The outer surface of the keg 27 is covered by a metallic coating 30 which terminates at each end in pockets 31 and 32 formed by flanges 33 and 34 respectively on the outer surface of the keg. The metallic coating 30 is provided with a spring contact 35 which engages a terminal 36 on a conductor 37, passing through an outlet bushing 38 into a flexible casing 39 through which the conductor 37 is led to apparatus to be supplied with energy from the conductor 10 through the capacitance coupling formed by the capacitance member 30. Various forms of apparatus may be supplied with energy in this way.

In the drawing a transformer 38 is shown for connecting the conductor 37 to a voltmeter 39. A resistance 40 is illustrated for adjusting the apparatus. An arcing gap 41 is shown for limiting the voltage to be applied to the transformer 38. It will be understood, of course, that various devices other than that illustrated may be supplied with energy through the capacitance coupler. An insulated flux control 42 surrounds the keg 27 above the upper extremity of the extension 28 on the flange 11. This control may be similar to that described in my prior Patent No. 1,972,590.

The effect of the extension 28 and flux control 42 upon the operation of the capacitance coupler will be understood from Figs. 2, 3 and 4. In Fig. 2 the insulating cone 13 and dome 14 are represented by broken lines; the two insulator members bearing on the supporting flange 43 having a ground sleeve extension 44. The capacitance member 45 extends beyond the flange 43 and ground sleeve extension 44 as has heretofore been the practice. The electrostatic field is represented by lines drawn from the conductor 10 to the capacitance member 45 and to the grounded members 43 and 44. With the construction illus-

trated in Fig. 2, many of the lines of force from the portions of the conductor extending beyond the capacitance member 42 will extend to the capacitance member adjacent its ends. Other lines of force further out along the conductor will extend directly to the grounded flange and sleeve. The distribution of the electrostatic field, when the insulating members 13 and 14 are dry, will be approximately that illustrated in Fig. 2. The lower end of the bushing is usually enclosed in a housing so that it is not subject to the weather, but the upper end is frequently exposed and during rain or snow a portion of the cone 13 may be covered with moisture, as shown by the solid line 46. When this occurs, the wet outer surface of the cone becomes a conductor and forms a continuation of the grounded flange 43 so that the lines of force from the upper end of the conductor 10, instead of terminating in the capacitance member 45, will be diverted to the wet surface of the cone 13, as illustrated in Fig. 3. This diversion of the electrostatic lines of force will of course change the capacitance of the coupling formed by the conductor 10 and capacitance member 45 so that for a given voltage on the conductor 10, less energy will be diverted when the insulator is wet than when it is dry.

If the tap 47 is connected with a voltmeter, for instance, this will produce an error in the reading if the connection is calibrated for dry conditions. To avoid this error, the arrangement shown in Figs. 1 and 4 is employed in which a grounded extension is carried inside of the bushing and disposed beyond the end of the capacitance member. This grounded extension comprises the members 28 and 42 in Fig. 1 of the drawing and is illustrated diagrammatically at 48 in Fig. 4 of the drawing. It will be seen from Fig. 4 of the drawing that the electrostatic field, which is affected by the weather conditions, is permanently diverted from the electrostatic coupler 49 which terminates below the extremity of the grounded flange.

In Fig. 1, no provision is made for diverting the lines of force from the lower end of the conductor 10 away from the capacitance member 30 because where the lower end of the bushing is

enclosed in the housing, it is of course not subject to weather changes. In the case of wall or other bushings where both ends of the bushing may be subject to conditions producing a variable field, corrective means like that shown at one side only of the supporting flange in Fig. 1 may be applied at both sides of the flange.

I claim:

1. The combination with a bushing insulator having a conductor extending therethrough, of a grounded fitting for said bushing insulator, a capacitance coupler comprising a capacitance sleeve surrounding said conductor, a portion of said conductor extending beyond said sleeve, and a grounded flux control sleeve disposed within said bushing insulator beyond the end of said capacitance sleeve but adjacent thereto and having its inner surface of substantially the same diameter as the inner surface of said capacitance sleeve, said inner surfaces being arranged in registration with each other, said flux control sleeve being interposed between said bushing insulator and said conductor for diverting, from said capacitance sleeve, lines of force emanating from a portion of said conductor extending beyond but adjacent to the end of said capacitance sleeve.

2. The combination with a conductor of a grounded support for said conductor having an opening through which said conductor extends, a bushing insulator for supporting said conductor in said opening and for insulating said conductor from said support, a capacitance coupler for diverting energy from said conductor and comprising a capacitance sleeve surrounding said conductor, a portion of said conductor projecting from said capacitance sleeve beyond said grounded support, and a grounded flux control sleeve of substantially the same inner diameter as said capacitance sleeve and disposed beyond but closely adjacent the end of said capacitance sleeve and registering with the end of said capacitance sleeve for diverting, from said capacitance sleeve, electrostatic lines of force emanating from a portion of said conductor adjacent to but extending beyond said capacitance sleeve.

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