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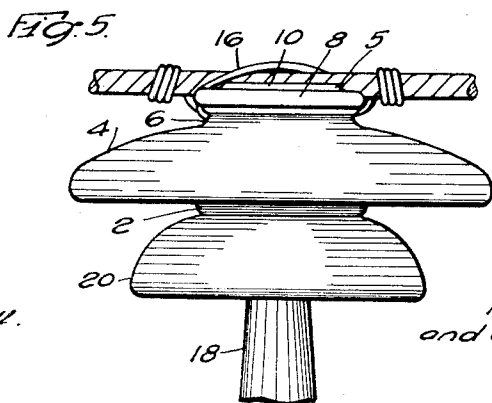
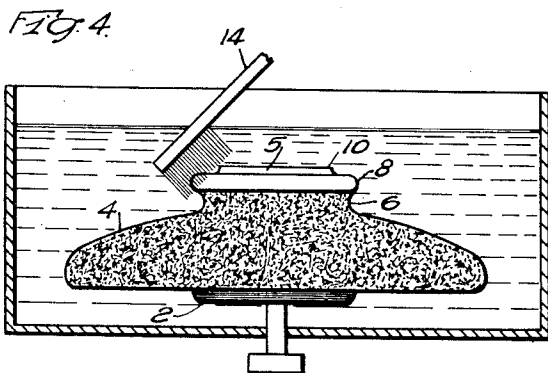
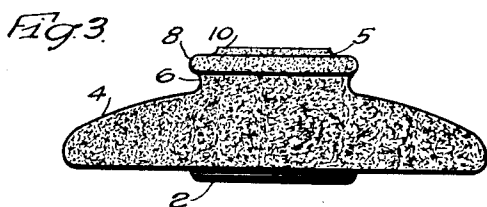
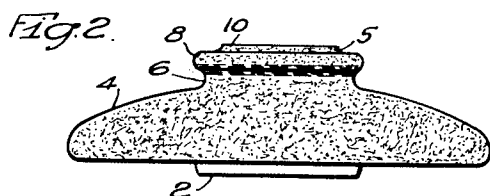
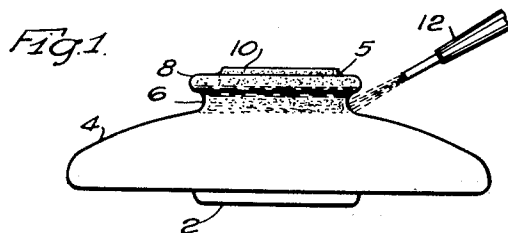
M. H. HUNT ET AL

1,987,683

INSULATOR

Filed July 3, 1931

2 Sheets-Sheet 1



WITNESSES.

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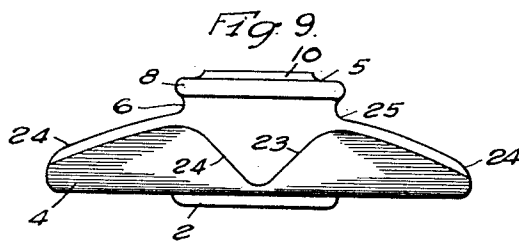
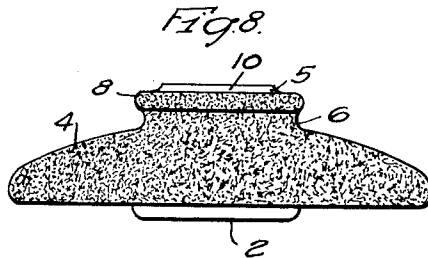
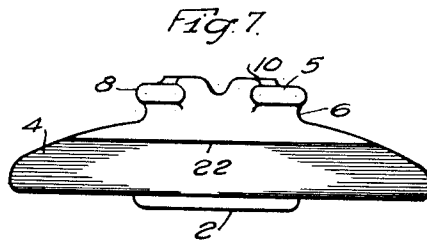
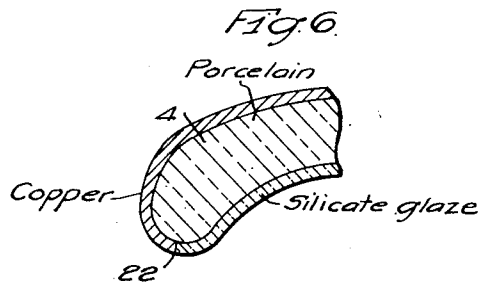
M. H. HUNT ET AL

1,987,683

INSULATOR

Filed July 3, 1931

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,987,683

INSULATOR

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Application July 3, 1931, Serial No. 548,588

3 Claims. (Cl. 91-70.1)

Our invention relates to electrical insulators and particularly to means for reducing electrostatic discharges thereon.

An object of our invention is to prevent radio interference and to overcome other objectionable results normally caused by electrostatic discharges between the electrodes or terminals and the dielectric bodies of insulators.

Another object of our invention is to facilitate the coating of dielectric bodies with conducting and semi-conducting materials, such as metals and the oxides thereof.

Another object of our invention is to provide an insulator that shall be simple and durable in construction, economical to manufacture and effective in its operation.

In high-voltage transmission-line practice, electrostatic discharges occur between the metal and the dielectric parts of insulators, as between the metal cap or pin and the porcelain body of an insulator of one type and between the tie-wire or cable and the dielectric body of an insulator of another type. These discharges cause interference with radio reception.

To overcome this objection, it has been suggested to modify the surface resistance of the insulators by coating the surfaces in various ways, but porcelain, the most extensively used dielectric material, resists to a high degree the provision of a simple, economical and permanent metallic or conducting coat.

Various suggestions have been made, including the suggestions of coating the porcelain with metallic glaze, an electrolytically-deposited film, a solder coat, a sprayed coat over a smooth or roughened surface, carbon particles rubbed into the porcelain and various other expedients.

While each of the prior suggestions may be made to operate successfully, the questions of cost and durability have not been solved in a satisfactory manner.

The metallic glaze requires separate firing and, to be highly successful, must also be placed over silicate glaze. This procedure is warranted in many applications, however, because a metal coat has other uses, besides reducing radio interference; the metallic-glaze coat adhering to the porcelain with the highest degree of tenacity of any of which we are aware.

When metallic glaze, in the raw state, is placed over bare porcelain, or, in other words, over fired porcelain which has not been coated with silicate glaze, it is absorbed by the porous porcelain.

An electrolytically-deposited coat requires a conducting under coat, as of carbon or metallic

glaze, and thereby occasions undue labor and expense.

A solder coat also, requires an under coat or flux to adhere with any satisfactory degree of tenacity; a sprayed-on coat of solder, copper, or any other material of which we are aware not being highly satisfactory or permanent. Such coats are subject to peeling from the porcelain surface.

Where a sanded under surface is provided, a sprayed copper or other coat adheres better but even this structure has not taken a place amongst the recognized successful articles of the art, is expensive and is not of the simple, economical and permanent character of my invention.

A coat made by rubbing carbon particles into a porcelain surface is more or less uncertain and irregular in character, is not solid like a sheet of metal, is limited in its application and has other undesirable qualities.

Other suggestions require special kilns and heating operations, and are objectionable.

It is our aim to provide a permanent and desirable coat for a porcelain insulator that shall be reduced to substantially the minimum of cost and manufacturing difficulty or, in effect, become almost as simple in application as a coat of paint, but which shall be substantially as permanent as a silicate or metallic-glaze coat and be very strong. In this aspect, it is not only as good for preventing radio interference as any suggestion of which we are aware, but it more nearly approaches metallic glaze in tensile strength or adherence to the porcelain than any other coat of which we are aware.

Figure 1, of the accompanying drawings, is a view, in elevation, of the top unit of a multi-part insulator of the pin type, showing diagrammatically how the unit may be spray-coated while rotating,

Figs. 2, 3, 4 and 5 are similar views of the unit at successive stages of production,

Fig. 6 is an enlarged, detail view, in section, of a fragment of the unit shown in the other figures, and

Figs. 7, 8 and 9 are views, similar to Fig. 1, of modified forms of our invention.

Referring to Fig. 1, the insulator, which is a preferred embodiment of the invention but illustrative of only one of several embodiments, comprises a body portion 2, a petticoat or surface-creepage flange 4, a head 5 including a tie-wire groove 6, a bead or flange 8 and a portion 10 through which extends a cable-receiving groove 55

or channel at right angles to the structure, as viewed in the drawings.

As illustrated in Fig. 1, the insulator is in a state just previous to firing and, being of porcelain, is of a substantially light buff or cream color before being coated, as by dipping or by the use of a spray gun 12. In the condition indicated, the insulator is of a relatively hard, chalky consistency having a smooth surface. Being a solid of revolution, a preferred method of coating is to rotate the insulator, while operating the spray gun, to ensure an evenly distributed coat.

A preferred spraying material, indicated as having been partially deposited on the insulator of Fig. 1 at the top thereof, is of a light-slate gray color and comprises water, copper oxide and a substantial quantity of inert filler material, such as calcined zinc oxide, red oxide of iron, china clay, and the like.

The fluid composition may comprise one or more of the inert materials, in proportions of from ten to eighty per cent of the solids. The inert materials are provided to give body or viscosity to the resulting mixture, so that it will be deposited in a uniform layer and be self-supporting while drying, and not run by gravity to form overlaps, waves or beads.

A preferred coating liquid comprises, as its solid constituents, forty to fifty per cent copper oxide and sixty to fifty per cent zinc oxide, with enough water to allow the liquid to wet the porcelain and firmly adhere thereto.

Fig. 2 shows the unfired insulator, with the parts 4, 6, 8 and 10 covered with the slate-gray coating material and the part 2 of its natural porcelain color. The part 2 and underside of the petticoat 4 are next coated with silicate glaze (not shown), after which the insulator is placed in a kiln and fired, in a usual manner, to vitrify the porcelain.

Fig. 3 shows the insulator, after it has been fired, with the slate-gray coating turned to a dull deep black and the silicate glaze, which was, originally gray, turned to a mahogany brown or any other selected color, depending upon the constituents used.

The microscopic action occurring during the kiln firing is not exactly known but, in any event, the resultant structure is a usual porcelain insulator, with an oxide coating on it which, when reduced to metal, requires several thousand pounds tension per square inch to dislodge it.

Particles of the porcelain, the copper oxide and the inert filler become thoroughly mixed and vitrified together in a homogeneous solid mass to a substantial depth in the insulator surface, with particles of the oxide constituting an outer stratum of substantial thickness and so homogeneously united as to provide a continuous or fluid-impervious film.

The black copper oxide covering, as indicated in Fig. 3, may be reduced to a brilliant copper coat that appears to be an integral part of the insulator.

As indicated in Fig. 4, a preferred method of reducing the copper film from the oxide coat, is to place the insulator in an acid bath including nascent hydrogen caused by the addition of powdered zinc; the operation being facilitated by rotating the insulator and rubbing the surface, as by a brush 14. During this operation, which is exceedingly simple, the bright copper layer appears quickly and the insulator is finished.

Fig. 5 illustrates the device as assembled in service between terminals 16 and 18, in the form

of a cable or tie-wire and a pin, respectively; an attempt having been made, by shade lines, to bring out the distinction between the copper plated upper shed 4 and a lower shed 20 that is coated with a usual silicate glaze of mahogany, chocolate or other hue.

In Fig. 6, a section of the shed 4 is illustrated with the upper copper coat and the lower silicate-glaze coat merging at a line 22 which may be any place on the shed.

In Fig. 7, the line 22 extends around the shed at a position between the upper and lower limits thereof.

Ordinarily, where the shed is covered entirely with silicate glaze, electrostatic discharges occur in the intense electrostatic field between the tie-wire or cable and the insulator surface to cause radio interference. This discharge is reduced or eliminated entirely by the metal coat in accordance with its texture, shape and thickness, depending upon the voltage employed; it being feasible to grade and revise the coat in various ways, as by cutting out regular areas of it, by electroplating it, by soldering to it, by oxidizing it, by exposing it to the weather and by other means.

One method of grading the resistance of the coating is to only partially reduce the metal from the oxide. This effect can be produced by applying a paste comprising powdered zinc and strong sodium hydroxide. After remaining on the insulator a certain length of time, the paste may be washed off; the copper being reduced only where the surface was coated, or only partially reduced, depending upon the strength of the paste and the length of time it is allowed to remain on the oxide.

Fig. 8 indicates an insulator coated partially with metallic copper and partially with copper oxide. That is, it has a composite coat of both materials intermingled with each other.

In Fig. 9, a line 23 about the shed 4, marks a division between copper, copper oxide or a mingled coating of both, disposed above the line, and copper oxide or silicate glaze below the line in which case, the resistance of the coating is graded not only in accordance with its thickness and consistency but also, in accordance with its area; the line 23 defining fingers or projections 24 of varying cross-sectional area projecting outwardly from an annular portion 25 of the coating on the flange 4 toward the supporting pin (not shown).

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

We claim as our invention:

1. The method of coating a porcelain body which comprises applying a liquid glaze material including a metallic oxide to a portion of said body in its unfired state, firing said body to vitrify the body and glaze material, applying to a selected portion of said vitrified glaze, when cooled, a paste composed of constituents which react to produce nascent hydrogen which in turn reacts upon the glaze to reduce the metallic oxide.

2. The method of coating a porcelain body comprising covering a portion of an unfired ceramic body with a liquid glaze material containing a metallic oxide and inert filler mixed with water, and covering an adjacent portion of the body with a liquid silicate glaze material, then firing said coated body at a temperature sufficiently high to vitrify the body and glaze materials, and re-

ducing a selected area of the body portion covered by said metallic oxide glaze.

3. The method of applying a graded resistance coating to an insulator comprising applying a
5 liquid glaze material, containing copper oxide and an inert filler, to a portion of the upper surface of the insulator before the latter is fired, and

applying a silicate glaze material to the remainder of the surface, firing said insulator to vitrify it and the glaze materials, and applying a reducing agent to a selected portion of the oxide glaze when the insulator has cooled.

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5