March 29, 1932. R. M. JOHNSTON ET AL 1,851,671

HIGH TENSION INSULATOR

Filed April 8, 1926

FIG. 1.

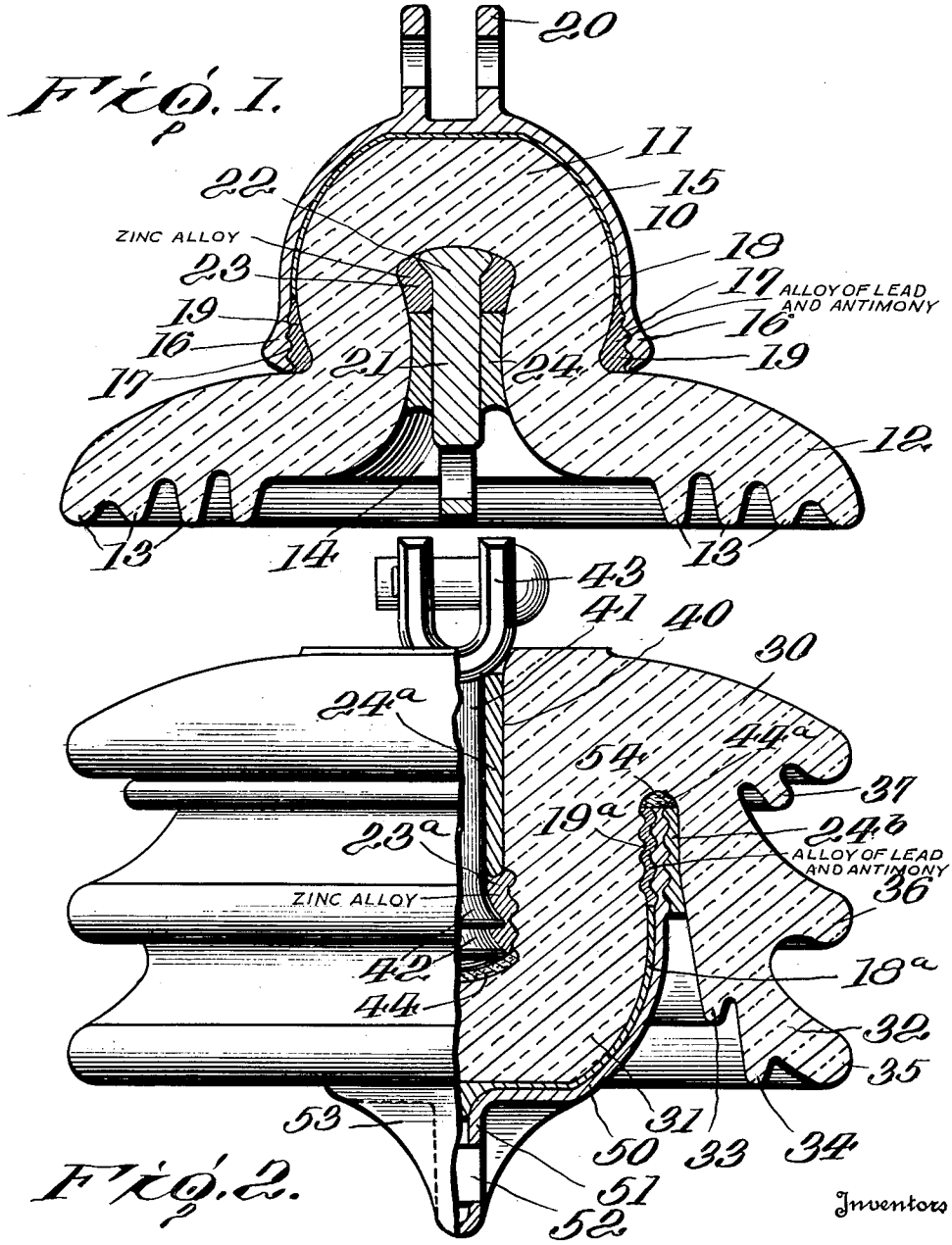

FIG. 2.

Inventors

Robert M. Johnston

Alexander McLachlan

By

Attorney

Patented Mar. 29, 1932

1,851,671

UNITED STATES PATENT OFFICE

ROBERT M. JOHNSTON AND ALEXANDER McLACHLAN, OF HUNTINGTON, WEST VIRGINIA

HIGH TENSION INSULATOR

Application filed April 8, 1926. Serial No. 100,597.

This invention is a high tension insulator of the suspension type.

One of the objects of the invention is to provide a suspension type insulator for high tension strains, and for high unit electric values capable of use on "superpower" high voltage lines. A further object is to provide an insulator of the character mentioned, possessing mechanical strength, and constructed to give a maximum flash-over value for any given diameter of insulator. A further object is to provide an insulator so constructed that arcs are kept away from the hardware and "cascading" from metal to metal is prevented. A further object is to provide an insulator of the type referred to in which the hardware is united to the dielectric body by means of materials which cooperate to prevent cracking of the porcelain due to any excess expansion of the metal suspension pin. A further object is to unite a suspension cap to the dielectric body in such a manner that said cap will back up and reenforce the porcelain, and resist bursting or splitting strains which may be imposed by undue expansion of an embedded metal suspension pin. A further object is to provide an insulator in which the metal and dielectric elements are united by means of metals or metal alloys which may be applied while in a molten state, and to protect the hardware and the metal anchoring materials by means of waterproofing material capable of withstanding the effects of atmospheric moisture, and possessing sufficiently high insulating qualities to effectively reduce corona discharge under electric stress.

In the accompanying drawings:—

Figure 1 is a cross sectional view illustrating an insulator constructed in accordance with the invention. Figure 2 is a side elevation, partly in section, illustrating a modification.

Referring to Figure 1 of the drawings, 10 designates an insulator body constructed of suitable dielectric material, preferably porcelain, provided with a hub-like portion 11, of any desired contour, an approximately spherical shape having been selected for purposes of illustration. The body is also provided with a flange or petticoat 12, having depending annular ribs 13, to increase the leakage and flash-over distances. Said body is also provided with a central chamber 14, open at one end, as shown.

The hub-like portion 11 is enclosed within a correspondingly shaped cap 15, preferably of pressed steel, the internal diameter of said cap being somewhat larger than the external diameter of the hub-like portion 11. The edge or mouth of said cap is flared outwardly as indicated at 16, the inner surface of said flared portion being provided with horizontally disposed annular ribs 17. The space between the cap 15 and the hub portion 11, except in the vicinity of the flared portion 16, is filled, as indicated at 18, with an asphaltum water-proofing material. Interposed between the mouth portion of the cap and the contiguous portion of the dielectric body and interlocking with the ribs 17 is an anchorage 19, consisting preferably of an alloy of lead and antimony, which may be applied while in a molten condition. Said alloy possesses the characteristic that upon cooling it will slightly expand, or at least will not shrink. An alloy of lead with fifteen percent of antimony has practically no shrinkage and a higher percentage of antimony swells on cooling. For this reason, it is preferred to use an alloy consisting of not less than sixteen percent of antimony or more than eighty-four percent of lead. The cap 15 is provided with a clevis 20, by means of which the insulator may be suspended from a suitable support or from another superposed insulator, in a well known manner.

Extending into the chamber 14 is a suspension pin 21, having its inner end enlarged to provide a head 22, the inner end of said

chamber being correspondingly enlarged contiguous to said head. Said pin is retained in the said chamber by means of an anchoring metal 23, preferably zinc or a zinc alloy, capable of being applied while in a molten condition, and possessing the characteristic that it will shrink slightly upon cooling. It is preferred to use for the zinc alloy ordinary commercial spelter which is practically pure zinc except for small impurities which do not affect it for the purposes of the present invention. It will be observed that the anchoring metal extends laterally or radially into the enlarged inner end of the chamber 14 and beneath the lower edge of the head 22, so as to surround a portion of the shank of the pin 21 and firmly retain it in place. Said anchoring metal 23 is covered to a substantial depth by a body of waterproofing material 24, similar to the material 18. The lower end of the pin 21 is shaped to extend between the arms of a clevis 20 of a lower insulator, or to engage a conductor support, in a manner well understood in the art.

Referring to Figure 2 of the drawings, 30 designates an insulator body preferably constructed of porcelain, and provided with a central depending portion 31, of approximately spherical shape. The body 30 is also provided with a petticoat 32, of substantial depth, extending down and enclosing the depending portion 31. If desired the flash-over and leakage distances of the insulator may be greatly increased by providing the petticoat with annular ribs 33, 34, 35, 36 and 37, as shown.

The body 30 is provided with a central recess or aperture 40, extending inwardly from the top to receive the shank 41 of a clevis pin enlarged at its lower end as indicated at 42, and provided at its upper end with a clevis 43. Interposed between the inner end of the pin and the adjacent surface of the dielectric material is a body 44 of cushioning material, located in the bottom of the recess. Said pin is secured in position by means of an anchoring material 23^a, preferably an alloy of zinc or pure zinc, similar to the anchorage metal 23 of Figure 1, the surrounding portion of the wall of the aperture 40 having annular anchoring ribs, as shown. The exposed portion of the alloy 23^a is covered by a body 24^a of water proofing material of substantial depth similar to the material 24 of Figure 1.

The approximately spherical portion 31 of the insulator body is enclosed within a correspondingly shaped cap 50 of metal, such as pressed steel, said cap being shaped to provide a centrally disposed coupling tongue 51, having an opening 52 for the clevis bolt carried by the clevis 43 of an adjacent insulator unit. Said tongue is stiffened by suitable webs 53. The open edge of the cap 50 extends into the narrow recess formed between the body portion 31 and the petticoat 32 and covers the body portion 31. Said cap is united to the body 31 by means of a body of alloy material indicates at 19^a, having the same characteristics as the alloy 19 of Figure 1.

Extending from the edge of the cap, and between said edge and the end of the recess 54 is a body of elastic cushioning material 44^a, similar to that previously described Said elastic material is covered by a body 24^b of water-proofing material similar to that already described, and a layer 18^a of similar water-proofing material is also introduced between the cap 50 and the body portion 31, extending downwardly from the alloy 23^b. The wall of the cap adjacent its mouth is provided with internal annular ribs, as shown.

The advantages of the invention will be readily understood by those skilled in the art to which it belongs. It will be noted that the same provides a suspension type insulator for high tension strains, and for high unit electric values, such as is required for high voltage lines of the super-power type. An important advantage is that the high mechanical strength permits heavy conductors to be strung under high tension and without double yoking i. e. two strings yoked in parallel.

Very important advantages are gained by the use of the anchoring materials which may be applied while in a molten state and possessing the described characteristics relative to shrinkage upon cooling. For instance, it is well known that the compressive strength of porcelain is much greater than its tensile or bursting strength, due to the nature of porcelain and the shapes employed. Therefore, an expanding alloy between the cap and the porcelain places a stress upon the cap which will prevent bursting of the porcelain under the expected conditions of service. At the same time a shrinking alloy between the pin and the porcelain provides a relief against bursting stress due to expansion of the metal pin by heat. Therefore, the employment of a material 23 which will shrink slightly upon cooling, will prevent cracking of the porcelain due to any strains set up by an excessive expansion of the metal pin 24 at the high temperatures frequently encountered in service, because said material 23 will act as a cushion and take up said strains before they can have any destructive effect upon the porcelain. By employing an anchoring material for the cap, which material has the characteristic that it will swell slightly upon cooling, a tension between the cap and the porcelain is assured, which will back up and reenforce the porcelain to such extent that it will resist the bursting or splitting strains normally im-

posed by the enlarged head of the pin 21. The use of the water proofing material serves to seal all holes through which the molten material is poured and fills all of the air spaces so as to prevent corona discharge under electric stress. At the same time the hardware is also well protected from water and corrosion.

Having thus explained the nature of the invention and described an operative manner of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the forms of its use, what is claimed is:—

1. An insulator of the character described comprising a body of dielectric material having a hub portion and an internal chamber extending centrally into said hub portion, a metal cap complemental to said hub portion, a compensator interposed between the edge of said cap and said hub-like portion, said compensator consisting of a metal capable of expanding after being placed in position, a pin having a portion extended into said chamber, a compensator for excessive expansion of said pin, said compensator consisting of a metal anchoring material located within said chamber and surrounding the adjacent end portion of said pin, said last mentioned metal possessing the characteristic of shrinking after being placed in position.

2. An insulator of the character described comprising a body of dielectric material having a hub-like portion and an internal chamber, a metal cap complemental to said hub-like portion, a compensator interposed between the edge of said cap and the adjacent surface of said hub-like portion, said compensator consisting of an alloy of lead and antimony capable of being applied while in a molten condition, and capable of expanding upon cooling a pin having an end extended into said chamber, a compensator for excessive expansion of said pin, said compensator consisting of zinc capable of being applied in a molten condition, said zinc substantially filling the cross section of the closed end of said chamber and engaging the end of said pin.

3. An insulator of the character described comprising a body of dielectric material having a hub-like portion of approximately spherical shape and a petticoat flange, said body of dielectric material being provided with an axially disposed chamber, a cap having an edge resting on said flange, said cap being thickened adjacent to said edge, a compensator interposed between said edge and the adjacent surface of said spherical portion, said compensator consisting of a metal capable of expanding after being placed in position, a filling of water proof material interposed between the cap and the hub-like portion above the first mentioned compensator, a pin inserted in said chamber, a compensator for excessive expansion of said pin, said compensator consisting of a metal anchoring material located within said chamber and engaging said pin, said metal possessing the characteristic of shrinking after being placed in position, and a filling of water proof material within said chamber and covering the compensator located in the chamber.

In testimony whereof we have hereunto set our hands.

ROBERT M. JOHNSTON.
ALEXANDER McLACHLAN.