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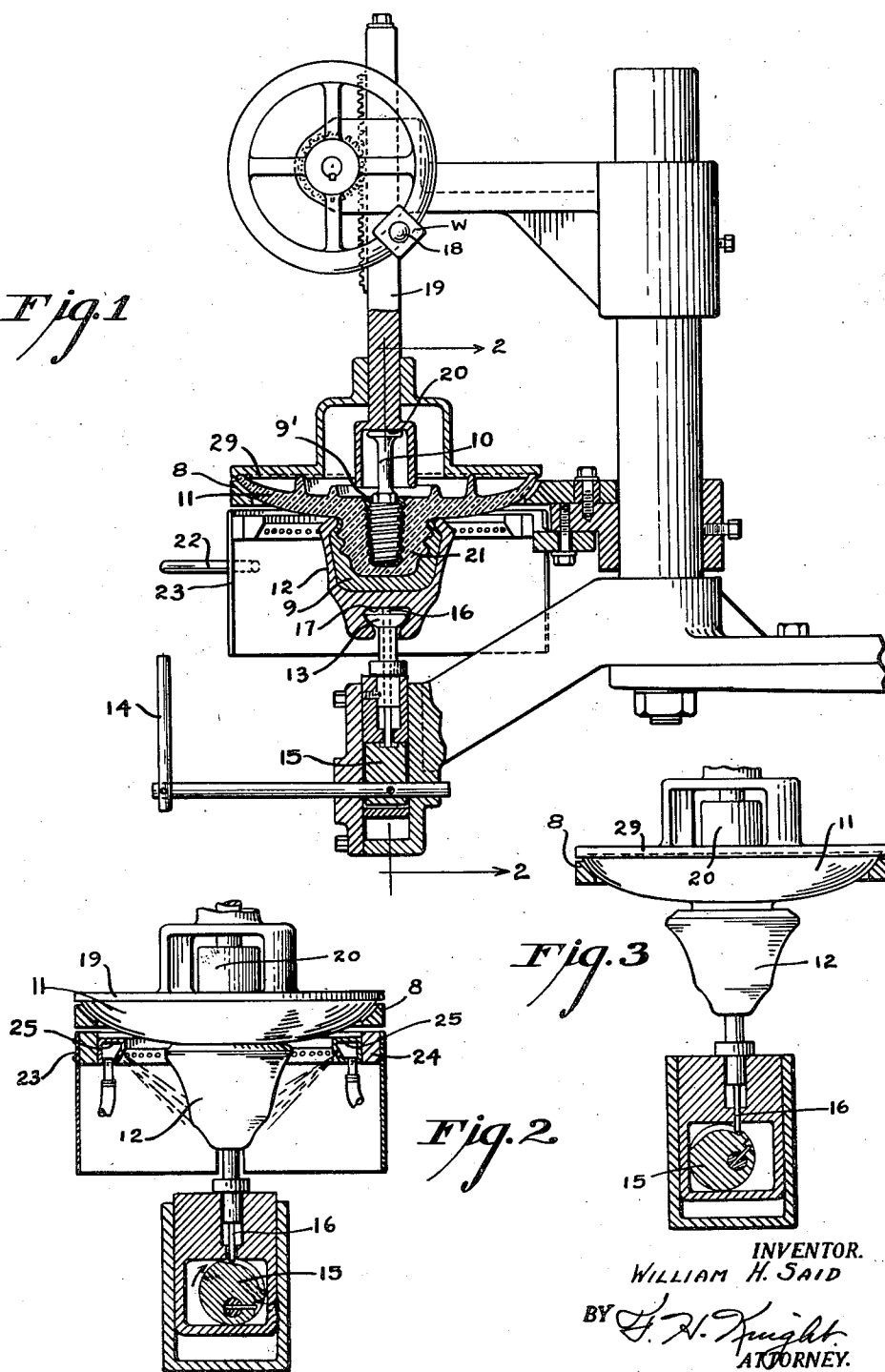
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METHOD OF ASSEMBLING INSULATORS

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Fig. 1



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METHOD OF ASSEMBLING INSULATORS

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This invention relates to electrical insulators of the type commonly referred to as suspension insulators, and it has as the principal object to increase the strength thereof.

Another object is to produce suspension insulators of high strengths in which the dielectric members are of glass.

A further object is to decrease the cost of manufacture of suspension insulators.

The above and other objects may be realized by practicing my invention which embodies among its features filling molten alloy into the spaces between the assembled metal and dielectric parts of the insulator and rapidly freezing the alloy in such manner that voids which form during cooling will be allocated to regions within the alloy remote the areas of attachment to the metal cap member.

Prior attempts to improve the strength of suspension insulators have, so far as I am aware, been directed primarily toward improvement of design features.

It is well known that the strength of a string of insulator assemblies is only as strong as the weakest insulator in the string. The greater the axial load applied, the greater will be the probability that one of the assemblies will fail under conditions met with in service. It is important therefore that each individual unit from which such an assembly is constructed and that the materials by which such units are joined have high strength.

The method by which I accomplish the objects of my invention are most conveniently carried out by use of apparatus such as illustrated in the accompanying drawing arranged near a convention form of kiln (not shown) wherein the dielectric and metal parts are heated to above the melting temperature of an alloy used to affix them to each other.

In the accompanying drawing Fig. 1 is an elevational view, partly in section, of one head assembly of a multihead insulator assembling machine having an assembled insulator therein, shown in section.

Fig. 2 is a sectional view on lines 2—2 of Fig. 1, but showing the insulator in full.

Fig. 3 is an elevational view, partly in section, showing certain parts of the insulator just before they are brought into final position with respect to one another.

The method by which I prefer to carry out the assembling operation is to employ two operators working together and which I will hereinafter refer to as operators "A" and "B." Op-

erator A withdraws a dielectric member such as 11 and a metal cap member such as 12 from the kiln, places the dielectric member in an inverted position on a suitable fixture (not shown) and the cap member on the fixture head 13 at which time the top of an associated rod 16 of the machine is flush with the top of head 13. In the meantime, operator B ladles a quantity of the molten alloy from a suitable container (not shown) and pours part of it into the pinhole cavity of member 11 and a suitable quantity of the alloy into the cap 12. The alloy is designated in the drawing by the numerals 9 and 9'. While operator B is thus occupied, operator A withdraws a pin from the kiln and by use of asbestos gloves threads the pin, identified in the drawing by the numeral 10, into the pinhole cavity and immediately thereafter transfers the assembly onto a support 8 of the machine with the insulator head 21 projected part way into the cap 12, which is the relationship of the parts as shown in Fig. 3. The operator A, by means of a crank 18 and an associated rack and pinion, now lowers a shaft 19 having a pin aligning fixture 20 formed on its lower end and having a dielectric leveling plate 29 resting on the fixture. In the lowering of the shaft, leveling plate 29 engages the bottom skirt surfaces of the insulator and transfers its weight from fixture 20 to the insulator. Upon a slight further downward movement of the shaft 19 it is stopped by the engagement of the fixture 20 with pin 10. A weight W associated with crank 18 causes downward pressure to be thereafter maintained on the pin 10 to hold it in position during the subsequent operation. At this time the dielectric part 11 is still resting on the support 8, as shown in Fig. 3. By means of a handle 14, operator A now rotates a cam 15 clockwise, causing it to travel from the position illustrated in Fig. 3 to that shown in Figs. 1 and 2. During the initial portion of the rotation of the cam, it slowly raises the fixture head 13 and with it the cap 12 from the position it is shown in in Fig. 3 until it engages the dielectric part 11 during which time any alloy in excess of that required is forced out between the top of the cap and part 11. As rotation of cam 15 to the full alternative position occurs, the cam forces the rod 16 against surface 17 of the cap, thereby forcing the cap upward until the spherical surface of cap 12 adjoining the lower spherical surface of fixture head 13 are in perfect register, as illustrated in Fig. 1, thereby bringing the cap 12 in definite axial alignment with pin 10. Since

the latter raising movement of cap 12 occurs after the cap has engaged part 11, such part is at the same time lifted from engagement with support 8, as illustrated in Figs. 1 and 2, thereby enabling the plate 29 to, by its shear weight, bring part 11 into proper alignment with its cap and pin. Operator A, by means of suitable handles such as 22, now closes a hinged chilling unit, comprises parts 23 and 24, about the cap 12. The closure of the unit about the cap in manner not shown opens a valve controlling the supply of chilling fluid to apertures of chambers 25 of the unit to direct chilling fluid against the walls of cap 12. Although excellent results have been obtained by directing the fluid generally to the entire side wall of the cap, I prefer to direct it primarily to the area adjacent the bottom of the cap cavity as shown. The time required to freeze the alloy, including that between the pin and dielectric by extraction of heat through the dielectric, is but a fraction of a minute, after which the insulator may be removed from the assembly. It is more convenient, however, to employ a multihead machine, such as is in part shown, in which the heads rotate about a common center, because this enables the attendant closing the chilling head about an assembly to make another head of the machine available to him by a slight rotation of the machine. Also, while the attendant A is performing the various foregoing operations, operator B can conveniently be removing a chilled insulator assembly from another head of the machine.

The rapid chilling which is impressed upon the cap, in the manner above described, causes all voids which form within the alloy during cooling to be confined within the interior regions of the alloy and relatively remote the rim portion of the cap where greatest service load stresses are encountered, with the result that the assembly so formed will be of improved strength over like assemblies which have not been so thermally conditioned.

Tests conducted by me have shown that the method of assembling suspension insulators with the means and in the manner herein described has increased the strength of the insulators up to an average of 33% greater than that possessed by like insulators which have not been so thermally conditioned.

For the purpose of my invention I prefer to bond the parts of a suspension insulator in their designed relation with an inexpensive alloy which melts at greatly reduced temperatures in comparison with most metals. A typical alloy preferred by me comprises 2% tin, 13% antimony, and 85% lead, which is the eutectic mixture of these metals and consequently has the lowest melting point of any mixture of these elements.

A further desirable property of this type of alloy is that it expands slightly upon freezing, which additionally contributes to producing a strong union between the inner surface of the cap and the exterior surface of the dielectric member.

I claim:

1. The method of assembling the respective parts of an electric insulator by use of a suitable alloy, which includes heating the parts to a temperature above that of the alloy in a molten state, filling the space between the parts with molten alloy and spraying a chilling medium

against one of the parts to rapidly bring the alloy to a solid state.

2. The method of connecting parts of an electric insulator of the strain type, involving heating the parts to a temperature above the melting temperature of an alloy used to connect the parts, filling the space between the parts with such molten alloy and directing streams of chilling fluid against surfaces of one of such parts to rapidly chill the alloy to a solid state.

3. The method of attaching a metal cap to the dielectric of a suspension insulator by means of a suitable alloy, which includes heating the metal cap and dielectric to a temperature above that of the alloy in a molten state, filling the space between the cap and dielectric with molten alloy and rapidly chilling the alloy to a solid state by direction of a spray of chilling fluid against the exterior surface of the metal cap.

4. The method of attaching the metal cap over the dielectric head of a suspension insulator by means of an alloy, which includes heating the cap and head to a temperature above that of the alloy in a molten state, supporting the cap in an inverted position to that in normal use, pouring a quantity of molten alloy therein, inserting the head into the cap and holding it centrally oriented therein while rapidly chilling the alloy to the solid state by spraying a chilling medium against the outer surfaces of the cap.

5. The method of attaching the metal cap part over the dielectric head part of a suspension insulator and the pin in the pinhole cavity in the head part by means of an alloy, which includes heating the respective parts to a temperature above the temperature of the alloy in a molten state, supporting the cap and dielectric parts in position to each receive a quantity of molten alloy and pouring molten alloy therein, threading a pin into the pinhole cavity, removing the dielectric part from its support and introducing it into the cap, holding the parts in juxtaposed relation and rapidly chilling them to the solidifying temperature of the alloy by directing a spray of chilling fluid against the exterior surface of the metal cap.

6. The method of assembling a suspension insulator of the type including a dielectric member having a head with a metallic cap fixed thereon, which includes heating the dielectric and cap members to a temperature above the melting temperature of a molten alloy employed to anchor the dielectric member to the cap, placing the cap in an inverted position, pouring a quantity of the molten alloy therein, introducing the head of the dielectric member in the cap and applying a spray of liquid chilling medium to the cap to rapidly convert the alloy into the solid state.

7. The method of assembling the parts of an electrical insulator comprising a dielectric member having a head with a pinhole therein, a metal cap adapted to be affixed upon the head and a metal pin adapted to be retained in the pinhole, which includes preheating the parts to above the melting temperature of an alloy employed to affix them to one another, introducing a suitable quantity of the molten alloy into the metal cap and into the pinhole, engaging the cap upon the head and the pin within the pinhole while the alloy is still in a molten state, and spraying a chilling fluid against the exposed surface of the cap immediately adjacent the bottom of the cap cavity thereof until the alloy is cooled to a solid state.

8. The method of assembling the respective parts of an electrical insulator composed of metallic and dielectric parts, which includes heating the parts to above the melting temperature of an alloy employed to affix the parts to one another, introducing a suitable quantity of alloy in a molten state into a cavity of one of the parts while such part is still of a temperature above the melting temperature of the alloy, projecting 5 another of the parts while still at a temperature above the melting temperature of the alloy down into the molten alloy within the cavity and thus forcing the level of the alloy therein to rise in the surrounding space within the cavity, and spraying a chilling fluid against an exposed surface of one of the parts until the alloy is cooled to a solid state.

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