A. O. AUSTIN.

INSULATOR.

APPLICATION FILED MAY 29, 1916.

1,284,976.

Patented Nov. 19, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

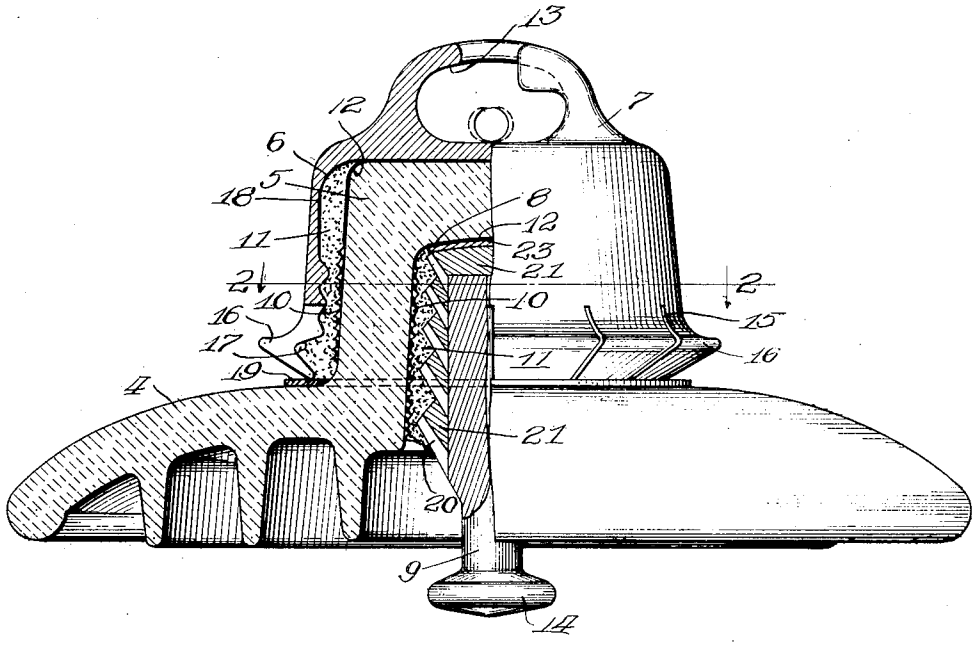


Fig. 2.

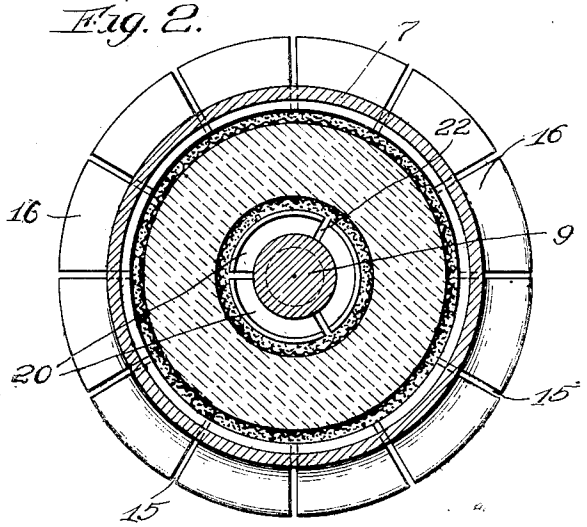
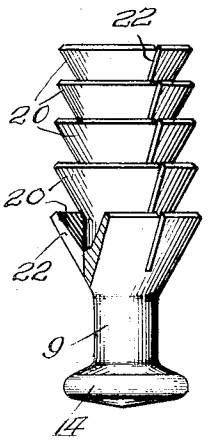


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

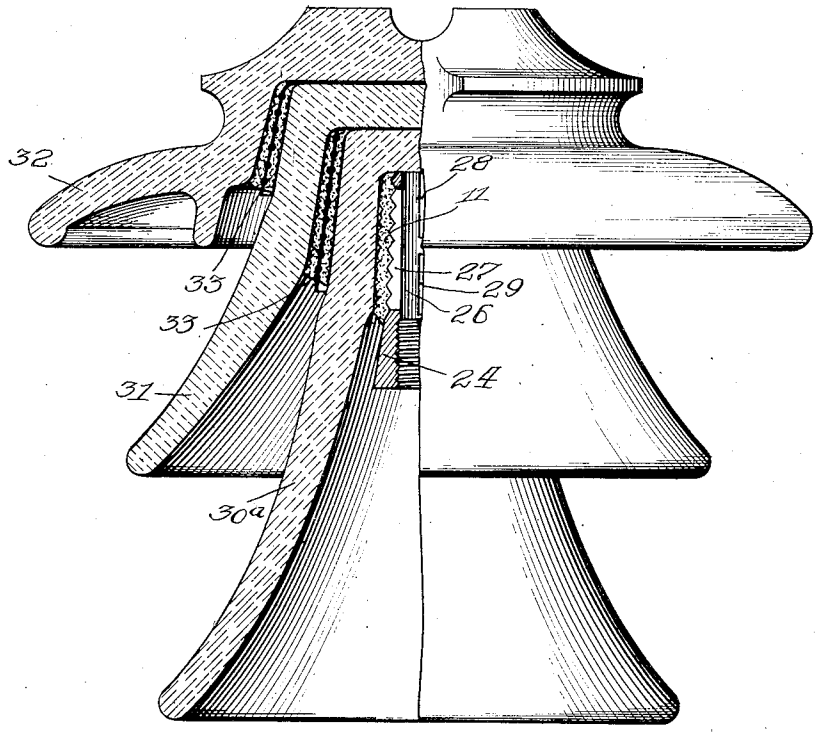


Fig. 5.

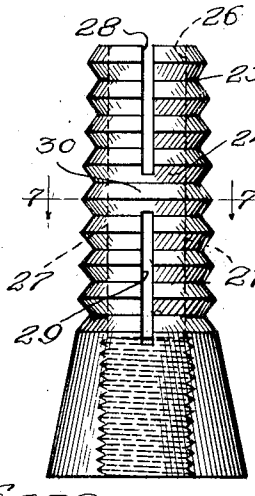


Fig. 8.

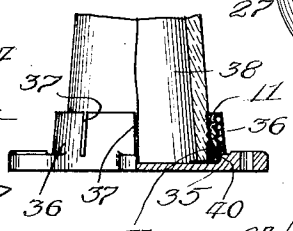


Fig. 6.

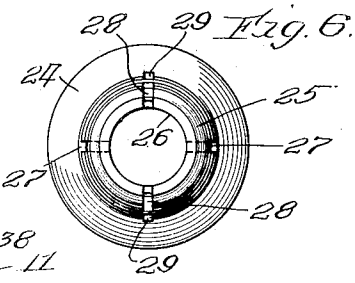
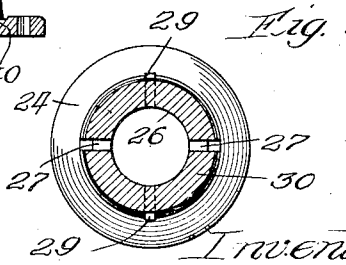


Fig. 7.



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UNITED STATES PATENT OFFICE.

ARTHUR O. AUSTIN, OF BARBERTON, OHIO, ASSIGNOR TO THE OHIO BRASS COMPANY, OF MANSFIELD, OHIO, A CORPORATION OF NEW JERSEY.

INSULATOR.

1,284,976. Specification of Letters Patent. Patented Nov. 19, 1918.

Application filed May 29, 1916. Serial No. 100,483.

To all whom it may concern:

Be it known that I, ARTHUR O. AUSTIN, a citizen of the United States, residing at Barberton, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Insulators, of which the following is a specification.

This invention relates to insulators which are supported by a metal cap or pin, the insulating member being of porcelain, glass or some similar material of which the coefficient of expansion is different than that of the metal supporting part.

The principal object of the invention is to provide a new and improved construction, combination and arrangement of parts by which any stress or strain due to the unequal expansion or contraction of the insulator parts may be relieved without breaking the insulating member or causing an actual separation of the insulator parts.

In the accompanying drawings, Figure 1 is a view, partly in elevation and partly in section, of an insulator constructed in accordance with the principles of my invention; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is an elevation of a suspending pin; Fig. 4 is a view, partly in elevation and partly in section, of a pin type insulator embodying the invention; Fig. 5 is an elevation of the pin shown in Fig. 4; Fig. 6 is a top view of the pin; Fig. 7 is a sectional view taken on the line 7—7 of Fig. 5, and Fig. 8 is a detail of a post type insulator embodying this invention.

It has been found in insulator practice that due to the greater coefficient of expansion of metal and cement over that of porcelain, glass or other insulating materials, very severe stresses may be set up in the insulator due to changes in temperature. These stresses may be so great as to cause the insulating member to become cracked or seriously damaged so that it will fail electrically or mechanically. If the insulator operates at a lower temperature than that at which it was assembled, surrounding metal parts will contract and set up stresses in the insulating member, or the expansion of an internal member due to a rise in temperature will tend to burst the insulating member.

If the stress in the insulating member is distributed over considerable area the maximum will be less and danger of cracking from stresses set up in the member will be greatly lessened. In order to distribute these stresses the edge of a surrounding metal cap is slotted, or the section made exceedingly thin at a number of points to give it elasticity. When the edge of the surrounding member is slotted the tongues formed thereby act as beams supported at one end and will yield under a much less force than where the edge of this member is in continuous and connected form. In practice there are many ways of producing supporting members, such as coring out the slotted portions or machining them after the supporting member is formed or making the member in several parts having projecting tongues which are then held together at the upper or connected ends by a cylindrical or conical portion.

As shown in Fig. 1 the numeral 4 designates generally an insulating member composed of porcelain, glass or some suitable insulating material. This member is formed with a projecting flange or petticoat and a hub or boss 5 adapted to be inserted in a cup-shaped recess 6 of a metal supporting cap 7. The inside of the boss 5 is formed with a recess 8 in which a metal suspending pin 9 is inserted.

The inner and outer side surfaces of the boss 5 are preferably formed with rough or uneven projections 10 which form a more firm anchoring engagement for cement 11 by which the insulating member is connected to the cap and the pin These uneven projections 10 are preferably coated with an elastic or yielding substance 12 which fills or partially fills the space between the projections at their bases, leaving the outer extremities of the projections uncoated or thinly coated for a more permanent engagement with the cement. This coating 12 may also be extended over the outer end of the boss 5 and at the bottom of recess 8, as clearly shown in Fig. 1.

At the top of the supporting cap 7 is a suspending notch 13 of usual form and construction adapted to be engaged by a head 14 of the suspension pin 9 so that a number of insulators can be connected in series. The depending side of the cap 7 or the edge of the cup-shaped recess which is inserted over the boss of the insulator is formed with a plurality of slots 15 extending from the edge of the cap. These slots are sufficiently close together and are of sufficient depth to form

yielding tongues of metal. The lower edge of the cap may be straight or it may be formed with an angular projection 16 in which there is an internal annular groove 17 for providing a material and sufficient anchorage for the cement 11. Adjacent that portion of the cap 7 where the cup portion joins the suspension portion of the cap the metal is preferably made thinner, as indicated at 18 in Fig. 1, so that if the insulator tends to burst or explode it will blow out at the thinnest portion of the cap without actually severing the connection between the lower edge of the cap and the insulating member and thus causing a mechanical break-down or separation.

Thus it is obvious that if the metallic supporting cap 7 is subjected to a temperature lower than the temperature at which the insulator is assembled, the contraction of the cap tends to shear the head or boss from the flange. If it were not for the yielding tongues the rigid edge of the cap might check the surface of the insulating member or tend to shear the boss from the flange. The yielding tongues, however, allow the metal cap to give, thereby preventing a damaging strain from being placed on the boss of the insulating member.

If the metal cap expands and its lower edge bears against the porcelain flange it may set up a high stress tending to break the flange from the head of the insulating member. This may be prevented by leaving a small space between the lower edge of the cap and the flange of the insulating member, but it is difficult to maintain this space as the cement used in securing the cap to the insulating member may overflow and fill up the space. If the cement fills the space it is practically equivalent to leaving the metal against the insulating member. This cement may also expand with time or with an increase in temperature and increase the stress due to the elongation of the cap in a downward direction, thereby causing a crack or check where the flange joins the head or boss of the insulating member. A pad or washer 19 is therefore interposed between the edge of the metal cap and the flange of the insulating member which insures a clearance space between them and provides an expansion joint in the cement. This washer or pad may be of yielding or fibrous material, such as felt, rubber, wax, gutta percha, cork, and some kinds of metal.

If the material of the pad or washer is such that it will absorb water and expand either through the absorption of the water or by the formation of ice, it is necessary to remove it before placing the insulator in service. It is also evident that the washer may be made of metal or some other material and removed after the cement has become set and before placing the insulator in service, thereby insuring an open space. If the washer is made of soft rubber pulling on it reduces the thickness and permits it to be easily removed. The washer may be impregnated with some material which will impregnate the cement and tends to prevent its expansion with time. In some cases the cement at the lower end of the cap may expand in time producing the same effect as though the metal cap were contracted. This stress whether alone or added to that due to the contraction of the metal cap when the insulator is operated at a temperature lower than the assembling temperature of the insulator may cause severe cracking of the insulator tending to shear the boss from the rigid flange.

It is obvious that if the contraction of an external member tends to shear off a portion of the insulating member, the expansion of an internal member will tend to produce the same result. For this reason it is advantageous to provide a suspension pin 9 which will give slightly, and for that reason the construction shown more clearly in Figs. 1, 2 and 3 may be adopted. In this construction the pin 9 is provided with projecting petticoats which preferably overlap or are frusto-conical forming an angular space for the insertion of yielding material 21 which partially fills the space between the petticoats or flanges, leaving projecting points which form an anchoring surface for the cement 11. These flanges are also preferably formed with slots 22 which are filled with the resilient or yielding material 21 when the pin is cemented in the insulator, and at the inner end of the pin a pad of this material 21 is inserted together with a pad 23 of either similar or different yielding material. This yielding material 21 may be any suitable substance, such as wax, rubber and other substances which will allow the flanges 20 to yield when the pin expands due to the action of heat.

Another yielding pin 24 is shown in Figs. 4 to 7 inclusive, in which the outer surface is formed with angular grooves 25, a hole 26 extending the full length thereof, the lower and projecting end of which is threaded. The walls of the pin are slotted, the opposite sides being formed with slots 27 which terminate adjacent the ends of the notched portion and opposite slots 28 between the slots 27 which extend from the inner end of the pin to a point adjacent the center with continuations 29 thereof, leaving a tongue 30 of material between the slots 28 and 29. All of the openings of the pin are then filled with wax, wood, rubber or some yielding material so that when the pin is applied to an insulator 30 of the pin type and secured thereto by cement 11 the slots of the pin 24 will not be filled by the cement but will leave the metal parts of the pin yielding so that

it will give when the pin tends to expand due to the action of heat.

In the pin type of insulator, as shown by Fig. 4, comprising a plurality of insulating members 30ª, 31 and 32 connected together it is desirable that some means be provided for allowing a relative expansion and contraction of the parts and therefore a shell of yielding material 33 may be inserted between the insulating members which, although it allows for yielding under pressure, will still connect them rigidly together under normal conditions.

In the post type of insulator, as shown by Fig. 8, a metallic base 35 is provided with an upstanding flange 36 in which are slots 37 at distances forming tongues of metal. A tubular insulating member 38 is inserted in the upstanding flange and secured thereto by cement 11, and the contraction of the metal supporting base 35 is yieldingly transmitted to the insulating member by means of the tongues 37. It is evident that if the slotted pieces are permitted to grip the insulating member near the base they would give but little and considerable stress could be set up by the contraction of the base 35. If, on the other hand, the slotted portions do not grip until they are some distance from the base they will act as beams, the force producing a considerable leverage and consequent spring in the pieces preventing a high stress from being set up in the insulating member. To obtain this result the lower inside portion of the upstanding flange is painted or dipped with paraffin 40 or other suitable material so that it will form a yielding coating on the inside. Another way which is equally as effective is to dip the lower end of the insulating member in wax or paraffin 41 or to cover it with a rubber or yielding band. This prevents gripping near the lower end of the insulating member at the base of the slotted portion. This is the reason for coating the bottom of the cap 7 and the bottom of the recess 8 with paraffin, as the radial stress is of very little, if any, benefit to the insulating member.

By slotting the supporting members, as set forth, whether they be inside of the insulating member or on the outside thereof, stresses due to expansion and contraction are greatly relieved and the tendency to break or crack the insulating member is greatly reduced. This not only increases the life of the insulator but prevents the mechanical and electrical break-down in a good many cases. This is especially true where the insulators are subjected to a wide range of temperature, the principle involved being that of relieving the stress by making the metallic parts yielding rather than attempting to make all the parts of sufficient strength so that they will withstand the strain or stress. The construction comprising an elastic cap or pin, may be used to advantage to distribute stress due to applied external loads. The construction of the pin 9, (Fig. 3) is such as to make it very valuable in distributing a heavy load, as the flanges or ribs 20 yield as the pressure increases, distributing the load among the others. If the fastening cement is very rigid, it is evident that the space between the flanges should be filled with a yielding material 21, otherwise the ribs will not be flexible.

Owing to the comparatively high modulus of elasticity and low elastic limit of the insulating members, a comparatively low stress in the metal posts or pins will produce a destructive stress in the adjacent insulating member, owing to the elastic elongation of the metal. This applies when the pins are attached firmly together, the greatest elongation of the pin being at the lower end, as the stress is greatest at this point, and drops off as the load is taken up by the adjacent cement or porcelain. To make the cap and pins such that proper stress distribution will be obtained in the dielectric becomes more difficult as the load increases, when the ordinary pin is used. As the metal has to be worked at a comparatively low stress in the ordinary construction, it is evident that a method of providing elasticity in the pin, will permit the use of higher stress in the metal, resulting in a lighter pin for a given load. The elastic pin stress, due to pin stretch, is offset my making the rigidity and bearing areas such that the bearing surfaces of the flanges 20 will deflect the flanges without setting up a dangerous stress in the adjacent insulating member.

I claim:

1. In an insulator, a metal supporting cap having a cup-shaped portion with the edge provided with slots to form a plurality of separate yielding tongues all connected together at their bases.

2. The combination of a frangible insulating member, and a metal suspension cap having a cup-shaped portion fitting over the insulating member with slots in the edge to form a plurality of separate yielding tongues free at their outer ends but having a common connection at their bases.

3. An insulator comprising members secured together having different coefficients of expansion, one of the members being a metal supporting cap placed over a portion of the other member and provided with slots in the edge to form a plurality of separate yielding tongues free at their outer ends but all connected together at the inner ends.

4. In an insulator, the combination with a frangible member, of a metal suspension cap having a cup-shaped portion fitting over the frangible member and formed about the edge with an inwardly opening groove and with

slots in the edge at intervals to form resilient tongues, and a fastening cemenet between the members also filling the said groove to hold the members together.

5. In an insulator, the combination with a metal supporting pin, of a frangible member having a hollow boss in which the pin is secured, and a metal suspension cap having a cup-shaped portion fitting over the boss with slots in the edges to form resilient tongues which bear at their ends upon the frangible member.

6. In an insulator, the combination with a frangible member having an extending flange and a projecting boss, of a metal cap positioned over the boss having slots in the edge to form separate yielding tongues adjacent the flange of the member, and a pad of yielding material interposed between the ends of the tongue and the flange of the member.

7. In an insulator, the combination with a frangible member having an extending flange and a hollow projecting boss, of a metal suspension pin cemented in the hollow of the boss and a metal suspension cap secured over the outside of the boss and having the edge formed with yielding tongues bearing against the flange, and yielding material disposed between the inner end of the suspension pin and the frangible member and between the extremities of the said tongues and the flange of the said member.

8. In an insulator, the combination with an insulating member having an extending flange and a projecting boss, of a metal cap inserted over the boss having a yieldable edge adjacent the flange of said member, and a pad or washer of yieldable material interposed between the edge of the cap and the flange of the washer.

9. In an insulator, the combination with an insulating member having a recessed boss, of a metal suspension member cemented over the boss having yieldable sides, a metal suspension pin cemented in the recess having yieldable attachment surfaces, the adjacent surfaces of the insulating member being formed with anchoring projections, and a yielding material disposed at the bottom of the said recess and at the outer end of the boss which permits a relative axial expansion or contraction of the insulating member with respect to the said metal members.

10. In an insulator of the class described, an insulating member having a recess, and a supporting pin cemented in the recess having projections at different distances from the inserted end, each having a bearing surface and being free to spring under a load applied thereto.

11. In an insulator of the class described, an insulating member having a recess, and a bearing pin cemented therein having flanges which extend outwardly and toward the next adjacent flange in one direction so that when a load is applied each flange will give separately in the direction of the flange next to it.

12. In an insulator of the class described, an insulating member having a recess, and a metal suspension pin secured in the recess having a series of cone-shaped flanges substantially nested one within the other so that the bearing stress is at the outer edges thereof.

13. In an insulator of the class described, an insulating member having a recess, and a metal suspension pin cemented in the recess having extending flanges and yielding material fitting the spaces between the flanges so that each flange is free to yield in one direction.

14. An insulator comprising a recessed insulating member, a suspension pin insertible in the recess having cone-shaped flanges, yielding material disposed between the flanges, a cement between the flanges and the recess for bearing against the outside of the flanges, the yielding material allowing the flanges to give in the other direction.

15. In an insulator, an insulating member having a recess, a metal pin insertible within the recess having a series of cone-shaped flanges partially overlapping each other, yielding material disposed between adjacent flanges, and a fastening cement bearing against the outside of each flange so that the flange is free to yield inwardly under load.

16. In an insulator, an insulating member having a recess, a metal pin insertible within the recess having flanges extending therefrom in a direction to overlap each other, yielding material interposed between adjacent flanges, a cement between the flanges of the pin and the insulating member, the yielding material preventing the cement from filling the space back of each flange so that the flange will yield inwardly under load preventing a rigid connection between the pin and the insulating member.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 26th day of May A. D. 1916.

ARTHUR O. AUSTIN.

Witnesses:
A. J. CRANE,
K. W. WONNELL.