Dec. 15, 1931. A. O. AUSTIN 1,836,743

INSULATOR

Filed Sept. 14, 1928 2 Sheets-Sheet 1

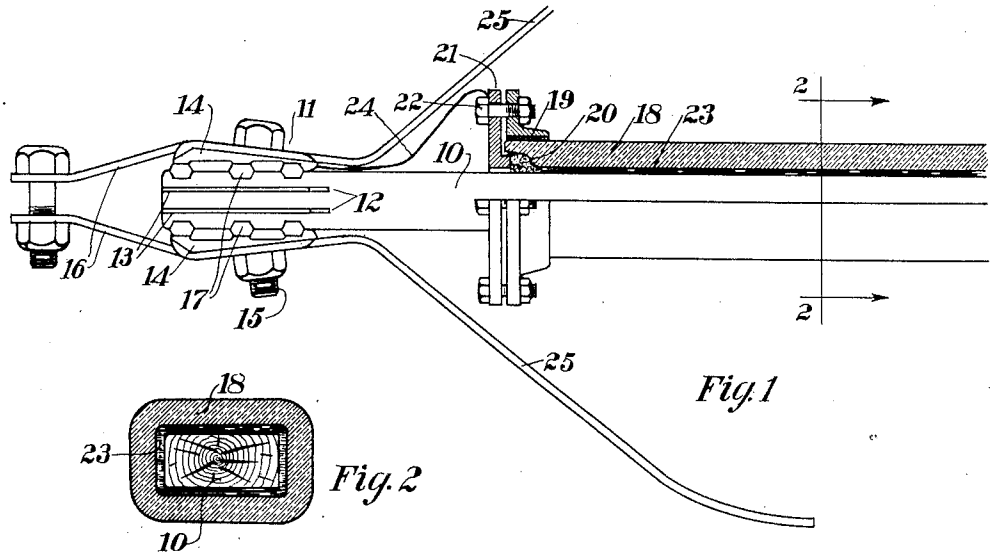

Fig. 1

Fig. 2

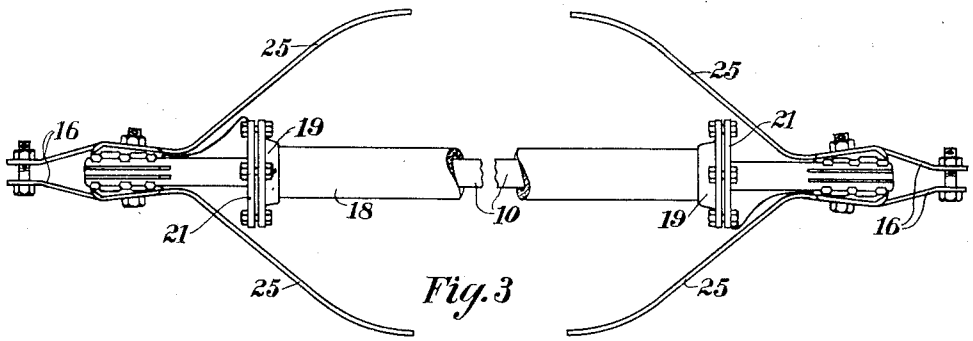

Fig. 3

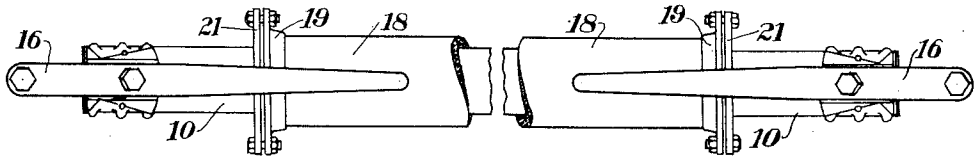

Fig. 4

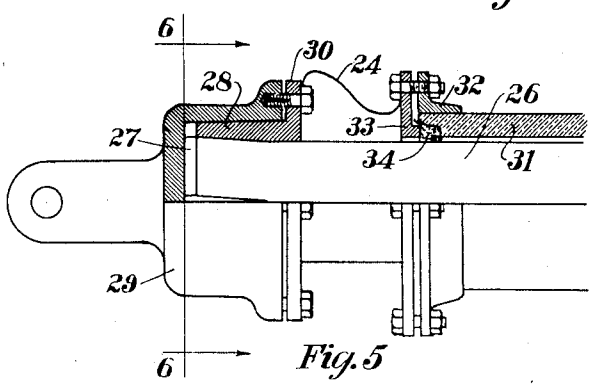

Fig. 5

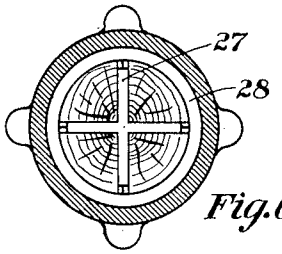

Fig. 6

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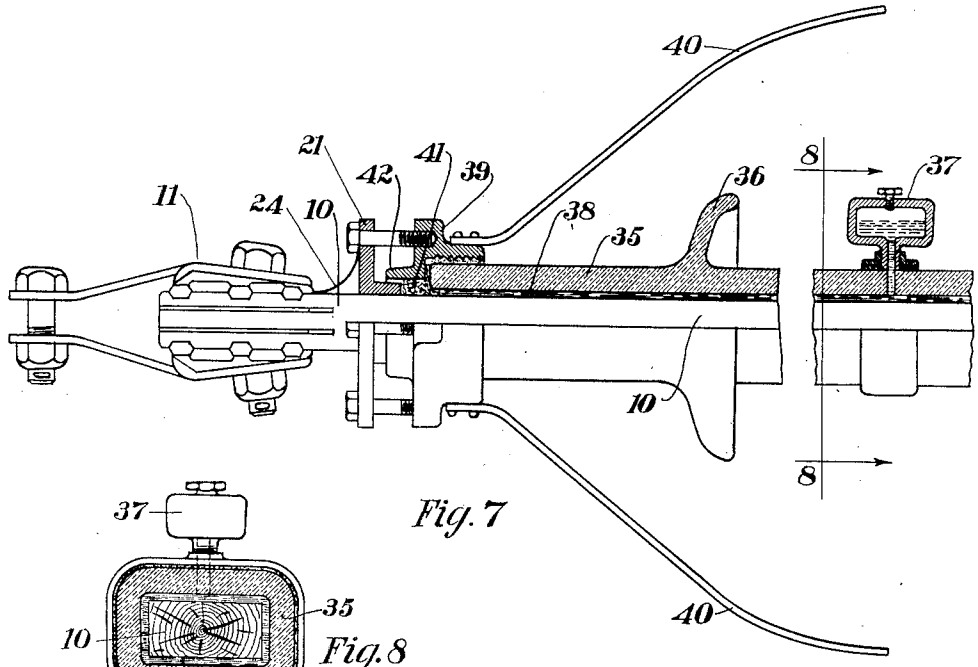

Fig. 7

Fig. 8

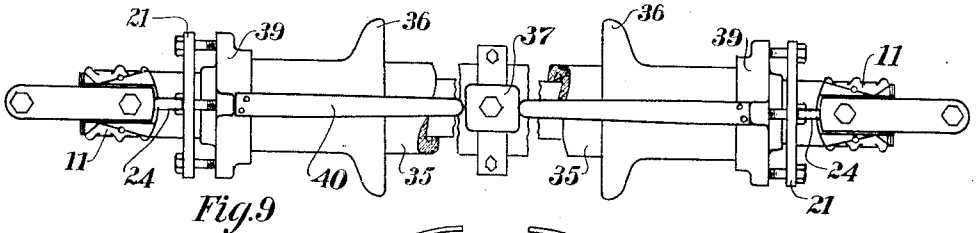

Fig. 9

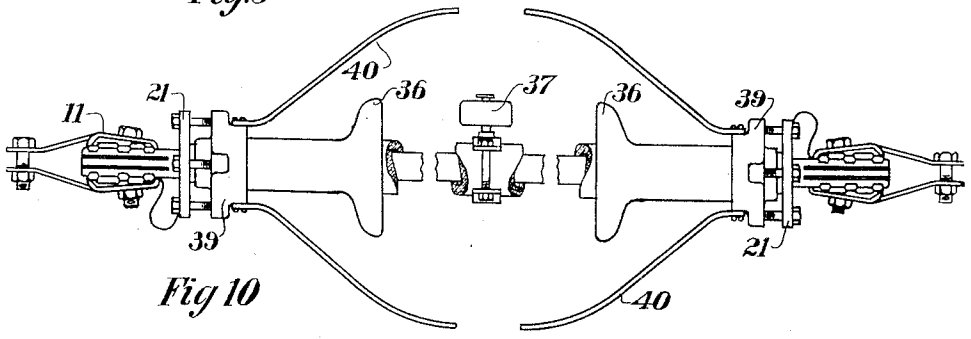

Fig 10

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Patented Dec. 15, 1931

1,836,743

UNITED STATES PATENT OFFICE

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

INSULATOR

Application filed September 14, 1928. Serial No. 305,975.

This invention relates to electrical insulators and has for one of its objects the provision of an insulator having high mechanical stress and one which will withstand high electrical surges produced by atmospheric disturbances and, at the same time, will not be injured by leakage currents under normal operating voltages.

A further object is to provide an insulator having a tension member equipped with a weather jacket and economical means for insuring a tight seal between the weather jacket and the tension member. Other objects and advantages will appear from the following description.

The invention is exemplified in the combination and arrangement of parts shown in the accompanying drawings and described in the following specification and it is more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a fragmentary elevation with parts in section showing one embodiment of the present invention.

Fig. 2 is a transverse section on line 2—2 of Fig. 1.

Fig. 3 is an elevation on a somewhat smaller scale than Fig. 1 showing both ends of an insulator constructed according to the present invention.

Fig. 4 is an elevation at right angles to Fig. 3.

Fig. 5 is a view similar to Fig. 1 showing a somewhat modified form of the invention.

Fig. 6 is a section on line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 1 showing another modification of the invention.

Fig. 8 is a section on line 8—8 of Fig. 7.

Fig. 9 is an elevation on a somewhat smaller scale than Fig. 7 showing the insulator of Fig. 7 but having a slightly modified device for securing the expansion chamber in place.

Fig. 10 is a view at right angles to Fig. 9.

In electrical work, such as the insulation of any high tension transmission lines and railway systems, considerable difficulty is encountered in obtaining an insulator of high mechanical strength and one which will withstand high electrical surges produced by lightning and, at the same time, provide for leakage currents under the normal operating voltage. This is particularly true in the insulation of railway systems where the insulators are likely to be subject to smoke or dirt from locomotives or in locations where there is a considerable accumulation of conducting material.

In many cases, insulators made of wood or fibre will operate satisfactorily. If, however, the leakage current becomes too heavy, the surface is likely to burn, destroying the insulating properties of the insulator. In the past, improved insulators having wood, fibre, or other similar tension members have been protected by an insulating sleeve such as porcelain or glass which will withstand leakage current without carbonizing. While these insulators have been very successful, their cost is rather high when considered for guy insulators or for the insulation of lower voltage catenary systems. In the latter, it frequently develops that considerable insulation is needed, even though the voltage is not high, to withstand the rather severe conditions produced by smoke and conducting material and it is also necessary in many cases to provide an insulator of good length so that birds, cats or squirrels will not readily short-circuit the insulator.

For many installations, it is highy desirable to produce insulators of great strength but of small radial dimensions such as those used for sectionalizing purposes or in places of restricted clearance, as under bridges. The present invention is an improvement on an insulator shown in my previous Patent, Number 1,497,319, June 10, 1924, and makes it possible to provide an insulator which will

withstand very severe electrical conditions and at much lower cost.

In the form of the invention shown in Fig. 1, the tension member 10, which is usually of wood, is provided with a self-tightening grip head or holding member 11 similar to those shown in my previous patent, referred to above, but somewhat simpified. The tension member 10 is slotted at 12 forming wood friction plates and metal friction plates 13 are inserted in the slots 12. Wedge shaped gripping plates 14 are disposed at opposite sides of the tension member 10 and a bolt 15 extends through the member 10, friction plates 13 and wedge plates 14. Straps or bars 16 engage the outer faces of the wedge members 14 and have openings therein for the bolt 15. The bars 16 having portions thereof inclined to fit the outer inclined faces of the wedge members 14 and thus form clamping plates for clamping the wedge members 14 against the surface of the member 10 and for clamping the friction plates of the member 10 against the friction plates 13. The wedge plates may have depressions for the straps 16 and lugs 17 for overlapping the edges of the member to locate the parts relative to one another. The ends of the bolt 15 are preferably bent to bring the head and nut squarely against the outer surface of the bars 16.

The openings in the bars 16 and plates 13 for the bolt 15 preferably fit the bolt closely while clearance is permitted about the bolt in the members 10 and 14 so that the stress of the load is transmitted through friction of the metal parts upon the wood. The wedging action between the bars 16 and wedge members 14 under the stress of the load, tends to draw the wedging members more tightly between the bars 16 and stress member 10, thus acting to tighten the grip on the member 10 and automatically compensating for any loosening of the joint caused by shrinkage of the wood or other causes.

The tension member 10 is provided with an insulating sleeve 18 composed of porcelain or other suitable insulating material. This member 18 is provided with a flange or gripping member 19 which is cemented or clamped to the insulating jacket 18. In the assembly of the insulator, the insulating sleeve 18 is slipped over the tension member 10 before one of the self-tightening heads 11 is attached. After the sleeve 18, with its flange 19, is slipped over the tension member 10, a ring or collar 20 composed of rubber, cork or other yielding material, is placed in a gland at the end of the sleeve 18. A tightening flange 21 is then slipped over the member 10 and secured in place by bolts 22.

When the clamping member 21 is tightened, the packing material 20 will be deformed so that tight contact will be made between the packing material, the tension member 10 and the sleeve 18, making a perfectly tight joint. After one end is tightened, the intervening space between the sleeve 18 and the tension member 10 may be filled with an insulating compound 23 to prevent the entrance of water or other material, even though the packing gland may become loose. Since the surface of the member 10, protected by the sleeve 12, will always have a high resistance compared to the outer surface of the sleeve 18, any leakage of current will take place over the sleeve 18. Since this material will not carbonize, the insulator will withstand very severe conditions which might otherwise destroy the member 10 by carbonization of the surface from leakage currents.

In order that any exposed portion of the member 10 will not carry leakage current, a conducting jumper 24 connects the head 11 electrically with the flange 22. In very severe conditions where there is some danger that electrical discharge due to lightning may take place over the surface of the insulator, the gripping head 11 may be provided with discharge members 25 which may be in the form of extensions of the bars 16. These discharge members, in addition to providing a path for the discharge between these points, also tend to grade the electrical stress at the ends of the insulator and provide an improved operating condition.

In the form of the invention shown in Figs. 5 and 6, the central stress member 26 is cylindrical and is spread at its end by a wedge 27 seating it firmly in a collar 28 having a tapered opening therein. A fitting 29 is secured to the collar 28 by cap screws 30 and holds the wedge 27 in place. The sleeve 31 and packing members 32, 33 and 34 are circular in section but are otherwise similar to the corresponding members in Fig. 1.

Figs. 7, 8, 9 and 10 show another modification of the insulator intended for more severe conditons or higher operating voltages. The insulating sleeve 35 is provided with flanges 36 and an expansion chamber 37, which is attached to the sleeve 35, so as to provide means for keeping the space 38 filled with compound or insulating material at all times. This expansion chamber may be located at any position along the sleeve 35 but its location may differ for different positions of the insulator in use.

Where an expansion chamber is provided, it is possible to use a soft compound or insulating oil, the expansion chamber taking up any variations in volumetric expansion or contraction in the tension member, in the compound, or in the sleeve. In Fig. 7 the flange 39 secured to the sleeve 35 is provided with discharge or flux horns 40 instead of the head at the end of the stress member. The packing material 41 is compressed in a pocket formed about the stress member 10 by an extension 42 of the flange 39. With

this arrangement, it is not necessary to provide a special gland or pocket in the sleeve 35. The other parts are similar to those of Fig. 1. In this form of the invention, a shorter portion of the tension member 10 is exposed outside of the cover sleeve 35 than in the form shown in Fig. 1. The exposed wood portion is preferably thoroughly impregnated with a weatherproofing and preserving compound.

It is evident that many modifications may be provided. The improved construction provides an insulator having a tension member equipped with a weather jacket and a cheaper means for insuring a tight seal between the weather jacket or its attachments and the tension member. With this method of construction, it is possible to provide insulators for practically any mechanical load and having high insulation and small size. The method of construction permits of a lower cost so that insulators of this type are available for many purposes where the cost of former types was prohibitive. Where the conditions are severe, it is usually advisable to impregnate thoroughly or varnish the tension members 10 where the latter are made of wood. Where the cores of the wood are filled with an insulating varnish, the capillary attraction will prevent moisture being carried into the inside of the sleeve.

I claim:—

1. An insulator comprising a porcelain tube, a wood bar extending through said tube, a gripper head of conducting material secured to the projecting end of said bar, a metal flange secured to the end of said tube and insulated from said gripper head by the end portion of said wood bar, means attached to said flange for forming a packed joint between the end of said tube and said bar, and a jumper connecting said gripper head and flange.

2. An insulator comprising a dielectric tubular member, a fibre rod extending through said member, a gripper head of conducting material secured to the end of said rod and spaced from the end of said tubular member, means forming a pocket at the end of said member around said fibre rod, a flange of conducting material secured to the end of said tubular member, packing disposed in said pocket against the surface of said rod, means attached to said flange for pressing said packing into said pocket and against the surface of said rod, and a jumper bridging the space between said gripper head and said flange.

3. An insulator comprising a dielectric tube of weather resisting material, a wood bar extending through said tube and projecting from the end thereof, a holding member of conducting material secured to the end of said wood bar, means for forming a packed joint between the end of said dielectric tube and the surface of said wood bar at a point spaced from said holding member, means electrically connecting said holding member and the surface of said dielectric member, and a discharge horn electrically connected with said holding member and extending therefrom toward the opposite end of said insulator and spaced outwardly from said dielectric tube.

4. An insulator comprising a stress member of fibrous material having a slot formed in the end thereof, a friction plate disposed in said slot, wedge shaped friction plates engaging opposite faces of said stress member, holding members having faces inclined toward each other engaging the outer faces of said friction plates, and a bolt extending through said holding members, wedge shaped plates, friction plate and stress member for holding said parts together and pressing said wedge shaped plates and friction plate into frictional engagement with said stress member.

5. An insulator comprising a porcelain tube, a wood bar extending through said tube, a gripper head of conducting material secured to the projecting end of said wood bar, a packed joint between said porcelain tube and the surface of said wood bar at a point spaced from said gripper head, means electrically connecting said gripper head and the surface of said porcelain tube, and a discharge horn electrically connected with said gripper head and extending toward the end of said insulator opposite said gripper head.

6. An insulator comprising a wood bar having flat faces at the sides thereof, wedge shaped metallic members engaging said faces, clamping plates having inner faces disposed at an oblique angle to each other and engaging the outer faces of said wedge shaped members the outer faces of said clamping plates being also at an oblique angle to each other, and a bolt extending through said clamping plates, wedge shaped members and bar said bolt being bent to bring the axis of said bolt at the ends thereof normal to the outer faces of said clamping plates respectively.

7. An insulator comprising an insulating stress bar of material subject to injury by passage of leakage currents over the surface thereof, an insulating casing for the central portion of said bar supported at its ends upon said bar at points spaced inwardly from the ends of said bar, means for forming tight joints at the ends of said casing between said casing and the lateral surface of said bar, holding members attached to the ends of said bar beyond the ends of said casing leaving portions of said bar exposed, and electrical conductors bridging the space between said holding members and the ends of said casing.

8. An insulator comprising a wood bar, a

porcelain tube enclosing a portion of said bar, the ends of said bar projecting from the ends of said tube, means forming a tight joint between the ends of said tube and the surface of said bar at points spaced inwardly from the ends of said bar, gripper heads of conducting material secured to the projecting ends of said bar beyond the ends of said tube, and means forming a shunt path for leakage currents across the exposed portions of said bar between said gripper heads and the ends of said tube.

9. An insulator comprising a tension bar of fibrous insulating material, a housing of refractory insulating material surrounding said bar, the ends of said bar projecting from the opposite ends of said housing, holders of conducting material secured to the projecting ends of said bar beyond the ends of said housing, electrical conductors bridging the space between said holders and the surface of said housing, and arcing horns electrically connected with said holders respectively and extended toward the middle portion of said bar.

10. A strain insulator comprising a wood bar having the end thereof slotted, a fitting for said insulator comprising a friction plate disposed in the slot in said bar and clamping plates at opposite sides of said bar, a bolt extending through said friction plate, clamping plates and bar for holding said fitting in place on said bar, said fitting comprising means forming a wedging connection with said bar to tighten the grip of said fitting on said bar when tension is exerted on said bar, said clamping plates being bent intermediate the ends thereof and inclined inwardly at opposite sides of the bent portions of said plates, said bolt being bent to dispose the heads thereof squarely against the outer faces of said clamping plates.

11. A wood strain insulator comprising a wood bar having the end thereof slotted forming tongues, a fitting for said bar for gripping the tongues, said fitting comprising a friction plate disposed in the slot between the tongues, clamping plates at opposite sides of the bar and having relatively converging outer faces wedging means disposed in the space between said clamping plates and cooperating with said clamping plates and said friction plate to produce a gripping action on said tongues, and a bolt passing through openings in said tongues, friction plate and clamping plates, certain of said openings being larger than said bolt to permit slipping of said bar in said fitting to tighten the wedging grip on said tongues, said bolt being bent to position the heads thereof squarely against the faces of said clamping plates.

12. An insulator comprising a wood stress member and a holding member, said members having overlapping interfitting friction plates, a bolt passing through perforations in said plates for pressing said plates together, the perforations in the plates of one of said members having sufficient clearance to permit relative slipping of said plates under stress of a load on said insulator, and a wedge registering with overlapping portions of said plates for forcing said plates more tightly together when they slip under load.

13. An insulator comprising a wood stress member slotted at its end to provide wood friction plates, holding means comprising a metallic friction plate extending between the wood plates of said stress member, clamping plates disposed outside of said friction plates and having clamping surfaces inclined relative to each other, a bolt passing through perforations in said plates to hold said plates together, said bolt having clearance in all of the said plates fixed to one of said members to permit relative slipping under load of the plates fixed to said respective members, and a wedge bearing on some of said plates and having wedging surfaces inclined in a direction to increase the pressure between said plates when said plates slip under load.

14. An insulator comprising a wood stress member slotted at its end to provide wood friction plates, a holding member comprising a metallic friction plate extending between the wood plates of said stress member, clamping plates disposed outside of said friction plates, a bolt passing through perforations in said plates to hold said plates together, said bolt having clearance in all of the said plates fixed to one of said members to permit relative slipping under load of the plates fixed to said respective members, and a wedge bearing on said plates and having its wedging surfaces inclined in a direction to increase the pressure between said plates when said plates slip under load, said clamping plates having their outer faces inclined to correspond to the inclination of the surface of said wedge, said bolt being bent to dispose the head thereof squarely against the outer faces of said clamping plates.

15. In an insulator, a wood stress member having the end thereof slotted to provide frictional surfaces and holding means for said stress member, said holding means comprising a friction plate disposed in a slot in said stress member, clamping plates disposed outside of the outer faces of said stress member and pressing the slotted portion of said stress member into frictional contact with said frictional plate, wedging means located in the space between said clamping plates and registering with the slotted portion of said stress member and with said friction plates, said clamping plates being inclined toward each other and cooperating with said wedging means and said friction plates to grip said stress member, the inclined surfaces of said clamping plates and of said wedging means being relatively arranged so that ten-

sion on said insulator increases the gripping action on said stress member, and a bolt extending through said clamping plates, said stress member and said friction plate for holding said parts together, said bolt being bent to dispose the heads of said bolt squarely against the inclined faces of the clamping plates.

In testimony whereof I have signed my name to this specification this 12th day of September, A. D. 1928.

ARTHUR O. AUSTIN.