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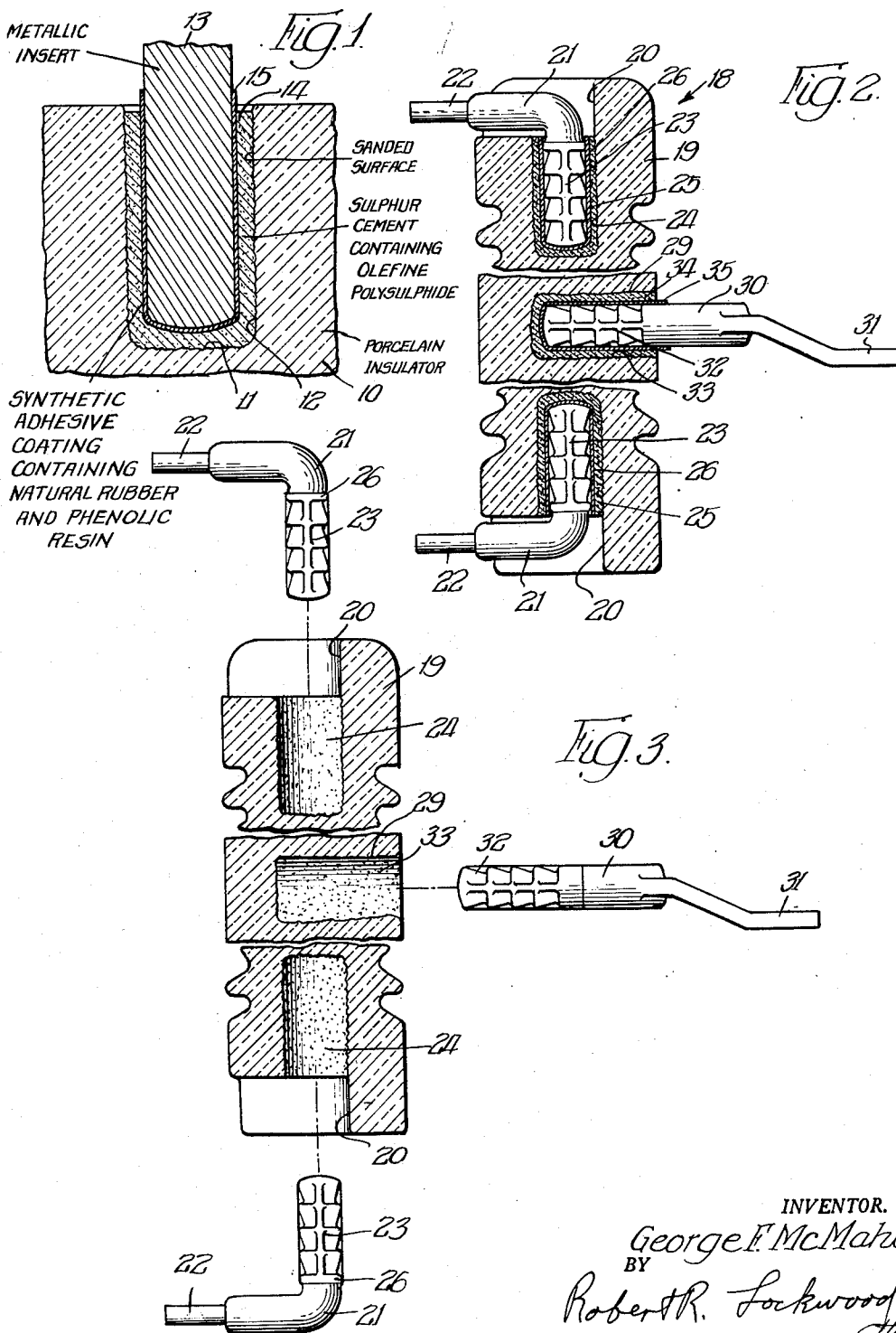
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2,671,822

MOUNTING FOR ELECTRICAL DEVICES AND METHOD
OF SECURING SAME IN PORCELAIN INSULATORS

Filed June 2, 1950

2 Sheets-Sheet 1



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Fig. 4

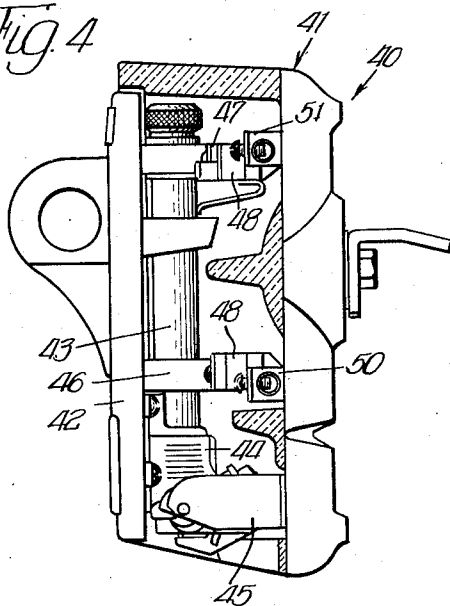
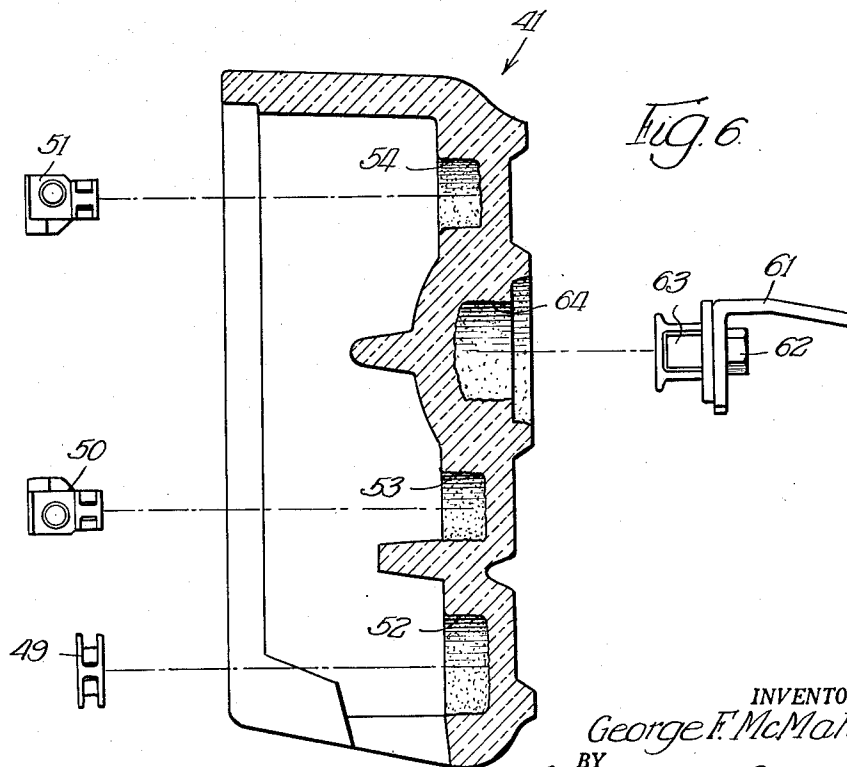
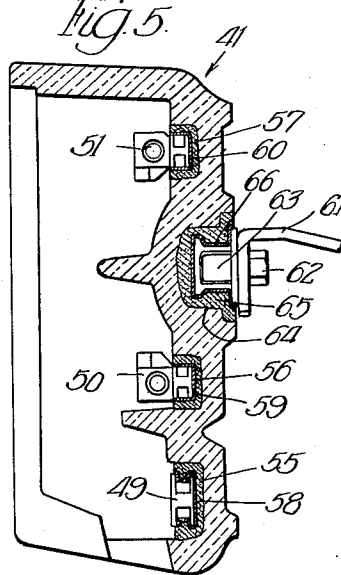


Fig. 5



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MOUNTING FOR ELECTRICAL DEVICES AND
METHOD OF SECURING SAME IN PORCE-
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This invention relates, generally, to mounting means for electrical devices and has particular relation to the construction thereof and methods of making the same.

Electrical devices, such as fuses, for use on electrical distribution systems operating at voltages ranging upwardly from 2300 volts utilize porcelain insulators. They serve a dual function. Provision is made for mounting the terminals of the device in insulated spaced relation in such manner as to withstand line to ground voltage and line to line voltage after operation of the device and opening of the circuit. In addition the insulator is supported, usually from a cross arm, and the support is arranged with respect to the terminals to provide the necessary creepage distance and other necessary relationships.

For mounting the terminals and the support, cavities are provided in the porcelain insulator during manufacture for receiving metallic inserts, such as zinc coated steel or iron members. These cavities usually are provided with sanded surfaces during manufacture. The inserts are secured in place in the cavities by cement. The terminals may be and usually are separately mounted on inserts while the support comprises an insert one end of which is cemented in a cavity and the other end is arranged for clamping to a cross arm or the like. Alternatively an insert may be provided to which a support bracket is clamped.

In order to be satisfactory from a mechanical and electrical standpoint, the inserts must be secured in the cavities in such manner that the joints between the cement and the inserts on the one hand and between the cement and the cavities on the other are tight and strong, weather resisting, non-corrosive and temperature resistant over a wide range of operating temperatures. In attempting to achieve these features, "neat" Portland cement has been employed. This cement contains no sand and is mixed with definite amounts of water. Usually the cement is placed in the cavities and the inserts are embedded therein, the inserts being held by jigs in order to provide proper alignment. The assembly then is placed in a steam room or humid chamber at temperatures in the neighborhood of 100° F. for twenty-four hours or longer until the cement is set. Then the jigs are removed and the assembly remains in the steam room for a time, such as four to five days, in order to insure proper hydration. Thereafter the porcelain with the cemented inserts therein is removed from the steam chamber, the excess cement is cleaned off of the insulator and it is prepared for final assembly with the finished product.

Experience has shown that Portland cement tends to grow with age. It expands or increases in volume due to combination with water and carbon dioxide from the atmosphere. In

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some instances after several years of outdoor exposure, the growth is enough to cause failure or cracking of the porcelain. This takes place more often in localities near the seaboard than it does in areas away from a salty atmosphere. There are other causes of failure also. One is the result of rusting of the insert after the galvanized or zinc coating thereon has failed. Attempts have been made to overcome these conditions by coating the portions of the inserts to be located within the cavities with a thin resilient paint. Usually asphalt or wax is used. The sanded surface of the cavity in the porcelain also is given a thin coating of such compound. Such a coating on the insert tends to arrest chemical reaction of the alkaline cement. When such reaction does take place, excessive looseness of the insert often results when stresses are applied thereto under operating conditions. Looseness also may result from the use of too thick a layer of wax or paint.

Another and serious objection to the use of Portland cement is the time required for the cement to set. On a mass production basis it is necessary to use a large number of jigs or holding fixtures. A relatively large space for the steam room is required to handle any quantity of porcelain to which insulators are being cemented.

In addition to the use of Portland cement for securing metallic inserts in cavities in porcelain insulators, other materials have been proposed. These include molten metallic alloys and sulphur and silica cement. The most successful alloys which have been used contain lead, antimony, tin and cadmium in varying amounts. Such alloys are expensive. There is a tendency toward looseness of the inserts under load stresses and vibration. This is caused by the cold flowing of the alloy under stress with a result that it no longer is in close contact with the surface of the insert. The sulphur and silica cements act peculiarly in taking on certain crystallization changes with time and temperature. Poor strength and growth with age sometimes occur.

A particularly desirable sulphur sand cement is one containing sulphur, sand (silica) and an olefine polysulphide. The olefine polysulphides constitute a class of synthetic rubber because of their similarity in characteristics to rubber. When such cements are employed, a construction much more resilient than that provided by Portland cement is obtained. This is an important characteristic particularly when it is considered that an insert in a porcelain insulator is subjected to very severe stress when a fuse mounted thereon operates under short circuit conditions. When this occurs the assembly often receives a very severe mechanical impact which, if the insert is held rigidly in the cavity in the porcelain insulator, may result in its being broken loose whereas, if it

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is resiliently mounted therein, such action may not take place.

There is, however, a very serious difficulty encountered in the use of cements containing sulphur, silica, and olefine polysulphide. They have very poor adhesion to the insert whether made of bronze or galvanized iron or steel. Although the joint with the insert at first appears to be tight when the cement has solidified, under continual loading and vibration the inserts become loose. Despite this the cement itself remains dense and strong.

Accordingly, the principal object of this invention is to provide for securing metallic inserts in a porcelain insulator in such manner that the foregoing objections will be overcome. Other objects of this invention are: To provide a good and intimate bond between the cement and the metallic insert; to maintain and utilize the resilient characteristics of sulphur cement in the securing of metallic inserts in the cavities in porcelain insulators; and to secure the inserts in cavities in porcelain insulators in such manner that substantially no change takes place over the years in the characteristics of the cement insofar as its effects may be on the secure holding of the inserts in position.

Other objects of this invention will, in part, be obvious and in part appear hereinafter.

For a more complete understanding of the nature and scope of this invention, reference may be had to the following detailed description, taken together with the accompanying drawings, in which:

Figure 1 is a sectional view, at an enlarged scale, illustrating how a metallic insert can be secured in a cavity in a porcelain insulator in accordance with this invention;

Figure 2 is a longitudinal sectional view of a generally cylindrical insulator in which inserts are provided in the ends for mounting an electrical device, such as a fuse or disconnecting switch, and a centrally located insert is provided for mounting the insulator on a cross arm;

Figure 3 is a view, similar to Figure 2, showing the inserts in spaced relation to the cavities into which they are positioned for cementing;

Figure 4 is a view, partly in side elevation and partly in section, showing a porcelain housing in which a fuse device is mounted on inserts which are assembled in the housing in accordance with this invention;

Figure 5 is a longitudinal sectional view of the housing shown in Figure 4 with the inserts in place; and

Figure 6 is a view similar to Figure 5, at an enlarged scale, showing the inserts in spaced relation with respect to their cavities in the rear wall of the housing.

Referring now particularly to Figure 1 of the drawings where a typical assembly of an insert in a porcelain insulator is disclosed, the reference character 10 designates the porcelain insulator which may be of the conventional wet process type. The insulator 10 during manufacture is provided with a cavity 11 having a sanded surface 12. The cavity 11 is arranged to receive a metallic insert 13 which may be of bronze or galvanized iron or steel. The insert 13 is secured in position by means of cement 14.

Preferably the cement 14 is a sulphur silica cement containing olefine polysulphide. The silica content may range from thirty-five to forty per cent, the sulphur content may range from sixty to sixty-five per cent, and the olefine

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polysulphide or synthetic rubber content may range from one to five per cent. Specifically, percentages of the order of thirty-five—sixty-four—one, respectively, have been used. Also, percentages of the order of thirty-five—sixty—five, respectively, have been used.

Prior to placing the insert 13 in the cavity 11, it is coated with a thin layer 15 of a synthetic adhesive. This is accomplished by dipping that portion of the insert 13 which is to be located within the cavity 11 in a synthetic adhesive containing rubber and phenolic resin. Preferably the synthetic adhesive contains a fusible phenol-formaldehyde resin and synthetic rubber made by polymerizing 1,3-butadiene and acrylonitrile in aqueous dispersion. For illustrative purposes the layer 15 of synthetic adhesive has been shown several times thicker than it actually is. In effect it is a very thin coating and is formed, as indicated, merely by dipping the insert 13 into a synthetic adhesive of the character described. In cementing the insert 13 in position in the cavity 11, after it is dipped in the synthetic adhesive 15, it is placed in the cavity 11 and held therein by a suitable jig. Then the cement 14, at a temperature of from 290° F. to 300° F., is poured in the space around the insert 13. The cement 14 cools quickly and, in so doing, it adheres to the sanded surface 12 of the insulator 10 and reacts with the rubber in the synthetic adhesive 15 containing the same with a vulcanizing action to provide a satisfactory bond with the insert 13. The synthetic adhesive 15 adheres to the cement 14 on the one hand and to the insert 13 on the other. It prevents any chemical reaction taking place between the sulphur in the cement 14 and the zinc or galvanizing coating on the insert 13 when it is employed. The synthetic adhesive 15 provides a resilient impervious layer between the insert 13 and the cement 14. Also it provides thermal insulation therebetween which permits the cement 14 to set more uniformly throughout.

When a metallic insert 13 is secured in the cavity 11 of a porcelain insulator 10 in the manner described, the insert is highly resistant to torsion and cantilever loading. The cement 14 does not appear to be subject to growth. One reason for this is considered to be the absence of iron therein. Since there is a very tight fit between the cement 14 and the insert 13 and since this relationship is maintained, there is no likelihood of the insert 13 becoming loose even though it may be subjected to severe mechanical shock resulting from the blowing of a fuse or the stopping of a switch blade in a ninety degree or 180 degree position by a stop.

While the synthetic adhesive 15 has been described as containing synthetic rubber, it also may contain natural rubber.

Illustrative applications of the assembly of an insert in a porcelain insulator as shown in Figure 1 and described above now will be set forth.

In Figure 2 of the drawings there is illustrated, generally, at 18 a universal single insulator mounting of the character disclosed in Baker application Serial No. 16,268, filed March 22, 1948, and assigned to the assignee of this application now Patent No. 2,606,954. This mounting includes a porcelain insulator 19 that is generally cylindrical in character and has cavities 20 at the ends arranged to receive inserts 21. The inserts 21 may be galvanized steel rods bent to the shapes indicated with flattened terminal receiving ends 22. The inserts 21 have corrugated ends 23 to facilitate holding the same in position

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in the cavities 20 which have sanded surfaces 24. The inserts 21 are held in position in the cavities 20 by cement 25 which, as described hereinbefore, comprises sulphur, silica, and olefine polysulphide in the amounts set forth. Prior to insertion in the cavities 20 the corrugated ends 23 are dipped in a synthetic adhesive, containing synthetic or natural rubber and phenolic resin as described, so as to provide a thin layer 26 thereon.

The porcelain insulator 19 also is provided with an intermediate cavity 29 for receiving a support insert 30. It has a support flange 31 for mounting on a suitable cross arm or the like. At its other end the insert 30 has a corrugated end 32 for positioning within the cavity 29 which has a sanded surface 33. A cement 34, identical with the cement 25, serves to hold the insert 30 in position. Prior to placing the insert in the cavity 29, it is dipped in a synthetic adhesive containing synthetic or natural rubber and phenolic resin to provide a layer 35 of the same thereon.

In Figure 3 of the drawings the manner in which the inserts 21 and 30 are assembled with the insulator 19 is illustrated. The inserts 21 and 30 with the layers 26 and 35 of synthetic adhesive thereon are held in position in the respective cavities 20 and 33 by suitable jigs. The cement 25 and 34 is poured into the cavities 20 and 33 which are successively positioned in the upright position for receiving the same.

The present invention can be employed for securing inserts for the dropout fuse that is illustrated, generally, at 40 in Figure 4. The details of the construction of the dropout fuse 40 are set forth more clearly in Ramsey et al. United States Patent No. 2,292,341, issued August 4, 1942, and, accordingly, will not be set forth herein. The dropout fuse 40 comprises a porcelain housing or box, shown generally at 41, which is closed on the rear, top and sides and is open at the front and bottom. The housing 41 carries a door 42 on which a fuse tube 43 is slidably mounted. The fuse tube 43 is slidably mounted in a sleeve 44 that is carried by the door 42. In turn the sleeve 44 is rockably mounted on a hinge bracket 45. The fuse tube 43 is provided with contacts 46 and 47 that are arranged to cooperate with stationary contacts 48. As shown more clearly in Figure 5, the hinge bracket 45 is arranged to be carried by an insert 49 while the contacts 48 are arranged to be carried by inserts 50 and 51.

The inserts 49, 50, and 51 are located, respectively, in cavities 52, 53, and 54 having sanded surfaces and located in the front side of the rear wall of the housing 41. These inserts are held in place by cement 55, 56, and 57, respectively, which, as previously described, contains sulphur, silica and olefine polysulphide. Prior to placing the inserts 49, 50, and 51 in their respective cavities they are dipped in a synthetic adhesive containing synthetic or natural rubber and phenolic resin so as to provide layers 58, 59, and 60, respectively, thereon.

The porcelain housing 41 is supported on the rear side by a support bracket 61 which may be secured by a bolt 62 to an insert 63. It will be noted that the insert 63 is located in a cavity 64 having a sanded surface and opens rearwardly from the back wall of the porcelain housing 41. The insert 63 is secured in position by cement 65 which comprises sulphur, silica, and olefine polysulphide. Prior to placing the insert 63 in the cavity 64, it is given a coating 66 of synthetic adhesive containing synthetic or natural rubber and phenolic resin.

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In Figure 6 there is illustrated the manner in which the inserts 49, 50, and 63 are assembled in their respective cavities. As indicated, they are first dipped in the synthetic adhesive to provide relatively thin layers of the same thereon. Next they are held in their respective cavities by a suitable jig. The cement then is poured in the cavities and is allowed to set.

Since certain further changes can be made in the foregoing construction and method and different embodiments of the invention can be made without departing from the spirit and scope thereof, it is intended that all matter shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

What is claimed as new is:

1. Method of securing a metallic insert in a porcelain cavity which comprises: coating the entire surface of that portion of the insert to be placed in the cavity with a film of synthetic adhesive containing rubber and phenolic resin, locating the coated portion of the insert in position in the cavity, filling the remaining space in the cavity with molten sulphur cement carrying in solution an olefine polysulphide at a temperature ranging from 290° F. to 300° F., and allowing the assembly to cool to room temperature.

2. Mounting means for electrical devices and the like comprising, a porcelain insulator having a cavity therein provided with a sanded surface, a device supporting metallic insert in said cavity, a synthetic adhesive coating containing rubber and phenolic resin on the portion of said insert within said cavity, and a filling of sulphur cement carrying in solution an olefine polysulphide in said cavity, said filling adhering to said sanded surface and to said adhesive coating and resiliently mounting said insert without looseness.

3. Mounting means for electrical devices and the like comprising, a porcelain insulator having spaced terminal insert receiving cavities and a support insert receiving cavity therebetween, said cavities having sanded surfaces, terminal inserts in said terminal insert receiving cavities and a support insert in said support insert receiving cavity, a synthetic adhesive coating containing rubber and phenolic resin on that portion of said inserts within their respective cavities, and a filling of sulphur cement carrying in solution an olefine polysulphide in each of said cavities, said filling in each cavity adhering to the sanded surface thereof and to the adhesive coating of the insert therein and resiliently mounting the same without looseness.

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