Aug. 10, 1937. H. MILLIKEN 2,089,284

POTHEAD TERMINAL

Filed Aug. 4, 1933

Fig. 1

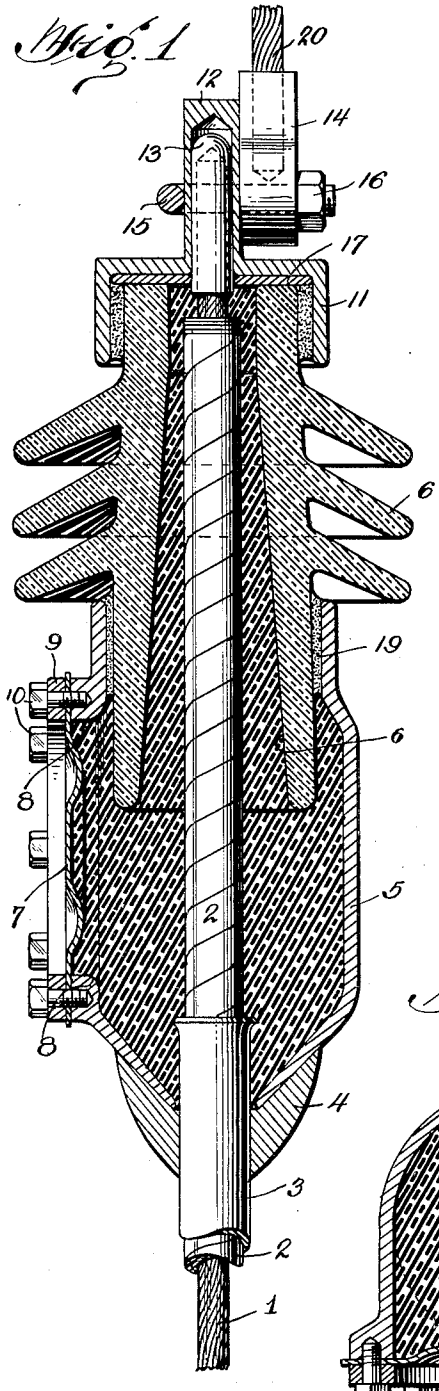


Fig. 2

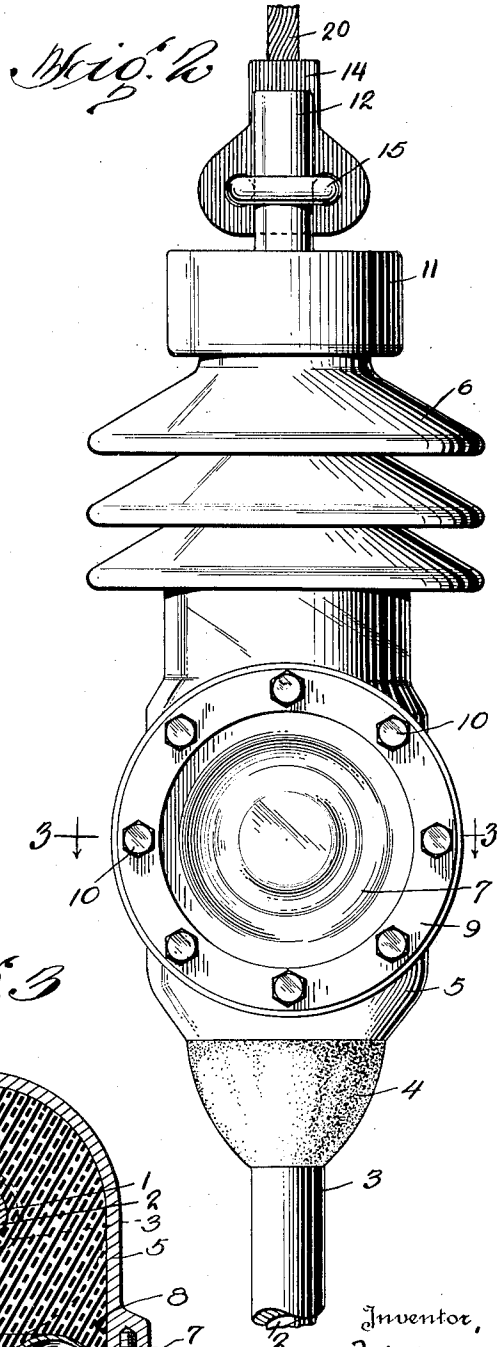
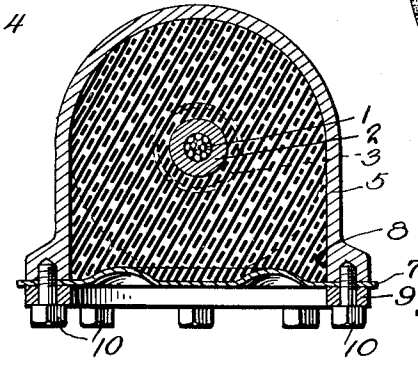


Fig. 3



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POTHEAD TERMINAL

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4 Claims. (Cl. 173—353)

Electric power cables insulated with paper, are encased in lead sheaths to exclude moisture from the paper as moisture seriously impairs the insulating properties of paper. The usual means provided for excluding moisture, is some kind of removable joint, depending for tightness, upon machined metal surfaces, with or without gaskets. Slight imperfections (which are practically unavoidable) in such machined surfaces or gaskets, or failure to properly tighten or maintain tightness of the joint, together with alternating pressure and vacuum inside the tube, due to hot and cold weather in certain cases, results in the entrance of moisture and breakdown of the insulation.

After all of the parts have been assembled on the cable and the lead sheath has been wiped to the pothead body, the pot is filled with a melted bituminous compound which solidifies when cooled. It is customary to do this filling with the cable and terminal in an upright position, and for this purpose, two small holes with plugs are provided, one near the bottom of the pot and the other near the top. The instructions are to leave an opening at the top of the porcelain tube to allow the air to escape to permit the compound to rise to the top of the porcelain tube so as to completely cover the paper insulation. This is difficult and is not always done, one reason being that the hot liquid compound becomes chilled by the relatively cool porcelain and the compound becomes so thick that it stops the upward flow of compound in the tube. Even though the porcelain tube is completely filled at the start, the compound contracts when it cools and recedes, leaving a void at the upper portion of the tube. The sole purpose of the compound is to cover the insulation and prevent moisture from entering it. Voids in the compound (especially in the upper portion of the tube) therefore defeat the purpose of the compound.

My cable terminal hereinafter described eliminates such defects.

In the drawing annexed:

Figure 1 is a vertical section view;

Figure 2 is a side elevation of a device embodying my invention; and

Figure 3 is a horizontal section view on the line 3—3 of Figure 2.

Referring to the drawing annexed, 1 is the conductor of the cable (usually stranded copper), 2 is the insulating covering (usually paper tape suitably impregnated with petrolatum compound), 3 is the lead sheath, 5 is a metal pot, (preferably of cast bronze) which can be effectively soldered, 6 is a porcelain tube with suitable rain shields, 7 is a flexible diaphragm, preferably of non-corrosive metal such as sheet copper, and having suitable corrugations to increase its flexibility, covering a relatively large hole 8 in the side of the pot 5; 9 is a clamping ring preferably of metal. Cap screws 10 hold the cover 7 in place. The contact surfaces are machined, polished or otherwise made smooth, and are preferably coated with a suitable elastic varnish. Such a joint may be used with or without a gasket and can be readily made impervious to moisture; furthermore the entrance of moisture by this joint would cause no harm as will be more apparent after considering the complete construction as hereinafter described.

The porcelain tube 6 is sealed into the round hole 19 of the pot 5, by means of portland cement, or litharge and glycerine, which are well known methods, or by other suitable means, this joint being non-separable (except by breaking out the porcelain and replacing it with a new porcelain). A moisture proof joint can readily be made at this point.

On the top of the porcelain tube, a metal cap 11, preferably of soft cast brass (high in copper), of suitable electrical conductivity, is permanently sealed to exclude moisture, by any of the methods above cited.

Integral with 11 is a sleeve 12, there being no vent holes, nor openings nor joints of any kind in 11 and 12, 11 being sealed to the porcelain in the factory and never thereafter removed. This practically eliminates the possibility of moisture entering the top of the tube, there being no separable joints as in the case of the cable terminals heretofore used.

A terminal 13, preferably of copper, is soldered to the end of the conductor 1. 13 is made accurately cylindrical and smooth, to fit closely in the bore of 12. A lug 14 is secured to 12 by a U bolt 15 and two nuts 16, all preferably of copper.

The wall of 12 is made relatively thin, and slightly elastic so that the tightening of the U bolt slightly compresses and distorts the wall of 12 transmitting the pressure to 13, making a high-pressure electrical contact amply capable of carrying the required current. The bare conductor 20 is soldered into the lug 14.

A soft gasket 17 is used as a cushion to minimize the strains on the porcelain due to temperature changes in the porcelain and metal cap 11. The gasket also serves to stop the cement from running through before it has set; it also pre-

vents the insulating compound from running into any minute crevice which there might be between 12 and 13.

This cable terminal is installed in the following manner: The cable is cut off the required length (within ½ inch is sufficiently accurate; cable terminals heretofore in use require much closer measurement). The lead sheath and insulation are removed to the points shown. Terminal 13 is soldered to conductor 1. Cover 7 is removed. The entire cable terminal is slipped over the end of the cable and pushed down until the upper end of 12 comes down against the top of 13. Lug 14 is clamped to 12 and tightened sufficiently to grip 13 and hold it in place. The cable terminal (and cable) are then placed in the position required on the supporting structure (not shown). This may bring 5 slightly higher or lower (by less than half an inch) than the desired position on the supporting structure. Assuming that it is not convenient to move the entire cable (which may be 100 ft. or more in length) by this fraction of an inch, it is easier to loosen the U bolt 15 and let the cable terminal slide up or down the required amount (fraction of an inch) the sliding taking place between 12 and 13, after which the U bolt 15 is tightened again gripping 13 and holding it from slipping while finishing the installation.

The "wiped" joint 4 is next made, securing the pot 5 to lead sheath 3. The cable terminal is next removed from its supporting structure and the cable is bent over until the terminal is in a horizontal position with the hole 8 uppermost and approximately level. The melted compound is then poured into the pot through hole 8. As the level of the compound rises, the hot liquid flows freely into the entire length of the porcelain tube; in case any part of the compound cools sufficiently to thicken before reaching the far end of the porcelain, fresh liquid compound can readily flow over the dam formed by the thickened compound, and thus reach the far end of the tube and completely cover and surround the paper insulation. There are no points where the air can be trapped as the level of the compound rises, all air passing freely out of the large hole 8. When the compound reaches the level of hole 8, pouring is stopped and time allowed for the compound to cool and contract, after which additional compound is poured in. When the compound has cooled so that the contraction has practically ceased, and the level is up flush with the top of hole 8, the cover 7 is fastened in place, the cable terminal is brought upright and secured to its supporting structure, the lug 14 is soldered to the overhead conductor 16 and bolted to 12, and the job is complete.

In cold weather the compound will contract (it never becomes too hard to flow slowly even in the coldest weather) and draws in the flexible diaphragm 7 thus relieving any tendency to cause excess vacuum, and in hot weather the reverse takes place, the diaphragm bulging out and relieving any excessive internal pressure.

Lugs on pot 5 for bolting it to the supporting structure have been omitted from the drawing, to avoid confusion. These lugs should be located on the same side as the opening 8, to facilitate bending the cable over, away from the supporting structure, into a horizontal position, for filling, as described above.

The drawing shows a terminal for a single-conductor cable. The same construction is applicable to a cable having two or more conductors. The most common case is that of a cable having three conductors insulated from each other and encased in a single lead sheath. In such case a single pot or body (5) with a single opening 8, would have three openings 19 and three porcelain tubes 6 with three each of parts 11, 12, 13, 14, 15, 16, 20.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiments thereof, but I desire to have it understood that the apparatus disclosed is only illustrative and that the invention can be carried out by other means.

I claim:

1. In a device of the class set forth, an insulating tube, a metallic cap permanently cemented onto the upper end thereof, an upstanding tube formed integral with said cap and having its outer end closed by an integral closure wall to thereby provide a jointless metallic cap structure, the inner end of said metallic tube being open to the interior of the insulating tube and the interior of said metallic tube being smooth to slidably receive the end of a conductor passing up through the insulating tube, said upstanding tube being slightly yieldable transversely for distortion under external pressure applied thereto to force the wall of said tube inwardly to thereby insure good electrical contact with the end of a conductor lying in said metallic tube.

2. In a device of the class set forth, an insulating tube, a metallic cap permanently cemented onto the upper end thereof, an upstanding tube formed integral with said cap and having its outer end closed by an integral closure wall to thereby provide a jointless metallic cap structure, the inner end of said metallic tube being open to the interior of the insulating tube and the interior of said metallic tube being smooth to slidably receive the end of a conductor passing up through the insulating tube, said upstanding tube being slightly yieldable transversely for distortion under external pressure applied thereto at opposite points on the tube to force said opposite points inwardly to thereby insure good electrical contact with the end of a conductor lying in said metallic tube.

3. In a device of the class set forth, an insulating tube, a metallic cap permanently cemented onto the upper end thereof, an upstanding tube formed integral with said cap and having its outer end closed by an integral closure wall to thereby provide a jointless metallic cap structure, the inner end of said metallic tube being open to the interior of the insulating tube and the interior of said metallic tube being smooth to slidably receive the end of a conductor passing up through the insulating tube, said upstanding tube being slightly yieldably transversely for distortion under external pressure applied thereto to force said tube wall inwardly, an insulated conductor extending through said insulating tube, and a metallic cap electrically connected to the said conductor and slidably fitting in said metallic tube and adapted to be gripped by the wall of said metallic tube when said wall is forced inwardly.

4. In a device of the class set forth, an insulating tube, a metallic cap permanently cemented onto the upper end thereof, an upstanding tube formed integral with said cap and having its outer end closed by an integral closure wall to thereby provide a jointless metallic cap structure, the inner end of said metallic tube being

open to the interior of the insulating tube and the interior of said metallic tube being smooth to slidably receive the end of a conductor passing up through the insulating tube, said upstanding tube being slightly yieldable transversely for distortion under external pressure applied thereto to force said tube wall inwardly, an insulated conductor extending through said insulating tube, and a metallic cap electrically connected to the said conductor and slidably fitting in said metallic tube and adapted to be gripped by the wall of said metallic tube when said wall is forced inwardly, and insulating material filling the insulating tube, surrounding the insulated conductor and holding it positioned therein.

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