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SUSPENSION INSULATOR WITH ARCING HORNS

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Fig.1

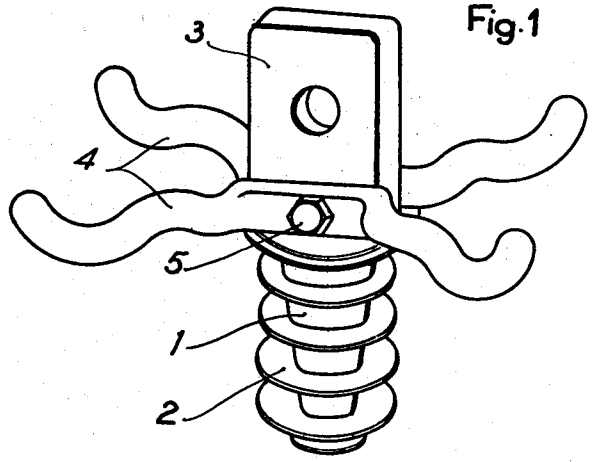
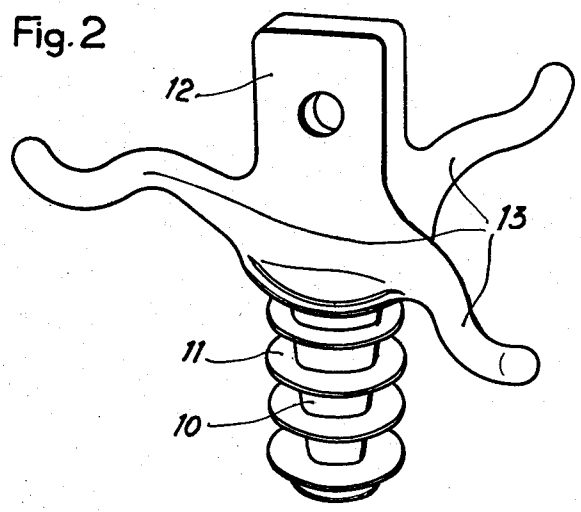


Fig.2

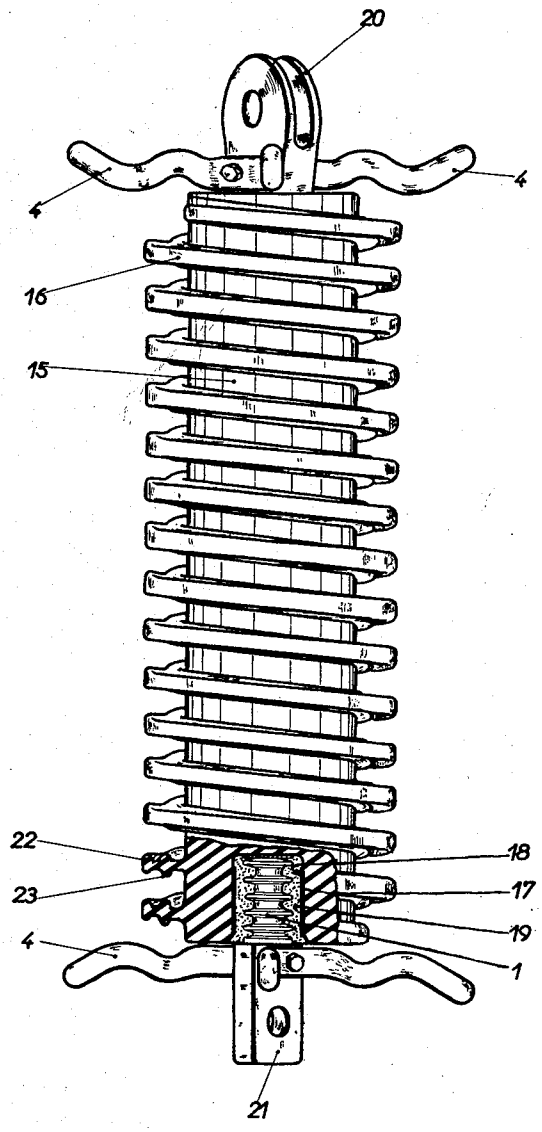


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SUSPENSION INSULATOR WITH ARCING HORNS

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Fig.:3

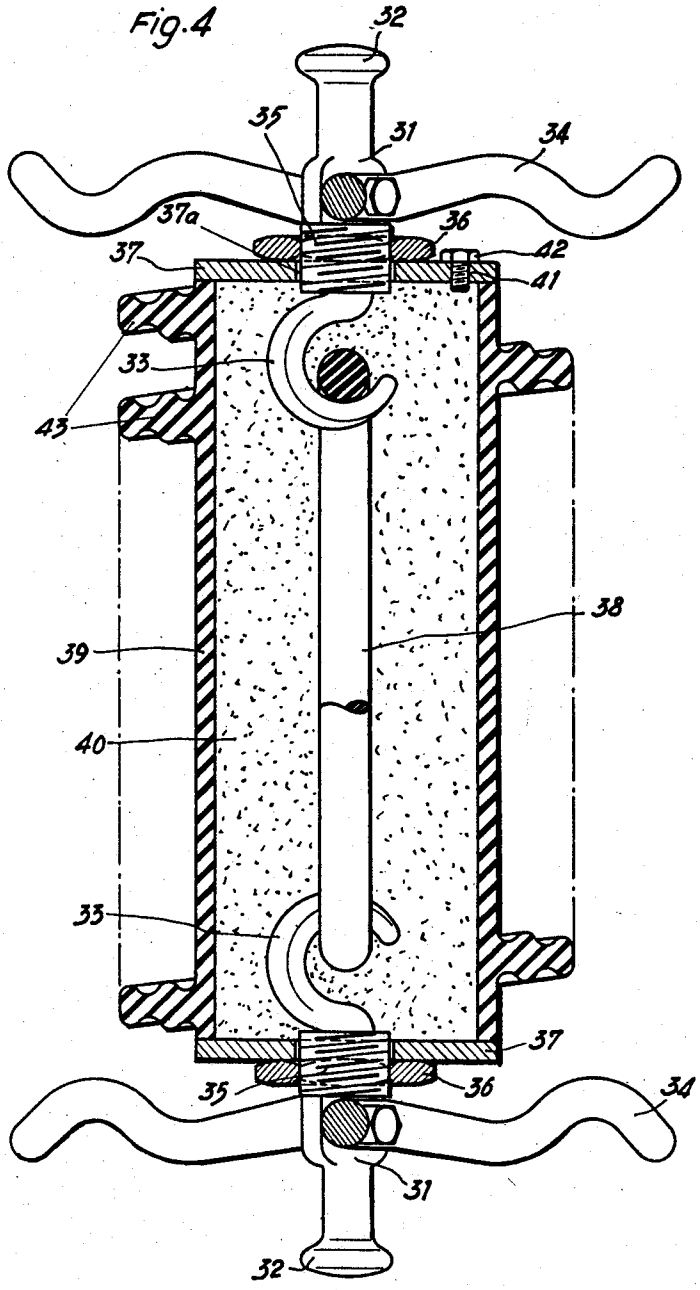


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SUSPENSION INSULATOR WITH ARCING HORNS

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Fig. 4

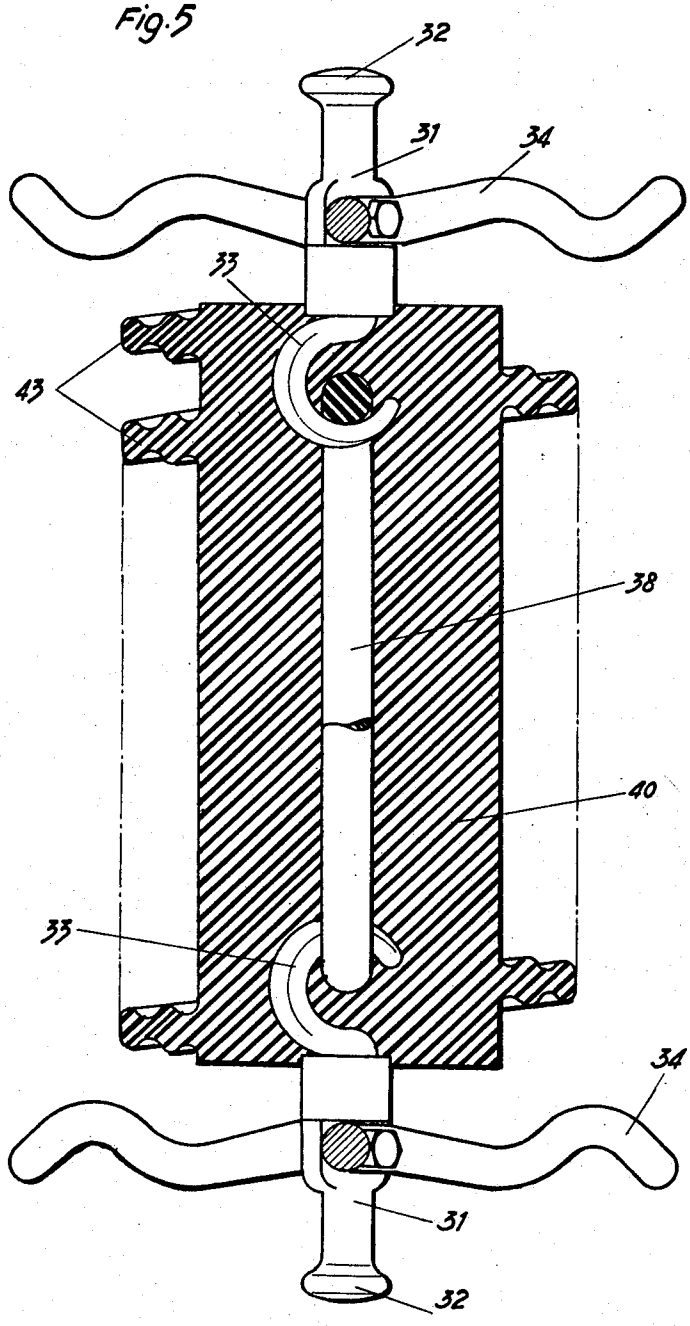


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Fig. 5



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SUSPENSION INSULATOR WITH ARCING HORNS

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11 Claims. (Cl. 174—140)

The present invention relates to fittings for suspension insulators of the long-pin type with internal sealing. As is well-known, suspension insulators with internal sealing offer, in comparison with similar insulators having external fittings, of which the cap-type insulator is an example, improved characteristics in respect to the flashover voltage for a given size, the electrical noise voltage and the capacity for withstanding arcing. This latter characteristic is markedly improved by the use of such protective devices as arcing horns which it is commonplace to use with external-sealing insulators.

It has been found that in order to effectively improve the capacity to withstand arcing in external-sealing insulators, it was necessary to provide a size of protective fitting notably larger than that required for an insulator with internal sealing. Such relatively compact size in the latter case permits, in accordance with the invention, the easy combining into a single unit of the connecting or fastening fitting and the protective fitting, and the consequent equipping of each unit in a string of insulators with an integrally combined connecting or fastening fitting and protective fitting.

Such protection for each unit in a string has already been resorted to in the case of insulators with external sealing, by the provision, for example, of shielding devices on the caps, but, as stated precedingly, it has not been found possible in such cases to insure adequate efficiency of the protective devices fixed to the caps, so that such devices, have had to be associated to conventional protective devices of which they then constitute but auxiliary appurtenances. Indeed insulator strings, in which each unit is suitably protected, generally consist of a plurality of units joined together via a connecting piece between the cores normally provided in such insulators, the shielding means common to two successive units being secured to said connecting pieces.

In accordance with our invention, on the other hand, each unit intrinsically embodies its own means of protection. It has further been found that in embodiments in accordance with our invention, the corona voltage is raised by reason of the reduced size of the protective devices needed to insure a comparable degree of protection, all other things being equal. Thus, in the case of a 150 kv. string consisting of externally sealed units equipped with arcing horns approximately fifteen to twenty-three inches long, the voltage corresponding to the onset of corona is 80 kv., whereas in a corresponding string consisting of internally sealed units individually protected by two sets of arcing horns arranged in cruciform fashion to give an overall diameter of some nine and a half inches, the corona onset voltage is 150 kv.

The accompanying drawings, given by way of example only, will give a clear understanding of the nature of the invention.

In these drawings, FIGURES 1 and 2 are perspective views of two possible embodiments of a protective fitting in accordance with the invention.

FIGURE 3 is a view in elevation, with partial sections, of a long-pin type insulator equipped with protective fittings in accordance with the invention.

FIGURES 4 and 5 are schematic axial sections through two variants.

Referring now to FIGURE 1, the fitting in accordance

with the invention comprises a pin **1** to permit sealing of the fitting inside the insulating core of the insulator, as disclosed in our patent application Serial Number 8063/60 filed on Feb. 11, 1960. The said pin **1** is provided with resilient fins **2** designed to be embedded in the sealing cement, with a link **3** for fastening the insulator and with a protective fitting consisting of a pair of arcing horns **4** fixed by a bolt **5** to a reduced surface between the sealed pin **1** and the link **3**.

FIGURE 2 shows a unit type of execution wherein the attachment fitting, comprising both a sealing pin **10** equipped with resilient fins **11** and a link **12**, further embodies three cast-on arcing horns **13** spaced at regular 120-degree intervals. The compact size of such a protective-fitting/attachment-fitting unit makes it possible to produce the latter in the form of a one-piece casting.

Although this form of execution makes it difficult to replace a horn damaged as the result of some mishap occurring in the transmission line and consequently entailing scrapping of the whole insulator, on the other hand such a fitting offers the advantage of insuring that under no circumstances can the insulator be used without the protection that the manufacturer deemed necessary to incorporate in each unit regardless of whether the latter was to be used singly or as part of a string of insulators.

Clearly, many modifications can be made without departing from the scope of our invention: thus the fitting can be modified by altering either the nature of the fastening component or the shape and/or number of the arcing horns, while bolting, welding, riveting or screwing are but a few examples of possible ways of securing the horns.

FIGURE 3 shows a complete long-pin type insulator executed in accordance with our invention. This insulator comprises an insulating core consisting of a substantially cylindrical barrel **15** provided with a spiral flange **16** cast or machined onto its periphery. Each end of the barrel is provided with a housing **17** the cylindrical inner wall of which is made rough at **18**, say by means of enamel-bonded porcelain grains, the said two housings being used to seal-in the fittings at each end of the barrel. Pin **1** (FIG. 1) or **10** (FIG. 2) of each such fitting, which carry the arcing horns in the manner described heretofore engage into the corresponding housings **17** and are sealed therein by means of some suitable material **19**, cement being an example. The resilient fins **2** (or **11**) of each pin provide purchase for the sealing material while their inherent resiliency insures a reduction in the local stresses sustained by the cement when the insulator is supporting the transmission line.

One of the fittings, say the upper one, terminates in a yoke **20**, while the other terminates in a flat piece **21** capable of locating with the yoke of the adjoining insulator, thereby facilitating the assembly in string form of a multiplicity of insulators each equipped with its individual system of arcing horns **4** (or **13**).

By virtue of the spiral shape of flange **16**, rainwater is able to drain down the length of the flange, as opposed to the dripping which takes place from one fin to the next when the latter are provided in the form of plain rings. With the former arrangement, the turns in the spiral flange can be tightened together by adopting a finer pitch for the spiral flange, thereby enabling the electrical leakage path along the insulator barrel to be lengthened.

By combining the three particularities indicated hereinbefore: to wit, internal sealing of the two terminal fittings, a spiral-shaped peripheral flange on the barrel and a horn-type shielding device secured to the parts of the fittings projecting from each end of the barrel—the said horns offering a path-length at least equal to the length of the insulating barrel to any electric arc that might flash over across the insulator's terminal fittings—there is thereby

obtained an insulator offering an exceptional degree of safety and which is at the same time both simple and relatively inexpensive to manufacture, it being possible for the spiral flange to be produced by machining the barrel blank prior to the baling process.

It will be found of advantage to impart to the flange a cross-section embodying one or more rims such as were described in patent application Serial number 789,356 filed on Jan. 27, 1959, now Patent 3,003,022. The provision of such rims is illustrated by the partial section in FIGURE 3 wherein may be seen a spiral flange cross-section embodying a terminal rim 22 and an intermediate rim 23 on each side of the flange.

In the variant shown in FIGURE 4, the insulator fittings 31 comprise a core in the form of a bolt rigidly united to a hook 33, the head of said bolt serving to secure the insulator. A set of arcing horns 34 is connected, in any suitable way, to a reduced part of the bolt, rearwardly of the threaded portion 35 of said bolt. Said threaded portion co-operates with a nut 36 whose inner diameter is greater than the diameter of the head of bolt 32, and said threaded portion passes freely through an end-plate 37 which is provided for the purpose with a hole 37*a* whose diameter is greater than that of head 32.

Over the hooks 33 of fittings 31 is engaged an insulating ring 38 made of resin-bonded glass fiber, the whole being enclosed in a substantially cylindrical insulating barrel 39 closed by end-plates 37 and filled with an insulating medium 40. One of the end-plates (the upper one) is provided with an orifice 41 obturated by a plug 42, and the insulating barrel 39 is provided with external spiral flanges 43 designed chiefly to lengthen the leakage path.

Said flanged insulating barrel may be made by molding a suitable plastic. The insulating filler medium 40 may likewise consist of some suitable plastic, chosen so that its coefficient of expansion matches that of the barrel 39, in order to prevent any danger of said insulating medium detaching itself from the barrel wall and causing play that would be detrimental to good insulator performance. Polyesters or plastics of the resin ethoxiline type, such as the product known by the trademark "Araldite," are examples of suitable materials for use as the filler medium.

An insulator such as has just been described can be assembled in the following manner.

With the insulating ring 38 placed in position on the hooks 33 of the fittings 31, the latter being devoid for the time being of their arcing horns 34, the barrel 39 is fitted over the hooks 33 and the coupling ring 38, and the end-plates 37 applied against the ends of the barrel 39. The nuts 36 are then screwed onto the threaded portions 35, thereby setting the insulating ring 38 under tension and the barrel 39 under compression. The insulating medium 40 may then be cast into the barrel through the orifice 41, the latter being obturated by means of the plug 42 after the filling operation has been completed. Lastly, the arcing horns 34 are secured to the body of the fittings 31. Obviously, the insulator shown in FIGURE 4 can be modified by substituting rings or eyes for the hooks 35; similarly, the device used to pre-stress the insulating barrel may be designed to use means other than nuts to achieve its purpose. It is furthermore possible to dispense with the envelope 39 containing the insulating medium 40, in which case the latter will itself constitute the barrel of the insulator and may be provided with an integrally cast-on, or otherwise formed spiral flange.

FIGURE 5 shows an insulator thus modified.

It is to be noted that the insulating ring 38 coupling the fittings 31 can be omitted if the barrel is capable of withstanding, on its own, the tensible forces which such a suspension insulator is called upon to sustain. In such a variant, the fittings will be molded directly into an insulating mass of some suitable plastic, surrounded or not by an envelope, and will not require to be coupled together by a special device.

As stated precedingly, an insulator made in accordance with the present invention has excellent flashover-withstanding properties, due to the combination of the following three means: core-fixing members buried in an insulating medium, protective arcing horns, spiral flange. The buried fixing member provide favorable distribution of the electrical field, and any arc that might strike does not tend to lick the insulating material but immediately strikes across to the protective horns. At the same time, for a leakage path of given length, the spiral flange permits tightening together of the turns in the spiral and a reduction in their width, which, among other advantages, offers that of creating poorly ventilated and therefore difficult-to-ionize zones of still air about the insulator barrel, thereby further contributing to protection of the insulator against arcing effects. Such a combination results in the obtainment of an insulator whose capacity for withstanding arcing is such that it permits substituting, for the ceramics commonly used in the insulator art, organic insulating materials such as charged or laminated resins, an alternative which carries with it numerous industrial advantages.

Such a suspension insulator made of organic insulating material can be still further improved by coating its surface with an insulating substance possessing the property of becoming volatilized under the effect of arcing, without leaving any carbonaceous traces.

To this end, there is deposited upon the outside of the flanged barrel a coating of polytetrafluoroethylene, better known under the trademark "Teflon," and this process has the added advantage of making the surface water-repellent.

What is claimed is:

1. A suspension insulator comprising a generally cylindrical body of insulating material and metal fittings at the opposite ends thereof, each metal fitting having three distinct portions mechanically assembled to form a rigid unitary structure, namely: an inner portion having at least an end section embedded and sealed within said body, an outer portion projecting therefrom and having fastening means for the mechanical connection of said suspension insulator, and protective arcing horns shaped to assist extinction of flashover arcs and positioned intermediate said inner and outer portions, said horns extending generally transversely of the axis of said cylindrical body, the narrowest interval between the arcing horns of the opposite metal fittings being at least equal to the length of said cylindrical body.

2. A suspension insulator as claimed in claim 1, in which said insulating body is provided with a peripheral spiral flange disposed extending axially on said body from one end to the other thereof.

3. A suspension insulator as claimed in claim 2, in which said spiral flange is provided with a bulge along its outer edge.

4. A suspension insulator as claimed in claim 3, in which said flange is provided with another bulge intermediate its outer edge and the insulating body.

5. A suspension insulator as claimed in claim 1, further comprising a device coupling the attachment fittings together, said device being made of insulating material capable of withstanding the tensile forces the insulator is called upon to sustain and disposed, embedded in said body of said insulator.

6. A suspension insulator as claimed in claim 5, in which said coupling device comprises an insulating ring made of resin-bonded glass fiber coupling said fittings disposed at opposite ends of said body.

7. A suspension insulator as claimed in claim 6, in which said fittings are each provided with a hook engaged on said insulating ring.

8. A suspension insulator as claimed in claim 6, in which the coupling device is pre-tensioned mechanically, thereby pre-stressing said insulator body.

9. A suspension insulator as claimed in claim 1, in which said insulating body is made of plastic.

10. A suspension insulator as claimed in claim 1, in

which said insulating body of the insulator is coated externally with an insulating substance possessing the property of becoming volatilized under the effect of arcing without leaving any carbonaceous traces.

11. A suspension insulator as claimed in claim 10, in which said insulating coating substance comprises polytetrafluoroethylene.

References Cited in the file of this patent

UNITED STATES PATENTS

1,156,442	Steinberger	Oct. 12, 1915
1,250,387	Thomas	Dec. 18, 1917
1,448,604	Steinberger	Mar. 13, 1923
1,501,688	Steinberger	July 15, 1924
1,520,984	Thomas	Dec. 30, 1924

FOREIGN PATENTS

50,098	Sweden	Sept. 28, 1921
221,722	Switzerland	Sept. 1, 1942
843,561	Germany	July 10, 1952
1,193,114	France	Apr. 27, 1959

OTHER REFERENCES

German printed application 1,072,669, Jan. 7, 1960.