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(54) Insulator for medium and high voltage electric lines

(57) Insulator for medium and high voltage electric lines comprising a supporting structural component for a plurality of ribs of insulating material characterised by the fact that said structural component is made as a single piece of high-performance thermoplastic polymeric material.

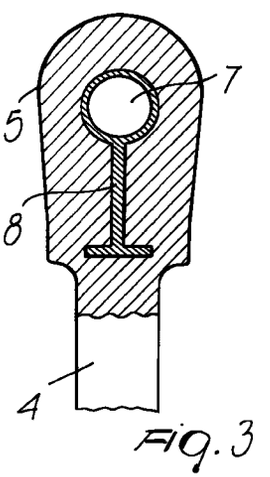

Fig. 3

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Description

[0001] The present invention relates to an insulator for medium and high voltage electric lines.

[0002] As it is known, medium and high voltage insulators are currently obtained fitting rubber ribs on a structural component.

[0003] The structural component has a substantially cylindrical central section made of thermosetting material, such as fibreglass with epoxy resin that, has an insulating function; the ends of this central section are fitted with steel parts that have the purpose of mechanical connection to the electric conductor on one side and to an earth potential point on the other side.

[0004] The central section of the structural component acts also as a supporting core for the aforesaid silicone rubber ribs.

[0005] The metal parts can be fitted with hooking slots or can have a forked shape.

[0006] Manufacturing insulators in accordance with the present technology requires several production phases because a coupling between the central section of thermosetting material and the end sections of steel is needed, with consequent increased production times and high costs.

[0007] In addition, insulators of the state of the art do not offer complete reproducibility due to possible constructional tolerances or variations in the coupling between the metal parts and the core of the thermosetting material. Main task of the present invention is to provide an insulator for medium and high voltage electric lines that can be obtained using a simplified construction process compared to those conventionally known. As part of this task, one aim of the present invention is to provide an insulator for medium and high voltage electric lines with a structure that offers a high level of reproducibility.

[0008] Another aim of the present invention is to provide an insulator for medium and high voltage electric lines that offers high resistance to mechanical and dielectric stresses in the hooking areas at the ends of the insulator itself.

[0009] Yet another object of the present invention is to provide an insulator for medium and high voltage electric lines in which the electric field can be confined to the insulator zone in which the silicone rubber ribs are present, simultaneously increasing the breaking load of the insulator by distributing it uniformly over all of the top and bottom part of the insulator.

[0010] A further aim of the present invention is to provide a procedure for the manufacture of an insulator for medium and high voltage electric lines.

[0011] A further but not the last aim of the present invention is to provide an insulator for medium and high voltage electric lines that offers high reliability and relatively easy to manufacture at competitive costs.

[0012] This task, together with these and other aims that shall emerge more clearly hereinafter are achieved by an insulator for medium and high voltage electric lines made of a structural supporting component for a plurality of ribs of insulating material. The insulator, as in the present invention, is characterised by the fact that said structural component is made as a single piece of high-performance thermoplastic polymeric material.

[0013] The aforementioned task and aims are also achieved by a method for manufacturing an insulator for medium and high voltage electric lines as in claim 1, characterised by the fact that it comprises the phase that consists in:

> injection moulding said structural component using high-performance thermoplastic polymeric material, defining a substantially cylindrical central section suitable for supporting radial ribbing and having end sections fitted with hooking means.

[0014] Further characteristics and advantages of the invention shall emerge more clearly from the description of a preferred but not exclusive embodiment of the device as in the invention, illustrated purely by way of example and without limitation in the attached drawings in which:

> Fig. 1 is a view in perspective of the insulator as in the present invention;
> Fig. 2 is a partially-exploded side elevation view of the insulator as in the present invention complete with rubber ribbing;
> Fig. 3 is a partial section view showing a first embodiment of the insulator as in the present invention;
> Fig. 4 is a partial section view showing a further embodiment of the insulator as in the present invention;
> Fig. 5 is a view in perspective showing the insert used in the insulator as in the invention; and
> Fig. 6 is a partial section view showing a further embodiment of the insulator as in the present invention.

[0015] With reference to the aforesaid figures, the insulator as in the present invention, indicated by reference number 1, comprises a one-piece structural component 2 made of thermoplastic polymeric material such as polyetherimide (PEI), polyphthalamide (PPA), polysulphone (PSU) or polyphenylsulphone (PPS), etcetera, by injection moulding.

[0016] A non-conductive reinforcing fibre, such as fibreglass or aramid fibre, preferably of the short or discontinuous type, is advantageously added to the thermoplastic polymeric material together with, if desired, mineral fillers such as kaolin, calcium carbonate, mica or talc, etcetera.

[0017] The structural component 2, that acts as a support for a plurality of silicone rubber ribs 3, of conventional type, has a substantially cylindrical central section

4 that terminates in two rounded end sections 5, each separated from the central section 4 by a flange 6 that forms an abutting element for the ribs 3 which are then positioned radially around the central section 4.

[0018] The rounded end sections 5 are each fitted with a hole 7 for hooking to a conductor of the electric line or to the supporting pylon (not shown in the figures).

[0019] The end sections 5 can have other configurations than those shown, being fork-shaped for example.

[0020] The insulator 1 described above can be used individually or can be connected to identical insulators in order to form a chain of insulators, depending on the degree of insulation required.

[0021] In figures 3 and 4 are represented preferred embodiments of the present invention that are quite advantageous because they allow to avoid problems due to both mechanical and dielectric stresses.

[0022] Mechanical stresses are due to the forces imparted to the end sections 5 of the insulator when the latter is placed in its operating position. Dielectric stresses are due to the development of surface charges in the presence of an electric field in the proximity of the holes 7, with the possible destruction or incorrect behaviour of the insulator itself.

[0023] The concentration of mechanical and dielectric stresses occurs as said in the proximity of the holes 7 formed in the end sections 5. The consequence of mechanical stresses is to create cracks which gradually spread once they have occurred, leading to the breakage of the insulator, while dielectric stresses can trigger a surface discharge.

[0024] In embodiments represented in figures 3 and 4, a metal insert 8 is provided to be buried during the phase for moulding the insulator around the region of the holes 7 in order to surround the hole and to terminate in proximity of the flange 6. The metal insert 8 can be shaped differently, as illustrated for example in Figures 3 and 4, but its object is in all cases to relieve the areas of the holes 7 of mechanical and dielectric stresses, distributing them along the central section 4 of the insulator.

[0025] Alternatively, in a further embodiment illustrated in figure 5, a bush 9 is present in each of the holes 7 and the metal insert can be a bolt welded to the bush 9 at one end and connected transversely to a plate 10 at the other end.

[0026] In the embodiments represented in figures 3, 4 and 5, the insert 8 is placed in advance in the mould in which the thermoplastic material is to be injected to form the one-piece structural component 2 of the insulator in such a way that the metal insert 8 remains buried within this structural component 2.

[0027] The metal insert 8 is advantageously made of stainless steel.

[0028] The presence of the insert thus has the dual effect of distributing the mechanical and dielectric stresses along the central section 4.

[0029] It has in practice been seen that the insulator as in the present invention fully achieves its set tasks: the structural component for supporting the ribs is made as a single injection-moulded piece of thermoplastic polymeric material, reducing the phases of the construction process and consequently the costs compared to insulators of known type.

[0030] Furthermore, the presence of a metal insert around the end hooking areas of the insulator makes it possible to redistribute any mechanical and dielectric stresses present in the end hooking sections along the central section, thus avoiding undesirable breakages and loss of reliability of the insulator.

[0031] The insulator conceived in this way is capable of numerous modifications and variants that are all within the inventive concept; moreover, all the details may be substituted by other technically equivalent elements.

[0032] In practice, the dimensions and materials used can be of any kind to suit the requirements and state of technology providing they are compatible with the specific use.

Claims

1. Insulator for medium and high voltage electric lines comprising a structural component supporting a plurality of ribs of insulating material characterised by the fact that said structural component is made as a single piece of high-performance thermoplastic polymeric material.

2. Insulator as in claim 1 characterised by the fact that said structural component is made using a single injection-moulding phase.

3. Insulator as in one or more of the previous claims characterised by the fact that said structural component has a substantially cylindrical central section having end sections fitted with hooking means, said end sections being separated from said central section by connections made in a single body in said structural component.

4. Insulator as in claim 3 characterised by the fact that said sections fitted with hooking means have a rounded shape and each feature a hole for hooking said insulator in its operating position.

5. Insulator as in one or more of the previous claims characterised by the fact that said structural supporting component is made of high-performance thermoplastic polymeric material to which non-conductive reinforcing fibres have been added.

6. Insulator as in one or more of the claims from 1 to 4 characterised by the fact that said structural supporting component is made of high-performance thermoplastic polymeric material to which non-con-

ductive reinforcing fibres and mineral fillers have been added.

7. Insulator as in one or more of the previous claims characterised by the fact that it includes, for each of said end sections, one metal insert placed around the related hole of said end sections, said metal insert making it possible to distribute mechanical and dielectric stresses affecting the insulator along said central section.

8. Insulator as in claim 7 characterised by the fact that said metal insert is made of stainless steel.

9. Insulator as in claim 7 characterised by the fact that said metal insert takes the form of a bolt connected at one end to a bush suitable for being inserted in each of said holes and to a plate at the other end.

10. Insulator as in claim 7 characterised by the fact that said metal insert is buried within said structural component of high-performance thermoplastic polymeric material in the moulding phase.

11. Method for the manufacture of an insulator for medium and high voltage electric lines as in claim 1, characterised by the fact that it comprises the phase that consists in: injection moulding said structural component using high-performance thermoplastic polymeric material, defining a substantially cylindrical central section suitable for supporting radial ribbing and terminating in end sections fitted with hooking means.

12. Method as in claim 11 characterised by the fact that said thermoplastic polymeric material has non-conductive reinforcing fibres added to it.

13. Method as in claim 11 characterised by the fact that said thermoplastic polymeric material also has mineral fillers added to it.

14. Method as in one or more of the claims from 11 to 13 characterised by the fact that it also includes the phase that consists in inserting in advance in the mould for making said structural component one metal insert suitable for being placed around said hooking means defined in said end sections.

15. Method as in claim 14 characterised by the fact that said metal insert is made of stainless steel.

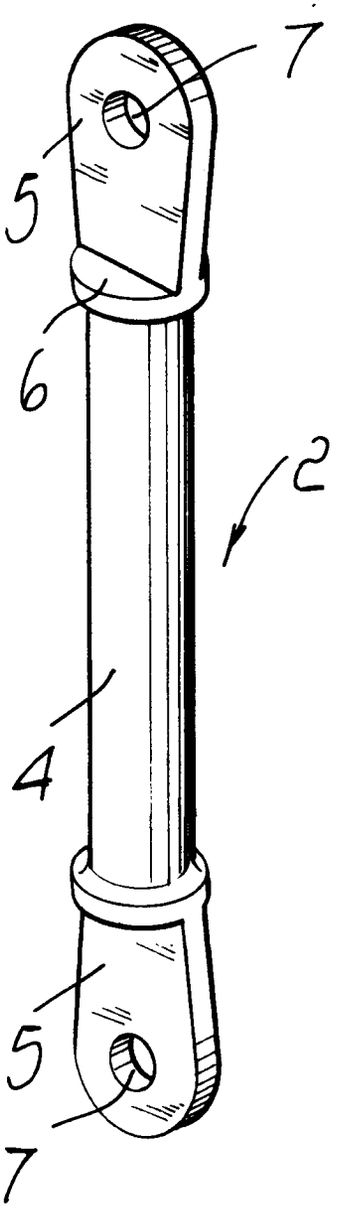

FIG. 1

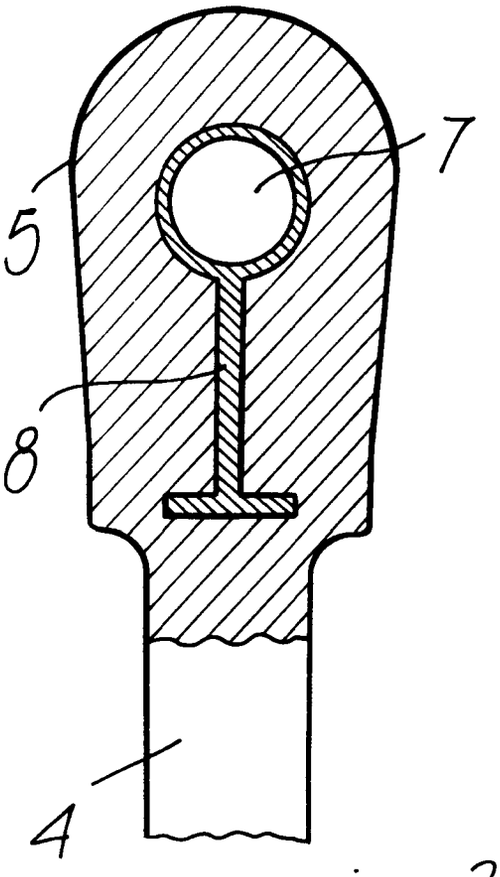

FIG. 3

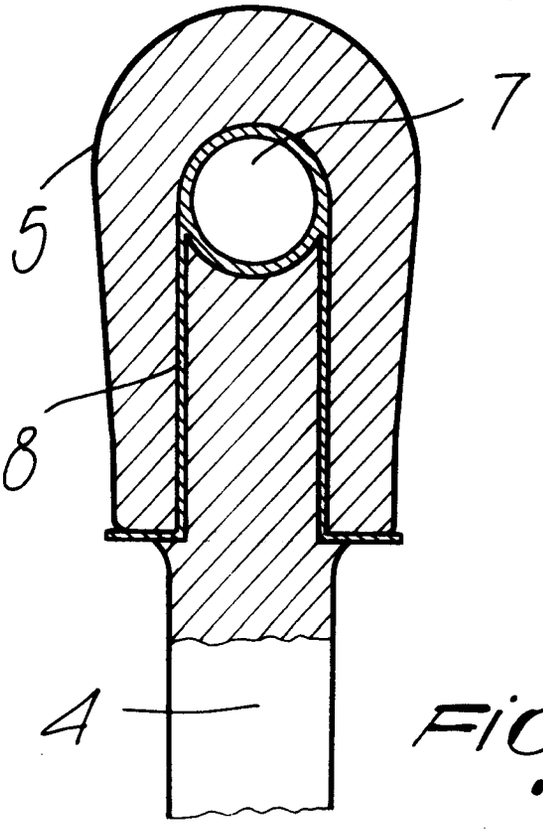

FIG. 4

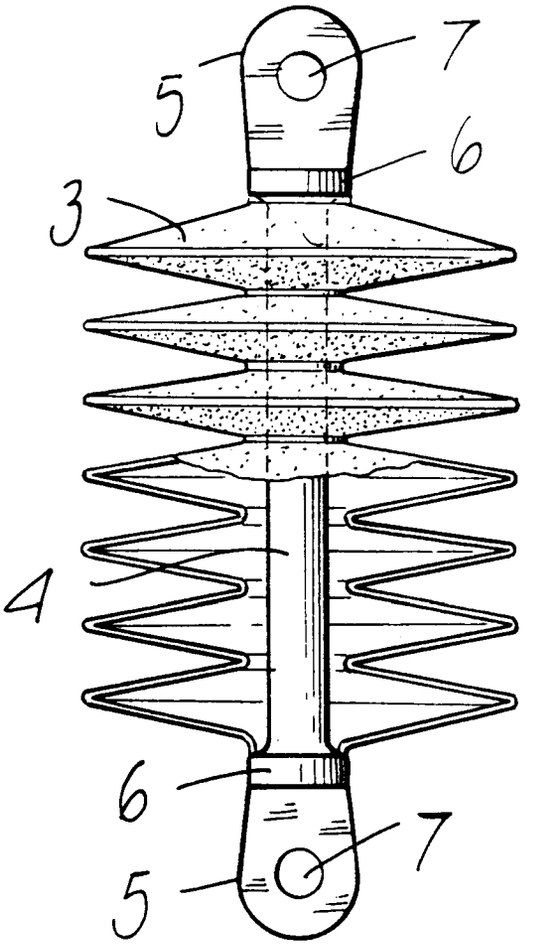

FIG. 2

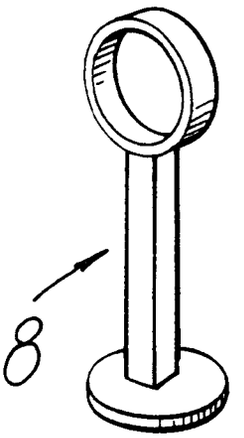

FIG. 6

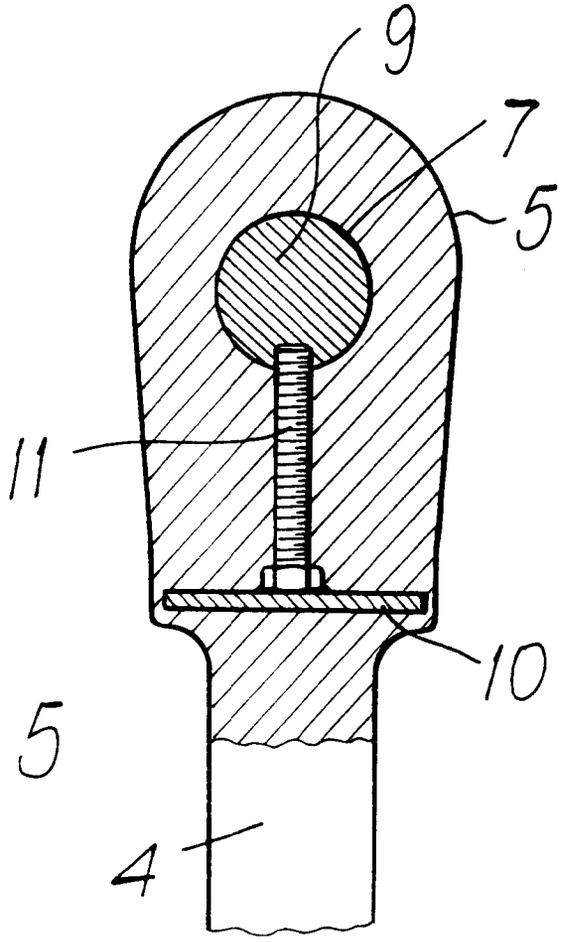

FIG. 5