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(54) Shed insulator

(57) A shed insulator, particularly for poles of medium and/or high-voltage circuit breakers, comprising an upper part and a lower part, each of which comprises a tube made of composite material around which sheds made of silicone material are arranged, the upper part having a larger diameter than the lower part, the two parts being mutually connected by interposing a single metal collar.

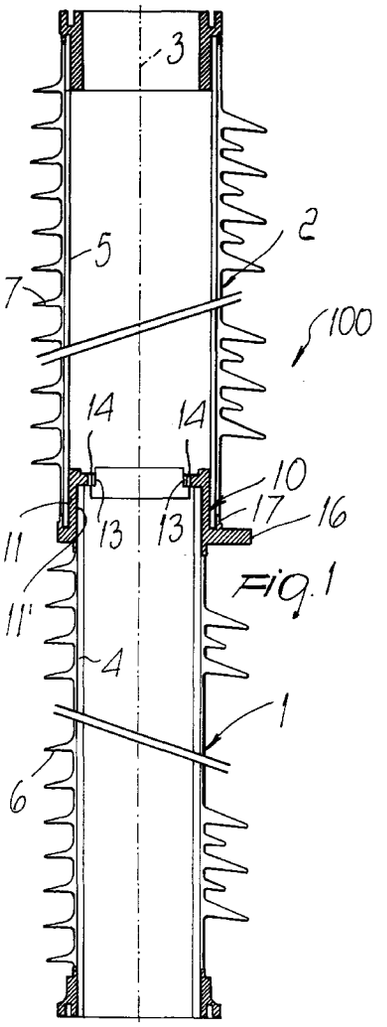

Fig. 1

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Description

[0001] The present invention relates to a shed insulator, particularly for a pole of a medium ad/or high-voltage circuit breaker, having particular shape and characteristics.

[0002] As it is known, shed insulators are generally constituted by a shed tube which is entirely made of ceramic material; as an alternative, it is possible to have insulators provided with a tubular part, made of composite material, around which sheds made of silicone material are arranged.

[0003] These insulators are widely used mainly in the manufacture of the poles of medium- and/or high-voltage circuit breakers; specifically as regards the provision of the poles, the use of porcelain insulators leads to severe limitations in the conventional art.

[0004] In the current state of the art, the pole of the circuit breaker in fact comprises a porcelain insulator which is constituted by two mutually separate parts: a first part, commonly termed supporting insulator, which is arranged in the lower part of the pole relative to the vertical axis of the circuit breaker and constitutes a supporting structure inside which the means for actuating the fixed and moving contacts of the circuit breaker are located; and a second part, generically termed interruption chamber insulator, is located in the upper part of the pole and contains the interruption chamber for the contacts of the circuit breaker.

[0005] The connection between these two structurally separate parts is provided by adopting intermediate junction components according to an embodiment which entails considerable drawbacks and disadvantages.

[0006] In particular, a metal collar is fixed both to the upper end surface of the supporting insulator and to the lower end surface of the interruption chamber insulator in order to provide size matching between these two parts; the two collars are fixed to the respective insulators by cementing. An additional geometric matching element is then interposed between the two collars and is generally constituted by a metal plate, with whose surface a tang is associated which acts as a current tap for external electrical connection to the insulator; the current reaches the tang by means of a current collector which is located inside the interruption chamber insulator and is screwed to said plate.

[0007] The metal plate is then screwed to both collars by means of a complicated system of bolts; in this manner, the supporting insulator is assembled to the interruption chamber insulator.

[0008] This solution is clearly disadvantageous, since by using intermediate connection components it entails an increase in the necessary material and therefore in the overall weight of the pole of the circuit breaker and in the manufacturing costs and times. Moreover, it is necessary to machine in the surface of the plate suitable seats in which an operator must fit sealing gaskets during assembly. These gaskets must ensure that the provided junctions are hermetic with respect to an insulation gas which is used in the circuit breaker to quench any electric arc produced by the opening of the contacts; said gaskets must therefore be positioned accurately and this leads to an increase in assembly time and difficulty.

[0009] Another considerable drawback of the above-described solution is the fact that, being defined the creepage distance as the perimetric length of the sheds required to give the pole of the circuit breaker the necessary dielectric strength, the presence of the two collars and of the intermediate plate increases the overall height of the pole for an equal creepage distance, or forces a decrease in the creepage distance for an equal overall height of the pole. Moreover, an increase in the height of the pole of the circuit breaker leads to additional difficulty in its transport to the installation side, owing to road code constraints affecting the maximum allowed height of the load that can be transported by a truck.

[0010] In the case of high-voltage circuit breaker poles with an insulator made of composite material, the insulator is formed monolithically. Although this solution allows to eliminate some of the drawbacks of the production of porcelain insulators, it also entails drawbacks especially as regards the production step. In particular, the production of monolithic insulators, owing to the dimensions involved, entails the use of very long spindles, producing a single insulator at a time and consequently increasing the production times. Moreover, the production of a monolithic insulator does not allow to optimize the amount of composite material used, since for example it prevents the adoption of a smaller diameter in the supporting insulator part that contains the means for actuating the contacts of the circuit breaker, which would allow to save on the amount of composite material to be used.

[0011] The aim of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, which has a simplified structure with a reduced number of components required to produce it in practice.

[0012] Within the scope of this aim, an object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, which provides a reduced overall height of the insulator for an equal creepage distance, consequently simplifying transport to the installation site.

[0013] Another object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, which provides an increase in the creepage distance for an equal total height of the pole, with a consequent improvement in the dielectric strength of said insulator.

[0014] Another object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, having a reduced number of junctions between its components.

[0015] Another object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, in which the amount of material used is reduced and therefore the overall weight of the pole of the circuit breaker is also reduced together with its production costs.

[0016] Another object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, which allows simple and optimized production.

[0017] Another object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, in which assembly can be performed easily and quickly.

[0018] Another object of the present invention is to provide a shed insulator, particularly for poles of medium- and/or high-voltage circuit breakers, which is highly reliable, relatively easy to manufacture and at competitive costs.

[0019] This aim, these objects and others which will become apparent hereinafter are achieved by a shed insulator for poles of medium and/or high-voltage circuit breakers, characterized in that it comprises two parts, an upper part and a lower part respectively, each of said two parts comprising a tube made of composite material around which sheds made of silicone material are arranged, the upper part having a larger diameter than the lower part, the two parts being mutually connected by interposing a single metal collar.

[0020] In this manner the great advantage is obtained of eliminating the collars cemented to the two parts of the insulator, simplifying the structure of the insulator and thus reducing the amount of material required and the overall weight of said insulator.

[0021] Further characteristics and advantages of the present invention will become apparent from the following detailed description of some preferred but not exclusive embodiments of the insulator according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

- Figure 1 is a schematic sectional view of the shed insulator according to the present invention;
- Figure 2 is a view of the shed insulator of Figure 1 with a current collector fixed to a junction collar according to the invention; and
- Figure 3 is a partial perspective view of the collar used in the insulator according to the invention.

[0022] In particular, the description refers to a shed insulator used to provide a pole of a medium-and/or high-voltage circuit breaker, but this application must not be considered limitative in any way.

[0023] As shown in Figures 1 and 2, the shed insulator according to the invention, generally designated by the reference numeral 100, comprises two parts, respectively a lower part 1 and an upper part 2 with reference to a vertical axis 3 of the insulator. Both the lower part 1 and the upper part 2 are constituted by a tube, designated by the reference numerals 4 and 5 respectively, which is made of composite material, for example fiberglass, and around which sheds made of silicone material, designated by the reference numerals 6 and 7 respectively, are arranged; in particular, the tube 4 of the lower part 1 has a smaller diameter than the tube 5 of the upper part 2.

[0024] If the insulator is used in a pole of a medium- and/or high-voltage circuit breaker, the upper part 2, hereinafter termed interruption chamber insulator, contains the fixed contacts and the moving contacts, which are not shown in the figures. Said moving contacts, are actuated by known actuation means, also not shown, and couple to, and uncouple from, the corresponding fixed contacts, causing a closed/open state of the circuit breaker.

[0025] The lower part 1, hereinafter termed supporting insulator, contains means for actuating the moving contacts; the operation and the structure of said actuation means is extensively known from the art and is therefore not described further.

[0026] In the embodiment of the insulator according to the invention, the two parts 1 and 2 are mutually connected by interposing a single metal collar 10. As shown in Figure 3, the metal collar 10 has a tubular portion 11 on whose internal surface 11' and external surface 11" the lower part 1 and the upper part 2 are respectively glued at an end portion thereof. Advantageously, the collar 10 has, externally to said tubular portion 11, a circular groove 12 with parallel cylindrical walls 11 and 17 in which at least the tip portion of the lower end of the upper part 2 of the insulator is embedded. Additionally, on the internal surface 11' of the collar a raised portion 13 is provided against which the upper end of the lower part 1 of the insulator abuts. It is possible to provide, on the raised portion 13, holes 14 which allow coupling to a current collector 15 which is arranged inside the interruption chamber insulator. The holes 14 are arranged along a circumference whose diameter is smaller than the diameter of the tube 4 of the lower part 1; in this manner a collar is obtained which is already per se compact and needs a reduced amount of material.

[0027] Advantageously, the current flows through the collector 15 into a tang 16 which is associated with the collar 10 and constitutes a current tap of the pole of the circuit breaker; in this manner, the collar acts not only as an element for joining the two parts of the insulator but also as a current tap of the circuit breaker.

[0028] In practice it has been observed that the insulator according to the invention fully achieves the intended aim and objects, since in practice a monolithic insulator is obtained whose joining and assembly are extremely simplified. Moreover, by virtue of the particular embodiment of the joining collar, the insulator parts that are fixed to the collar are partly embedded inside said collar. In this manner, the outer insulator surface that is not covered by sheds is reduced significantly with re-

spect to conventional insulators, with enormous advantages especially in the case of the poles of medium- and high-voltage circuit breakers. In this case, in fact, for an equal creepage distance, defined as the perimetric length of the sheds of the insulator, the overall height of the pole is reduced, with advantages related to the bulk of said pole and to its transport to the installation site; as an alternative, if required by particular requirements and/or specific applications, the overall height of the pole can be left unchanged but in this case the creepage distance of the insulator is increased. In particular, as shown in Figure 2, it is possible to cover the outer surface of the insulator almost entirely with sheds, achieving a distance 30 between the tang and the nearest shed which can be compared with the average distance 31 between two adjacent sheds of said insulator.

[0029] The mutual gluing of the two parts of the insulator and the collar in the case of the pole of a circuit breaker further ensures the tightness of the junction with respect to an insulating gas without having to use a sealing gasket; said insulation gas is used in the circuit breaker to quench any electric arc produced by the opening of the contacts. The current insulator thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may also be replaced with other technically equivalent elements.

[0030] In practice, the materials and the dimensions may be any according to requirements and to the state of the art.

Claims

1. Shed insulator for poles of medium and/or high-voltage circuit breakers, characterized in that it comprises two parts, an upper part and a lower part respectively, each of said two parts comprising a tube made of composite material around which sheds made of silicone material are arranged, the upper part having a larger diameter than the lower part, the two parts being mutually connected by interposing a single metal collar.

2. Shed insulator according to claim 1, characterized in that said metallic collar has a tubular portion on whose inner and outer surfaces said lower and upper parts are respectively glued with a tip portion.

3. Shed insulator according to claim 2, characterized in that said collar has, outside said tubular portion, a groove in which the lower end of the upper part of the insulator is embedded with at least a tip portion.

4. Shed insulator according to one or more of the claims 2-3, characterized in that the collar has, in its inner part, an annular raised portion against whose lower surface the upper end of the lower part of the insulator abuts.

5. Shed insulator according to claim 4, characterized in that holes for coupling to a current collector are formed in said annular raised portion, said holes being arranged along a circumference whose diameter is smaller than the diameter of the lower part of the insulator.

6. Shed insulator according to one or more of the claims 2-5, characterized in that a tang is externally associated with said collar and constitutes a current tap.

7. Shed insulator according to claim 6, characterized in that the distance between said tang and the nearest shed is substantially equal to the average distance between two adjacent sheds.

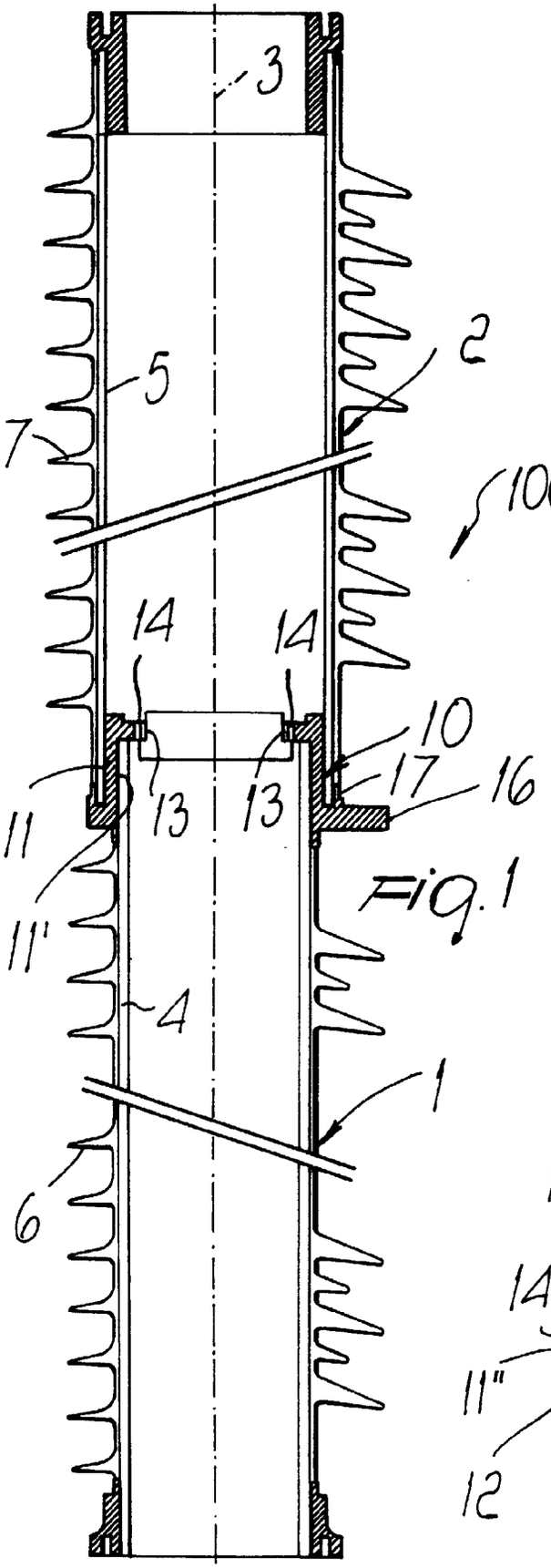

Fig. 1

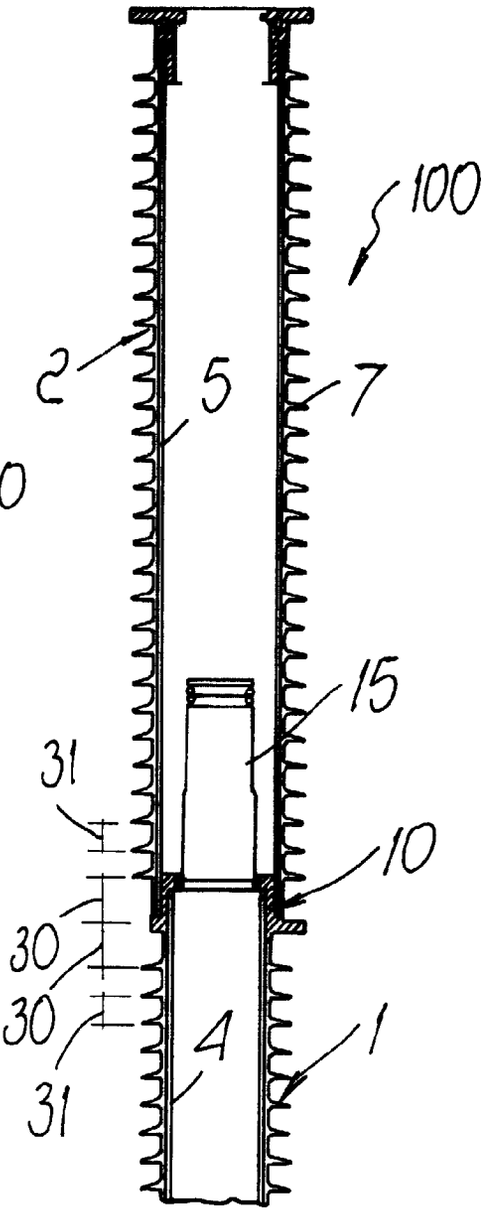

Fig. 2

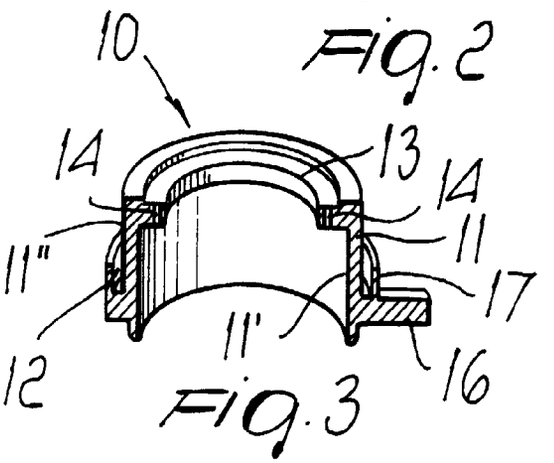

Fig. 3