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(54) **Embedded pole part for switchgear**

(57) The invention relates to an embedded pole part for switchgear, especially for medium voltage use, according to the preamble of claim 1. In order to keep up the thermoplastic pole part without problems about die-

lectric strength, it is proposed that an additional part is used for extension of creepage path and adhered to the inside of thermoplastic pole part housing by gluing or pressing method.

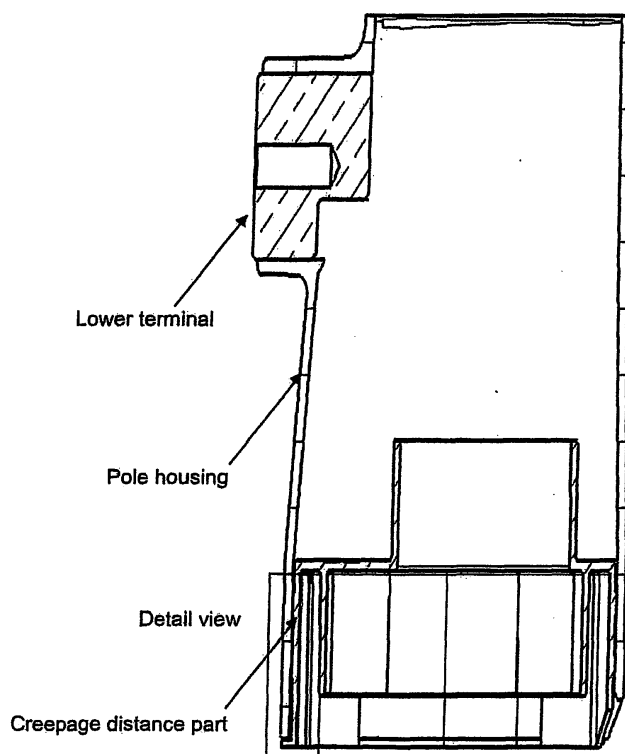


Fig. 1

Description

[0001] The invention relates to an embedded pole part for switchgear, especially for medium voltage use, according to the preamble of claim 1.

[0002] The present invention relates to an embedded pole part for switchgear especially in medium voltage use until to 72 KV.

[0003] In the state of the art, embedded pole parts are constructed with epoxy-resin coverage, as well as with a thermoplastic coverage.

[0004] In the epoxy resin process, as well as in the injection moulding process, on the outer surface of pole parts are arranged sections for extension of creepage path, which has a dielectric length of at least 20 mm/KV. In so-called pole part the vacuum interrupt and two terminals (upper and lower terminals), which are connected with the vacuum interrupt, are embedded by the a.m. coverage.

[0005] So in result, embedded poles from the state of the art are produced from epoxy resin in the manufacture. The epoxy pole parts themselves have inner ribs which increase the dielectric strength. In the injection moulding process for the manufacture of thermoplastic pole part the inner ribs are eliminated for the reasons such as processing, thickness, etc.

[0006] In order to ensure sufficient length of the interior creepage path of pole part, the thermoplastic pole part can be assembled with an additional part by the use of gluing or pressing methods. In such this way with the help of the additional part the length of interior creepage path can be extended.

[0007] So, it is an object of the invention, to avoid problems with dielectric strength also over the inner surface of the pole part.

[0008] This problem is solved with the features of claim 1.

[0009] Further embodiments of this invention are mentioned in the depending claims.

[0010] In order to keep up the thermoplastic pole part without problems about dielectric strength, it is proposed that an additional part is used for extension of creepage path and adhered to the inside of thermoplastic pole part housing by gluing or pressing method.

[0011] By this, the a.m. problems could be overcome in a highly reproducible way, so that high quality standard of such manufactured pole part can be realised. So technically is given a sufficient length of the interior creepage path of pole part with the help of the an additional part which extends the length of interior creepage path.

[0012] Furthermore the additional part is fixed in the pole part by a method, given by claim 8, and an alternative method is given by claim 9.

[0013] This method is used for the connection between thermoplastic pole part and an additional part, such as glueing. In this case there are clear advantages which occur by the invention.

[0014] This is, that the connection possibility is given

for different materials.

Furthermore, the fixation in this way has a sealing and insulation function, which support the dielectric strength additionally.

5 **[0015]** By this manufacturing step, it is possible, to match incorrect construction, or to fit high manufacturing tolerances.

[0016] Also weight saving compared to other joining methods is given, as well as it supports Automation in manufacturing, also under the condition of high reproducibility.

10 **[0017]** The aim of the invention is therefore to integrate the additional part for extension of creepage path by using different cost-effective joining methods into the pole part housing, in order to meet the requirement on the length of the Creepage.

[0018] An advantageous embodiment is, that the additional part is glued or pressed or screwed into the open inner foot area of the pole part.

20 **[0019]** For this, it is advantageous, that the surface of the additional part has structures in that way, that it extends the creepage path, as well as it is a part of a fixation structure. By these structures it is for example possible to screw the additional part into the opening.

25 **[0020]** Furthermore it is described optionally, that the additional part has surface structure of parallel horizontal lines or at least one such structure with a gap of at least 0,5 mm between each line which are at least 0,1 mm thick, and that the outer measure of the lines of the additional part fits into the opening of the pole part in its foot area, so that ring volumina between additional part and inner surface of the pole part opening occur, in which is placed the glueing material.

30 **[0021]** Advantageous is a gap measure of even 10 mm between each line.

35 **[0022]** The additional part is made of exopy material, or thermoplastic material.

[0023] Furthermore could be manufactured as a hollow part.

40 **[0024]** For the use of a sealing lip, the additional part has a sealing lip which is integrally formed at this additional part.

[0025] A first method to manufacture a pole part for switchgear, is formed with epoxy in that way, that an additional part is glued into the inner surface of the open foot area of the pole part and that the outer surface of the additional part is structured in lines which are arranged in such a way, that they have areas between two lines, which has a depth of at least 0,1 mm, and in which the glue is located before fixing the additional part into the opening of the pole part.

45 **[0026]** An alternative method is, that the additional part is located into the opening at the foot area of the pole part under the use of an elastic sealing lip in the area of the joint between these two parts, and that the additional part will be pressed mechanically into the opening.

50 **[0027]** An embodiment of the invention is shown in the drawing.

Figure 1: Additional part located in the opening at the foot area of the pole part.

Figure 2: Most detailed part partial view of figure 2.

[0028] Figure 1 shows in detail the additional part for extension of creepage path, which sticks or is fixed in the thermoplastic pole part in the inner foot area, in order to lengthen creepage path between the low terminal and ground in the interior of pole part housing. In order to achieve a reliable connection between pole part housing and additional part, this can be realized by specific adhesive or hot melt process. The additional part for extension of creepage path is so designed, that a particular area or channel for bonding should be furnished, like seen in Figure 2. In this example a channel is designed for bonding with a width of 10 mm and joining gap of 0.5 mm.

[0029] The material for manufacturing of this additional part can be used with same Material as the thermoplastic pole part.

[0030] It is also envisaged that the interior surface of pole part could be increased by means of additional part. In this way the total creepage between the low terminal and ground is also extended. Like it can be seen in figure 2.

[0031] In order to create a reliable connection between pole part and additional part, the specific adhesives or hot-melt should have the following requirements:

- No conductivity, good insulating, dielectric strength higher than 20 kV / mm
- No sensitivity against humidity and temperature cycle.
- Apply the temperature range from -60 °C to 120 °C.
- Suitable for long-term durable connection.
- Ability to seal the joining gap, high viscosity.

[0032] Another method involves a combination of two plastic parts which in this case are the thermoplastic pole part and an additional part under the use of an elastic sealing lip in the area of the joint between these two parts.

[0033] The sealing lip of the additional part can be produced in a proceeding of that kind of two-component injection and then the additional part is bond together with the pole part housing by means of a mechanical joining method.

[0034] In this method for connecting two plastic parts by pressing, wherein at the connecting points there is at least one part with elastic or compressible sealing lip, which can be elastically deformed by defined presses of the part. In this case with the help of the sealing lip on the additional part, that is compressed into the pole part housing.

Claims

1. Embedded pole part for switchgear, with thermoplastic housing on a vacuum switch chamber and on the electric terminals,
characterized in,
that an additional part is arranged in the inside area of the foot of the pole part, in order to extend the extension of creepage path at the inner surface of the embedded pole part.
2. Embedded pole part, according to claim 1,
characterized in,
that the additional part is arranged without further sealing element.
3. Embedded pole part according to claim 1,
characterized in,
that the additional part is glued or pressed or screwed into the open inner foot area of the pole part.
4. Embedded pole part according to one of the claims 1 to 3,
characterized in,
that the surface of the additional part has structures in that way, that it extends the creepage path, as well as it is a part of a fixation structure.
5. Embedded pole part according to claim 2,
characterized in,
that the additional part has surface structure of parallel horizontal lines, with a gap of at least 0,5 mm between each line which are at least 0,1 mm thick, and that the outer measure of the lines of the additional part fits into the opening of the pole part in its foot area, so that ring volumina between additional part and inner surface of the pole part opening occur, in which is placed the glueing material.
6. Embedded pole part according to one of the afore-said claims,
characterized in,
that the additional part is made of exopy material.
7. Embedded pole part according to one of the afore-said claims,
characterized in,
that the additional part is made of thermoplastic material.
8. Embedded pole part according to one of the afore-said claims,
characterized in,
that the additional part as a hollow part.
9. Embedded pole part according to one of the afore-said claims,
characterized in,

that the additional part has a sealing lip which is integrally formed at this additional part.

10. Method to manufacture a pole part for switchgear, with epoxy or thermoplastic coverage on a vacuum switch chamber and on the electric terminals, 5
characterized in,
that an additional part is glued into the inner surface of the open foot area of the pole part and that the outer surface of the additional part is structured in lines which are arranged in such a way, that they have areas between two lines, which has a depth of at least 0,1 mm, and in which the glue is located before fixing the additional part into the opening of the pole part. 10
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11. Method to manufacture a pole part for switchgear, with epoxy or thermoplastic coverage on a vacuum switch chamber and on the electric terminals, 20
characterized in,
that the additional part is located into the opening at the foot area of the pole part under the use of an elastic sealing lip in the area of the joint between these two parts, and that the additional part will be pressed mechanically into the opening. 25

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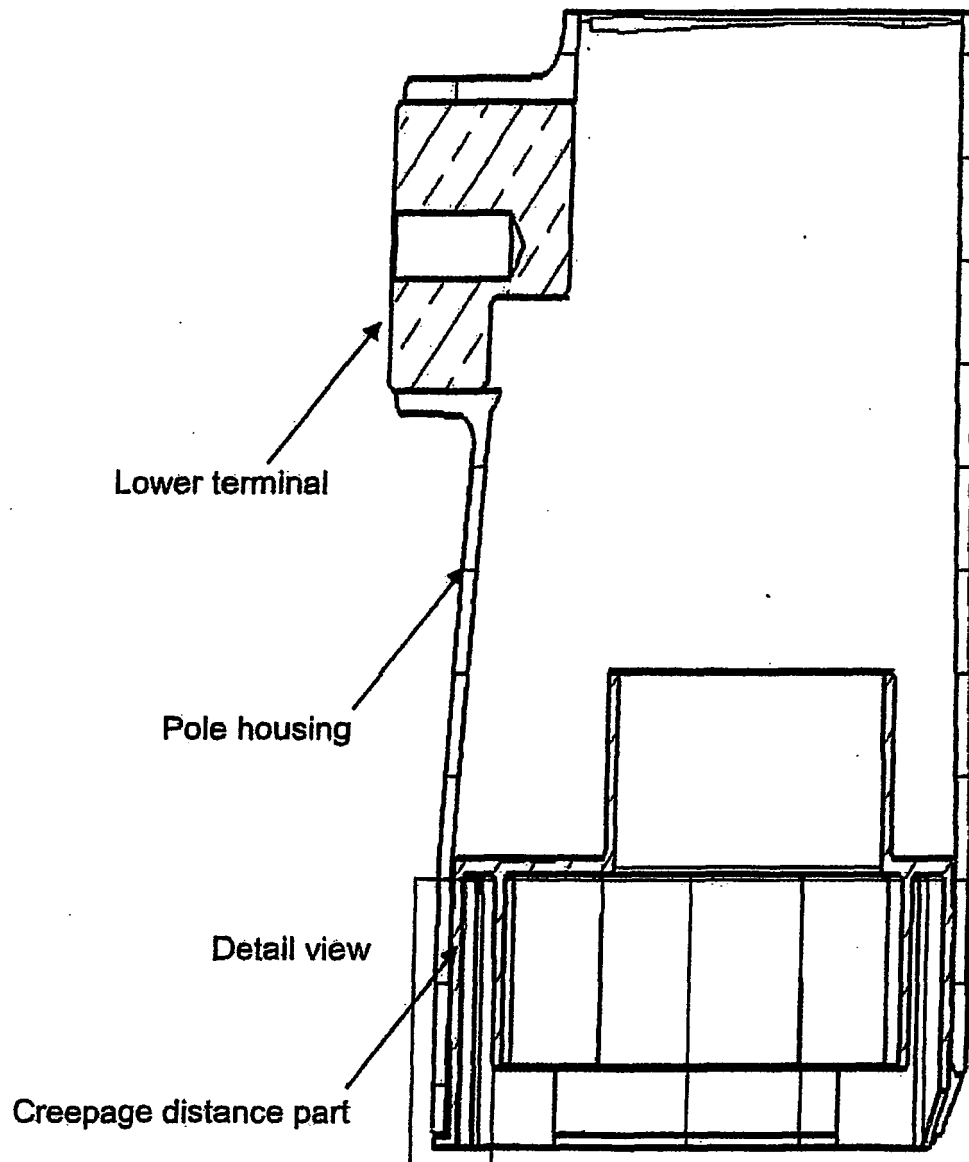


Fig. 1

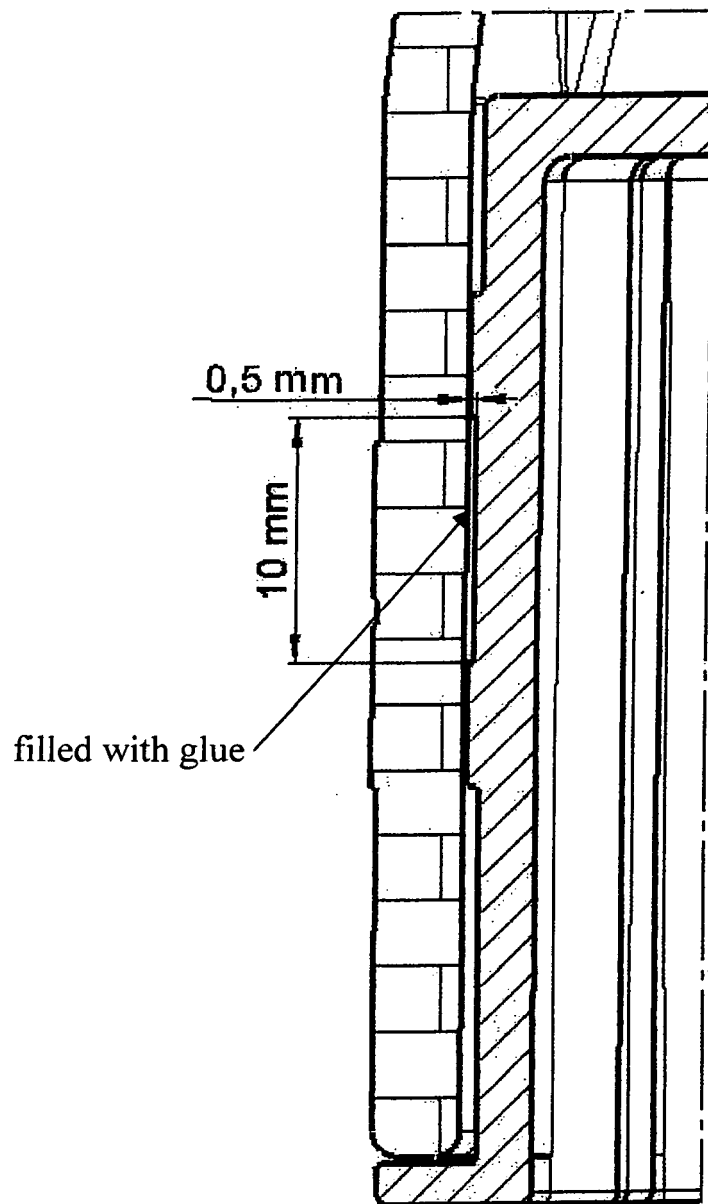


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 09 00 9397

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 101 20 447 A1 (ABB PATENT GMBH [DE]) 31 October 2002 (2002-10-31) * paragraphs [0004] - [0006] * * paragraphs [0019] - [0023]; figures 3-5 *	1-11	INV. H01H33/66 ADD. H01H33/24
X	----- WO 2004/010448 A (MAYSTEEL LLC [US]) 29 January 2004 (2004-01-29) * paragraph [0007] * * paragraphs [0032], [0033]; figures 4-6 *	1-11	
A	----- WO 2007/022931 A (ABB TECHNOLOGY AG [CH]; CLAUS OLIVER [DE]; GENTSCH DIETMAR [DE]) 1 March 2007 (2007-03-01) * abstract; claims 1,2; figure 1 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		20 October 2009	Starck, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 00 9397

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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