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**Datasheet for the decision  
of 20 March 2020**

**Case Number:** T 0769/15 - 3.5.02

**Application Number:** 05798826.3

**Publication Number:** 2102874

**IPC:** H01B17/30

**Language of the proceedings:** EN

**Title of invention:**

Electric bushing and a method of manufacturing an electric bushing

**Applicant:**

ABB Schweiz AG

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

Inventive step - (yes)



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 0769/15 - 3.5.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.02**  
**of 20 March 2020**

**Appellant:** ABB Schweiz AG  
(Applicant) Brown Boveri Strasse 6  
5400 Baden (CH)

**Representative:** Romedahl, Bengt  
Kransell & Wennborg KB  
P.O. Box 27834  
115 93 Stockholm (SE)

**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 4 December 2014  
refusing European patent application No.  
05798826.3 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman** R. Lord  
**Members:** C.D. Vassoille  
W. Ungler

## Summary of Facts and Submissions

- I. The applicant (appellant) filed an appeal against the decision of the examining division to refuse European patent application no. 05798826.3, corresponding to the international application published as WO 2006/049567 A1.
- II. The following documents are relevant for the present decision:
- D3: WO 00/55872 A1  
D4: "Power<sup>IT</sup> Resin Impregnated Paper Bushing, Type CORIP, Oil to Air", ABB Inc., April 2003.  
D5: D.J. O'Brien et al., "Viscoelastic Properties of an Epoxy Resin during Cure", Journal of Composite Materials, Vol. 35, No 10/2001, 2001, pages 883 to 904.
- III. In the decision under appeal, the examining division came to the conclusion that the subject-matter of claim 1 of the former main request did not fulfil the requirements of Articles 56 and 84 EPC. On the same grounds, the former first auxiliary request was refused. The former second to fourth auxiliary requests were refused solely on the ground that the subject-matter of claim 1 did not involve an inventive step in the sense of Article 56 EPC.
- IV. With the statement setting out the grounds of appeal of 2 April 2015, the appellant filed a new main request as well as a first and a second auxiliary request, these requests being based on the second, third and fourth auxiliary requests underlying the decision under appeal.

V. In a communication under Rule 100(2) EPC the board informed the appellant that the subject-matter of claim 1 of the main request seemed to involve an inventive step in view of document D4 and the common general knowledge of the skilled person. The board however noted a number of formal defects in the application, and it was suggested that the appellant file revised application documents in order to overcome these remaining objections.

VI. With letter of 21 October 2019, the appellant filed an amended set of claims 1 to 15 as well as an amended description page 3 corresponding to the new main request. The board interprets this as a request of the appellant that the decision under appeal be aside and a patent be granted on the basis of the following documents:

Claims:

No. 1 to 15 filed with the letter of 21 October 2019;

Description:

Pages 1, 4 to 9 and 11 to 13 as published;  
Pages 2, 2a filed with letter of 21 May 2013;  
Page 10 filed with letter of 20 August 2013;  
Page 3 filed with letter of 21 October 2019;

Drawings:

Sheets 1/2 to 2/2 as published.

VII. Claim 1 of the new main request reads as follows:

"A bushing (1) for electric current and/or voltage through a grounded plane (2) comprising a rotationally symmetrical insulator body (3) surrounding a central electrical conductor (4), **characterized in** that said

bushing exhibiting a sealing element (6) for gas/liquid sealing between the conductor and the insulator body, said sealing element (6) having compressible means arranged on a part of the axial lengths of the central electrical conductor (4) between the insulator body (3) and the central electrical conductor (4), the sealing element being in a compressed state between the externally arranged insulator body and the conductor (4), said sealing element (6) forming a gas/liquid seal, integrated with the insulator body, between the central electrical conductor (4) and the insulator body (3), wherein said insulator body (3) comprises winding insulating material arranged onto the central electrical conductor, wherein the winding insulating material comprises a hardening material having a solid shape, and wherein said compressible means of the sealing element (6) comprise grooves (7a) formed on an annular band, which grooves (7a) are arranged perpendicular to the axial direction of the conductor facing the same."

Claims 2 to 8 are dependent on claim 1.

VIII. Independent method claim 9 of the new main request reads as follows:

"A method for manufacturing a bushing (1) for electric current and/or voltage through a grounded plane (2) according to the preceding claims, comprising a rotationally symmetrical insulator body (3) surrounding a central electrical conductor (4), **characterized** by said bushing exhibiting a sealing element(6) for gas/liquid sealing between the central electrical conductor (4) and the insulator body (3), said sealing element (6) having compressible means, applying said compressible means to a part of the axial

lengths of the central electrical conductor (4) between the insulator body (3) and the central electrical conductor (4) prior to winding of the insulating material, said material being applied so as to cover the sealing element (6), then imparting a permanent and radial compressive force to the sealing element (6) with its compressible means during the subsequent manufacturing process by the surrounding insulator body (3), wherein forming said insulator body (3) by winding insulating material onto the conductor, then impregnating said insulator body (3) with a hardening material and then transferring said insulator body (3) into solid shape by a hardening process, whereby the sealing element (6) in its compressed state serves as a gas/liquid seal between the central electrical conductor (4) and the insulator body (3), and compressing the sealing element (6) consisting of rubber or a rubber-like material by deformation of its compressible means comprising grooves (7a) making contact with the central electrical conductor (4)."

Claims 10 to 15 are dependent on claim 9.

IX. The arguments of the appellant as far as they are relevant for the present decision are as follows:

Contrary to the examining division's opinion, the subject-matter of claim 1 did not include the use of O-rings. Rather, claim 1 explicitly stated the following distinguishing feature over D4: "wherein said compressible means of the sealing element (6) comprise grooves (7a) formed on an annular band", which in no way could be interpreted as an O-ring by a person skilled in the art, because an O-ring was neither an annular band nor did it comprise grooves.

Therefore, if the person skilled in the art would have considered the application of O-rings in bushings, they would not have arrived at the subject-matter of claim 1 having a sealing element comprising grooves formed on an annular band, wherein the grooves are arranged perpendicular to the axial direction of the conductor facing the same.

It was further unreasonable to consider that the grooves could be of microscopic nature as their size was not defined in claim 1, because the grooves would have no technical effect in this case. If on the contrary an O-ring had grooves resulting in a technical effect, it would be considered to be a defective O-ring.

The objective technical problem formulated by the examining division in the decision under appeal, namely that of how to provide a gas/liquid sealing between the conductor and the insulator body (see page 8, second last paragraph of the reasons for the decision under appeal), was incorrect and artificial.

Rather, the known technical solution of providing O-rings in slots was complicated and costly in manufacture, and a suitable objective technical problem should therefore be considered to be that of how to facilitate and reduce costs of manufacture of the bushing.

This problem was solved by the use of the sealing element as defined in claim 1, which allowed manufacture of the bushing without slots for the application of O-rings. A corresponding sealing element was not disclosed in the prior art and was therefore not obvious to the skilled person.

## **Reasons for the Decision**

1. The appeal is admissible.
2. *Main request - inventive step (Article 56 EPC)*

### *Closest prior art*

- 2.1 In the reasons for the decision under appeal, the examining division considered document D4 to be the closest prior art. The appellant did not contest this point of the decision under appeal and the board has no reason to deviate from the examining division's assessment in this respect.

### *Distinguishing features*

- 2.2 The examining division in the decision under appeal concluded that claim 1 merely defined "some sealing means between the central conductor and the cured insulating body" and further considered it obvious to place "some sealing means" around the central conductor before winding the resin impregnated paper around it (see the second paragraph on page 9 of the reasons for the decision under appeal).
- 2.3 The board does not agree with the findings of the examining division in the reasons for the decision under appeal.

The board first observes that, contrary to the examining division's opinion, claim 1 clearly defines the "compressible means" as being part of the sealing element and arranged on a part of the axial length of the central electrical conductor between the insulating



body and the central electrical conductor, and further as comprising (a plurality of) grooves formed on an annular band.

Claim 1 thus structurally defines the sealing element in an unambiguous way and in particular its compressible means comprising grooves formed on an annular band. It is true that claim 1 does not include a definition of the number or depth of the grooves or the spacing between them. It is, however, evident that the actual number and design of the grooves strongly depend on the further design of the bushing and must therefore be understood in functional terms (see in particular page 3, lines 26 to 30 of the patent application). In any case, the board agrees with the appellant that the subject-matter of claim 1 cannot reasonably be interpreted as including O-rings, which neither correspond to an annular band nor have grooves.

The subject-matter of claim 1 therefore differs from document D4 at least in that the compressible means of the sealing element comprise grooves formed on an annular band. A corresponding distinguishing feature is present in the independent method claim 9.

*Technical effect and objective technical problem*

- 2.4 The board agrees with the appellant that the examining division was wrong in their conclusion, which was based on an incorrect understanding of claim 1, that the objective technical problem was that of how to provide a gas/liquid sealing between the conductor and the insulator body (see page 8, second last paragraph of the reasons for the decision under appeal).

Rather, the objective technical problem resulting from the distinguishing feature should be considered to be that of how to facilitate and reduce costs of manufacture of a bushing, while maintaining the sealing ability of the sealing element also during a temperature change.

*Non-obviousness*

- 2.5 The subject-matter of claims 1 and 9 is not rendered obvious by a combination of document D4 with the common general knowledge and in particular with documents D3 and/or D5.

The decision under appeal does not contain a reference to a prior art document which discloses compressible means of a sealing element comprising grooves formed on an annular band in the context of bushings or a similar application. A corresponding document was also not cited in the course of the examination procedure, which was in principle confirmed by the examining division during the oral proceedings (see point 12 of the minutes of the oral proceedings held on 17 December 2013 before the examining division).

- 2.6 Documents D3 and D4 may indeed disclose the use of O-rings as sealing elements in the context of bushings but these documents do not disclose a sealing element having compressible means comprising grooves formed on an annular band, as required by claim 1. Furthermore, from document D5 it may be known that epoxy resins change form while curing. There is however no indication to use compressible means of a sealing element in the sense of claim 1, and the board agrees with the appellant that the sole fact that the use of O-rings as sealing elements as well as the curing

behaviour of epoxy resin may generally be known in the art, is not sufficient to show that the subject-matter of claim 1 is obvious to the skilled person.

In conclusion, the available prior art documents, in particular documents D3, D4 or D5, either alone or in combination, do not teach or suggest the provision of a compressible means as defined in claim 1 in order to solve the objective technical problem. Nor can it be said that a corresponding sealing element forms part of the common general knowledge and would obviously be applied to solve the above problem.

2.7 The board has therefore come to the conclusion that the subject-matter of claim 1 is not rendered obvious by document D4 in combination with the common general knowledge of the skilled person or with either or both of documents D3 and D5 and consequently involves an inventive step in the sense of Article 56 EPC. The same applies to the subject-matter of independent method claim 9.

### 3. *Conclusion*

Given that the subject-matter of claims 1 and 9 of the main request involves an inventive step in the sense of Article 56 EPC and considering that the application fulfils the further requirements of the Convention, the board had to accede to the appellant's main request.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division with order to grant a patent in the following version:

#### Claims:

No. 1 to 15 filed with the letter of 21 October 2019;

#### Description:

Pages 1, 4 to 9 and 11 to 13 as published;  
Pages 2, 2a filed with letter of 21 May 2013;  
Page 10 filed with letter of 20 August 2013;  
Page 3 filed with letter of 21 October 2019;

#### Drawings:

Sheets 1/2 to 2/2 as published.

The Registrar:

The Chairman:



U. Bultmann

R. Lord

Decision electronically authenticated