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Bezeichnung der Erfindung: Conductor insulating method and apparatus
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : H02K 15/12

ENTSCHEIDUNG / DECISION

vom / of / du 19 October 1990

Anmelder / Applicant / Demandeur : GENERAL ELECTRIC COMPANY

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPO / EPC / CBE Article 111(1)

Schlagwort / Keyword / Mot clé : "Application remitted to the first instance
after restriction of Claim 1 by a feature
derived from the description."

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt
Beschwerdekammern

European Patent
Office
Boards of Appeal

Office européen
des brevets
Chambres de recours



Case Number : T 620/88 - 3.5.2

DECISION
of the Technical Board of Appeal
of 19 October 1990

Appellant : GENERAL ELECTRIC COMPANY
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Decision under appeal : Decision of Examining Division 054 of the European
Patent Office dated 14 July 1988 refusing European
patent application No. 85 901 837.6 pursuant to
Article 97(1) EPC

Composition of the Board :

Chairman : E. Persson
Members : W. Riewald
Y. Van Henden

Summary of Facts and Submissions

- I. European application No. 85 901 837.6 was filed as International application No. PCT/US 85/00518 on 29 March 1985, claiming priority of an application in the United States of 2 April 1984, and published under No. WO 85/04532 on 10 October 1985.

The application was refused by a decision of the Examining Division on 14 July 1988.

- II. The reason given for the refusal was that the independent Claims 1 and 5 (filed on 19 January 1988) were not allowable in that they did not comply with Article 56 EPC for lack of inventive step having regard to the prior art known from

D1: CA-A-951 864

D2: US-A-3 075 250

and that the features of the dependent Claims 2 to 4 and 6 to 9 were only to be regarded as routine features to the man in the art.

- III. On 30 August 1988, the Applicant filed a notice of appeal against that decision and paid the appeal fee on the same day. A statement of grounds was filed on 18 November 1988 accompanied by a slightly amended page 1 of the description.

- IV. In a communication dated 4 August 1989, the Rapporteur expressed the provisional opinion that the refusal of the application, based on the independent claims, was justified and that features specified in the dependent

claims, when incorporated in a new independent claim, were not sufficient in order to arrive at an allowable claim. The main points raised by the Rapporteur can be summarised as follows:

The closest prior art is represented by D1 describing a method of electrically insulating a series loop by enclosing it in a plastic mould and filling this mould with curable plastic material.

As for the viscosity of the applied fill material, D1 suggests to make use of de-aeration and a long pouring time if materials with a viscosity greater than 100 000 centipoise are used. However, the Appellant's different suggestion, viz. to force the plastic material into the mould under a suitable pressure (greater than about 20 psi = 1.4 bar), would also readily be envisaged by a skilled person who is aware of the teaching of D2. As for the principal choice of the materials used and the bonding of the plastic fill material to both the series loop to be insulated and the mould, there is also conformity between the prior art disclosed in D1 and the subject-matter of the present application.

Since the description of the application provides more information about specific materials used for the mould and for the fill material, respectively, the Rapporteur drew the Appellant's attention to the requirement of a closer specification in the independent claims of the materials, if the Appellant saw some inventive merit in the choice of a particular material to the effect of achieving specific properties in an unpredictably advantageous manner.

The Rapporteur objected, however, to the "incorporation" of the information of a co-pending US-application or a

related EP-application into the present application. The content of the US-application was not available to the public on or before the filing date of the present application, nor was a copy of that application filed together with the present application. The EP-application was not cited in the present application documents as filed.

- V. With letter of 8 February 1990, the Appellant filed new Claims 1 to 6 with an accordingly adapted description (pages 1 to 18).

With letter of 27 March 1990, the Appellant asked for Oral Proceedings by way of an auxiliary request.

- VI. Oral Proceedings were held on 19 October 1990, in the course of which the Appellant filed

new Claims 1 to 6 and
a new description, pages 1 to 18,

replacing the claims and description so far on file, the drawings remaining as originally filed.

Since the independent Claims 1 and 3 were restricted by incorporation of a feature that had not yet been a subject of examination, the Appellant requested that the decision under appeal be set aside and that the case be remitted to the first instance for further prosecution on the basis of the above documents.

VII. The independent Claims 1 and 3 read as follows:

"1. A method of electrically insulating a series loop including stator bar end connections of a large electric generator stator which comprises the steps:

enclosing in situ the series loop (31) in a fill chamber (32) of a plastic mold (14),

non-hermetically sealing the mold against leakage of liquid fill from the mold,

forcing plastic fill material of viscosity greater than about 100,000 mPa.s (cps) at 25°C into the mold under pressure greater than about 1.4 bar (20 psi) and thereby filling the mold fill chamber,

curing the plastic fill material in contact with both the loop (31) and the mold (14) and thereby bonding the plastic fill to the mold and producing a composite molded insulating body,

wherein the plastic mold (14) consists of a high-performance thermoplastic resin selected from the group consisting of bisphenol-A polycarbonates, polyester material made from 1,4-butanediol and terephthalic acid, polyetherimide resin and polysulfone resins and

wherein the plastic fill material comprises fillers and a thermosetting resin compatible with both the metal of the series loop and the plastic material of the mold and bondable to both the loop and the mold upon curing.

3. In a stator of a large steam turbine generator having a plurality of stator bars (37, 38) and liquid-coolant series loops (31) connected to the stator bars, the combination of a clamshell mold (14) of a first plastic material comprising two half shells (16, 17) having edge portions (16A, 17A) interfittingly overlapped providing a closed fill chamber (32) and enclosing an end portion (35, 36) of one of said plurality of stator bars, and an end portion of one of said plurality of liquid-coolant series loops (31) connected to said end portion of said one of said plurality of stator bars and having apertures through which said one of said plurality of stator bars and liquid-coolant series loops extend, and cured second plastic material filling the fill chamber and bonded to said connected end portion of said one of said plurality of stator bars and one of said plurality of loops liquid-coolant series within the clamshell mold fill chamber wherein said first plastic material consists of a high-performance thermoplastic resin selected from the group consisting of bisphenol-A polycarbonates, polyester material made from 1,4-butanediol and terephthalic acid, polyetherimide resin and polysulfone resins and wherein said second plastic fill material comprises fillers and a thermosetting resin compatible with both the metal of the series loop and said plastic material of the mold and bondable to both the loop and the mold upon curing."

VIII. The Appellant's arguments can be summarised as follows:

The independent Claims 1 and 3, filed at the Oral Proceedings have been amended over the independent claims, as rejected by the Examining Division by the incorporation of specific details concerning the materials used.

The selection of high-performance thermoplastic resins for the plastic mould, as specified in the claims, is different from the cellulose triacetate preferably used according to D1 (page 3, lines 17 to 22), but not suitable to stand the high filling pressure (greater than about 1.4 bar) of the claimed method.

The plastic fill material is not exclusively a thermosetting material as used according to D1 (page 5, lines 8 to 24) but a mixture of fillers and thermosetting material. It is the filler that provides for the high viscosity of greater than 100 000 centipoise, the thermosetting material itself having a much lower viscosity. Reference is made to the originally filed description, page 3, lines 22 to 30 and page 14, lines 1 to 5. The avoidance of the setting problem, i.e. the elimination of the need for mixing the insulating material shortly before introducing it into the mould, is closely related to the use of the said filler in the plastic fill material. This feature is now incorporated in the independent claims because it is essential for the success of the invention.

Emphasis is put on the fact that this feature is far away from the teaching of D2. According to this document, the curing plastic fill material is introduced into the end cup disposed over and about the end turns on one end of an electric motor (Figure 4: fill line N; Figure 5: fill line F), passes through the slots of the motor stator and then fills the end cup at the other end of the motor where an overflow line (Figure 4: L; Figure 5: O) is connected. The suggestion in D2 to forcibly inject the thermosetting resin under pressure can be understood as caused by the necessity to drive the resin through the narrow passages in the slots of the machine, and there is no incitation for application of a particularly high viscosity for the resin or even of a composition with a filler.

Furthermore, the said overflow lines in D2 let any surplus resin at the end of the filling operation drain off. Quite apart from this, the present invention provides a non-hermetical sealing of the mould against leakage of the resin from the mould, e.g. in the form of sponge elastomeric material according to Claim 4.

Reasons for the Decision

1. The appeal is admissible.
2. The method-Claim 1 has been amended during the appeal proceedings by the incorporation of specific details concerning the materials used.

The "high performance resin" selection for the plastic mould specified in the penultimate paragraph of Claim 1 is based on the disclosure on page 4, lines 10 to 26 of the originally filed documents.

The thermosetting and bonding properties of the plastic fill material, specified in the last paragraph of Claim 1 are derived from the original Claim 6. The feature that the plastic fill material comprises also "fillers" is supported by the disclosure on page 14, first paragraph of the original description. It is made clear in this passage that the high viscosity of the fill material is the result of the incorporation of fillers in a low viscosity resin. Notwithstanding the fact that the application refers in this context to another application whose content is not disclosed in the present application, the principle of using fillers in the indicated way is to be regarded as clearly disclosed, this all the more so since also the Examples I and II disclosed in the present application contain fillers (e.g. glass).

Consequently, there is no objection to Claim 1 under Article 123(2) EPC.

3. The same applies to the features concerning the materials used and incorporated in the last nine lines of the independent product Claim 3.

The product Claim 3 has further been restricted by structural details concerning the electrical insulation of the series loops in a large steam turbine generator whose stator bars are cooled by a liquid. The basis for these features can be clearly derived from the original Claims 9, 15 and 17 in connection with the drawings and their description.

Therefore, also Claim 3 meets the requirement of Article 123(2) EPC.

4. The closest prior art is represented by the document D1.

The method of electrically insulating conductor joints disclosed in D1 is of particular relevance for large electric generators (page 1, second paragraph). It comprises the steps:

- enclosing in situ the joint in a fill chamber of a plastic mould (10 with mould halves 13; page 3, lines 1 to 13),
- sealing the mould against leakage of liquid fill from the mould (page 4, lines 6 to 21),
- filling plastic fill material into the mould and thereby filling the mould fill chamber (page 4, line 28 to 29),
- curing the plastic fill material in contact with both the joint and the mould,

- wherein the plastic mould consists of a thermoplastic material (page 3, lines 17 and 22),
- wherein the plastic fill material is a curable, contingently thermosetting resin compatible with the joint and bondable to the joint (page 1, lines 1 to 18).

According to page 6, lines 13 to 16 of D1, the mould may remain on the joint, thus being compatible with and bondable to the joint.

According to page 5, lines 14 to 17, a fill material of a viscosity greater than about 100 000 centipoise may be used, but require a preceding de-aeration and a long pouring time.

5. The Board agrees with the Examining Division's finding that no inventive step can be perceived in the suggestion to force the plastic fill material into the mould under pressure greater than about 1.4 bar (20 psi) instead of pouring it, since the procedure of injecting plastic fill material under pressure in moulds covering and confining the exposed end turns of motor windings is known from D2, column 2, lines 33 to 52; column 4, line 60 to column 5, line 2.

Notwithstanding the fact, stressed by the Appellant, that D2 gives no hint to the use of materials of a particularly high viscosity, the Board takes it as self-evident basic knowledge of the skilled man that pressure is a good means for accelerating the filling of any enclosing by a viscous fluid. Having once taken up this obvious concept from D2 for an application to the insulating method known from D1, the skilled person will, of necessity, design the mould such that it can resist the pressure and he will

readily understand that the sealing can, without difficulty, be conceived as providing both resistance against leakage of heavily viscous liquid fill material and non-hermetical property in order to allow the air to be displaced from the mould fill chamber during the filling procedure.

6. In addition to these features, which had already been the subject-matter of Claim 1 dealt with by the Examining Division, Claim 1 now filed in the appeal proceedings is more narrowly restricted to a closer specification of the plastic materials used.

With respect to the plastic mould, the Appellant relies on the selection of a high-performance thermoplastic resin from a group of resins which, according to the original description, page 4, second paragraph, appear to have been readily available at the priority date of the application under registered trade marks. The Board doubts that there is any inventive merit in the use of these known materials in order to meet the obvious requirements of pressure resistance of the moulds.

With respect to the plastic fill material, the Board is satisfied that the compatibility of the thermosetting resin with both the loop to be insulated and the mould, as well as the bonding of the fill material to these parts, are requirements that flow as matters of course from the envisaged insulating method.

7. The Appellant's main argument put forward in the Oral Proceedings, viz. that the mixture of the thermosetting resin with fillers is a non-obvious way for achieving the desired high viscosity of the fill material despite the application of a thermosetting resin of lower viscosity, requires, however, further consideration.

No document has been cited so far in the proceedings that would disclose this feature. The Board suspects, however, that this feature, at least in its general form, is known per se and regards it to be necessary to clarify the state of the art in this respect, which would possibly require an additional search. In this context, it may turn out that additional specifications of the mixture based on the disclosed examples I and II have to be discussed and contingently be incorporated in the claim.

The other independent claim, viz. Claim 3, requires the same reconsiderations since it comprises the same material specifications.

For these reasons, the Board deems it necessary for carrying out a further examination of the case to remit the case to the first instance in accordance with the Appellant's request.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution on the basis of Claims 1-6 and an adapted description submitted during the oral proceedings.

The Registrar:

The Chairman:

M. Kiehl

E. Persson