Decision of Technical Board of Appeal 3.5.2 dated 25 February 2003

T 986/00 - 3.5.2

(Language of the proceedings)

Composition of the board:

Chairman: W. J. L. Wheeler
Members: M. Ruggiu
J. H. P. Willems

Patent proprietor/Respondent: Alstom UK Ltd
Opponent/Appellant: Siemens AG

Headword: Rotating electrical machines/ALSTOM UK LTD

Article: 56, 113(2) EPC
Rule: Rules of procedure of the Boards of Appeal 11(1), 11(3)

Keyword: "Inventive step (no)" - "Basis of decision - further opportunity to amend (no)"

Headnote

According to Article 113(2) EPC, the European Patent Office shall consider and decide upon a European patent only in the text submitted to it, or agreed, by the proprietor of the patent. A proprietor who chooses not to be represented at oral proceedings should ensure that he has filed all amendments he wishes to be considered before the oral proceedings.

Summary of facts and submissions

I. The opponent appealed the decision of the opposition division rejecting the opposition against European patent No. 0 697 148.

II. The following documents of the state of the art were cited during the appeal:

D01: GB-A-824 861;

D05: "Plasma-sprayed Coatings" by H. Herman, published in "Scientific American", September 1988, pages 78 to 83;

D06: DE-A-3 832 094;

D09: entry "Keramik" in "Lexikon Technik und exakte Naturwissenschaften", published by Fischer Taschenbuch Verlag, October 1972, vol. 6, pages 1623 to 1627; and

D10: Keramik", published by Springer-Verlag, 1983, vol. 2: "Keramische Werkstoffe", pages 166 to 172 and 233 to 235.

Documents D01, D05 and D06 had been discussed in the decision under appeal while documents D09 and D10 were cited for the first time in the statement setting out the grounds of appeal.

III. In reply to the statement setting out the grounds of appeal, the respondent proprietor indicated in a letter of 20 December 2001 that he re-submitted the comments and observations contained in his communications to the opposition division, dated 2 February 1999 and 6 September 1999. In the same letter, he also indicated that he conditionally re-submitted claims C and D that had been

conditionally submitted during the opposition proceedings and further conditionally submitted a new claim F, the wording of which was recited in the letter.

IV. Oral proceedings were appointed on the request of the appellant. In a communication accompanying the summons to the oral proceedings, the board indicated inter alia that the respondent proprietor should be prepared to amend the description and the dependent claims at the oral proceedings, should the board decide to maintain the patent in amended form on the basis of one of the auxiliary requests. This communication from the board also indicated that a party intending to make written submissions in preparation for the oral proceedings should file corresponding documents at the EPO at the latest one month before the date scheduled for the oral proceedings.

V. In a letter dated 28 January 2003, the proprietor indicated that he would not attend the oral proceedings. He reserved his position as previously expressed and requested the board to give due weight to his submissions in respect of the current claims. If the board decided not to uphold the current claims, the proprietor requested the board to consider patentability of the conditionally submitted claims.

VI. Oral proceedings took place before the board on 25 February 2003. As announced, the respondent proprietor was not represented at the oral proceedings.

The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 0 697 148 be revoked.

It was noted that the respondent (patentee) requested that the appeal be dismissed or that the patent be maintained on the basis of conditionally filed claims C, D or F.

VII. The claims of the patent in suit as granted read as follows:

"1. A rotating electrical machine rated at a power in excess of 10 kilowatts having a rotor comprising bar conductors of copper or copper based material located in slots (5) in a rotor core (7) of magnetic material and electrically connected together to form a winding, wherein said bar conductors (3) are provided with a coating of a heat treated ceramic-based material, the conductors being coated and the ceramic being heat treated before the conductors (3) are located in said slots (5), characterised in that said heat treatment is at or above the firing temperature of the ceramic and said coating is adapted to prevent sparking between the bar conductors (3) and the rotor core (7).

2. A machine as claimed in Claim 1 and wherein said bar conductors are electrically connected by welding or brazing to common endrings (11) to constitute said winding.

3. A machine according to Claim 1 or 2 wherein the coating consists of an alumina ceramic-based material.

4. A machine according to Claim 1, 2 or 3 wherein the coating has a thickness of less than 500 ìm.

5. A machine according to any one of the preceding claims wherein the coating comprises a micro-porous ceramic-based material.

6. A machine according to Claim 5 wherein the coating has been applied to the conductor using a plasma spraying process.

7. A machine according to Claim 5 or 6 wherein the coating is impregnated with a synthetic resin material.

8. A machine according to any one of Claims 1 to 4 wherein the coating has been applied to the conductor bars (3) by firing after dipping in a liquid suspension of the ceramic-based material.

9. A machine according to Claim 8 wherein the ceramic-based material is a glass ceramic-based material."

VIII. Conditionally filed claims C, D and F are as follows:

Claim C

"1. A rotating electrical machine rated at a power in excess of 10 kilowatts having a rotor comprising bar conductors of copper or copper based material [~~located~~] inserted in slots (5) in a rotor core (7) of magnetic material and electrically connected together to form a winding, wherein said bar conductors (3) are provided with a coating of a heat treated ceramic-based material, the conductors being coated and the ceramic being heat treated before the conductors (3) are [~~located~~] inserted in said slots (5), characterised in that said heat treatment is at or above the firing temperature of the ceramic, and said coating is a microporous plasma-sprayed coating adapted to prevent sparking between the bar conductors (3) and the rotor core (7)."

Claim D

"1. A rotating electrical machine rated at a power in excess of 10 kilowatts having a rotor comprising bar conductors of copper or copper based material [~~located~~] inserted in slots (5) in a rotor core (7) of magnetic material and electrically connected together to form a winding, wherein said bar conductors (3) are provided with a coating of a heat treated ceramic-based material, the conductors being coated and the ceramic being heat treated before the conductors (3) are [~~located~~] inserted in said slots (5), characterised in that said heat treatment is at or above the firing temperature of the ceramic, and said coating is microporous and is adapted to prevent sparking between the bar conductors (3) and the rotor core (7), said microporous coating being

impregnated with synthetic resin material after application of said coating and before insertion of said conductors into said slots."

Claim F

"1. A rotating electrical machine rated at a power in excess of 10 kilowatts having a rotor comprising bar conductors of copper or copper based material [~~located~~] inserted in slots (5) in a rotor core (7) of magnetic material and electrically connected together to form a winding, wherein said bar conductors (3) are provided with a coating of a heat treated ceramic-based material, the conductors being coated and the ceramic being heat treated before the conductors (3) are [~~located~~] inserted in said slots (5), characterised in that said heat treatment is at or above the firing temperature of the ceramic, and said coating is a microporous plasma-sprayed alumina based coating and is adapted to prevent sparking between the bar conductors (3) and the rotor core (7), said microporous coating being impregnated with synthetic resin material after application of said coating and before insertion of said conductors into said slots."

IX. The appellant opponent essentially argued as follows:

Document D01 described a squirrel cage motor (Example 3) in which the copper rods of the rotor were provided, before being fitted into grooves of the rotor, with an insulating coating containing SiO_2 which, as could be seen from document D09, was a ceramic material. Example 3 of D01 had all the features of the pre-characterising portion of claim 1 of the patent in suit as granted, except that it did not mention that the motor was rated at a power in excess of 10 kilowatts. However, squirrel cage motors as described in D01 were commonly used in industry for powers exceeding 10 kilowatts. Therefore, the power range specified in claim 1 of the patent was usual for this kind of machine and did not involve inventive considerations. With respect to the prior art disclosed in D01, the objective problem solved by the invention was that of finding and using a mechanically and electrically superior material for the insulating coating provided on the rotor bar conductors. The use of a fired ceramic material, in

particular Al_2O_3, as an insulating coating was obvious to the skilled person, in this case a specialist in the field of materials, as was apparent from the text book cited as document D10, whose content had to be regarded as part of the common general knowledge of the skilled person.

As regards the conditionally submitted claims C, D and F, the appellant essentially argued that the requests in respect of these claims were not clear.

X. The arguments of the respondent proprietor can be summarised as follows:

The prior art method of manufacturing a rotor for machines required to operate in explosive atmospheres was to insert un-insulated conductor bars by force-fitting into slots of the rotor core to ensure that the conductor bars be continually in perfect electrical contact with the rotor core. This was intended to prevent sparking between the bars and the rotor core. The proprietor had found that it was impossible to guarantee that such contact was maintained throughout the service life of the machine, due, e.g. to differential thermal expansion between the conductor bars and the rotor core. None of the cited documents disclosed the problem of relative movement between the bars and the rotor core, or that sparking could occur later in the life of machines with un-coated bars and therefore due account had to be taken of the proprietor's recognition of the previously unrecognised problems associated with the use of un-coated bars which are in apparent perfect electrical contact with the rotor core. The invention overcame these problems by providing the bars with an electrically insulating coating which enabled sparking to be totally eliminated. It had been found that a "fired" ceramic material, particularly of the microporous type such as is produced by plasma spraying, and particularly consisting of alumina-based material, gave the best results. The use of a fired ceramic-based material resulted in a coating that was very robust, adhered strongly to the conductor bars, provided the degree of electrical insulation required to obviate sparking, gave the required level of heat transfer from the bars to the core and withstood the significant deformations of

the bars experienced during manufacture of the machine. It was submitted that these technical advantages were not to be expected by the average specialist from a study of the available prior art. In particular, document D01 did not disclose firing a ceramic coating on the conductor bars but only drying it up to 350°C. The coating of D01 had to withstand a soldering process to short-circuit the end-faces of the bars, whereas the proprietor's fired ceramic coating was more robust and could withstand a brazing or welding process. Furthermore, the proprietor did not accept that it was known to use rotors of the kind described in D01 in machines rated at a power in excess of 10 kilowatts. The thrust of the disclosure of D01 was concerned primarily with providing a very thin coating as a base for a further main layer of conventional insulation. This emphasis taught away from the invention claimed in the patent in suit by directing the mind of the skilled reader away from a single thicker fired ceramic layer as the sole insulation.

Reasons for the decision

1. The appeal is admissible.

2. *Main request*

2.1 The respondent proprietor submits that the invention concerns the problem of avoiding sparking between the bar conductors and the core forming the rotor of an electrical machine and concludes therefrom that the closest prior art, from which to start when examining whether the invention involves an inventive step, has to be constituted by a prior art attempt to avoid such sparking.

However, the board does not share this view because Article 56 EPC specifies that an invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art. Thus, the board considers that objections against inventive step can, in principle, legitimately take any

specific item of the state of the art as a starting point, the decisive question being whether, starting therefrom, the notional skilled person would arrive in an obvious manner at an object falling within the scope of the claim under scrutiny.

2.2 Example 3 described in document D01 is a rotor of a squirrel cage motor comprising bar conductors of copper fitted into slots of a rotor core of magnetic material and electrically connected together to form a winding by means of soldered copper rings. The bar conductors are coated with a solution which is then dried in air and heat treated in an oven to obtain a coating which protects the bar conductors against scaling, tarnishing and corrosion. D01 further indicates that this coating insulates the bar conductors from metallic contact with the lateral surfaces of the slots in the sheets forming the rotor core. It is therefore apparent that, in example 3 of D01, no further insulation is applied to the bar conductors.

Thus, Example 3 of D01 is a rotating electrical machine having all the features of the pre-characterising portion of claim 1 of the patent in suit as granted, except that D01 does not mention that the machine is rated at a power in excess of 10 kilowatts. Furthermore, although not mentioned in D01, the coating applied to the copper bar conductors of Example 3 of D01 will prevent sparking between the bar conductors and the rotor core, at least to some extent, since it insulates the bar conductors from the core.

2.3 Taking Example 3 of D01 as starting point for the examination of inventive step, the subject-matter of claim 1 of the patent in suit as granted differs from this closest prior art in that:

(a) the machine is rated at a power in excess of 10 kilowatts; and

(b) the coating applied to the bar conductors is heat treated at or above the firing temperature of the ceramic, which means that the bar conductors are coated with a fired ceramic-based material.

2.4 It is apparent to the skilled person that providing a coating on the bar conductors which insulates them from the lateral surfaces of the sheets forming the rotor core can reduce the losses in the machine whatever its rated power. Furthermore, machines having a rated power in excess of 10 kilowatts are commonly used in industry. Therefore, the board comes to the conclusion that it is obvious to the skilled person to apply the teaching of D01 to a machine having a rated power in excess of 10 kilowatts, as specified in claim 1 of the patent in suit.

2.5 In Example 3 of D01 the bar conductors are soldered to the end rings after they have been fitted into the rotor core. According to the patent in suit, the fired ceramic coating adheres strongly to the bar conductors and is sufficiently robust to withstand the significant deformations of the ends of the bar conductors which occur in particular during welding to the end rings. Thus, the objective problem solved by feature (b) above with respect to the state of the art disclosed in D01 can be regarded as that of providing a robust insulating coating that can withstand a tough treatment without special precautions. The board regards this problem as being obvious to the skilled person, who would inevitably notice if an insufficiently robust coating was causing problems.

2.6 Document D10 is relevant to the objective problem identified above, since it discloses that a fired ceramic material can be used to provide an electrically insulating coating on a copper substrate. Thus, it is appropriate to consider the teaching of D10 in the discussion of inventive step. According to D10, ceramic materials can in particular protect metals against erosion and abrasion. This means that it is known that ceramic coatings are robust and adhere strongly to a metal substrate. D10 further indicates that ceramic coatings resisting high temperatures

can in particular be obtained by plasma-spraying and that adhesion of a plasma-sprayed coating is in general due to mechanical anchoring on the substrate. Document D05, which relates to plasma spraying, confirms that a plasma-sprayed coating can be firmly anchored by mechanical bonding to the substrate on which it is applied. D10 is a text book and D05 an article from a popular scientific magazine, so that both can be regarded as disclosing common general knowledge that would be taken into account by the notional skilled person. It would therefore have been obvious to the notional skilled person, in view of the common general knowledge in the field of insulating coatings, to replace the coating described in D01 by a plasma sprayed ceramic coating and, thereby, arrive at the subject-matter of claim 1 of the patent as granted. Therefore, the subject-matter of claim 1 of the patent as granted is not considered as involving an inventive step in the sense of Article 56 EPC.

2.7 Thus, the board is of the opinion that the grounds of opposition mentioned in Article 100 EPC prejudice the maintenance of the patent unamended.

3. *Auxiliary requests*

3.1 Conditionally submitted claims C, D and F, which are presumably intended to replace claim 1 as granted, incorporate features, in particular the microporous structure of the ceramic-based material, which are recited in the dependent claims of the patent as granted. No amendments to the dependent claims have been submitted. Thus, the claims of the auxiliary requests are inconsistent and therefore not clear. Claims C and F, which specify application by means of plasma-spraying, are also incompatible with dependent claims 8 and 9 and the second machine described in the patent, according to which the coating is applied to the bar conductors by firing after dipping them in a liquid suspension of a ceramic-based material. Furthermore, the description of the patent in suit specifies that **preferably** the coating comprises a microporous ceramic based material, and is thus inconsistent with claims C, D and F.

Thus, the patent in the form of any auxiliary request does not meet the requirements of Article 84 EPC.

3.2 The board is therefore of the opinion that, taking into account the amendments proposed by the proprietor of the patent, the patent does not meet the requirements of the EPC.

3.3 The board adds that conditionally submitted claims C, D and F could have constituted a suitable basis for discussion of the corresponding auxiliary requests, if the proprietor had been represented at the oral proceedings and could have amended the dependent claims and the description. However, the proprietor, who had been duly summoned, chose not to be represented at the oral proceedings and, despite the warning given in paragraph 7 of the communication issued with the summons that the proprietor should be prepared to amend the description and the dependent claims at the oral proceedings should the board decide to maintain the patent in amended form on the basis of one of the auxiliary requests, did not file any further amendments to the patent in suit. As directed in paragraph 6 of the communication, any written submission should have been filed at the latest one month before the oral proceedings. According to Article 113(2) EPC, the board shall decide upon the patent only in the text submitted, or agreed, by the proprietor. Furthermore, according to Articles 11(3) and 11(1) of the Rules of Procedure of the Boards of Appeal, a case should normally be ready for decision at the conclusion of oral proceedings and the parties should provide all relevant information and documents before the hearing. Thus, a proprietor who chooses not to be represented at oral proceedings should ensure that he has filed all amendments he wishes to be considered before the oral proceedings. This is all the more so in the present case, where the proprietor has been expressly warned in the communication of the board about the possible necessity of amending the claims and the description. The board can therefore take the decision without further ado.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.