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# Datasheet for the decision of 22 September 2009

**Case Number:** T 1562/06 - 3.5.02

**Application Number:** 99111814.2

**Publication Number:** 0967709

**IPC:** H02K 3/34

**Language of the proceedings:** EN

**Title of invention:**
Vehicle ac generator's stator and method of manufacturing the same

**Patentee:**
DENSO CORPORATION

**Opponent:**
VALEO EQUIPEMENTS ELECTRIQUES MOTEUR

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 56

**Relevant legal provisions (EPC 1973):**
-

**Keyword:**
"Inventive step - no"
"Priority - yes (doctrine of exhaustion of priority right - no)"

**Decisions cited:**
T 0998/99, T 0015/01, T 0005/05

**Catchword:**
See point 2.1 of the reasons

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Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 1562/06 **-** 3.5.02

# D E C I S I O N
**of the Technical Board of Appeal 3.5.02**
**of 22 September 2009**

**Appellant:** (Opponent)
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**Respondent:** (Patent Proprietor)
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**Decision under appeal:**
**Interlocutory decision of the Opposition Division of the European Patent Office posted 11 August 2006 concerning maintenance of European patent No. 0967709 in amended form.**

**Composition of the Board:**

**Chairman:** M. Ruggiu
**Members:** R. Lord
H. Preglau

## Summary of Facts and Submissions

I. This is an appeal of the opponent against the interlocutory decision of the opposition division concerning the European patent No. 0 967 709 that, account being taken of the amendments made by the patent proprietor, the patent and the invention to which it related met the requirements of the EPC.

II. In the contested decision the opposition division held *inter alia* that the subject-matter of claim 1 of the first auxiliary request filed during the oral proceedings of 25 April 2006 involved an inventive step in the sense of Article 56 EPC.

III. Of the documents cited during the opposition and appeal proceedings, the following are relevant to this decision:

D8: US-A-1 555 931;
E1: H.W. Turner and H.M. Hobart, "Die Isolierung elektrischer Maschinen", Springer, Berlin 1906; and
E2: C. Clément, "La Construction des Bobinages Electriques", Dunod, Paris 1949.

IV. In a communication dated 7 April 2009 accompanying a summons to oral proceedings, the board informed the parties that it was not inclined to follow the decision T 998/99 (OJ 2005, 229), in particular in the light of the subsequent decisions T 15/01 (OJ 2006, 153) and T 5/05 (not published in OJ) and drew the attention of the parties to documents D8, E1 and E2.

V. Oral proceedings before the board took place on 26 August 2009.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (proprietor of the patent) requested that the appeal be dismissed.

VI. Claim 1 of the patent as maintained in opposition reads as follows:

"A stator of an ac generator for a vehicle comprising:
a stator core (32) having a plurality of parallel-sided slots (30) having an opening,
a stator winding composed of a plurality of U-shaped conductor segments (33) each having a pair of in-slot portions (33a) disposed in said slots (30), and wherein each of said plurality of slots (30) includes an insulator (34) so as to insulate said stator winding from said stator core (32), wherein
each of said insulators (34) has an outer periphery closely fitted to one of said plurality of slots (30), and wherein
each of said insulators (34) is formed of a roll of a rectangular sheet that has an overlapping portion extending along said stator winding; wherein
the overlapping portion (34a) is disposed on the radially outer wall of the parallel-sided slot (30) to be pressed down by the stator winding; and
said overlapping portion is disposed on the same radial line as the in-slot portions (33a) in each one of the slots are aligned to in one of said plurality of slots

opposite said opening."

Claims 2 and 3 are dependent on claim 1.

Claim 4 of the patent as maintained in opposition reads as follows:

"A method of manufacturing the stator as claimed in claim 1, characterized in that each of said insulators (34) is inserted into one of said slots (30) and disposed closely to fit the entire peripheral surface of said slots and to close said openings (35) of said slots (30),
said conductors (33) are inserted into said slots (30) from one axial end of said stator core (32), and connecting portions (33c) extending from said in-slot portions (33a) are connected to one another to form said stator winding."

VII. The appellant's arguments, as far as they are relevant to the present decision, are essentially as follows:

The subject-matter of claims 1 to 4 was not new with respect to the document EP-A-0 961 386, which represents prior art according to Article 54(3) EPC because both that application and the patent in suit claimed priority for the same invention from the same earlier application (JP-A-1998 180 755), whereas according to the decision T 998/99 once priority has been validly claimed from an application for a particular invention, that priority cannot be claimed again for the same invention.

The sole difference between the stator according to

claim 1 and that disclosed in D8 was that each of the insulators has an overlapping area which is positioned at the bottom of the slot in which it is placed. This feature was however known to the skilled person from document E1 (Fig. 52, in particular the variant shown at the right, which has two sheets of insulator, with overlapping portions at top and bottom) and document E2 (Fig. 116). Therefore the subject-matter of claim 1 did not involve an inventive step according to Article 56 EPC. No technical problem which might form the basis for an inventive step could be identified.

The fact that E1 and E2 make use of different insulator materials than those used by the proprietor did not render the teaching of those documents irrelevant, because the skilled person would consider it obvious to apply the teaching of those relatively old documents also to more modern materials.

The question as to how the conductors might be inserted into the core without using an additional tool of the type described in D8 was not relevant because the patent contains no teaching in this respect, and in particular does not mention the coefficients of friction which would be essential for such a method.

VIII. The relevant arguments of the respondent can be summarised as follows:

The decision T 998/99 should not be applied in the present case, for the reasons explained in the decisions T 15/01 and T 5/05, so that the document EP-A-0 961 386 did not represent prior art according to Article 54(3) EPC.

The technical problem addressed by the invention according to claim 1 as maintained in opposition could be seen in the provision of an insulator which was simpler to fabricate and which enabled the insulators and conductors to inserted in the slots by a simple method. Moreover, the positioning of the overlap at the base of the slot minimised the ingress of moisture.

The insulator depicted in Fig. 10 of D8 was not in the form of a roll, and did not have an overlapping portion. Moreover the presence of the dividing wall (36 in the figure) resulted in a change in behaviour during insertion of the conductors, because it would become clamped between the conductor pairs, so that special measures (die 41 as depicted in Fig. 5 of D8) were necessary to prevent the insulators being pushed out of the slots. The form of the insulator in accordance with claim 1 of the patent as maintained in opposition had the surprising effect that such measures were not necessary. The respondent demonstrated this during the oral proceedings of 26 August 2009 by means of a model which he stated was according to claim 1 of the patent, and in which U-shaped conductors could be simply inserted axially without pushing out the previously inserted insulators.

The "Megohmit" insulators described in E1 could, according to the last paragraph of page 88 and paragraphs 1 to 4 of page 89 of that document, apparently be hard or elastically deformable, but could not be formed as a roll of a rectangular sheet of insulating material. Moreover the insulating sleeves were only described as being for electrical machines,

not for stators of ac generators for vehicles, and appeared to be more suitable only for higher power devices. Also the shapes depicted in Fig. 54 of E1, which specifically shows slot insulators, were all different from what was defined in claim 1 of the patent.

The description of page 139 of E2 relating to Figs. 116 and 117 implied that the insulator is wrapped around the conductors before they are inserted in the slots, so deviated from the invention of the patent, and that document also did not disclose any interaction between conductors in a slot and an overlapping portion of the insulator at the base of the slot.

Insulators with extensive overlapping portions and/or multiple layers as depicted in the right-hand drawing of Fig. 52 of E1 would not enable the simple conductor insertion technique of the patent, because the low degree of friction between the layers of the insulator would result in a quasi-telescopic deformation of the insulator during conductor insertion.

## Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

2.1 The appellant's sole objection of lack of novelty relies on the application of the principle indicated in the decision T 998/99 that priority can only be claimed once from a particular priority document for a

particular invention. The board however agrees with the conclusions in the subsequent decisions T 15/01 and T 5/05, according to which the conclusion reached in T 998/99 is not valid. Therefore the document EP-A-0 961 386 does not form part of the prior art according to Article 54(3) EPC.

2.2 Document D8 discloses (see in particular Figs. 2 and 4) a stator (armature) of an ac generator, which can be considered to be of a type suitable for a vehicle. The stator comprises a stator core (34) having a plurality of parallel-sided slots (21, see Fig. 9), which as described on page 2, lines 38 to 43 may be in the form of slots having an opening. The stator winding is composed of a plurality of U-shaped conductor segments each having a pair of in-slot portions (bars 22 and 23) disposed in said slots. Each of said plurality of slots includes a paper insulator (35) so as to insulate said stator winding from said stator core. Each of said insulators has an outer periphery closely fitted to one of said plurality of slots and is formed of a roll of a rectangular sheet (see Fig. 10 and page 2, lines 48 to 50).

2.3 The stator of the present claim 1 is distinguished from that of D8 in that the roll of rectangular sheet forming the insulator has an overlapping portion extending along the stator winding, the overlapping portion being disposed on the radially outer wall of the parallel-sided slot to be pressed down by the stator winding, and being disposed on the same radial line as the in-slot portions in each of the slots are aligned to in one of the plurality of slots opposite the opening.

2.4 The subject-matter of claim 1 as maintained in opposition is thus new within the meaning of Article 54 EPC.

3. *Inventive step*

3.1 The technical problem addressed by the stator of claim 1 can be seen in providing an insulator which is simpler to fabricate and provides improved resistance to the ingress of moisture via the slot opening.

The documents E1 and E2 are textbooks the teaching of which forms part of the common knowledge of the skilled person in the field of windings for electrical machines. These documents demonstrate (see Figs. 52 and 54 of E1 and Figs. 111 to 118 of E2) that the skilled person was aware of a variety of forms which the insulator can take according to circumstances and requirements, and document E1 also demonstrates that he was aware that moisture resistance is a significant requirement (see page 89, second full paragraph).

Of these known options, and considering the first aspect of the technical problem indicated above, the skilled person would recognise that those involving a single overlap (as depicted in E1, Fig. 52, left-hand illustration, and in E2, Fig. 116) would be simplest to fabricate. He would thus conclude that the replacement of the complex insulator form depicted in Fig. 10 of D8 by a simple folded sheet with an overlap at one of the narrower sides would address this part of the technical problem.

The skilled person would then necessarily be faced with the question as to where to position the overlap in the slot of the stator core. Bearing in mind the second aspect of the technical problem indicated above, it would be immediately evident that, since the overlapping portion represents the weakest part of the insulator in terms of moisture resistance, this should be placed as far as possible from the opening through which water might enter, i.e. it should be placed at the radially outer end of the slot. This arrangement would be such that, when the stator is fully assembled the overlapping portion would be disposed on the same radial line as the in-slot portions of the conductor segments are aligned to, and such that these conductor segments would automatically press the overlapping portion down within the slot.

3.2 The respondent's argument that the insulator of D8 is not in the form of a roll is not found convincing because, although the shape depicted in Fig. 10 of D8 is clearly different from that in the patent in suit, it nonetheless appears to result from a rolling of a sheet of the insulator material, so can be considered to be in the form of a roll.

His argument that the skilled person wishing to improve the insulator of D8 would not consider the teaching of E1, because the mechanical properties of the materials described there would make them unsuitable to replace materials such as insulating paper, and because the insulators discussed in that document would only be suitable for electrical machines with much higher power ratings than ac generators for vehicles, is not found convincing, because the document nonetheless

illustrates that the skilled person was aware of the different manners in which sheets of insulating material could be formed to produce in-slot insulators, so that it would be obvious to him to consider the use of the insulator shapes depicted in that document in different types of electrical machine and using other insulating materials.

His argument that the teaching of E2 is not relevant to the claimed subject-matter because pages 139 and 140 of that document make clear that the insulator is wound on the conductors before they are inserted into the slots, whereas the patent at issue is based on the concept of inserting the insulators into the slots and then subsequently inserting the conductors, is not considered relevant, because this difference is not defined in claim 1. This specific assembly method is defined only in claim 4, and moreover paragraph [0030] of the patent as maintained indicates that the conductor segments 33 and insulators 34 can be inserted jointly. For the same reasons the respondent's arguments concerning the surprising effect of enabling insertion of the conductors after insertion of the insulators without requiring any additional means to hold the insulators in place are not considered to be relevant to the present claim 1. Furthermore, as the appellant has noted, the patent in suit contains no teaching about this surprising effect, and specifically says nothing about the coefficients of friction between the different elements which, according to the respondent, underlie this effect.

3.3 Thus an obvious development of the stator of D8 on the basis of the common knowledge of the skilled person, illustrated by E1 and E2, would result in a stator including all of the technical features of claim1 as maintained in opposition. Therefore the subject-matter of this claim does not involve an inventive step in the sense of Article 56 EPC.

## Order

## For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar: The Chairman:

U. Bultmann M. Ruggiu