

Publication in the Official Journal ~~Yes~~ / No

File Number: T 406/90 - 3.5.2

Application No.: 83 201 702.4

Publication No.: 0 111 366

Title of invention: Electric motor

Classification: H01R39/06

D E C I S I O N
of 19 June 1991

Proprietor of the patent: N.V. Philips' Gloeilampenfabrieken

Opponent: Siemens Aktiengesellschaft, Berlin and
München

Headword:

EPC Article 56

Keyword: "Inventive step - yes, after amendment"

Headnote



Case Number : T 406/90 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 19 June 1991

Appellant :
(Proprietor of the patent)

N.V. Philips' Gloeilampenfabrieken
Groenewoudaeweg 1
NL-5621 BA Eindhoven

Representative :

H.J.M. Schrijnemaekers
INTERNATIONAAL OCTROOIBUREAU B.V.
Prof. Holstlaan 6
NL-5656 AA Eindhoven

Respondent :
(Opponent)

Siemens Aktiengesellschaft,
Berlin und München
Postfach 22 16 34
W-8000 München 22

Decision under appeal :

Decision of Opposition Division of the European
Patent Office dated 28.03.90 revoking European
patent No. 0 111 366 pursuant to Article 102(1)
EPC.

Composition of the Board :

Chairman : E. Persson
Members : W.J.L. Wheeler
A. Hagenbucher

Summary of Facts and Submissions

- I. The Appellant contests the decision of the Opposition Division revoking European patent No. 0 111 366 on the ground that Claim 1 did not involve an inventive step.
- II. The following prior art documents, inter alia, were considered in the proceedings before the Opposition Division:
- (a) US-A-3 244 917
 - (b) DE-B-2 856 310
 - (d) FR-A-1 440 800.
- III. During preliminary correspondence between the Board and the parties, the Appellant filed new claims and a new description and the Respondent cited a further prior art document:
- (g) US-A-3 678 314.
- IV. Oral proceedings were held on 19 June 1991. In response to objections raised by the Board and the Respondent to certain phrases in the claims, the Appellant declared that the claims were not intended to cover bearings of the type shown in document (d), Figure 1, reference 21, and filed new Claims 1 to 3 and a new description.
- V. Claims 1 and 3 are independent and worded as follows:
- "1. An electric motor comprising a stator (4,5,6), a rotor (2) with a rotor shaft (1) and brushes (11) in slidable contact with a commutator (10) on one end of the rotor shaft, which end of the rotor shaft is journalled in a bearing device having a one-piece cylindrical sleeve-type bearing (8), the bearing device and the commutator

having relatively rotatable parts which co-operate with one another, characterized in that one of said parts is a sealing-sleeve (12) whose inner diameter is larger than that of the sleeve-type bearing, which sealing-sleeve extends axially from the sleeve-type bearing at a side thereof facing the commutator and is formed with the sleeve-type bearing as a one-piece unitary element and which surrounds the rotor shaft (1) with clearance, and the other of said parts is formed by a peripheral wall portion bounding an annular recess (13) in a central portion (14) of the commutator, the sealing-sleeve extending axially into the annular recess with slight clearance to constitute a dust seal for the sleeve-type bearing against entry of dust originating from the brushes."

"3. An electric motor comprising a stator (4,5,6), a rotor (2) with a rotor shaft (1) and brushes (11) in slidable contact with a commutator (10) on one end of the rotor shaft, which end of the rotor shaft is journalled in a bearing device having a one-piece cylindrical sleeve-type bearing (8), the bearing device and the commutator having relatively rotatable parts which co-operate with one another, characterized in that one of said parts is a sealing-sleeve which is integral with the commutator, surrounds the rotor shaft (1) and extends axially into an annular recess in the bearing with slight clearance to constitute a dust seal for the bearing against entry of dust originating from the brushes."

Claim 2 is dependent on Claim 1.

VI. Concerning inventive step, the Appellant argued in effect that document (a) was the closest prior art, since it was the only document which showed a motor with a sleeve-type bearing. Such bearings were sensitive to dust from the

brushes, which could shorten their life. The invention excluded the dust in a simple way which was not derivable from the prior art. A sealing-ring would have produced frictional losses, which had to be avoided in small battery-driven motors. It was surprising that the claimed solution could provide sufficient protection. There was no need for any other sealing means. The sealing sleeve did not function as a bearing.

VII. The Respondent argued that Claim 1 was not properly delimited against document (a), which showed a sleeve (72) having an inner diameter greater than the shaft diameter. The only real characterising feature was that the bearing had been turned through 180°. The motor shown in Figure 7 of document (g) had all the structural features of Claim 1 except for the fact that it had a different type of bearing. It was obvious to adapt this known motor for mass production by replacing the ball bearing by a cheaper sleeve-type bearing. The clearance between the sealing sleeve and the commutator was only for the purpose of avoiding friction, and had to be such as to allow for the relatively large tolerances inherent in mass produced articles.

VIII. The Appellant requested that the decision of the Opposition Division be set aside and that the patent be maintained on the basis of Claims 1 to 3 and the new description as filed during the oral proceedings.

IX. The Respondent requested dismissal of the appeal.

Reasons for the Decision

1. The appeal is admissible.

2. The Respondent contends that Claim 1 (see paragraph V above) is not properly delimited against document (a) and that its subject-matter does not involve an inventive step.
- 2.1 Document (a) discloses an electric motor comprising a stator and a rotor with a rotor shaft (54, Figure 2) journalled in a pair of one-piece cylindrical sleeve-type bearings (72). Brushes (64, 66) are in slidable contact with a commutator (60, 80) on one end of the rotor shaft. One of the bearings and the commutator have relatively rotatable parts which co-operate with one another, namely the mutually facing end surfaces of the bearing and the hub (78) of the commutator, which co-operate, together with a washer (76), to take up the armature end thrust. Thus, this known motor has all the features of the prior art part of Claims 1 and 3.
- 2.2 According to the Respondent, the document (a) motor also has some of the features specified in the characterising part of Claim 1. It is true that in document (a) the through bores (74) of the bearings (72) are slightly tapered and that the outer ends of these bores have a diameter larger than that of the shaft (54), but this is clearly a feature of the bearing surfaces per se, to facilitate self-alignment of the shaft with the bearings (see column 2, lines 48 to 57), and has nothing to do with anything which could properly be described as a sealing-sleeve. In the opinion of the Board, when Claim 1 is read as a whole, as it should be, it becomes clear that the passages "whose inner diameter is larger than that of the sleeve-type bearing", "extends axially from the sleeve-type bearing at a side thereof", and "formed with the sleeve-type bearing as a one-piece unitary element and which surrounds the rotor shaft (1) with clearance," define features of the sealing-sleeve. These passages

should not be read in isolation, or applied to other parts of the bearing device in an arbitrary manner. In fact, document (a) does not disclose anything which could be regarded as a sealing-sleeve extending axially from the sleeve-type bearing. Similarly, the annular recess existing between the commutator segments (60) and the hub (78) does not co-operate with any part of the bearing. There is no disclosure of any part of the bearing device extending axially into the annular recess.

2.3 Thus, in the opinion of the Board, document (a) does not disclose any of the features in the characterising part of Claim 1 of the patent in suit and the claim is correctly drafted in accordance with Rule 29(1) EPC.

2.4 As far as inventive step is concerned, the Board notes that substantial modifications would have to be made to the document (a) motor for it to fall within the scope of Claim 1 of the patent in suit. Merely turning the bearing (72) through 180°, as suggested by the Respondent, would not be enough. The commutator would have to be modified as well. The hub (78) would have to be removed, the diameter of the annular recess in the central portion of the commutator and the outer diameter of the bearing device would have to be adapted to each other, and the washer (76) would have to be removed or modified, so that the end of the bearing device could extend into the annular recess with a clearance slight enough for it to act as a dust seal for the sleeve-type bearing against entry of dust originating from the brushes.

2.5 The Board also notes that substantial modifications would have to be made to the document (a) motor for it to fall within the scope of Claim 3 of the patent in suit. An annular recess would have to be provided in the end of the bearing device facing the commutator. The diameter of the

hub (78), or at least of its end, would have to be adapted to the diameter of the annular recess in the bearing device, and the washer (76) would have to be removed or modified, so that the end of the hub could extend into the annular recess with a clearance slight enough for it to act as a dust seal for the sleeve-type bearing against entry of dust originating from the brushes.

2.6 The Respondent has not brought any evidence or argument to show why it would be obvious to a person skilled in the art to make the above described modifications to the document (a) motor. The argument to the effect that it is obvious to provide sufficient clearance between the sleeve and the annular recess to avoid friction in worst case tolerances is not convincing because it assumes that the document (a) motor has already been modified to have a sleeve extending into an annular recess. Furthermore, it says nothing about making the clearance slight enough for it to act as a dust seal for the sleeve-type bearing against entry of dust originating from the brushes.

2.7 In the opinion of the Board, it is not obvious to modify the document (a) motor in the way indicated in paragraph 2.4 or 2.5 above, whether to prevent ingress of dust originating from the brushes to the bearing, or for any other purpose.

3. The Respondent argued that it was obvious to adapt the motor shown in Figure 7 of document (g) for cheap mass production by using a one-piece sleeve-type bearing in place of the ball bearing, and that the resulting motor would fall within the scope of Claim 1 of the patent in suit.

3.1 Assuming, for the sake of argument, that this is an obvious thing to do, and the Board is not saying it is, it

appears to the Board that the resulting motor would not fall within the scope of Claim 1 of the patent in suit. As shown in Figure 7 of document (g), a ring seal is provided around the shaft between the bearing and the commutator. If this seal is retained (mounted as shown) in the suggested modification, there would be no parts of the bearing device and the commutator co-operating with one another, there would be no need for a sealing-sleeve as defined in Claim 1 of the patent in suit, and no part of the bearing device would extend into the central annular recess of the commutator. If the ring seal is omitted entirely in the suggested modification, the resulting motor would be in accordance with the prior art part of Claim 1 of the patent in suit and part of the bearing would extend into the central annular recess of the commutator. However, the bearing would not have a sealing-sleeve as defined in the claim, nor would the clearance between the bearing and the peripheral wall portion of the annular recess of the commutator be small enough to act as a dust seal for the sleeve-type bearing against entry of dust originating from the brushes.

- 3.2 Substantial modifications would have to be made to the motor shown in Figure 7 of document (g) for it to fall within the scope of the claims of the patent in suit, which, in the opinion of the Board, would not be obvious without foreknowledge of the present invention.
4. Documents (b) and (d) are not more relevant than document (g). The Respondent has not argued on the basis of them against the present claims.
5. The Board therefore agrees with the Appellant that the subject-matter of Claims 1 and 3 involves an inventive step within the meaning of Article 56 EPC, so that ground (a) in Article 100 EPC does not prejudice maintenance of the patent in suit on the basis of these claims. The same

applies to the dependent Claim 2 which relates to a particular embodiment of the subject-matter of Claim 1.

6. All the features specified in the claims in their present form were disclosed in the originally filed application. The scope of the claims is now more restricted than it was in the patent as granted. The description has been adapted to the present claims. In the opinion of the Board, the amended form of the patent satisfies the requirements of Article 123(2) and (3) EPC. This was not disputed by the Respondent.
7. In the result, the Board is of the opinion that the patent may be maintained in the amended form requested by the Appellant.

Order

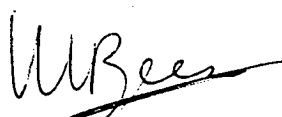
For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance to maintain the patent in amended form on the basis of:

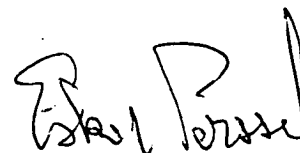
Claims 1 to 3 and pages 1 and 2 of description as filed at the oral proceedings;

Drawing as printed in EP-B1-0 111 366.

The Registrar


M. Beer

The Chairman


E. Persson