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File Number: T 194/89 - 3.5.2  
Application No.: 80 107 037.6  
Publication No.: 0 031 026  
Title of invention: Brushless DC motor

Classification: H02P 6/02

D E C I S I O N  
of 4 December 1990

Applicant:  
Proprietor of the patent: International Business Machines  
Corporation  
Opponent: Papst Motoren GmbH & Co. KG

Headword: Brushless DC motor/IBM

EPC Articles 56, 84, 123(2) and (3)

Keyword: "Clarity of claims" - "Insertion of the expression  
approximately (not allowed)" -  
"Technical advantage (no requirement under the EPC)"

Headnote



Case Number : T 194/89 - 3.5.2

**D E C I S I O N**  
of the Technical Board of Appeal  
of 4 December 1990

Appellant :  
(Opponent)

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Respondent :  
(Proprietor of the patent)

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US

Representative :

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Decision under appeal :

Interlocutory decision of the Opposition Division of  
the European Patent Office dated 20 January 1989  
concerning maintenance of European patent  
No. 0 031 026 in amended form.

Composition of the Board :

Chairman : E. Persson

Members : A. Hagenbucher

J. Van Voorthuizen

## ry of Facts and Submissions

European patent No. 31 026 was granted on the basis of European patent application No. 80 107 037.6. The patent as granted contained five claims of which Claims 2-5 were dependent on Claim 1. The Appellant filed an opposition requesting revocation of the patent.

By an interlocutory decision within the meaning of Article 106(3) EPC, the Opposition Division decided to maintain the patent in amended form on the basis of four claims of which independent Claim 1 now reads:

- "1. A bifilar wound brushless DC motor including a rotor (17, 18), a stator (22) having a plurality of bifilar winding wire pairs (P1, P3 and P2, P4) arranged in a series of equi-angularly disposed bifilar windings (Fig. 2) mounted around the periphery of the stator with adjacent bifilar windings formed by coiling from different bifilar winding wire pairs and the bifilar winding wire pairs each forming a plurality of equi-angularly disposed bifilar windings with at least one intervening bifilar winding formed from a different bifilar winding wire pair, and a plurality of similar winding circuits (Fig. 6) connected in parallel to a potential source (+V) and each including a respective winding wire (P1 to P4), switch means (T1, T3) for energising the associated winding wire (P1 to P4), diode means (45), each respectively connected in parallel with the associated switch means to permit a reverse flow of current through the associated winding wire that by-passes the switch means connected in parallel thereto, the motor further having switch control means (Fig. 4 and 5) arranged

.../...

to cyclically and individually energise the winding wires in such a sequence that first one winding wire (P1, P2) of each bifilar pair (P1, P3 and P2, P4), and then the other winding wire (P3, P4) of each bifilar pair are energised in succession (P1, P2, P3, P4) to provide a precession of induced magnetic poles around the stator, characterised in that each of the bifilar windings is formed of two bifilar sub-windings which overlap one another and have axes of symmetry separated by an angle approximately half the angular separation between the axes of adjacent bifilar windings."

The amendments of the patent, as far as Claim 1 is concerned, consisted mainly in transferring the characterising part to the precharacterising part and in replacing the characterising part by the characterising features of Claim 4 as granted and by the insertion of the word "approximately" into the characterising part of Claim 1. However, the amended Claim 1 was not as former Claim 4 - by way of reference to former Claim 3 - limited to the embodiment of a motor having a stator with only two bifilar winding wire pairs but is, as amended, embracing embodiments of motors having an indefinite plurality of such bifilar winding wire pairs.

- III. The Appellant lodged an appeal against the decision of the Opposition Division requesting revocation of the patent.
- IV. In a communication prior to oral proceedings, the Board, *inter alia*, raised the question whether the insertion of the word "approximately" into the amended Claim 1 of the patent in suit was in conformity with the requirements of clearness and conciseness of patent claims in Article 84 EPC.

- V. At oral proceedings before the Board, the Respondent (the Patentee) requested that the appeal be dismissed and the patent be maintained as amended by the Opposition Division (main request) or on the basis of a first or a second subsidiary request. The first subsidiary request differs from the main request only in that the word "approximately" in amended Claim 1 has been deleted, while the second subsidiary request further implies a limitation of the scope of amended Claim 1 mainly by restricting its precharacterising part to a motor having a stator with only two bifilar winding wire pairs (as in former Claim 4; cf. paragraph II above), former Claim 3 being deleted.
- VI. At the oral proceedings, the Appellant (the Opponent) declared that he did not object to the patent being maintained on the basis of the second subsidiary request, but made the following objections in respect of the main request and the first subsidiary request.

(a) Main request

In spite of the fact that the word "approximately" appears in the description of the patent application as filed (cf. column 2, lines 3-6 of the patent specification), it would seem that the insertion of this word into the characterising part of amended Claim 1 violates the provisions of Article 123(2) EPC. In any case, it extends the protection conferred by the patent as granted and is, therefore, in contradiction to Article 123(3) EPC, because it allows non-defined deviations for any number of bifilar winding wire pairs which go beyond the specifically disclosed angular separation of the axes of symmetry of sub-windings for two bifilar winding wire pairs.

(b) Main request and first subsidiary request

In referring, as before the Opposition Division, to DE-A-2 527 744 (R1) and Bödefeld-Sequenz: "Elektrische Maschinen", Springer-Verlag 1952, Figures 376-379 and 385, pages 281 and 282 (R12), of which the latter document was disregarded by the Opposition Division in view of its late filing and non-relevance, it was submitted that the claimed subject-matter was obvious to a man skilled in the art and, therefore, not fulfilling the requirements of Articles 52 and 56 EPC.

VII. The Respondent, contesting that the insertion of the word "approximately" into the characterising part of amended Claim 1 (main request) was contrary to the requirements of Article 123(2) or (3) EPC or that there were any other formal deficiencies in respect of either the main request or the two subsidiary requests, argued essentially as follows with regard to the objection of obviousness: The specific arrangement of the windings as claimed leads to the generation of narrower poles with a higher torque per ampere and in addition maintains a compact winding configuration (cf. column 2, lines 6 to 10 of the description). The Appellant has accepted that the claimed subject-matter is new with respect to R1. R12 cannot render the invention obvious, because it does not relate to brushless motors, does not show bifilar windings, does not show bifilar sub-windings, does not show angularly separated bifilar sub-windings having the geometrical relationship specified in the present Claim 1.

Reasons for the Decision

1. The appeal is admissible.

2. The Respondent's main request

- 2.1 As mentioned in paragraph IV above, the Board, in a communication prior to the oral proceedings, raised the question whether the insertion of the word "approximately" in amended Claim 1 was in conformity with the requirements of clearness and conciseness of patent claims in Article 84 EPC. The Board has come to the conclusion that this insertion renders Claim 1 of the main request unallowable under that provision for the following reasons.
- 2.2 "Approximately" is as such a very vague concept without any generally recognised technical meaning in the present context. Nor is there any support in the description or the drawings for how to interpret this concept in a reasonably clear way, if it does not simply mean to cover normal and self-evident tolerances.
- 2.3 Bearing in mind that Claim 1 of the main request is covering embodiments of motors having an indefinite plurality of bifilar winding wire pairs, thus including motors with two such pairs and multiples thereof (cf. paragraph II above), the concept of "approximately" is misleading in the case of two such pairs (and certain multiples thereof), since at least in that case the angular separation, as can be seen from Figure 2 of the drawings, is just half the angular separation between the axes of adjacent bifilar windings subject to normal tolerances as referred to above.
- 2.4 Since the Respondent's main request has to be rejected already because of the above lack of clarity in respect of Claim 1, there is obviously no need for the purpose of this decision to deal with any other aspect of the main request.

3. The Respondent's first subsidiary request
- 3.1 As stated in paragraph V above, the first subsidiary request differs from the main request in that Claim 1 does not contain the word "approximately". Consequently, the deficiency with regard to clarity, which is inherent in Claim 1 of the main request, does not apply to Claim 1 of the first subsidiary request.
- 3.2 The Board has considered whether, in order to avoid any doubts regarding the interpretation of the patent, the word "approximately" should also be deleted from the description, where it appears in column 2, line 4. However, in accepting the confirmation given by the Respondent to the effect that the word "approximately" in this context is only aimed at making it clear that in practice no device can be geometrically perfect, i.e. that the angular separation in question is subject to normal and self-evident tolerances, the Board sees no need to delete this word from the description.
- 3.3 Claim 1 of the first subsidiary request does not contravene Article 123(2) or (3) EPC, since no subject-matter has been added extending beyond the content of the application as filed and the scope of protection has in fact been narrowed in comparison with Claim 1 as granted.
- 3.4 As stated by the Opposition Division, document R1 is to be considered as the closest state of the art.
- 3.5 Starting from R1, the objective problem underlying the solution as defined in Claim 1 of the first supplementary request is to provide a construction of the motor of the



known kind which permits the generation of angularly narrower magnetic poles with higher torque per ampere, and, in addition, permits a more compact winding configuration. This problem is solved by the arrangement that each of the bifilar windings is formed by two bifilar sub-windings which overlap one another and have axes of symmetry separated by an angle half the angular separation between the axes of adjacent bifilar windings. R1 does not give any hint at overlapping two bifilar sub-windings so that their axes of symmetry are separated by an angle half the angular separation between the axes of adjacent bifilar windings.

- 3.6 The Appellant argued that the claimed invention does not represent any technical advantage over the teaching of R1. In that respect it is to be noted that "technical advantage" is no requirement for patentability under the EPC.
- 3.7 In the Board's view, the Opposition Division was correct in disregarding the late filed document R12 under Article 114(2) EPC, because it does not relate to brushless motors and does not show bifilar windings or two overlapping sub-windings. Regarding the Appellant's argument that the use of overlapping windings for brushless DC-motors was obvious to a man skilled in the art in view of the teaching of this document, attention is drawn to the fact that the scope of the claimed invention is not restricted to the simple use of lap windings for a brushless DC motor, but to a specific angular arrangement of sub-windings with respect to the angular separation between the axes of adjacent bifilar windings.
- 3.8 For the reasons set out in paragraphs 3.4-3.7 above, the Board considers that the subject-matter of Claim 1 according to the first subsidiary request is new and

involves an inventive step and thus meets the requirements of Articles 54 and 56 EPC. Dependent Claims 2-4 concern particular embodiments of the motor claimed in Claim 1 and are also allowable.

- 3.9 It follows that the patent in suit shall be maintained in accordance with the Respondent's first subsidiary request.

#### Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The Respondent's main request is rejected.
3. The case is remitted to the first instance with the order to maintain the patent in amended form according to the Respondent's first subsidiary request, i.e. with Claims 1 to 4 as filed at the oral proceedings held on 4 December 1990 and page 1 of the description as filed on 30 March 1987, the rest of the patent specification (column 2, line 11 until column 4, line 50) and the drawings being unamended.

The Registrar:

The Chairman:

M. Kiehl

E. Persson