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DECISION
of 3 February 2004

Case Number: T 0752/01 - 3.5.2
Application Number: 96119149.1
Publication Number: 0777314
IPC: H02K 21/22
Language of the proceedings: EN

Title of invention:
Motor structure

Applicant:
MINEBEA CO., LTD.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123(2)

Keyword:
"Admissibility of amendments (yes)"
"Novelty and inventive step after amendment (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0752/01 - 3.5.2

DECISION
of the Technical Board of Appeal 3.5.2
of 3 February 2004

Appellant:

MINEBEA CO., LTD.
4106-73, Ohaza-Miyota,
Miyota-cho
Kitasaku-gun
Nagano-ken (JP)

Representative:

Schickedanz, Willi, Dr. Dipl.-Ing.
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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 15 December 2000
refusing European application No. 96119149.1
pursuant to Article 97(1) EPC.

Composition of the Board:

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

Summary of Facts and Submissions

I. The appellant contests the decision of the examining division to refuse European patent application No. 96 119 149.1. The reason given for the refusal was that the subject-matter of claim 1 filed with the letter dated 21 July 2000 and of claims 2 and 3 as originally filed did not meet the requirements of Articles 52(1) and 56 EPC, having regard to the prior art known from documents:

D1: JP-A-01 164 252 with a full translation into English and "JAPIO" abstract, and

D2: DE-A-3 936 662.

II. The current version of claim 1, which was filed with the letter dated 19 January 2004, reads as follows (the copy of claim 1 supplied by the appellant had reference paragraph numbers in the left hand margin, but they do not appear to be part of the text of the claim *per se* and have been omitted here):

"A two-phase synchronous motor (105) comprising:

a ferromagnetic stator (4) having N stator salient poles (4a),

and a rotor magnet (2,9) having M poles,

wherein N and M are selected to be both even numbers so a relation $N:M = 2:2n - 1$ (n is a natural number) holds,

said N stator salient poles (4a) are divided into first and second salient pole groups (A1 to A6 and B1 to B6, respectively) of N/2 stator salient poles on which windings (a_1a_1' - a_6a_6' and b_1b_1' - b_6b_6' , respectively) are wound,

said stator salient poles (A1 - A6, B1 - B6) belonging to said first and second pole groups are alternately arranged in a circumferential direction of said stator (4),

phases of said windings (a_1a_1' - a_6a_6' and b_1b_1' - b_6b_6' , respectively) of said stator salient poles (A1 - A6; B1 - B6) belonging to said first (A1 - A6) and second (B1 - B6) salient pole groups being sequentially opposite to each other in a circumferential direction in units of groups,

said windings (a_1a_1' - a_6a_6' and b_1b_1' - b_6b_6') of said stator salient poles (A1 - A6, B1 - B6) belonging to said first and second salient pole groups being sequentially, electrically connected in a circumferential direction to respectively from [sic] first and second phases,

a first drive circuit (101a,102a,103a) which excites windings (a_1a_1' - a_6a_6') of said first salient pole groups (A1 - A6) with a sinusoidal waveform voltage,

a second drive circuit (101b,102b,103b) which excites windings (b_1b_1' - b_6b_6') of said second salient pole group (B1 - B6) with a cosinusoidal waveform voltage,

characterized in that

the first drive circuit (101a,102a,103a) includes a memory (101a) for storing the sinusoidal waveform voltage with compensatory components superimposed thereon and the second drive circuit (101b,102b,103b) includes a memory (101b) for storing cosinusoidal waveform voltage with compensating components superimposed thereon, so as to compensate for cogging torque inherent to the motor."

Claim 2 is dependent on claim 1.

III. The arguments of the appellant can be summarized as follows:

The characterizing features of claim 1, namely that "the first drive circuit (101a,102a,103a) includes a memory (101a)... so as to compensate for cogging torque inherent to the motor", were disclosed on page 9, lines 10 to 13 of the application as originally filed. These features were neither disclosed by either of the prior art documents, nor suggested by their teachings.

IV. The appellant requested that the decision under appeal be set aside and that a patent be granted in the following version:

claims: 1 and 2, filed with letter dated
19 January 2004,

description: column 1 to 8 as in the published
application with the amendments of the
description in column 2 filed with
letter dated 19 January 2004,

drawings: pages 7 to 13 as in the published application.

Reasons for the Decision

1. The appeal is admissible.

Amendments

2. The Board is satisfied that claims 1 and 2 and the amendments to the description according to the present request satisfy the requirements of Article 84 EPC and do not contravene Article 123(2) EPC.

- 2.1 This applies in particular to the subject matter of claim 1 which comprises all the features recited in claim 1 of the application as filed and the following additional features:

- a first drive circuit (101a,102a,103a) which excites windings (a_1a_1' - a_6a_6') of said first salient pole groups (A1 - A6) with a sinusoidal waveform voltage;
- a second drive circuit (101b,102b,103b) which excites windings (b_1b_1' - b_6b_6') of said second salient pole group (B1 - B6) with a cosinusoidal waveform voltage; and
- the first drive circuit (101a,102a,103a) includes a memory (101a) for storing the sinusoidal waveform voltage with compensatory components

superimposed thereon and the second drive circuit (101b,102b,103b) includes a memory (101b) for storing cosinusoidal waveform voltage with compensating components superimposed thereon, so as to compensate for cogging torque inherent to the motor.

2.2 The preferred embodiment of realisation of the motor of the invention which is disclosed in the application as filed (see published application, column 3, lines 56 to column 7, line 52; figures 1 to 7) comprises all the features recited in claim 1 of the application as filed. According to this embodiment (column 4, line 49 to column 5, line 18; figure 2), sinusoidal wave information and cosinusoidal wave information obtained by superposing components, that compensate for the cogging torque inherent to the motor, on sinusoidal and cosinusoidal waves are stored in respective ROM memories (101a, 101b). Converters and amplifiers (102a, 102b, 103a, 103b) generate analog voltages in accordance with the outputs of the ROM memories for exciting the motor windings. This disclosure supports the additional features incorporated in claim 1. Accordingly, the amendments made to claim 1 do not contravene Article 123(2) EPC.

2.3 Claim 2 is derivable from claim 3 as originally filed which was depended on claim 1 as originally filed. The amendments made to the description are for removal of inconsistencies and the acknowledgement of the prior art. These amendments are unobjectionable under Article 123(2) EPC.

Novelty and inventive step

3. The subject-matter of claim 1 is considered to be new (Article 54 (1) EPC) because neither of the cited prior art documents discloses a motor comprising the features "the first drive circuit (101a,102a,103a) includes a memory (101a)... so as to compensate for cogging torque inherent to the motor" recited in the characterizing part of claim 1.

4. Document D1, which is the closest prior art document, discloses all the features recited in the precharacterizing preamble of claim 1.

4.1 Windings belonging to the first and second salient pole groups, whose phases are sequentially opposite to each other in a circumferential direction in units of groups, and which are sequentially, electrically connected in a circumferential direction to respectively form first and second phases, are called in the description of the application in suit "two-phase windings" (see the published application, column 5, line 19 to column 6, line 43: for instance "the windings of the respective salient poles form two-phase windings as a whole"). Such two-phase windings are disclosed in D1 (see the full translation into English, page 7, lines 1 to 3) which with reference to figure 1 explains that the "windings 1α and 1β are provided on opposed salient poles, so forming 2-phase winding of α and β phases". A first and a second drive circuit which respectively excite the windings of the first and second pole groups with a sinusoidal and a cosinusoidal waveform voltage are implicitly disclosed in D1 (page 7, line 2 to 3:

"2-phase winding of α and β phases which, electrically, have a phase difference of 90° ".

5. Starting from D1, the objective problem addressed by the present invention can be seen as providing a compensation for the cogging torque inherent to the motor.
- 5.1 The solution to this problem is to provide the motor with a first and a second drive circuits according to the characterizing part of claim 1.
- 5.2 As already mentioned in paragraphs 3 to 4.1 above, no suggestion of such a solution can be found anywhere in the cited prior art documents D1 and D2, taken alone. Nor can it be derived from a combination of them.
6. For the foregoing reasons, in the Board's judgement, the subject-matter of claim 1 according to the present request is considered to be new and involve an inventive step within the meaning of Articles 54 and 56 EPC. The application as amended meets the requirements of the EPC.
7. The Board has noticed an obvious clerical error in claim 1, indicated by *[sic]*, it being clear that "from" is intended to read "form". This error may be corrected.

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 with the order to grant a patent in the following version:

claims: 1 and 2, filed with letter dated 19 January 2004, with correction of the obvious clerical error (see paragraph 7 of the reasons),

description: column 1 to 8 as in the published application with the amendments of the description in column 2 filed with letter dated 19 January 2004,

drawings: pages 7 to 13 as in the published application.

The Registrar:



D. Sauter

The Chairman:



W. J. L. Wheeler