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**Datasheet for the decision
of 30 May 2011**

Case Number: T 1883/07 - 3.5.02

Application Number: 01954433.7

Publication Number: 1315275

IPC: H02K 37/16

Language of the proceedings: EN

Title of invention:
Stepping motor

Applicant:
Minebea Co. Ltd.

Headword:
-

Relevant legal provisions:
EPC Art. 83

Keyword:
"Sufficiency of disclosure - (no) - all requests"

Decisions cited:
-

Catchword:
-



Case Number: T 1883/07 - 3.5.02

D E C I S I O N
of the Technical Board of Appeal 3.5.02
of 30 May 2011

Appellant: Minebea Co. Ltd.
4106-73 Oaza Miyota
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 29 May 2007
refusing European patent application
No. 01954433.7 pursuant to Article 97(1) EPC
1973.

Composition of the Board:

Chairman: M. Ruggiu
Members: R. Lord
E. Lachacinski

Summary of Facts and Submissions

I. This is an appeal of the applicant against the decision of the examining division to refuse European patent application No. 01 954 433.7.

II. The reasons given for the refusal were that the independent claim 1 then on file defined subject-matter extending beyond the content of the application as originally filed, contrary to the requirements of Article 123(2) EPC, and that that claim was unclear, contrary to the requirements of Article 84 EPC.

III. The appellant requested in writing that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 9 of his main request filed with letter dated 2 October 2007, or on the basis of claim 1 according to one of his first to seventh auxiliary requests filed with the same letter. In that letter the appellant also referred to eighth to eleventh auxiliary requests in which claim 1 was based on that of either the first or the second auxiliary request, with the addition of the features of claim 5 or those of both claim 5 and claim 7, but did not file text for these requests.

In a communication accompanying a summons to oral proceedings dated 1 March 2011 the appellant was informed *inter alia* that the claims of his requests were considered to give rise to a number of objections under Articles 84 and 123(2) EPC, and that the arguments raised in the context of those objections indicated that the application did not disclose the claimed invention in a manner sufficiently clear and

complete for it to be carried out by a person skilled in the art, thus not meeting the requirements of Article 83 EPC.

Oral proceedings before the board took place on 30 May 2011 at which, as he had previously informed the board, the appellant was not represented.

IV. Claim 1 of the appellant's main request reads as follows:

"A stepping motor comprising:

a rotor including a permanent magnet having multiple magnetic poles magnetized to be reversed alternately along a circumferential direction;

two or more stator yokes being disposed on an outer periphery of said rotor for forming multi-phase field magnet having two or more phases; and

exciting coils for exciting said stator yokes, wherein magnetic pole portions of said stator yokes are disposed so as to face close to a magnetic pole-passing surface of said permanent magnet,

and characterised in that the stepping motor further comprises:

a single intermediate member formed of soft magnetic material without an exciting coil, which intermediate member is disposed in a given position between respective pole portions of two adjacent stator yokes [located on both sides thereof] for facing close to said magnetic pole-passing surface of said permanent magnet."

The appellant's letter of 2 October 2007 included two versions of claim 1 of his main request, one of which

included the text in square brackets above, the other of which did not.

Claim 1 according to the appellant's first auxiliary request differs from that of the main request (without the bracketed text) in that the expression "soft magnetic material" in the first line of the last paragraph is replaced by the expression "an electromagnetic material".

Claim 1 according to the appellant's second auxiliary request differs from that of the first auxiliary request in that the expression "an electromagnetic material" in the first line of the last paragraph is replaced by the wording "electromagnetic soft iron or electromagnetic stainless steel".

Claim 1 according to the appellant's third auxiliary request differs from that of the main request in that the wording "characterised in that the stepping motor further comprises:" is replaced by the word "wherein", and in that the final paragraph reads:

"a single intermediate substance made of soft magnetic material that exerts a magnetic property not by being excited by a coil but by a magnetic field caused by the permanent magnet of the rotor and/or the excited stator yokes and that is not in contact with said stator yokes located on both sides thereof is disposed in a substantially central position only between one magnetic pole portion (6a1) of one of the yokes (5a) and an adjacent magnetic pole portion (6b1), located adjacent to said one magnetic pole portion (6a1) of another yoke (5b), the intermediate substance facing

close to said magnetic pole-passing surface of said permanent magnet."

Claim 1 according to the appellant's fourth auxiliary request reads as follows:

"A stepping motor comprising:

 a rotor including a permanent magnet having multiple magnetic poles magnetized to be reversed alternately along a circumferential direction;

 two or more stator yokes being disposed on an outer periphery of said rotor for forming multi-phase field magnet having two or more phases; and

 exciting coils for exciting said stator yokes, wherein magnetic pole portions of said stator yokes are disposed so as to face close to a magnetic pole-passing surface of said permanent magnet, wherein

 said permanent magnet includes three pairs equal to six magnetic poles;

 said two stator yokes are provided, each of said stator yokes being formed of a pair equal to two magnetic poles,

 said two stator yokes are provided in a manner that both magnetic poles in said each stator yoke are arranged to form an angle of 60 degrees,

 one of said magnetic poles of a first stator yoke and one of said magnetic poles of a second stator yoke are disposed to form an angle of 90 degrees, and wherein the stepping motor further comprises:

 a single intermediate member formed of soft magnetic material without an exciting coil, which intermediate member is disposed in a given position between the magnetic poles of the two adjacent stator yokes which form an angle of 90 degrees for facing

close to said magnetic pole-passing surface of said permanent magnet."

Claim 1 according to the appellant's fifth auxiliary request differs from that of the fourth auxiliary request in that in the last phrase of the penultimate paragraph the word "and" (before "wherein") and the colon at the end are deleted, and in that the following text is inserted at the end of the claim:

", and

wherein a width of a portion of said intermediate member, the portion facing close to said magnetic pole-passing surface of the permanent magnet, is set not greater than 1/2 of an axial height of said magnetic pole-passing surface of said permanent magnet"

Claim 1 according to the appellant's sixth auxiliary request reads as follows:

"A stepping motor comprising:

a rotor including a permanent magnet having multiple magnetic poles magnetized to be reversed alternately along a circumferential direction;

two or more stator yokes being disposed on an outer periphery of said rotor for forming multi-phase field magnet having two or more phases; and

exciting coils for exciting said stator yokes, wherein magnetic pole portions of said stator yokes are disposed so as to face close to a magnetic pole-passing surface of said permanent magnet,

said permanent magnet includes three pairs equal to six magnetic poles,

said two stator yokes are provided, each of said

stator yokes being formed of a pair equal to two magnetic poles,

said two stator yokes are provided in a manner that the two magnetic poles in said each stator yoke are arranged to form an angle of 60 degrees therebetween,

one of said magnetic poles of a first stator yoke and one of said magnetic poles of a second stator yoke are disposed to form an angle of 90 degrees therebetween, and wherein

an intermediate substance made of soft magnetic material that exerts a magnetic property not by being excited by a coil but by a magnetic field caused by the permanent magnet of the rotor and/or the excited stator yokes and that is not in contact with said stator yokes located on both sides thereof is disposed in a given position between the magnetic poles of the said two adjacent stator yokes forming an angle of 90 degrees, the intermediate substance facing close to said magnetic pole-passing surface of said permanent magnet."

Claim 1 according to the appellant's seventh auxiliary request differs from that of the sixth auxiliary request in that the word "wherein" is inserted at the end of the fifth paragraph (i.e. after "*said permanent magnet,*"), in that at the end of the penultimate paragraph the word "and" (before "*wherein*") is deleted, and in that the following text is inserted at the end of the claim:

", and wherein

a width of a portion of said intermediate substance, the portion facing close to said magnetic

pole-passing surface of the permanent magnet, is set not greater than 1/2 of an axial height of said magnetic pole-passing surface of said permanent magnet"

- V. The appellant did not present any arguments concerning sufficiency of disclosure within the meaning of Article 83 EPC.

Reasons for the Decision

1. The appeal is admissible.
2. *Sufficiency of disclosure*
 - 2.1 The claims of all of the appellant's current requests relate to that part of the original application which is referred to as the "*second principal means of the invention*" (paragraphs [0029] to [0039] of the description of the published application) and the "*second embodiment*" (paragraphs [0070] to [0090]), which address the technical problem of reducing the detent torque ratio by means of the insertion of an intermediate magnetic substance (also referred to in the present claims as intermediate member) at a defined position in the stepping motor. The application is however extremely vague as to which mechanism is responsible for achieving this effect. The only statements in the application concerning this mechanism are paragraph [0030], which mentions three possible mechanisms, and paragraph [0036], but both of these paragraphs explicitly state that these are only "*conceivable*" mechanisms. Thus these parts of the application provide no clear teaching to the skilled

person as to how to select the material (or materials) of the intermediate magnetic substance.

2.2 It is nonetheless apparent from paragraphs [0036] and [0083], as well as the original claim 10, that the relationship between the magnetic permeability of the intermediate magnetic substance and that of the stator cores is relevant to achieving the desired effect, since those passages all disclose that the permeability of the intermediate magnetic substance should be less than or equal to that of the stator cores. These statements therefore appear *prima facie* to provide a criterion enabling the skilled person to select the material to be used for the intermediate magnetic substance.

2.3 However, consideration of the examples described with reference to Table 1 of the description casts doubt on that conclusion.

2.3.1 According to paragraph [0083], the material designated "SUY" in the first example is the same as that used for the stator cores, so can be assumed to correspond to the option mentioned above in which the permeabilities of the stators cores and the intermediate magnetic substance are equal, whereas the material designated "SUS" in the second example is described as having a lower permeability than "SUY", so corresponds to the other option mentioned above, namely that the permeability of the intermediate magnetic substance is less than that of the stator cores. This suggests that both of these examples are examples of the invention as described in paragraph [0036] and defined in original claim 10.

2.3.2 On the other hand, Table 1 indicates that the example using the material "SUY" has a detent torque ratio of 100. According to the only definition of this parameter in the application, in paragraph [0080], a value of 100(%) for the detent torque ratio corresponds to the situation in which no intermediate magnetic substance is provided. Thus the result in Table 1 indicates that the insertion of an intermediate magnetic substance of the material "SUY" has no effect on the detent torque ratio (whereas the material "SUS" does result in the desired reduction of this parameter). This therefore suggests to the skilled person that in fact an intermediate magnetic substance with a permeability equal to that of the stator cores is not able to provide the technical effect underlying the claimed invention, thus contradicting the disclosure of paragraph [0036] and original claim 10.

2.4 The board thus comes to the conclusion that the selection of the material of the intermediate magnetic substance is crucial for achieving the technical effect of the claimed invention (indeed the application itself indicates that this is the case), but that the application does not provide any clear teaching as to how that selection should be made. Moreover, in the absence of any clear disclosure regarding the mechanism by which the claimed invention provides the reduction of the detent torque ratio, the skilled person would not be able to derive that teaching from his common general knowledge. Thus the board concludes that the application does not disclose the claimed invention in a manner sufficiently clear and complete for it to be

carried out by a person skilled in the art, thus not meeting the requirement of Article 83 EPC.

2.5 The board observes that it could be assumed that at least the material designated "SUS" is a material which would enable the desired technical effect to be achieved, but notes also that the exact nature of this material is not clear from the application. The board considers that it is reasonable to assume that the skilled person would recognise that this designation (like "SUY") refers to a JIS standard for iron and steel. However, the designation "SUS" refers in that standard to a significant number of individual material classes. The board therefore considers that, in the absence of any indication in the application as to which class or classes might be suitable for use in the claimed invention, this additional information cannot contribute to establishing sufficiency of disclosure within the meaning of Article 83 EPC.

2.6 The board notes also that from technical considerations it is apparent that the reduction of the detent torque ratio would depend also on both the position and the dimensions of the intermediate magnetic substance, neither of which is clearly disclosed in the application. In particular, the application is entirely silent as regards the circumferential extent around the rotor of this material. The board considers that this deficiency also results in the application not meeting the requirements of Article 83 EPC.

2.7 Since the claims of all of the appellant's requests relate to the same aspect of the original application, as indicated in section 2.1 above, the above conclusion

concerning sufficiency of disclosure applies not only to the main request filed with letter of 2 October 2007 (in either of the versions of claim 1 mentioned in section IV above), but also to the first to seventh auxiliary requests filed with that letter, and would, on the basis of the indications in that letter, also apply to the eighth to eleventh auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

C. Moser

M. Ruggiu