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**Datasheet for the decision
of 20 June 2022**

Case Number: T 0594/19 - 3.5.02

Application Number: 06712814.0

Publication Number: 1855370

IPC: H02K1/27, H02K21/14

Language of the proceedings: EN

Title of invention:

Magnetic Body, Rotor, Motor

Applicant:

DAIKIN INDUSTRIES, LTD.

Relevant legal provisions:

EPC Art. 54, 56, 84

Keyword:

Novelty - (yes) - feature not derivable from drawing, feature size on the order of image resolution



Beschwerdekammern

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Case Number: T 0594/19 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 20 June 2022

Appellant:
(Applicant)

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 8 October 2018
refusing European patent application No.
06712814.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman R. Lord
Members: F. Giesen
A. Bacchin

Summary of Facts and Submissions

- I. The present appeal by the applicant (appellant) lies from the decision of the examining division refusing European patent application No. 06712814.0.

Reference was made to the following documents:

D1: JP 2000 069695 A
D2: JP 2004 180460 A.

The reasons for the impugned decision were *inter alia* that claim 1 in the version of the then main request lacked novelty in view of document D1, which the examining division held to disclose in the drawings gaps in the magnetic member having rounded edges.

- II. With the statement of grounds of appeal the appellant maintained the main request and auxiliary requests 1 and 2 on which the impugned decision was based.
- III. In a communication pursuant to Rule 100(2) EPC and Article 17 RPBA 2020, the board informed the appellant that it agreed with them concerning novelty of the main request, but that it had noted further deficiencies, namely that the exemplary shapes shown in figures 24 and 25 did not fall under the wording of claim 1, that claim 12 of the main request referred back to itself and that in order to satisfy the requirements of Rule 41(2)(b) EPC, document D1 should be cited in the description. The board also asked the appellant to confirm that no oral proceedings were requested on the condition that the board decided to order the grant of a patent based on the correspondingly amended application documents.

IV. In response, with letter of 8 March 2020, the appellant filed claims 1 to 12 as a new main request, together with replacement description pages 1 to 7. That letter also indicated that oral proceedings were not requested for the case that this request could be granted.

V. Claim 1 of the main request reads as follows:

"A magnetic member (1) comprising:

a periphery (10);

a plurality of field magnet through-holes (2) disposed annularly in a circumferential direction, each having a pair of ends (21, 22) in the circumferential direction; and each field magnet through-hole having a pair of gaps (31, 32) provided one at each of said pair of ends, wherein each gap (31) provided at one (21) of said ends of one of said field magnet through-holes:

(i) extends toward the other one (22) of said ends passing on the side of said periphery with respect to the field magnet through-hole;

(ii) has a first portion (311) spaced from said periphery at a constant first distance (L1) in the circumferential direction from the side of said other one of said ends and a second portion (312) whose distance from said periphery gradually or stepwise [sic] increases while extending from said first portion toward another one of said field magnet through-holes adjacent on the side of said one of said ends; and

(iii) further has a third portion (313) provided between said second portion and said one of said field magnet through-holes."

Underlining was added by the board to identify amendments with respect to claim 1 as originally filed.

Claims 2 to 12 are dependent on claim 1, claim 11 being directed to a rotor comprising the magnetic member of the previous claims, and claim 12 being directed to a motor comprising the rotor of claim 11.

In view of the tenor of this decision, the wording of the independent claims of the auxiliary requests is not reproduced here.

VI. The appellant's arguments relevant for the present decision can essentially be summarised as follows:

The amendments to claim 1 had a basis in the application documents as originally filed.

The subject-matter of claim 1 was new in view of D1. A "gradual increase", which the examining division considered to be realised in D1 by rounded edges, was not directly and unambiguously derivable from the drawings of D1, since these were schematic and not accompanied by a clear technical teaching to that effect. The addition of a stepwise increase to claim of the main request covered the embodiments in figures 24 and 25.

Reasons for the Decision

1. *Admissibility of the Appeal*

The appeal complies with the requirements of Articles 106 to 108 and Rule 99 EPC. It is therefore admissible.

2. *Decision in the Written Proceedings*

Since the board accedes to the appellant's main request, and oral proceedings were not requested if the main request was considered to be allowable, the decision can be handed down in the written procedure.

3. *Amendments*

3.1 The board is satisfied that the claims were amended in compliance with Article 123(2) EPC.

3.2 The fact that each of the field magnet through-holes has gaps is disclosed in the original description on page 11, lines 6 to 9 and is consistently derivable from figures 1, 2 and 5. A stepwise increase of the distance between the second portion and the periphery is disclosed in original dependent claim 6.

4. *Main Request - Clarity*

4.1 The board is satisfied that claim 1 is clear within the meaning of Article 84 EPC.

4.2 The expression "gradual increase" designates a slow change of increase without indicating clearly any rate

of change that would distinguish "gradual" from "steep" or "abrupt". Despite this, in the context of claim 1 the expression "gradual increase" does not lead to a lack of clarity. It clearly excludes any shape of gap, in which the edge of the second portion of the gap lies along the direction locally normal to the peripheral edge, i.e. in the radial direction in case of a circular magnetic member. Furthermore, it excludes that the distance from the periphery to the edge of the second portion of the gap can reduce at any point along it, when going away from the first portion in a circumferential direction. The distance can remain the same over a certain length of the gap, but not become smaller.

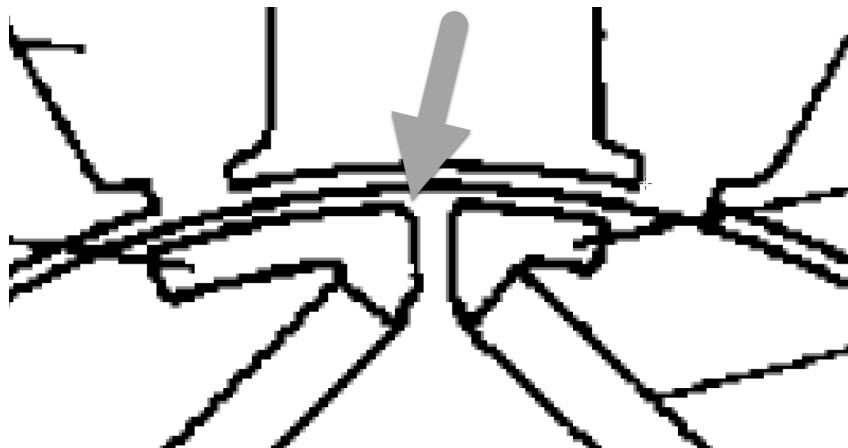
Given that in usual claim interpretation, expressions in claims must be given the broadest reasonable meaning, one has to conclude that the expression "gradual increase" does not limit the gap shape to any particular rate of change of the distance between the periphery and the gap edge. However, it expresses the aforementioned limitations clearly. In conclusion, the expression thus allows clear limitations to be derived without any recourse to other means of interpretation.

5. *Main Request - Novelty*

5.1 The subject-matter of claim 1 is new over D1 within the meaning of Article 54 EPC.

5.2 The only point in dispute is whether the gaps in the magnetic member of D1 clearly and unambiguously possess rounded edges. In the impugned decision the examining division held that such rounded edges were disclosed in the figures and that these anticipated the feature that

the distance of the second portion from the periphery increases gradually.



Reproduction of a partial view of figure 3 of D1

In the above magnified reproduction of a part of figure 3 of D1 a grey arrow was added by the board to indicate the part of the gap which the examining division considered to be rounded edges.

As is readily visible, the radius of curvature of the edges of the gaps (if there is any) is so small as to be close to the resolution of the drawing. The board notes that even straight lines are shown to be very irregular in the above figure, e.g. the upper edge of the field magnet recess on the left side of the drawing. This can safely be regarded as an artifact of the drawing resolution. Likewise, it can be safely considered an artifact of the drawing resolution that clear steps are seen on the circular outside periphery of the magnetic member.

Given that the size of the artifacts of the drawing resolution of the periphery and the straight magnet through-hole edge are of the same order of any radius of curvature that may or may not be present, it cannot

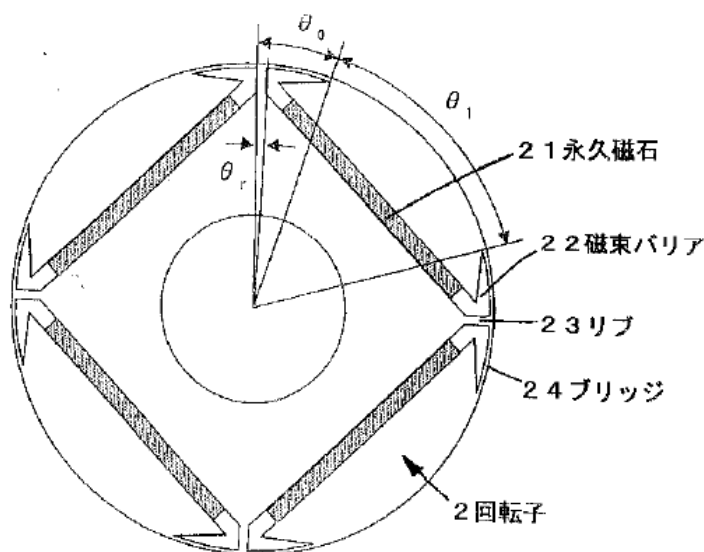
be derived directly and unambiguously from the above drawing, or in fact any other drawing in D1, that the gaps have rounded edges. Thus D1 does not disclose the feature of claim 1 concerning the gradual increase of the distance between the second portion and the periphery.

5.3 Hence, the subject-matter of claim 1 is new over D1.

5.4 The subject-matter of claim 1 of the main request is also new in view of D2.

5.5 D2 discloses a magnetic member with field-magnet through-holes each having a gap (22) at either side.

【 図 5 】



Reproduction of figure 5 of D2

The gaps can, however, not be seen to be in three portions, such that the distance of the second of these three portions from the periphery increases in a step-wise (or gradual) manner, as required by claim 1 of the main request. In the board's view the part that could be identified as a second portion does not have any

edge that extends along the outer periphery and hence the distance to the outer periphery cannot be said to increase.

6. *Main Request - Inventive Step*

6.1 The subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC.

6.2 The impugned decision contains - consistently, given its tenor - no discussion of inventive step. The appellant merely asserts that the subject-matter of claim 1 involved an inventive step. Such absence of arguments is not in compliance with the requirements of Article 12(2) RPBA 2007, which stipulates that the statement of grounds must contain a party's complete appeal case. The primary object of the appeal proceedings is to review the impugned decision in a judicial manner, see Article 12(2) RPBA 2020, and this implies that a board should normally refrain from introducing considerations going beyond the basis of the appeal. However, Article 11 RPBA 2020 implies that the board can decide in the present case without remitting, even in the absence of useful arguments concerning inventive step, since the assessment of the latter does not require an extensive examination for the board.

6.3 The distinguishing feature of the magnetic member of claim 1 over that of D1 is that each of the ends of the through-hole have a second portion (312) whose distance from said periphery increases gradually or in a step-wise manner while extending from said first portion toward another one of said field magnet through-holes adjacent on the side of said one of said ends.

6.4 The technical effect achieved by said feature is demonstrated in the application in figures 8 to 19 and in the passage on page 18, line 10 to page 19, line 8 for a gradual increase and in page 25, line 25 to page 26, line 5 for a stepwise increase. In particular figure 9 depicts the results of simulations of torque ripple for the case that there is no second portion ($L_1 = L_2$), which in the board's view corresponds to the shape of the gap of figure 3 of D1 having no rounded edges or the shapes of D2, figure 5 and, as a comparison, for the case that there is a gradual increase of the distance of a second portion, which corresponds to the claimed magnetic member. The simulation shows that a gradual increase of the distance between the periphery and the edge of the second gap portion leads to a reduction in torque ripple. The application offers as explanation that the radial component of the force on the surface of the magnetic member is reduced, which in turn appears to lead to a more homogeneous distribution of the tangential component of the force on the surface as shown in the comparative simulations of figures 13 and 14. While the application discloses only simulations rather than experimental data, the board has no reason to question their validity.

These simulations also show that the effect occurs across the entire claimed range, i.e. any change in distance between the periphery reduces torque ripple. The application shows further exemplary gap shapes, which do not rely on a linear increase, but which are disclosed to also achieve the above technical effect. The reduction in torque ripple is also observed for a stepwise increase according to the passage on page 25, line 25 to page 26, line 5.

6.5 Consequently, the technical problem is to be seen in providing a magnetic member which reduces torque ripple.

6.6 Given the state of the art on file, the solution to this problem according to claim 1 was not obvious.

Document D1 is silent on introducing a second portion with distance increasing gradually or in a stepwise manner in order to reduce torque ripple. D1 rather suggests, that magnetic members having different gap shapes should be combined thus reducing torque ripple, see paragraph [0024] of the machine translation of D1 available on Espacenet. Likewise, D2 does not suggest adding a second portion to the gaps with a gradual or stepwise increase of the distance to the periphery of the magnetic member.

6.7 The subject-matter of claim 1 therefore involves an inventive step within the meaning of Article 56 EPC in view of the state of the art on file.

7. Conclusions

The board therefore comes to the conclusion that the application and the invention to which it relates meets the requirements of the EPC and accedes to the appellant's main request.

Order

For these reasons it is decided that:

1. The impugned decision is set aside.

2. The case is remitted to the examining division with the order to grant a patent based on the following application documents:

Description	pages 1 to 7	filed on 8 March 2022
	pages 8 to 26	as originally filed
Claims	1 to 12 of the main request	filed on 8 March 2022
Drawings	Figs. 1 to 25	as originally filed

The Registrar:

The Chairman:



U. Bultmann

R. Lord

Decision electronically authenticated