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**Datasheet for the decision
of 27 May 2025**

Case Number: T 1273/23 - 3.5.01

Application Number: 19812524.7

Publication Number: 3739725

IPC: H02K1/27, H02K1/30

Language of the proceedings: EN

Title of invention:
MOTOR ROTOR DEVICE AND MOTOR

Applicant:
Shenzhen Yinwang Intelligent
Technologies Co., Ltd.

Headword:
Rotor bonding element/YINWANG

Relevant legal provisions:
EPC Art. 56
RPBA 2020 Art. 12(6)

Keyword:
Inventive step (main request - no)
Admissibility of request not admitted in first instance
proceedings (auxiliary request - no)



Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 1273/23 - 3.5.01

D E C I S I O N
of Technical Board of Appeal 3.5.01
of 27 May 2025

Appellant:
(Applicant)

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 31 January 2023
refusing European patent application No.
19812524.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman G. Flynn
Members: L. Falò
D. Rogers

Summary of Facts and Submissions

- I. This is an appeal against the examining division's decision to refuse European patent application No. 19 812 524.7.
- II. The following documents were cited in the European Search Report:
- D1: EP 3 021 459 A1
D2: DE 10 2015 203018 A1
D3: WO 2018/024467 A1
D4: US 2018/041080 A1
- III. The application was refused on the grounds of added subject matter (main request at that time) and lack of novelty and inventive step over D1 (second auxiliary request at that time). The first, third and fourth auxiliary requests at that time were not admitted into the proceedings.
- IV. In the statement setting out the grounds of appeal, the appellant requested that the decision of the examining division be set aside and that a patent be granted on the basis of the main request or the first or second auxiliary request, all filed with the statement of grounds of appeal.

The main request was filed for the first time on appeal. The first and second auxiliary requests respectively corresponded exactly to the second and first auxiliary requests as filed during the first-instance oral proceedings and as considered in the contested decision.

- V. In a communication under Article 15(1) RPBA, the Board set out its preliminary view that the subject-matter of claim 1 of the first auxiliary request did not involve an inventive step and that it was minded not to admit the main and second auxiliary request into the appeal proceedings. Therefore, the Board was inclined to dismiss the appeal.
- VI. In a letter of reply dated 24 April 2025 the appellant withdrew the main request filed with the grounds of appeal. The auxiliary requests 1 and 2 filed with the grounds of appeal were re-filed as a main request and first auxiliary request.
- VII. Oral proceedings were held as a videoconference on 27 May 2025. The appellant maintained the requests filed with the letter of 24 April 2025.
- VIII. Claim 1 of the main request reads as follows:

A motor rotor apparatus, wherein the motor rotor apparatus comprises a rotor core (201) and a bonding element (401), wherein the bonding element (401) is embedded in the rotor core (201);

the rotor core (201) is provided with a first air sub-groove (301a), the first air sub-groove (301a) comprises a first tooth (3011a) and a first slot (3011b), and the bonding element (401) comprises a second tooth (4011a) and a second slot (4011b), wherein

the first tooth (3011a) is engaged with the second tooth (4011a), and the first slot (3011b) is engaged with the second slot (4011b),

wherein the rotor core (201) further comprises a second air sub-groove (302a), the second air sub-groove (302a) and the first air sub-groove (301a) are connected head to tail to form a first air groove (30a), and the first air sub-groove (301a) and the second air sub-groove (302a) are connected; and

the second air sub-groove (302a) is configured to accommodate a permanent magnet (202),

wherein the rotor core (201) is further provided with a second air groove (30b), and the second air groove (30b) is configured to accommodate the permanent magnet (202),

wherein a first bearing structure (10) comprises the first air groove (30a) and the second air groove (30b), and the rotor core (201) comprises a plurality of first bearing structures (10),

wherein a first magnetic bridge is formed between the first air groove (30a) and the second air groove (30b), a second magnetic bridge is formed between the first air groove (30a) and a circumferential surface of the rotor core (201), and a third magnetic bridge is formed between the second air groove (30b) and the circumferential surface of the rotor core (201).

IX. Claim 1 of the first auxiliary request reads as follows:

A motor rotor apparatus, wherein the motor rotor apparatus comprises a rotor core (201) and a bonding element (401), wherein the bonding element (401) is embedded in the rotor core (201);

the motor rotor apparatus includes a first bearing structure (10) and a second bearing structure (20),

the first bearing structure (10) includes a first air groove (30a) including a first air sub-groove (301a) and a second air sub-groove (302a), a second air groove (303a), and two air regions (304a, 305a),

correspondingly, the second bearing structure (20) includes a third air groove (30b) including a third air sub-groove (301b) and a fourth air sub-groove (302b), a fourth air groove (303b), and two air regions (304b, 305b),

the rotor core (201) is provided with the first air sub-groove (301a), the first air sub-groove (301a) comprises a first tooth (3011a) and a first slot (3011b), and the bonding element (401) comprises a second tooth (4011a) and a second slot (4011b), wherein

the first tooth (3011a) is engaged with the second tooth (4011a), and the first slot (3011b) is engaged with the second slot (4011b),

the second bearing structure (20) is symmetrically distributed with the first bearing structure (10) by using a radius direction as a center, wherein the first air groove (30a) is symmetrically distributed with the third air groove (30b), and the second air groove (303a) is symmetrically distributed the fourth air groove (303b), and the air regions (304a, 305a) of the first bearing structure (10) are symmetrically distributed with the air regions (304b, 305b) of the second bearing structure (20), and

a part of the core (201) between the second air sub-groove (302a) and the fourth air sub-groove (302b) is a magnetic bridge; a part of the core (201) between the second air groove (303a) and the fourth air groove (303b) is a magnetic bridge; parts of the core (201) between a circumferential surface of the rotor core (201) and each of the first air sub-groove (301a), the second air groove (303a), the third air sub-groove (301b), and the fourth air groove (303b) are also magnetic bridges.

Reasons for the Decision

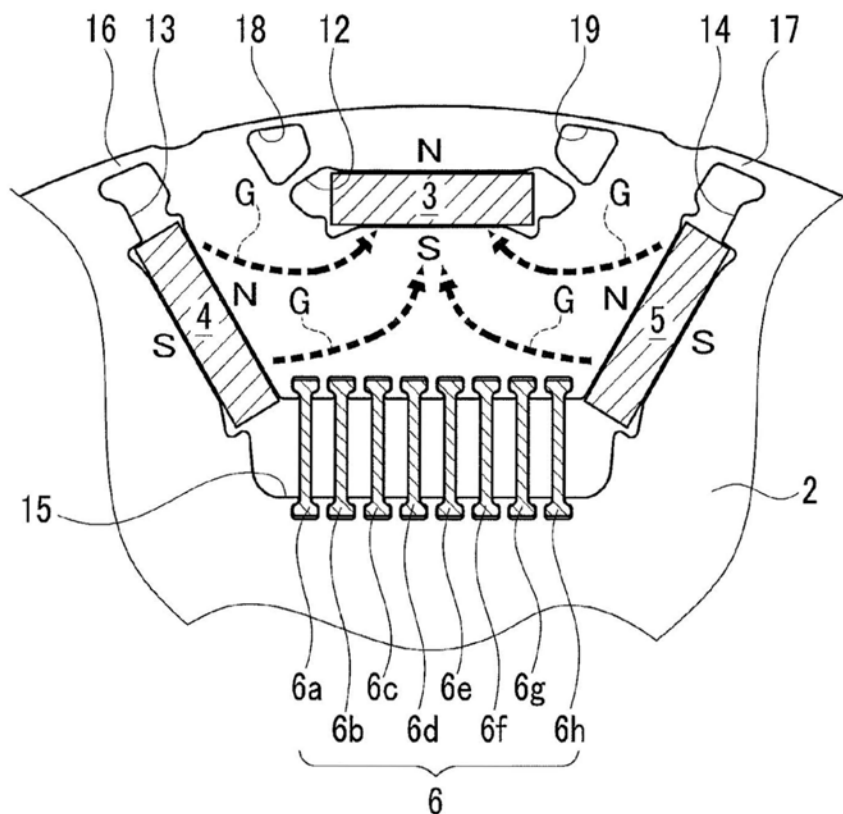
1. The invention as set out in the description and figures concerns a rotor for an electric motor. Looking at Figure 6, reproduced below, the rotor core is provided with a plurality of "air grooves" and "air regions", i.e. cavities (30a, 30b 304a, 304b, 303a, 303b, 305a, 305b), some of which accommodate permanent magnets ("sub-grooves" 302a, 302b). At least some of these cavities (the "grooves") are located so as to form "magnetic bridges", i.e. narrower portions of core, between the cavity and the circumference of the rotor as well as between the cavities themselves.

According to the description, providing cavities can increase the motor's torque, but has the disadvantage to degrade the robustness of the core ([0044]). Because of this, at high speed the centrifugal force may cause considerable stress to the thinner portions of the core (i.e. the "bridges").

To increase robustness, the rotor core according to the invention includes one or more "bonding elements" (Figure 4), i.e. structures made of non-

preventing holes", 13, 14, 15, 12, 18, 19), some of which (13, 14, 12) accommodate permanent magnets (3, 4, 5). Magnetic bridges are formed between some of the cavities and the circumference of the rotor (16, 17) as well as between some of the cavities (portions of core between 12 and 18 and between 12 and 19). One of the cavities includes a structure (6) comprising plurality of "non-magnetic bridges" or bonding elements (6a to 6h) to prevent deformation of the core due to the centrifugal force ([0045],[0046]).

FIG.2



4. The appellant argued that the following features of claim 1 of the main request were not disclosed in D1:

a) a first magnetic bridge being formed between the first air groove (30a) and the second air groove (30b).

b) a bonding element

c) the first air sub-groove comprising a first tooth and a first slot, and the bonding element comprising a second tooth and a second slot, wherein the first tooth is engaged with the second tooth and the first slot is engaged with the second slot.

5. The examining division found that, in D1, the portions of core between cavity 12 and cavities 13 or 15 could be mapped to the claimed magnetic bridge between the first and second air groove.

The Board takes however a different view. Even though the application does not provide any definition of the expression "magnetic bridge", the person skilled in the art of electrical machines would interpret it as indicating a portion of core designed to enter saturation and, thereby, minimise leakage of magnetic flux through it. This is not the function of the above mentioned portions of core in D1. Rather they carry the magnetic flux flows G of the permanent magnets (see D1, Figure 2 together with paragraph [0041]).

The Board therefore agrees with the appellant that feature a) is not unambiguously disclosed in D1.

6. Concerning feature b), the appellant argued that the plurality of non-magnetic bridges of D1 could not be mapped to the single bonding element of the claim, because an element could not be formed by two separate entities, each having their own chamfer and direction of installation. Moreover, the space between any two of these elements was not part of any non-magnetic bridge, and there was not a first slot and a second slot

engaging with each other and adjacent to a first tooth and a second tooth.

7. The Board is not convinced by these arguments. Even when accepting that the plurality of I-shaped non-magnetic bridges 6 of D1 cannot collectively be considered a "bonding element" in the sense of claim 1, the Board observes that each of the I-shaped non-magnetic bridges 6a to 6h, separately considered, can be considered such and performs the same function, namely that of reducing the deformation and structural stress of the rotor components due to the centrifugal force, see for example D1, paragraph [0045]).

Moreover, D1 does include also an embodiment with a single non-magnetic bridge (paragraph [0042], *"In a case where a single non-magnetic bridge 6 is provided for each leak prevention hole 15, the end portion 61 could be formed as a wide-width portion having a large size (cross sectional area) from necessity for strength"*). Whilst D1 points out the advantages of an embodiment with eight non-magnetic bridges, the single-bridge embodiment is nonetheless disclosed.

Hence, the Board finds that D1 anticipates feature b).

8. Feature group c) is anticipated by the "dovetail groove" arrangement of D1, see for example Figure 7, in which each of the two portions of the core form a slot and two teeth, which engage a corresponding tooth (end portion 61, 62 of the non-magnetic bridge) and the two concave portions formed on either side by the curved surface 201 and the I-shaped portion of the non-magnetic bridge. Each of these concave portions may be considered a "slot" in the sense of claim 1.

9. Summarising, the Board judges that D1 discloses features b) and c), but not feature a). Hence the subject-matter of claim 1 of the main request is novel over D1 (Article 54 EPC).
10. Considering inventive step, the appellant argued that feature a) should not be considered in isolation. The central magnetic bridge (the "first magnetic bridge") increased the robustness of the core, as explained for example in paragraphs [0004] and [0005] but, being at the same time affected by the deformation of the core, required the presence of the bonding element ([0010], [0021], [0024], [0066]). There was therefore a synergistic effect deriving from the combination of these features. D1 did not disclose the presence of a central bridge.
11. The Board finds this argument unconvincing. The wording of claim 1 does not define the location of the first magnetic bridge, apart from specifying that it is formed between two "air grooves" rather than between an air groove and the circumferential surface of the rotor. Hence, the bridge is not necessarily central but could be located anywhere within the core, apart from at the circumferential surface. Moreover, the passages of the description cited by the appellant concern the effect of the bonding element on all the magnet bridges, rather than on a specific one. Thus, there is no plausible synergistic effect deriving from the interaction of feature a) with the remaining features of claim 1.
12. The Board judges that the only effect of providing the first magnetic bridge between the first and second air grooves (i.e. cavities) is to increase the robustness of the core. This would have been an obvious design

possibility for the skilled person, as motor cores including radially extending bridges between cavities were well known at the priority date of the application, as shown for example in D2, Figure 5, reference 45 or D4, Figure 17, references 41 and 42.

13. The appellant also argued that, even though such bridges were disclosed in D2 and D4, combining D1 with these documents implied hindsight, especially considering that D2 and D4 were published after D1 and concerned different technical problems. The Board observes however that documents D2 and D4 are only cited as examples of a well-known constructional arrangement.
14. In view of the above, the Board concludes that starting from the rotor core of document D1 it would be obvious for the skilled person to provide also magnetic bridges within the disclosed cavities for additional robustness. Hence, the subject-matter of claim 1 of the main request lacks an inventive step over D1 (Article 56 EPC).

First auxiliary request - Admissibility

15. The present first auxiliary request corresponds to the first auxiliary request filed during the first instance oral proceedings but not admitted by the opposition division because it was considered late-filed and *prima facie* not compliant with Article 123(2) EPC. Claim 1 thereof defines two "bearing structures" symmetrically distributed in respect of a rotor radius, wherein the first structure corresponds to the one defined in claim 1 of the main request. According to the appellant, claim 1 of the present auxiliary request 1 is a combination of original claim 1 with the features

disclosed in paragraphs [0056], [0057] and [0065] of the description of the application as filed.

16. The examining division found that the omission of the expression "*the motor rotor apparatus includes a plurality of first bearing structures, and all the bearing structures have a same size and a same shape*" of paragraph [0056] (referred to as "Fd.1") resulted in an unallowable intermediate generalisation.

17. The examining division further found that the introduction of the feature:

"the first bearing structure (10) includes a first air groove (30a) including a first air sub-groove (301a) and a second air sub-groove (302a), a second air groove (303a), and two air regions (304a, 305a)"

resulted in added-subject matter, since the corresponding feature in paragraph [0056] (identified as feature "Fd.3" in the decision) was only disclosed in conjunction with Figure 6. Hence, all the additional characteristics of Figure 6, such as the position, size and shape of the grooves should have also been included.

18. The appellant argued that claim 1 combined all the features from Figure 6 as disclosed in paragraphs [0056], [0057], [0065], and that features present only in Figure 6 but not disclosed anywhere else in the description were not essential features and may therefore be omitted. During the oral proceedings before the Board, the appellant further argued that the examining division's conclusions were due to an erroneous interpretation of paragraph [0056] of the

description. Hence, the request should have been admitted in the first-instance proceedings.

19. It is established case law that if a discretionary decision of the examining division not to admit submissions is challenged on appeal, it is not the task of the Board to review all the facts and circumstances as if it were in the place of the division and to decide whether or not it would have exercised discretion in the same way. The Board should overrule the way in which the first instance division exercised its discretion only if it concludes that the division did so according to the wrong principles or without taking into account the right principles, or that it exercised its discretion in an unreasonable way and thus exceeded the proper limit of its discretion (Case Law of the Boards of Appeal, V.A.4.3.6.a)).
20. *Prima-facie* allowability is a generally accepted criterion to assess admissibility, particularly for late-filed requests. Hence, the decision was not taken according to the wrong principles or without taking into account the right principles. Furthermore, the decision also explains in detail how the division came to this conclusion and is therefore sufficiently reasoned. An alleged misunderstanding in the interpretation of a passage of the application concerns the substance of the reasoning and is not an error in the use of discretion in the sense of Article 12(6) RPBA.
21. In view of the above, the Board concludes that the division correctly exercised its discretionary power not to admit the first auxiliary request in the examination proceedings. Moreover, the Board does not see any exceptional circumstances which would justify

the admittance of the request in the appeal proceedings. The first auxiliary request is therefore not admitted under Article 12(6) RPBA.

Conclusion

22. As the only admitted request is not allowable, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



T. Buschek

G. Flyng

Decision electronically authenticated