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**Datasheet for the decision  
of 26 October 2022**

**Case Number:** T 3220/19 - 3.5.02

**Application Number:** 13847789.8

**Publication Number:** 2911280

**IPC:** H02K55/04, H02K7/00, H02K9/20

**Language of the proceedings:** EN

**Title of invention:**  
Field rotor for superconducting rotating machine

**Patent Proprietor:**  
Kawasaki Jukogyo Kabushiki Kaisha

**Opponent:**  
Siemens Aktiengesellschaft

**Relevant legal provisions:**  
EPC Art. 100 (a), 100 (b)

**Keyword:**  
Grounds for opposition - insufficiency of disclosure (no) -  
lack of patentability (no)



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Case Number: T 3220/19 - 3.5.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.02**  
**of 26 October 2022**

**Appellant:** Siemens Aktiengesellschaft  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 19 November  
2019 rejecting the opposition filed against  
European patent No. 2911280 pursuant to Article  
101(2) EPC.**

**Composition of the Board:**

**Chairman** R. Lord  
**Members:** H. Bronold  
W. Ungler

## **Summary of Facts and Submissions**

- I. The appeal of the opponent is against the decision of the opposition division to reject the opposition against European patent No. 2 911 280.
- II. The appellant requested in writing that the decision under appeal be set aside and that the patent be revoked in its entirety.
- III. The respondent (patent proprietor) requested as main request that the appeal be dismissed, or if that was not possible, that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of one of their first to sixteenth auxiliary requests, all filed with the reply to the statement of grounds of appeal.
- IV. The following documents cited during the proceedings before the opposition division are of particular relevance for the decision:  
  
D5 : JP S52 29911 A  
D5a : English translation of D5  
D6 : DE 100 63 724 A1  
D7 : DE 24 48 900 A1
- V. In a communication under Article 15(1) RPBA the board informed the parties of its preliminary opinion that the ground of opposition under Article 100(b) EPC did not prejudice the maintenance of the patent, that it seemed that all features of granted claim 1 were already known from document D7 and that none of the remaining objections of the appellant convinced the

board. Thus it seemed that the ground of opposition under Article 100(a) EPC prejudiced the maintenance of the patent as granted. Regarding the auxiliary requests, the board noted that no substantiated argument had been provided by the appellant regarding these requests.

- VI. With letter dated 23 September 2022 the respondent provided further arguments supporting novelty of granted claim 1 over document D7.
- VII. The appellant reacted neither to the board's preliminary opinion nor to the respondent's arguments in the letter dated 23 September 2022.
- VIII. Oral proceedings were held before the board on 26 October 2022. Although duly summoned, the appellant was neither present nor represented at the oral proceedings.
- IX. Claim 1 according to the patent as granted according to the feature analysis represented on page 3 of the contested decision reads as follows:

"**[1a]** A field rotor (100) of a superconducting rotating machine comprising:

**[1b]** a rotation shaft (18);

**[1c]** a supply shaft (10) that supplies a refrigerant to the rotation shaft at one end of the rotation shaft;

**[1d]** an input/output shaft (24) provided at the other end of the rotation shaft so as to integrally rotate with the rotation shaft; and

**[1e]** a superconducting coil (20) held on a circumferential surface of the rotation shaft to be cooled by the refrigerant, wherein

**[1f]** the supply shaft (10) and the input/output shaft (24) are fixed to each other so as to rotate integrally with each other, characterised in that

**[1g]** the rotation shaft (18) and the supply shaft (10) are at least partly brought in contact with each other in order to allow the rotation shaft to be supported by the supply shaft

**[1h]** and in order to be slidably fitted to each other in a circumferential direction of the rotation shaft

**[1i]** and in an axial direction of the rotation shaft,

**[1j]** and in that the supply shaft (10) and the rotation shaft (18) are disposed such that one of them having relatively a large thermal contraction amount in a diameter direction upon a change from a room-temperature state to a cool-temperature state is located at the outer circumference of the other one having a relatively small thermal contraction amount."

Dependent claim 6 includes the feature "a hollow torque tube having a relatively small thickness in a diameter direction".

X. The appellant's arguments, as far as they are relevant for the decision, can be summarised as follows.

Claim 6 of the granted patent was not sufficiently disclosed because the patent nowhere mentioned in relation to which other elements the claimed feature

"hollow torque tube having a relatively small thickness in a diameter direction" had to be understood.

Claim 1 was not novel over document D7. In particular, feature 1j followed implicitly from the fact that a temperature gradient existed between cylinder 46 and cylinder 42, which implied that the outer rotation shaft was shrink-fitted to the supply shaft.

Document D5 was also novelty-destroying for claim 1. The disputed feature that D5 disclosed a key between the rotation shaft and the supply shaft did not mean that D5 was not novelty-destroying because the key was inserted only after the fitting of the cylinder elements 3 and 6A of D5. Thus, during the fitting, cylinder elements 3 and 6A corresponding to the rotation shaft and the supply shaft, respectively, had the claimed property of being slidably fitted to each other in a circumferential direction of the rotation shaft and in an axial direction of the rotation shaft.

The subject-matter of claim 1 was further not inventive. Starting from document D7, it was likely that the person skilled in the art would use the same material for the rotation shaft and the intermediate cylinders of D7 such that feature 1j was already known from D7. Shrink-fitting of the radially outer cylinder 46 to the radially inner end portion 44 of cylinder 42 was implicit in D7.

A combination of documents D7 and D5 also rendered the subject-matter of claim 1 obvious. In particular, the person skilled in the art would not include the key disclosed in D5 into a combination of D7 with D5 because according to D7 the torque transmission took place at the opposite side of the rotation shaft and

the intermediate cylinders of D7 were not mechanically robust.

Starting from document D6, the subject-matter of claim 1 was not inventive in combination with either the common general knowledge of the person skilled in the art, D9 or D5. Document D6 disclosed all features of claim 1 except feature 1j. Regarding feature 1j, D6 contained the information that in the region of contact between the rotation shaft and the supply shaft no relevant cooling took place such that no shrinking occurred and the radial mechanical contact was preserved. Feature 1j was further hinted at by the common general knowledge, D9 or D5.

XI. The respondent's arguments, as far as they are relevant for the decision, can be summarised as follows:

A hollow torque tube in the sense of granted claim 6 was disclosed in paragraphs [0033] and [0063] of the description as well as in figures 1 and 4. Thus, the skilled person would have no difficulty assembling a field rotor having a torque tube as recited in claim 6.

Claim 1 of the granted patent was further novel and inventive.

Document D7 failed to disclose *inter alia* feature 1h. The rotor according to document D5 comprised a key which contradicted the claimed feature that allowed circumferential movement between the rotation shaft and the supply shaft. Consequently, claim 1 was novel over both D7 and D5. The respondent's arguments in this respect are discussed in detail below in sections 3.1 and 3.2 of the Reasons.

Further, document D7 neither explicitly nor implicitly disclosed feature 1j. Nor was this feature obvious from the common general knowledge or document D5. Thus, a combination of D7 with common general knowledge or D5 did not render the subject-matter of claim 1 obvious.

Finally, document D6 taught explicitly against any thermal shrinking between the rotation shaft and the supply shaft, as followed from paragraph [0024] of D6.



## **Reasons for the Decision**

1. Admissibility of the appeal - Article 108 EPC and Rule 99 EPC

The appeal was filed in due time and form and sufficiently substantiated. Consequently, the appeal is admissible.

2. Insufficient disclosure - Article 100(b) EPC

The appellant argued that dependent claim 6 was insufficiently disclosed because the feature "hollow torque tube having a relatively small thickness in a diameter direction" was undefined and it was left open to which other claimed element it referred.

The board is not convinced by the appellant's arguments regarding insufficiency of disclosure. As pointed out by the respondent, corresponding disclosure can be found in the patent in paragraph [0063] of the description and in figures 1 and 4.

The board thus concludes that claim 6 is sufficiently disclosed and consequently the ground of opposition under Article 100(b) EPC does not prejudice the maintenance of the patent.

3. Lack of novelty - Articles 100(a) and 54(2) EPC

3.1 Document D7

The appellant argued that document D7 anticipated all features of claim 1 of the patent as granted. The respondent contested that document D7 discloses features 1g, 1h and 1j of claim 1.

Regarding feature 1g, the board interprets the claimed contact between the rotation shaft and the supply shaft to include an indirect contact, because claim 1 does not further specify the contact between the two shafts. As argued by the appellant, document D7 discloses on page 7, 2nd paragraph, line 17 to page 8, line 5 that the intermediate cylinders 46, 48 and 50 are welded together and to the rotation shaft 18. Thus, having regard to the broad wording of claim 1, the board tends to the opinion that D7 discloses a contact (of whatever kind) between the supply shaft and the rotation shaft in the sense of feature 1g.

Regarding feature 1h, document D7 explicitly defines that the rotation shaft and the supply shaft are restricted only in a radial direction of movement and that axial movement between the two shafts is possible. As argued by the appellant, in the absence of any further restriction of the degrees of freedom of movement, the axial movement disclosed in D7 implies that circumferential movement between the two shafts in the sense of feature 1h is possible. The respondent's argument that the intermediate cylinders would deform and therefore no longer allow any movement between the rotation shaft and the supply shaft is not pertinent in view of the fact that the intermediate cylinders according to D7 are welded together and to the rotation

shaft. Moreover, document D7 does not include any hint that a key might be present between the rotation shaft and the supply shaft, in particular, because the transmission of torque according to D7 takes place between the drive shaft 26 and the opposite end of the rotation shaft 18.

Feature 1j merely defines the thermal contraction amount of the rotation shaft and the supply shaft in relative terms without indicating any specific values, materials used or the like. Further, no effect of the claimed difference in thermal contraction amount is defined in claim 1. Thus, any argument based on such details which are not covered by the claim wording are not suitable to prove a difference between the disclosure of document D7 and claim 1. The patent describes for example in paragraph [0042] that the difference in thermal contraction amount may be due to the temperature difference between the rotation-shaft-side and the supply-shaft-side. Document D7 also describes a temperature difference between the two shafts on page 14, second paragraph.

According to the board's preliminary opinion, feature 1j was also known from document D7. However, the respondent replied to the board's corresponding communication and argued with their letter dated 23 September 2022, that feature 1j was not disclosed in document D7. Feature 1j defined the relative positions of the supply shaft and the rotation shaft not by their temperatures, but by their extent by which each of the shafts thermally contracted when the rotor changes from a room-temperature state to a cool-temperature state. D7 was completely silent about the specific materials used for the cylinder 46 and the end portion 44 such that D7 did not disclose how the cylinder 46 and the

end portion 44 contracted in the diameter direction when the rotor was cooled. Thus, claim 1 was novel over D7.

The board considers the respondent's argument to be plausible. In the absence of any counter-argument from the appellant, the board sees no reason not to be convinced by this plausible argument. Any other conclusion would imply that the board had to investigate for counter-arguments on its own, i.e. on behalf of the opponent, which is not foreseen in opposition appeal proceedings due to the principle of impartiality of the boards in such *inter partes* proceedings.

Thus, the board concludes that document D7 does not disclose feature 1j and that document D7 is therefore not novelty-destroying for the subject-matter of claim 1 as granted.

3.2 Document D5 (references below are to the translation D5a)

The appellant argued further that the subject-matter of claim 1 was not novel over both the conventional machine described in D5 as well as over the machine according to the embodiment of D5. However, as argued by the respondent, both machines described in document D5 use a key between the rotation shaft and the supply shaft in order to transmit torque.

According to page 3, lines 25 and 26 for the conventional machine of D5 or according to page 5, lines 12 to 14 for the machine according to the embodiment of D5, a key is present between the rotation shaft and the supply shaft of D5 "to help ensure the

reliable transmission of torque" between them. The board has therefore no doubts that the key hinders any circumferential movement between the two shafts. Consequently, document D5 does not disclose feature 1h.

Document D5 is thus not novelty-destroying for the subject-matter of claim 1.

3.3 Since none of the appellant's objections of lack of novelty is successful, the ground of opposition under Articles 100(a) and 54(2) EPC does not prejudice the maintenance of the patent.

4. Lack of inventive step - Article 100(a) and 56 EPC

The attacks of lack of inventive step argued by the appellant in their statement of grounds of appeal do not convince the board either.

4.1 D7 and common general knowledge

In the contested decision, it was found that features 1g, 1h and 1j are not disclosed in document D7. Nevertheless, the appellant referred to the fact that they consider feature 1g disclosed in D7 and feature 1h implicitly disclosed in D7. Regarding feature 1j, they argued essentially that it was likely that the skilled person would use the same material for the rotation shaft and the intermediate cylinders of D7, that feature 1j was already implicitly known from D7 and that shrink-fitting of the radially outer cylinder to the radially inner end portion 44 of cylinder 42 was implicit in D7.

The board notes in this respect that claim 1 neither defines the material used nor that the rotation shaft and the supply shaft are shrink-fitted to each other. Further, in view of the submissions of the respondent filed with letter dated 23 September 2022 and discussed above with respect to novelty over document D7, the board is not convinced of the appellant's assumption that the rotation shaft and the supply shaft of D7 were made of the same material. Therefore, the appellant's conclusion based on this assumption, that D7 implicitly disclosed feature 1j does not convince the board.

The board is thus not convinced by the appellant's line of argument combining the disclosure of document D7 with the common general knowledge of the person skilled in the art.

#### 4.2 D7 and D5

A combination of documents D7 and D5 does not render the subject-matter obvious either. As argued by the respondent, D5 explicitly teaches a key in order to align the rotation shaft and the supply shaft and in order to transmit torque between these shafts, see the above section 3.2 on novelty over document D5. Thus, even a combination of documents D7 and D5 does not include feature 1h.

#### 4.3 Document D6 as starting point

Starting from document D6 does not render the subject-matter of claim 1 obvious. D6 teaches explicitly against any thermal shrinking between the rotation shaft and the supply shaft, as argued by the respondent *inter alia* with respect to paragraph [0024] of D6. According to that paragraph, the connection element of

D6 is made of a thermally isolating material. Therefore, the board has reached the conclusion that starting from document D6, the subject-matter of claim 1 is not rendered obvious by a combination with the common general knowledge of the person skilled in the art, or with D9 or D5.

- 4.4 Since none of the appellant's objections on lack of inventive step is successful, the ground of opposition under Articles 100(a) and 56 EPC also does not prejudice the maintenance of the patent.

5. Conclusion

The board concludes that none of the grounds of opposition according to Article 100 EPC presented by the appellant prejudices the maintenance of the patent. The board therefore accedes to the main request of the respondent.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



U. Bultmann

R. Lord

Decision electronically authenticated