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Datasheet for the decision of 16 July 2020

Case Number: T 1953/16 - 3.5.02

Application Number: 10726133.1

Publication Number: 2589132

IPC: H02K1/24, H02K1/32

Language of the proceedings: EN

Title of invention:
Synchronous reluctance machine using rotor flux barriers as cooling channels

Patent Proprietor:
ABB Schweiz AG

Opponent:
KSB Aktiengesellschaft

Relevant legal provisions:
EPC Art. 100(a), 54, 56
RPBA Art. 12(4)

Keyword:
Novelty - main request (yes)
Inventive step - main request (yes)
Late-filed evidence - submitted with the statement of grounds of appeal - admitted (no)

Decisions cited:
T 0162/09, T 0724/08, T 0876/05, T 0718/98

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Case Number: T 1953/16 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 16 July 2020

Appellant: (Patent Proprietor)	ABB Schweiz AG Brown Boveri Strasse 6 5400 Baden (CH)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Appellant: (Opponent)	KSB Aktiengesellschaft Johann-Klein-Strasse 9 67227 Frankenthal (DE)
Representative:	von Tietzen und Hennig, Nikolaus Lorenz Seidler Gossel Rechtsanwälte Patentanwälte Partnerschaft mbB Widenmayerstraße 23 80538 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 27 June 2016 concerning maintenance of the European Patent No. 2589132 in amended form.**

Composition of the Board:

Chairman	R. Lord
Members:	C.D. Vassoille
	A. Bacchin

Summary of Facts and Submissions

I. The patent proprietor and the opponent have filed appeals against the interlocutory decision of the opposition division concerning European patent no. 2 589 132.

II. In the decision under appeal, the opposition division came to the conclusion that the patent as granted (main request) did not satisfy the requirement of Article 56 EPC. The then first auxiliary request, submitted during the oral proceedings on 24 May 2016, was considered to fulfil the requirements of the EPC.

III. The following documents are relevant for the present decision:

D1: US 2006/0222528 A1
D4: JP 2009/195089 A
D5: EP 0 579 625 B1
D6: GB 337,334
D7: DE 10 2008 020 426 A1
D8: US 2009/0261667 A1
D9: DE 101 07 298 C1
D15: JP 61-141952 U
D16: US 2,413,525
D17: EP 1 786 088 A2

IV. The parties were summoned to oral proceedings. In a communication under Article 15(1) RPBA 2020 annexed to the summons, the board set out their preliminary observations on the appeal, concluding *inter alia* that the subject-matter of claim 1 of the patent proprietor's main request appeared to be new and to involve an inventive step and that the board intended

not to admit documents D15, D16 and D17 into the appeal procedure.

V. Oral proceedings were held on 16 July 2020.

The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted, or, in the alternative, on the basis of one of the first to third auxiliary requests filed with the statement setting out the grounds of appeal.

The opponent requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

VI. Claim 1 of the patent as granted (proprietor's main request) reads as follows:

"A synchronous reluctance machine comprising a rotor having a plurality of rotor disks (110), each rotor disk (110) comprising a plurality of longitudinal flux barriers (130) configured to give the rotor an anisotropic magnetic structure, the rotor disks (110) being stacked together to form a rotor core (100) in such a way that the flux barriers (130) define channels (140) extending in an axial direction of the rotor core (100), **characterized in that** air is forced to flow through a flux barrier (130) of a rotor pole in one axial direction, and through another flux barrier (130) of the same rotor pole in an opposite axial direction."

Claims 2 to 10 are dependent on claim 1.

VII. The arguments of the patent proprietor as far as they are relevant for the present decision are as follows:

Main request - Novelty in view of D8 (Articles 100(a) and 54 EPC)

The flux barriers necessarily correspond to the poles in a synchronous reluctance machine. Otherwise, no torque was generated. Since the through-holes 27 in document D8 were not located on an axis of a pole, they did not constitute flux barriers in the sense of claim 1. To the contrary, since the through-holes 27 were located on the q-axis (see D8, figure 3 and paragraphs [0055] and [0056]) they decreased the q-axis inductance if they were to constitute flux barriers and reluctance torque would therefore be decreased. The through-holes 27 consequently could not be considered to be flux barriers in the sense of claim 1.

Admittance of documents D15, D16 and D17 into the appeal procedure (Article 12(4) RPBA 2007)

The late-filed documents D15 to D17 should not be admitted into the appeal procedure, since they could and should have been filed already in the first instance proceedings. The proprietor's reference to the compressor structure of D1 in the context of the inventive step discussion in the letter of 14 April 2016, was not a new argument. Rather, it was already present in the fifth paragraph on page 3 of the proprietor's reply of 18 March 2015 to the statement of grounds for opposition.

Main request - Inventive step in view of D1 in combination with D5, D8 or D9 (Articles 100(a) and 56 EPC)

The teaching of D1 concerned the rotor of a compressor for use in a refrigeration cycle, wherein a gaseous

refrigerant compressed by the compressor was used for cooling the reluctance motor (see claim 10 and paragraph [0033] of D1).

D1 did not disclose the use of air as a gaseous medium, wherein said gaseous medium is forced to flow through an opening of the rotor in an opposite axial direction and said opening is another flux barrier of the same rotor pole.

The objective technical problems of the distinguishing features were the application of the compressor for air and improving the cooling homogeneity in the axial direction of the compressor's rotor.

The person skilled in the art would have faced overwhelming problems when trying to implement the teaching of D5 (or D8 and D9) in D1, because it required a sealing between the top inner and outer penetrating holes.

D1 was primarily concerned with avoiding oil leakage through gaps of the rotor stack due to the centrifugal force of the rotor (see paragraph [0037]). The skilled person would not have envisaged using the outer flux barrier passages as refrigerant passage due to the higher risk of oil leakage linked with the higher centrifugal force in the outer positions of the rotor.

If the skilled person had nonetheless considered using the outer flux barriers as refrigerant passages, they would have used the outer flux barriers instead of the inner barriers as the refrigerant passages, not in addition to them.

The skilled person, starting from D1 would not have modified D1 according to the subject-matter of claim 1 of the main request. The subject-matter of claim 1 therefore involved an inventive step over D1 in combination with D5, D8 or D9.

VIII. The arguments of the opponent as far as they are relevant for the present decision are as follows:

Main request - Novelty in view of D8 (Articles 100(a) and 54 EPC)

The subject-matter of claim 1 was not new in view of document D8. A weight-saving function of the q-axis through-holes 27 was not disputed. However, the through-holes 27 also had a magnetic flux-blocking effect, since every through-hole blocked the magnetic flux unless it was filled with a magnetically conductive material. From a physical point of view, a flux barrier function of the through-holes 27 therefore could not be denied. Claim 1 did not contain a more precise definition of the flux barriers and the through-holes 27 therefore were to be understood as flux barriers in the sense of claim 1. This was also clear from the fact that the through-holes 27 had a larger diameter than the through-holes 26, wherein the latter were explicitly described in D8 as constituting flux barriers and thus, as contributing to the generation of reluctance torque. Therefore, considering the larger diameter of the through-holes 27, they necessarily had an influence on the reluctance torque as well.

Admittance of documents D15, D16 and D17 into the appeal procedure (Article 12(4) RPBA 2007)

Documents D15, D16 and D17 were to be admitted into the appeal procedure. Filing of these documents only with the statement setting out the grounds of appeal was caused by the patent proprietor's alleged new line of argument referring to the required modification of the compressor of D1, which was submitted for the first time with the letter of 14 April 2016, of which the opponent was only notified on 3 May 2016. It was therefore not possible for the opponent to complete an additional search in good time prior to the oral proceedings before the opposition division on 24 May 2016.

More specifically, the appellant in the reply of 18 March 2015 to the grounds for opposition had argued that the realisation of an air supply for cooling a rotor would have constituted an almost unsurmountable problem for the skilled person. Only with letter of 14 May 2016 had the proprietor argued that the compressor of D1 as a whole had to be taken into account in the assessment of an inventive step.

Furthermore, in view of the opposition division's preliminary opinion which was in favour of the opponent, there was no need to perform an additional search at that time. It was further not very likely that new evidence filed only shortly before the oral proceedings would have been admitted by the opposition division into the opposition procedure.

As regards documents D15 and D16, the submission of these documents was a direct reaction to the decision under appeal, which considered that the patent in the

version of the first auxiliary request fulfilled the requirements of the EPC.

Main request - Inventive step in view of D1 in combination with D5, D8 or D9 (Articles 100(a) and 56 EPC)

The person skilled in the art would have inferred from document D1 the general teaching as to how to advantageously provide a refrigerant passage in the rotor of a synchronous reluctance machine (see D1 in figures 2 and 3) which is entirely independent of the application of such a rotor in a compressor. It was particularly to be noted that none of the features defined in claim 1 of D1 either directly or indirectly interacted with components of the compressor illustrated in figure 1 of D1.

The skilled person would have recognised that the described functional principle of cooling a synchronous reluctance motor by means of a cooling medium flow through a flux barrier generally applied to synchronous reluctance motors. Furthermore, the skilled person did not recognise any reason as to why the flux barriers of the synchronous reluctance machine could not be used as cooling passages in other applications.

In light of the teaching of D5, the skilled person would further have modified the synchronous reluctance machine known from D1 so that also the outer flux barriers of the rotor would have been used as refrigerant passages in the opposite direction.

Furthermore, the risk of oil leakage would not have prevented the skilled person from additionally using the outer flux barriers for conducting a cooling

medium. Rather, D1 disclosed the solution to the problem of oil leakage in the form of the oil leakage prevention device and there was no reason apparent as to why the radially outer flux barriers should not be equipped with corresponding oil leakage prevention devices.

Document D8 had sealed inlets and outlets for the cooling medium, which could easily have been integrated into the embodiment of figure 1 of D1 or any other compressor (see in particular figure 14).

Since the temperature was highest in the outer part of the rotor of document D1, it would have been obvious to use the outer flux barriers in the rotor of D1 to improve the temperature distribution in the rotor.

Reasons for the Decision

1. The appeals are admissible.

2. Main request - Novelty (Articles 100(a) and 54 EPC)

2.1 Lack of novelty of the subject-matter of claim 1 in view of document D8 was raised as a ground for opposition by the opponent.

2.2 The patent proprietor has disputed that document D8 disclosed the feature of air being forced to flow through another flux barrier of the same rotor pole in an opposite axial direction. It was particularly in dispute, whether the "q-axis through-holes 27" of D8 corresponded to flux barriers in the sense of claim 1 (see D8, figure 3).

2.3 The board is convinced that the "q-axis through-holes 27" of document D8 do not constitute flux barriers in the sense of claim 1 and that the subject-matter of claim 1 is therefore new in view of D8. The board consequently concurs with the opposition division in the decision under appeal on this point (see point 1.1 of the reasons for the decision under appeal).

2.4 Document D8 in paragraphs [0055] and [0056] explicitly distinguishes between "through-holes 27" and "flux barriers". More specifically, document D8 in paragraph [0056] recites the following:

> "*Although the q-axis through-holes 27 contribute to an improvement in responsiveness to rotational speed changes by weight saving, the q-axis through-holes are used as the refrigerant channel in the invention as will be described later.*"

2.5 The board further observes that in the context of claim 1, the term "flux barrier" clearly implies a specific function in a synchronous reluctance machine, namely to effect a reluctance torque. A purely literal understanding of the term in the sense that any opening in the rotor interrupts a flux, and thus forms a "flux barrier", as was argued by the opponent, therefore is not appropriate.

The q-axis through-holes 27 do not contribute to the generation of a reluctance torque. As was convincingly argued by the patent proprietor, flux barriers in the context of D8 are required to be located on the d-axis in order to contribute to a reluctance torque. This finding is particularly evident from paragraph [0055] of D8, explaining the following:

"*The d-axis through-holes 26 increases magnetic resistance in the d-axis direction and decreases a d-axis inductance Ld. Consequently, the difference between a q-axis inductance Lq and the d-axis inductance Ld is increased such that reluctance torque is increased*."

Providing a flux barrier on the q-axis would thus have the opposite (undesired) effect of reducing the q-axis inductance Lq and thereby reducing instead of increasing the reluctance torque. In the light of this, the fact that the q-axis through-holes 27 have a larger diameter compared to the d-axis through-holes 26 is irrelevant.

2.6 The board has thus come to the conclusion that document D8 does not disclose the feature of air being forced to flow through another flux barrier of the same rotor pole in an opposite axial direction and that the subject-matter of claim 1 is consequently new in view of document D8.

No further objection of lack of novelty was raised by the opponent. Therefore the ground for opposition under Articles 100(a) and 54 EPC does not prejudice the maintenance of the European patent as granted.

3. Admittance of documents D15, D16 and D17 into the appeal procedure (Article 12(4) RPBA 2007)

3.1 Documents D15, D16 and D17 were filed for the first time with the opponent's statement setting out the grounds of appeal on 27 October 2016. The patent proprietor has requested that the new documents under

Article 12(4) RPBA 2007 not be admitted into the proceedings.

3.2 According to Article 12(4) RPBA 2007 the board has the discretionary power to hold inadmissible evidence which could (and should) have been presented or was not admitted in the first instance proceedings. The provision expresses the principle that each party should submit all facts, evidence, arguments and requests that appear relevant as early as possible so as to ensure a fair, speedy and efficient procedure (e.g. T 162/09, point 7 of the reasons and T 724/08, point 3.4 of the reasons). According to the established case law of the Boards of Appeal, the filing of new documents for the first time in the appeal proceedings requires a sound and plausible reason in the specific case, in particular exceptional circumstances that justify the late filing of the respective documents. It follows that, in principle, documents could be admitted in the case of e.g. a normal reaction to a late turn of events in the opposition (oral) proceedings, an exceptional interpretation by the opposition division at a late stage or in the decision, or evident non-allowability in view of the newly cited documents and/or objections (see the Case Law of the Boards of Appeal, 9th edition 2019, V.A.4.11.3).

In the present case, a reason of the type that would justify the filing of documents D15, D16 and D17 for the first time with the opponent's statement setting out the grounds of appeal, however, does not exist.

3.3 The opponent's main justification for filing documents D15, D16 and D17 was that the patent proprietor with letter of 14 April 2016, of which the opponent was notified only on 3 May 2016, had introduced a new

argument shortly before the oral proceedings before the opposition division which took place on 24 May 2016. According to the opponent, the new argument concerned the structure of the compressor as a whole of D1 and not the rotor in an isolated manner, as had previously been argued by the patent proprietor (see in particular pages 2 and 3 of the patent proprietor's letter of 14 April 2016), and the short time between becoming aware of the new argument on 3 May 2016 and the date of the oral proceedings on 24 May 2016 made it impossible to perform an additional search.

3.4 Irrespective of the question whether the available period before oral proceedings (21 days) could be regarded as sufficient for carrying out an *additional* search, the board does not agree with the opponent that the patent proprietor with letter of 14 April 2016 introduced a new argument, which justified the filing of documents D15, D16 and D17 for the first time in the appeal procedure. In the reply to the statement of grounds for opposition filed on 18 March 2015, the patent proprietor on page 3 in the fifth paragraph stated the following:

> "*Instead, the realization of an air supply for cooling the rotor in a hermetic compressor, as disclosed in D1, would have constituted an almost unsurmountable problem for the skilled person.*"

The mention of the compressor contained in the reply is brief and the specific problems involved in implementing the invention in the compressor of D1 are indeed not further explained. Nevertheless, contrary to the opponent's allegation, the patent proprietor's argument was directed to the structure of the compressor as a whole, not only to the rotor, and the

above statement was sufficient for the opponent to realise at the very beginning of opposition proceedings that the patent proprietor was thereby casting doubt on the suitability of document D1 in the assessment of an inventive step, on the ground that this document was related to a hermetic compressor. Indeed this argument of the patent proprietor was taken into account and discussed by the opponent already in the following communication of 14 September 2015 (see point 2 a) of the communication). It would therefore have been possible and appropriate to submit one or more documents taking account of that argument, in particular by providing a prior art document which was not specifically related to a compressor, as soon as the opponent had been notified of the proprietor's reply to the opposition. The opponent however did not do that. On account of these facts, it cannot be said that the subsequent submission by the patent proprietor on 14 April 2016 contained a new argument, but rather constituted a development of an argument which had already been raised.

3.5 The opponent further submitted that he had no reason to file these documents in the first instance proceedings, since the opposition division's preliminary opinion expressed in the communication accompanying the summons issued on 26 November 2015 was in favour of the opponent. However this fact is irrelevant under the present circumstances. It was the existence of a pertinent argument already in the proceedings which should have given reason to perform an additional search and file evidence against that argument. The opposition division's preliminary opinion was issued after the argument had been introduced by the patent proprietor and after the opponent had decided how to take position on it. In this context, the opponent's

further argument is also irrelevant according to which new documents filed shortly before the oral proceedings would most likely not have been admitted by the opposition division into the procedure and it was therefore preferable for him not to file those documents until the appeal stage. Indeed under Article 12(4) RPBA 2007 documents which could have been submitted before the department of first instance and documents which had been submitted but had not been admitted are put on an equal footing. The worst which could have happened by filing these documents in the opposition proceedings, was that they would have been regarded as inadmissible (as noted also in T 876/05, point 2 of the reasons). However, a party filing the evidence first during appeal, would have to overcome the additional hurdle of satisfying the board that its action represented to a fair procedure, i.e. did not amount to a strategic measure for improving its own case against the adverse party (see also T 718/98, point 1.3 of the reasons).

In the present case, the board sees no valid justification for the opponent not having filed this evidence in the first instance proceedings, as the opponent had reason and time to react to the proprietor's above argument already more than one year prior to the date of the oral proceedings before the opposition division.

3.6 Additionally, regarding documents D15 and D16 the opponent has further argued that filing of these documents only at the appeal stage was justified because it was a direct reaction to the interlocutory decision under appeal stating that the then first auxiliary request fulfilled the requirements of the Convention.

Given that the then first auxiliary request (corresponding to the current second auxiliary request) is not a subject of the present decision, it can be left open whether filing of the first auxiliary request in the first instance proceedings shortly before the oral proceedings justified the submission of new documents D15 and D16 only at the appeal stage or not.

3.7 In light of the above, the board has exercised its discretion under Article 12(4) RPBA 2007 not to admit documents D15, D16 and D17 into the appeal procedure.

4. Main request - Inventive step (Articles 100(a) and 56 EPC)

4.1 The subject-matter of claim 1 of the main request involves an inventive step in the sense of Article 56 EPC.

Closest prior art

4.2 The patent proprietor contested that document D1 constituted the closest prior art on the ground that it was not a promising "springboard" for the person skilled in the art. More particularly, the proprietor argued that this document was not concerned with an air-cooled synchronous machine, but rather with oil entrained in a refrigerant to be compressed and that it clearly referred to a rotor of a compressor in a refrigeration cycle.

Although the patent proprietor's arguments as regards the suitability of D1 as a starting point in the assessment of an inventive step may appear sensible to the board, the proprietor failed to provide any

alternative prior art document representing a more suitable starting point in the current assessment of inventive step.

The opponent also based their objection of lack of inventive step of the subject-matter of claim 1 of the main request primarily on combinations based on D1 as the closest prior art (and on document D17, which however was not admitted into the appeal proceedings, see point 3 above).

4.3 In so far as the opponent made reference to further lines of attacks based on document D4 (see point V of the statement setting out the grounds of appeal filed on 27 October 2016), the board observes that, irrespective of the question of whether a mere reference to first instance submissions constitutes a sufficiently substantiated presentation of facts, document D4 lies further away from the subject-matter of claim 1 than document D1.

In particular, document D4 relates to a rotating electric machine comprising permanent magnets embedded in the rotor (see in particular the abstract of D4). It therefore does not relate to a synchronous reluctance machine in the sense of claim 1 of the main request.

4.4 Consequently, the board sees no reason to base the assessment of inventive step on any other document as the closest prior art than document D1.

Distinguishing features

4.5 It was not in dispute between the parties that the subject-matter of claim 1 of the main request differs from document D1 in that:

(a) it is **air** that is being forced to flow through a flux barrier of a rotor pole in one axial direction; and

(b) the air is forced to flow **through another flux barrier of the same rotor pole in an opposite axial direction**.

Objective technical problem

4.6 The objective technical problem of the above distinguishing feature (b) was considered by the opponent to be that of how to optimise the cooling effect of the cooling medium flowing through the rotor, which the board considers to be appropriate.

Obviousness

4.7 Irrespective of whether or not the person skilled in the art would have considered the use of air instead of a compressed gaseous refrigerant to flow through the rotor of D1 (see the distinguishing feature (a) under point 4.5 above), the skilled person in any case would not have modified the synchronous reluctance machine of D1 in order to implement the invention according to distinguishing feature (b).

4.8 Modifying the synchronous reluctance machine of D1 in such a way as to force the compressed gaseous refrigerant to flow through another flux barrier of the same rotor pole in an opposite axial direction in accordance with the distinguishing feature (b) (see point 4.5 above) in the context of D1 would have meant providing additional gaseous refrigerant passages in the outer flux barriers (reference number 11, figure 3)

of the rotor, since the inner flux barriers (reference number 12, figure 3) are already used as refrigerant passages.

4.9 According to the established case law of the boards of appeal, the technical disclosure in a prior art document should be considered in its entirety, as it would be done by a person skilled in the art and it is not justified arbitrarily to isolate parts of such a document from their context in order to derive from them technical information which would be distinct from the integral teaching of the document (see the Case Law of the Boards of Appeal, 9th edition 2019, I.D.9.4)

Taking the above principles into consideration, the board agrees with the patent proprietor that the overall disclosure of document D1 relates to the rotor of a compressor for use in a refrigeration cycle, wherein a gaseous refrigerant compressed by the compressor is used for cooling the synchronous reluctance machine (see D1, in particular claim 10 and paragraph [0033]).

More specifically, document D1 is concerned with the problem of how to avoid oil contained in the discharged compressed gaseous refrigerant from leaking through gaps of the rotor stack due to the centrifugal forces of the rotor (see D1, in particular paragraph [0037]).

4.10 The isolated aspect of a rotor and in particular that of how to cool a rotor in a synchronous reluctance machine, independent of any described application or set-up of the machine, does not correspond to what the skilled person would actually derive from D1. In particular, the fact that claim 1 of D1 is directed to a "rotor of a compressor" as well as the isolated

illustration of the rotor in figures 2 and 3, in the light of the overall disclosure of D1, do not lead the person skilled in the art to believe that the rotor, and more specifically cooling of the rotor, forms the general teaching of the invention, regardless of the description of D1 as a whole, which is clearly directed to a compressor in a refrigeration cycle. In this context, it is also to be noted that the application of the rotor in a compressor is not described in D1 as a mere embodiment or example of a more general invention concerned with the cooling of a rotor in a synchronous reluctance machine. Additionally, no further hints are present in the disclosure of D1 that would have led the skilled person to believe that the rotor, described in D1 solely in connection with a compressor used in a refrigeration cycle, could reasonably be transferred to any other application of a synchronous reluctance machine.

4.11 The skilled person would have been prevented from implementing a forced flow of a cooling medium through another flux barrier of the same rotor pole in an opposite axial direction in view of the corresponding modifications necessary in the compressor of D1 in order to arrive at the claimed invention according to the above feature (b). In particular, significant structural changes of the compressor of D1 would have been necessary, in particular the provision of additional oil leakage prevention devices in the outer flux barriers as well as appropriate sealing means required between the top inner and outer penetrating holes of the rotor, while cooling of the stator still had to be ensured. Moreover, the advantages achieved with the necessary modifications in terms of cooling would not have outweighed the effort, and there is no

good reason why the skilled person would have carried out the modifications anyway.

4.12 The opponent has argued that a sealing was already present in D1 or could in view of the solution illustrated in figure 14 of D8 at least have been implemented without any difficulties in the synchronous reluctance machine of D1. It was further argued that additional oil leakage prevention devices could easily have been provided in the outer flux barriers as well.

The board does not contest the opponent's finding that specific solutions to any of the problems involved in the required structural changes of the compressor of D1 could in theory have led to the implementation of the invention in a compressor of D1. However, the board considers that even if the solution to the objective technical problem was known to the skilled person, in particular from documents D5, D8 or D9, the nature of the required modifications were in sum such that implementing the solution in the compressor of D1 would not have been taken into consideration by the person skilled in the art and was thus not obvious.

4.13 This also applies under the assumption that the skilled person, when considering the teaching of D1 as the closest prior art document, was aware of the problem of an increased heat development in the outer areas of the rotor. The board in this respect finds the patent proprietor's argument reasonable that, if the skilled person in view of D5, D8 or D9 had indeed considered using the outer flux barriers as refrigerant passages in D1 in order to cool the predominantly heated outer areas of the rotor, a simpler and therefore preferred solution would have been that of using the outer flux

barriers as the refrigerant passages instead of, but not in addition to, the inner flux barriers.

4.14 The opposition division in the decision under appeal did not take into account the obstacles that the skilled person had to overcome when implementing the invention in the compressor of D1, or more generally speaking the question of whether the skilled person not only could but would have implemented the invention in the compressor of D1. Notwithstanding the fact that the rotor of D1 is provided with outer flux barriers which in principle could have been used as cooling medium flow passages in the opposite direction, the specific application of the rotor in D1 does not allow for the compelling conclusion that the skilled person would actually have used these flux barriers as additional cooling medium flow passages in the opposite direction.

The board consequently does not agree with the findings of the opposition division in the decision under appeal that the skilled person, by simply applying the solution provided in particular by document D5, would have used the outer flux barriers in the rotor of D1 as cooling passages of a cooling medium flowing in the opposite direction (see the last paragraph of point 1.2 on page 6 of the reasons for the decision under appeal).

4.15 The board concludes that, even if documents D5, D8 and D9 disclosed a solution to the objective technical problem by providing a cooling medium passage in the outer flux barriers of the rotor of a synchronous reluctance machine, it was not obvious to the skilled person to implement this solution in the compressor of D1. The board for the present decision therefore does not consider it necessary to discuss documents D5, D8

or D9 in detail. The same applies to documents D6 and D7 referred to by the opponent in the statement setting out the grounds of appeal of 27 October 2016 (see point V).

4.16 The board has therefore come to the conclusion that the subject-matter of claim 1 is not rendered obvious by document D1 in combination with any one of documents D5, D6, D7, D8 or D9 and that the ground for opposition under Articles 100(a) and 56 EPC consequently does not prejudice the maintenance of the patent as granted.

5. *Final remarks*

Given that the ground for opposition under Article 100(a) EPC in connection with Articles 54 and 56 EPC does not prejudice the maintenance of the patent as granted, the board, in the absence of any further objections, had to accede to the patent proprietor's main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

U. Bultmann R. Lord

Decision electronically authenticated