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**Datasheet for the decision
of 16 January 2014**

Case Number: T 1570/12 - 3.2.05

Application Number: 04765352.2

Publication Number: 1668277

IPC: F16J15/34

Language of the proceedings: EN

Title of invention:

Heat exchanger device for a gas seal for centrifugal compressors

Patent Proprietor:

Nuovo Pignone Holding S.p.A.

Opponent:

Siemens Aktiengesellschaft

Headword:

Relevant legal provisions:

EPC 1973 Art. 54(2), 56
EPC Art. 100(a), 100(b)

Keyword:

Sufficiency of disclosure (yes)
Novelty (yes)
Inventive step (yes)

Decisions cited:

Catchword:



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Boards of Appeal
Chambres de recours**

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Case Number: T 1570/12 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 16 January 2014

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 30 April 2012 rejecting the opposition filed against European patent No. 1668277 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman: M. Poock
Members: P. Lanz
M. J. Vogel

Summary of Facts and Submissions

- I. The appeal by the opponent is against the decision of the opposition division rejecting the opposition against European patent EP-B-1 668 277.

During the opposition proceedings, the grounds for opposition according to Article 100(a) (lack of novelty and lack of inventive step) and 100(b) EPC were raised.

- II. Oral proceedings were held before the board of appeal on 16 January 2014.

- III. The appellant (opponent) requests that the decision under appeal be set aside and that the European patent No. 1 668 277 be revoked.

The respondent (patent proprietor) requests that the appeal be dismissed.

- IV. Claim 1 of the patent as granted reads as follows:

"1. A heat exchanger device for a gas seal (1) for centrifugal compressors **characterized in that** it comprises a fluid heat exchanger (3) positioned between the gas seal of the compressor and the housing wall of said seal (1) to keep the temperature of said seal (1) low in the case of high temperatures of the wall and/or compressed gas; wherein said exchanger (3) comprises at least one inlet opening (4) and at least one outlet opening (6) of the cooling liquid connected to each other by a coiled path (8); and wherein at least one inlet duct (7) of the seal gas passes through the centre of the exchanger."

V. The following documents are referred to in the present decision:

D1: US-A-2 223 519
D2: WO-A-97/01053
D3: DE-C-641 288
D6: US-A-5 125 792
D7: DE-A-2 034 586
D8: EP-A-0 280 778

VI. The arguments of the appellant, in writing and during oral proceedings, can be summarised as follows:

The opposition division was wrong in excluding documents D2 and D3 from the opposition procedure. In fact, documents D2 and D3 formed a basis for an objection already raised by the examiner, which the appellant incorporated by reference into its notice of opposition. The prior art erroneously excluded from the opposition proceedings should be taken into account in the appeal proceedings.

The patent in suit did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. In particular, the feature of claim 1 *"at least one inlet duct (7) of the seal gas passes through the center of the heat exchanger"* was undefined in the contested patent, thereby making it impossible to carry out the invention. A skilled person would understand the terminology *"center of the heat exchanger"* as the spatial center of the cylindrical heat exchanger on its rotational axis, which was not in accordance with the embodiments described in the patent specification. The opposition division interpreted the contested wording as meaning *"inlet duct in the middle of the heat*

exchanger in an axial direction between the inlet opening and the outlet opening of the cooling liquid channels". However, this had no literal basis in the patent and was in contradiction with the figures showing that the distance between the inlet duct 7 and the inlet opening 4 was different from the distance between the inlet duct 7 and the outlet opening 6. The disclosure of the subject-matter claimed was thus insufficient.

Moreover, the subject-matter of claim 1 was not novel over document D1. Although this prior art document concerned a heat exchanger for a pump, it had to be considered suitable for cooling a gas seal of a compressor. The fluids used for cooling and sealing did not structurally limit the contested claim directed to an apparatus, and the sealing fluid used in the claimed apparatus was thus not necessarily different from the cooling fluid. Even if the different nature of the fluids used for sealing and cooling was considered as limiting the disputed apparatus claim, this aspect could not establish novelty over document D1, where the liquid, for example water, was used for sealing after having served as a cooling liquid, thereby leading to different temperatures, i.e. physical properties, of the sealing and cooling fluid. Therefore, in document D1, too, the heat exchanger was suitable for being operated with different fluids for sealing and cooling. Finally, the scope of independent claim 1 covered the possibility that the seal gas was provided to the seal via a supply line in the shaft going radially outwardly from its rotational axis. This was equally possible in the arrangement of document D1, which was, for this further reason, suitable for use with different fluids for sealing and cooling, thus anticipating the subject-matter claimed in the contested patent.

Finally, the subject-matter of independent claim 1 was not based on an inventive step. Document D1 was the closest prior art. A skilled practitioner was always looking for new applications of a known advantageous solution. With this motivation he would equip the gas seal 22 of the compressor according to Figure 1 of document D2 with a heat exchanger of document D1 (or D7 or D8). The text of document D1 deliberately distinguished between the sealing fluid and the cooling liquid by using a different terminology (cf. page 1, right column, lines 1 and 20). Together with its Figure 2, document D1 thereby provided a hint to the skilled reader that the heat exchanger could be operated with a cooling liquid and a sealing gas. Such a solution did not even require a design modification of the known heat exchanger since the seal gas could be supplied to the seal from the centre of the shaft. Hence, the subject-matter of claim 1 was obvious to a person skilled in the art.

VII. The respondent argued essentially as follows:

The contested wording *"at least one inlet duct (7) of the seal gas passes through the center of the heat exchanger"* had to be read in the context of the whole disclosure with a mind willing to understand. The description of the patent in suit, for example paragraph [0026], provided the skilled person with a clear teaching on the location of the inlet duct. Moreover, referring to the objection that, according to the figures, the inlet duct 7 was not exactly in the middle between the inlet opening 4 and the outlet opening 6, it had to be noted that the claimed wording *"center of the heat exchanger"* did not require an equidistance of the inlet and outlet openings from the

inlet duct. Rather, the inlet duct should be positioned in a central area between the inlet and outlet openings as shown in Figure 2. In summary, the contested patent disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

The subject-matter of independent claim 1 was new over the content of document D1, which did not disclose a heat exchanger suitable for different fluids for sealing and cooling, thus requiring the cooling circuit to be separated from the seal gas supply.

Furthermore, the subject-matter claimed was based on an inventive step. Document D1 was directed to a pump for hot liquids and therefore required a liquid as the sealing fluid. By contrast, document D2 concerned a compressor equipped with a dry gas seal. Moreover, document D2 did not even mention that the temperature of the seal could be an issue. A combination of documents D1 and D2 was thus not obvious.

VIII. On 9 December 2013 an anonymous third party submitted observations under Article 115 EPC via online filing, alleging a lack of novelty in view of document FR 2 607 874. The board communicated the submission to both parties to the appeal proceedings, who, however, did not refer to them during the further proceedings. The board likewise saw no reason for doing so *ex officio*.

Reasons for the Decision

1. *Admission of prior art documents*

The opposition division decided not to admit documents D2 and D3 into the procedure, since, according to the decision of the opposition division, they were cited in the notice of opposition but not relied upon in the submissions concerning the validity of the patent in suit. Moreover, documents considered during the examination proceedings were, as a general principle, not automatically included in the opposition proceedings, except for the document presented as the closest prior art in the patent in suit.

In its statement setting out the grounds of appeal, the appellant submits that there was no legal basis for excluding the above documents from the proceedings since they were cited in the notice of opposition. Moreover, documents D1, D2 and D3 also formed the basis for an objection already raised by the examiner, which the opponent incorporated by reference into the notice of opposition (cf. page 5, fourth paragraph):

"Mangelnde Neuheit und mangelnde erfinderische Tätigkeit

*Die Ausführungen des Prüfers während des Prüfungsverfahrens, insbesondere mit der "Written Opinion of the International Searching Authority" betreffend die Dokumente **D1**, **D2** und **D3** und deren Relevanz, seien hiermit durch Bezugnahme zum Bestandteil dieser Einspruchsschrift gemacht."*

The board notes that in the written opinion mentioned above the search examiner raised inventive step objections based on documents D1, D2 and D3.

The above prior art thus forms part of the facts and evidence presented by the opponent in the notice of opposition in support of the grounds of opposition according to Article 100(a) EPC. These submissions, based *inter alia* on documents D2 and D3, were within the legal and factual framework of the opposition proceedings *ab initio* and their admission was hence not a matter of discretion for the opposition division. Moreover, neither the EPC nor the case law of the boards of appeal provides a basis for excluding them from the opposition proceedings on the ground that they had already been considered by the examining division when it granted the patent in suit.

The board concludes that documents D2 and D3 were erroneously excluded from the opposition proceedings. They are to be taken into account in the present appeal proceedings.

2. *Sufficiency of disclosure*

For the question of whether the contested patent discloses the invention in a manner which is sufficiently clear and complete for it to be carried out by a person skilled in the art, the content of the patent as a whole, including the claims, description and drawings, has to be taken into account.

In the present case, description paragraphs [0022] to [0026] together with the figures disclose

- a circular heat exchanger 3, arranged in the axial direction with respect to the shaft 5 of the impeller
- so as to enfold the gas seal 1.
- Between the gas seal 1 and the flange 2 and between the inlet opening 4 and the outlet opening 6 there is at least one inlet duct 7 of the gas seal
- positioned so as to be surrounded by the heat exchanger 3.

This explicit disclosure, taken in combination with the figures, provides a clear teaching of where the inlet duct 7 is to be located. Moreover, the above disclosure of the invention in the description and the drawings is in accordance with the definition of the subject-matter in the independent claim, in particular since the contested feature "*at least one inlet duct (7) of the seal gas passes through the center of the heat exchanger*" of independent claim 1 does not require an equidistance between the inlet duct and the openings for inlet and outlet of the cooling liquid.

The board concludes that the patent as a whole provides a skilled person with sufficient information to realise the claimed invention. Thus, the patent discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, Article 100(b) EPC.

3. *Novelty*

The disputed claim is essentially directed to a heat exchanger for a gas seal. In particular, the wording of claim 1 defines the sealing fluid as being a seal gas and the cooling fluid as being a cooling liquid. Thus,

according to the patent in suit, the fluids for sealing and cooling are different and require the cooling circuit to be separated from the seal gas supply, the latter being achieved by the inlet duct specified in the claim. By contrast, in prior art document D1, which is likewise directed to a heat exchanger for a seal, the cooling liquid (see page 1, right column, line 20) also serves as a sealing fluid (see page 1, left column, line 52 to right column, line 2). It is supplied to the seal from the cooling circuit via bore 35. The subject-matter of contested claim 1 structurally differs from the heat exchanger device according to document D1 in that the heat exchanger is suitable for use with different fluids for sealing and cooling, thereby requiring the cooling circuit to be separated from the seal gas supply.

Turning to the appellant's arguments, it is observed that the pump of document D1 is not equipped with a gas seal and therefore does not contain any seal gas supply, be it via the pump shaft or the heat exchanger. Moreover, the submission that in document D1, due to a temperature difference, the physical properties of the liquid were different when used for cooling and for sealing, is not persuasive, since document D1 does not have a cooling circuit structurally separated from a supply line through which a gas could be provided to the seal, as required in the disputed claim.

Although the appellant did not maintain its further novelty objections based on documents D6, D7 or D8, which were originally presented in statement setting out the grounds of appeal, the board acknowledges for the sake of completeness that the subject-matter of claim 1 is also novel over the content of these documents.

The board concludes that the subject-matter of claim 1 is novel over the disclosure of the prior art on file, Article 100(a) EPC in conjunction with Article 54(1) and (2) EPC 1973.

4. *Inventive step*

4.1 As the closest prior art, the appellant relies on document D1, which is directed to a heat exchanger for a seal of a shaft of a pump for hot liquids. Document D2 discloses a gas seal but does not at all mention the temperature aspect of the sealing arrangement. The board agrees that its teaching is thus more remote from the claimed invention directed to a heat exchanger than the disclosure of document D1.

As stated in point 3. above, the subject-matter of contested claim 1 differs structurally from the heat exchanger known from document D1 in that the heat exchanger is suitable for different fluids for sealing and cooling, thus requiring the cooling circuit to be separated from the seal gas supply.

4.2 Starting from document D1, the objective technical problem is to provide a heat exchanger device for a gas seal reliably cooling the gas seal in order to prevent the discharge of hot compressed gas from a centrifugal gas compressor into the atmosphere (cf. paragraph [0016] of the patent in suit).

4.3 In view of the parties' submissions, the claimed solution to the above problem is based on an inventive step. The heat exchanger of document D1 is designed to supply a part of the cooling liquid as the sealing liquid to the surface of the sleeve 26, thereby sealing

the hot liquid pressurised in the pumping chamber (cf. page 2, left column, line 13 to right column, line 7). Redesigning the combined cooling and sealing circuit of this known heat exchanger in order to render it suitable for liquid-cooling a gas seal for a centrifugal compressor would require efforts going beyond the common general knowledge of the skilled person. The subject-matter claimed is thus not obvious in view of document D1 and the common general knowledge. This reasoning would equally apply if one of the closely related documents D6, D7 or D8 was used as a starting point.

The person skilled in the art would also consider combining document D1 with document D2, which is, in fact, directed to the supply of seal gas to a gas seal. However, document D2 is not concerned with the temperature of the gas seal. For this reason alone it is not apparent why the skilled person should contemplate providing the gas seal of document D2 with a heat exchanger of documents D1, D6, D7 or D8, all specifically designed for a pump for handling hot liquids. Regarding the appellant's argument that the wording used in document D1 provided a hint as to the claimed solution, the board does not see why the skilled person should implicitly understand from the figures and the text of document D1, in which the liquid circulating in the heat exchanger is at one point designated as a fluid, that the heat exchanger could also be operated with a cooling liquid and a sealing gas. Additionally, it is observed that none of the prior art documents on file shows a seal gas supply from the centre of the shaft, which the appellant suggests as an obvious measure in case of a combination of documents D1 and D2. The board concludes that the reasoning put forward by the appellant is not suitable

to establish that a skilled person would arrive at the subject-matter claimed without an inventive contribution.

In view of the above, the subject-matter of claim 1 is based on an inventive step, Article 100(a) EPC in conjunction with Article 56 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Meyfarth

M. Poock

Decision electronically authenticated