Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 9 February 2024

Case Number: T 1603/22 - 3.2.04

Application Number: 16723907.8

Publication Number: 3295029

IPC: F04B39/12, F04B25/00

Language of the proceedings: EN

Title of invention:
ECONOMIZED RECIPROCATING COMPRESSOR

Patent Proprietor:
Carrier Corporation

Opponent:
BITZER Kuhlmaschinenbau GmbH

Headword:

Relevant legal provisions:
RPBA 2020 Art. 12(4)
EPC Art. 56

Keyword:
Amendment to case - evidence
Inventive step - (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1603/22 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 9 February 2024

Appellant: (Opponent)	BITZER Kuhlmaschinenbau GmbH Peter-Schaufler-Platz 1 71065 Sindelfingen (DE)
Representative:	Hoeger, Stellrecht & Partner Patentanwälte mbB Uhlandstrasse 14c 70182 Stuttgart (DE)
Respondent: (Patent Proprietor)	Carrier Corporation 17900 Beeline Highway Jupiter, FL 33478 (US)
Representative:	Dehns St. Bride's House 10 Salisbury Square London EC4Y 8JD (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 9 May 2022 concerning maintenance of the European Patent No. 3295029 in amended form.**

Composition of the Board:

Chairman	A. de Vries
Members:	G. Martin Gonzalez
	C. Heath

Summary of Facts and Submissions

I. The appeal was filed by the appellant opponent against the interlocutory decision of the opposition division finding that, on the basis of the auxiliary request 4, the patent in suit met the requirements of the EPC.

The division held inter alia that the upheld claims involved an inventive step starting from E2 in combination with common general knowledge.

II. In preparation for oral proceedings the board issued a communication setting out its provisional opinion on the relevant issues.

Oral proceedings before the Board were held on 9 February 2024.

III. The appellant opponent requests cancellation of the decision under appeal and revocation of the patent in its entirety.

The respondent proprietor requests dismissal of the appeal and thus maintenance of the patent as upheld (auxiliary request 4 before the opposition division), alternatively that the decision under appeal be set aside and the patent be maintained according to one of auxiliary requests 5-8 or 11-15, submitted on 14 October 2021 before the opposition division, whereby auxiliary requests 6 and 13 are withdrawn.

IV. Independent claim 1 of the requests relevant to this appeal read as follows:

(a) Auxiliary request 4

1. "A compressor (22) having a plurality of cylinder banks, comprising:
a case (32) defining:
a first cylinder bank (70) having a plurality of cylinders (76, 77);
a cylinder head (100);
a suction port (26);
a discharge port (28); and
an economizer port (30); and
a plurality of pistons, each individually associated with a respective one of the cylinders; and a crankshaft (202) held by the case for rotation about a crankshaft axis and coupled to the pistons,
characterized in that:
the first cylinder bank cylinder head is divided into: a first suction chamber (130); a second suction chamber (132); and a single discharge chamber (128);
the first cylinder bank first suction chamber is coupled to the suction port;
the first cylinder bank second suction chamber is coupled to the economizer port; and
the first cylinder bank discharge chamber is coupled to the discharge port, and wherein the case (32) further defines:
a second cylinder bank (72) having a plurality of cylinders (78, 79); and
for the second cylinder bank, a cylinder head (102);
the second cylinder bank cylinder head is divided into: a single suction chamber (120); and a single discharge chamber (124);

the second cylinder bank suction chamber is coupled to the suction port; and
the second cylinder bank discharge chamber is coupled to the discharge port,
wherein the first cylinder bank first suction chamber and, second cylinder bank suction chamber are coupled to the suction port via a sump (140) of the compressor."

(b) Auxiliary request 5

Claim 1 as in auxiliary request 4 with the following features added to the claim (emphasis by the Board to indicate added text):

"...the first cylinder bank cylinder head is divided into: a first suction chamber (130); a second suction chamber (132); and a single discharge chamber (128), wherein a wall (134) of the first cylinder bank cylinder head between the first suction chamber and the second suction chamber intersects a wall (250) between the discharge chamber of the first cylinder bank and the first and second suction chambers of the first cylinder bank;
the first cylinder bank first suction chamber is coupled to the suction port;..."

(c) Auxiliary request 7

Claim 1 as in auxiliary request 4 with the following features added at the end of the claim (emphasis by the Board to indicate added text):

"...to the suction port via a sump (140) of the compressor,
wherein the case defines a third cylinder bank (74) having a head (104) divided into a single suction chamber (122) and a single discharge chamber (126);
the third cylinder bank suction chamber is coupled to the suction port; and
the third cylinder bank discharge chamber is coupled to the discharge port, and
wherein the first, second, and third cylinder banks each have exactly two cylinders;
the second cylinder bank is a central cylinder bank; and
the first cylinder bank discharge chamber and third cylinder bank discharge chamber are coupled to the discharge port via the second cylinder bank discharge chamber."

(d) Auxiliary request 8

Claim 1 as in auxiliary request 4 amended to incorporate all features added in both auxiliary request 5 and auxiliary request 7.

(e) Auxiliary requests 11,12,14,15

Independent claim 1 of these requests is directed to

"A method for using a compressor, the compressor comprising...",

where the compressor is herein stated to include the features defined by claim 1 of auxiliary requests 4 (see *note below),5,7 and 8, respectively. The claim further incorporates the following features (present in all requests):

"...wherein the method comprises:
passing a first flow to the suction port;
passing a second flow to the economizer port;
splitting the first flow into respective first and second branch flows to the first cylinder bank first suction chamber and the second cylinder bank suction chamber passing the first branch flow through a first cylinder of the first cylinder bank to the first cylinder bank discharge chamber;
passing the second branch flow through the second cylinder bank cylinders in parallel to the first cylinder bank discharge chamber;
passing the second flow through a second cylinder of the first cylinder bank to the first cylinder bank discharge chamber; and
passing a combined flow from the first cylinder bank discharge chamber and the second cylinder bank discharge chamber out the discharge port."

(*note: The Board considers the correct version of auxiliary request 11 to be as defined and defended by the respondent on page 12 of their reply dated

1 February 2023 in the present appeal, including the features of the compressor as defined in auxiliary request 4. The proprietor mistakenly filed on 14 October 2021 an auxiliary request 11 that is literally identical in content to auxiliary request 14, including in both cases the features of the compressor as defined in auxiliary request 7.)

V. In the present decision, reference is made to the following documents:

(E2) EP 0 180 904 B1

(E11) Taschenbuch für den Maschinenbau. GROTE, Karl-Heinrich und FELDHUSEN, Jörg, 2005. Springer-Verlag. ISBN 3-540-22142-5. Pages: M66-M67.

VI. The appellant's arguments can be summarised as follows:

Document E11 illustrates common general knowledge that was contested for the first time in the decision under appeal. It should therefore be admitted. Claim 1 of all requests does not involve an inventive step in the light of E2 in combination with the common general knowledge of the skilled person, as illustrated by E11, and, for some requests, also in combination with the prior art acknowledged in the contested patent itself.

VII. The respondent's arguments can be summarised as follows:

Late filed document E11 should not be admitted. Claim 1 of all valid requests involves an inventive step over E2 also considering the common general knowledge of the skilled person as illustrated by E11.

Reasons for the Decision

1. The appeal is admissible.

2. Background.

The opposed patent relates to reciprocating compressors for economized vapor compression systems, see patent specification para 0001. The compressor drives a flow of refrigerant along a main flow-path, entering the compressor through its main suction port. Further to its main suction port, the compressor has on its suction side an economizer port for an economizer flow-path. In economized vapor compression systems, an economizer flow is branched from the main refrigerant flow-path and used to further cool down the remainder of the refrigerant in the main flow-path. Thereafter, the economizer flow is directly reinjected into the compressor via the economizer port, without being used at the evaporator, see para 0026 and Fig. 1.

3. Document E11 - Admission

3.1 The appellant submits document E11 as evidence of common general knowledge. Document E11 is new to the appeal, thus representing an amendment to the party's case under Art. 12(4) RPBA, its admission being at the discretion of the Board.

3.2 The relevant feature concerns routing suction gas through the sump of the compressor. This feature was introduced in independent claim 1 of auxiliary request 4, filed by the proprietor on 14 October 2021, in preparation for the oral proceedings before the division. Following the discussions at the oral proceedings, the opposition division concluded that

there was insufficient proof that the feature was generally known to a skilled person, see sections 62 and 65 of the impugned decision.

It is noteworthy that the opponent had challenged this feature as part of common general knowledge in the notice of opposition. The feature was originally part of granted claim 7, specifically feature 7.1, and was challenged as common general knowledge on pages 13, 22-23, 45, and 46. This was not contested during the opposition written proceedings. Only at the oral proceedings before the division did the proprietor contest that this would be so.

3.3 With their grounds of appeal, at the first opportunity after the common general knowledge was disputed, the appellant opponent submits new document E11 (a textbook excerpt) as evidence. As variously stated in case law, belated submissions may be taken into account as evidence of alleged common general knowledge, where such knowledge is disputed, cf. Case Law of the Boards of Appeal, 10th edition 2022 (CLBA), V.A.5.13.1.c).

According to established case law, common general knowledge is found inter alia in basic handbooks and textbooks, see CLBA I.C.2.8.1, as is the case of E11. E11 is a standard textbook, if not *the* standard textbook, for all mechanical engineering students in Germany (Dubbel, "Taschenbuch für den Maschinenbau"). The contested feature is represented in Figure 3 (Bild 3) on page M67 and is specifically referred to in the caption of that figure as element 7. This supports the Board's conclusion that E11 is prima facie suitable to substantiate the argument that routing suction gas through the sump of the compressor may be considered common general knowledge.

3.4 Given that only at the oral proceedings did the division hold the allegation of common general knowledge to be unproven, where hitherto this had not been contested, and given also the prima facie relevance of textbook E11 for that issue, the Board decided to admit E11 into the proceedings under Art. 12(4) RPBA.

4. Auxiliary request 4 - Inventive step

4.1 It is common ground that E2 is a valid starting point for the assessment of inventive step.

It is also undisputed that E2 discloses a six cylinder compressor 21 in the sense of the contested patent, see Fig. 2 or Fg. 3 and col. 2, ln. 56-61. As described in col. 3, lines 57-59, with reference to Fig. 4, compressor 21 is a twin cylinder bank compressor. Twin cylinder heads are visible at the left part of compressor 21 of Figs. 2 or 3. The depicted compressor 21 also shows a suction port connected to suction line 22, an economizer port connected to economizer line 32 and a discharge port connected to discharge line 24. As described in col. 3, ln. 57 - col. 4, ln. 8, with reference to Fig. 4, the suction chamber of the cylinder bank connected to the economizer line 32 is divided into two suction chambers 42 and 43 by a partition wall 41. Chamber 42 is connected to the economizer suction line 32. Suction chamber 43, like the suction chambers of the other cylinders, is connected to the suction line 22, and thus to the suction port. All cylinders of the arrangement are connected to a common discharge chamber (not shown) in the usual manner, and thus to the discharge port and discharge line 24.

4.2 However, and contrary to the appellant opponent's submissions, document E2 does not unambiguously disclose a sump in the housing of the compressor that connects the compressor main suction port with the suction chambers of the cylinders. Figure 2 of E2 does not show a compressor sump or any connection through it.

4.3 Therefore, the claimed compressor differs from the known one of E2 only in that the (main) suction port is coupled with the corresponding suction chambers via a sump of the compressor. The corresponding technical problem would thus be how to find a way to route the suction fluid from the known port on the motor-side of the compressor (cf. Fig. 2 of E2) towards the cylinder, similarly as formulated by the division in section 61 of the appealed decision.

4.4 Routing suction gas from the motor-side suction port through a compressor motor sump is a standard design practice that is well-known to the skilled person, a mechanical engineer designing vapour compression systems, as illustrated by in Fig. 3 (Bild 3) of E11: *Dubbel Pocket- (or Hand)book for Mechanical Engineering* (DUBBEL" Taschenbuch für den Maschinenbau" 21. Auflage), page M67 in section 5.2.1 "Refrigerant-compressor" of Chapter 5 - *Air Conditioning Technology - Systems and Components of Refrigeration Systems* ("Klimatechnik- 5 Systeme und Bauteile der kältetechnischen Anlagen"). The Board considers E11 to be a widely recognized handbook for mechanical engineering students in Germany, and thus serving as a reliable reference for common general knowledge in the industry. In Figure 3, captioned *Semi-hermetic compressor* ("halbhermetischer Verdichter"), the primary

and sole vapor suction flow path 7 is depicted, through the compressor motor compartment in the form of a collection area with an oil sump. The caption of figure 3 for reference numeral 7 reads "path of the suction refrigerant vapour" ("7 Weg des angesaugten Kältemitteldampfes"). The corresponding subsection on page M66 of section 5.2.1, headed "Halbhermetischer Verdichter" further states that the motors are suctiongas cooled (by refrigerant) ("Die Motoren sind sauggasgekühlt (durch Kältemittel)").

From the above the Board concludes that it is common general knowledge to feed the suction vapour through the compressor motor compartment via its oil sump, in order to cool the motor. Thus, the sole difference is a well-known textbook measure and hence obvious.

4.5 The respondent proprietor challenges the reliability of E11 as evidence of this common general knowledge. However, the Board is wholly unconvinced. It seems to the Board hard to deny from E11's title, from the fact that is published by one of the world's largest publishers of academic and technical literature, including textbooks, and from the fact that it must enjoy considerable popularity, as this 2005 edition is its 21st edition, that E11 is a textbook. From its content, covering the entire breadth of mechanical engineering, and its ordered, itemized structure, it is clearly meant as a reference work for the mechanical engineer in general. Indeed, the Board can hardly imagine a better illustration of common general knowledge in mechanical engineering. The skilled person who is, as stated, a mechanical engineer specialized in developing refrigerant compressor systems will be familiar with its contents. As regards the relevant passages of E11, as stated, the contested feature is

not only shown in figure 3 but explicitly referenced in its caption and the relevant subsection of section 5.2.1. Not only does that subsection mention cooling of the compressor motor by suction gas, so does the immediately following subsection *Hermetic Compressors* ("Hermetische Verdichter,") stating that this is done *in principle* ("Grundsätzlich wird der Antriebsmotor durch das einströmende Kältemittelgekühlt (sauggasgekühlt)". Textbook E11 thus repeatedly, clearly and consistently states that the compressor motor is cooled by the refrigerant suction gas. Absent any compelling evidence to the contrary (here the respondent bears the burden of proof), the Board can but conclude that this is textbook knowledge. The Board is satisfied that it indeed forms part of the common general knowledge of the skilled person.

4.6 The Board therefore holds, contrary to the opposition division's conclusion, that claim 1 of auxiliary request 4 lacks an inventive step, Art 56 EPC.

5. Auxiliary request 5 - Inventive step

5.1 This request adds the feature that a wall of the first cylinder bank cylinder head between the first suction chamber and the second suction chamber intersects a wall between the discharge chamber of the first cylinder bank and the first and second suction chambers of the first cylinder bank.

5.2 This added feature is also disclosed in E2. Figure 4 of E2 shows a separation wall ("Trennwand")41 between the first suction chamber and the second suction chamber.

The respondent contends that the known wall 41 has a check valve 45, it does not therefore fully separate

the incoming suction flows and cannot be thus considered a wall in the sense of the contested claim. However, the claimed subject-matter is not so limited, either read alone or in context, to exclude wall constructions with a check valve. A compressor with occasional flow through valve 45 of E2 would also fall within the claimed subject-matter. Moreover, as explained in col. 4, ln. 9-31 of E2, during use of the economizer circuit (the relevant use for comparison with the contested patent), check valve 45 remains closed and the two suction flows are therefore completely separated. Therefore wall 41 of E2, which is undisputedly described there as a wall ("Trennwand"), is for all intents and purposes a wall in the sense of the claim.

5.3 Therefore claim 1 of auxiliary request 5 does not involve an inventive step, Art 56 EPC, over the combination of E2 with common general knowledge for similar reasons as auxiliary request 4.

6. Auxiliary requests 7 and 8 - Inventive step

6.1 Auxiliary requests 7 and 8 are amended in comparison to auxiliary request 4 and auxiliary request 5, to incorporate a third cylinder bank, wherein each cylinder bank has exactly two cylinders. The second cylinder bank serves as the central cylinder bank, and the discharge chambers of the first and third cylinder banks are connected to the discharge port through the discharge chamber of the second cylinder bank.

6.2 These requests do not involve an inventive step in the light of E2 in combination with the prior art acknowledged in the patent and common general knowledge.

6.3 E2 also discloses that the compressor can be a 4, 6 or 8 cylinder compressor in V, W, or WW configuration, see E2, col. 3, ln 57 ff. The 6 cylinder compressor in the W configuration has three cylinder banks, each bank having exactly two cylinders and one of the banks being a central cylinder bank.

6.4 Therefore, the subject-matter of each of these requests differs from E2 in that the (primary) suction port is coupled to the corresponding suction chambers via a sump of the compressor and in that the discharge chambers of the first and third cylinder banks are connected to the discharge port through the second (central) cylinder bank discharge chamber. These two differentiating features have no apparent synergistic effect. Nor has the respondent proprietor put forth any. They address two unrelated technical problems, so that inventive step can be assessed independently for each group of features.

6.5 As stated earlier for auxiliary request 4, directing the suction gas through the sump is a textbook measure.

6.6 Regarding the routing of the discharge flow, E2 lacks specific details on how the discharge chambers are connected to the shared discharge port, posing a problem to the skilled person when seeking to implement the teachings of E2. The claimed routing through the central bank discharge chamber provides a solution.

6.7 In this context, the disputed patent is based on the re-engineering of a known baseline compressor, which includes a discharge gas routing as defined in claim 1 of auxiliary requests 7 and 8, see paras 0029, 0031 and Fig 4. Figure 4 of the patent illustrates this

configuration acknowledged to be prior art. This is not disputed by the respondent proprietor. The Board is satisfied that this discharge routing is known from the baseline compressor. Whether it is part of the common general knowledge, contested by the respondent, is irrelevant for the inventive step analysis.

6.8 As mentioned earlier, when implementing E2, the skilled person needs to create a structure for connecting the discharge chambers to the common discharge port. The baseline compressor offers a solution, in a three-bank compressor in W configuration (Fig. 4 of the disputed patent), making it an obvious choice for the relevant compressor in E2.

6.9 The Board therefore concludes that the subject-matter of claim 1 of either auxiliary requests 7 or 8 lacks inventive step in the sense of Art 56 EPC.

7. Auxiliary requests 11,12,14 and 15 - Inventive step

7.1 In its written opinion, the Board gave its preliminary assessment on this issue:

"8.4 Auxiliary requests 11-15 are restricted to the method claims with equivalent features as in the device independent claim of auxiliary requests 4-8.

These requests seek to differentiate its subject-matter by the definition of two parallel suction vapor flows, which correspond to the main and economizer suction flows. The respondent proprietor submits that E2 does not disclose such parallel separated flows but parallel flows connected through check valve 45 between the corresponding suction chambers, as shown in Fig. 4 of E2. This is however not convincing. As explained in

col. 4, ln. 9-31 of E2, valve 45 opens only when no circulation is allowed through the economizer circuit (Unterkuhler), i.e. valve 29 is closed (see Figs. 2 and 3). During use of the economizer circuit, by opening circuit valve 29, compressor valve 45 remains closed and the suction side of the two parallel flows of E2, main and economizer, remain fully separated.

Moreover, contrary to the respondent's submissions, the claim wording is not limited to fully separated parallel suction flows. Even a method with partial leakage through valve 45 of E2 would also fall within the claimed subject-matter."

7.2 In the oral proceedings, the respondent proprietor chose not to provide additional comments on the issue. Consequently, the Board finds no reason to depart from its preliminary view and concludes that auxiliary requests 11, 12, 14, and 15 lack an inventive step for similar reasons as their corresponding higher-ranked requests 4, 5, 7, and 8.

8. The Board is thus unable to confirm the conclusion of the decision under appeal that claim 1 as upheld (auxiliary request 4) involves an inventive step, so that the decision must be put aside. Furthermore, taking into consideration the amendments made by the appellant proprietor, the patent and the invention to which it relates do not meet the requirement of the Convention and the patent must be revoked pursuant to Article 101(3)(b) EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated