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Datasheet for the decision of 5 May 2022

Case Number: T 1649/18 - 3.2.03

Application Number: 08848015.7

Publication Number: 2220450

IPC: F28B11/00

Language of the proceedings: EN

Title of invention:
TRANSPORT REFRIGERATION SYSTEM AND METHOD OF OPERATION

Patent Proprietor:
Carrier Corporation

Opponents:
BITZER Kuhlmaschinenbau GmbH
Maersk Container Industry A/S

Headword:

Relevant legal provisions:
RPBA 2020 Art. 13(2)
EPC Art. 123(2), 56

Keyword:
Amendment after summons - exceptional circumstances (yes)
Amendments - added subject-matter (no)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
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Office européen des brevets

Beschwerdekammern

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Case Number: T 1649/18 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 5 May 2022

Appellant: (Patent Proprietor)	Carrier Corporation One Carrier Place Farmington, CT 06034 (US)
Representative:	Dehns St. Bride's House 10 Salisbury Square London EC4Y 8JD (GB)
Appellant: (Opponent 1)	BITZER Kuhlmaschinenbau GmbH Peter-Schaufler-Platz 1 71065 Sindelfingen (DE)
Representative:	Hoeger, Stellrecht & Partner Patentanwälte mbB Uhlandstrasse 14c 70182 Stuttgart (DE)
Appellant: (Opponent 2)	Maersk Container Industry A/S Bjerndrupvej 47 6360 Tinglev (DK)
Representative:	Zacco Denmark A/S Arne Jacobsens Allé 15 2300 Copenhagen S (DK)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 8 May 2018 concerning maintenance of the European Patent No. 2220450 in amended form.**

Composition of the Board:

Chairman	C. Herberhold
Members:	B. Goers
	D. Prietzel-Funk

Summary of Facts and Submissions

I. European patent No. 2 220 450 ("the patent") relates to a refrigeration system for, and a method of operation of, a transport refrigeration unit for cooling a temperature-controlled cargo having a compression device with a variable speed drive and a controller for controlling a cooling capacity of the system which is configured to operate the variable speed drive in three modes of operation.

II. With the impugned decision, the opposition division decided that the patent as amended on the basis of the first auxiliary request then on file complied with the requirements of the EPC. The patent proprietor and both opponents appealed. Therefore, they will be referred to in this decision as "patent proprietor", "opponent 1" and "opponent 2".

III. With the parties' consent, oral proceedings before the Board were held on 5 May 2022 by videoconference using the Zoom platform.

IV. During the oral proceedings the patent proprietor first requested that the decision under appeal be set aside and that the patent be maintained as granted or, alternatively, on the basis of several auxiliary requests. After the discussion of the main request with respect to Article 100 (c) EPC and of an auxiliary request with respect to Article 123(2) EPC the patent proprietor submitted "new auxiliary request 2", which was admitted into the proceedings. Then, the patent proprietor made the new auxiliary request 2 the new main request and withdrew all of the other requests on file. The final request of the patent proprietor was

that the patent be maintained in amended form on the basis of claims 1 to 13 of the main request (filed as "new auxiliary request 2" during the oral proceedings).

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

V. The following documents already cited in the opposition proceedings are relevant for this decision:

O1: WO 01/35040 A1
O3: US 2002/0088241 A1
O4: JP 2006/132807 A
O4T: English translation of O4

VI. Independent claims 1 and 13 of the main request read as follows (feature numbering added in "[]").

Claim 1:

"[1.1] *A refrigeration system (10) for a transport refrigeration unit for cooling a temperature controlled cargo space (200), said refrigeration system comprising:*
[1.2] *a primary refrigerant circuit including a refrigerant compression device (20), a refrigerant heat rejection heat exchanger (40) downstream of said compression device, a refrigerant heat absorption heat exchanger (50) downstream of said refrigerant heat rejection heat exchanger, and a primary expansion device (55) disposed downstream of said refrigerant heat rejection heat exchanger and upstream of said refrigerant heat absorption heat exchanger;*

[1.3] *a motor (25) operatively associated with said compression device (20) for driving said compression device;*
[1.4] *a variable speed drive (80) operatively associated with said motor (25) for varying the speed of operation of said compression device (20); and*
[1.5] *a controller (100) operatively associated with said variable speed drive (80) and said compression device (20) for co11trolling a cooling capacity of the refrigeration system (10) by selectively controlling the speed of said compression device;*
characterised in that
[1.6] *said controller (100) is configured to operate the variable speed drive (80) in three modes of operation,*
[1.6a] *to determine whether to operate in the first, second or third mode of operation in response to temperature control requirements and whether to operate the refrigerant compressor at a fixed speed or a variable speed to match cooling capacity of the refrigeration system to a cooling demand associated with the cargo space (200) in each of the three modes;*
wherein the first, second and third modes are:
[1.7] *a pull down mode in which the temperature controlled cargo space (200) is at a higher temperature than a desired temperature and the controller (100) is configured to cool the temperature controlled cargo space (200) as rapidly as possible using the maximum cooling capacity of the system (10) by operating the compression device (20) in a continuous run mode;*
[1.8] *a capacity mode of operation in which the controller (100) is operable to maintain the temperature in the temperature controlled cargo space (200) within a temperature range by operating the compression device (20) in a power on/off cycling mode at a fixed speed, wherein the fixed speed of the*

compression device (20) in the capacity mode is its maximum speed;
[1.9] *a part load mode of operation, in which the controller (100) is operable to operate the compression device (20) at a cooling capacity that is less than a maximum cooling capacity by reducing the speed of the compression device (20) to a speed less than the a maximum speed of the compression device,*
[1.10] *the controller (100) being configured to operate the compression device (20) in a continuous run, variable speed mode in a first portion of the part load mode and a power on/off cycling run, fixed speed mode in a second portion of the part load mode, wherein the fixed speed of the compression device (20) in the second portion of the part load mode is its minimum speed.*"

Claim 13:

"[13.1] *A method for operating a refrigeration system (10) for a transport refrigeration unit for cooling a temperature controlled cargo space (200),*
[13.2] *the refrigeration system including a refrigerant compression device (20) and a motor (25) operatively associated with the compression device for driving the compression device,*
[13.3] *wherein three modes of operation are associated with the refrigeration system:*
[13.4]*a pull down mode in which the temperature controlled cargo space (200) is at a higher temperature than a desired temperature and the temperature within the temperature controlled cargo space (200) is pulled down to the desired temperature as rapidly as possible using the maximum cooling capacity of the system (10);*
[13.5] *a capacity mode of operation in which the temperature is maintained within a range;*

[13.6] *a part load mode of operation, in which the refrigerant compressor (20) is operated at a cooling capacity that is less than a maximum cooling capacity by reducing the refrigerant compressor speed to a selected speed that is less than the maximum compressor speed,*
[13.7] *said method comprising the steps of: providing a variable speed drive (80) for controlling the speed of operation of the motor (25) to selectively varying a speed of the refrigerant compressor (20);*
[13.8] *and providing a controller (100) operatively associated with said variable speed drive (80),*
[13.9] *said controller determining whether to operate the refrigeration system (10) in the pulldown mode, in the capacity mode or in the part load mode in response to temperature control requirements and whether to operate the refrigerant compressor (20) at a fixed speed or a variable speed to match a cooling capacity of the refrigeration system to a cooling demand associated with the cargo space (200) in each of the pull down mode, the capacity mode and the part load mode,*
[13.10] *operating the refrigerant compressor (20) in a power on/off cycling mode at a fixed speed in the capacity mode, wherein the fixed speed of the compression device (20) in the capacity mode is its maximum speed;*
[13.11] *operating the refrigerant compressor (20) in a continuous run mode in the pull down mode;*
[13.12] *operating the refrigerant compressor (20) in a continuous run, variable speed mode in a first portion of the part load mode;*
[13.13] *and operating the refrigerant compressor (20) in a power on/off cycling run, fixed speed mode in a second portion of the part load mode, wherein the fixed*

speed of the compression device (20) in the second portion of the part load mode is its minimum speed."

VII. The opponents' arguments, where relevant to the present decision, may be summarised as follows.

(a) Main request - Article 123(2) EPC

The subject-matter of the claims extended beyond the application as filed. Firstly, the claims failed to include the precise selection criteria for the modes as defined in paragraphs [0029] to [0031] which constituted an unallowable intermediate generalisation. Secondly, the capacity mode was only originally disclosed to operate at full cooling capacity, and not at the maximum speed of the compressor. In addition, the amended back-references in claims 3 to 8 and 11 resulted in added subject-matter.

(b) Main request - Inventive step

Claims 1 and 13 did not involve an inventive step when starting from O1 and taking into consideration the teaching of either O3 or O4. The distinguishing feature was that O1 failed to disclose a capacity mode. The technical problem was to optimise performance. A capacity mode was disclosed for this purpose in both O3 (Figure 3 and paragraph [0027]) and O4 (Figure 5(b)).

VIII. The patent proprietor's arguments, where relevant to the present decision, may be summarised as follows.

(a) Main request - Admittance

The main request should be admitted into the proceedings. Exceptional circumstances were present since the Board raised a new objection under Article 123(2) EPC in the communication under Article 15(1) RPBA 2020.

(b) Main request - Article 123(2) EPC

The subject-matter of the claims was disclosed in the application as filed. The selection criteria in the modes were defined by features [1.6a] and [13.9], which had explicit bases in original claim 15 and paragraph [0029]. The details regarding the selection of the modes disclosed in paragraphs [0029] to [0031], such as "temperature control required for the particular product stored in the temperature controlled cargo space is not extremely tight" or "accurate temperature control of the cargo space", did not add more to the modes than what had been implicit from their definition in the claims. Moreover, even if a generalisation was present, original claim 15 would provide a basis for this generalisation. Therefore, the omission of the respective wording did not constitute an unallowable intermediate generalisation.

The skilled person understood from paragraph [0030] as filed that the capacity mode was to be operated at the maximum speed of the compressor.

The arguments with respect to the amended back-references were not substantiated.

(c) Main request - Inventive step

The subject-matter of claims 1 and 13 involved an inventive step. Neither O3 nor O4 disclosed the

distinguishing feature of a capacity mode with on/off cycling at the maximum compressor speed. On the contrary, both documents suggested cycling only at the minimum speed of the compressor.

Reasons for the Decision

Admission of the main request

1. The main request is admitted into the proceedings for the following reasons.

1.1 The main request was submitted during the oral proceedings before the Board. It thus constitutes an amendment of the proprietor's appeal case under Article 13(2) RPBA 2020 and the admission thereof is therefore subject to the Board's discretion and to the presence of exceptional circumstances justified by cogent reasons. The admittance of the main request was not challenged by the opponents and the single main request overcomes all of the objections related to added matter (see point 2. below).

1.2 As explained by the patent proprietor, claim 1 of the main request is essentially a combination of the features of auxiliary requests 4 and 6, both of which were already filed with the statement of grounds of opposition (as auxiliary requests 3 and 4). With the communication under Article 15(1) RPBA 2020, the Board gave its preliminary view on whether the requests on file added subject-matter. While some but not all of the opponent's objections were considered relevant here, the Board also raised, *ex officio*, an additional added subject-matter issue for the first time in the proceedings, namely that the independent claims according to the patent as granted lacked selection criteria for the modes. This objection of the Board was addressed by a number of further requests filed by the

patent proprietor in response to the communication without delay.

1.3 The conclusion of the discussion of added subject-matter in the oral proceedings was that the addition into claim 1 of the general selection criteria feature according to paragraph [0029], second sentence and claim 15 of the A-publication overcomes the aforementioned objection (see also point 2.3 below). An appropriate and timely reaction to a new objection first raised by the Board with the communication under Article 15(1) RPBA 2020 is the very example of a possibly admissible amendment in the context of Article 13(2) RPBA 2020 given in the document "Table setting out the amendments to the RPBA and the explanatory remarks" (see page 228 of Supplementary Publication 1, OJ EPO 2022). Moreover, the combination of this amendment with features of auxiliary requests which had been in the proceedings since the filing of the reply to the notice of opposition cannot be considered surprising to the other parties, which, in the present case, did not object to the filing of the main request. For these reasons, exceptional circumstances justified by cogent reasons as according to Article 13(2) RPBA 2020 are present.

Extension of subject-matter

2. The subject-matter of the claims of the main request complies with the requirements of Article 123(2) EPC.

2.1 The opponents' objections against claims 1 and 13 of the main request relating to an unallowable extension of subject-matter are as follows:

(a) No selection criteria were defined for the capacity and part-load modes.
(b) In the capacity mode, the feature that the device is operated at full cooling capacity was omitted.
(c) The amended back-references in claims 3 to 8 and 11 resulted in added subject-matter.

In the following paragraphs, the references to the application as filed are made with respect to the A-publication WO 2009/061804 Al as "A1".

2.2 The features of claims 1 and 13 of the main request are based on claims 1 and 15 to 17 of A1 and the embodiment described in paragraphs [0029] to [0032]. Claims 1 and 13 both define that the controller is capable of determining which of the three operation modes is selected (features [1.6a] and [13.9]). This is consistent with the general definition disclosed in paragraph [0029] as well as with the method originally disclosed in claim 15 of A1. Furthermore, the modes are defined in claims 1 and 13 with respective distinct operation ranges of the compression device, as defined in paragraphs [0029] to [0032] of A1:

- pull-down mode at maximum cooling capacity, i.e. **maximum continuous speed** of the compression device
- capacity mode with power on/off **cycling** of the compression device **at maximum speed**
- part-load mode with either **continuous speed** of the compression device **below the maximum speed** or power on/off **cycling** of the compression device **at minimum speed.**

2.3 Objection (a): "no selection criteria"

2.3.1 Opponent 1 argued that the embodiment of paragraphs [0029] to [0032] in A1 included the following more specific definitions of the mode-selection criteria, the omission of which in claims 1 and 13 constituted an unallowable intermediate generalisation. For the pull-down mode, it had to be defined that the "temperature controlled space was at a higher temperature than the desired temperature" (paragraph [0029]). For selecting the capacity mode, it was allegedly required that the "temperature control required for the particular product stored in the temperature controlled cargo space was not extremely tight" (paragraph [0030]). For the part-load mode, the alleged missing criteria had been that "accurate temperature control of the cargo space is required" (paragraph [0031]). However, the Board is not convinced that the omission of these criteria is in conflict with the requirements of Article 123(2) EPC.

2.3.2 Features [1.6a] and [13.9] define that the controller includes a function to select ("determine") one out of three operation modes "in response to temperature requirements" in order to "match a cooling demand associated with the cargo space in each of the three modes", i.e. they do provide a selection criterion for the modes in a general way. Claim 15 of the application as filed, together with paragraph [0029], first two sentences, provides a basis for this alleged intermediate generalisation. Moreover, more detailed selection criteria are not disclosed as being a crucial element of the method of the invention. Thus, even if an intermediate generalisation is present, it is an originally disclosed and thus allowable one.

2.3.3 Furthermore, the omission of the allegedly unallowable missing features does not result in added matter by introducing a contradiction between the disclosure of paragraphs [0029] to [0031] and the claim features defining the modes. The pull-down mode is usually required when the cargo space temperature is significantly above the control target. The on-off control of the capacity mode inherently results in the oscillation of the cargo space temperature according to the "temperature range" as defined in features [1.8] and [13.5]. This renders the mode solely suitable for storing products allowing varying temperatures, i.e. not having extremely tight temperature requirements. The continuous variable speed drive compressor in a cooling cycle allows for an accurate temperature control if so required by the type of cargo.

2.4 Objection (b): "operating at full capacity in the capacity mode"

2.4.1 Opponent 1 considered that the capacity mode as defined in paragraph [0030] of A1 required the application of the **maximum cooling capacity** and that therefore the feature "maximum speed of the compression device" was an extension of subject-matter. This is not persuasive.

2.4.2 The application as filed discloses two measures to adjust the cooling capacity, which are the speed of the compression device (paragraph [0008]) and, optionally **in addition**, the use of an economiser (paragraphs [0009], [0029]: "may or may not be used" and [0030]: "as required"). Since the use of an economiser is only disclosed as an optional add-on measure, full cooling capacity according to the application as filed requires at least that the compression device be operated at maximum speed.

2.4.3 The third sentence of paragraph [0030] might introduce an ambiguity by referring to a "specific speed as required for optimisation of the performance". However, the skilled person will understand from the paragraph as a whole, that the only suitable specific speed in the capacity mode is the maximum speed. It is explained in paragraph [0030] that, when switched on in the capacity mode, the compression device "runs at maximum capacity", i.e. maximum speed. This understanding is also in line with the speed of the compression device in the capacity mode shown in Figure 3 being the maximum speed. The statement in paragraph [0030] that "the variable speed drive can be bypassed" further supports this understanding. Therefore, the application as filed provides a basis for cycling in the capacity mode at the maximum speed of the compression device as according to features [1.8] and [13.10].

2.5 Objection (c): "amended back-references"

Opponent 1 further objected to the amended back-references of claims 3 to 8 and 11, all of which were originally only dependent on claim 1. In its view, these amendments created added subject-matter. However, it was not substantiated by opponent 1 which of the resulting combinations of features had no basis in the application as filed. The mere observation that the dependencies of the claims had previously been different is not sufficient to prove for the presence of added subject-matter.

Main request - Inventive step

3. Opponent 1 raised the following two objections against claims 1 and 13 of the main request relating to a lack of inventive step:

- O1 seen in combination with O3
- O1 seen in combination with O4

Neither of the objections is persuasive.

3.1.1 O1 discloses a "transportable cooling unit" with a cooling cycle according to claims 1 and 13 which is operable in various different modes determined by a controller, which are exemplarily shown in Figure 5.

3.1.2 It was common ground that O1 discloses a part-load mode with the two portions as claimed. A first mode ("stage 1") provides for cycling at the lowest possible speed ("a") of the compression device (see Figure 5 and page 16, second to fifth paragraphs). In a second mode ("stage 2"), the compression device is operated continuously ("uninterruptedly") using a speed controller with a variable frequency drive (see page 17, second paragraph). It was also undisputed that O1 additionally discloses a pull-down mode at the maximum compressor speed (see Figure 5, "E", and page 22, second paragraph).

3.1.3 O1 does not disclose a capacity mode in which the speed of the compression device is on/off cycled at the maximum speed which is the distinguishing feature. Opponent 1 considers the "optimisation of performance" with respect to the cooling demand to be the underlying technical problem. A more specific problem directed to the distinguishing feature (capacity mode) is not

apparent from the patent. While the optimisation of performance with respect to different types of loads and cooling demands appears to be the correct underlying problem, this is already also addressed in O1 (page 1, third paragraph). In O1 this problem is solved differently, *inter alia* by the provision of a two-stage compressor which is selectively operated with one or both stages. Therefore, the objective technical problem is to provide an alternative to optimise performance with respect to the cooling demand.

3.1.4 When assessing the obviousness of the distinguishing feature, it has to be considered that the inclusion of a two-stage compressor is disclosed in O1 as one of the essential features for realising the modes of the temperature control scheme. The second stage of the compressor is added in a third mode ("stage 3"), once the first portion of the part-load mode (stage 2) reaches its maximum cooling capacity, with a certain overlap (hysteresis) of the two modes for avoiding excessive cycling between one- and two-stage operation (Figure 5). An additional fourth mode ("stage 4") is to add an economiser; also with a respective overlap with stage 3.

3.1.5 It is not persuasive that the skilled person would consider replacing any of the modes of this control concept of interrelated modes with a different capacity mode without being provided with a very specific indication to do so. However, even if the skilled person were to do so, neither the disclosures of O3 nor O4 would lead the skilled person to a capacity mode according to features [1.8] and [13.10] since neither of these documents discloses such a mode.

3.1.6 In O3, two basic modes are described: an on/off mode and a continuous mode, which are selected according to the efficiency range of the compressor as a function of the selected speed and torque. As is apparent from Figure 2 and paragraph [0027], the cycling mode is only selected at low compressor speeds (i.e. close to its minimum speed) where the achieved torque becomes undesirable. Therefore, the cycling mode in O3 corresponds to the second portion of the part load mode and does not teach the operation of the compression device in the on/off mode **at its maximum speed** as defined in the distinguishing feature.

3.1.7 In O4, various control modes are described, including an on/off cycling mode (see O4, Figure 5(b), which shows the pressure provided by the compressor over time). O4 teaches the selection of the on/off cycling mode "at a low pressure" (O4T, page 5, third full paragraph). A low pressure corresponds to a low compressor speed. Like O3, O4 thus also suggests a cycling mode only for low compressor speeds corresponding to the second portion of the part-load mode.

4. Neither the opponents not the Board had any objections with respect to the amendments made to the description.

5. To conclude, the main request is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent as amended in the following version:

   - Claims 1 to 13 of the main request filed as "new auxiliary request 2" during the oral proceedings before the Board

   - Description: columns 1 to 4 as filed during the oral proceedings before the board, and columns 5 to 11 of the patent specification

   - Figures 1 to 4 of the patent specification.

The Registrar: The Chairman:

C. Spira C. Herberhold

Decision electronically authenticated