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Datasheet for the decision of 4 May 2010

Case Number: T 1491/08 - 3.2.04

Application Number: 96109417.4

Publication Number: 0748937

IPC: F04B 27/18

Language of the proceedings: EN

Title of invention:
Displacement controlling structure for clutchless variable displacement compressor

Patentee:
Kabushiki Kaisha Toyoda Jidoshokki Seisakusho

Opponent:
Zexel Valeo Climate Control Corporation
Zexel Valeo

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)
RPBA Art. 13(1)

Relevant legal provisions (EPC 1973):
EPC Art. 56, 100a)

Keyword:
"Main request - novelty (yes) - inventive step (no)"
"Auxiliary requests - not admitted into the proceedings"

Decisions cited:
T 0087/05

Catchword:
-

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Case Number: T 1491/08 **-** 3.2.04

D E C I S I O N
of the Technical Board of Appeal 3.2.04
of 4 May 2010

Appellant: (Patent Proprietor)	Kabushiki Kaisha Toyoda Jidoshokki Seisakusho 2-1, Toyoda-cho Kariya-shi Aichi-ken (JP)
Representative:	TBK-Patent Bavariaring 4-6 D-80336 München (DE)
Respondents: (Opponent I)	Zexel Valeo Climate Control Corporation Konan Plant 39 Higashihara Sendai Konan-Machi Ohsato-Gun Saitama 360-0193 (JP)
(Opponent II)	Zexel Valeo Compressor Europe GmbH Zeppelinstrasse 5 D-64331 Weiterstadt (DE)
Common representative:	Prinz & Partner Rundfunkplatz 2 D-80335 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 3 June 2008 revoking European patent No. 0748937 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman: M. Ceyte
Members: C. Scheibling
T. Bokor

Summary of Facts and Submissions

I. By its decision dated 3 June 2008 the Opposition Division revoked the European patent. On 25 July 2008 the Appellant (patentee) filed an appeal and paid the appeal fee simultaneously. The statement setting out the grounds of appeal was received on 13 October 2008.

II. The patent was opposed on the grounds based on Article 100a), b) and c) EPC 1973.

III. The following documents played a role in the present proceedings

D2: EP-A-0 628 722
D4: US-A-4 894 999

IV. Oral proceedings took place on 4 May 2010 before the Board of Appeal.

The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims as granted (main request); in the alternative on the basis of one of auxiliary requests 1 to 5 or 7 to 10 filed with letter dated 1 April 2010. Auxiliary request 6 was withdrawn during the oral proceedings.

He mainly argued as follows:
D4 does not disclose the claimed features e), f1) and f2). In D4 the compressor is controlled by varying the value of electric current for actuating the valve body on the basis of the difference between the intake air temperature and a calculated target intake air

temperature. Transforming the control system of D4 in order to vary the value of electric current in function of the deviation of a passenger compartment temperature from the set temperature would be so complicated that a skilled person would not envisage such modifications.
The auxiliary requests have been filed to overcome the objections raised by the opponent. The subject-matter claimed therein is clearly patentable over D4 and the amendments comply with the requirements of Article 123(2) EPC.

Through their common representative, Respondents I and II (opponents I and II) mainly submitted that the subject-matter of claim 1 as granted is not novel with respect to D4. Even if it were considered that D4 does not implicitly disclose to use the amount of deviation of the passenger compartment temperature from the set temperature as parameter for controlling the value of electric current of the compressor valve, it would be obvious for the skilled person to use this parameter for regulating the compressor.
The auxiliary requests are late filed and should not be admitted into the proceedings because they are not clearly allowable.

The Respondents I and II requested that the appeal be dismissed.

V. Claims 1 as granted reads as follows:

"1. A vehicle air-conditioner compressor of a variable displacement type, wherein

a) the compressor has a plurality of pistons (22) mounted in respective cylinder bores (la) and reciprocated by rotation of a variably inclinable swash plate (15), the inclination of the swash plate (15) being determined by the pressure within a crank chamber (2a) that houses the swash plate (15);

b) the pressure within the crank chamber (2a) is established by feeding compressed gas from a discharge chamber (3b) through a supply passage (31; 61) into the crank chamber (2a) and returning gas from said crank chamber (2a) through a pressure release passage (30; 30, 58) to a suction chamber (3a);

c) the flow of gas is controlled by an electromagnetic valve (20; 57; 59); and

d) control means (Ca; Cb; Cc) control a value of electric current flowing through a solenoid (32) of said electromagnetic valve (20; 57; 59) for actuating a valve body (45; 50; 60) and adjusting the amount of opening of body (45; 50; 60) and adjusting the amount of opening of an associated valve hole (44d),

e) said value of electric current being continuously varied on the basis of input parameters between zero and a maximum value and all values in-between and

f) said input parameters including

f1) whether the temperature of an evaporator (38) of an external refrigerant circuit (35) has fallen below a predetermined value thus indicating the possibility of frost; and

f2) a deviation of a passenger compartment temperature from a temperature set by a temperature controller (56)."

Claim 1 of auxiliary request 1 is based on claim 1 of the main request and limits it to a clutchless compressor.

Claim 1 of auxiliary request 2 differs from claim 1 of the main request in that the following features have been added: "and said value of electric current is adjusted in accordance with said temperature deviation."

Claim 1 of auxiliary request 3 comprises in combination the amended features of claim 1 of auxiliary requests 1 and 2.

Claim 1 of auxiliary request 4 differs from claim 1 of the main request in that the following features have been added: "the compressor has a shutter member (21) for preventing refrigerant from being delivered outside the compressor when the displacement of the compressor is at a minimum".

Claim 1 of auxiliary request 5 differs from claim 1 of auxiliary request 4 in that it is specified that the vehicle air-conditioner is of a clutchless type.

Claim 1 of auxiliary request 7 differs mainly from claim 1 of auxiliary request 1 in that the following features have been added:

"h1) the control means (Ca; Cb; Cc) energize the solenoid (32) when the passenger compartment temperature becomes equal to or higher than the temperature set by the temperature controller (56);
h2) the control means (Ca; Cb; Cc) increase the value of electric current to increase the inclination of the swash plate (15) when cooling is greatly needed, and decrease the value of electric current to decrease the inclination of the swash plate (15) when the requirement for cooling becomes low; and
h3) the inclination of the swash plate (15) becomes minimum when the solenoid (32) is de-energized."

Claim 1 of auxiliary request 8 differs mainly from claim 1 of auxiliary request 1 in that the following features have been added:
"h1) the control means (Ca; Cb; Cc) energize the solenoid (32) when the passenger compartment temperature becomes equal to or higher than the temperature set by the temperature controller (56) and
k) the temperature of the evaporator (38) is higher than the predetermined value;
h2) the control means (Ca; Cb; Cc) increase the value of electric current to increase the inclination of the swash plate (15) when cooling is greatly needed, and decrease the value of electric current to decrease the inclination of the swash plate (15) when the requirement for cooling becomes low;
j1) the control means (Ca; Cb; Cc) de-energize the solenoid (32) when the temperature of the evaporator (38) becomes equal to or lower than the predetermined value;
h3) the inclination of the swash plate (15) becomes minimum when the solenoid (32) is de-energized."

Claim 1 of auxiliary request 9 comprises in combination the amended features of claim 1 of auxiliary requests 4 and 7.

Claim 1 of auxiliary request 10 comprises in combination the amended features of claim 1 of auxiliary requests 4 and 8.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Novelty

2.1.1 It is undisputed that D4 discloses the features a) to d) of claim 1 of the main request.

2.1.2 Feature e) requires that "said value of electric current being continuously varied on the basis of input parameters between zero and a maximum value and all values in-between".
That the electric current is varied between zero and a maximum value and all values in-between is shown by figures 8A and 8B of D4.
The Appellant contended that in D4 under given circumstances the compressor is stopped (column 18, lines 44 to 48) and that in this case the current is not continuously varied.
However, as indicated in the earlier decision T1131/03 concerning the same patent, "continuously" has to be

interpreted as meaning without interruption in "time" and not without interruption in "value". The fact that in D14 the compressor is stopped does not mean that the computer control is switched off too. Figure 11 of D4 which illustrates this specific control routine, shows that the step following the "compressor off" step is the "return" step and that accordingly the routine is executed again and the control is continuous. This is not different from the control performed in accordance with the patent under appeal where (paragraph [0033]) "The computer Ca de-energizes the solenoid 32 when the temperature of the evaporator 38… becomes equal to or lower than a predetermined value…"
Thus feature e) is disclosed in D4.

2.1.3 Feature f1) requires that the input parameters include "whether the temperature of the evaporator of an external refrigerant circuit has fallen below a predetermined value thus indicating the possibility of frost"
According to D4, column 9, lines 47 to 50 and 54 to 56 "The control unit … is connected through an input circuit to", "an intake air temperature sensor 46 for detecting temperature T_{INT} of air flowing just downstream of the evaporator".
The Appellant argued that the temperature just downstream the evaporator is not the temperature of the evaporator.
However, according to column 18, lines 34 to 48, when the temperature T_{INT} is in the seventh state, i.e. indicative of a possible freezing of the evaporator, the compressor is stopped.
Thus in D4 the temperature T_{INT} is used to determine that the temperature of the evaporator has fallen below

a predetermined value which is indicative of the possibility of frost. Feature f1) does not require more, in particular the manner how this temperature is determined and therefore feature f1) is also disclosed in D4.

2.1.4 Feature f2) requires that the deviation of a passenger compartment temperature from a temperature set by a temperature controller is used as parameter for varying the electric current.
Although in D4 the passenger compartment temperature T_{INC} and the temperature set by a temperature controller are used as input parameters for the control processing unit (column 10, lines 38 to 49), there is no indication that the difference between these two parameters is used to regulate the electric current of the valve controlling the compressor.

2.1.5 Accordingly, novelty of the subject-matter of claim 1 as granted is given with respect of D4.

2.2 Inventive step

2.2.1 The compressor of claim 1 of the main request differs from that of D4 by feature f2).

The variable displacement compressor of D4 is provided with a control unit comprising different control routines to satisfy the needs for a good cooling performance as well as for the prevention of frost and thus partly solves the problem of the invention as stated in paragraph [0009] of the patent specification.

It is common knowledge of the skilled person that, when the temperature of the passenger compartment has reached the set temperature, less refrigerant needs to be delivered to the evaporator by the compressor. Otherwise, it could become necessary to warm up the cool air leaving the evaporator before it enters the passenger compartment.

Therefore, with respect to D4 the technical problem to be solved by the claimed invention may be seen in providing a variable displacement compressor having a more flexible displacement controlling mechanism which also improves the energy consumption especially when the set temperature has been reached.

2.2.2 Reaching the set temperature is the aim of any air-conditioner regulation and implies that the amount of deviation of the passenger compartment temperature from the temperature set by a temperature controller becomes close to zero. It is therefore obvious for a skilled person to monitor this deviation and to use it as a further input parameter to adjust the value of electric current of the valve so as to improve control of the compressor.
The Appellant argued that the control system of D4 is too complex to be modified.
This point of view cannot be shared, since the control system of D4 already computes the passenger compartment temperature and the set temperature and uses different routines according to external conditions. Thus, there would be no difficulty for a skilled person for including the deviation in a routine as one of the parameters for the calculation of the current.

2.3 Accordingly, the subject-matter of claim 1 of the main request does not involve an inventive step.

3. *Auxiliary requests*

3.1 Auxiliary requests 1 to 5 and 7 to 10 were filed one month before the oral proceedings that is well after filing of the grounds of appeal.
Consequently, they constitute amendments to the Appellant's case in the meaning of Article 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA), according to which "Any amendment to a party's case after it has filed the grounds of appeal or reply may be admitted and considered at the Board's discretion…".

According to the established case law of the Boards of Appeal, filing of an auxiliary request may be admitted into the proceedings if sound reasons exist for the filing of the new auxiliary request and if the new auxiliary request is clearly allowable, that is to say clearly overcomes the objections raised (see the Case Law of the Boards of Appeal, 5th edition, 2006, chapter VII.D.14.2.1 and 14.2.3).

3.2 The Board's communication annexed to the summons for oral proceedings, in which it was merely stated that the amended claims of the two auxiliary requests filed with the grounds of appeal will be examined with respect of Article 123(2) EPC, is not a proper justification for withdrawing these two requests and replacing them by ten new requests.
Therefore, no sound reasons exist for filing these ten new requests at this stage of the appeal proceedings.

3.3 Furthermore, the amended claims are not clearly or obviously allowable, i.e. the amendments do not successfully address the issues raised without giving rise to new ones (see T 0087/05, point 2).

3.3.1 Auxiliary request 1

In Claim 1 of the first auxiliary request the limiting feature is introduced that the compressor is of a "clutchless" type.

D4 does not indicate whether the compressor is connected to the engine through a clutch or not.

However, D2 discloses a clutchless vehicle air-conditioner compressor of a variable displacement type.

Furthermore, it is common knowledge for the skilled person that in a variable displacement compressor the swash plate can be tilted such that the compressor runs idle, i.e. with almost no delivery, and that therefore it is not necessary to provide a clutch to stop it.

Accordingly, the skilled person would provide a vehicle air-conditioner compressor according to D4 with or without a clutch according to circumstances without exercising any inventive skill.

The Appellant argued that even if the delivery of the compressor of D4 would be brought to a minimum, this would not prevent frost and that therefore the compressor of D4 must be equipped with a clutch so that the compressor can be stopped.

However, this argument is not convincing because in the contested patent where the same type of variable displacement compressor is used, frost can be prevented without stopping the compressor.

Thus, claim 1 of the first auxiliary request is not clearly allowable having regard to the requirement of inventive step.

3.3.2 Auxiliary request 2 and 3

Claim 1 of auxiliary requests 2 and 3 comprises the following additional features "said value of electric current is adjusted in accordance with said temperature deviation."

The Appellant submitted that this amendment was based on the passage, page 12, line 32 to page 13, line 2 of the original description.

However, this passage is taken out of a paragraph which reads "A large difference between the temperature in the passenger compartment, which is detected by the temperature sensor 56a, and the temperature set by the temperature controller 56 indicates that cooling is greatly needed. In such a case, the computer Ca adjusts the value of the electric current that flows through the solenoid 32 in accordance with…"

Thus the additionally claimed features are only disclosed in the specific case where a large difference between the temperature in the passenger compartment and the set temperature is detected.

Without limitation to this particular case, the additional features constitute an unallowable intermediate generalisation under Article 123(2) EPC.

Accordingly claim 1 of auxiliary requests 2 and 3 is not clearly allowable having regard to the provisions of Article 123(2) EPC.

3.3.3 Auxiliary requests 4 and 5

Claim 1 of auxiliary requests 4 and 5 comprises the following additional features that "the compressor has

a shutter member (21) for preventing refrigerant from being delivered outside the compressor when the displacement of the compressor is at a minimum".

The Appellant argued that these amendments are supported by claims 19 and 20 as originally filed, as well as by the passage page 17, line 16 to page 18, line 12 of the original description.

However, claims 19 and 20 refer back to independent claim 18 which relates to a clutchless variable displacement compressor comprising inter alia "a pressure sensitive member (52) responsive to a suction pressure for transmitting variation of said suction pressure to said valve body".
This specific member is only present in the compressor according to the first embodiment (Figures 1-5). Therefore, claims 19 and 20 can only support an amended claim where the shutter member is claimed together with the pressure sensitive member of the first embodiment.

Furthermore, in the passage of the description referred to by the appellant, the shutter is disclosed only together with a positioning surface (27), a thrust bearing (28), the swash plate (15) and the suction passage (26). Since there is clearly a close functional or structural relationship between these features, it amounts to an unallowable amendment to isolate the feature concerning the shutter member from its combination with the other features when adding it to the claim.

Accordingly, claim 1 of auxiliary requests 4 and 5 is not clearly allowable having regard to the provisions of Article 123(2) EPC.

3.3.4 Auxiliary requests 7 and 8

Claim 1 of auxiliary requests 7 and 8 comprises the following additional features

"h1) the control means (Ca; Cb; Cc) energize the solenoid (32) when the passenger compartment temperature becomes equal to or higher than the temperature set by the temperature controller (56)" and "h2) the control means (Ca; Cb; Cc) increase the value of electric current to increase the inclination of the swash plate (15) when cooling is greatly needed, and decrease the value of electric current to decrease the inclination of the swash plate (15) when the requirement for cooling becomes low".

The Appellant submitted that feature h1) was based on the passage, page 12, lines 3 to 27 of the original description. In this passage it is stated "When the switch 40 is turned on and the temperature in the passenger compartment detected by the temperature sensor 56a …" However, h1 makes no reference to the presence of a temperature sensor for detecting the temperature of the passenger compartment.

The Appellant further considered that feature h2) is supported by the passages page 12, line 29 to page 14, line 4 and page 14, line 17 to page 15, line 15. However in these passages the control means are disclosed only together with a temperature sensor and a shutter member located between the crank chamber and the suction chamber.

It is not admissible to isolate a feature h1) or h2) from a set of features originally disclosed in combination in an embodiment when the isolated feature has a functional relationship with the other features that is inter alia with the temperature sensor or a shutter member located between the crank chamber and the suction chamber, these two chambers being connected by a conduit.

Accordingly claim 1 of auxiliary requests 7 and 8 is not clearly allowable having regard to the provisions of Article 123(2) EPC.

3.3.5 Auxiliary requests 9 and 10

Claim 1 of auxiliary requests 9 and 10 the features h1) and h2).

For the same reasons as given in section 3.3.4 above claim 1 of auxiliary requests 9 and 10 is not clearly allowable having regard to the provisions of Article 123(2) EPC.

3.4 As there is no clearly allowable auxiliary request, all of the auxiliary requests are not admitted into the proceedings.

Order

For these reasons it is decided that:

The appeal is dismissed.

The registrar: The Chairman:

G. Magouliotis M. Ceyte