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**Datasheet for the decision
of 15 December 2011**

Case Number: T 1219/09 - 3.2.03

Application Number: 01952270.5

Publication Number: 1295070

IPC: F25B 9/00

Language of the proceedings: EN

Title of invention:

Nonflammable mixed refrigerants (MR) for use with very low temperature throttle-cycle refrigeration systems

Patentee:

Brooks Automation, Inc.

Opponent:

TFI Telemark

Headword:

-

Relevant legal provisions:

EPC Art. 56

Relevant legal provisions (EPC 1973):

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Keyword:

"Inventive step (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 1219/09 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 15 December 2011

Appellant: TFI Telemark
(Opponent) 20936 Cabot Blvd.
Hayward CA 94545 (US)

Representative: Ellis, Robin Patrick
Reddie & Grose
16 Theobalds Road
London WC1X 8PL (GB)

Respondent: Brooks Automation, Inc.
(Patent Proprietor) 15 Elizabeth Drive
Chelmsford, MA 01824 (US)

Representative: Jenkins, Peter David
Page White & Farrer
Bedford House
John Street
London WC1N 2BF (GB)

Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
9 April 2009 concerning maintenance of European
patent No. 1295070 in amended form.

Composition of the Board:

Chairman: U. Krause
Members: C. Donnelly
K. Garnett

Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division, posted on 9 April 2009, maintaining European patent no. EP-B-1295070 in amended form.
- II. The opponent (hereinafter: "the appellant") filed a notice of appeal on 8 June 2009 and paid the fee the same day. The grounds of appeal were filed on 19 August 2009.
- III. The patent proprietor (hereinafter: "the respondent") replied to the appeal by letter of 31 December 2009.
- IV. In support of its case for the revocation of the contested patent, the appellant referred to the following documents:
- O2: JP-5-118677 and English translation thereof;
O3: JP-11-310775 and English translation thereof;
O4: US-6 076 372;
O5: EP-0 882779;
O6: 1998 ASHRAE Refrigeration Handbook- Chapter 7; Lubricants in Refrigerant Systems, pages 7.1-7.7;
O7: New Chemical Alternatives for the protection of Stratospheric Ozone - Darryl D. MesMarteau and Adolph L. Beyerlein, United States Environmental Protection Agency, published February 1998;
O11: "Retrofit Guidelines for Suva 95 (R-508B),4/99.
- V. In addition, the appellant filed the results of tests carried out to show that the composition of an as-charged refrigerant meeting the requirements of Table 10 of O4 also falls within the ranges of claim 1

at the evaporator. During the oral proceedings the appellant withdrew this submission.

VI. In a communication dated 22 August 2011 pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings, the board informed the parties of its provisional opinion. In particular, the board indicated that document O2 appeared to be particularly relevant for the question of inventive step.

VII. Oral proceedings were held on 15 December 2011.

At the close of the debate the parties confirmed the following requests:

The appellant (opponent) requested that the decision under appeal be set aside and that the European Patent No. 1295070 be revoked.

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

VIII. Claim 1 as maintained by the opposition division reads:

"A refrigeration system operating at temperatures in the range of -50°C and -200°C , wherein the refrigeration system utilizes a refrigerant blend not containing HCFC, the refrigeration system comprising an evaporator at a temperature as low as 155K, wherein the refrigerant blend is selected from the following refrigerants comprising, in mole percent:

Component	Overall range (mole%)
At least one of argon(Ar) or nitrogen (N2)	0.0-40.0%
R-14	5.0-50.0%
R-23	5.0-40.0%
R-125	0.0-40.0%
R-134a	0.0-30.0%
At least one of R-236fa or R245fa	0.0-30.0%
At least one of E-347 or R-4112	0.0-20.0%
provided that at least one of R-236fa,R245fa,E-347, or R4112 is present in the blend	

wherein the mole percents of the refrigerants are the mole percents in circulation through the evaporator; and wherein the refrigerant blend further comprises a POE type or PAG type lubricating oil."

IX. The relevant arguments of the parties can be summarised as follows:

Appellant

The subject-matter of claim 1 as maintained by the opposition division does not involve an inventive step in view of O2 in combination with O3 and/or O7.

A relative atomic mass or relative molecular mass analysis of figure 5 in O2 reveals a refrigerant blend

which only differs from that of claim 1 of the patent as maintained in that it comprises $C_2HCl_2F_3$ (HCFC-123 or R-123) as opposed to at least one of E-347, R4112, R-236fa and R-245fa. It may be that the composition given in figure 5 is for the as charged composition, but nevertheless the relative amount of the components will still be within the broad ranges specified in claim 1 at the evaporator.

However, paragraph [0002] of O3 states that HCFC-123 is scheduled to be abolished in the future and replacements such as HFC-245fa are being studied. O7 indicates in Table 3 that HFC-245fa is a suitable alternative for HCFC-123. Thus, the skilled person is given a clear hint to replace HCFC-123 by HFC-245fa.

The final sentence of paragraph [0002] and paragraph [0004] of O3 point to the fact that acceptable lubricant compatibility for HFCs is obtainable by using a lubricant such as polyol ester (POE), polyalkyleneglycol (PAG) or polyvinylether (PVE). Furthermore, O6 indicates that "Polyol ester lubricants are used commercially with HFC refrigerants in all types of compressors" (see page 7.5, final sentence of the section "Synthetic lubricants").

Respondent

The blend in O2 requires R-123, which is an HCFC component. Thus, O2 is not the correct starting point for the skilled person trying to make an HCFC-free refrigerant blend.

However, even if the skilled person did decide to start out from O2, the mole amounts calculated by the appellant do not correspond to those in circulation through the evaporator.

Furthermore, O2 neither discloses a refrigerant blend comprising at least one of R-236fa, R-245fa, E-347 or R-4112, nor one further comprising a POE or PAG type lubricating oil. On the contrary O2 teaches at paragraph [0026] that two kinds of synthetic oil, namely Suniso 3GS and alkyl benzene, are suitable lubricants at such low temperatures. Thus, the skilled person has no need to look any further since O2 already provides a solution.

Also, the Montreal Protocol does not mention the phasing out of HCFCs, Thus, there is legislative pressure to modify the blend of O2.

Therefore, the objective technical problem to be solved is one of providing a refrigerant blend that can be used in a compressor based refrigeration system down to temperatures as low as 155K without encountering freeze-out and providing good refrigerant effect.

O3 cannot give the skilled person faced with this problem a hint towards the solution of the contested patent since it does not deal with a refrigeration system operating at temperatures as low as 155K. Further, O3 does not disclose a refrigerant blend, but a sole refrigerant, namely R-245fa.

Under these circumstances, the skilled person would only consult O3 with the benefit of hindsight, besides

which, a combination of O2 and O3 would not lead to the subject-matter of claim 1 since neither discloses a POE or PAG type lubricating oil.

Neither does O6 help the skilled person seeking a suitable lubricant for operating down to temperatures as low as 155K since it does not give any examples of lubricants suitable for use at such temperatures.

Reasons for the decision

1. The appeal is admissible.
2. *Interpretation of claim 1*
 - 2.1 Claim 1 requires at least one of R236fa or R245fa in a range from 0 to 30% and at least one of E-347 or R4112 to be present in a range from 0 to 20%. Additionally, it is specified that only one of these four components need be present, as opposed to at least one from each pair as would seem to be implied by the first requirement. However, there is no contradiction since the ranges concerned comprise the value "zero". Thus, in order for a blend to fall within the requirements of the claim, there need only be one of these components present.
 - 2.2 The claim requires that the mole percents of the refrigerants are those in circulation through the evaporator as opposed to the charge composition at the compressor. A difference occurs between these two values when a phase separator is present in the refrigerating system (see the application as published,

page 31, line 21 to page 32, line 4). Systems with and without separators are covered by the claim.

- 2.3 The wording "wherein the refrigerant blend is selected from the following refrigerants comprising...." used in claim 1 does not impose a requirement that the components of the blend to add up to 100%. This is borne out by claim 2 as maintained which specifies that the blend "further comprises at least one additional component in the blend....."

3. *Inventive Step*

- 3.1 The respondent has argued that O4 should be taken as the nearest prior art. However, although this document discloses a number of preferred mixtures of refrigerant for very low temperature refrigeration (see tables 7 to 15) these are defined by wide ranges for the individual components and no explicit examples of refrigerant blends are given. Further, the question of suitable lubrication is not addressed.
- 3.2 In view of this, the Board considers O2 to be the most relevant art since this document describes a refrigeration system comprising an evaporator (15) operating at a temperature as low as 155K(-118°C), wherein the refrigerant blend can be used in a compressor based refrigeration system down to temperatures as low as 155K (-118°C) without encountering freeze-out and providing good refrigerant effect (see paragraph [0001]), i.e. it aims to solve exactly the same problem as the contested patent.

- 3.3 Further, O2 is the only document which specifically discloses a refrigerant blend comprising both R-14 and R-23 as principal components.
- 3.4 The subject-matter of claim 1 therefore differs from that disclosed in O2 in that
- i) the blend contains no HCFC
 - ii) the blend comprises a presence of R-236fa, R-245fa, E-347 or R-4112,
 - iii) the blend further comprises a POE type or PAG type lubricating oil.
- 3.5 The board does not agree with the objective technical problem proposed by the respondent since the blend according to O2 already provides a solution to it.
- 3.6 Rather the Board sees the objective technical problem facing the skilled person as one of maintaining the properties of the existing blend of O2 whilst bringing it into conformity with future requirements of the Montreal Protocol. This convention foresees the gradual phasing out of HCFC's (e.g. see O3 paragraph [0002]). Thus, there is legislative pressure to produce HCFC-free refrigerant blends.
- 3.7 The respondent's argument that O2 already proposes a solution for a refrigeration system in compliance with the Montreal Protocol is not convincing. The Montreal protocol foresees different phase-out dates for first and second generation ozone-depleting substances (ODS). First generation substances, such as for example CFCs,

were phased out by 1 January 1996. HCFCs are second-generation substances which, on account of their low ozone-depleting potential, were given later phase-out dates in order to give the industry more time to adapt; production cut deadlines started in 2004 and complete phase-out is scheduled for 1 January 2030.

3.8 Thus, O2 is a response to the initial demands of the Montreal Protocol imposing urgent removal of CFCs. However, with looming imposition of production cuts in HCFCs, the skilled person would be forced to look into seeking a suitable substitute for these substances as well.

3.9 O7, which would have been accorded specific relevance by the skilled person since it was published by the US Environmental Protection Agency, indicates in Table 3 in conjunction with page 2, middle column, final sentence, that HFC-245fa (R-245fa) is apparently the best candidate alternative for HCFC-123 (R-123) based on a comparison of their thermophysical properties.

3.10 Thus, the skilled person seeking to solve the above problem is given a direct hint by a government agency charged with enforcing the legislation in question as to a recommended alternative for HCFC-123 and would expect a reasonable chance of success when making this substitution in blends such as those disclosed in O2 given the similarity of the thermophysical properties: in particular, the boiling point of R-245fa being 15°C (cf. 28°C for R-123) and its freezing point being -102°C (cf. -107°C for R-123).

- 3.11 The respondent has argued that the ranges given in figure 5 of O2 relate to the as-charged composition and not to that passing through the evaporator and the values are not comparable with those of the contested patent.
- 3.12 The board does not accept this point of view. It is evident that the phase separators present in the system of O2 would first remove the majority of the high boiling point components, especially R-123 or its replacement R-245fa, as the temperature dropped towards the evaporator. However, using the mole% as calculated by the appellant in its letter of 19 August 2009, page 7), if almost all of the R-123 (boiling point of 28°C) or R-245fa (boiling point 15°C) were to be separated out to leave just a presence, complete removal not being obtainable, the blend composition would be within the ranges claimed. If additionally the R-134a (boiling point -26.3°C) were to be largely removed the relevant amounts of the remaining components would still remain within the broad ranges claimed.
- 3.13 Thus, even though the blend composition disclosed in O2 is not defined at the evaporator it is inevitable that the blend composition will fall within the range claimed at the evaporator operating as low as minus 118°C when the obvious substitution of R-123 by R-245fa is made. Merely changing the definition of where the components of a composition are to be measured is not in itself sufficient to distinguish one composition from another but, rather, may mask a lack of novelty, especially where broad ranges are concerned.

- 3.14 The respondent's argument that the skilled person would not have expected any success using HFC-245fa since it has a freezing point of 171K (minus 102°C) and therefore would be expected to freeze at the operating temperatures encountered is not persuasive. R-123 has a freezing point of 166K (minus 107°C) and so would also have been expected to freeze. Thus, the skilled person would have a reasonable expectation that, upon substitution, the same type of thermophysical process would occur, not least of which is that in the circuit of O2 the majority of the components would be removed in the phase separators.
- 3.15 The skilled person also knows that the substitution of HFC-245fa for HCFC-123 poses another problem in terms of finding a suitable lubricant (see for example paragraph [0012] of the contested patent).
- 3.16 O6, which is a standard handbook and would be a first point of reference for the skilled person faced with a problem of lubricant selection, states in the final paragraph of the section "Synthetic Lubricants" that POEs (polyol esters) are used commercially with HFC refrigerants.
- 3.17 Additionally, O3, although dealing with a higher temperature system using a single refrigerant, confirms that R-245fa (HFC-245fa) is a substitute for HCFC-123 and suggests using POE or PAG lubricants as a solution to the lubricant compatibility problem (see paragraphs [0002] and [0004]).
- 3.18 The respondent's argument that the skilled person would have no reason to deviate from the lubricants suggested

- for use at low temperatures in paragraph [0026] is not convincing since the lubricant incompatibility problem only arises once the substitution of HCFC-123 by HFC-245fa has been made.
- 3.19 The further argument that O6 gives no hint to the skilled person about which lubricants to use at extremely low temperatures also fails to convince since simply trying out a proven solution at lower temperatures does not require any inventive activity since finding the limits of the existing composition would be the first step in routine testing.
- 3.20 Consequently, starting out from O2, the skilled person is led directly to the subject-matter of claim 1 by a combination of legislative pressure and a standard handbook.
- 3.21 The respondent's arguments relating to an unexpected freezing point depression effect in the very low temperature range which occurs despite R-245fa having a higher freezing point than the corresponding HCFC refrigerant (i.e. R-123) are not convincing. Not only is the respondent apparently claiming the effect for several different components, each of which can be present in only the slightest quantity, but also in the case of R-245fa and R-123 there is little difference in the freezing points. Moreover, since the skilled person is any case led to the refrigeration system claimed in an obvious manner by straightforward considerations of legal conformity and standard handbook proposals, any surprising effect, if present, must be considered as a bonus.

3.22 Consequently, the subject-matter of claim 1 does not meet the requirements of Article 56 EPC since it does not involve an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

Registrar:

Chairman:

D. Hampe

U. Krause