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**D E C I S I O N**  
**of 26 February 1998**

**Case Number:** T 0181/94 - 3.3.1

**Application Number:** 88908343.2

**Publication Number:** 0349647

**IPC:** C09K 5/00

**Language of the proceedings:** EN

**Title of invention:**  
Refrigerant

**Applicant:**  
Daikin Industries, Limited

**Opponent:**  
-

**Headword:**  
Refrigerant/DAIKIN

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Use of known composition (non-obvious)"  
"Common general knowledge (not established)"

**Decisions cited:**  
-

**Catchword:**  
-



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Boards of Appeal

Chambres de recours

Case Number: T 0181/94 - 3.3.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.1  
of 26 February 1998

**Appellant:**

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**Representative:**

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**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 5 October 1993  
refusing European patent application  
No. 88 908 343.2 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** A. J. Nuss  
**Members:** P. Krasa  
W. Moser

## Summary of Facts and Submissions

I. This appeal lies from the Examining Division's decision refusing the European patent application No. 88 908 343.2, with the publication No. 0 349 647, and claiming a priority date of 21 September 1987, for not complying with the requirements of Articles 52(1) and 56 EPC.

II. The decision was rendered on the basis of four claims which were submitted by the Appellant (applicant) in the course of the examination proceedings. Independent Claim 1 read as follows:

"Use of a composition comprising 1,1,1-trifluoroethane and either chlorotetrafluoroethane or tetrafluoroethane as a refrigerant."

III. The stated ground of refusal in the decision under appeal was that whereas the use of the compositions as defined in the claims of the application in suit as refrigerants was not known, the compositions per se and their use as propellants were known from the document

(1) FR-A-2 361 454.

The Examining Division, relying also on

(2) "The Condensed Chemical Dictionary",

argued that it would have been obvious for a person skilled in the art to try the excellent propellant composition known from document (1) as refrigerants to solve the underlying technical problem, since the components of this propellant composition were members of the range of products known under the trademark Freon, which series of products were used in

refrigeration and as aerosol propellants. The technical problem was seen by the Examining Division to be the development of refrigerants having a high coefficient of performance (COP) and little effect on the atmospheric ozone layer.

IV. The Board, on its own motion, considered the documents

- (3) Kirk-Othmer, "Encyclopedia of Chemical Technology", Third Ed., vol. 10, John Wiley & Sons, Inc. 1980,
- (4) Kirk-Othmer, "Encyclopedia of Chemical Technology", Fourth Ed., vol. 21, John Wiley & Sons, Inc. 1997,
- (5) Quinston, Parker, "Heating, Ventilation, and Air Conditioning Analysis and Design", Fourth Ed., John Wiley & Sons, Inc. 1994,
- (6) Langley, "Refrigeration and Air Conditioning", Third Ed., Prentice-Hall, 1986, and
- (7) Sax, Lewis, "Hawley's Condensed Chemical Dictionary", Eleventh Ed., Van Nostrand Reinhold Company Inc. 1987.

V. The Appellant, with the statement of grounds for appeal, submitted a new set of three claims, which he replaced in the course of oral proceedings, taking place on 26 February 1998, by a single claim reading

"Use of a composition comprising 5-40% by weight 1,1,1-trifluoroethane and 60-95% by weight 1,1,1,2-tetrafluoroethane as refrigerant."

VI. The Appellant submitted that the basic problem underlying the invention as disclosed in the application in suit was the need to develop substitutes for the well known chlorofluoromethane derivatives Flon 12 and Flon 22 which had to be replaced as refrigerants due to their detrimental effects on the stratospheric ozone layer. He argued essentially that 1,1,1-trifluoroethane (Flon 143a) had never been used as a refrigerant because of its low COP. He concluded that the Examining Division's statement according to which the use of Flon 143a as a refrigerant was common general knowledge was not well founded .

He further submitted that there was no teaching available in the prior art, which would have led a skilled person to expect that the compositions known from citation (1) as propellants could be used as high performance refrigerants.

He emphasised that the spectrum of properties which qualify a particular compound or composition as a propellant differs from that which is relevant for its use as a refrigerant. Finally, he submitted that since the compositions to be used according to the application in suit were no azeotropes, they allowed to broaden the temperature range of their application and, thus, their operating range.

VII. The Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the single claim submitted during oral proceedings.

## Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*
  - 2.1 Apart from the change from a composition claim to a use claim, which is supported by the whole contents of the application as filed, the single claim submitted during oral proceedings corresponds in principle to Claim 4 as originally filed. The restriction of the tetrafluoroethane used to 1,1,1,2-tetrafluoroethane (Flon 134a) is supported by the passage on page 4, line 5 and by the examples 7 to 12 on page 8 of the application as filed.
  - 2.2 The amended claim is also clear. Thus, no objections arise against this claim under Articles 84 and 123(2) EPC.
3. *Novelty*
  - 3.1 The Board is satisfied that the subject-matter of the claim is not disclosed in any of the citations on file. This not being in dispute, the Examining Division having already acknowledged novelty for claims having a broader scope than the present one, it is not necessary to give detailed arguments in this respect.
4. *Inventive step*
  - 4.1 For the following, it is appropriate to note that Flon 143a, HFC 143a, fréon 143a, and Freon 143a are synonyms for the chemical compound 1,1,1-trifluoroethane, as are Flon 134a, HFC 134a, fréon 134a, and Freon 134a for the chemical compound 1,1,1,2-tetrafluoroethane.

4.2 The application in suit relates to the use of a composition comprising 5-40% by weight Flon 143a and 60-95% by weight Flon 134a as a refrigerant. The use of halogenated hydrocarbons as refrigerants was well known in the art prior to the priority date of the present application. In particular chlorinated fluoro alkanes such as chlorodifluoromethane (Flon 22) and dichlorodifluoromethane (Flon 12) had found broad application in refrigerators and air conditioning systems (see the application as published, page 2, lines 11 to 25). It is beyond doubt that this uncontested state of the art was part of the common general knowledge of those skilled in the art of refrigeration at the priority date of the application in suit. It was also known that these refrigerants exerted a detrimental effect on the earth's ozone layer (see, eg document (3), the paragraph bridging pages 864 and 865, and page 865, penultimate paragraph).

4.3 Therefore, the technical problem underlying the application in suit was, as already stated by the Examining Division, to provide refrigerants having little influence on the ozone layer and a high COP which, in the Board's judgement, means that they can be used economically.

4.4 In respect to the issue of whether the technical problem was solved by the solution as claimed in the application in suit, the Board considered, as expert opinions, documents (4) and (5). Both documents confirm indeed that chlorine-free fluorohydrocarbons are less harmful to the ozone layer than the chlorofluorohydrocarbon refrigerants and were used to replace the latter for this reason (document (4), the paragraph bridging pages 132 and 133, and document (5), the fourth complete paragraph on page 634).

Moreover, a comparison of the Comparative Example 1 with the Examples 7 to 12 of the application in suit demonstrates that the compositions defined in the claim have a COP which is higher than that of pure Flon 143a (see the first entry in Table 2 on page 4, and Table 4 on page 5 of the application as published) and are in the range of from 3.68 (Example 7; Flon 143a : Flon 134a = 90 : 10 by weight) to 4.24 (Example 11; Flon 143a : Flon 134a = 20 : 80 by weight). For conventional chlorofluorohydrocarbon refrigerants COP values between 2.010 and 5.025 are reported (for R-502 and R-11, respectively; document (6), Table 9-9 on page 180, and Table 9-6 on page 178). The COP values of the compositions to be used in accordance with the claim of the application in suit being well within the range of broadly used conventional refrigerants, the Board concludes that the claimed subject-matter fulfills also the second requirement of the existing technical problem (see point 4.3 above).

Therefore, the Board is satisfied that the claimed subject-matter solves the underlying technical problem as defined above and concurs in this respect with the findings of the Examining Division.

4.5 However, the Board cannot join the Examining Division's opinion that the use as a refrigerant of the respective compositions was obvious in view of document (1).

4.5.1 Citation (1) relates to propellants and discloses, inter alia, binary propellant mixtures of 5 to 60% by weight of Flon 143a and of 40 to 95% by weight of Flon 134a (Claim 10 in combination with Claims 3 and 4; a mixture of these two components, designated as 'fréons



143a + 134a', is also disclosed on page 5, lines 3 to 5, as a preferred binary mixture). Document (1) discloses that the compositions concerned meet all requirements for a use as a propellant; in particular, they have

- the appropriate vapour pressure,
- a high solvent power, and
- a density, which is close to that of water, and

they are

- noninflammable,
- stable against hydrolysis under neutral and acidic conditions,
- chemically inert, and
- (practically) non-toxic

(see page 4, lines 9 to 16, and page 6, lines 32 to 39).

4.5.2 The Board accepts that at least a number of the above properties are also valuable features of a refrigerant. However, there is no indication at all in document (1) that 'fréons 143a + 134a' could be used as a refrigerant, let alone that the thermodynamic properties, such as heat of vaporisation, heat capacity, etc., which are important for the latter application, would be appropriate and qualify these compositions as refrigerants with the desired high COP. Thus, in the absence of further information,

document (1), which is completely silent on those properties crucial for solving the existing technical problem, cannot render obvious the claimed solution of the latter.

4.5.3 The Examining Division, relying seemingly on common general knowledge the existence of which was contested by the Appellant, argued that it would have been merely a matter of routine for a skilled person to consider the propellants known from document (1), in particular 'fréons 143a + 134a', as refrigerants, since the components of the latter were known to be used under their trademarks Freon 143a and Freon 134a in refrigeration and as aerosol propellants. In support, the Examining Division referred to a document (2) labelled as "The Condensed Chemical Dictionary" giving neither any further information on the bibliographic data of this book nor on the particular passages or pages considered to be relevant. The Board cannot accept such a citation as proper evidence for supporting the alleged common general knowledge unambiguously, since the poor information available on it does not allow to identify this evidence. It is not even clear, whether or not this reference had been published prior to the priority date of the application in suit.

4.5.4 The Board, on its own motion, refers to document (7), the only book it could trace with a title similar to the designation of document (2) as given by the Examining Division. In document (7), the following entry can be found under the heading "**Freon**":

"TM for a series of fluorocarbon products used in refrigeration and air-conditioning equipment, as blowing agents, fire extinguishing agents, and cleaning fluids and solvents . . . . For listing of specific types, see fluorocarbon." (page 541, right hand column).

Under the heading **fluorocarbon** one finds:

"... Use: Refrigerants, solvents, blowing agents, fire extinguishment, lubricants and hydraulic fluids, floatation and damping fluids, dielectric, plastics, electrical insulation, wax coatings for alkali cleaning tanks, air conditioning ..." (page 531, right hand column).

4.5.5 The quoted passages inform the skilled person that within the range of products called "Freon" there exist products which may be used, e.g. as a refrigerant, and products which may be used as propellants. However, they cannot be construed as teaching that **all** the "Freon"-products can be employed in **all** the cited various fields of application. Thus, this document (7), which perhaps was meant by the Examining Division when referring to document (2), cannot establish the existence of common general knowledge according to which **any** "Freon"-product, which can be used as a propellant, can also be used as a refrigerant. The Board is not aware of any other evidence in this respect. Neither did the Examining Division provide convincing evidence to that end, especially not for Flon 134a and Flon 143a, which products are both **not mentioned** in document (7).

4.5.6 In the absence of any relevant common general knowledge, the Examining Division's assumption is not well founded that a skilled person would have tried the compositions disclosed in document (1) as refrigerants

because of their known applicability as propellants. Rather, it is the result of an interpretation of the contents of document (1) with the benefit of knowing the disclosure of the application in suit, and is thus not suitable for demonstrating the obviousness of the claimed subject-matter.

4.5.7 Moreover, both documents (4) and (5), published 1997 and 1994, respectively, report on the efforts and the ongoing research to replace the conventional refrigerants exerting a detrimental effect on the earth's ozone layer (see point 4.2 above) by hydrofluorocarbons such as HFC 134a (document (4), page 137, lines 9 to 11,; document (5), page 634, last and last but one complete paragraph). This demonstrates, in the Board's judgement, that it was far from being obvious for those skilled in the art, even in the mid-1990s, let alone at the priority date of the application in suit, to simply use any known Fluoro-propellant - and consequently also the mixture of Fluoro 134a with Fluoro 143a known from document (1) - as such a substitute refrigerant.

4.5.8 For these reasons, the Board comes to the conclusion that the solution of the existing technical problem as claimed in the application in suit was not rendered obvious by document (1) or any other document on file, either alone or in combination, but that it involves an inventive step and that it complies, therefore, with the requirements of Article 56 EPC.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order to grant a patent with the claim submitted during oral proceedings and a description to be adapted thereto.

The Registrar:



P. Martorana

The Chairman:



A. Nuss

