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Datasheet for the decision of 25 April 2023

Case Number: T 1498/19 - 3.3.10

Application Number: 09773598.9

Publication Number: 2324092

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Language of the proceedings: EN

Title of invention:
REFRIGERANT COMPOSITION COMPRISING 1,1,1,2-TETRAFLUOROETHANE (HFC134a) AND 2,3,3,3-TETRAFLUOROPROPENE (HFO1234yf)

Patent Proprietor:
Daikin Industries, Ltd.

Opponents:
Arkema France
Mexichem Amanco Holding S.A. de C.V.

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no)

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Catchword:

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Case Number: T 1498/19 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 25 April 2023

Appellant: (Patent Proprietor)	Daikin Industries, Ltd. Umeda Center Building 4-12, Nakazaki-Nishi 2-chome Kita-ku Osaka-shi Osaka 530-8323 (JP)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Respondent: (Opponent 1)	Arkema France DRD/Département Propriété Industrielle 420, rue d'Estienne d'Orves 92705 Colombes Cedex (FR)
Respondent: (Opponent 2)	Mexichem Amanco Holding S.A. de C.V. Rio San Javier No. 10 Fraccionamiento Viveros del Rio Tlalnepantla, Estado de Mexico C.P. 54060 (MX)
Representative:	Potter Clarkson Chapel Quarter Mount Street Nottingham NG1 6HQ (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 13 March 2019 revoking European patent No. 2324092 pursuant to Articles 101(2) and 101(3)(b) EPC.**

Composition of the Board:

Chair	P. Gryczka
Members:	R. Pérez Carlón
	F. Blumer

Summary of Facts and Submissions

I. The appellant (patent proprietor) appealed against the opposition division's decision revoking European patent No. 2 324 092.

II. This is the second appeal on the case. In T 1311/15, the board concluded that the claimed invention was sufficiently disclosed for it to be carried out by a skilled person and remitted the case to the opposition division for further prosecution.

III. Three notices of opposition had been filed on grounds that included lack of inventive step (Article 100(a) EPC). The opposition by opponent 3 was withdrawn during these appeal proceedings.

IV. The following documents are relevant to the present decision:

D2 WO 2006/094303
D13 1,2,2,2-Tetrafluoroethane, R134a, Safety Data Sheet 2003
D14 V. C. Papadimitriou *et al.* "$CF_3CF=CH_2$ and (*Z*)-$CF_3CF=CHF$: temperature dependent OH rate coefficients and global warming potentials" Physical Chemistry Chemical Physics, 2007, 9, 1-13
D16 Experimental report by Tatsumi Tsuchiya dated 11 September 2013

V. The appellant's requests, filed with the statement of grounds of appeal, are identical to the requests before the opposition division.

Claim 1 of auxiliary request 17 reads as follows:

"A refrigerant composition consisting of 40 mass% of 1,1,1,2-tetrafluoroethane (HFC134a) and 60 mass% of 2,3,3,3-tetrafluoropropene (HFO1234yf), or of 50 mass% of 1,1,1,2-tetrafluoroethane (HFC134a) and 50 mass% pf 2,3,3,3-tetrafluoropropene (HFO1234yf)."

It was undisputed that both compositions defined in claim 1 of auxiliary request 17 are embodiments of claim 1 of every higher-ranking request.

Claim 1 of the patent as granted, which was the appellant's main request, relates to a refrigerant composition comprising 36 to 50 mass% of HFC134a (134a) and 50 to 64 mass% of FHO1234yf (1234yf).

Each claim 1 of auxiliary requests 1 to 7 requires the same proportions of 134a and 1234yf as claim 1 of the patent as granted. In addition, claim 1 of auxiliary requests 1 to 4 has features seeking to exclude other refrigerants from the claimed compositions. Each claim 1 of auxiliary requests 5 to 7 requires the claimed composition to be non-flammable, or to be non-flammable under specific, defined conditions.

Claim 1 of auxiliary request 8 relates to a composition having 36 to 42 mass% of 134a and 58 to 64 mass% of 1234yf.

Like auxiliary requests 1 to 7, auxiliary requests 9 to 15 seek to limit the claimed mixture by excluding other refrigerants from the composition, or require the claimed composition to be non-flammable.

Lastly, claim 1 of auxiliary request 16 relates to a composition having the components and proportions defined in claim 1 of the main request and, in addition, requires the refrigerant to be a mixture of 134a and 1234yf in a ratio of 40/60 or 50/50.

VI. The opposition division concluded that the refrigerant compositions on pages 61 and 62 of D2 were the prior art closest to those in claim 1 of auxiliary request 17. The problem underlying the claimed invention was to provide alternative refrigerant compositions. The claimed solution, which was characterised by the required proportions of 134a and 1234yf, would have been obvious to a skilled person and was therefore not inventive.

VII. The appellant's arguments concerning the issue of inventive step were as follows:

Document D2 was the closest prior art. It disclosed binary mixtures of 134a and 1234yf which did not have the proportions required by claim 1 of auxiliary request 17. The technical problem underlying the claimed invention was to provide non-flammable refrigerant compositions having reduced global warming potential (GWP), no ozone depletion potential (OPD) and high refrigerant capacity. The solution was characterised by the mass proportion 134a/1234yf, which was 50/50 or 40/60. D16 demonstrated that the refrigerant capacity of the claimed compositions was higher than that which could have been expected. An effect of this kind could not have been foreseen and the claimed compositions were thus inventive.

The appellant did not dispute that the compositions in claim 1 of auxiliary request 17 were an embodiment of

claim 1 of all the requests on file.

VIII. Respondent 2 (opponent 2) agreed with the opposition division's conclusion that D2 was the closest prior art and that the problem underlying the claimed invention was to provide alternative refrigerant compositions. The claimed solution, characterised by the proportions of the components, would have been obvious to a skilled person and was thus not inventive.

IX. In a communication dated 23 December 2020, the board informed the parties of its preliminary view that it was likely to consider the claimed subject-matter not to be inventive.

X. Respondent 1 (opponent 1) made no substantive submissions during these appeal proceedings. It informed the board that it would not be attending the oral proceedings to which it had been summoned and which took place on 25 April 2023. Respondent 2 did not attend the oral proceedings, either.

XI. The parties' final requests were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or that the patent be maintained with the claims of any one of auxiliary requests 1 to 17, all auxiliary requests having been filed with the statement setting out the grounds of appeal.

Respondent 2 requested in writing that the appeal be dismissed.

XII. At the end of the oral proceedings, the decision was announced.

Reasons for the Decision

1. The appeal is admissible.

Auxiliary request 17 - inventive step

2. Claim 1 of auxiliary request 17 relates to two refrigerant compositions. The first one consists of 40 mass% of 134a and 60 mass% of 1234yf. The second consists of 50 mass% of each of them. These compositions will be referred to in the following in terms of their 134a/1234yf mass proportions as the 40/60 and 50/50 compositions.

3. Closest prior art

The opposition division and the parties considered that document D2 was the closest prior art. The board sees no reason to disagree.

Like the patent, D2 seeks to replace refrigerants such as 134a with others with lower global warming potential (GWP; page 1, lines 31 to 32).

Table 2 of D2 discloses binary mixtures of 134a and 1234yf having mass proportions of 1-99/99-1, preferably 70-1/30-99, most preferably 10/90 (page 15, entry 21).

Table 3 of D2 discloses a 30/70 mixture (entry 3, 29.6% 134a and 70.4% 1234yf), which is azeotropic (page 21, line 19).

In the passage bridging pages 61 and 62, Table 9 of D2 discloses a number of binary compositions, namely 1/99, 10/90, 20/80, 30/70, 60/40, 80/20, 90/10 and 99/1.

Table 10 of D2 discloses (page 79, entry 6) the COP (coefficient of performance) and capacity of a 10/90 composition. The values are only slightly poorer than those for 134a alone (first entry in Table 10).

D2 thus discloses binary mixtures of 134a and 1234yf which differ from the subject-matter of claim 1 only on account of the proportions of the components. The mixtures in D2 are suitable replacements for 134a as the refrigerant.

4. Technical problem underlying the invention

The appellant formulated the problem as that of providing a refrigerant composition that is suitable as a replacement for 134a with the following properties:

- non-flammable,
- low GWP,
- no ODP (ozone depletion potential), and
- high refrigerant capacity.

5. Solution

The solution to this technical problem is the claimed composition consisting of 134a and 1234yf, characterised in that the 134a/1234yf mass proportion is 40/60 or 50/50.

6. Success

In view of the experimental report, D16, it can be concluded that the claimed compositions have a high refrigerant capacity, close to that of 134a alone (see Figure A).

According to Test Example 2 of the patent, these compositions are not flammable.

It is known from the prior art that 134a and 1234yf have no ODP (see D2: page 1, lines 25 and 26; D14: page 1, right-hand column, lines 37 to 39 and 55 to 59).

It is also known from the prior art that 1234yf has a low GWP (D14: page 1, right-hand column, lines 55 to 59). The combination of 1234yf with 134a inevitably leads to a refrigerant of which the GWP is lower than the GWP of 134a alone.

The problem as formulated by the appellant can therefore be considered to be credibly solved.

7. It thus remains to be decided whether the proposed solution to the objective problem defined above would have been obvious to a skilled person in view of the prior art.

7.1 The claimed invention seeks to provide non-flammable alternatives to 134a having no ODP, low GWP and high refrigerant capacity.

7.2 The following was known from the prior art as regards the properties sought by the claimed invention:

Flammability

It was known that 134a is not flammable (see point 5 of D13) and that 1234yf is flammable (Table 14 of D2, second entry).

GWP

It was also known that 134a needed to be replaced with a chemical or a blend (D14: right-hand column, lines 51 to 54; D2: page 1, lines 19 to 35). The reason was its high GWP, which is 1430 for a 100-year time horizon (D14: page 1, right-hand column, lines 42 to 44). The GWP of 1234yf is, in contrast, essentially zero (D14: page 1, right-hand column, lines 55 to 59).

ODP

The ODP of both components required by claim 1 is essentially zero (see D2: page 1, lines 25 and 26; D14: right-hand column, lines 37 to 39 and 55 to 59).

Refrigerant capacity

The refrigerant capacity of a 10/90 mixture under refrigerating conditions is 3.61 kW (see Table 10 of D2, sixth entry on page 79), which is comparable to that of 134a alone, which is 3.73 kW (see Table 10 of D2, first entry). A composition having 90% of 1234yf and only 10% of 134a thus has a refrigerant capacity which is only 3% less than that of pure 134a.

7.3 D2 discloses binary mixtures of 134a and 1234yf, and also discloses them as being suitable replacements for 134a.

A skilled person, seeking a non-flammable replacement for 134a containing 134a and 1234yf with no ODP, low GWP and high refrigerant capacity, would have sought the optimum balance of these properties by adjusting the proportions of the components.

In view of the known GWP values of the components, the

higher the proportion of 1234yf, the lower the GWP of the mixture; however, the proportion of 1234yf should not be too high, otherwise the mixture would become flammable. The refrigerant capacity of 134a/1234yf mixtures does not differ greatly from that of pure 134a, but the greater the proportion of 134a, the better the refrigerant capacity.

A skilled person would thus have expected an optimum balance of the proportions of 134a and 1234yf at which the mixture is not flammable, GWP is as low as possible and the refrigerant capacity is as high as possible. In seeking that optimum balance, a skilled person would have inevitably arrived at the claimed invention.

7.4 With reference to D16, the appellant argued that the refrigerant capacity of the 40/60 and 50/50 compositions in claim 1 of auxiliary request 17 was higher than that which would have been expected from the mere combination of the individual components. Since that effect could not have been foreseen by a skilled person, the claimed compositions were inventive.

However, a skilled person would have arrived at the claimed invention by seeking the optimum proportions of the binary mixtures in D2. This is the case regardless of whether or not that optimum proportion exhibited particular good performance. This argument is not convincing.

7.5 The compositions in claim 1 of auxiliary request 17 are thus not inventive (Article 56 EPC).

8. It was undisputed that the compositions in claim 1 of auxiliary request 17 are embodiments of claim 1 of

every one of the appellant's requests. The reasoning in the previous points applies analogously to the compositions in claim 1 of the main request and auxiliary requests 1 to 16.

Therefore, the ground of opposition set out in Article 100(a) EPC precludes the maintenance of the patent as granted, and none of the appellant's auxiliary requests is allowable.

9. In view of the board's negative conclusion on the issue of inventive step, it is not necessary to decide on any other point.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

C. Rodríguez Rodríguez P. Gryczka

Decision electronically authenticated