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**Datasheet for the decision
of 12 March 2019**

Case Number: T 2172/16 - 3.3.10

Application Number: 09743642.2

Publication Number: 2271724

IPC: C09K3/30, C09K5/04, C08J9/14,
C07C17/25

Language of the proceedings: EN

Title of invention:
COMPOSITIONS COMPRISING 2,3,3,3- TETRAFLUOROPROPENE

Patent Proprietor:
The Chemours Company FC, LLC

Opponents:
ARKEMA FRANCE
Mexichem Amanco Holding S.A. de C.V.
Daikin Industries, Ltd.

Headword:

Relevant legal provisions:
EPC Art. 100(a), 56
RPBA Art. 12(4)

Keyword:

Inventive step - (no) - all requests
Evidence filed before the opposition division and filed again
with the grounds of appeal - admitted in the absence of a
decision of the opposition division on its admissibility

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 2172/16 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 12 March 2019

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 11 July 2016
revoking European patent No. 2271724 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman P. Gryczka
Members: R. Pérez Carlón
W. Van der Eijk

Summary of Facts and Submissions

- I. The appellant (patent proprietor) lodged an appeal against the decision of the opposition division to revoke European patent No. 2 271 724.
- II. Three notices of opposition had been filed on the grounds of added subject-matter (Article 100(c) EPC), insufficiency of disclosure (Article 100(b) EPC), and lack of novelty and inventive step (Article 100(a) EPC).
- III. The documents filed during these proceedings include the following:
- D5 Invoice No. B147-203 from SynQuest Laboratories dated 13 August 2007
 - D18 3,3,3-trifluoropropyne, Safety Data Sheet, issued 31 August 2000
 - D25 EP 2 143 702 A1
 - D27 EP 1 716 216 A0, published under WO 2005/105947
 - D59 Morrison and Boyd, "Organic Chemistry", 3rd Ed. 1973, pages 254 and 257
 - D60 García, Sierra and Torrens, "Facile Cyclotrimerization of $\text{CF}_3\text{C}\equiv\text{CH}$ and $\text{CF}_3\text{C}\equiv\text{CCF}_3$ with Bimetallic Rhodium Catalyst" *Tetrahedron Letters* Vol 37, No. 34, pages 6097-6098, 1996
 - D65 CPO vs Capacity - Peng Robinson Equation of State
 - D66 Estimation of the Atmospheric Lifetime of Trifluoropropyne vs that of 1234yf
 - D67 Table containing properties of mixtures of TFA and 1234yf in various proportions

The opposition division concluded, *inter alia*, that the subject-matter of claim 1 and claim 2 of the third auxiliary request before it, which corresponds to the

subject-matter of claims 5 and 8 as granted, was not inventive.

- IV. Claims 1 and 3 of the patent as granted, which is the appellant's main request, read as follows:

"1. A composition comprising HFO-1234yf and 3,3,3-trifluoropropyne.

3. The composition of claim 1 containing less than 1 weight percent of 3,3,3-trifluoropropyne."

- V. The arguments of the appellant relevant for the present decision were as follows:

Document D27 disclosed HFO-1234yf as a refrigerant and was the closest prior art for the assessment of inventive step of the composition of claim 3 as granted. At the oral proceedings before the board, the appellant formulated the problem underlying the claimed invention as to provide a heat transfer composition with improved cooling capacity, an almost unchanged coefficient of performance and reduced global warming potential. The solution to this technical problem was the composition according to claim 3 of the patent as granted, which was characterised by containing 3,3,3-trifluoropropyne (TFP) in an amount of less than one weight percent. Even if the sole problem credibly solved by the claimed subject-matter were that of providing an alternative heat transfer composition, the proposed solution was still not obvious. Since global warming potential could not be predicted, the skilled person would have expected TFP to be too reactive for the claimed purpose, and its effect on the coefficient of performance could not have been foreseen. For this reason, the subject-matter of claim 3 as granted was

inventive.

VI. The arguments of the respondents (opponents) where relevant for the present decision were as follows:

Document D27 was the closest prior art. The problem formulated by the appellant was not credibly solved by the composition of claim 3 and should be reformulated as the provision of an alternative heat transfer composition. Document D25 disclosed TFP as suitable for such type of compositions, and the claimed solution would thus have been obvious for the skilled person. The claimed composition was, therefore, not inventive.

VII. Oral proceedings before the board of appeal took place on 12 March 2019.

VIII. The final requests of the parties were as follows:

- The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted or, alternatively, that the patent be maintained in amended form on the basis of one of its auxiliary requests 1-34, auxiliary requests 1-25 and 30-34 as filed on 21 November 2016 and auxiliary requests 26-29 as filed on 23 August 2018.
- The respondents requested that the appeal be dismissed.

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

Reasons for the Decision

The appeal is admissible.

Preliminary remarks

1. Since the board arrived at the conclusion that the subject-matter of claim 3 of the patent as granted, namely a composition comprising HFO-1234yf (1234yf) and 3,3,3-trifluoropropyne (TFP) in a relative amount of less than one weight percent is not inventive, and this negative conclusion also applies to the subject-matter of all the requests on file, it is not necessary to decide on the other issues raised by the parties.

Right to priority and document D25

2. It is undisputed that the patent in suit does not validly claim the right to priority. The state of the art as defined in Article 54(2) EPC thus comprises everything made available to the public before the filing date of the patent in suit, namely 7 May 2009.
3. Document D25 was published on 13 January 2010, i.e. after 7 May 2009 and is thus not state of the art as defined in Article 54(2) EPC for the claimed invention.

This document is, however, based on WO 2008/132964, published on 6 November 2008 and thus is state of the art, not in an official language of the EPO. The parties and the opposition division have relied on D25 as the translation into English of the corresponding international publication.

Documents D65, D66 and D69

4. The respondents requested that experimental evidence D65, D66 and D69 be held inadmissible by the board following Article 12(4) RPBA.

4.1 The opposition division did not take an explicit and reasoned decision of the admissibility of D65 and D66. Under these circumstances, the board is not in a position to decide whether the opposition division correctly used its discretion in this respect.

As D65 and D66 were filed again with the grounds of appeal by the appellant, and there was no decision from the opposition division on their admissibility during the proceedings before it, the board decided to admit them into the proceedings.

4.2 Document D69 was also filed with the grounds of appeal and provides global warming potential values of various substances, which are common knowledge in the field. The board sees no reason why D69 should not be admitted.

Inventive step

5. Claim 3 of the patent as granted relates to a composition comprising 1234yf and TFP, the latter being present in an amount of less than one weight percent of the claimed composition.

6. Closest prior art

The opposition division and the parties considered that document D27 was the closest prior art. The board sees no reason to differ.

It is undisputed that document D27 discloses 1234yf as

a refrigerant.

7. Technical problem underlying the invention

The appellant formulated the technical problem underlying the claimed invention as providing a heat transfer composition with improved cooling capacity, an almost unchanged coefficient of performance (COP) and a reduced global warming potential (GWP).

At the oral proceedings before the board, the appellant did not rely on any effect with respect to temperature glide of the claimed compositions.

8. Solution

The solution to this technical problem is the claimed composition, characterised in that it contains TFP in an amount of less than one weight percent.

9. Success; redefinition of the technical problem

Products used as refrigerants are not highly pure compounds (see D47). 1234yf was sold before the filing date with a purity of "97% min" (D5). The skilled person would have considered it as being of "technical grade".

The relative amount of TFP as defined in claim 3, namely, less than one weight percent, falls even at its upper limit well within the usual level of impurities of a pure compound in this technical field and includes, at its lower end, compositions merely containing traces of TFP.

It cannot be assumed in this technical area that adding

such a small amount of an additional fluorocompound to a compound known as an efficient refrigerant will have an effect on its heat transfer relevant properties with a technically relevant amplitude.

This is corroborated by the graph in document D65, which shows the variation in the COP of three different ternary mixtures. Although the slope of the combination 1234yf/TFP is lower than the other two mixtures, there is practically difference in the COP at one weight percent, regardless of the components considered.

Since the sole difference with regard to the closest prior art is the presence of a negligible amount of an additional compound, the board is not convinced that any technical problem other than merely providing an alternative is solved by the claimed subject-matter.

10. It thus remains to be decided whether the proposed solution to the objective problem defined above would have been obvious for the skilled person in view of the prior art.
- 10.1 The skilled person, trying to obtain an alternative heat transfer or refrigerant composition, would have considered adding traces of a further component, such as TFP, provided such an additional component were not deleterious for the intended use.
- 10.2 The skilled person would have considered TFP as a suitable component of heat transfer or refrigerant compositions for the following reasons.
 - 10.2.1 It is common ground that TFP has a boiling point lower than 1234yf. It is undisputed that cooling capacity depends on the boiling point of the refrigerant and

that it is enhanced by adding compounds with a lower boiling point. With regard to this property, TFP is thus a suitable component.

- 10.2.2 It is also common general knowledge that GWP is a function of atmospheric lifetime. According to document D66, GWP is linked to reactivity with chlorine under photolytic conditions. Any compound more reactive than 1234yf under these conditions would thus provide a suitable alternative in this respect.

Alkynes such as TFP share the reactivity profile of alkenes, including reaction with chlorine under photolytic conditions, and a triple carbon-carbon bond is more reactive than a double bond. Thus, the skilled person would have expected a small amount of TFP not to affect the GWP of 1234yf.

- 10.2.3 The skilled person would also have expected a composition comprising 1234yf and traces of TFP to have almost the same COP as 1234yf alone.

Document D65 provides a graphical representation of the COP versus cooling capacity of three binary mixtures. It can be seen from these results that adding to a refrigerant one percent by weight of another component leads, as expected, to a negligible change in the COP.

- 10.3 Thus, the skilled person, aiming at providing an alternative heat transfer composition having comparable properties to that of 1234yf in terms of cooling capacity, GWP and the COP would have considered adding very small amounts of a second fluorocarbon component such as TFP (which according to D25 "can become a functional material, such as a refrigerant" [0001], is more reactive and has a lower boiling point than

1234yf), and would thus have arrived at the claimed invention without using inventive skills.

For these reasons, the composition of claim 3 of the patent as granted is not inventive, as required by Article 56 EPC.

- 10.4 The appellant argued at the oral proceedings before the board that the GWP values could not be predicted and relied in this respect on document D69, which showed that GWP of HCFC-225cb was a quintuple that of its structural isomer HCFC-225ca. It argued that the skilled person could not have foreseen the properties of TFP in this respect, which could have turned out to be completely unsuitable.

However, the appellant acknowledged that GWP could be determined by measuring the reactivity of a compound with chlorine under photolytic conditions (D66, footnote), hence that GWP is directly linked to its reactivity, which is known to be higher for alkynes than alkenes. This argument is thus not convincing.

- 10.5 Lastly, the appellant argued that a compound bearing a triple bond would not have been considered a suitable component of a refrigerant since such a molecule would be too reactive for the intended purpose. The appellant relied in this respect on documents D59 and D60.

However, document D25 hints at the use of TFP as a refrigerant. The board fails to see why the skilled person would have considered that a composition comprising a minor amount of a compound, stable under normal conditions (D18, point 10), could not have been used for refrigeration purposes.

Document D59 merely discloses that terminal alkynes are acids that react more readily than alkenes, which is what the skilled chemist would have known.

Document D60 relates to the cyclotrimerisation of alkynes such as TFP in the context of coordination chemistry of a bimetallic Rhodium catalyst, which is by no means an indication of its stability under heat transfer conditions. Furthermore, D60 indicates that in the absence of this catalyst, very high temperatures are required for cyclotrimerisation (see first paragraph). Thus, D60, contrary to the appellant's argument, does not disclose TFP as unstable.

This argument is thus not convincing.

11. The appellant did not dispute that the conclusion on the subject-matter of claim 3 of the patent as granted on the issue of inventive step applies *mutatis mutandis* to every request on file. For these reasons, none of the compositions, uses and methods of these requests are inventive, within the meaning of Article 56 EPC.

Conclusion

12. The ground of opposition under Article 100(a) EPC precludes the maintenance of the patent as granted or on the basis of the appellant's auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



C. Rodríguez Rodríguez

P. Gryczka

Decision electronically authenticated