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**Datasheet for the decision
of 24 February 2021**

Case Number: T 0813/17 - 3.3.10

Application Number: 08840751.5

Publication Number: 2203402

IPC: C07C17/25, C07C21/18,
C07C19/08, C07C17/21, C07C17/23

Language of the proceedings: EN

Title of invention:
PROCESSES FOR SYNTHESIS OF FLUORINATED OLEFINS

Patent Proprietor:
Honeywell International Inc.

Opponent:
ARKEMA France

Headword:
PROCESSES FOR SYNTHESIS OF FLUORINATED OLEFINS/ HONYWELL

Relevant legal provisions:
EPC Art. 54, 56, 100(b), 123(2)
RPBA Art. 12(4)

Keyword:

Amendments - allowable (yes)

Grounds for opposition - insufficiency of disclosure (no)

Novelty - (yes)

Inventive step - (yes)

Decisions cited:

Catchword:



Beschwerdekammern

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Case Number: T 0813/17 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 24 February 2021

Appellant: ARKEMA France
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
8 February 2017 concerning maintenance of the
European Patent No. 2203402 in amended form.**

Composition of the Board:

Chairman P. Gryczka
Members: J.-C. Schmid
F. Blumer

Summary of Facts and Submissions

- I. The Appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division which found that the European patent No. 2 203 402 amended according to the then pending first auxiliary request met the requirements of the EPC.
- II. Notice of opposition had been filed by the Appellant requesting revocation of the patent-in-suit in its entirety on the grounds of lack of novelty and inventive step (Article 100(a) EPC), insufficient disclosure of the invention (Article 100(b) EPC) and extension of the subject-matter of the patent-in-suit beyond the content of the application as filed (Article 100(c) EPC).

Inter alia, the following documents were cited in the opposition proceedings

- (1) WO-A-2009/018561,
- (2) WO-A-2007/079431,
- (5) US-A-2007/0112230 and
- (15) WO-A-2009/158321.

- III. According to the Opposition Division, the subject-matter of claim 1 of the then pending first auxiliary request did not extend beyond the content of the parent application as filed and application as filed (Articles 100(c) and 123(2) EPC). The Opposition Division found that the patent in suit provided sufficient information for the skilled person to carry out the claimed process and that the opponent had not provided any evidence to the contrary. The patent-in-suit met therefore the requirement of sufficiency of disclosure. The subject-

matter of claim 1 of the then pending first auxiliary request was novel over documents (1) and (2). Document (15) was not prior art under Art. 54(3) EPC since the claimed subject-matter was entitled to the priority date of 15 October 2007. Document (5) disclosed a two-steps process to prepare HFO-1234yf comprising the fluorination of 3,3,3-trifluoropropene to yield HFC-245eb and the dehydrohalogenation of HFC-245eb to afford HFO-1234yf. The claimed process differed from the process of document (5) in that a different starting material was used in step (a). The problem to be solved was the provision of a safer process to prepare 2-halo-3,3,3-trifluoropropenes of formula (IV). The experimental data contained in the specification made credible that the process defined in claim 1 efficiently leads to the compounds of formula (IV) (see examples 1-5). There was no hint in document (5) nor in the cited documents to replace the 3,3,3-trifluoropropene by HCO-1230xa. Consequently, the subject-matter of the then pending first auxiliary request was not rendered obvious by document (5) alone or in combination with any other prior art documents. Hence, claim 1 of auxiliary request 1 met the requirements of inventive step (Article 56 EPC).

IV. In the letter setting out the grounds of appeal, the Appellant submitted that claims 1, 4 and 5 of the then pending first auxiliary request maintained by the Opposition Division introduced subject-matter which extended beyond the content of the parent application as filed. The subject-matter of the claims of the then pending claims lacked novelty over documents (1), (2) and (15). The closest prior art to the invention was document (5). The subject-matter of the then pending claims 1 to 13 lacked an inventive step over document

(5) combined with document (2) or in the light of document (5) alone.

- V. With the letter of response to the Appellant's grounds of appeal dated 12 October 2017, the Respondent filed five auxiliary requests.
- VI. In a communication pursuant to Article 15(1) RPBA sent on 7 November 2019, the Board *inter alia* indicated that it considered that claim 1 of the main request then pending did not satisfy the requirements of Article 123(2) EPC and sufficiency of disclosure. The Board furthermore indicated that claim 1 of auxiliary request 1, which was limited to the synthesis of HFO-1234yf, appeared to fulfil the requirement of Article 54, 56, 83 and 123(2) EPC.
- VII. With a letter dated 30 March 2020, the Respondent withdraw the main request and filed a new main request corresponding to the previous auxiliary request 1. It furthermore filed auxiliary requests 1 to 3 corresponding to previous auxiliary requests 2, 4 and 5, respectively. It furthermore withdrew its request for oral proceedings.

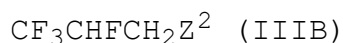
Claim 1 of the main request reads as follows:

"1. A process for the synthesis of 2-halo-3,3,3-fluoropropene comprising:

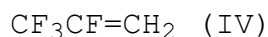
(a) reacting HF

with a compound $\text{CH}_2\text{Cl}-\text{CCl}=\text{CCl}_2$

to produce a reaction product comprising a compound of formula (IIIB)



(b) exposing said compound of formula (III B) to reaction conditions effective to convert said compound of formula (III B) to a compound of formula (IV)



wherein Z^2 is Cl or F."

VIII. With a letter dated 17 February 2021, the Respondent announced that it would not be attending the oral proceedings scheduled 24 February 2021.

IX. According to the Appellant the main and auxiliary requests 1 to 3 should not be admitted in the appeal proceedings, since the Respondent only gave the basis of these requests in the application as filed, but did not indicate any reasons to why these requests would overcome the various objections raised by the Appellant.

Selections should be made in the disclosure of the application as filed in order to arrive at the subject-matter of claim 1 of the main request. The subject-matter of dependent claims 4 and 5 was not supported by the application as filed. Hence, the subject-matter of claims 1, 4 and 5 of the main request did not meet the requirement of Article 123(2) EPC.

The objections made under the heading "Absence de caractéristiques essentielles (Article 84 CBE)" in the letter dated 4 February 2020 were rather objections of sufficiency of disclosure of the invention since pieces of information were missing in example 1 to 3 of the patent to prepare HFC-245eb and of lack of inventive step in the sense that it was not credible that HFC-245eb could be prepared by reacting HCO-1230xa with

HF. As shown in example 3 of document (1), the same process as in example (1) of the contested patent gave other results under similar reaction conditions. Hence, claim 1 of the main request did not meet the requirements of Article 83 EPC.

The subject-matter of claim 1 lacked novelty with respect to example 2 of document (15).

Document (5) was the closest prior art to the invention. This document disclosed the preparation of HFO-1234yf from HCF-245eb. HFC was obtained by fluorination of trifluoropropene. The technical problem to be solved was the provision of a further process to prepare HFO-1234yf. It was not credible that HCF-245eb could be prepared by reacting HCO-1230xa with HF. The process of claim 1 of the main request was therefore not a solution to the problem of providing an alternative process for the preparation of HFO-1234yf. Furthermore the proposed solution of preparing HCF-245eb by reacting HCO-1230xa with HF was obvious in the light of document (2). Therefore, the subject-matter of claim 1 of the main request lacked an inventive step.

- X. According to the Respondent, there was a clear and unambiguous disclosure for HF as the compound of Formula (I) in the application as filed. Moreover, claim 1 of the main request did not require that the compound of formula (I) consisted of HF. The features of conducting step a) of claim 1 catalytically at a temperature of 0 to 250°C in the liquid phase and the feature of carrying out step a) of claim 1 at a pressure from 500 to 1000 psig were disclosed in the application as filed. Accordingly, the subject-matter of claims 1, 4 and 5 of the main request did not

represent an intermediate generalisation. Hence, claims 1, 4 and 5 of the main request met the requirement of Article 123(2) EPC.

Document (1) did not show that HFO-1234yf could not be obtained by the process of claim 1. In Example 1 of the contested patent HF and HCO-1230xa were combined, stirred and heated before SbCl_5 was added. Example 3 of document (1) pre-treated the SbCl_5 catalyst with HF prior to the addition of HCO1230xa. In addition, the final holding pressures were different (625 psig vs 400 psig) and the reaction times were different (12 hours vs 1 hour). The Appellant's assertion that the same process was giving the opposite results in similar conditions was therefore incorrect. The Appellant did not provide any verifiable facts indicating that the process of claim 1 of the main request could not be worked, and therefore failed to discharge the burden of proof that laid upon him for supporting an objection of lack of sufficient disclosure. Hence, claim 1 met the requirements of Article 83 EPC.

The claims of the main request were entitled to the priority date of 15 October 2007, so that document (15) was not prior art to the claims. As a consequence, the subject-matter of the claims of the main request did not lack novelty over document (15).

Document (5) represented the closest prior art to the invention. This document disclosed a process for the synthesis of HFO-1234yf (formula (IV)) using a compound of formula (III B) which was prepared by reacting HFO-1243zf with fluorine. Document (5) did not disclose step (a) of the claimed process. The technical problem was to provide a much saver process for preparing HFO-1234yf. The process of document (5) required a

reaction between HFO-1243zf and fluorine. HFO-1243zf was a flammable gas which was incompatible with strong oxidising agents. Thus, the first step of document (5) presented a significant fire risk due to the chemicals involved. Step (a) of the claimed process required a reaction between HCO-1230xa and HF. HCO1230xa did not represent a particular fire risk. Accordingly, step (a) of claim 1 of the main request presented a much lower fire hazard than the equivalent step disclosed in document (5). Document (2) did not teach towards step (a) of claim 1 of the main request for any reason, let alone in the context of reducing the fire risk. Accordingly, the subject-matter of the claims of the main request involved an inventive step.

XI. The Appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 2203402 be revoked.

The Respondent (patent proprietor) requested in writing that the decision under appeal be set aside and that the patent be maintained on the basis of any one of the main request or auxiliary requests 1 to 3, all requests as filed with letter dated 30 March 2020.

XII. At the end of the oral proceedings held on 24 February 2021, the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of the main request*

The main request corresponds to auxiliary request 1 filed with the response to the statement of the grounds of appeal. This request was also filed before the opposition division as auxiliary request 2.

The Appellant objected to the admissibility of this request in the appeal proceeding, since the Respondent did not indicate the reasons for its submission in the appeal proceedings (Article 12(2) and (4) RPBA).

Claim 1 of the request maintained by the opposition division is directed to two alternatives corresponding on the one hand to the synthesis of the compound HCFO-1233xf (formula (IV) wherein Z is Cl) and, on the other hand, to the compound HFO-1234yf (Formula (IV) wherein Z is F).

It is obvious that a request where only one of the alternatives relating to the synthesis of HFO-1234yf is retained overcomes any objections raised in the statement of ground of appeal against the other alternative relating the synthesis of HCFO-1233xf.

Hence, the main request is admitted in the appeal proceedings.

3. *Modifications (Article 123(2) and (3) EPC)*

3.1 Claim 1 of the main request results from the combination of claims 1 to 4 and 7 as originally filed.

According to the Appellant, claim 1 of the main request requested reacting HCO-1230xa with HF, whereas claim 2 as originally filed disclosed the reaction with a compound comprising HF. Claim 1 of the main request

must be interpreted as reacting HCO-1230xa with a compound consisting of HF. The terms "comprising" and "consisting" did not have the same meaning or scope. Thus, changing "comprising" to "consisting" did not satisfy the requirements of Article 123(2) EPC.

However, claim 1 of the main request does not require reacting HCO-1230xa with a compound consisting of HF, but with HF. Claim 1 does not require that the reactant consists only in HF.

Hence, this argument of the Appellant must be rejected.

3.2 Claims 2, 3, 6 and 7 are backed up by claims 5, 6, 9 and 10 as originally filed, respectively.

Claim 4 is supported by the section on page 5, line 19 to page 6, line 2 of the application as filed.

3.3 Claim 5 is supported by the section on page 6, lines 6 to 11 of the application as filed.

According to the Appellant, the pression of 500 psig to 1000 psig indicated in claim 5 of the main request was not supported by the application as filed, since the range of pressures in the first full paragraph of page 6 of the application as filed was disclosed to be inextricably linked with processes to be carried out batchwise.

However, in this section of page 6 of the application as filed, it is specified that the reaction pressure may vary widely, in preferred embodiments the reaction occurs under pressure, preferably pressure of at least 500 psi of pressure, more preferably at pressures of

from about 500 to about 1000psig. Accordingly, the disclosed range of pressures of from 500 to 1000psig is not limited to processes operated batchwise.

The Appellant further pointed out the section page 6, lines 11 to 13, which reads "Furthermore, for batch reaction conditions, in particular, it is contemplated that the reaction time is from about 5 hours to about 24 hours".

However, this section relates to reaction times when the process is carried out batchwise. This section does not restrict the pressures disclosed beforehand to be only applicable to batch processes.

The Appellant's argument must therefore be rejected.

3.4 Consequently, claim 1 to 7 meets the requirements of Article 123(2) EPC.

3.5 In comparison with the claims of the patent as granted, the compound of formula (IV) has been limited to $\text{CF}_3\text{CF}=\text{CH}_2$ (HFO-1234yf), which restricts the scope of the claims as granted and therefore the protection conferred thereby, which is in keeping with the requirement of Article 123(3) EPC.

4. *Sufficiency of the disclosure (Article 100(b) EPC)*

The invention relates to a 2-step synthesis route for preparing the compound of formula (IV) (HFO-1234yf) from $\text{CH}_2\text{Cl}-\text{CCl}=\text{CCl}_2$ (HCO-1230xa). The reaction scheme comprises two alternatives. It starts from a reaction of HCO-1230xa with hydrofluoric acid (HF) to provide a reaction product comprising a compound of formula (IIIB) wherein Z^2 is F (HFC-245eb) and/or a compound of

formula (IIIB) wherein Z^2 is Cl (HFCC-244eb), which after a dehydrohalogenation step affords HFO-1234yf.

- 4.1 The Appellant objected that the alternative passing through the intermediate HFC-245eb would not be achievable for a person skilled in the art having regard to the disclosure of the patent in suit.

According to the Appellant it would not be credible that HFC-245eb is formed by reaction HCO-1230xa with HF following the procedure described in example 1 of the patent. Its objection is based on the fact that a similar procedure described in example 3 of document (1) results in structurally very different products from the same starting compounds. It was therefore not credible that a process as described in example 1 of the contested patent would give other results under similar conditions. Thus, data essential for obtaining HFC-245eb was missing in the patent in suit, since the specific conditions described in example 1 were known to result in a different product.

- 4.2 In example 1 of the patent the reaction mixture was stirred at 100 °C and when the temperature reached 100 °C, the catalyst was added into the reaction mixture. The reaction mixture was kept under a pressure of 625 psig for 12 hours.

In example 3 of document (1), HF is first mixed with $SbCl_5$ and heated to 85°C. HCl and the non-condensibles are vented. The reaction mixture is kept under a pressure of 400 psig for only 1 hour.

The predominant product obtained by the fluorination process of example 3 of document 3 is HFCC-244bb, namely 2-chloro-1,1,1,2-tetrafluoropropane.

Fluorination is therefore not complete, since a chlorine atom still remains in the product obtained. The predominant product obtained by the fluorination process in Example 1 of the contested patent is HFC-245eb, namely a pentafluoropropane.

In view of the more drastic fluorination conditions, *inter alia* a reaction time 12 times longer under a higher pressure used in example 1 of the contested patent, it is not inconceivable that further fluorination occurred on the intermediate HFCC-244bb to result predominantly in the pentafluorinated derivative HFC-245eb.

The Appellant did not reproduce the processes described in Example 1 of the contested patent and Example 3 of document 1 to show that HFC-245eb was not formed. Its statement that HFC-245eb cannot be obtained by reproducing the process in Example 1 of the patent is therefore not based on established facts and must be rejected.

- 4.3 The Board comes therefore to the conclusion that, having regard to the information given in the patent in suit, the invention as defined in claims 1 to 7 can be performed by a person skilled in the art without undue burden, such that the opposition ground pursuant to Article 100(b) EPC fails.

5. *Novelty*

According to the Appellant, example 2 of document (15) was novelty destroying for the subject-matter of claim 1 of the main request.

- 5.1 Document (15) is an international PCT application filed on 23 June 2009 claiming priority from US 61/075,804 of 26 June 2008. As document (15) was filed after the filing date of 14 October 2008 of the contested patent, subject to other provisions, it could be novelty destroying for claim 1 of the main request only with respect to subject-matter entitled to its priority date of 26 June 2008, i.e. with respect to subject-matter disclosed in its priority document US 61/075,804.
- 5.2 Example 2 of priority document US61/075,804 discloses a one-step gas fluorination of 1230xa with HF to 1234yf. Table 2 shows that HFO-1234yf is formed, however fails to reveal that HFC-245eb is formed. Therefore, the priority document does not disclose that HCF-245eb is formed by the fluorination of HCO-1230xa.
- 5.3 According to the Appellant, the products formed by the process of example 2 included 0,5% of compounds named "others" in the priority document. In example 2 of document (15), it has been shown that 0.1% of these other compounds formed was HFC-245eb. The procedure of fluorination of 1230xa of example 2 of the priority document (15), which was identical to that of example 2 of document (15) would therefore inevitably amount to the production of HFC-245eb and would therefore be a method as claimed in claim 1 the main request. As example 2 the priority document of document (15) inherently disclosed the process, example 2 of document (15) was novelty-destroying for the subject-matter of claim 1 of the main request.
- 5.4 For assessing novelty over a written description, it has to be examined what information has been made available to the public by the written description.

In the present case, the priority document (15) does not mention nor contain any technical teaching to the effect that HFC-245eb is formed by the process disclosed therein. Thus, from the sole description provided by the priority document of document (15), it is not possible to draw any conclusion with respect to the formation of HFC-245eb when the process disclosed in example 2 of the priority document of document (15) is operated.

Also with the help of his general knowledge, the skilled person reading this priority document cannot realise that HFC-245eb is formed when the procedure of example 2 is operated. The formation of HFC-245eb thus remains hidden in the disclosure of the priority document of document (15) with the consequence that the subject of claim 1 of the main request is new, regardless whether or not HFC-245eb is formed by applying the procedure disclosed in example 2 of the priority document of document (15).

5.5 Accordingly, document (15) cannot be novelty-destroying for the subject-matter of claim 1 of the main request. It is therefore unnecessary to assess whether the subject-matter of the main request is entitled to the priority date of 15 October 2007.

6. *Inventive step*

6.1 *Closest prior art*

The Board considers, in agreement with the parties that document (5) represents the closest prior art to the invention, and, hence takes it as the starting point in the assessment of inventive step.

This document discloses the synthesis of HFO-1234yf by dehydrofluorination of HFC-245eb (see examples 1-6). Document (5) reveals that HFC-245eb can be formed by reaction of trifluoropropene with fluorine (see paragraph [0022] on page 2; examples 1 to 6)

6.2 *Technical problem underlying the invention*

The technical problem to be solved was seen in the provision of an alternative process to prepare HFO-1234yf.

6.3 *Proposed solution*

The solution is the process of claim 1 of the main request characterised by step (a), i.e. that the reaction product comprising a compound of formula (IIIB) is produced by reacting HF with HCO-1230xa.

6.4 *Success*

The Appellant alleged that the problem was not solved since it was credible that the reaction of HCO-1230xa with HF affords HFC-245eb.

Examples 1 to 3 of the contested patent discloses the synthesis of HCF-245eb by reaction of HCO-1230xa with HF. The Board has no good reason to find that HFC-245eb is not formed in examples 1 to 3 of the patent in suit (see point 4 above).

Hence, the Board is satisfied that the proposed solution is an alternative process to prepare HFO-1234yf.

6.5 *Obviousness*

According to the Appellant, the solution was obvious in the light of document (2), in particular considering that example 9 of document (2) discloses the fluorination of $\text{CCl}_3\text{CCl}=\text{CH}_2$ with HF to yield $\text{CF}_3\text{CFClCH}_3$.

However, document (2) does not disclose the preparation of HFC-245eb. Accordingly, the skilled person would not turn to example 9 of document (2), which discloses the preparation of a chlorotrifluoropropane ($\text{CF}_3\text{CFClCH}_3$), when looking for preparing a HFC-245eb, which is a tetraafluoropropane.

Hence, the Board comes to the conclusion that the proposed solution is not rendered obvious by document (2). Consequently, the subject-matter of claim 1 of the main request, and by the same token that of dependent claims 2 to 7, fulfils the requirement of inventive step (Article 56 EPC).

7. Since the main request is considered to be allowable, it is not necessary to decide on the lower-ranking auxiliary requests.
8. The Appellant has no objection to the adaptation of the description to the claims of the main request filed by the respondent. The Board on its side has no reason to differ therefrom.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of claims 1 to 7 of the main request as filed with letter dated 30 March 2020 and the amended description (5 pages) titled "Amended description for main request and auxiliary request 2" as filed with letter dated 30 March 2020.

The Registrar:

The Chairman:



C. Rodríguez Rodríguez

P. Gryczka

Decision electronically authenticated