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**Datasheet for the decision
of 11 February 2021**

Case Number: T 1257/18 - 3.3.10

Application Number: 10719653.7

Publication Number: 2421810

IPC: C07C17/20, C07C17/25, C07C21/18

Language of the proceedings: EN

Title of invention:

PROCESS FOR PREPARING 2-CHLORO-3,3,3-TRIFLUOROPROPENE

Patent Proprietor:

Daikin Industries, Ltd.

Opponent:

ARKEMA FRANCE

Headword:

Relevant legal provisions:

EPC Art. 100 (a), 100 (b), 100 (c)

Keyword:

Grounds for opposition do not preclude the maintenance of the patent as granted

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 1257/18 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 11 February 2021

Appellant: ARKEMA FRANCE
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 23 March 2018
rejecting the opposition filed against European
patent No. 2421810 pursuant to Article 101(2)
EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the opposition division rejecting the opposition against European patent No. 2 421 810.

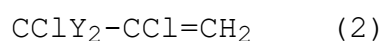
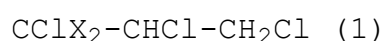
II. Notice of opposition had been filed on the grounds of added subject-matter (Article 100(c) EPC), insufficiency of disclosure (Article 100(b) EPC) and lack of novelty and inventive step (Article 100(a) EPC).

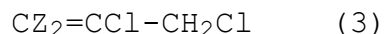
III. The documents filed during the opposition proceedings include the following:

D1 WO 2008/054781 A1
D2 US 3,436,430
D3 WO 2007/053736 A2
D4 WO 2009/015317 A1

IV. The main and sole request of the respondent (patent proprietor) is the patent as granted. Claim 1 reads as follows:

"A process for preparing 2-chloro-3,3,3-trifluoropropene comprising reacting, in the absence of a catalyst, at least one chlorine-containing compound selected from chloropropane of formula (1), chloropropene of formula (2) and chloropropene of formula (3):





wherein each of X, Y and Z each independently is Cl or F, with HF under heating in a gas phase at a temperature of 350-450°C."

- V. The opposition division concluded that claim 1 had the required basis in the combination of claim 1 as originally filed and the most preferred temperature disclosed on page 7, line 17. The claimed invention was sufficiently disclosed for it to be carried out by a person skilled in the art. Even if document D1 disclosed all the features of claim 1, it did not disclose them in combination. The claimed process was thus novel.

Document D4 was the closest prior art. It disclosed a process which differed from that of claim 1 in that it required a catalyst. The problem underlying the claimed invention was to provide a more economical process for the preparation of 2-chloro-3,3,3-trifluoropropene with high conversion and high selectivity. The claimed solution was the process of claim 1, characterised by the absence of a catalyst. Neither D2 or D3 taught the claimed solution. The claimed process was thus inventive.

- VI. The arguments of the appellant relevant to the present decision were as follows.

Claim 1 did not have the required basis in the combination of claim 1 and page 7, line 17 of the application as originally filed. The temperature on page 7 was disclosed as that "in the reactor", whereas this limitation was not a feature of claim 1.

The patent did not indicate how to measure temperature. Nor did it indicate where. For these reasons, the claimed invention was not sufficiently disclosed for it to be carried out by a person skilled in the art.

The examples of the patent were carried out in the presence of Ni beads. These beads had a catalytic activity. For this reason too, the patent did not disclose sufficiently the claimed process which should be carried out without a catalyst.

The patent did not disclose how to carry out the process in non-adiabatic reactors. For that reason as well, the claimed invention was not sufficiently disclosed.

Document D1 disclosed all the features of claim 1. The claimed process was thus not novel.

At the oral proceedings, the appellant agreed that D4 can be considered as the closest prior art. The problem underlying the claimed invention was the mere provision of an alternative. The claimed solution, characterised by not requiring a catalyst, would have been obvious for a person skilled in the art having regard to D1, in particular Example 1 and page 8, lines 10-24. The claimed process was thus not inventive.

VII. The arguments of the respondent where relevant to the present decision were as follows.

It was clear that the reaction temperature was the temperature in the reactor. Claim 1 thus did not contain any added subject-matter.

Temperature measurements belonged to the common general knowledge of the person skilled in the art. Nickel beads had no catalytic activity in the context of the claimed process, and there was no evidence on file that they had. The type of reactor suitable for the claimed process was also indicated in the description. The claimed invention was thus sufficiently disclosed.

Document D1 did not disclose all the features of claim 1 in combination. The claimed process was thus novel.

Document D4 was the closest prior art. It discloses a process for preparing 2-chloro-3,3,3-trifluoropropene which required a catalyst. The problem underlying the claimed invention was to prepare that compound in a more cost-efficient way with high conversion and selectivity and little overfluorinated material. The claimed solution, characterised by being carried out in the absence of a catalyst, would not have been obvious for a person skilled in the art and was thus inventive.

- VIII. In preparation for the oral proceedings, the board informed the parties with a communication dated 27 March 2020 that its preliminary view was that:
- Claim 1 did not contain added subject-matter.
 - The claimed invention was sufficiently disclosed.
 - Document D1 did not disclose, in combination, the features of claim 1.
 - Document D4 came closest to the claimed invention.
- IX. Oral proceedings before the board took place on 11 February 2021.
- X. The final requests of the parties were as follows:

- The appellant requested that the decision under appeal be set aside and that European patent No. 2 421 810 be revoked.
- The respondent requested that the appeal be dismissed and the patent thus be maintained as granted.

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

Reasons for the Decision

1. The appeal is admissible.
2. Amendments

The board concurs with the reasoning and conclusion of the opposition division that claim 1 has a basis in claim 1 as originally filed in combination with the most preferred temperature for carrying out the claimed process on page 7, line 17 of the description.

The appellant argues that the passage on page 7 relates to the temperature in the reactor, which is not a feature of claim 1. However, claim 1 relates to a process "under heating in a gas phase at a temperature of 350-450°C". In a process in gas phase, the reaction temperature is the temperature in the reactor.

Therefore, the ground of opposition under Article 100(c) EPC does not preclude the maintenance of the patent as granted.

3. Sufficiency of disclosure

- 3.1 There is no apparent reason why compound 1233xf could not be obtained by treating a compound of formula (1), (2) or (3) with HF in the gas phase at the required temperature.

Even if, as argued by the appellant, the patent did not disclose how or where to measure the temperature required by claim 1, such measurement falls within the general knowledge of a person skilled in the art.

- 3.2 The appellant also argued that nickel beads, which filled the reactors in the examples of the patent, were in fact catalytic. For this reason, the patent did not sufficiently disclose how to put the claimed invention into practice.

However, there is no evidence on file that nickel beads are catalytic as argued by the appellant. In fact, nickel is the main component of the alloys of the reactors used for these type of processes (D3, page 10, lines 12-16) due to its inertness. This argument thus cannot be accepted.

It is thus concluded that the ground under Article 100(b) EPC does not preclude the maintenance of the patent as granted.

4. Novelty

- 4.1 The opposition division concluded that D1, despite disclosing all the features of claim 1, did not disclose them in combination. The board is of the same view.

4.2 Document D1 discloses the preparation of 1233xf from starting materials which include those required by claim 1, but also different compounds. The reaction can be carried out in the vapour or in the gas phase. A catalyst is not required, but it is preferred to carry out the reaction in its presence. None of the examples disclose the reaction of a starting material of formula (1), (2) or (3). Example 1 discloses a process leading to 1233xf in the absence of a catalyst, but it requires a different starting material and is carried out at a lower temperature.

4.3 D1 therefore does not disclose the combination of technical characteristics as required by claim 1. The claimed process is therefore novel (Article 54(2) EPC).

5. Inventive step

5.1 Claim 1 relates to the preparation of 2-chloro-3,3,3-trifluoropropene (1233xf) by treating with HF, in gas phase, at 350-450°C and, in the absence of catalyst, a compound of formula (1), (2) or (3).

5.2 Closest prior art

In its statement of grounds of appeal, the appellant argued that documents D1 and D4 represented a suitable starting prior art for examining inventive step.

The board informed the parties in its communication in preparation of the oral proceedings that it was inclined to conclude, like the opposition division, that document D4 came closest to the claimed invention.

The appellant has not disagreed, either in writing or at the oral proceedings before the board.

Document D4 discloses the preparation of 1233xf from HF and $\text{CH}_2\text{ClCCl}=\text{CCl}_2$, which is a compound of formula (3) according to claim 1. The reaction takes place in the gas phase (Examples 1-2, page 10, line 11). The process uses two reaction zones. The low temperature zone is maintained at 180°C (page 10, line 20) and uses FeCl_3/C (page 10, line 17) as catalyst. The high temperature zone contains chromia (page 10, line 16) and is maintained at 350°C (page 10, line 19). Preferably, the process is carried out in the presence of a stabiliser (Examples 3-5).

It was not disputed that document D4 discloses a process for preparing 1233xf in the presence of a catalyst, which is excluded from the claimed process.

5.3 Technical problem underlying the invention

The respondent formulated the technical problem underlying the claimed invention as to provide an economically advantageous process for producing 1233xf with good conversion and selectivity.

5.4 Solution

The solution to this technical problem is the process of claim 1, characterised in that it is carried out in the absence of a catalyst.

5.5 Success

The appellant argued that the problem as formulated above had not been credibly solved by the claimed process for the reasons that follow.

- 5.5.1 The examples of the patent in suit required Ni beads, which needed to be replaced due to degradation. It could not thus be concluded that the claimed process was economically more favourable.

However, there is no evidence on file that Ni beads in the reactor degrade under the reaction conditions. In fact, the reactors suitable for these type of processes are made of Ni alloys (paragraph [0022] of the patent; D3, page 10, lines 12-16) precisely due to its inertness. This argument is thus not convincing.

The claimed process is carried out at the same temperature as that of D4 without requiring a catalyst (and a stabiliser). At least in this respect, the provision of an economically favourable process can be regarded as solved.

- 5.5.2 The appellant further argued that the process of claim 1 required subsequent separation steps, and that went contrary to the economy of the process.

The board agrees that the claimed process would most likely require purification. However, the process of the prior art would also most likely require it. This argument is thus not convincing.

- 5.5.3 Lastly, the appellant argued that the available data could not prove that good selectivity and conversion were achieved. Example 3 of the patent in suit achieved 60% selectivity, which was only moderate. In contrast, D4 disclosed on page 9, lines 20 and 25, a process having 100% conversion and 90% selectivity. Examples 3 to 5 of D4 disclosed an almost quantitative conversion and a selectivity of 87%, 93.6% and 95.94%, respectively. The results of D4 were thus far better

than those of the patent.

Examples 3 and 4 of the patent indeed show lower selectivity towards 1233xf than that achieved in Examples 3 to 5 of D4.

Example 3, nevertheless, discloses a selectivity over 60% towards 1233xf. It also allows obtaining 28% of 242dc, which can be recycled into the process. The problem defined in point 5.3 above does not require an improvement in terms of conversion and selectivity, only good results. It is thus credible that the problem as defined above is solved by the process of claim 1, as even the worst example disclosed in the patent leads to good results.

- 5.6 It 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.
- 5.6.1 The appellant relied in this respect on page 8, lines 10-24, and Example 1 of document D1.
- 5.6.2 Page 8, lines 10-24 of D1 discloses the use of a pre-reactor, preferably filled with nickel alloy turnings, at temperatures of 80-250°C. Higher temperatures resulted in greater conversion of the starting materials entering the reactor. The appellant concluded that the skilled person would have combined this teaching with that of D4 and thus arrive at the claimed invention.

However, this passage relates to a pre-reactor. Even if the skilled person were to combine this teaching with that of D4, they would have considered such pre-reactor

as an alternative to the low temperature reaction zone disclosed in the examples of D4 (over FeCl_3/C at 180°C , page 10, lines 16-20). They would not have considered that this pre-reactor conditions could be used in the high temperature zone (chromia, 350°C) of the process of D4. This argument is thus not convincing.

- 5.6.3 The appellant further referred to Example 1 of D1. This example showed that 1233xf could be obtained in a non-catalysed reaction.

However, this example uses a different starting material and a temperature well below that required by claim 1. Conversion is merely 11.6%. The process leads to 7.4% of 244db, which is an overfluorinated compound that cannot be recycled into the process. The yield of 1233xf is 3.9% only.

- 5.6.4 Seeking to obtain a process with good conversion and selectivity, the skilled person had no reason to consider the teaching of Example 1 of D1. It relates to a process from a different starting material, and leads to poor results.

- 5.6.5 In its statement of grounds of appeal, the appellant also relied on the teaching of D2 for showing that the skilled person would have considered carrying out the preparation of 1233xf in the absence of a catalyst.

However, document D2 relates to a different process which requires not only HF but also chlorine. There is no reason why the skilled person would have considered the teaching of D2 in trying to solve the problem of providing a process for preparing 1233xf, let alone one having good conversion and selectivity.

5.6.6 Catalysis allows carrying out a process under less harsh conditions and increasing selectivity towards a particular product. The skilled person would have expected that the process of D1 could also be carried out without a catalyst by increasing the reaction temperature. However, by doing so, they would not have expected to obtain good selectivity towards 1233xf.

5.7 The claimed process is therefore inventive (Article 56 EPC).

6. Conclusion

None of the opposition grounds pursuant to Article 100 EPC precludes the maintenance of the patent as granted.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



C. Rodríguez Rodríguez

P. Gryczka

Decision electronically authenticated