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**Datasheet for the decision
of 13 March 2018**

Case Number: T 1836/13 - 3.3.10

Application Number: 07119344.5

Publication Number: 1918269

IPC: C07C17/358, C07C21/18

Language of the proceedings: EN

Title of invention:

Processes for geometric isomerization of halogenated olefins

Patent Proprietor:

Honeywell International Inc.

Opponent:

Mexichem Amanco Holding S.A. de C.V.

Headword:

Relevant legal provisions:

EPC Art. 123(2), 84, 83, 54(2), 56

Keyword:

Amendments - allowable (yes)

Claims - clarity - main request (yes)

Sufficiency of disclosure - (yes)

Novelty - (yes)

Inventive step - (yes)

Decisions cited:

T 0728/98

Catchword:



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Case Number: T 1836/13 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 13 March 2018

Appellant: Mexichem Amanco Holding S.A. de C.V.
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Decision under appeal: **Interlocutory decision of the Opposition**
Division of the European Patent Office posted on
19 July 2013 concerning maintenance of the
European Patent No. 1918269 in amended form.

Composition of the Board:

Chairman P. Gryczka
Members: R. Pérez Carlón
C. Schmidt

Summary of Facts and Submissions

- I. The appeal lies from the interlocutory decision of the opposition division which resulted in the maintenance of European patent No. 1 918 269 in the form of the then pending main request.
- II. Notice of opposition had been filed on the grounds of 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: EP 1 900 716 A1
 - D2: JP 11-140002 A and translations into English D2a and D2b
 - D6: "Experiments carried out by the opponent", filed with a letter dated 17 April 2013
 - D7: EP 0 939 071 A1
 - D8: EP 1 067 106 A1
- IV. Claim 1 of the main request, which was also the main request before the opposition division, reads as follows:
- "A process for the conversion of cis-1,3,3,3 tetrafluoropropene to trans-1,3,3,3 tetrafluoropropene comprising:*
- a) providing a reactor feed comprising cis-1,3,3,3 tetrafluoropropene; and*
 - b) introducing said reactor feed to catalytic reaction conditions effective to convert at least a portion of said cis-1,3,3,3 tetrafluoropropene in said feed to trans-1,3,3,3, said conditions comprising exposing said*

feed to a metal based catalyst selected from the group consisting of halogenated metal oxides, Lewis acid metal halides, zero-valent metals, and combinations of these at a temperature from 75°C to 110°C, wherein the catalyst comprises a binder and/or a lubricant."

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

Documents D6, D7 and D8 should have been admitted into the proceedings, as they had not been filed late and, even if they had been, D6 and D7 were highly relevant.

Claim 1 of the main request did not find a basis in the application as originally filed as it did not disclose the combination of the required temperature with a binder and/or a lubricant, and neither of these features in the context of the reaction of *cis-* to *trans*-1,3,3,3-tetrafluoropropene.

The feature "a binder and/or a lubricant" was not clear, as the skilled person could not determine whether a substance would or would not "help insure the physical integrity of the catalyst during granulating or shaping the catalyst into the desired form", which was the effect of additives such as a binder and/or lubricant according to the patent in suit. The respondent had not provided any evidence which could show that these terms were commonly used in the art, and their clarity was particularly relevant, as they distinguished the claimed subject-matter from that of D1. Lastly, the respondent argued that this feature was not supported by the description, which contained no example including either a binder or a lubricant.

The claimed invention was not sufficiently disclosed,

as the patent in suit had no example which could represent the claimed subject-matter. Even if it were concluded that example 1 showed that chromia was a catalyst suitable for the claimed invention, it failed to provide support for other catalysts. Document D6 proved that not every catalyst was suitable for the claimed invention, and finding suitable catalysts other than chromia represented an undue burden for the skilled person. Lastly, applying the Arrhenius equation to the reactions of examples 2 and 3 of the patent in suit showed that the reaction rate would be too low at the temperatures required by claim 1.

Having regard to the low conversions put forward in D6 and to the low conversion rates predicted by the Arrhenius equation, the appellant also concluded that the claimed invention was not suitable for industrial application.

Document D7 disclosed all the features of claim 1, as all *cis*-1,3,3,3-tetrafluoropropene had reacted after the second step of example 3. If it were to be argued that it had not isomerised, this should inevitably lead to the conclusion that the claimed invention was not sufficiently disclosed.

Document D2 was the closest prior art, and differed from the claimed process merely by virtue of the reaction temperature. The problem underlying the claimed invention was how to provide an alternative process for isomerising *cis*- into *trans*-1,3,3,3-tetrafluoropropene, and the solution, characterised by the temperature required by claim 1, was not inventive as it was a matter of routine to determine the boundaries of the process conditions of D2, which would inevitably lead the skilled person to the claimed

invention.

- VI. The arguments of the respondent (patent proprietor) where relevant for the present decision were as follows:

Claim 1 of the main request found a basis in the combination of claim 1, page 16, lines 7 and 9, and page 14, lines 10 to 15 of the application as originally filed.

The feature "a binder and/or a lubricant" was clear to the skilled reader, and the claimed invention was sufficiently disclosed. Example 1 contained an experiment carried out at 100°C, and D6, contrary to the appellant's arguments, proved that the catalysts tested were suitable for the claimed process.

Document D7 failed to disclose the isomerisation of *cis*- to *trans*-1,3,3,3-tetrafluoropropene, and for that reason alone the process of claim 1 was novel.

Document D2 was the closest prior art, and the problem underlying the claimed invention was how to provide an alternative process for the conversion of *cis*- to *trans*-1,3,3,3-tetrafluoropropene. Even if the solution were characterised only by the temperature required by claim 1, document D2 pointed away from such a low temperature, with the consequence that the claimed solution was inventive.

- VII. The appellant informed the board that it would not be attending the oral proceedings, which took place on 13 March 2018.

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

- The appellant requested that the decision under appeal be set aside and the patent revoked.
- The respondent requested that the appeal be dismissed or, subsidiarily, that the patent be maintained in the form of one of the first to 23rd auxiliary requests, all auxiliary requests having been filed with a letter dated 22 December 2017.

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

Reasons for the Decision

1. The appeal is admissible.

Admissibility of documents D6, D7 and D8

2. Documents D6, D7 and D8 were filed by the appellant during opposition proceedings, and were not admitted by the opposition division.
3. Since D6 and D7 were filed again in these appeal proceedings in response to the opposition division's decision on the question of sufficiency, and since these documents could a priori be relevant, the board admitted them into these appeal proceedings.

As the appellant has not relied on the content of document D8 during these appeal proceedings, it is not necessary to decide whether or not the opposition division applied the proper criteria in not admitting this document into the opposition proceedings.

Amendments

4. The appellant argued that claim 1 of the main request contained added subject-matter, as the features "at a temperature from 75°C to 110°C" and "wherein the catalyst comprises a binder and/or a lubricant" were not disclosed either in combination or in the context of the conversion of *cis-* to *trans*-1,3,3,3-tetrafluoropropene.

5. Claim 1 as originally filed related to the *cis-/trans-*isomerisation of 1,3,3,3-tetrafluoropropene. The skilled reader would thus consider the process details provided in the description, such as those now required by claim 1, to be disclosed in the context of that specific isomerisation procedure.

The temperature required by claim 1 finds a basis on page 16, lines 7 and 9, of the application as originally filed. As every reaction requires a reaction temperature, the skilled person would seek such information in the description and consider it combined with the claimed isomerisation process.

The use of a binder and/or a lubricant is disclosed on page 14, lines 10 to 15. The description does not indicate that the presence of binders or lubricants would affect the reaction temperature, nor is any such relationship apparent to the skilled reader.

The combination of features of claim 1 thus find the required basis in the application as originally filed.

Clarity

6. The appellant argued that the feature "a binder and/or a lubricant", which was introduced into claim 1 as granted during opposition proceedings, was not clear.

The appellant acknowledged, however, that claim 1 merely required "any substance that lubricates and/or binds the catalyst". For that reason alone, the skilled person is able to understand these terms.

7. The appellant further argued that the respondent had failed to provide evidence that these terms had an unequivocal, generally accepted meaning in the art.

However, in the present case such evidence is not considered necessary, as both terms have a generally accepted meaning: a binder is a substance which aggregates particles; a lubricant is a substance which reduces friction between surfaces.

In addition, the patent in suit indicates that such compounds "help insure the physical integrity of the catalyst during granulating or shaping the catalyst into the desired form" [0023].

8. The appellant also argued that the patent in suit did not contain any example of a reaction over a catalyst comprising a binder or a lubricant, and concluded that the claims were not supported by the description.

However, the EPC does not require a patent to contain specific examples of the claimed invention. In the present case, such examples are not necessary due to the trivial nature of the feature "a binder and/or a lubricant", which has no bearing on inventive step and

merely serves to distinguish the claimed invention from document D1, which constitutes prior art according to Article 54(3) EPC.

9. Lastly, the appellant argued that the feature "a binder and/or a lubricant" delimited the claimed subject-matter from that of document D1, and it relied on T 728/98 (OJ EPO 2001, 319), in which the board concluded that clarity was key for legal certainty, all the more so if an unclear feature was supposed to distinguish the claimed invention from the prior art.

This argument is to be rejected, however, since the feature "a binder and/or a lubricant" is clear.

Sufficiency of disclosure

10. Claim 1 is directed to a catalytic isomerisation process which converts *cis-* into *trans-1,3,3,3-*tetrafluoropropene at a temperature between 75°C and 110°C.

It is not disputed that example 1 of the patent in suit contains data related to a *cis-/trans-* isomerisation process over chromia at 100°C, without a binder or a lubricant.

11. The appellant argued that the skilled person could not carry out the claimed invention for the following reasons:
 - 11.1 Example 1 of the patent in suit, in which chromia was used as a catalyst, was the sole example carried out at the temperature required by claim 1. As this example was already state of the art (D1), the respondent could not rely on it in the context of sufficiency.

However, the board sees no reason why the sufficiency of a disclosure could not be substantiated by relying on the state of the art. For this reason alone, this argument of the appellant is not convincing.

11.2 The appellant further argued that, even if it were concluded that the process of example 1 of the patent in suit could prove that the process of claim 1 could be carried out over chromia at 100°C, it still failed to disclose the remaining embodiments of claim 1 for the reasons below:

11.2.1 According to the Arrhenius equation, reaction rate halved for every 10°C drop in temperature. This implied that none of the reactions over the catalysts of examples 2 and 3, which required temperatures of 200°C (example 2 over AlF_3) and 350°C (example 3 over Pd or Co on activated carbon), could be carried out at a temperature of 75°C to 110°C as required by claim 1.

However, the loss in reaction could be offset by adjusting other variables such as residence time. For that reason alone, this argument is not convincing.

In addition, the sole conclusion that the appellant drew using the Arrhenius equation was that conversion would be very low at the temperature required by claim 1. It fails, however, to prove that there would be no conversion. As claim 1 does not set any threshold with respect to yield, conversion or selectivity of the process, this argument is also not convincing.

11.2.2 The appellant argued that, if the board concluded that example 3 of document D7 did not disclose an isomerisation reaction (see point 12. below), the

claimed process could not be carried out by a skilled person, as example 3 of D7 disclosed all the remaining features of claim 1.

However, the process of D7 is carried out in the presence of a large excess of HF (column 19, lines 23 to 25), which could lead to the formation of pentafluoropropane by addition to the double bond of *cis*-1,3,3,3-tetrafluoropropene. For this reason, the conditions of example 3 of D7 are not, as required by claim 1, effective to convert at least a portion of *cis*- to *trans*-1,3,3,3-tetrafluoropropene.

Contrary to the appellant's argument, D7 fails to prove that the claimed process cannot be carried out, but merely discloses conditions unsuitable for the claimed process.

- 11.2.3 The appellant further relied on document D6 in order to show that the claimed process could not be carried out. D6 disclosed tests carried out over catalysts of the same type as those required by claim 1 at 80°C, 100°C and 110°C. The obtained conversions were too low for any practical application. For this reason, only chromia had been shown to be a suitable catalyst for the claimed process.

As the patent in suit did not contain any indication which could allow the skilled reader to determine which catalysts other than chromia could be used at the temperatures required by claim 1, the invention was not sufficiently disclosed for it to be carried out by a person skilled in the art over the whole ambit of the claimed subject-matter.

However, claim 1 does not require any specific

conversion level, but only that the reaction occurs. As document D6 proves that this is the case, and as the board has not been provided with any evidence showing the contrary, it can only conclude that no negative conclusion on sufficiency can be based on D6.

- 11.3 Lastly, the appellant argued that, having regard to the very low conversions obtained in the assays of D6 and the very low reaction rate predicted by the Arrhenius equation, the claimed process would not find any industrial application.

Regardless of the fact that the appellant did not rely on Article 57 EPC during the opposition proceedings, the board sees no reason why the criterion of industrial applicability should necessarily imply that the claimed process must be profitable, let alone what link there might be between this argument and the question of sufficiency of disclosure of the invention. This argument of the appellant is thus also dismissed.

Novelty

12. The appellant argued that document D7 disclosed all the features of claim 1, whose subject-matter was for that reason not novel.
- 12.1 Example 3 of D7 discloses a process whose second step is carried out over activated carbon impregnated with SbCl_5 (catalyst preparation 5), which is a Lewis acid metal halide, at 80°C (column 19, lines 7-8). According to column 19, lines 42-43, the starting material of this second step contains 1.4% of 1,3,3,3-tetrafluoropropene (*trans/cis*), and the product contains (column 19, lines 34-35) 0.5% of 1,3,3,3-tetrafluoropropene (*trans* form).

The appellant concluded that any *cis*-1,3,3,3-tetrafluoropropene must inevitably have reacted and isomerised to the *trans*- isomer.

- 12.2 The board can share only the first part of the appellant's conclusion, namely, that any *cis*-1,3,3,3-tetrafluoropropene present in the feed of the second step has reacted.

Document D7 does not indicate, however, how this product reacted. The reaction conditions of D7 include a large excess of HF (column 19, lines 23 to 25), as it requires a 20:1 molar excess of hydrogen fluoride with respect to pentachloropropane. If conversion of pentachloropropane were complete, at least 15 equivalents of HF with respect to the initial amount of pentachloropropane must be fed to the second reactor. It can thus be envisaged that *cis*-1,3,3,3-tetrafluoropropene could be also hydrofluorinated to yield pentafluoropropane. In fact, if it were isomerised to the corresponding *trans*- olefin, the amount of *trans*-1,3,3,3-tetrafluoropropene after the second step should have been comparable to that of the *cis*-/*trans*- mixture in the incoming feed.

For these reasons, document D7 fails to disclose the process of claim 1, whose subject-matter is thus novel over this prior art.

Inventive step

13. Closest prior art

The opposition division and the parties considered that document D2 was the closest prior art. The board sees

no reason to differ.

It has not been disputed that document D2 discloses a process which differs from the process of claim 1 in that it is carried out at a higher temperature.

The parties were, however, divided as to whether or not D2 disclosed the conversion of *cis*-1,3,3,3-trifluoropropene into the corresponding *trans*-derivative. The question of whether or not this feature is disclosed in document D2 can, however, be left aside, since the board holds that, even if it were, the proposed solution is not obvious for the reasons explained below.

14. Technical problem underlying the invention

The appellant (page 15, lines 38-39, of the notice of appeal) and the respondent during the oral proceedings formulated the technical problem underlying the claimed invention as how to provide an alternative process for the conversion of *cis*- to *trans*-1,3,3,3-tetrafluoropropene.

15. Solution

The solution to this technical problem is the claimed process, characterised in that it is carried out at a temperature from 75°C to 110°C, and in that the catalyst comprises a binder and/or a lubricant.

16. Success

The examples of the patent and D6 show that the claimed process, albeit without a binder or a lubricant, can be carried out at the claimed temperatures. There is no

reason why the same result could be achieved when the catalyst also contains a binder and/or a lubricant. The problem as defined in point 14. is thus considered to be credibly solved by the features of claim 1.

17. It thus remains to be decided whether or not the proposed solution to the objective problem defined above is obvious from the prior art.

17.1 The skilled person, trying to obtain an alternative isomerisation process, would not consider using the temperatures required by claim 1, as paragraph [0014] of document D2 clearly indicates that reaction temperatures below 200°C made the process of D2 slow and impractical, the preferred temperature range being 250-500°C.

17.2 The appellant argued that document D2 focused on the dehydrofluorination of pentafluoropropane to 1,3,3,3-tetrafluoropropene and thus that the teaching in paragraph [0014] did not apply to the process of claim 1.

However, D2 still fails to indicate that the isomerisation of claim 1 could be carried out at lower temperatures, as in fact D2 does not explicitly refer to the conversion of *cis*- to *trans*-1,3,3,3-tetrafluoropropene at all. For that reason alone, D2 does not provide any hint towards the claimed solution.

17.3 The appellant further argued that it was a matter of routine to determine the boundaries of the process conditions described in D2. By doing so, the skilled person would inevitably have arrived at the claimed invention.

However, the prior art opposed to the patent in suit does not provide a hint towards the temperature range required by claim 1, either in the context of the starting material required by claim 1 or in the context of the isomerisation of a different olefin, let alone of a fluorinated olefin. This argument is thus not convincing.

17.4 For these reasons, the process of claim 1 of the main request and, for the same reasons, that of dependent claims 2 to 10 is inventive within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



C. Rodríguez Rodríguez

P. Gryczka

Decision electronically authenticated