Datasheet for the decision
of 13 November 2018

Case Number: T 0779/15 - 3.3.09
Application Number: 08744553.2
Publication Number: 2129711
IPC: C08J9/00, C08J9/14
Language of the proceedings: EN

Title of invention:
Blowing agent compositions of hydrofluoroolefins and hydrochlorofluoroolefins

Patent Proprietor:
Arkema Inc.

Former Opponent:
Honeywell International Inc.

Headword:

Relevant legal provisions:
EPC Art. 100(c), 100(b), 54, 56
RPBA Art. 13(1)
Keyword:
New evidence - admitted (yes)
Amendments - extension beyond the content of the application as filed (no)
Sufficiency of disclosure (yes)
Novelty - (no, main request, first and second auxiliary requests) - (yes, third auxiliary request)
Inventive step - (yes, third auxiliary request)

Decisions cited:

Catchword:
CASE NUMBER: T 0779/15 - 3.3.09

DECISION
of Technical Board of Appeal 3.3.09
of 13 November 2018

Appellant: Arkema Inc.
(Patent Proprietor)
900 First Avenue, Bldg. 4-2
King of Prussia PA 19406 (US)

Representative: Casalonga
Casalonga & Partners
Bayerstraße 71/73
80335 München (DE)

Decision under appeal: Decision of the Opposition Division of the European Patent Office posted on 3 February 2015 revoking European patent No. 2129711 pursuant to Article 101(3)(b) EPC.

Composition of the Board:
Chairman W. Sieber
Members: J. Jardón Álvarez
A. Jimenez
Summary of Facts and Submissions

I. This decision concerns the appeal filed by the proprietor of European patent No. 2 129 711 against the decision of the opposition division to revoke it.

II. The granted patent contained 29 claims, claim 1 reading as follows:

"1. A blowing agent composition for thermoplastic foaming comprising (1) at least one hydrofluoroolefin and (2) from 2wt% to 90wt% of hydrochlorofluoroolefins selected from 1-chloro-3,3,3-trifluoropropene, 2-chloro-3,3,3-trifluoropropene, 1,1-dichloro-3,3,3-trifluoropropene, 1,2-dichloro-3,3,3-trifluoropropene, or mixtures thereof."

Claim 21 was directed to a foamable resin composition comprising the blowing agent composition of claim 1, and claim 29 to a foamed product produced using the blowing agent composition of claim 1. The remaining claims were dependent claims.

III. The opponent had requested revocation of the patent in its entirety on the grounds of Article 100(a) (lack of novelty and lack of inventive step), (b) and (c) EPC.

The documents submitted during the opposition proceedings included:

D1: US 5 710 352 A;

D2: CN 101028992 A (D2a: its translation into English);

D3: WO 2007/002703 A2;
D4: WO 2009/089511 A2;

D6: WO 2009/048802 A2; and


IV. The opposition division's decision to revoke the patent was based on a main request and four auxiliary requests. The only requests relevant for this decision are the main request (claims as granted) and the first auxiliary request filed by letter of 19 April 2013.

Auxiliary request 1 contained 29 claims, claim 1 reading as follows:

"1. The use of a blowing agent composition for thermoplastic foaming, wherein the composition comprises (1) at least one hydrofluoroolefin and (2) from 2wt% to 90wt% of hydrochlorofluoroolefins selected from 1-chloro-3,3,3-trifluoropropene, 2-chloro-3,3,3-trifluoropropene, 1,1-dichloro-3,3,3-trifluoropropene, 1,2-dichloro-3,3,3-trifluoropropene, or mixtures thereof."

Claim 21 was directed to a foamable resin composition comprising the blowing agent composition as defined in claim 1, and claim 29 to a foamed product produced using the blowing agent composition as defined in claim 1. The remaining claims were dependent claims.

The opposition division's decision on the main request and the first auxiliary request can be summarised as follows:

- Claim 1 as granted (main request) did not contain added subject-matter (Article 100(c) EPC), and the
invention was sufficiently disclosed. However, the subject-matter of claim 1 lacked novelty in view of D2/D2a and in view of this finding, it was not necessary to arrive at a conclusion with regard to the novelty objections based on documents D1, D3, D4, D6 and D8.

- The claimed subject-matter of auxiliary request 1 was novel over documents D3, D4 and D8 but lacked inventive step starting from D3 as the closest prior art. The claimed subject-matter was a selection within the general disclosure of D3, which was, in the absence of an advantageous technical effect, obvious for the skilled person.

V. This decision was appealed by the patent proprietor (in the following: the appellant), who requested that the decision under appeal be set aside and the patent be maintained as granted, or alternatively on the basis of auxiliary requests 1 to 6 filed with the statement setting out the grounds of appeal dated 15 June 2015. The appellant also filed the following documents:

E3: Test report headed "Batch Foaming" (4 pages); and


VI. In its reply, the opponent requested that the appeal be dismissed.

VII. By letter dated 6 June 2017, the opponent withdrew its opposition and is therefore no longer a party to the proceedings. It will be referred to hereinafter as "the former opponent".
VIII. In preparation for the oral proceedings, the board indicated in a communication the points to be discussed. It also gave the preliminary view that it agreed with the finding in the appealed decision that D2/D2a anticipated the subject-matter of claim 1 of the main request and that this finding equally applied to the first and second auxiliary requests.

IX. In its reply to the communication of the board, the appellant filed the following document:

E5: Test report headed "Example 1 - Polystyrene foaming using 1-chloro-3,3,3-trifluoropropene (1233zd) at various temperatures" (5 pages).

X. Oral proceedings were held before the board on 13 November 2018, where the requests relevant to this decision were discussed, namely the main request and auxiliary requests 1 to 3.

XI. The claims of the main request are the granted claims (see point II above).

Claim 1 of auxiliary request 1 reads as follows (amendments over claim 1 as granted in italics):

"1. A blowing agent composition for thermoplastic foaming comprising (1) at least one hydrofluoroolefin and (2) from 2wt% to 90wt% of at least one hydrochlorofluoroolefin selected from 1-chloro-3,3,3-trifluoropropene, 2-chloro-3,3,3-trifluoropropene, 1,1-dichloro-3,3,3-trifluoropropene, 1,2-dichloro-3,3,3-trifluoropropene, or mixtures thereof."

Claim 1 of auxiliary request 2 reads as follows (amendments over claim 1 as granted in italics):

"1. A blowing agent composition for thermoplastic foaming comprising (1) at least one hydrofluoroolefin and (2) from 2wt% to 90wt% of hydrochlorofluoroolefins selected from 1-chloro-3,3,3-trifluoropropene, 2-chloro-3,3,3-trifluoropropene, 1,1-dichloro-3,3,3-trifluoropropene, 1,2-dichloro-3,3,3-trifluoropropene, or mixtures thereof, wherein said hydrofluoroolefin is selected from 3,3,3-trifluoropropene, (cis and/or trans)-1,3,3,3-tetrafluoropropene, 2,3,3,3-tetrafluoropropene, (cis and/or trans)-1,2,3,3,3-pentafluoropropene and mixtures thereof."

The claims of auxiliary request 3 are the claims of auxiliary request 1 before the opposition division (see point IV above).

XII. The arguments of the appellant, where relevant to the present decision, may be summarised as follows:

- D2a did not clearly and unambiguously disclose an embodiment according to claim 1 of the main request. There was no information in D2a as to whether the percentages reported therein corresponded to weight percent, mole percent or area under the gas chromatography curve. Furthermore, the compositions of D2a were intermediate compositions to be used for the preparation of 1,1,1,3-tetrafluoropropene. There was no information in D2a indicating that they might be used as blowing agents. On the contrary, the compositions obtained according to the process of D2a would still contain starting material, which
would make them unsuitable as blowing agent compositions.

- D3 represented the closest prior art. It disclosed various uses of C2 to C6 fluoroalkenes, in a variety of applications, including their use as blowing agents. D3 did not disclose the claimed use of a blowing agent composition comprising at least one hydrofluorooolefin and from 2 wt% to 90 wt% of a hydrochlorofluorooolefin. The closest embodiment disclosed in D3 was example 1B using trans-1,3,3,3-tetrafluoropropene alone as blowing agent.

- Starting from this embodiment, the problem to be solved by the patent was to provide blowing agents which were able to produce foams having a good balance of low density and acceptable cell size. This problem was solved by the claimed combination of hydrofluorooolefin and hydrochlorofluorooolefin. The experiments in the patent and the results in E3 convincingly showed that the density of foams could be reduced while maintaining an acceptable cell size. This result was surprising as the prior art indicated that the cell size would be reduced when the density was lowered.

XIII. The appellant requested that the decision under appeal be set aside and the patent be maintained as granted (main request), or that the patent be maintained on the basis of the claims of any of auxiliary requests 1 to 6 filed on 15 June 2015 with the statement of grounds of appeal.
Reasons for the Decision

1. Admission of E3 to E5

1.1 Documents E3 and E4

These documents were submitted as a direct reaction to the finding in the appealed decision that the evidence then on file failed to show a technical effect resulting from the specific blowing agent compositions. Since they were furthermore filed at the earliest stage in appeal proceedings, namely with the statement setting out the grounds of appeal, the board saw no reason not to admit them into the proceedings. Thus E3 and E4 were admitted into the proceedings.

1.2 Document E5

This document was filed in reaction to the board's communication. Taking into account that this document further supports arguments already on file, the board, exercising its discretion under Article 13(1) RPBA, decided to admit E5 into the proceedings.

MAIN REQUEST (granted claims)

2. Interpretation of claim 1

2.1 Claim 1 as granted defines the second component as follows:

"... (2) from 2wt% to 90wt% of hydrochlorofluoroolefins selected from 1-chloro-3,3,3-trifluoropropene, 2-chloro-3,3,3-trifluoropropene, 1,1-dichloro-3,3,3-trifluoropropene, 1,2-dichloro-3,3,3-trifluoropropene, or mixtures thereof."
2.2 Due to the use of the term "hydrochlorofluoroolefins" (i.e. in the plural), claim 1 appears to imply at first glance the mandatory presence of more than one hydrochlorofluoroolefin. However, such a reading is in contradiction with the further definition of component (2), namely the wording "or mixtures thereof" following the list of four hydrochlorofluoroolefins. A listing of four individual compounds followed by the expression "or mixtures thereof" implies that the listed compounds can be used alone. Otherwise the reference to "mixtures thereof" would not make sense.

2.3 Thus, as pointed out in the decision under appeal, the wording of claim 1 is "not unambiguously clear". However, the board agrees with the opposition division that the application as filed, and in particular the wording in the first full paragraph of page 3 and the examples, supports the appellant's broader interpretation of claim 1, namely that claim 1 is directed to compositions comprising at least one hydrochlorofluoroolefin. In other words, claim 1 embraces compositions which, in addition to at least one hydrofluoroolefin, contain one of the listed hydrochlorofluoroolefins or more than one of the listed hydrochlorofluoroolefins (i.e. mixtures thereof).

3. Amendments (Article 100(c) EPC)

3.1 The opposition division held that the range of 2wt% to 90wt% for the specific four hydrochlorofluoroolefins in claim 1 as granted was derivable for claims 2 and 14 as filed. Although the amounts of claim 2 as filed were disclosed for hydrochlorofluoroolefins in general, the skilled person would immediately assume that these amounts equally applied to the preferred hydrochloro-
fluoroolefins listed in claim 14 as filed. The board sees no reason to deviate from this finding.

3.2 As to the former opponent's objection that there was no disclosure in the application as filed of a blowing agent composition comprising two or more hydrochlorofluoroolefins (due to the use of the plural "hydrochlorofluoroolefins"), this objection is moot in view of the board's interpretation of claim 1 as granted. Even the former opponent admitted that there was a basis for at least one hydrochlorofluoroolefin in the application as filed.

3.3 Thus, claim 1 does not contain subject-matter which extends beyond the content of the application as filed.

4. Sufficiency of disclosure

4.1 The opposition division held that the requirements of sufficiency of disclosure were met.

4.2 In its reply to the statement of grounds of appeal, the former opponent stated that it maintained its arguments in relation to sufficiency set out in the opposition statement. However, it did not provide any reasons why the finding of the opposition division was wrong.

4.3 Under these circumstances, the board sees no reason to revise the finding of the opposition division that the invention is sufficiently disclosed.

5. Novelty

5.1 The finding in the appealed decision that the valid date of the patent is the filing date has not been contested by the appellant.
5.2 The opposition division denied novelty of the subject-matter of claim 1 in view of the disclosure of D2a. In its reply to the statement setting out the grounds of appeal, the former opponent maintained that the subject-matter of the claims of the main request also lacked novelty in the light of the disclosure of documents D3, D4, D6 and D8.

5.3 Document D2a

5.3.1 D2a discloses a process for preparing 1,1,1,3-tetrafluoropropene (HFC-1234ze) by a two-step gas-phase fluorination of 1,1,1,3,3-pentachloropropane (HCC-240fa) with hydrogen fluoride in the presence of a fluorination catalyst (page 3, lines 6 to 13) [board's note: the correct IUPAC name for HFC-1234ze is 1,3,3,3-tetrafluoro-1-propene]. Tables 1 and 2 disclose several compositions obtained in the context of this process. It is apparent from the tables that the compositions contain, apart from the desired hydrofluoroolefin HFC-1234ze, also a hydrochlorofluoroolefin, namely 1-chloro-3,3,3-trifluoropropene (HCFC-1233zd), which is one of the listed components (2) in present claim 1. The amount of the hydrochlorofluoroolefin HCFC-1233zd in the compositions of Table 1 varies from 99.0% (example 8) to 65.3% (example 7) and in those of Table 2 from 64.9% (example 15) to 10.5% (example 26).

5.3.2 The appellant did not contest that D2a disclosed compositions comprising (1) a hydrofluoroolefin and (2) a hydrochlorofluoroolefin as required by present claim 1. However, it argued that the subject-matter of claim 1 was novel over the disclosure of D2a because:
(a) it was not clear whether the numeric values given in the tables of D2a referred to mole%, weight% or percent of area under the gas chromatography curve;

(b) the starting material HCC-240fa would still be present in the compositions of Tables 1 and 2, which would make these compositions unsuitable for use as blowing agent compositions due to the high boiling point of HCC-240fa; and

(c) the compositions of D2a were only intermediate compositions in the two-step process for preparing 1,1,1,3-tetrafluoropropene, and were never used as blowing agents.

5.4 The board is not convinced.

5.4.1 Concerning (a), it is true that Tables 1 and 2 do not specify that the percentages are weight percent. However, the board cannot see how this could lead to a novelty-distinguishing feature. As already indicated above, Tables 1 and 2 give a wide range of numerical values for 1-chloro-3,3,3-trifluoropropene from 10.5 to 89.8%. Taking furthermore into account the fact that the amount for the hydrochlorofluoroolefin ranges from 2wt% to 90wt% in present claim 1, some of the compositions disclosed in D2a will inevitably fall in this broad range, independently of the unit used. The appellant has admitted during the oral proceedings that this would indeed be the case if the values in D2a were given in mole%, because the molecular weights of the components of the claimed compositions lie close to each other.

As to the argument that the values in D2a could also refer to the percent area under the gas chromatography
curve, this appears to be rather speculative, as this unit is seldom used. Apart from that, the appellant has not provided any evidence, let alone a concrete example, to show that the situation would be different when using the percent area under the gas chromatography curve.

Therefore, the appellant's argument is not convincing.

5.4.2 Concerning (b), there is no indication in D2a to justify the appellant's allegation that the reaction product could still contain non-reacted starting material. On the contrary, page 9, lines 31 to 34 reads:

"After 20-hour reaction, the reaction product was washed with water and a base to remove HCl and HF, and then the organic composition of the reaction product was analyzed by GC".

The organic composition of the reaction product in Tables 1 and 2 adds up to 100% excluding the presence of other organic products such as unreacted starting material.

5.4.3 Lastly, the fact that the compositions of D2a were not used in D2a as blowing agents does also not amount to a novelty-distinguishing feature. The composition of claim 1 is directed to "A blowing agent composition for thermoplastic foaming...", that is to say, to compositions which are suitable for use as blowing agents for thermoplastic foaming. Indisputably, the compositions of D2a (having no interfering starting material as explained above) are suitable for use as blowing agent compositions.
5.4.4 In view of the above, the board agrees with the opposition division that the examples in Tables 1 and 2 of D2a disclose a composition suitable for thermoplastic foaming comprising at least one hydrofluoroolefin and 1-chloro-3,3,3-trifluoropropene (a hydrochlorofluoroolefin), the latter in an amount falling within the broadly defined range of from 2 wt% to 90 wt%, and therefore anticipate the subject-matter of claim 1.

5.4.5 For these reasons, the subject-matter of claim 1 of the main request is not novel over D2a.

AUXILIARY REQUESTS 1 AND 2

6. Novelty

6.1 As admitted by the appellant during the oral proceedings, the amendment made in claim 1 of auxiliary requests 1 and 2 cannot alter the finding on novelty of the subject-matter of claim 1 of the main request.

6.2 The subject-matter of claim 1 of auxiliary requests 1 and 2 therefore lacks novelty over the disclosure of D2a.

AUXILIARY REQUEST 3

7. Amendments

7.1 Compared with granted claim 1, the only amendment made is that claim 1 was reformulated into a use claim. The same amendment was made to the dependent claims referring directly or indirectly to the blowing agent composition of claim 1.
7.2 The amendment is supported by the application as filed. The wording "a blowing agent for thermoplastic foaming" as used in claim 1 as filed already inherently discloses the use of the composition for thermoplastic foaming. Further support can be found on page 1, first paragraph of the application as filed, wherein it is stated that "The present invention relates to blowing agent compositions [...] used in the preparation of thermoplastic compositions."

7.3 The change of the claim category from "a blowing agent composition..." to "use of a blowing agent composition for thermoplastic foaming ..." also restricts the scope of the granted claims.

7.4 The subject-matter of the claims therefore fulfils the requirements of Articles 123(2) and (3) EPC.

8. Novelty

8.1 The amendment also delimits the subject-matter of the claims of auxiliary request 3 against D2a. In D2a, the compositions are merely intermediate products in the preparation of 1,3,3,3-tetrafluoropropene. They are not used for the production of foams.

8.2 The opposition division held in its decision that the subject-matter of claim 1 of auxiliary request 1 (auxiliary request 3 in appeal proceedings) was novel over the cited prior art.

8.3 In its reply to the statement of grounds of appeal, the former opponent stated that it maintained its objections in relation to lack of novelty of the claims in light of the disclosure of D3, D4, D6 and D8. However, it did not provide any reasons why the finding
of the opposition division concerning the then pending auxiliary request 1 was wrong.

8.4 Under these circumstances, the board sees no reason to revise the finding of the opposition division that the claims of auxiliary request 3 are novel over the cited prior art.

9. Inventive step

9.1 The patent relates to the use of blowing agent compositions with negligible ozone-depletion potential and low global warming potential for use in the preparation of thermoplastic foams. The invention is based on the finding that the use of at least one hydrofluoroolefin and one specific hydrochlorofluoroolefin permits the production of low-density, closed-cell foams with enlarged, controlled cell size (paragraph [0004] of the specification).

9.2 Closest prior art

9.2.1 The board considers, in agreement with the opposition division and the appellant, that D3 represents the closest prior-art document.

9.2.2 In general terms, D3 relates to various uses of fluoroalkenes, including tetrafluoropropenes, in a variety of applications, including as blowing agents (abstract). More specifically, D3 aims at the provision of new compounds and compositions that are attractive alternatives to, and are considered environmentally safer substitutes for, compositions so far used as blowing agents (page 4, lines 26 to 28).
9.2.3 This object is said to be achieved by compositions comprising at least one fluoroalkene compound and optionally other ingredients (page 9, first paragraph). D3 then describes various fluoroalkenes (pages 9 to 13) and the other ingredients that can optionally be added to the blowing agent compositions (pages 13 to 18). The examples describe the preparation of polystyrene foams (examples 1A to 1F) and polyurethane foams (examples 2 to 6) using various blowing agents.

9.2.4 The board agrees with the appellant that example 1B represents the closest embodiment of D3 with regard to the claimed subject-matter. In this example a polystyrene foam is prepared using 1,3,3,3-tetrafluoropropene as the sole blowing agent.

The subject-matter of claim 1 differs from this disclosure in that the blowing agent comprises, in addition to 1,3,3,3-tetrafluoropropene, from 2 wt% to 90 wt% of at least one hydrochlorofluoroolefin as specified in claim 1.

9.3 Problem to be solved and its solution

9.3.1 According to the appellant, the problem to be solved by the patent in view of D3 is to provide a blowing agent composition that permits the production of thermoplastic foams having lower density without degrading its cell size.

9.3.2 To show that this problem is solved, the appellant relied on examples in the patent in suit and the additionally filed test report E3. In E3, the blowing agent used in example 1B of D3 (example 1 of E3) was compared with a blowing agent composition containing 1,3,3,3-tetrafluoropropene and 1-chloro-3,3,3-
trifluoropropene in weight ratios of 80/20 (example 4), 50/50 (example 5) and of 30/70 (example 6).

The results in Table 2 of E3 show that the claimed combination of hydrofluoroolefin and hydrochlorofluoroolefin, i.e. examples 4 to 6 of E3, leads to foams of lower density without degrading the cell size compared with a foam obtained with the single blowing agent used in example 1B of D3.

9.3.3 The opposition division did not recognize a technical effect of the claimed combination of blowing agents because, in its view, the evidence then on file did not compare the claimed compositions with those of D3 and that it was not credible that all embodiments covered by the claims would show the technical effect.

9.3.4 These objections have been overcome by the appellant with the evidence submitted during the appeal proceedings. E3 discussed above provides a direct comparison of the invention with the closest embodiment of D3. Moreover, E3 shows that the technical effect is achieved over a wide range of hydrofluoroolefin/hydrochlorofluoroolefin ratios.

9.3.5 In view of this new experimental evidence, and the absence of any experimental evidence to the contrary, the board concludes that the problem underlying the patent in suit has been credibly solved over the whole scope claimed.

9.4 Obviousness

9.4.1 It remains to be decided whether, in view of the available prior art, it would have been obvious for the
skilled person to solve the technical problem by the means claimed.

9.4.2 D3 itself does not give any hint to the claimed invention. D3 mainly aims to provide blowing compositions being environmentally safe substitutes for chlorofluorocarbons and hydrochlorofluorocarbons with low or no toxicity (paragraph bridging pages 4 and 5) and non-flammable (page 5, first full paragraph). D3 is entirely silent on foam density, in particular on lowering the foam density. Thus, D3 does not point towards the claimed combination of blowing agents in order to solve the posed problem.

9.4.3 Moreover, the finding that the use of the claimed blowing agent compositions leads to lower foams density compared with the use of the hydrofluoroolefin alone without degrading its cell size is unexpected in view of the teaching of E4 that indicates that low density is usually achieved at the expense of cell size reduction (page 157, lines 1 to 2).

9.4.4 No other documents have been cited in the appealed decision that could have given a hint to the use of the combination of selected blowing agents to solve the above problem.

9.4.5 In view of this, the board concludes that there is no incentive in the prior art for the skilled person to select the blowing agent compositions now claimed from the broad teaching of D3 to solve the above technical problem. Thus, the subject-matter of claim 1 involves an inventive step.

9.4.6 For the same reasons, the subject-matter of claim 21 (a foamable resin composition comprising the blowing agent
composition as defined in claim 1), claim 29 (a foamed product produced using the blowing agent composition as defined in claim 1) and the dependent claims also satisfies the requirements of Article 56 EPC.

10. During the oral proceedings the appellant filed a description adapted to the claims of auxiliary request 3.

AUXILIARY REQUESTS 4 TO 6

Since auxiliary request 3 is allowable, there is no need for the board to deal with the further auxiliary requests.
Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent as amended in the following version:

   - Claims 1 to 29 filed as auxiliary request 3 by letter dated 15 June 2015; and
   
   - Description pages 2 to 5 filed on 13 November 2018 during the oral proceedings before the board.

The Registrar: The Chairman:

M. Cañuelo Carbajo W. Sieber

Decision electronically authenticated