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**Datasheet for the decision
of 5 May 2021**

Case Number: T 0091/18 - 3.3.03

Application Number: 10752339.1

Publication Number: 2475700

IPC: C08G18/48, C08G65/26

Language of the proceedings: EN

Title of invention:

PROCESS FOR PREPARING A POLYURETHANE FOAM

Patent Proprietor:

Shell Internationale Research Maatschappij B.V.

Opponent:

Covestro Deutschland AG

Relevant legal provisions:

RPBA Art. 12(4)
EPC Art. 83, 56, 112a

Keyword:

Admittance of documents (Yes)
Admittance of a new objection in appeal (No)
Sufficiency of disclosure - Main request (Yes)
Inventive step - Main request (Yes)
Referral of a question to the Enlarged Board of Appeal (No)

Decisions cited:

G 0003/98



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Case Number: T 0091/18 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 5 May 2021

Appellant: Covestro Deutschland AG
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 18 October 2017
rejecting the opposition filed against European
patent No. 2475700 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
W. Ungler

Summary of Facts and Submissions

I. The appeal of the opponent lies from the decision of the opposition division posted on 18 October 2017 to reject the opposition against European patent number 2 475 700.

II. Claim 1 as granted read as follows:

"1. Process for preparing a polyurethane foam, wherein a polyether polyol and a polyisocyanate are reacted in the presence of:
a blowing agent;
of from 1 to 30 ppmw, based on the polyether polyol, of metals derived from a composite metal cyanide complex catalyst; and
of from 0.5 to 100 ppmw, based on the polyether polyol, of a phosphoric acid compound comprising a phosphoric acid selected from orthophosphoric acid, polyphosphoric acid and polymetaphosphoric acid, and/or a partial ester of such a phosphoric acid".

Claims 2 to 7 were dependent on claim 1. Claims 8 and 9 were independent claims directed to a polyurethane foam and a shaped article.

III. The decision of the opposition division was based *inter alia* on the following documents:

D1: EP 1 589 071 A1

D2: Acclaim Bulletin, Issue No. 2 van Arco Chemical, December 1996

D14: CN 101353413 A

D14a: English translation of D14

D21: EP 1 995 263 A1

IV. The decision of the opposition, as far as it is relevant to the present appeal, can be summarized as follows:

Sufficiency of disclosure

- The patent in suit provided enough guidance regarding the preparation of a composition with "from 1 to 30 ppmw, based on the polyether polyol, of metals derived from a composite metal cyanide complex catalyst" including the choice of the metal cyanide complex catalyst. The experimental parts of the patent in suit provided sufficient guidance to provide 0.5 to 100 ppmw of phosphoric acid during the foaming process. The claims of the patent as granted were therefore sufficiently disclosed.

Inventive step

- D14a was the closest prior art while D2 was not suitable as the closest prior art. Claim 1 as granted differed from the teaching of D14a in the presence of 1-30 ppmw, based on the polyether polyol, of metals derived from a composite metal cyanide complex catalyst while D14a did not mention such amount of metals and also in that the composition contained 0.5 to 100 ppmw, based on the polyether polyol, of a phosphoric acid compound comprising a phosphoric acid selected from orthophosphoric acid, polyphosphoric acid and polymetaphosphoric acid, and/or a partial ester of such a phosphoric acid while D14a did not directly and unambiguously disclose the presence of 0.5 to 100 ppmw phosphoric acid during the second step of the process of D14a.

- The first distinguishing feature was not associated with any effect in the patent in suit. The partial problem of that feature was thus the provision of an alternative process for the preparation of a polyurethane foam. The solution to that problem was obvious in view of D21.

- The second distinguishing feature solved the problem of providing a higher cell-opening rate. The solution proposed in D14a was to use a modified MDI instead of a crude MDI, while this document did not motivate a skilled person to use phosphoric acid in an amount of from 0.5 to 100 ppm nor did any of the other documents of the prior art. D1 and D2 were not relevant in that respect since they did not relate to PUR-foams. Claim 1 as granted thus involved an inventive step over D14a.

- Claim 1 as granted was also inventive over D21. Claim 1 differed from the teaching of D21 in that in the process for preparing a PUR-foam from 0,5 to 100 ppmw, based on the polyether polyol, of a phosphoric acid compound comprising a phosphoric acid selected from orthophosphoric acid, polyphosphoric acid and polymetaphosphoric acid, and/or a partial ester of such a phosphoric acid were used, while in D21 no such amount of phosphoric acid was present. The effect of that distinguishing feature as shown in examples 1-3 of the patent in suit was to provide higher cell-opening rates. The problem was to devise a process to obtain foams with higher cell opening rates. Since the problem addressed in D21 was different from the problem posed, D21 did not lead to claim 1 as granted. Moreover, D1 and D2 were not relevant

since they did not relate to PUR-foams, so that an inventive step had to be acknowledged.

- V. The opponent (appellant) lodged an appeal against the decision of the opposition division and submitted with the statement of grounds of appeal document D30 (J. H. Saunders, K. C. Frisch, POLYURETHANES - CHEMISTRY AND TECHNOLOGY, Part 1, Chemistry, INTERSCIENCE PUBLISHERS, 1962, pages 235-255) as well as Annex D (Calculation of the minimum amount of polyol component which had to be used in the process according to D14 in order to fall below the lower limit for the phosphoric acid compound as specified in the patent in suit).
- VI. With the reply to the statement of grounds of appeal, the patent proprietor (respondent) submitted a main request and first to ninth auxiliary requests. The main request corresponded to the claims as granted from which claims 8 and 9 were deleted. An experimental report containing the supplementary examples 4 and 5 was also filed therewith. A further experimental report (Examples 6-8) was submitted with letter of 28 November 2018, while new first to fourteenth auxiliary requests were submitted with letter of 5 March 2021.
- VII. Oral proceedings were held on 5 May 2021, the parties being present by videoconference. During the oral proceedings the appellant requested that a question be referred to the Enlarged Board of Appeal. That question was whether, in case an applicant or patent proprietor in order to establish inventive step over the closest prior art relied on a technical effect that was also achieved in the prior art but by other means that were not excluded by the application or the patent in suit, comparative examples had to reflect the closest prior

art (then using the other means) or if it was sufficient to provide comparative examples which did not make use of the proposed solution of the closest prior art (translation by the Board of the question as submitted in German at the oral proceedings).

VIII. The appellant's arguments, insofar as relevant to the present decision, may be summarised as follows:

Admittance

- There was no objection against the admittance into the proceedings of the supplementary examples provided by the respondent with letter of 28 November 2018.
- The objection of lack of inventive step starting from D1 was not new to the appeal proceedings. That objection had been raised during the oral proceedings before the opposition division, as recorded in the minutes, and as such, it was already part of the proceedings.

Sufficiency of disclosure

- The definition, in operative claim 1, of the presence in the process of "metals derived from a composite metal cyanide complex" did not mean that the polyol had to be prepared in the presence of a DMC catalyst. There was however no information in the patent in suit as to the source of these metals in the process. It was also not plausible that any metal solved the problem posed in the patent in suit.

- A skilled person did not know how to ensure that the process was carried out in the presence of these metals and in the required amounts since the patent in suit did not provide guidance as to whether the metals resulted from the polyol or whether they were later added in the process and in which form. There was also no information as to whether the amount of metals resulted from a calculation or whether it had to be measured and if so, by which method. Furthermore, claim 1 defined the amount of metals by reference to one polyol only. The patent in suit lacked however guidance for processes in which a mixture of polyols was used. Besides the polyols used in polyurethane foam preparation could contain amounts of DMC catalysts in excess of 30 ppmw. The patent in suit did not disclose how the excess DMC catalyst could be removed in order to adjust the amount of metals during reaction.

- The reference for the calculation of the amount in phosphoric acid compound present in the reacting mixture lacked sufficiency of disclosure for the same reasons. Moreover, if the phosphoric acid compound was added to the polyol prior to the reaction with the polyisocyanate, it could react with bases in the system and be consumed prior to the blowing reaction. The patent in suit did not provide guidance as to how a defined amount of phosphorus acid compound could be adjusted, nor how it could be measured.

- For all these reasons the process of claim 1 of the main request lacked sufficiency of disclosure.

Inventive step

- D21 could be taken as the closest prior art, since it concerned the preparation of polyurethane foams having excellent air flow, which also meant that the foams had a high open cell content. In D21 a mixture of two polyols (A) and (B) was reacted with a polyisocyanate whereby the polyol (A) comprised metals derived from a DMC catalyst in an amount according to claim 1 of the main request. Claim 1 of the main request differed from the process of D21 in that 0.5-100 ppmw of a phosphoric acid compound was present in the polyol during the foaming reaction. Neither the patent in suit nor the supplementary examples provided established that that difference resulted in a higher open cells content compared to the process of D21. In particular, the comparative example of the patent in suit did not represent the process of D21, since only one polyol had been used, while in D21 a mixture of two polyols was used to provide a higher open cells content. Thus, the problem solved over D21 was the provision of a further process for the preparation of polyurethane foams. The solution to that problem was already known from D1 and D2. Besides, D30 already taught that the open cells content of polyurethane foams could be improved by controlling the urethanization reaction. That control could be exerted by regulating the amount of catalysts (amine and tin catalyst) in the reaction, but it could also be done by adding a phosphoric acid compound as an inhibitor as taught in D1. With that knowledge in mind, the skilled person would have considered the use of 0.5-100 ppmw of phosphoric acid as already done in D1 and D2.

- D14a was also a valid starting point for the assessment of inventive step. It disclosed the preparation of a isocyanate prepolymer from a polyol and isocyanate in the presence of 10 ppm phosphoric acid. That prepolymer was further reacted with a polyol to produce polyurethane foams which were characterized by their open cells content. Since phosphoric acid was an inhibitor, it was also still present in the foaming reaction in an amount that had to be in the range of 0.5-100 ppm, as shown in Annex D. Claim 1 of the main request differed from the process of D14a only in the presence of 1-30 ppmw of metals derived from a DMC catalyst with the polyol. Neither the patent in suit nor the supplementary examples provided by the respondent showed that that difference had any effect compared to D14a. In that regard the problem was to provide a further process for the production of polyurethane foams. The use of polyols having 1-30 ppmw of metals derived from DMC catalysts was known from D1. Also, even if the presence of a phosphoric acid compound was seen as a difference over D14a, the addition of that compound in a process for the preparation of polyurethane was known from D1 or D2. In particular, the use of a phosphoric acid compound as an inhibitor of the urethanization reaction was known in the art and D30 taught that it was the control of that reaction that determined the open cells content in the foam. Therefore, also the addition of a phosphoric acid compound in the production of polyurethane foams in order to improve their open cells content lacked an inventive step.

- Document D2 could also be considered as the closest prior art. It concerned Acclaim Polyols produced by

DMC catalysis containing 1-30 ppm metals derived from the DMC catalyst. D2 also disclosed that 20 ppm phosphoric acid should be used in the polyols Acclaim DP4220 and DP6320 to reduce their reactivities. In addition D2 disclosed the use of these polyols for the production of polyurethanes by a one shot process. The only difference resided therefore in that no foam was prepared. The problem solved was thus to find further uses of the polyols according to D2. A skilled person willing to find new uses for existing polyols would have considered the production of polyurethane foams. Claim 1 of the main request thus also lacked an inventive step over D2.

Referral of a question to the Enlarged Board of Appeal

- Should the Board consider that the examples of the patent in suit and the supplementary examples provided by the respondent show an improvement over the processes of D21 or D14a, a question should be referred to the Enlarged Board of Appeal according to the text as submitted during the oral proceedings.

IX. The respondent's arguments, insofar as relevant to the present decision, may be summarised as follows:

Admittance

- There was no objection against the admittance of D30 into the proceedings.
- The objection of lack of inventive step based on D1 had not been raised during the opposition proceedings. It was only at the oral proceedings

before the opposition division that the opponent made a comment that the claimed subject-matter also lacked an inventive step over D1 without elaborating the objection any further. In that regard, the objection was not in the proceedings and it should not be admitted in the appeal proceedings.

Sufficiency of disclosure

- The arguments of lack of sufficiency of disclosure all related to objections of lack of clarity. It was not shown how these objections would have prevented a skilled person from performing the process according to claim 1 of the main request. In particular, it was possible to adjust the amounts of phosphoric acid compound and metals before or at the outset of the foaming reaction such that these amounts corresponded to the ranges of operative claim 1 when the polyol reacted with the polyisocyanate in the presence of the blowing agent. Furthermore, several measurement methods were available in the art to determine the amounts in metals and phosphoric acid compound in a composition that could be used for the claimed process. The patent in suit was thus sufficiently disclosed.

Inventive step

- The process of operative claim 1 differed from the disclosure of D21 which could be considered as the closest prior art in that it involved reacting a polyether polyol and a polyisocyanate in the presence of from 0.5 to 100 ppmw, based on the polyether polyol, of a phosphoric acid compound. In

D21, no phosphoric acid compound was used when making a polyurethane foam, nor in any preceding step. The examples of the patent in suit and those provided with letter of 28 November 2018 showed that the presence of 0.5-100 ppmw of a phosphoric acid compound in the foaming reaction led to an improved number of open cells in the foam. The problem solved over D21 was therefore the provision of a polyurethane foam with improved properties, particularly improved cell opening. The solution of the patent in suit was nowhere disclosed nor suggested in the prior art. Neither D1 nor D2 related to polyurethane foams, so that these documents could not be relevant for the cell-opening effect attributed to the phosphoric acid compound. D1 related in fact to polyether polyol compositions used for preparing resins and D2 related to the role of acidification in urethane prepolymers, as clear e.g. from its title. D30 did not in any way link the presence of phosphoric acid compound to open cells in a polyurethane foam. Also, D30 was concerned with the production of polyurethane foams wherein a polyether polyol and a polyisocyanate were reacted in the presence of a blowing agent, whereas D1 and D2 were not concerned with that.

- Also, the DMC catalysts from which the metals present in operative claim 1 were derived were different from the tin-containing catalyst taught in D30. D30 did not disclose to what extent their amounts could be changed while still obtaining satisfactory results in terms of the open cells content in the foam. There was also no indication in the prior art how the teaching of D30 would apply to phosphoric acid compounds, in particular

because such compounds could interact with the polyurethane foam formation. Therefore, D30 was not relevant to the question of inventive step and would not have prompted a skilled person to combine D21 with D1 or D2. Operative claim 1 involved therefore an inventive step over D21 when taking into account D1, D2 and D30.

- Starting from the disclosure of D14a as the closest prior art, the process of operative claim 1 differed therefrom in the presence of 1-30 ppmw of metals derived from a DMC catalyst and of 0.5-100 ppmw of a phosphoric acid compound. In particular, D14a did not disclose that phosphoric acid, present in the first step of the reaction in embodiment 1, was still present in the second step which corresponded to the foaming reaction according to the patent in suit. In fact, D14a disclosed in embodiment 1 that phosphoric acid, together with other components, was reacted and therefore consumed in the first step. The examples of the patent in suit and those provided with letter of 28 November 2018 showed that the presence of 0.5-100 ppmw of a phosphoric acid compound in the foaming reaction led to an improved number of open cells in the foam. The problem solved over D14a was therefore the provision of a polyurethane foam with improved properties, particularly an improved open cells content. In this regard, it was taught in D14a to use phosphoric acid for a completely different reason to that in the patent in suit. The acid was described in D14a as a polymerization inhibitor and there was no teaching nor any hint in D14a that phosphoric acid contributed to the open cells content in the case of polyurethane foams. The solution according to operative claim 1 was

also nowhere disclosed nor suggested in the further items of prior art as discussed for D21. Operative claim 1 involved therefore an inventive step over D14a.

- D2 was not appropriate to be taken as the closest prior art since it did not pertain to the preparation of polyurethane foams and their open cells content. D2 could thus not lead to the subject-matter of operative claim 1.

Referral of a question to the Enlarged Board of Appeal

- The case law regarding the question set out by the opponent was not divergent so there was no need to refer that question to the Enlarged Board of Appeal.

X. The appellant requested that the decision of the opposition division be set aside and that the patent be revoked.

XI. The respondent requested that the patent be maintained on the basis of the main request filed with the reply to the statement of grounds of appeal, or in the alternative on the basis of the first to fourteenth auxiliary requests submitted with letter of 5 March 2021 or of the fifteenth to twenty-third auxiliary requests submitted as first to ninth auxiliary requests with the reply to the statement setting out the grounds of appeal.

Reasons for the Decision

Main request

1. Admittance

1.1 D30 is an excerpt of a textbook about polyurethanes providing, according to the appellant, information on the relation between the open cells of the polyurethane and the control of the urethane reaction (statement setting out the grounds of appeal, section I.3, page 3). It appears that D30 was filed in direct reply to the reasoning of the opposition division regarding the absence of a link between the urethane reaction and the open cells content in the resulting polyurethane in point iii) bridging pages 17 and 18 of the contested decision. In view of that and taking into account that the admittance of D30 was not contested by the respondent, the Board finds it appropriate to admit D30 into the proceedings.

1.2 Two sets of supplementary examples were provided by the respondent in appeal, the first set with the reply to the statement setting out the grounds of appeal (examples 4 and 5) and the second set with letter of 28 November 2018 (examples 6-8). The admittance of these two sets of examples was contested in the written phase of the appeal by the appellant but that objection was withdrawn at the oral proceedings before the Board. Since the two sets of examples can be seen as having been filed in reply of the argument of lack of inventive step made in the statement setting out the grounds of appeal (point II.2.8 on page 6 and point V. 2.12 on page 37) and taking into account that the

admittance was no longer contested by the appellant, the Board finds it appropriate to admit the two sets of examples into the proceedings.

- 1.3 The statement of grounds of appeal contained an objection of lack of inventive step against claim 1 of the main request in view of D1 as the closest prior art. The admittance into the proceedings of that objection was contested on the grounds that it had not been part of the proceedings up to its filing with the statement setting out the grounds of appeal.
- 1.3.1 In that regard, it was not contested that that objection had not been raised in the written proceedings before the opposition division. While the minutes of the oral proceedings before the opposition division indicate that the opponent mentioned that in principle D1 could be considered as the closest prior art (section 7.1), there is no indication that the parties were heard on an objection of lack of inventive step starting from document D1, nor that its admittance into the proceedings was even requested and discussed at the oral proceedings. On that basis, the Board cannot conclude that the objection of lack of inventive step starting from D1 was admitted into the proceedings by the opposition division at the oral proceedings. This is supported by the fact that the objection of lack of inventive step in view of D1 is not addressed in the decision under appeal and was not decided upon.
- 1.3.2 It follows therefrom that the admittance of the objection of lack of inventive step starting from D1 is subject to the Board's discretion under Article 12(4) RPBA 2007 (which applies by virtue of Article 25(2) RPBA 2020). In this respect the Board considers that, if the opponent intended to attack the patent on that

basis, they should have raised the objection in full in the opposition phase since D1 was submitted at the outset of the opposition proceedings and the objection of lack of inventive step in view of D1 was not shown to result from a later change in the opposition proceedings. In the absence for a justification to file the new objection in appeal, the Board finds it appropriate to exercise its discretion pursuant to Article 12(4) RPBA 2007 by not admitting the objection of lack of inventive step starting from D1 into the proceedings.

2. Sufficiency of disclosure

2.1 Sufficiency of disclosure in appeal was objected in view of the definitions, in claim 1, of the metals derived from a composite metal cyanide complex catalyst, of the phosphoric acid compound and of the polyether polyol which allegedly created uncertainties as to how the presence of metals and the phosphoric acid compound could be ensured and measured during the preparation of the polyurethane foam.

2.2 With regard to the questions raised by the appellant concerning the operation of the process, since they were not based on verifiable facts, they are not sufficient to establish that a skilled person would have had serious doubts as to how the process according to operative claim 1 could be performed using the common general knowledge in the field of polyurethane foams.

2.3 As to the presence, in a claim, of vague terms, it is a well-established principle laid down by the case law that a non-specific definition in a claim should be given its broadest technically sensible meaning (Case

Law of the Boards of Appeal, 9th Edition, July 2019, I.C.4.1, page 113, fourth paragraph). A vague or unspecific term used in the definition of essential features in a claim is however not in itself a sign of lack of sufficiency.

- 2.4 In particular, the lack of specification of the nature of the metals in "metals derived from a composite metal cyanide complex catalyst" only means that any metal of a DMC catalyst falls under the definition provided in claim 1. Metals of composite metal cyanide complex catalysts are known in the art and can also be identified in paragraph 24 of the patent in suit. The lack of specificity of claim 1 in that regard does not lead to the conclusion of a lack of sufficiency of disclosure.
- 2.5 As to the phosphoric acid compound, the limitation in claim 1 is that it is present in an amount of 0.5 to 100 ppmw during the blowing reaction. While consumption of the phosphoric acid compound prior to the blowing reaction is not excluded from the process of operative claim 1, it is also not excluded that its amount can be adjusted to be 0.5 to 100 ppmw during the blowing reaction. In that regard, it has not been shown that consumption of the phosphoric acid compound prior to blowing could not be accounted for by a skilled person with help of the common general knowledge.
- 2.6 As to the objection regarding the lack of a measurement method of the amounts of metals and phosphoric acid compound in the patent in suit, the respondent pointed at several general methods that are part of the common general knowledge (rejoinder, passage bridging pages 3 and 4). While these measurement methods may not have the same accuracy, it was not shown that a possible

lack of accuracy would have prevented the skilled person from performing the process of operative claim 1. In that regard, if there was a lack of accuracy of the determination of the amounts of metals and phosphoric acid compound, that would at most amount to a lack of clarity but not to a lack of sufficiency of disclosure.

2.7 With regard to the definition of operative claim 1 by reference to one polyether polyol only, it is recalled that a claim must be read based on its wording and how this is understood by the skilled person. In the present case the formulation chosen clearly means that one polyether polyol must satisfy the conditions laid out for the process. While the presence of other polyether polyols is not excluded, the requirement is that at least one of these polyether polyols is such that the conditions set out in operative claim 1 are fulfilled.

2.8 As to the question about the lack of a method to remove any composite metal cyanide complex catalyst from the polyether polyol used in operative claim 1, it must be emphasized that the preparation of the polyether polyol is not part of operative claim 1. It is thus irrelevant for the process claimed how the polyether polyol was prepared.

2.9 Under these circumstances, the Board concludes that the claims of the main request are sufficiently disclosed.

3. Novelty

3.1 The main request submitted with the reply to the statement setting out the grounds of appeal is based on the claims of the patent as granted in which claims 8

and 9 were deleted. It follows that the objections of lack of novelty of claims 8 and 9 raised in the statement of grounds are not relevant to the present set of claims as acknowledged by the appellant in their letter of 13 March 2019 (page 3, point II). There are no further objections against novelty of the claims of the main request.

4. Inventive step

4.1 The appellant considered in the statement setting out the grounds of appeal that any of D2, D14a or D21 could be seen as representing the closest prior art (as to D1 as the closest prior art see the conclusion on admittance of the objection in point 1.4.2, above).

4.2 D21

4.2.1 D21 was seen by both parties as a relevant document to be taken as the closest prior art for operative claim 1. D21 relates to a process for producing a flexible polyurethane foam which comprises reacting a polyol mixture comprising polyols (A) and (B) with a polyisocyanate compound in the presence of a urethane-forming catalyst and a blowing agent (claim 1). D21 discloses in paragraph 12 that the flexible polyurethane foams obtained by that process have, among other properties, excellent air flow and no irregular cell structure, which was accepted by both parties as being a display of their good open cell structure in the sense of the patent in suit. The Board thus agrees with the parties that D21 is a reasonable document to be taken as the closest prior art for operative claim 1.

- 4.2.2 The process of examples 1-3 of D21 was chosen as the most relevant starting point within D21. These examples, which are summarized in Table 1 on page 16, disclose the preparations of polyurethane foams from a polyisocyanate and a mixture of polyols of type (A) and (B), whereby the polyol mixtures contain metals from a DMC catalyst in total amounts of 2.1 ppm (Example 1), 10 ppm (Example 2) and 2.73 ppm (Example 3) originating from polyols A1 (paragraph 88) and A2 (paragraph 89). The presence of a phosphoric acid compound during the reaction of the polyisocyanate and the polyol mixture is not disclosed in D21.
- 4.2.3 In view of this it was acknowledged by the parties in appeal and it is shared by the Board that the process according to operative claim 1 differs from the process of examples 1-3 of D21 in the presence of 0.5-100 ppmw of a phosphoric acid compound in the course of the polymerization of the polyisocyanate with the polyol(s).
- 4.2.4 Starting from examples 1-3 of D21, it has to be determined whether the evidence made available in appeal, including the examples of the patent in suit and the supplementary examples 4-8 provided with the rejoinder of the respondent and with their letter dated 28 November 2018, allowed a fair comparison with the process of D21 such that it could be established that an effect was causally linked to the distinguishing feature of the process of operative claim 1.
- 4.2.5 The process of the examples of the patent in suit and that of examples 1-3 of D21 are however not comparable because they are based on different polyols. The polyol used in the process of the patent in suit that was also used in the supplementary examples 4-8 is disclosed in

paragraphs 59-65 of the patent. That polyol, named polyol X, is obtained by polymerization, in the presence of a DMC catalyst and glycerol as an initiator, of ethylene oxide and propylene oxide (paragraph 61). The polyol used in the process of examples 1-3 of D21 differs from polyol X of the patent in suit in that it is a mixture of distinct polyols (A1) or (A2) with (B1) and (B2) all polyols being based on propylene oxide only and obtained with a different catalyst and initiator (paragraphs 88, 89, 95 and 96). That difference is meaningful as D21 teaches in its paragraph 58 that the air flow of the produced foams depends on the proportion of the polyols (A) and (B) in the polyol mixture. Since none of the examples or comparative examples put forward by the respondent discloses a process relying on a polyol according to D21, the evidence provided cannot establish that the open cell content of the foams produced by the process according to operative claim 1 was improved over that in D21.

4.2.6 The evidence made available however shows that all other process parameters being equal, the use of 0.5-100 ppmw of phosphoric acid compound has an effect on the open cell content of the produced foams, as seen by the decreasing porosity values in mm EtOH with increasing amounts of phosphoric acid compound present (Table in paragraph 70 of the patent in suit and Table of the supplementary examples). While an improvement in absolute terms with respect to D21 cannot be acknowledged, it must be recognised that the addition of a phosphoric acid compound provides an alternative way to obtain high open cell content.

4.2.7 The problem that can be formulated in view of that evidence and of D21 is thus the provision of an

alternative way of providing polyurethane foams with a high open cell content.

- 4.2.8 With regard to obviousness and the submissions of the appellant in this respect, the question is whether D1 or D2 read in the context of the common general knowledge represented by D30, suggests the use of 0.5-100 ppmw of a phosphoric acid compound as a possible means for providing polyurethane foams having high open cell contents.
- 4.2.9 D30 is a textbook on polyurethanes and can be accepted to represent the common general knowledge in the field of polyurethanes. In particular it concerns the preparation of polyurethane foams by a process in which a polyether polyol and a polyisocyanate are reacted (the urethanization reaction) in the presence of a blowing agent (sections III and IV of D30). Section IV and in particular the part on pages 249-253 of D30 teaches that the catalysts used in the reaction can influence the ratio of open to closed cells in the foam. The second paragraph on page 252 in particular teaches that closed cells can be reduced by reducing the amount of tin catalyst that is involved in the isocyanate-hydroxyl reaction or that the open cell content can be increased by increasing the tin catalyst or reducing the amine catalyst. That teaching however is specific to the amine and tin catalysts. While this teaching could have been applied to the corresponding amine and tin catalysts that are already present in the process of examples 1-3 of D21 (catalyst a in Table 1 is the amine catalyst of paragraph 106 and catalyst d is the tin catalyst of paragraph 107), it provides no reason to consider the use of a phosphoric acid compound, which is not even mentioned in that document. In particular there is no indication in D30 of how the

addition of a phosphoric acid compound would influence the formation of cells in a process involving amine and tin catalysts.

4.2.10 D1 in its turn discloses the preparation of polyether polyols by ring opening polymerization of an alkylene oxide in the presence of a DMC catalyst (paragraph 12) and the subsequent preparation of a polyurethane (paragraph 13) by reaction of that polyether polyol with a polyisocyanate in the presence of 0.5-100 ppmw of a phosphoric acid. D1 teaches in paragraphs 15, 37 and 47/48 that, while control of the reaction is difficult due to the presence of metal residues from the DMC catalyst, the addition of 0.5-100 ppmw phosphoric acid, which acts as an inhibitor, permits to control the reaction rate of the urethanization reaction and produce a polyurethane having high storage stability. D1 however does not concern the production of foams so that it is unclear to which extent the teaching of D1 could have been applicable to the preparation of polyurethane foams. In particular, there is in D1 no indication that the addition of a phosphoric acid compound as an inhibitor of DMC catalysts in polyols would be compatible with the process for the production of polyurethane foams of D21, which is performed in the presence of further catalysts such as an amine and a tin catalyst, and suitable to provide high open cell contents. A different conclusion cannot be reached also when considering the teaching of D1 in the light of D30, as, even having in mind the effect of the tin and amine catalyst contents on the open cell rate as taught in D30, the skilled person would have no reason to employ a phosphoric acid compound as inhibitor of the DMC catalyst according to the teaching of D1 in the expectation of obtaining a similar effect on the open

cell formation. D1 therefore does not lead to the subject-matter of operative claim 1 also taking into account the teaching of D30.

4.2.11 D2 is a collection of several technical publications concerning Acclaim polyols. The second article in particular concerns the role of acidification in urethane prepolymers. That article pertains to specific polyols Acclaim DP4220 and DP6320, which are said to have such a high reactivity that their use to produce prepolymers requires the addition of a e.g. 20 ppm phosphoric acid (second page of D2, third column). There is however no apparent reason why the skilled person would have applied that teaching which concerns the production of prepolymers to the production of polyurethane foams and the control of cell opening of these foams. Therefore also D2 does not lead to the subject-matter of operative claim 1.

4.2.12 In view of these reasons the board comes to the conclusion that the process of operative claim 1 involves an inventive step when starting from document D21 as the closest prior art.

4.3 Referral to the Enlarged Board of Appeal

4.3.1 In the context of the analysis of inventive step with respect to document D21, the appellant requested a referral of a question to the Enlarged Board of Appeal should the Board conclude that the data forming the basis of the discussion of inventive step show an improvement in view of the closest prior art. The question related to the formulation of the technical problem in a specific situation of the patent in suit in view of the closest prior art and the evidence of an effect on file.

- 4.3.2 In particular, the question was to determine whether, in case an applicant or patent proprietor in order to establish inventive step over the closest prior art relied on a technical effect that was also achieved in the prior art but by other means that were not excluded by the application or the patent in suit, comparative examples had to reflect the closest prior art (then using the other means) or it was sufficient to provide comparative examples which did not make use of the proposed solution of the closest prior art.
- 4.3.3 According to Article 112(1)(a) EPC, a Board of Appeal shall refer a question to the Enlarged Board of Appeal if a decision is required in order to ensure uniform application of the law or if an important point of law arises. The answer to the referred question should not be merely of theoretical or general interest, but has to be essential to reach a decision on the appeal in question (see, for example, G 3/98, OJ EPO 2001, 62, Reasons No. 1.2.3).
- 4.3.4 In the present case, the Board came to the conclusion that an inventive step could be acknowledged even if the comparative examples made available for the discussion of inventive step did not reflect the relevant starting point in the closest prior art and the presence of an improvement over that closest prior art was not acknowledged. It follows that the outcome of the present appeal does not depend on the answer to the questions formulated by the appellant. That question consequently need not be referred to the Enlarged Board of Appeal.
- 4.3.5 The request for referral to the Enlarged Board of Appeal is therefore refused.

4.4 D14a

4.4.1 D14a (as an English translation of prior art document D14; reference in what follows is always made to D14a according to the submissions of both parties) was also considered as a relevant document to be taken as the closest prior art for claim 1 of the main request. D14a concerns the preparation of cold curing high-resilience foam plastics based on a reaction of polyether polyol with an isocyanate (claim 1) and aims at improving the open-cell rate of these foams (Specification, page 2/5, last paragraph). This problem is similar to the one addressed in the patent in suit (paragraph 6). On that basis, D14a is, objectively seen, a reasonable starting point for an assessment of inventive step of claim 1 of the main request.

4.4.2 The disclosure within D14a that comes closer to the process of operative claim 1 is that of embodiment 1, which concerns a process for the preparation of polyurethane foams in two steps. The first step of that process concerns the preparation of a modified MDI (called component B) during which 10ppm of phosphoric acid is present as a polymerization inhibitor. The first step is followed by a second step being the reaction of that component B with a high-resilience compound material (component A). Since it cannot be derived from D14a that the whole phosphoric acid present is fully consumed in the first step, it is reasonable to assume that some phosphoric acid may be present in the second step of embodiment 1, albeit in an amount that is not further disclosed in D14a. Annex D was referred to by the appellant in this respect. However, the calculations made in that annex are based on the assumption that the phosphoric acid present in

the first step is present in the same amount in the second step, which is not derivable from D14a. No mention is made in D14a of the presence of metals in the reacting system.

- 4.4.3 It follows that the process of operative claim 1 differs from the process of embodiment 1 of D14a in i) the presence of from 1 to 30 ppmw, based on the polyether polyol, of metals derived from a composite metal cyanide complex catalyst; and in ii) the presence of from 0.5 to 100 ppmw, based on the polyether polyol, of a phosphoric acid compound comprising a phosphoric acid selected from orthophosphoric acid, polyphosphoric acid and polymetaphosphoric acid, and/or a partial ester of such a phosphoric acid.
- 4.4.4 There is no comparative examples in the patent in suit or in the supplementary examples provided in appeal which can be taken as representative of the process of embodiment 1 of D14a. Moreover no relevance was given by the respondent to the presence of metals for the formulation of a technical problem. In view of the same considerations as detailed in the analysis starting from document D21 (see point 4.2.5 to 4.2.7, above), the problem remains the provision of an alternative way of providing polyurethane foams with a high open cell content.
- 4.4.5 Regarding the presence of a phosphoric acid compound in the process, the situation starting from D14a is the same as the one starting from D21. Taking into consideration the disclosures of D1 and D2 also in the light of D30, an inventive step must be acknowledged for the same reasons as detailed above (see points 4.2.8 to 4.2.12). As an inventive step is already acknowledged in view of the feature relating to the

phosphoric acid compound, there is no need to analyse the further distinguishing feature.

4.5 D2

4.5.1 D2 was also considered by the appellant as a suitable document to be taken as the closest prior art.

4.5.2 D2 concerns the commercially available Acclaim polyols and in particular Acclaim DP4220 and Acclaim DP6320 for which amounts of phosphoric acid and residual catalyst were derived. While D2 briefly mentions on page 1 (first column, first paragraph) that Acclaim polyols were used to prepare polyurethanes, that document does not concern a process for the preparation of polyurethane foams. In fact, D2 does not even explicitly disclose any process to produce polyurethanes from Acclaim DP4220 and Acclaim DP6320 specifically. In that regard, D2 discusses the properties of polyols, which represent nothing more than a single component of the reaction system of the process of claim 1 of the main request, without addressing the subject of the patent in suit which is the production of polyurethane foams. Therefore D2 is not a reasonable starting point for the skilled person aiming at developing a process for preparing a polymer foam and cannot lead already for this reason to the subject-matter of claim 1 of the main request.

4.6 The Board concludes from the above that claim 1 of the main request involves an inventive step over the prior art cited.

5. As all of the objections of the appellant against the main request of the respondent fail, the patent is to be maintained in that form.

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 on the basis of the claims of the main request filed with the reply to the statement of grounds of appeal and a description to be adapted.

The Registrar:

The Chairman:



A. Pinna

D. Semino

Decision electronically authenticated