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Datasheet for the decision of 26 April 2016

Case Number: T 0912/13 - 3.3.03

Application Number: 03735464.4

Publication Number: 1506245

IPC: C08G18/63

Language of the proceedings: EN

Title of invention:
PROCESS FOR PREPARING POLYMER POLYOLS

Patent Proprietor:
Shell Internationale Research Maatschappij B.V.

Opponent:
BASF SE

Relevant legal provisions:
EPC Art. 84, 56

Keyword:
Claims - clarity (not substantiated)
Inventive step - (yes)

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Case Number: T 0912/13 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 26 April 2016

Appellant: (Patent Proprietor)	Shell Internationale Research Maatschappij B.V. Carel van Bylandtlaan 30 2596 HR Den Haag (NL)
Representative:	Shell Internationale Research Maatschappij B.V. P.O. Box 302 2501 CH Den Haag (NL)
Respondent: (Opponent)	BASF SE Global Intellectual Property GVX-C006 67056 Ludwigshafen (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 13 February 2013 revoking European patent No. 1506245 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	O. Dury
Members:	D. Marquis
	J. Geschwind

Summary of Facts and Submissions

I. The appeal by the patent proprietor lies from the decision of the opposition division revoking European patent No. 1506245 pursuant to Article 101(3)(b) EPC.

II. A notice of opposition against the patent was filed in which the revocation of the patent was requested on the grounds according to Article 100(a) EPC (lack of novelty and lack of inventive step).

III. The decision was based among others on a second auxiliary request filed during oral proceedings before the opposition division. The following documents were inter alia cited in opposition:
D2: US 5,223,570
D3: EP 0 698 628 A1

The decision was based among others on a second auxiliary request (5 claims) filed during oral proceedings before the opposition division, independent claim 1 of which reads as follows:

"1. Process for the batch or semi-batch preparation of a polymer polyol in a reactor, which process comprises (1) preparing a seed by polymerizing in a base polyol at least one ethylenically unsaturated monomer in the presence of a polymerization initiator and macromer, and in the presence of from 0.5 to 50 %wt of polymer polyol heel, based on amount of polymer present in heel compared with total amount of polymer present, wherein the polymer polyol heel is polymer polyol which remained in the reactor,
(2) adding additional ethylenically unsaturated monomer to the seed obtained in step (1) and optionally additional polyol, and

(3) polymerizing the mixture obtained in step (2), wherein the removal of polymer polyol product is stopped before the reactor has been fully emptied to ensure that heel is present in the reactor, and wherein the amount of polymer derived from step (1) as present in the final product, is of from 4 to 20 %wt."

Claims 2 to 5 were dependent claims of claim 1.

The opposition division held in particular that the claims of the second auxiliary request satisfied the requirements of Article 84 EPC, were novel over D2 (US 5,223,570) but lacked an inventive step over the closest prior art D3 (EP 0 698 628 A1).

"1. Process for the batch or semi-batch preparation of a polymer polyol in a reactor, which process comprises
(1) preparing a seed by polymerizing in a base polyol at least one ethylenically unsaturated monomer in the presence of a polymerization initiator and macromer, and in the presence of from 0.5 to 50 %wt of polymer polyol heel, based on amount of polymer present in heel compared with total amount of polymer present, wherein the polymer polyol heel is polymer polyol which remained in the reactor,
(2) adding additional ethylenically unsaturated monomer to the seed obtained in step (1) and optionally additional polyol, and
(3) polymerizing the mixture obtained in step (2), wherein the removal of polymer polyol product is stopped before the reactor has been fully emptied to ensure that heel is present in the reactor, and wherein the amount of polymer derived from step (1) as present in the final product, is of from 4 to 20 %wt."

Claims 2 to 5 were dependent claims of claim 1.

IV. The patent proprietor lodged an appeal against the opposition division's decision. In the statement setting out the grounds of the appeal the patent proprietor (appellant) requested that the decision of the opposition division be set aside and that the patent be maintained in amended form according to a main request corresponding to the second auxiliary request filed during the oral proceedings before the opposition division.

V. The reply to the statement of grounds of the appeal was received on 25 October 2013 in which the opponent (respondent) requested the dismissal of the appeal.

VI. On 14 August 2015, the parties were summoned to oral proceedings to be held on 26 April 2016. A communication pursuant to Article 15(1) RPBA was sent by the Board on 16 March 2016.

VII. On 5 April 2016, the appellant submitted a letter containing further arguments.

VIII. On 18 April 2016, the respondent confirmed its requests of dismissal of the appeal and stated that it will not take part to the oral proceedings before the board.

IX. At the end of the oral proceedings which were held on 26 April 2016 the Board announced its decision.

X. The appellant's arguments, as far as relevant for the present decision, may be summarised as follows:

Clarity

No arguments were provided by the appellant.

Inventive step

D3 and in particular the process disclosed in examples 27 and 28 was considered as the closest prior art. There were at least three differences between the subject matter of claim 1 and that of examples 27 and 28 of D3:
i) the process was carried out in a single reactor without removal of the reaction materials between any of steps (1), (2) and (3);
ii) the retention of heel in the reactor; and
iii) the amount of polymer derived from step (1) as present in the final product is in the range of from 4 to 20 %wt.
The total amount of polymer present in the final product was 16.8% for the process of example 3, 15.5% for the process of comparative example 1 and 1.78% for the process of comparative example 2. Although example 3 did not specify that the heel was polymer polyol remaining in the reactor from a previously run, it did use material very similar, if not identical, to such material by using material from a previous reaction. Although lacking the extra advantage using such a retained heel provides, example 3 could nevertheless be considered representative of the process of the present invention.
The objective technical problem was the provision of a process for preparing polymer polyols with either an improved viscosity at relatively high solids content or a broader particle size distribution. There was no teaching in D3 of the use of a single reactor for the steps of preparing a seed from a macromer and ethylenically unsaturated monomer in the presence of a heel remaining from a previous reaction, adding

additional ethylenically unsaturated monomer and polymerising the mixture without removal of the reaction materials between any of steps (1), (2) and (3). D3 taught away from the range of from 4 to 20 %wt for the amount of polymer derived from step (1) in the final product. D3 taught that the preformed polymer polyol called 'seed' must be present in an amount such that the polymer from it provides in the range of 0.25 %wt to 3 %wt of the polymer in the final product. Examples 32 and 33, using 4 %wt, demonstrated less desirable properties. Example 32 (4 %wt) provided a polymer polyol with much higher viscosity than does comparable Example 31 (1 %wt). Such teaching could not have led the skilled person to a process in which a higher percentage of the polymer in the final polymer polyol is formed in an initial step in which macromer and ethylenically unsaturated monomer are reacted in the presence of a heel to form a 'seed'. Claim 1 of the main request was therefore inventive in view of D3.

XI. The respondent's arguments, as far as relevant for the present decision, may be summarised as follows:

Lack of clarity

A reference to the minutes of the oral proceedings before the opposition division was provided as an argument against the clarity of the claims. The claimed process was a perpetuum mobile because it never ended as the polymer polyol heel was present at the beginning as well as at the end of the process. The following feature "to ensure that heel is present in the reactor" was a definition of the invention by a result to be achieved. The main request did not fulfil the requirements of Article 84 EPC.

Inventive step

Claim 1 of the main request was not limited to a process carried out in one single reactor. Claim 1 of the main request therefore encompassed examples 27 and 28 of D3. The patent in suit did not provide a clear and unambiguous definition of the terms "heel" and "seed", so that the seed disclosed in D3 could be seen as the heel referred to in claim 1 of the main request. The main request lacked therefore an inventive step.

XII. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained in amended form according to the main request filed with the statement setting out the grounds of appeal.

XIII. The respondent (opponent) requested in writing that the appeal be dismissed.

Reasons for the Decision

1. The appellant and the respondent were duly summoned to oral proceedings. The respondent however did not attend, as expected from the statement made in its letter of 18 April 2016. The oral proceedings were continued in the absence of the respondent in accordance with Rule 115(2) EPC, the respondent being treated as relying only on its written case (Article 15(3) RPBA).

2. Main request – Clarity

2.1 The main request was objected under Article 84 EPC in the reply to the statement of grounds of appeal. That objection of lack of clarity was only based on a general reference to submissions made in the first instance proceedings against the claims of the then pending auxiliary request 2 which now corresponds to the claims of the main request (paragraph 3.6.2.i together with paragraph 3.4.2.1 of the minutes of the oral proceedings before the opposition division).

2.2 According to the minutes of the oral proceedings before the opposition division, the appellant's argument was that the formulation of claim 1 lacked clarity because it was formulated as a perpetuum mobile and because the feature "to ensure that heel is present in the reactor" was a result to be achieved. These arguments were dealt with by the opposition division in its contested decision (points 5.2 and 6.2). The opposition division did not follow the argumentation of the opponent on the grounds that "claim 1 merely specifies that the reactor, after the reaction has been completed, is not fully emptied, but a part is retained for reuse as ingredient in a subsequent reaction.".

2.3 The reply to the statement of grounds of appeal did not contain a reasoning as to why the findings of the decision under appeal regarding the clarity of the claims corresponding to the main request (point 6.2 together with point 5.2 of the decision of the opposition division) are not correct. As a result, the reply to the statement of grounds of appeal did not fulfil the requirements set out in Art. 12(2) RPBA according to which, in the present case it was up to the respondent to give all the arguments relied upon to contest the reasoning of the opposition division about the clarity of the claims and on that basis set out

clearly and concisely why the final decision of the opposition division to revoke the patent had to be upheld.

2.4 In its communication dated 16 March 2016, the Board indicated that the objection contained in the reply to the statement of grounds of appeal did not seem to contain a rationale that would allow the Board to understand why the claims of the main request would lack clarity and that for this reason the objection was not sufficiently substantiated (point 5.3). The respondent did not provide any further reply to the Board's communication and did not take part to the oral proceedings before the Board. It is considered that, as far as the objection of lack of clarity is concerned, the respondent chose to rest its case on the reference to the arguments provided before the opposition division as referred to in the reply to the statement of grounds of appeal.

2.5 As the argument of the appellant concerning the clarity of the claims had already been dealt with by the opposition division in its contested decision, the Board cannot recognize which reasons of the decision are regarded as mistaken by the respondent, and why, contrary to the requirements set out in Article 12(2) RPBA. It follows that the reply to the statement of grounds of appeal does not specify any legal or factual reason why the decision of the opposition division regarding the alleged lack of clarity of the claims may be regarded to be wrong and therefore lacks adequate substantiation. The objection of lack of clarity of the claims of the main request is therefore rejected.

3. Main request – Inventive step

3.1 The patent in suit provides a batch or semi-batch process for preparing polymer polyols which were found to have a low viscosity at relatively high solids content while having a broad particle size distribution (paragraphs 7 and 8).

3.2 D3 discloses a semi-batch process for the preparation of polymer polyols with broad particle size and reduced viscosities (page 2, lines 35-45). D3 relates to the same technical field and problem as that of the patent in suit and it was considered to represent the closest prior art by both parties. The Board sees no reason to deviate from that view.

3.3 D3 generally relates to a semi-batch process for preparing a final polymer polyol comprising the in-situ polymerization in a batch reactor of one or more ethylenically unsaturated monomers in a polyether polyol media in the presence of a seed polymer polyol, wherein from about 0.25 to about 3 weight percent of the polymer solids in the final polymer polyol comes from the seed polymer polyol, and wherein the final polymer polyol has a broader particle size distribution than an identically prepared polymer polyol prepared in the absence of the seed polymer polyol (claim 1).

3.4 More specifically, examples 27 and 28 have been cited by the parties as the disclosure in D3 that was the closest to the subject matter claimed in the patent in suit. Example 27 shows the semi-batch preparation of a polyether polyol according to procedure A of D3 (Table VIII, page 14 with page 5, lines 11 to 18). In that process, a reactor charge comprised of a polyol, a dispersant, isopropanol, and a seed polymer polyol E

are added to a resin kettle. After heating the reactor charge to reaction temperature (120°C), a feed charge containing styrene and acrylonitrile as monomers, an initiator and a base polyol was added over 4 hours to give a milk-white dispersion. Upon completion of the addition, the dispersion was held at the reaction temperature for 0.5 to 1.0 hr and the reaction mixture was stripped of residual monomers for 1.5 to 2.5 hrs at 100° to 120°C and <5 mm Hg to yield the polymer polyol.

3.5 According to the results reported in Table VIII, the polymer polyol obtained in that process contained 1 %wt of the initial polymer polyol seed E. The dispersant present in the reactor charge is defined in D3 as any dispersant known to stabilize polymer polyols (page 4, lines 4 to 10). It follows that the definition of the dispersant as given in D3 corresponds to that of the macromer of claim 1 of the patent in suit since a macromer is also defined as a stabilizer of the polymer polyol (page 3, lines 25 and 26). The seed polymer polyol E is a polymer polyol of relatively narrow particle size distribution (page 6, lines 22-23). It is prepared according to the procedure A disclosed on page 5 of D3, which is also that of example 27. The parameters of that preparation are reported in Table I on page 7 of D3. The seed polymer polyol E is obtained as a dispersion resulting from the polymerization of styrene and acrylonitrile monomers in the presence of a base polyol, a dispersant and an initiator. It is obtained from the same monomers and starting materials as those used in the preparation of the polymer polyol of example 27. The monomer conversion of the polymerization was as high as 97.1%, indicating that almost no unreacted monomer remained in the seed polymer polyol E (Table I). According to the definition given on page 4, lines 13-14 of D3, the seed polymer

polyol E is not an intermediate but a final polymer polyol product. D3 sets out on page 4, lines 12 to 16 that "the seed material may be comprised in whole or in part of the polymer polyol heel remaining in the reactor from the previous batch of polymer polyol prepared according to the process of the invention". A similar definition of the polymer polyol heel is found in the patent in suit, the polymer polyol heel is a preformed polymer polyol which remained in the reactor (paragraph 12). When the seed polymer polyol E obtained from the polymerization procedure A of D3 is present in the reactor charge of example 27 to participate in the polymerization described above following the same procedure A, its nature and function in the polymerization process is that of a "heel". Furthermore, it has not been shown by the appellant how a "seed" according to operative claim 1 could be distinguished in any manner from a "heel" obtained according to example 27 of D3.

3.6 It follows from the above that the polymerization disclosed in example 27 of D3, read according to the wording of claim 1 of the patent in suit, corresponds to a polymerization, in a base polyol, of at least one ethylenically unsaturated monomer (styrene and acrylonitrile) in the presence of a polymerization initiator and macromer (dispersant), and in the presence of from 0.5 to 50 %wt of polymer polyol heel, based on amount of polymer present in heel compared with total amount of polymer present, as 1 %wt of the seed polymer polyol E is used in the reactor charge of example 27. The polymerization of example 27 can therefore be seen as step (1) of claim 1 of the patent in suit.

3.7 The polymer polyol produced in example 27 was then used as a seed material in the process of example 28. Example 28 of D3 describes a polymerization according to the same procedure as that followed in example 27 (procedure A) in which 1 %wt of the polymer polyol obtained in example 27 is used as a seed for the polymerization of styrene and acrylonitrile. Therefore, the process of example 28 of D3 corresponds to steps (2) and (3) of claim 1 of the patent in suit, as it describes the addition of ethylenically unsaturated monomer (styrene and acrylonitrile in the feed charge of example 28) to the seed obtained in step (1) (the polymer polyol of example 27) and the polymerization of that mixture. Claim 1 of the patent in suit however differs from the disclosure of examples 27 and 28 in that the amount of polymer derived from step (1) as present in the final product, is of from 4 to 20 %wt instead of 1 %wt in the final product obtained from example 28. Also, in the process of claim 1, the removal of the polymer polyol product is stopped before the reactor has been fully emptied to ensure that heel is present in the reactor. The procedure A followed in example 28 describes in its final step that the reaction mixture was stripped of residual monomers to yield the polymer polyol. It does not disclose the partly removal of the final product from the reactor.

3.8 The appellant submitted that the claimed process also required that the steps (1) to (3) had to be performed in a single reactor, contrary to the process of D3 which had been carried out in several reactors. Claim 1 of the patent in suit discloses the batch or semi-batch preparation of a polymer polyol in a reactor, comprised of the steps (1) to (3). The wording of claim 1 does not explicitly disclose that the preparation is performed in a “single” reactor but it can be derived

from the sequence of steps (1) to (3) that the reaction is performed in the same reactor. The process of D3 is a sequence of three polymerizations constituted by i) the preparation of the seed polymer polyol E, ii) the polymerization of example 27 in the presence of the seed polymer polyol E and iii) the polymerization of example 28 in the presence of the product of example 27. According to D3, these three polymerizations were performed according to procedure A which is conducted in a reactor constituted by a 3 liter, 4 neck resin kettle with stirrer, condenser, thermometer and addition tube. However, D3 does not specify whether the three polymerizations i) to iii) were performed in the same reactor.

3.9 It follows from the above that the subject matter of claim 1 can be seen to differ from the process of D3 in that a) the amount of polymer derived from step (1) as present in the final product, is of from 3 to 30 %wt instead of 1 %wt, b) the preparation according to claim 1 requires that the removal of the polymer polyol product at the end of the reaction is stopped before the reactor has been fully emptied to ensure that heel is present in the reactor and c) the steps (1) to (3) of the process of the claim 1 are performed in the same reactor.

3.10 On the basis of example 3 and comparative example 2 of the patent in suit, the appellant formulated the technical problem solved over D3 as the provision of an improved process for the preparation of polymer polyols wherein at least one of the viscosity or the particle size distribution of the polymer polyol had been improved.

3.11 Example 3 of the patent in suit describes the preparation of a polymer polyol according to claim 1 wherein a seed polymer is prepared by polymerization of styrene and acrylonitrile monomers in the presence of a base polyol, AMBN as an initiator and a heel polymer which is a polyol polymer obtained from a previous polyol preparation. Additional styrene and acrylonitrile were added to the mixture and polymerized in a second step to result in a polymer polyol product having a solids content of 40.1 %wt (Table 1). The actual amount of polymer resulting from the first step as present in the final product was recalculated by the appellant to be 16.8% (letter of 5. April 2016), within the range of 4 to 20 %wt as claimed and corresponding to what was disclosed as the gist of the invention in paragraph 18 of the patent in suit. The product had a viscosity at 25°C of 6100 mPa.s and a span of particle size distribution of 2.34 (Table 2).

3.12 Comparative example 2 describes the preparation of a polymer polyol according to the same general process as that of example 3 with the difference that the styrene and acrylonitrile monomers are only added in one step instead as in the two steps (1) and (2) of claim 1 of the patent in suit. As argued by the appellant at the oral proceedings before the Board and as can be derived from Table 1 of the patent in suit, comparative example 2 corresponds to a polymerization process that does not contain the seed polymer polyol. The solids content of that polymer was 90.5 %wt as reported in Table 1. The actual amount of polymer resulting from the first step as present in the final product was recalculated by the appellant to be 1.78%, outside the claimed range of 4 to 20 %wt. The product had a viscosity at 25°C of 6200 mPa.s and a span of particle size distribution of 1.77 (Table 2). By comparison to

the product of example 3, which had been made by the process of claim 1, the product obtained in comparative example 2 had a narrower particle size distribution, which would be detrimental to the cell opening of polyurethane foams produced from that polyol (paragraph 7).

3.13 The process of comparative example 2, which was not according to claim 1 of the patent in suit, differed foremost from that of example 3 in that no seed polymer had been used in the process. The process of D3 as seen in examples 27 and 28 however contains and requires a seed polymer. The process according to comparative example 2 of the patent in suit is therefore not a fair representation of the process of D3.

3.14 The process according to comparative example 1 of the patent in suit was performed without polymer heel. The patent in suit contains no further example that could be seen as representative of the closest prior art. As a result, there is no evidence in the patent in suit that the distinguishing feature a) (amount of polymer resulting from step (1) in the final product) provides an improved process. Also, there is no evidence in the patent in suit showing that the distinguishing feature b) (partly removal of the final product from the reactor) and c) process steps performed in the same reactor are associated to any technical advantage over D3. In the absence of a comparison with D3, the technical problem solved can only be seen as the provision of an alternative batch or semi-batch process for the preparation of polymer polyols. From example 3 of the patent in suit it can be accepted that the problem has been credibly solved by the use of a process in which the amount in polymer resulting from step (1) in the final product is in the range of 4 to

20 %wt.

3.15 The question that remains to be answered is whether it was obvious in view of D3 to use 4 to 20 %wt of polymer polyol from step (1) in the final product in the expectation of solving the technical problem.

3.16 D3 describes that it is the addition of a small amount of seed polymer polyol to a semi-batch process which results in polymer polyols with broad particle size distributions and reduced viscosities (page 2, lines 35 to 37). According to D3, the small amount of seed considered critical to obtain these improved properties is from about 0.25 %wt to about 3 %wt (page 2, line 44 and page 3, lines 7 to 11). It is also that amount of polymer from the first step of the polymerization which will remain in the final polymer polyol. Thus, the amount of seed used in the examples of D3 that are according to claim 1 of D3 is comprised between 0.5 and 2.5 %wt. Also in examples 27 and 28, which represent the closest disclosure to that of claim 1 of the patent in suit, the amount of seed is 1 %wt. The teaching of D3 is therefore to use an amount of seed of 0.25 %wt to 3 %wt in order to obtain a polymer polyol of broad particle size distribution.

3.17 D3 further teaches that the polymer particle size and distribution in the polymer polyol depends on a number of factors including the amount of seeds, the method of seed addition, and the seed solid content (page 3, lines 5 to 16). According to D3, adding only a small amount of seed is critical for obtaining the improved properties in the semi-batch process of this invention, the critical amount being defined as a range between 0.25 %wt to 3 %wt in line 28 of page 3. It is that small amount of seed which resulted in new nucleation

of particles in addition to size growth of the seeds. By contrast, when a large amount of seeds was used, the new nucleation was depressed, resulting in a narrower particle size distribution and no improvement in viscosity (page 3, lines 9 to 11). That teaching appears to correspond to the process of example 32 of D3 for which an amount of seed of 4 %wt was used. Compared to the product of example 31 obtained under the same reaction conditions and with 1 %wt of seed in accordance to the teaching of D3, that of example 32 had a much higher viscosity (39220 cps vs. 9480 cps in example 31) and a narrower particle size distribution as derived from the smaller standard deviation (0.39 vs. 0.69 in example 31).

3.18 D3 aims at solving the same technical problem as that of the patent in suit, namely the provision of a polymer polyol with a low viscosity, at relatively high solids and having a broad particle size distribution. The teaching of D3 is that in order to achieve the broad particle size distribution of the polymer polyol, the amount of seed must be confined to a range of 0.25 %wt to 3 %wt. D3 also shows that when 4 %wt of seed was used in the process, the aim of the process is not achieved. As a result, the person skilled in the art, starting from the closest prior art D3 and in search of an alternative process, would not have considered to increase the amount of seed or polymer obtained from the first polymerization step in a range above 3 %wt. The person skilled in the art would have therefore not considered the range of 4 %wt to 20 %wt according to claim 1 of the main request. No other document was cited in appeal that could have been considered to provide an incentive towards the claimed range.

3.19 It is concluded from the above that claim 1 of the main request is inventive in view of D3 as closest prior art. That conclusion applies to the dependent claims 2 to 5 of the main request. The main request satisfies therefore the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in amended form according to the main request filed with the statement setting out the grounds of appeal and after any necessary adaptation of the description.

The Registrar: The Chairman:

B. ter Heijden O. Dury

Decision electronically authenticated