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Datasheet for the decision of 11 January 2012

Case Number: T 0594/08 - 3.3.03

Application Number: 98931772.2

Publication Number: 1098923

IPC: C08G 18/63, C08F 283/06

Language of the proceedings: EN

Title of invention:
Polymer polyols and a process for the production thereof

Patent Proprietor:
Dow Global Technologies LLC

Opponent:
Bayer MaterialScience AG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 114(2)

Keyword:
"Disclosure - Sufficiency (yes)"
"Novelty (yes)"
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0594/08 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 11 January 2012

Appellant: (Opponent)
Bayer MaterialScience AG
Law and Patents
Patents and Licensing
D-51368 Leverkusen (DE)

Respondent: (Patent Proprietor)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 7 February 2008 rejecting the opposition filed against European patent No. 1098923 pursuant to Article 101(2) EPC.

Composition of the Board:

Chairman: B. ter Laan
Members: D. Marquis
C. Vallet

Summary of Facts and Submissions

I. The appeal lies against the decision by the opposition division dated 22 January 2008, to reject the opposition against European patent No. 1 098 923 (application No. 98 931 772.2).

II. The patent as granted was based on eight claims of which independent claims 1 and 6 read:

"1. A polymer polyol composition which has a polymer content of 20 to 60 weight percent, based on total weight, a Brookfield Viscosity, as determined according to ASTM D-4878-93, that is equal to or less than (a $e^{[(0,051)(b)]}$) where "a" is the viscosity of the carrier polyol and "b" is the [(weight fraction of solids) (100)] and product stability such that essentially 100% passes through a square mesh with an average mesh opening of 0.105 mm (150 mesh) and up to 100% passes through a square mesh with a nominal opening of 0.030 mm (700 mesh) produced by a free radical polymerization of the composition comprising:
(a) a polyol;
(b) a preformed stabilizer;
(c) at least one ethylenically unsaturated monomer;
(d) a free radical polymerization initiator comprising at least a first active peroxide, said first active peroxide being present in an amount of equal to or less than 0.6 weight percent, based on the total monomer; and,
(e) a chain transfer agent."

"6. A process for the preparation of polymer polyol composition, which has a polymer content of 20 to 60

weight percent, based on total weight, a Brookfield Viscosity, as determined according to ASTM D-4878-93, that is equal to or less than (a $e^{[(0,051)(b)]}$) where "a" is the viscosity of the carrier polyol and "b" is the [(weight fraction of solids)(100)] and product stability such that essentially 100% passes through a square mesh with an average mesh opening of 0.105 mm (150 mesh) and up to 100% passes through a square mesh with a nominal opening of 0.030 mm (700 mesh) which process comprises providing a composition comprising:
(a) a polyol;
(b) a preformed stabilizer;
(c) at least one ethylenically unsaturated monomer
(d) a free radical polymerization initiator comprising at least a first active peroxide, said first active peroxide being present in an amount of equal to or less than 0.6 weight percent, based on the total monomer content; and,
(e) a chain transfer agent,
in a reaction zone maintained at a temperature sufficient to initiate a free radical polymerization, and under sufficient pressure to maintain only liquid phases in the reaction zone, for a period of time sufficient to react essentially at least major portion of the at least one ethylenically unsaturated monomer and recovering the polymer polyol."

III. The opposition was based on the grounds of Article 100(a) EPC (lack of novelty as well as lack of inventive step), Article 100(b) EPC and Article 100(c) EPC. Reference was made *inter alia* to WO97/15605 (D1).

In the course of the opposition procedure, the patent proprietor filed D5 (test report provided by letter dated 30 May 2006).

IV. The opposition division found that the requirements of Article 123(2) EPC were fulfilled and that the patent contained enough information for the skilled person to carry out the invention (Article 83 EPC). The opposition division also found that the difference with D1 was the kind of peroxide initiator used in the production of the polymer polyol and the resulting polymer polyol as such, so that novelty was acknowledged. As regards inventive step, the problem to be solved vis-à-vis D1 as the closest document, was to make available an alternative production method for a polymer polyol that improved the load-bearing capacity of a polyurethane foam made out of it and that had a high polymer content, a low viscosity and a defined particle size. D1 did not hint at the combination of features forming the solution to that problem provided by the opposed patent, so that the claimed subject-matter was inventive.

V. On 19 March 2008, the opponent lodged an appeal against that decision and paid the prescribed fee on the same day. The statement of grounds of appeal was filed on 09 June 2008. Nine further documents were cited, amongst which US-A-5 268 418 (E2).

VI. With letter dated 22 October 2008, the respondent (patent proprietor) filed a reply to the statement of grounds of appeal as well as an auxiliary request.

VII. With letter of 09 November 2011, the Board summoned the parties to oral proceedings and gave its preliminary opinion on the matters to be discussed.

VIII. With letter dated 15 December 2011, the appellant commented on the arguments of the respondent filed on 22 October 2008.

IX. With letter dated 15 December 2011, the respondent filed a new main request and two new auxiliary requests, replacing the auxiliary request submitted with the letter of 22 October 2008.

Main request

Claims 1 to 7 of the main request were identical to claims 1 to 7 as granted. Claim 8 was amended to read (addition indicated in bold by the Board compared to the granted version):

"8. A composition for the preparation of a polyurethane foam wherein there is used polymer polyol, a polyurethane catalyst, an organic polyisocyanate, a surfactant, and a blowing agent, characterized in that the polymer polyol comprises polymer polyol **composition** as claimed in any one of Claims 1 to 5."

Auxiliary request 1

Claims 1, 6 and 8 of auxiliary request 1 read (additions indicated in bold by the Board and deletions in strikethrough compared to the granted version):

"1. A polymer polyol composition which has a polymer content of 20 to 60 weight percent, based on total weight, a Brookfield Viscosity, as determined according to ASTM D-4878-93, that is equal to or less than (a $e^{[(0,051)(b)]}$) where "a" is the viscosity of the carrier polyol and "b" is the [(weight fraction of solids) (100)] and product stability such that essentially 100% passes through a square mesh with an average mesh opening of 0,105 mm (150 mesh) and up to 100% passes through a square mesh with a nominal opening of 0,030 mm (700 mesh) produced by a free radical polymerization of the composition comprising:
(a) a polyol;
(b) a preformed stabilizer;
(c) at least one ethylenically unsaturated monomer;
(d) a free radical polymerization initiator comprising at least a first active peroxide, said first active peroxide being present in an amount of **greater than 0.1 weight percent and** ~~equal to or~~ less than 0.6 weight percent, based on the total monomer; and,
(e) a chain transfer agent."

"6. A process for the preparation of polymer polyol composition, which has a polymer content of 20 to 60 weight percent, based on total weight, a Brookfield Viscosity, as determined according to ASTM D-4878-93, that is equal to or less than (a e[(0,051) (b)]) where "a" is the viscosity of the carrier polyol and "b" is the [(weight fraction of solids) (100)] and product stability such that essentially 100% passes through a square mesh with an average mesh opening of 0,105 mm (150 mesh) and up to 100% passes through a square mesh with a nominal opening of 0,030 mm (700 mesh), which process comprises providing a composition comprising:

(a) a polyol;
(b) a preformed stabilizer;
(c) at least one ethylenically unsaturated monomer
(d) a free radical polymerization initiator comprising at least a first active peroxide, said first active peroxide being present in an amount of **greater than 0.1 weight percent and** ~~equal to or~~ less than 0.6 weight percent, based on the total monomer content; and,
(e) a chain transfer agent,
in a reaction zone maintained at a temperature sufficient to initiate a free radical polymerization, and under sufficient pressure to maintain only liquid phases in the reaction zone, for a period of time sufficient to react essentially at least major portion of the at least one ethylenically unsaturated monomer and recovering the polymer polyol."

"8. A composition for the preparation of a polyurethane foam wherein there is used polymer polyol, a polyurethane catalyst, an organic polyisocyanate, a surfactant, and a blowing agent, characterized in that the polymer polyol comprises a polymer polyol **composition** as claimed in any one of Claims 1 to 5."

Auxiliary request 2

Claim 1 of auxiliary request 2 was identical to claim 1 of auxiliary request 1 except for component (d) (additions indicated in bold by the Board and deletions in strikethrough compared to the granted version):

"[...] (d) a free radical polymerization initiator **consisting of** ~~comprising at least~~ a first active peroxide, said first active peroxide being present in

an amount of **greater than 0.1 weight percent and** ~~equal to or~~ less than 0.6 weight percent, based on the total monomer; and, [...]".

Claim 4 of auxiliary request 2 was identical to claim 6 of auxiliary request 1 except for component (d) (additions indicated in bold by the Board and deletions in strikethrough compared to the granted version):

"[...] (d) a free radical polymerization initiator **consisting of** ~~comprising at least~~ a first active peroxide, said first active peroxide being present in an amount of **greater than 0.1 weight percent and** ~~equal to or~~ less than 0.6 weight percent, based on the total monomer content; and, [...]"

Claim 6 of auxiliary request 2 was identical to claim 8 of auxiliary request 1.

X. Oral proceedings were held on 11 January 2012 in the presence of both parties.

XI. The appellant's arguments may be summarised as follows:

(a) *Sufficiency of disclosure*

It was not technically possible to perform a free radical polymerization when an infinitesimal amount of active peroxide was present in the composition, as allowed by the open range "*amount of equal to or less than 0.6 weight percent*" defined in claim 1.

(b) *Late filed document*

Though late filed, E2 was relevant to the question of novelty and inventive step and should therefore be admitted into the proceedings.

(c) *Novelty*

The subject matter of claims 1 to 5 and 8 lacked novelty over D1 as the free radical polymerization described in the examples of Table 2 of D1 took place in the presence of residual amounts of peroxide initiator contained in the preformed stabilizer.

The subject matter of claims 1 to 5 lacked novelty over E2, because the polymer polyol compositions of examples 4, 5, 6, 9 and 10 could not be structurally differentiated from those of claim 1 of the patent in suit.

(d) *Inventive step*

- The closest prior art document was D1.

- There were too many differences between Examples 12 and 13 of the patent in suit to demonstrate an improvement of the viscosity properties of the polymer polyol compositions. Also, the polymer polyol compositions of Examples 4 and 5 revealed that there was no causal link between the type of free radical initiator used during polymerization and the viscosity properties of the resulting compositions. Hence, there was no evidence on file

showing an improvement of the properties of the claimed polymer polyol compositions over those of D1, so that the technical problem solved could only be to provide further compositions.

- The use of active peroxide initiators in the free radical polymerization was obvious in view of E2 which suggested improved properties when peroxides are employed. The maximum amount of 0.6 weight percent of active peroxide in claim 1 was arbitrary as could be deduced from examples 4 and 10 of E2 which revealed compositions of comparable properties although incorporating very different amounts of initiator (1.1 and 1.6 weight percent respectively).

- Therefore, the subject matter of the main request lacked an inventive step.

XII. The respondent's arguments may be summarized as follows:

Main request

(a) *Sufficiency of disclosure*

The requirements of Article 83 EPC were fulfilled because the wording of the claims made it clear that the composition should contain an amount of first active peroxide sufficient to perform free radical polymerization. Infinitesimal amounts of initiator were not encompassed by the claims.

(b) *Late filed document*

E2 should not be admitted into the proceedings because it was not highly relevant. E2 did not favour the use of peroxide initiators over azo initiators and further taught that the initiator concentration was not critical for the free radical polymerization reaction. E2 therefore taught away from using a small amount of peroxide initiator during the free radical polymerization.

(a) *Novelty*

Neither D1 nor E2 disclosed the use of an active peroxide initiator in an amount of equal to or less than 0.6 weight percent by weight during the production of the polymer polyol composition. In D1, a peroxide initiator was only added during the preparation of the preformed stabilizer and no evidence showed that any remaining peroxide was present during the production of the polymer polyol composition in an amount sufficient to initiate a free radical polymerization. The polymer compositions of the patent in suit could be structurally differentiated from those of D1 through their peroxo-initiated chains created during the production of the polymer polyol compositions.

(b) *Inventive step*

- The closest prior art document was D1.

- The technical problem solved was to provide polymer polyol compositions that satisfied the ever-increasing need of the polyurethane foam industry as far as handling and economical aspects were concerned and additionally to improve the properties of the polyurethane foams produced therefrom.

  Examples 12 and 13 of the patent showed comparable compositions and demonstrated an improvement of the viscosity properties of the claimed polymer polyol compositions over those of D1. The various differences identified in the polymer polyols of Examples 9 and 10 which were used for preparing the compositions of examples 12 and 13 were not relevant considering the magnitude of the viscosity improvement. The different viscosities measured for the polymer polyol compositions of Examples 2 and 6 were explained by the fact that the compositions belonged to different batches and were probably produced under different reaction conditions.

  The properties of the compositions of examples 4 and 5 of the patent in suit could not be compared because different amounts of different chain transfer agents were employed.

- Using active peroxides in the free radical polymerization of the patent in suit was not obvious in view of E2. An improvement of the properties of the polymer polyol compositions could not be expected because E2 actually showed that polymer content and viscosity of the polymer

polyols obtained in the presence of a peroxide were worse than when an azo catalyst was employed.

The maximum amount of 0.6 weight percent of active peroxide in claim 1 was not chosen arbitrarily, but was determined from logarithmic viscosity curves. E2 did not teach that the amount of peroxide was critical for the viscosity improvement. E2 was even self-contradictory in that regard. In column 20, E2 suggested that a smaller molar amount of peroxide led to a higher polymer content and a lower viscosity of the polymer polyol compositions. However, a comparison of the compositions of example 4 and 10 of E2 implied the contrary as both polymer content and viscosity worsened when a lower amount of peroxide was employed.

- Therefore, the subject matter of claim 1 of the main request involved an inventive step.

Auxiliary requests 1 and 2

(a) *Sufficiency of disclosure*

Infinitesimal amounts of active peroxide were not encompassed by the claims because the amendments in claims 1 and 6 specified a minimum amount of active peroxide of 0.1 weight percent.

(b) *Novelty*

An amount of active peroxide initiator in the range of 0.1 and 0.6 weight percent was not

explicitly disclosed in the prior art. Auxiliary requests 1 and 2 were therefore novel. Furthermore, Auxiliary request 2 excluded the presence of any initiator other than peroxide and was therefore clearly novel over D1.

(c) *Inventive step*

The reasoning regarding the main request was also fully applicable to the claims of auxiliary requests 1 and 2. These requests were therefore inventive.

XIII. The appellant requested that the decision under appeal be set aside and that the patent be revoked.

XIV. The respondent requested that the appeal be dismissed, or alternatively that the patent be maintained on the basis of one of auxiliary requests 1 or 2 as filed with letter of 15 December 2011.

XV. At the end of the oral proceedings, the chairman announced the Board's decision.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 *Late filed document E2*

As can be seen in point 2.4.5 below, E2 is considered to be highly relevant for the assessment of the inventive step of the subject-matter now being claimed. It is even considered prejudicial to the maintenance of the patent. Therefore, it is admitted into the proceedings.

2.2 *Sufficiency of disclosure*

The claims require the presence of "*a free radical polymerization initiator comprising at least a first active peroxide*" in the medium that is submitted to free radical polymerization. The wording "*active peroxide*" is interpreted to mean that the initiator must be present in the polymerization medium in an amount at least sufficient to perform its function, i.e. to actively initiate the free radical polymerization. Therefore, amounts of active peroxide initiator that are infinitesimal and insufficient to perform the free radical polymerization are not encompassed by the claims.

In addition, the prior art documents D1 and E2 confirm that the production of polymer polyol compositions with the help of active peroxide initiators in amounts that can be varied within wide limits is already part of the common technical knowledge of the skilled person (D1, page 11, lines 18 and 19; E2, column 20, lines 49 and 50). As far as D1 is concerned, while line 10 of page 11 erroneously mentions the "*preparation of the*

preformed stabilizer", it is clear that it is rather the production of the polymer polyol compositions which is meant on page 11, as can be deduced from line 18 "*in the polymer polyol*", line 22 "*based on the total feed of the reactor*" and the corresponding passage on page 8, lines 13 to 27.

In view of the above, the Board comes to the conclusion that a skilled person finds enough guidance in the patent in suit to choose an amount of peroxide initiator in order to perform the invention over the whole scope of the claims.

Therefore, article 83 EPC is complied with.

2.3 *Novelty*

2.3.1 D1 discloses a process for the production of polymer polyol compositions based on a precursor stabilizer, a polyol, an ethylenically unsaturated monomer, a free radical polymerization initiator and a chain transfer agent (Claim 7; page 5 line 23 to page 6 line 3; page 11 lines 9 to 24; examples 3 to 9). The preparation of the precursor stabilizer involves the free radical polymerization of a polyol, at least one ethylenically unsaturated monomer, a free radical initiator and a compound containing a silicon atom (Claim 1; page 6 line 31 to page 7 line 12; page 8 lines 13 to 27; examples 1 to 3). Whilst a peroxide initiator is used in the preparation of the precursor stabilizer (Examples 1 and 2), an azo catalyst is used in the production of the polymer polyol compositions (Examples 3 to 9).

2.3.2 E2 discloses polymer polyols obtained from the free radical polymerization of a composition comprising a polyol, a preformed stabilizer, at least one ethylenically unsaturated monomer, a free radical polymerization initiator and a liquid diluent (Claim 1; Examples 4 to 10). Either azo catalysts or peroxide initiators were used in the free radical polymerization reaction (Column 20 line 49 to column 21 line 5; Examples 4 and 10).

2.3.3 The examples of D1 and E2 disclose polymer polyol compositions produced by a free radical polymerization conducted in the presence of an azo catalyst, which leads to polymer polyols containing azo-initiated chains. By contrast, the polymer polyols of the present request are produced by a free radical polymerization in the presence of a peroxide initiator which leads to polymer polyols containing peroxo-initiated chains. It was not contested by the appellant that existing analytical methods can be used to distinguish between polyol polymers with azo-initiated chains like those of D1 and E2 from those with peroxo-initiated chains as in the patent in suit.

2.3.4 In the examples of D1, peroxide initiators are only used during the preparation of the preformed stabilizers which are later added to the free radical polymerization medium for the production of the polymer polyol compositions. Even though the preformed stabilizer might contain residual amounts of unreacted peroxide initiator when it is added to reaction medium for the preparation of the polymer polyol compositions, the appellant did not provide the evidence that such residual amounts of peroxide initiator would be

sufficient to result in peroxo-initiated polymer polyols identical to those produced in the patent in suit.

The appellant also did not provide any evidence showing that the polymer polyol compositions produced in the presence of 1.6 weight percent of peroxide initiator in example 10 of E2 were identical to the polymer polyols produced in the presence of at most 0.6 weight percent of peroxide initiator, as required in the claims of the present request.

In view of the above, neither D1 nor in E2 contains a clear and unambiguous disclosure of the present process and of the polymer polyols resulting from that process. The claimed subject-matter of the main request is therefore novel.

2.4 *Inventive step*

2.4.1 Closest prior art

The patent in suit relates to polymer polyol compositions and a process for the production thereof. Similar compositions and processes are known from D1, which both parties as well as the first instance considered to represent the closest prior art document. Since D1 aims at producing polymer polyols meeting foam processing and load-bearing properties required by the polyurethane foam industry (page 4, lines 12 to 15; page 12, lines 3 to 6), as does the patent in suit (paragraphs [0004], [0014] and [0019], [0029] [0036]), the Board sees no reason to depart from that position.

2.4.2 The technical problem

The patent seeks to provide polymer polyol compositions that satisfy the ever-increasing needs of the polyurethane foam industry as far as handling (paragraphs [0004], [0014] and [0019]) and economical aspects (paragraph [0029]) are concerned and additionally improve the properties of the polyurethane foams produced thereof (paragraphs [0004], [0036]).

2.4.3 Solution

The solution to the above problem resides in the compositions defined in claim 1 and the process of claim 6 and more specifically in the use of a first active peroxide initiator being present in an amount of equal to or less than 0.6 weight percent during free radical polymerization. This feature also represents the distinguishing feature of present claim 1 of the main request over D1 which discloses the use of an azo catalyst (Vazo 67, Table 2, page 19).

2.4.4 Success of the solution

The patent in suit provides examples of polyurethane foams (examples 12 and 13) made from polymer polyol compositions produced in the presence of an azo catalyst (example 9) or a peroxide initiator (example 10). However, the polymer polyol compositions disclosed in these examples do not allow a fair comparison of their properties because the reaction mixtures used in examples 9 and 10 do not only differ from one another in the nature and amount of free radical initiator (0.50 parts by weight versus 0.20

parts by weight) but also in the nature and/or amounts of several other essential constituents. In particular, the reaction media of examples 9 and 10 differ in the amounts of polyol employed (53.1 parts by weight versus 47.6 parts by weight of CP-3040 Polyol), in the nature and amount of the chain transfer agent (0.35 parts by weight of n-dodecyl mercaptan versus 2.07 parts by weight of isopropanol), in the amount of ethylenically unsaturated monomer styrene (29,3 parts by weight versus 30,3 parts by weight) and acrylonitrile (12,6 parts by weight versus 12,9 parts by weight) and in the reaction temperature during polymerization (130°C versus 125°C). These significant differences in several essential constituents and reaction conditions will inevitably result in substantial variations of the physical properties of the polymer polyols prepared in examples 9 and 10, and as a consequence, of the resulting polyurethanes of examples 12 and 13. Therefore, improvements in polymer content and viscosity of the polymer polyols of examples 9 and 10 and in indentation force deflection of the polyurethanes of examples 12 and 13 cannot be exclusively and unambiguously attributed to the use of 0.6 weight percent or less of an active peroxide initiator during the free radical polymerization of the composition defined in present claim 1.

In addition, test report D5 provides four embodiments of polymer polyol compositions obtained after a free radical polymerization. While example 1 discloses the use of an azo catalyst in an amount of 0.97 weight percent, example 1a and example 2a disclose the use of a peroxide initiator in an amount of 0.95 weight percent and 0.91 weight percent respectively. As the

subject-matter of claims 1 and 6 of the patent in suit requires the use of an active peroxide in an amount equal to or less than 0.6 weight percent, examples 1, 1a and 2a are therefore not representative of the claimed subject-matter. The sole embodiment of D5 representing the claimed polymer polyol compositions is example 2, but with 0.19 weight percent of peroxide initiator, example 2 covers only one embodiment of the claimed subject-matter which is rather remote from the claimed maximum amount of active peroxide initiator amount of 0.6 weight percent. Test report D5 does not demonstrate the presence of improved viscosities over the whole scope claimed, i.e. in an amount of active peroxide equal to or less than 0.6 weight percent.

Hence, it has not been shown that the polymer polyol compositions of claim 1 and 8 or the process of claim 6 lead to polymer polyols with improved viscosities or improved polymer contents or lead to polyurethane foams with improved load-bearing properties vis-à-vis D1, over the whole scope claimed. The technical problem effectively solved by the distinguishing feature of claims 1 and 6 of the patent in suit over D1 has therefore to be reformulated in a less ambitious way, namely, to provide further polymer polyol compositions suitable for the preparation of polyurethane foams.

In view of the results presented in Table 3 of the patent in suit and in view of the test report D5, the Board is satisfied that the reformulated problem as stated above is indeed solved over the whole claimed area by the proposed solution.

2.4.5 Obviousness

It remains to be decided whether the proposed solution to the technical problem as defined above is obvious in view of the prior art. Starting from the closest prior art D1, the question to be answered is whether a skilled person would have used an active peroxide initiator in an amount of equal to or less than 0.6 weight percent based on the total monomer instead of an azo catalyst during the production of the polymer polyol compositions.

D1 not only teaches that both azo catalysts and active peroxide initiators can be used as free radical initiators, it also discloses that their concentrations during free radical polymerization can vary within wide limits (page 11, lines 9 to 24). However, D1 rather suggests the use of more than 0.6 weight percent of azo catalysts in examples 3 to 9 which disclose the production of polymer polyol compositions in the presence of an azo catalyst in amounts of 0.40 parts and 0.41 parts, which corresponds to concentrations of between 0.91 and 1.01 weight percent based on total monomer. Therefore, D1 does not point at the use of a peroxide initiator in an amount of equal to or less than 0.6 weight percent so that D1 alone does not render the claimed subject-matter obvious.

E2 discloses the preparation of polymer polyol compositions suitable for use in producing polyurethane foams (column 1, lines 23 and 24). The preparation of the polymer polyol compositions of E2 (Examples 4 to 10 in Table IV) is similar to that of D1 and it has not been disputed by the parties that the polymer polyol

compositions of E2 display the same polymer contents, viscosities and stability as those of D1.

E2 further discloses the use of either azo catalysts or acyl peroxides as free radical polymerization initiators the concentration of which is described as non critical (column 20, line 49). It is further stated that "*acyl peroxides have the unique advantage of effecting the desired degree of polymerization essentially without raising the viscosity of the polymer/polyol over that obtained with the azo catalyst. This enhances ones ability to achieve higher solids polymer/polyols with good product stability without raising product viscosity. Such acyl peroxides can be used in molar amounts substantially less than the amounts required when using other free radical catalysts in forming the polymer/polyols.*" (column 20 line 64 to column 21 line 5). This passage constitutes in the Board's view a clear teaching that acyl peroxide initiators are preferred over azo catalysts when polymer polyol compositions with a high polymer content, a good stability and yet a satisfying viscosity are sought.

As to the amount of active peroxide initiator in the free radical polymerization medium, the person skilled in the art already knows from D1 (page 11, lines 22 to 24) and is also taught in E2 (column 21, lines 2 to 5) that it can be chosen within a wide range of concentrations and that minimal amounts of initiator are preferred as long as the properties of the polymer polyol compositions are not compromised. Since the specific range of equal to or less than 0.6 weight percent chosen in the claims of the patent in suit is

not linked to any particular technical effect, it is considered to result from an arbitrary choice within the ranges of peroxide initiators known from E2.

The Board sees no contradiction between the teachings of E2 and its examples. If E2 teaches that peroxide initiators can generally be used in lesser amounts than other free radical catalysts and that improved polymer polyols are obtained when peroxide initiators are used instead of azo catalysts, that does not mean that any peroxide initiator used in lesser amounts than any azo catalyst will always provide improved polymer polyols. Therefore, the general teaching of E2 cannot be invalidated by the observations made in examples 10 and 4 wherein the use of a peroxide initiator is shown to lead, under specific circumstances, to a polymer polyol having a lower polymer content and a higher viscosity.

It is concluded that E2 suggests the use of acyl peroxide initiators instead of azo catalysts when polymer polyol compositions with higher polymer contents and lower viscosities are sought. Hence, the solution proposed in the claims to solve the problem underlying the patent in suit is obvious.

3. Auxiliary requests 1 and 2

3.1 *Sufficiency of disclosure and novelty*

The considerations developed under 2.2 and 2.3 above also apply to the subject-matter claimed in auxiliary requests 1 and 2 since the amendments made therein merely represent further limitations of the claimed range relating to the amounts of peroxide initiator.

Therefore, the claims of the auxiliary requests 1 and 2 satisfy the requirements of Article 83 EPC and Article 54 EPC.

3.2 *Inventive step*

3.2.1 Claim 1 of auxiliary request 1 was amended so as to define a lower limit for the amount of peroxide initiator as greater than 0.1 weight percent. Notwithstanding this limitation, the amount of active peroxide initiator remains such that it cannot be associated with a new technical effect. The technical problem associated with claim 1 of the auxiliary request 1 therefore remains to provide further polymer polyol compositions suitable for the preparation of polyurethane foams. The choice of an amount of active peroxide initiator in the range of claim 1 of auxiliary request 1 remains arbitrary and devoid of an inventive step starting from D1 in view of the teaching of E2 for the same reasons as for the main request.

3.2.2 Claim 1 of auxiliary request 2 was amended so as to limit the amount of active peroxide initiator to greater than 0.1 weight percent to less than 0.6 weight percent and also limits the type of radical initiator present during polymerization to peroxide initiators only. In the patent in suit, compositions containing one peroxide initiator only (example 4) or a mixture of peroxide initiator and azo catalyst (example 5) are described. The properties of these compositions cannot be meaningfully compared because they are prepared using significantly different amounts of different chain transfer agents. Consequently, the patent in suit does not show any advantage of using peroxide

initiators only. The technical problem solved by claim 1 of auxiliary request 2 therefore remains to provide further polymer polyol compositions suitable for the preparation of polyurethane foams. The choice of an amount of active peroxide initiator in the range of claim 1 of auxiliary request 2 remains arbitrary and devoid of an inventive step starting from D1 in view of E2. As the teaching found in E2 relates to peroxide initiators, the limitation of claim 1 to this very same type of initiator does not change the argumentation regarding the absence of an inventive step of the main request (point 2.4 above) and first auxiliary request (point 3.2.1 above). Claim 1 of the auxiliary request 2 therefore lacks an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar The Chairman

E. Görgmaier B. ter Laan