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D E C I S I O N
of 6 December 1999

Case Number: T 0182/97 - 3.3.3

Application Number: 88115048.6

Publication Number: 0309816

IPC: C08G 18/48

Language of the proceedings: EN

Title of invention:
Polyurethane-forming compositions and process for preparing polyurethane-backed textiles

Patentee:
The Dow Chemical Company

Opponent:
Huntsman ICI Chemicals LLC

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - problem and solution"

Decisions cited:
-

Catchword:
-

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Case Number: T 0182/97 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 6 December 1999

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 6 December 1996 revoking European patent No. 0 309 816 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: C. Gérardin

Members: A. Däweritz
J. Stephens-Ofner

Summary of Facts and Submissions

I. The grant of European patent No. 0 309 816 in respect of European patent application No. 88 115 048.6 filed on 14 September 1988 and claiming priority of 29 September 1987 of an earlier application in the United States of America (102220), was announced on 15 June 1994 (Bulletin 94/24) on the basis of 12 claims which read as follows:

"1. A process for preparing a polyurethane-backed textile wherein an uncured polyurethane-forming composition is applied to a surface of the textile, gauged and cured to form an adherent backing thereto, the improvement comprising employing a polyurethane-forming composition comprising

(A) a polyol based on a C_3-C_8 alkylene oxide, which polyol has an equivalent weight of from 1000 to 5000, and an internal poly(ethylene oxide) block or a terminal ethylene oxide cap constituting from 15 to 30 percent of the weight of the polyol, or mixture of such polyols, wherein said polyol or mixture thereof has an actual average functionality of from 1.8 to 2.2,

(B) 2 to 25 parts per 100 parts polyol (A) of a low equivalent weight compound having 2 active hydrogen-containing groups per molecule, and

(C) a polyisocyanate having an average functionality of from 1.9 to 2.4, in an amount to provide the composition with from 0.9 to 1.3 isocyanate groups per active hydrogen-containing

group, and

(D) an effective amount of a blowing agent.

2. A process as claimed in Claim 1 wherein component (A) comprises an ethylene oxide capped poly(propylene oxide) or mixture thereof and component (B) comprises an á,ù-alkylene glycol or glycol ether.

3. A process as claimed in Claim 2 wherein said polyurethane-forming composition further comprises a particulate, inorganic filler comprising aluminum trihydrate, calcium carbonate, barium sulfate or mixtures thereof.

4. A process as claimed in Claim 3 wherein component (A) comprises a mixture of a nominally trifunctional ethylene oxide-capped poly(propylene oxide) and a nominally difunctional ethylene oxide-capped poly(propylene oxide), said mixture having an actual average functionality of from 1.95 to 2.05.

5. A process as claimed in Claim 4 wherein said polyisocyanate comprises toluene diisocyanate or a prepolymer thereof with glycerine or trimethylolpropane or mixture of glycerine or trimethylolpropane with an alkylene glycol or glycol ether, said prepolymer having an actual average functionality of from 2.03 to 2.2.

6. A process as claimed in Claim 4 wherein said polyisocyanate comprises a mixture of a liquid MDI having an equivalent weight of from 130 to 150 and a polymeric MDI, said mixture having an average functionality of from 2.03 to 2.2.

7. A process as claimed in Claim 4 wherein said textile is a carpet.

8. An active hydrogen-containing composition comprising

(A) a polyol based on a C_3-C_8 alkylene oxide, which polyol has an equivalent weight of from 1000 to 5000 and an internal poly(ethylene oxide) block or a terminal ethylene oxide cap constituting from 15 to 30 percent of the weight of the polyol, or a mixture of such polyols, wherein said polyol or mixture thereof has an actual average functionality of from 1.8 to 2.2,

(B) 2 to 25 parts per 100 parts polyol A of a low equivalent weight compound having 2 active hydrogen-containing groups per molecule, and

(E) from 5 to 500 parts, per 100 parts of component (A), of an inorganic, particulate filler.

9. A composition as claimed in Claim 8 wherein component (A) comprises an ethylene oxide capped poly(propylene oxide) or mixture thereof and component (B) comprises an alkylene glycol or glycol ether.

10. A composition as claimed in Claim 9 wherein the filler comprises aluminum trihydrate, calcium carbonate, barium sulfate or mixtures thereof.

11. A composition as claimed in Claim 10 wherein component (A) comprises a mixture of a nominally

trifunctional ethylene oxide capped poly(propylene oxide) and a nominally difunctional ethylene oxide capped poly(propylene oxide), said mixture having an actual average functionality of from 1.95 to 2.05.

12. A method according to claim 1 for preparing a polyurethane-backed carpet comprising

(A) applying to a surface of a carpet a layer of a polyurethane-forming composition comprising

(1) 92.3 parts by weight of a 50/50 by weight blend of a 2000 equivalent weight, 19 percent ethylene oxide-capped poly(propylene oxide) having a nominal functionality of 2 and an actual functionality of 1.75 and a 2000 equivalent weight, 17 percent ethylene oxide-capped poly(propylene oxide) having a nominal functionality of 3 and an actual functionality of 2.26,

(2) 7.7 parts by weight of diethylene glycol,

(3) 50 parts by weight aluminum trihydrate,

(4) 47 parts by weight calcium carbonate,

(5) 0.018 part by weight di(n-butyl)tin bis(isooctylmercaptylacetate),

(6) 0.125 part by weight silicone surfactant, and

(7) 34 parts by weight of a 50/50 by weight blend of a 181 equivalent weight MDI prepolymer and a polymeric MDI having an o,p'-content of 12 percent and an average functionality of 2.18, and

(8) an effective amount of a blowing agent,

(B) curing said polyurethane-forming composition to form a cellular polyurethane backing adherent to said carpet."

IV. On 14 March 1995, a Notice of Opposition was filed against Claims 1 to 11 of the patent in suit in which revocation of all the claims was requested on the ground of lack of inventive step within the meaning of Article 56 EPC.

The objections were essentially based on the following documents:

D1: WO-A-87/01656,

D2: US-A-4 296 159,

D3: GB-A-1 048 312 and

D4: GB-A-1 479 658.

III. By decision announced orally on 6 November 1996 and issued in writing on 6 December 1996, the Opposition Division revoked the patent on the ground of lack of inventive step of the process according to Claim 1 as granted and according to an auxiliary request submitted

during oral proceedings vis-à-vis the process as disclosed in D1. Because a request could only be considered and decided upon as it stood, none of the other claims of the requests could be upheld.

(i) The auxiliary request differs from the main request in that Claim 8 is drafted as a use claim reading:

8. "Use of an active hydrogen-containing composition for preparing a cellular polyurethane-backed textile, said composition comprising ..."

Dependent Claims 9 to 11 have been amended accordingly and, hence, relate to "The use as claimed in Claim ...".

(ii) In substance, the Opposition Division took the view that the Proprietor had failed to show that the presence of a higher ethylene oxide (**EO**) content in polyol (A), which was the only distinguishing feature between the disclosure of the closest state of the art, D1, and the claimed subject-matter, resulted in a surprising effect. In view of D2, it was, moreover, considered to be a matter of routine for a skilled person to raise the EO content in polyol (A) and to work in the range claimed.

IV. On 10 February 1997, a Notice of Appeal was lodged by the Appellant (Proprietor) against this decision with simultaneous payment of the prescribed fee and, as an auxiliary request, oral proceedings were requested.

In the Statement of Grounds of Appeal filed on 14 April 1997 as well as in later submissions, the Appellant objected to the reasons for the decision.

(i) To that end it relied on an experimental report annexed to the Statement of Grounds of Appeal in order to demonstrate improvements in frothing quality and, hence, in the quality of the resulting products. The major difference between the data obtained in accordance with D1 and those in accordance with the invention was a superior resiliency at a slightly lower density of the foam. Additionally, the Appellant referred to advantageous physical properties such as tensile strength, elongation and tear strength as shown e.g. in Tables 4 and 6 of the patent in suit.

(ii) Another experimental report was submitted on 12 December 1997 containing additional examples to further illustrate the differences between D1 and the claimed invention; since polyols as defined in the patent in suit were not available, "the best-possible polyols" were used which differed slightly in their functionality, whereby only a very small adjustment in formulation (MDI content) was necessary to achieve the same isocyanate index.

V. In its counterstatements, the Respondent (Opponent) supported the findings of the decision under appeal.

(i) In particular, it criticised the experimental report submitted with the Statement of Grounds of Appeal as being based on experiments containing

additional modifications, such as different amounts of MDI and reaction temperature. Moreover, none of the experiments had been carried out with polyols in accordance with D1 and the patent in suit, which both required the same equivalent weight. This was a major deficiency, since the molecular weight of a polymer determined to a great extent the properties of the materials wherein the polymer was used. Therefore, a surprising finding vis-à-vis D1 had not been shown.

(ii) By letter of 27 October 1999, the EPO was informed of a transfer of the ownership, all assets and interests in certain businesses, including Respondent's polyurethanes business, to Huntsman ICI Chemicals LLC with effect from 30 June 1999. The duly authorised professional Representative of the Respondent remained the same. These facts were confirmed in a fax received on 18 November 1999.

VI. Oral proceedings, which had been requested by both parties as an auxiliary measure, were scheduled to take place on 6 December 1999. Together with the summons to the hearing, a communication was issued on 19 August 1999 wherein, in addition to preliminary comments on the interpretation of the teaching of the various documents on file, the question of the conclusiveness of the experimental data provided so far by the parties was raised.

VII. All these points were addressed by the Appellant in a detailed submission dated 26 October 1999.

(i) D2, which was cited in D1 as technological background, could not serve to provide an incentive to modify the teaching of D1.

(ii) Although D3 referred to good physical properties, such as tensile strength and elongation together with good resiliency, compression set and load bearing properties, and suggested to use polyols containing from 8 to 30% by weight of ethylene oxide, the polyols were so-called statistical polyether polyols with not more than 30% of primary hydroxyl groups, i.e. the EO moieties were not present in the form of blocks or end-caps. It even taught away from EO end-capped polyether polyols (page 2, lines 63 to 70). A person skilled in the art would never seriously consider to combine D1 and D3, because D1 required at least 30% of the hydroxyls being primary.

(iii) D4 referred to polyether polyols chemically modified by free radical polymerisation of one or more ethylenically unsaturated monomers *in situ*. The critical EO content of 15 to 30% by weight was not disclosed nor rendered obvious.

(iv) Finally, the Appellant emphasised the relevancy of the comparative tests which it had filed previously and, by contrast, the arbitrary character of the tests submitted by the Respondent (cf. points 10 to 12).

VIII. In its letter of 28 October 1999, the Respondent merely referred to its written statements and test reports

submitted in the course of the opposition proceedings as well as to its previous objections regarding the conclusiveness of the Appellant's test reports. Additionally, the Representative of the Respondent informed the Board that the Respondent withdrew its request for oral proceedings and that he would not attend the hearing if maintained.

IX. The oral proceedings were cancelled on 30 November 1999.

X. The Appellant requested that the decision under appeal be set aside and that the patent be maintained in the form as granted or as amended during the oral proceedings before the Opposition Division on 6 November 1996.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Procedural matters*

Following the summons to oral proceedings, which were accompanied by preliminary comments on both the interpretation of the documents on file and the relevancy of the experimental data, the Respondent informed the Board by letter dated 28 October 1999, received on the same date, that it withdrew its request for oral proceedings and would not attend such proceedings if maintained.

The Appellant's statement of 26 October 1999 comprised (i) a review of the arguments previously submitted about the interpretation of the documents on file, and (ii) additional comments on test reports filed in the course of the examination and opposition procedures. As will be evident from the reasons below, these test reports have not had any influence on this decision. The said statement, consequently, does not add anything of significance to the arguments and evidence relied upon by the Appellant in the proceedings. It follows that the Respondent had ample opportunity to comment on the questions essential for the outcome of the case and that a decision on the basis of the written submissions is possible (Article 113(1) EPC). For these reasons, the oral proceedings were cancelled.

3. *Documents*

3.1 D1 describes a polyurethane-forming composition useful for backing textiles and a process for making such textiles. It aims at products showing high dimensional stability, low residual tack and strong adhesion of the coating to the textile as well as at a reduced sensitivity of the polyurethane-forming composition to changes in humidity and isocyanate index during its use (page 1, line 12 to page 3, line 9 and page 4, last paragraph). Experimental values of the corresponding parameters, in particular edge curl (dimensional stability), cohesive bond (tackiness) and tuft lock (adhesion) are reported in Table 1 (page 16, line 10 to page 18). An essential requirement to achieve the desired properties is that the reactivity be carefully controlled to permit the composition to be formed into a layer and gauged to the proper coating weight, yet

cure quickly thereafter (page 2, lines 27 to 31).

3.1.1 The composition contains: (A) a first polyol which comprises a relatively high equivalent weight polyol containing an average of from 1.4 to 1.95 hydroxyl groups per molecule ("nominal diol") or a mixture thereof with at least one additional relatively high equivalent weight polyol containing an average of at least 2.05 hydroxyl groups per molecule, in each of these polyols at least 30 percent of the hydroxyl groups being primary hydroxyls; (B) a relatively low equivalent weight compound having about 2 active hydrogen containing moieties per molecule (chain-extender); (C) a polyisocyanate and (D) a catalytic amount of a catalyst for the reaction of a polyol and a polyisocyanate, wherein the functionalities and proportions of components (A), (B), and (C) are such that the average functionality of the components together is from 1.97 to 2.03, and the composition has an isocyanate index of from 85 to 125 (Claim 1; page 3, line 10 *et seq.*).

3.1.2 The "nominal diol" in component (A) is prepared from alkylene oxide with a suitable polyhydric initiator compound, preferably from C_2- to C_4-alkylene oxide, in particular propylene oxide. Suitable initiators mentioned include ethylene glycol, diethylene glycol, propylene glycol, butane diols, p,p'-isopropylidine diphenol, water and various amines (page 7, lines 18 to 29).

The optional additional polyol of component (A) may be prepared in analogous manner using an initiator containing 3 to 8 active hydrogen atoms, e.g. glycerol,

hydroxyethylamines or aminoethylpiperazine (page 7, line 30 to page 8, line 4).

3.1.3 Although the textile backing is preferably non-cellular, a blowing agent can be employed in or frothing techniques can be applied to the composition if a cellular backing is desired (page 12, lines 8 to 15). Other optional ingredients of the composition, referred to in that paragraph, are antioxidants, pigments, smoke suppressants and flame suppressing agents. Fillers which are preferably included are mentioned in the last paragraph of page 12.

3.1.4 In the process for preparing a polyurethane-backed textile from these compositions, the textile is coated on one side with the said composition, whereby the coating weight is from 0.03 to 10.2 kg/m^2, and then heated to a temperature of from 50 to 150°C until the polyurethane-forming composition is cured to a tack-free state (Claim 6).

3.1.5 In Example 1, the polyol component is a mixture of two polyols, the first corresponding to a "nominal diol" as referred to above, the second being based on glycerol as the initiator. Both polyols (having functionalities of 1.94 and 2.56, respectively; page 14, lines 24 and 30) contain central blocks of polymerised propylene oxide (**PO**) which are end-capped with blocks of polymerised ethylene oxide (**EO**). 65 and 50%, respectively, of their hydroxyl groups are primary (page 14, lines 27/28 and page 15, lines 3/4). From their molecular weights, the EO contents of the two polyols can be calculated as being 12 and 8.3%, respectively.

In the different samples prepared in Example 1, the average functionalities of the polyol components made up from different amounts of these two polyols are reported to be 2.00 (75 g + 10 g; page 15, lines 6 to 10), 1.98 (85 g + 0 g; page 16, line 4) and 2.02 (65 g + 20 g; page 16, lines 8/9). Their respective EO contents can be calculated to be 11.5, 12 and 11.1% by weight. The isocyanate index is 110, corresponding to a ratio of 1.10 as required in present Claim 1.

In Example 2 coatings are described obtained from similar compositions having average functionalities of 2.00, 1.98 and 2.02, respectively.

3.1.6 Both examples are silent with respect to foaming. They are concerned with the influence of average functionality, isocyanate index and moisture content on such properties as tuft lock, edge curl and cohesive bond of the coated textiles (pages 19 to 21).

3.1.7 The document does not disclose mechanical or physical properties of foams, and it is silent with respect to tear and tensile strength properties and elongation.

3.2 D2 relates to polyurethane compositions which can be applied to carpets as unitary backing, thereby providing carpeting with good dimensional stability, bundle wrap pilling and fuzzing characteristics combined with tuft lock performance and edge curling properties (column 1, lines 5 to 12 and 61 to 68). The composition may be used to prepare foamed or unfoamed backings (column 5, lines 1 to 7).

3.2.1 The compositions are based on (A) a relatively high

molecular weight polyether polyol having an average of 2 to 8 hydroxyl groups per molecule and an average hydroxyl equivalent weight of from 500 to 2200, (B) a relatively low molecular weight having an average of 2 to 8 hydroxyl groups per molecule and an average equivalent weight of from 31 to 230 (chain-extender), (C) an organic polyisocyanate or polyisothiocyanate having an average of from 2 to 4 NCX groups (each X being independently O or S) and (D) an inorganic filler. The NCX:OH ratio of components (A), (B) and (C) is 0.95:1 to 1.5:1 (Claim 1).

3.2.2 Suitable polyether polyols are defined as adducts derived from various hydroxyl compounds and alkylene oxides (column 3, lines 47 to 68). Average functionalities of polyols are only disclosed in the examples.

Numerous polyiso(thio)cyanates, including prepolymers and mixtures thereof, are listed in column 4, lines 33 to 47.

In Examples 1 to 9 and 13 to 15, polyoxypropylene glycols are used which do not contain EO units at all, and which, except for Samples B, C and D of Example 9, have average hydroxyl functionalities **f** of 2. In Examples 10 and 11, polyols capped with 15% by weight of EO are used which have average functionalities **f** of 3. In Example 12, the functionality of the EO end-capped reaction product of glycerine with propylene oxide is 3 and its EO content can be calculated as being 8.8% by weight of the polyol.

3.3 D3 relates to a process for making polyether

polyurethane foams possessing good tensile strength and high elongation values, together with good resiliency, compression set and load bearing properties (page 1, lines 18 to 22). The document does not concern the field of textile backings but moulding in open or closed moulds in batch, pre-polymer or one-shot processes (page 2, lines 98 to 111). Hence, the processing difficulties occurring in the preparation of textile backings and addressed in the patent specification (page 2, lines 9 to 14) are not dealt with or considered in D3 at all.

3.3.1 The polyurethane is prepared by mixing and reacting an organic polyisocyanate with water and one or more polyether polyols having an equivalent weight of from 1000 to 2000, which consists of the condensation product of 1,2-propylene oxide (**PO**) and 8 to 30% by weight of ethylene oxide (**EO**) with a polyhydroxy compound containing from 2 to 18 carbon atoms and from 2 to 8 hydroxyl groups, not more than 30% of the hydroxyl groups in the polyether polyol being primary (page 1, lines 18 to 34, page 2, lines 51 to 63 and Claim 1). Preferably, the EO content in the EO/PO polyol is from 15 to 20% by weight. The description and claims are silent with respect to the actual average functionality.

3.3.2 The embodiment referred to at lines 1 to 8 of page 2 indicates that EO and PO can be used separately in any order of addition provided that PO or a mixture of PO containing 8 to 30% by weight of EO is the last component to be added to the polyetherpolyol being produced. This is evidently the prerequisite to limit the amount of primary hydroxyl groups to at most 30% of

all hydroxyls. According to page 2, lines 63 to 70, the desired advantageous properties of the foams are not obtained with polyols free of EO or end-capped with EO alone.

3.3.3 In each of Examples 1 to 4, 7 and 8, a polyether polyol is described which is based on a central block corresponding to an adduct of a starter compound and PO subsequently reacted with an EO/PO mixture to provide terminal blocks of EO/PO copolymer. In these polyols, the EO content is about 14, 14.5, 15, 21 and 27% by weight, respectively. In Examples 5 an 6, the starter compound is reacted in one step with EO/PO mixtures to prepare polyether polyols containing about 15% by weight of EO units. In Example 9, an adduct of glycerine and PO is first reacted with EO and then with PO to produce a polyol having an EO content of 9.3% by weight (as used in Runs C, D and E).

3.4 D4 relates to a process for the manufacture of a flexible polyurethane foam which comprises reacting a diphenylmethane diisocyanate with a modified polyether polyol prepared by the free radical polymerisation of one or more ethylenically unsaturated monomers *in situ* in a polyether polyol having a molecular weight in the range of 1000 to 10000 (Claim 1). Polyether polyols suitable as a starting component are referred to as "polyoxypropylene and poly(oxypropylene-oxyethylene) diols and triols and mixtures thereof" (page 2, lines 22 to 26). In Example 1 an EO tipped polyoxypropylene diol having a molecular weight of 3500 and an EO content of 20%, in Example 2 an EO tipped oxypropylated glycerol having a molecular weight of 5300 are used as starting compounds. The foams are said

to have excellent tensile strength and compression hardness properties as compared to foams based on the corresponding unmodified polyether polyols (page 4, lines 67 to 70).

The document is silent with respect to polyurethane-backed textiles or carpets.

4. *Novelty*

Novelty has not been disputed in the opposition proceedings. In view of the above documents, the Board does not have any reason to take a different position in this respect.

5. *Problem and solution*

5.1 The patent in suit concerns "Polyurethane-forming compositions and process for preparing polyurethane-backed textiles".

5.2 Such a composition and such a process are known from D1 which the Board, like the parties and the Opposition Division, regards as representing the closest state of the art. As discussed under points 3.1 to 3.1.7, D1 aims at backings for textiles showing high dimensional stability, low residual tack and strong adhesion of the backing to the textile. Like the patent in suit (page 2, lines 8 to 14), it stresses that the reactivity of the components must be carefully controlled to permit the composition to be formed into a layer and gauged, yet cure quickly thereafter. On page 12, paragraph 2, the document refers to the possibility to prepare foams from the general

composition, however, without providing any information about the features of the polyether polyols, in particular the functionality thereof, let alone considering a possible influence thereof on the mechanical properties of such foams. In the examples in D1, the only relation considered concerns the influence of the average number of functional groups per molecule of the blended compositions ("Polyol A, Polyol B, chain extender, and polyisocyanate") and the moisture content in the yarns on the above mentioned properties.

5.3 In line with the introductory statement in the patent specification, the technical problem underlying the patent in suit may thus be seen as the definition of a process for preparing polyurethane-backed textiles and the provision of an active hydrogen-containing composition giving rise to a foamed product having good tensile strength, elongation and tear properties without impairing other properties (page 2, lines 14 to 19 and 24 to 26).

5.4 According to the patent in suit, this problem is solved by using a composition which - in addition to polyisocyanate (C), chain extender (B) and blowing agent (D) - contains a polyol (or a mixture thereof) (A) having an equivalent weight of 1000 to 5000, a content of EO internal blocks or EO end-caps of 15 to 30% by weight of the total polyol weight, and an actual average functionality of from 1.8 to 2.2.

5.5 As can be seen from the results in Tables 2, 4, 5, 6 and 8 (Example 1/Sample No.1 (abbreviated to "1/1"); 2/2; 3/3; 4/4; 5/5 to 5/8) the backings in accordance with the invention have good to excellent properties

(page 8, lines 21 to 23; page 9, lines 28/29 and page 11, line 49). Consequently, the various aspects of the above defined technical problem are effectively solved by the process as defined in Claim 1 and the composition of Claim 8 of the patent in suit.

6. *Obviousness*

It remains to be decided whether this solution was obvious to a person skilled in the art having regard to the state of the art relied upon by the Respondent.

6.1 It is evident from the above considerations that D1 by itself does not provide any suggestion to achieve foamed backings showing good tear and tensile strengths as well as elongation, because these mechanical properties were not contemplated in this document at all.

6.1.1 The Respondent has based its objection to inventive step essentially on Example 1 of D1, because it describes two polyols each prepared in two-steps, by polymerising first PO and thereafter EO. The respective molecular weights obtained in each step, and their average functionality are given. Based on these data, the EO contents in each polyol and in their mixtures as used in the polyurethane composition can be calculated (point 3.1.5). In samples 1 to 3, 4 to 6 and 7 to 9 they are 11.5, 12 and 11.1% by weight, respectively, i.e. clearly below 15% by weight as required by the present claims. The Respondent confirmed this calculation in its letter of opposition of 13 March 1995, Annex 1, page 1. D1 is however silent about any effect that would be related to the EO content (cf.

page 6, lines 30 to 32).

6.1.2 Hence, D1 does not provide any incentive to solve the above technical problem by using a polyether polyol having a particular block or end-capped structure wherein an internal polyoxyethylene block or terminal ethylene oxide cap constitute from 15 to 30% by weight of the polyol in combination with the other mandatory components, as required by Claim 1. This applies to the composition of Claim 8 as well.

6.2 As shown in points 3.2 to 3.2.2, D2 does not consider the above technical problem either. Example 10, which was specifically referred to by the Respondent, mentions a polyether polyol capped with 15% by weight of EO, but having a different average functionality. Moreover, it is not evident from the document why this specific polyol should be used instead of e.g. those free of EO or end-capped with 8.8% by weight of such units as used in the other examples.

6.3 Contrary to the above two documents, D3 (see points 3.3 to 3.3.3) concerns a process for making polyether polyurethane foams possessing good tensile strength and elongation, good resiliency, compression set and load bearing properties. It additionally requires an EO content of 8 to 30% by weight, but is silent with respect to average functionalities and textile backings.

6.3.1 According to page 2, lines 63 to 70, the above advantageous properties are not attained if the polyol component is free of EO or if EO is used alone to form the end-caps, because this would result in more than

30% of the hydroxyl groups being primary and contradict the general teaching of the citation.

6.3.2 According to page 1, lines 58 to 82, the polyether polyol may be prepared on the basis of a variety of diols, triols or tetrols as initiator compounds which are then reacted with a mixture of EO and 1,2-PO or each of them separately in any order of addition, with the proviso that the PO or a mixture of PO and 8 to 30% by weight of EO is always the last moiety to be reacted in preparing the polyether polyol starting material (page 1, line 82 to page 2, line 8). Optionally this polyether polyol may be used together with further different polyether polyols based on polyhydroxy compounds as initiator compounds, such as e.g. sorbitol, mannitol, galactose, tripentaerythritol or sucrose containing 6 to 15 carbon atoms and 5 to 8 hydroxyl groups in the molecule. These latter polyether polyols are prepared in the same way.

6.3.3 In Example 9 (pages 10 and 11), a polyether triol is described which is the only embodiment containing separate internal EO blocks as well as internal and terminal PO blocks. In this embodiment the EO content is 9.3% (Table IV, Runs C, D and E). In all other examples EO is added as the minor component in admixture with PO and then copolymerised. Polymerisation of such mixtures results in random copolymers (see e.g. Kirk-Othmer, Encyclopedia of Chemical Technology, 3rd Edition, John Wiley & Sons, New York, 1982, Volume 18, page 638 "Manufacture").

6.3.4 It follows that - in the absence of any knowledge about the teaching of the patent in suit - the skilled person

could not derive from D3 in a plain or logical manner in which way to modify the teaching of D1 in order to solve the above technical problem, and thus arrive at the subject-matter of Claims 1 and 8. This is all the more true considering that the two documents contradict each other in some respect, since D1 recommends polymers which are at least partially end-capped with EO (page 6, lines 30 to 32 and both examples) whereas D3 clearly teaches away from such a polyol (page 2, lines 63 to 70).

6.4 D4 is further remote in that it clearly requires the polymerisation of ethylenically unsaturated monomers in the presence of polyether polyols. As discussed in point 3.4, the document does not relate to the above technical problem either.

6.5 It follows that neither the process according to Claim 1 nor the composition according to Claim 8 would be obvious to a person skilled in the art in view of the documents relied upon by the Respondent, whether considered in isolation or in combination and that, consequently, the subject-matter of these two independent claims involves an inventive step.

7. Claims 2 to 7, which relate to preferred embodiments of the process according to Claim 1, and Claims 9 to 11 concerning preferred embodiments of the composition according to Claim 8 are supported by the patentability of the independent claims and thus also allowable.

8. As the main request of the Appellant is successful, there is no need to further consider the auxiliary request.

Order

For these reasons it is decided that:

1. The decision of the Opposition Division is set aside.

2. The European patent No. 0 309 816 is maintained.

The Registrar: The Chairman:

E. Görgmaier C. Gérardin