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D E C I S I O N
of 14 July 2004

Case Number: T 0872/01 - 3.3.3

Application Number: 94901604.2

Publication Number: 0672075

IPC: C08G 18/10

Language of the proceedings: EN

Title of invention:
Polyurethanes cured with 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline)

Patentee:
UNIROYAL CHEMICAL COMPANY, INC.

Opponent:
AIR PRODUCTS AND CHEMICALS, INC.
Lonza AG

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84, 54, 56

Keyword:
"Main request - added subject-matter (yes)"
"First auxiliary request - novelty (no)"
"Second/third auxiliary request - late-filed (admitted) - added subject-matter (yes)"
"Fourth auxiliary request - inventive step (no)"

Decisions cited:
T 0150/82, T 0577/97, T 0360/01

Catchword:
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Case Number: T 0872/01 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 14 July 2004

Appellant: (Opponent 02)	Lonza AG Münchensteinerstrasse 38 CH-4002 Basel (CH)
Representative:	Weinhold, Peter, Dr.rer.nat. Dipl.-Chem. Winter, Brandl, Fürniss, Hübner, Röss, Kaiser, Polte Partnerschaft Patent- und Rechtsanwaltskanzlei Alois-Steinecker-Strasse 22 D-85354 Freising (DE)
Respondent: (Proprietor of the patent)	UNIROYAL CHEMICAL COMPANY, Inc. World Headquarters Middlebury Connecticut 06749 (US)
Representative:	Spott, Gottfried, Dr. Spott & Weinmiller Patentanwälte Sendlinger-Tor-Platz 11 D-80336 München (DE)
Party as of right: (Opponent 01)	AIR PRODUCTS AND CHEMICALS, INC. 7201 Hamilton Boulevard Allentown, PA 18195-1501 (US)
Representative:	Kador & Partner Corneliusstrasse 15 D-80469 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted 17 May 2001 concerning maintenance of European patent No. 0672075 in amended form.**

Composition of the Board:

Chairman: R. Young
Members: W. Sieber
H. Preglau

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 672 075, with 16 claims, in respect of European patent application no. 94 901 604.2 in the name of Uniroyal Chemical Company, Inc., filed on 17 November 1993 as PCT/US93/11233 and claiming a US priority of 7 December 1992 (US 987501), was published on 21 May 1997 (Bulletin 1997/21). Independent Claims 1, 7 to 11 and 13 read as follows:

"1. An organic diisocyanate prepolymer comprising:

(a) a first prepolymer component comprising a toluene diisocyanate endcapped polyether or polyester polyol, said prepolymer having a free toluene diisocyanate monomer level of below 0.4 percent by weight; and,

(b) a second component selected from

(i) an aliphatic diisocyanate selected from the various geometric isomers of 1,1'-methylene-bis-(4-isocyanatocyclohexane), pure or mixed; or,

(ii) an aliphatic-isocyanate-terminated prepolymer prepared by prereacting an aliphatic diisocyanate with a diol or polyol compound,

said first component being blended with said second component to form said organic diisocyanate prepolymer.

7. An organic diisocyanate-endcapped prepolymer formed by the reaction of:

(a) toluene diisocyanate and an aliphatic diisocyanate selected from the various isomers of 1,1'-methylene-bis-(4-isocyanatocyclohexane), 1,4-cyclohexane diisocyanate, or isophorone diisocyanate and

(b) a polyalkylene ether polyol or a polyester polyol, said organic diisocyanate prepolymer having a free toluene diisocyanate level of less than 0.4 percent by weight.

8. A polyurethane elastomer formed by the reaction of the organic diisocyanate prepolymer of Claim 1 with a curingly effective amount of a curative containing 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline).

9. A polyurethane elastomer formed by the reaction of the organic diisocyanate prepolymer of Claim 6 with a curingly effective amount of a curative containing 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline).

10. A process for making an aromatic/aliphatic blended isocyanate prepolymer having low free toluene diisocyanate comprising the steps of:

(a) reacting a molar excess of one or more isomers of toluene diisocyanate with a high molecular weight polyol selected from polyalkylene ether polyols and polyester polyols at between 30°C and 150°C for a time sufficient to form a high free toluene diisocyanate prepolymer;

(b) reducing the free toluene diisocyanate level of said high free toluene diisocyanate prepolymer to less than 0.4 percent to form a low free

toluene diisocyanate prepolymer; and

(c) adding to said low free toluene diisocyanate prepolymer an aliphatic diisocyanate or an aliphatic diisocyanate-encapped *[sic]* prepolymer to form an aromatic/aliphatic blended isocyanate prepolymer.

11. A polyurethane elastomer formed by the reaction of:

(a) an isocyanate-endcapped polyalkylene ether polyol or polyester polyol prepolymer having a molecular weight between 650 and 3000 and

(b) a curative blend consisting essentially of from 95 to 5 percent by weight of 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline) and 5 to 95 percent by weight of a second aromatic diamine curative.

13. A polyurethane elastomer formed by the reaction of:

(a) an isocyanate-endcapped polyalkylene ether polyol or polyester polyol prepolymer; and

(b) a curative blend comprising 70 to 90 percent by weight of 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline) and 30 to 10 percent by weight of 4,4'-methylene-bis-(2-chloroaniline)."

Claims 2 to 6 were dependent claims directed to elaborations of the organic diisocyanate prepolymer according to Claim 1.

Dependent Claims 12 and 14 to 16 read as follows:

"12. The polyurethane elastomer of Claim 11 wherein said

second aromatic diamine curative is selected from 4,4'-methylene-bis-(2-chloroaniline), dimethylthio-toluenediamine, trimethylene glycol di-p-amino-benzoate, and 1,2-bis-(2-aminophenylthio)ethane.

14. The polyurethane elastomer of Claim 11 wherein the isocyanate in said prepolymer is a toluene diisocyanate isomer blend wherein 2,4-toluene diisocyanate is present from 65 to 100% and 2,6-toluene diisocyanate is present from 0 to 35%.

15. The polyurethane elastomer of Claim 11 wherein the isocyanate content of the prepolymer is from 2 to 10%.

16. The polyurethane elastomer of Claim 11 wherein the free toluene diisocyanate monomer content of the prepolymer is less than 0.4%."

II. Notices of opposition were filed by Air Products and Chemicals, Inc. (opponent 01) on 19 February 1998, and by Lonza AG (opponent 02) on 20 February 1998.

The grounds of opposition raised by both opponents were the grounds of Article 100(a) EPC, ie lack of novelty and lack of inventive step, and the grounds of Article 100(b) EPC, ie insufficiency of disclosure. The oppositions were supported by 24 documents including:

D1: Adiprene® L-325 - A Liquid Urethane Elastomer; brochure from Uniroyal Chemical Company, Inc., printed 7/1988;

D2: US-A-5 077 371;

D3: Polyurethan - Elastomere, Systeme, Additive; brochure from Lehmann & Voss & Co., printed 9/1990;

D7: Adiprene® L-325; Safety Data Sheet of Uniroyal Chemical Company, Inc., issued 09.01.1986;

D13: US-A-4 182 825;

D21: Adiprene® L-325; Material Safety Data Sheet from Uniroyal Chemical Company, Inc., issued 09.01.1986; and

D22: Letters of Lehmann & Voss & Co. of 15 October 1999 and 16 February 1998 concerning the composition of Luvocure® MUT/A.

During prosecution of the case before the opposition division, the proprietor filed a set of 12 claims forming an auxiliary request. Apart from a clerical correction in Claim 10 ("diisocyanate-en**d**capped prepolymer"), Claims 1 to 10 corresponded to granted Claims 1 to 10. Claims 11 and 12 read as follows:

"11. A polyurethane elastomer formed by the reaction of:

(a) an isocyanate-endcapped polyalkylene ether polyol or polyester polyol prepolymer having a molecular weight between 650 and 3000, wherein the isocyanate in said prepolymer is a toluene diisocyanate isomer blend wherein 2,4-toluene diisocyanate is present from 65 to 100% and 2,6-toluene diisocyanate is present from 0 to 35% and wherein the free toluene diisocyanate monomer content of the prepolymer is less

than 0.4%,

(b) a curative blend consisting essentially of from 95 to 5 percent by weight of 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline) and 5 to 95 percent by weight of a second aromatic diamine curative selected from 4,4'-methylene-bis-(2-chloroaniline), dimethylthio-toluenediamine, trimethylene glycol di-p-aminobenzoate, and 1,2-bis-(2-aminophenylthio)ethane.

12. The polyurethane elastomer of claim 11 wherein the isocyanate content of the prepolymer is from 2 to 10%."

III. By an interlocutory decision which was announced orally on 24 April 2001 and issued in writing on 17 May 2001, the opposition division decided that the patent could be maintained in amended form based on the proprietor's auxiliary request (section II, above).

With respect to the claims of the auxiliary request, it was held that amended Claims 10 to 12 met the requirements of Article 123 EPC. The subject-matter of Claim 1 was considered to be novel over D1, D7 and D21 since the prepolymer disclosed in these documents contained more than 0.4 percent by weight of free toluene diisocyanate (TDI). As regards the assessment of inventive step of the polyurethane (PU) elastomers of Claims 8 and 9, the decision under appeal pointed out that the advantages provided by those PU elastomers, namely resistance to cracking during the cure stage, long pour life, low levels of toxicity and excellent dynamic properties in the elastomer (page 18, lines 3 to 10 of the patent in suit), had to be taken into

account when formulating the technical problem. D1, which was considered to represent the closest prior art, referred to Adiprene® L-325, a liquid PU elastomer, and the possibility to cure it with 4,4'-methylene-bis-(2-chloroaniline) (MBOCA). Adiprene® L-325 contained a small amount of volatile aliphatic diisocyanate and a small amount of free TDI monomer which was, however, higher than 0.4% by weight. There was no hint, either in D1 itself or in any other document, that the above mentioned advantages could be achieved by reducing the content of free TDI and by using a different curing agent, ie 4,4'-methylene-bis-(3-chloro-2,6-diethyl-aniline) (MCDEA) instead of MBOCA. Hence, the subject-matter of Claims 8 and 9 involved an inventive step.

IV. On 26 July 2001, opponent 02 (hereinafter referred to as the appellant) lodged an appeal against the above decision and paid the prescribed fee on the same day.

In the statement of grounds of appeal, filed on 27 September 2001, the appellant objected to the subject-matter of amended Claims 11 and 12 as maintained by the opposition division in view of Article 123(2) EPC. Furthermore, it was argued that the subject-matter of Claims 1 to 4 and 7 lacked novelty and inventive step with respect to D1/D7 and D2. As regards inventive step of the PU elastomers of Claims 8 and 9, the appellant argued that D3 disclosed TDI-polyether systems having excellent dynamic properties, whereby the table on page 3 of D3 explicitly suggested a combination of Adiprene® L-325 and Luvocure® MUT. It had been demonstrated that Luvocure® MUT/A was a mixture of curatives containing 75% MCDEA. Since it was furthermore known from D2 that high levels of free TDI

were undesirable, it was obvious for a skilled person to reduce the free TDI level as far as possible. Thus, the subject-matter of Claims 8 and 9 was obvious in view of a combination of D3 and D2.

The other objections raised by the appellant are not relevant for this decision.

V. On 4 April 2003, the proprietor (hereinafter referred to as the respondent) filed a written submission which, as far as it is relevant for this decision, can be summarized as follows:

(a) Claims 11 and 12 as maintained by the opposition division did not contravene Article 123(2) EPC since it was clearly and unambiguously derivable for the skilled person from the application as originally filed that the features of originally filed Claims 11, 12 and 14 to 16 could be combined altogether without departing from and without contradicting the original disclosure.

(b) The claimed subject-matter was novel over the cited documents. In particular, the subject-matter of Claim 1 was novel since D1 and D7 did not mention a prepolymer having a free TDI level of below 0.4 percent by weight. The subject-matter of Claim 1 was also novel over D2 since that document did not disclose the combined use of TDI and 1,1'-methylene-bis-(4-isocyanatocyclohexane) (H12MDI) as required in Claim 1.

(c) D2 disclosed a completely different solution for reducing the level of free TDI in the prepolymer,

namely the use of a TDI dimer which resulted in the formation of allophanate groups. Such groups were not present in the claimed PU elastomers. Therefore, a combination of D3 and D2 did not result in the PU elastomers of Claims 8 and 9. Consequently, the subject-matter of Claims 8 and 9 was based on an inventive step over D3 and D2.

VI. In a communication, issued on 29 March 2004, accompanying a summons to oral proceedings, the salient issues as to the claims maintained by the opposition division were identified by the board as being firstly, the basis for the amendment of Claims 11 and 12, secondly, novelty of the subject-matter of Claims 1 and 7 over D7 and D21, in particular with respect to the low TDI monomer content required for component (a) but not for the claimed "overall" prepolymer, thirdly, novelty of the subject-matter of Claims 8 and 9 over D3, and, fourthly, inventive step of the various independent claims.

VII. In a letter filed on 14 June 2004, the respondent filed a main request and four auxiliary requests on the basis of which it would defend the patent in suit during the oral proceedings. In a further letter filed on 7 July 2004, the respondent provided information with regard to the disclosure of the various sets of claims filed by the previous letter. A further auxiliary request headed "Supplemental Auxiliary Request 2/3" was received on 9 July 2004.

VIII. In a letter filed on 14 June 2004, opponent 01 (hereinafter referred to as party as of right) provided arguments as to why the subject-matter of Claims 11

and 12 as maintained by the opposition division was not based on an inventive step.

IX. On 14 July 2004, oral proceedings were held before the board where the respondent withdrew the first and the third auxiliary request filed on 14 June 2004 (section VII, above), filed a new auxiliary request headed "2' Auxiliary Request", and requested to consider the requests in the following order:

- main request (dismissal of the appeal);
- 2nd auxiliary request filed on 14 June 2004 (hereinafter referred to as the first auxiliary request);
- 2' auxiliary request filed at the oral proceedings (hereinafter referred to as the second auxiliary request);
- supplemental auxiliary request 2/3 filed on 9 July 2004 (hereinafter referred to as the third auxiliary request); and
- 4th auxiliary request filed on 14 June 2004 (remains the fourth auxiliary request).

The submissions of the parties can be summarized as follows:

(a) Both the appellant and the party as of right objected to the admissibility of the second and the third auxiliary request as being late filed.

(b) As regards the respondents main request, the appellant maintained its objection that Claims 11 and 12 as amended during the opposition procedure did not meet the requirements of Article 123(2) EPC. In this respect, both the appellant and the respondent basically relied on their written submissions.

(c) During the discussion of the first auxiliary request, the board directed the respondent's attention to the fact that documents D7 and D21, relied upon by the appellant for its novelty objection, were, although issued in 1986, revised in 1996, ie after the priority date of the patent in suit. However, the respondent confirmed that, whatever the revision was, the substances referred to in the material safety data sheets remained as in the first version. Thus, these documents were accepted as state of the art within the meaning of Article 54(2) EPC.

As regards novelty of the subject-matter of Claim 1, the discussion focussed on the question as to whether the feature "said prepolymer having a free toluene diisocyanate monomer level of below 0.4 percent by weight" in Claim 1 referred to the "overall" organic diisocyanate prepolymer or to the prepolymer component (a). According to the respondent, a person skilled in the art would immediately recognize from the claim language and the application as a whole that this feature related to the "overall" prepolymer. Furthermore, the prior art did not disclose the blending of components (a) and (b) as required in Claim 1.

Hence, the subject-matter of Claim 1 was novel over D1, D2, D7 and D21. The appellant maintained its position that the prepolymer of Claim 1 lacked novelty over these documents.

(d) The appellant and the party as of right argued that the amendment of Claim 1 of the second and the third auxiliary request did not meet the requirements of the Article 123(2) EPC. Such an amendment was, contrary to the opinion of the respondent, not clearly and unambiguously derivable from the application as filed.

(e) As regards the fourth auxiliary request, the appellant and the party as of right pointed out that D3 disclosed the combination of Adiprene®L-325 with various curatives whereby at least one of these curatives, ie Luvocure® MUT/A, fell within the scope of Claim 1. Thus, D3 disclosed, at least implicitly, the combination of Adiprene®L-325 with all curatives. The respondent was of the opinion that D3 did not disclose Adiprene®L-325 in combination with a specific curative.

The respondent considered D13 as the closest prior art which was directed to a curable composition comprising a prepolymer having low TDI content and MBOCA as a curative. Faced with the problem of substituting the toxic MBOCA while maintaining the good dynamic properties of the elastomers of D13, it was not obvious from the available prior art to substitute MBOCA with MCDEA and simultaneously add a second component to the prepolymer, namely component (b)(i) or b(ii). The party as of right

observed that D13 was not the correct starting point since the prepolymer used in Claim 1 was not restricted with respect to its free TDI content. Thus, as argued by the appellant, D3 was the closest prior art. Starting from this document, the subject-matter of Claim 1 was, however, not based on an inventive step.

X. The appellant and the party as of right requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

XI. The respondent requested that the appeal be dismissed (main request), or, in the alternative, that the decision under appeal be set aside and the patent be maintained on the basis of:

- the 2nd auxiliary request filed on 14 June 2004 (first auxiliary request), or
- the 2' auxiliary request filed at the oral proceedings (second auxiliary request), or
- the supplemental auxiliary request 2/3 filed on 9 July 2004 (third auxiliary request), or
- the 4th auxiliary request filed on 14 June 2004 (fourth auxiliary request).

The respondent's main request related to Claims 1 to 12 as maintained by the opposition division (section II, above).

The first auxiliary request contained 10 claims which corresponded to Claims 1 to 10 of the main request.

The second auxiliary request corresponded to the first auxiliary request except that the wording "An organic diisocyanate prepolymer comprising …" in line 1 of Claim 1 was substituted by "An organic diisocyanate prepolymer having a free toluene diisocyanate monomer level of below 0.4 percent by weight comprising …".

The third auxiliary request contained 9 claims. Claims 1 to 6 corresponded to Claims 1 to 6 of the main request, except that in line 1 of Claim 1 the word "comprising" was substituted by "consisting of". Claims 7 to 9 corresponded to claims 8 to 10 of the main request.

The fourth auxiliary request contained two claims which read as follows:

"1. A polyurethane elastomer formed by the reaction of an organic diisocyanate prepolymer with a curingly effective amount of a curative containing 4,4'-methylene-bis-(3-chloro-2,6-diethylaniline), said organic diisocyanate prepolymer comprising:

(a) a first prepolymer component comprising a toluene diisocyanate endcapped polyether or polyester polyol, said prepolymer having a free toluene diisocyanate monomer level of below 0.4 percent by weight; and,

(b) a second component selected from

(i) an aliphatic diisocyanate selected from the various geometric isomers of 1,1'-

methylene-bis-(4-isocyanatocyclohexane), pure or mixed; or,

(ii) an aliphatic-isocyanate-terminated pre-polymer prepared by prereacting an aliphatic diisocyanate with a diol or polyol compound, said first component being blended with said second component to form said organic diisocyanate prepolymer.

2. A polyurethane elastomer of Claim 1 wherein said polyol is polytetramethylene ether glycol and said aliphatic diisocyanate is selected from the pure or mixed isomers of 1,1'-methylene-bis-(4-isocyanato-cyclohexane)."

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 EPC and Rule 64 EPC and is therefore admissible.

Main request

2. *Amendments*

2.1 The respondent's main request contains 12 claims whereby Claims 1 to 10 correspond to Claims 1 to 10 as granted which have never been objected to under Article 100(c) EPC.

2.2 The polyurethane elastomer of Claim 11 (section II, above) is based on Claim 11 as originally filed and Claim 11 as granted, respectively, containing, in

addition, a more narrow definition of the reaction components (a) and (b), namely that:

- the isocyanate in the prepolymer component (a) is a toluene diisocyanate isomer blend wherein 2,4-toluene diisocyanate is present from 65 to 100% and 2,6-toluene diisocyanate is present from 0 to 35%;

- the free toluene diisocyanate monomer content of that prepolymer component (a) is less than 0.4%; and

- the second aromatic diamine curative in component (b) is selected from 4,4'-methylene-bis-(2-chloroaniline), dimethylthio-toluenediamine, trimethylene glycol di-p-aminobenzoate, and 1,2-bis-(2-aminophenylthio)-ethane.

2.2.1 The three amendments to Claim 11 are individually disclosed in Claim 12 (selected second curative), Claim 14 (toluene diisocyanate isomer blend) and Claim 16 (free TDI content) as originally filed and granted Claims 12, 14 and 16, respectively. However, these claims, both in the originally filed version and in the granted version, are dependent **upon Claim 11 only** and not upon each other (section I, above). This means that, even if one accepts that a certain free TDI content (Claim 16) presupposes the use of TDI monomer (Claim 14), the original claim structure discloses two alternative embodiments for the polyurethane elastomer of Claim 11, namely one embodiment (Claim 12) wherein the polyurethane elastomer contains a specific second curative and another embodiment (Claims 14/16) relating to TDI in the polyurethane elastomer. However, a polyurethane elastomer according to Claim 11 containing

both a specific second curative **and** TDI/free TDI content is not derivable from the original claim structure.

2.2.2 Although the application as originally filed quite generally refers to polyurethane elastomers, eg page 1 lines 13 to 19 ("*This invention relates to castable polyurethane and/or polyurethane/urea elastomer compositions with low hysteresis and improved processing characteristics* …") or page 5, lines 15 to 21 ("*In accordance with the present invention, it has been discovered that castable polyurethane elastomers can be formulated with both low hysteresis and enhanced processing characteristics during the casting operation,* …"), the application as filed does not contain an explicit disclosure of the polyurethane elastomer of amended Claim 11. In fact, it does not even contain a counterpart for the polyurethane elastomer of Claim 11 as originally filed requiring, *inter alia*, a specific molecular weight for its component (a).

2.2.3 The respondent took the view that originally filed Claims 12, 14 and 16 were not directed to alternative embodiments of originally filed Claim 11 but that each of these claims was directed to another single feature of the polyurethane elastomer of originally filed Claim 11. A person skilled in the art would understand, when reading the application as a whole, that the features of originally filed Claims 11, 12, 14 and 16 could be combined altogether without departing from and without contradicting the original disclosure.

However, the structure of the original disclosure does not support this argument. The application as originally filed claims four different polyurethane elastomers, namely those of claims 8, 9, 11 and 13 (corresponding to granted Claims 8, 9, 11 and 13), each polyurethane elastomer requiring a different combination of features. The polyurethane elastomer of Claim 11, for example, is the only polyurethane elastomer requiring a certain molecular weight for component (a). Nevertheless, the description as originally filed is not particularly oriented to these claimed polyurethane elastomers, and in particular not to the polyurethane elastomer of Claim 11. Thus, pages 7 to 15 as originally filed quite generally elaborate on individual features of the polyurethane elastomers without, however, indicating their relevance for the various claimed polyurethane elastomers. The passages referred to by the respondent, namely page 7, line 25 to page 8, line 7, page 10, lines 21 to 22 and page 13, lines 16 to 25, relate to TDI monomer, free TDI content and curative blends, but without reference to a particular polyurethane elastomer, let alone the polyurethane elastomer of originally filed Claim 11. On the contrary, the passage on page 13 lists more aromatic diamine curatives than are selected in amended Claim 11. There is no hint whatsoever that only some of the aromatic diamine curatives mentioned in the description should be selected to make up the specific curative blend now required in Claim 11.

In summary, the presentation of the individual features in the application as originally filed does not support the combination now required in Claim 11, ie the combination of features in Claim 11 is not clearly and

unambiguously derivable from the original disclosure. It is not permissible to treat the content of the application as originally filed as something in the nature of a reservoir from which it would be permissible to pick and choose individually disclosed features in order to create a new embodiment if there is no hint to such a combination.

2.2.4 The respondent's argument that the combination of granted Claim 11 with granted Claims 12, 14 and 16, which are dependent upon Claim 11 only, is common practice is not convincing. The only criterion with respect of Article 123(2) EPC is whether the new combination of features is clearly and unambiguously derivable from the application as filed.

2.2.5 Summing up, neither the original claim structure nor the application as filed discloses the combination of features required in amended Claim 11. Even when reading the application as a whole, the amendment of Claim 11 is not clearly and unambiguously derivable from the application as originally filed. Hence, Claim 11 of the main request does not meet the requirements of Article 123(2) EPC.

2.3 The same objection equally applies to the subject-matter of Claim 12 being dependent upon Claim 11.

3. It follows from the above that the respondent's main request has to be refused.

First auxiliary request

4. Claims 1 to 10 of the first auxiliary correspond to Claims 1 to 10 of the main request. No objection with respect to Article 123(2) EPC arises against these claims (section 2.1, above).

5. *Novelty*

5.1 In its first novelty attack, the appellant relied on documents D1, D7 and D21, all of them relating to the commercial product Adiprene® L-325, a liquid urethane elastomer. Both D7 and D21 have been issued in 1986 but have been revised in 1996, ie after the priority date of the patent in suit. However, the respondent confirmed at the oral proceedings that, whatever the revision was, the substances referred to in the material safety data sheets D7 and D21 remained as in the first version. Since, furthermore, at least D21 has been issued by Uniroyal Chemical Company, Inc., ie the respondent itself, the board considers the technical information contained in D7 and D21 as state of the art within the meaning of Article 54(2) EPC.

5.2 Although D1, D7 and D21 describe the same commercial product, ie Adiprene® L-325, D21 is the most relevant document since it is the most complete with respect to the technical details of this product. According to D21, Adiprene® L-325 is the reaction product of a polyether with toluene diisocyanate (TDI) and methylene-bis(4-cyclohexylisocyanate) (ie H12MDI). Under the heading "Health Related Data" it is indicated that the product contains 0.1% by weight 2,4-toluene diisocyanate, 1.5% by weight of 2,6-toluene diisocyanate and 8% by weight

methylene-bis(4-cyclohexylisocyanate). Thus, the commercial product Adiprene® L-325 is, as evidenced by D21, notionally equivalent to an organic diisocyanate prepolymer comprising a prepolymer reaction product (corresponding to component (a) of Claim 1) and remaining H12MDI (corresponding to component (b) of Claim 1) whereby the level of free TDI monomer of the commercial product is above 0.4% by weight.

5.3 In Claim 1, however, only the component (a) is characterized by a specific low free TDI monomer content. This feature is no longer attributable to component (a) in the **claimed prepolymer blend**. Since furthermore the wording of Claim 1 ("an organic diisocyanate prepolymer **comprising …**" (emphasis added)) allows the presence of further components in the prepolymer, eg further TDI monomer, the restriction of the free TDI monomer content in component (a) is meaningless for the claimed prepolymer. Consequently, the subject-matter of Claim 1 is not novel over the commercial product Adiprene® L-325 as disclosed in D21 (Article 54(1) and (2) EPC).

5.3.1 The respondent took the view that the board's finding on lack of novelty was based on a misinterpretation of Claim 1. According to the respondent, the feature "said prepolymer having a free toluene diisocyanate monomer level of below 0.4 percent by weight" in Claim 1 referred back to the "overall" organic diisocyanate prepolymer and not to the prepolymer component (a). This was apparent from the use of the wording "**said prepolymer**". If that feature had been intended to represent a limitation of the prepolymer component (a),

a wording as in dependent Claim 2 would have been used, namely "**said first component**".

However, the board cannot accept this argumentation for the following reasons: Firstly, there is no clear antecedent for the term "said prepolymer" in Claim 1. The "overall" prepolymer is referred to as "an organic diisocyanate prepolymer" and component (a) is referred to as "a first prepolymer component". Thus, to this extent the reference point for the term "said prepolymer" is unclear. Secondly, the feature itself is embedded within component (a) and the most straight-forward interpretation is, therefore, that the feature indeed relates to component (a). Finally, it is conspicuous to the board that Claim 1 refers at the end of the claim specifically to "said organic diisocyanate prepolymer" when the overall prepolymer is meant. Hence, a person skilled in the art would not inevitably, as alleged by the respondent, associate the feature "said prepolymer having a free toluene diisocyanate monomer level of below 0.4 percent by weight" with the "overall" organic diisocyanate prepolymer but rather with component (a).

5.3.2 Furthermore, the respondent argued that Claim 1 requires the blending of component (a) with component (b), a step which was not disclosed in the prior art, in particular not in D21. However, the actual wording of Claim 1, ie "said first component **being blended** (emphasis added) with said second component to form said organic diisocyanate prepolymer", does not necessarily require a blending step. The term "being blended" describes, in an adjectival form, that the prepolymer is in the form of a blend. It cannot be

disputed that Adiprene® L-325 as disclosed in D21 is in the form of a blend or mixture, respectively, comprising a reaction product, free TDI and free H12MDI. But even if the term "being blended" were to be considered as a process feature, it is not apparent how such a process feature even in principle could distinguish the claimed blend from the mixture in the prior art.

In this connection, it has been the established case law of the Boards of Appeal for at least 20 years, that claims for products defined in terms of their preparation (known as "product-by-process" claims) are admissible *inter alia* only if the products themselves fulfil the requirements for patentability (T 150/82; OJ EPO 1984, 309).

5.3.3 In summary, the respondent's arguments cannot challenge the board's interpretation of Claim 1, and, according to this interpretation, Claim 1 is anticipated by the disclosure of at least D21.

5.4 The appellant also raised a novelty objection against the prepolymer of Claim 1 in view of D2. D2 is directed to an organic diisocyanate prepolymer comprising the reaction product of (a) an isocyanate blend of 0.3 to 6.0 weight percent of a dimer of 2,4-toluene diisocyanate with 94 to 99.7 weight percent of an organic diisocyanate, and (b) a polyether polyol or polyester polyol blend (Claim 1). According to Claim 2 of D2, the organic diisocyanate is selected from the group consisting of toluene diisocyanate, 4,4'-methylene-bis(phenylisocyanate) and cyclohexyldi-isocyanate. Column 2, lines 39 to 41 refer to MDI, CHDI,

H12MDI, PPDI, and IPDI as other useful organic diisocyanates. Thus, D2 presents an **alternative listing** of diisocyanates but **not a combination** of these components. The appellant argued that D2 was directed to the provision of a prepolymer having low free TDI content (column 1, lines 57 to 61). Dealing with such a problem presupposed the mandatory use of TDI in the preparation of the prepolymer. Therefore, a person skilled in the art would consider the listing of other diisocyanates in column 1 not as an alternative listing but as optional diisocyanates which can be present in addition to TDI. It is admitted that the presentation of the invention in D2 both in the claims and the description contains rather inconsistent elements. However, this alone is, in the board's view, an indication that D2 does not clearly and unambiguously disclose the combined use of TDI and H12MDI. Hence, the subject-matter of Claim 1 is novel over D2.

6. Nevertheless, for the reasons given in section 5.3, above, the first auxiliary request has to be refused.

Second auxiliary request

7. *Procedural matter*

7.1 The board was confronted at a very late stage of the proceedings with the filing of a further auxiliary request, ie the second auxiliary request was filed at the oral proceedings held on 14 July 2004 (section IX, above).

7.2 In agreement with T 577/97 of 5 April 2000 (not published in the OJ EPO), the board holds that it has

at least the discretion to accept amended claims even at a late stage of the appeal proceedings. Of course, it has to be ascertained that the procedural fairness is not jeopardized by the admission of such late filed claims (T 360/01 of 21 October 2003; section 2.3 of the reasons; not published in the OJ EPO). In other words, the board has to satisfy itself that the other parties can properly deal with the late filed claims.

7.3 In view of the finding at the oral proceedings that Claims 11 and 12 of the main request do not meet the requirements of Article 123(2) EPC (section 2, above), the respondent withdrew its 1st auxiliary request then on file (filed on 14 June 2004) since that 1st auxiliary also contained the offending Claims 11 and 12 of the main request and filed a new auxiliary request, ie the present second auxiliary request. That new auxiliary request was, apart from the deletion of Claims 11 and 12, identical with the withdrawn 1st auxiliary request.

7.3.1 If, as in the present case, it turns out during the discussion at the oral proceedings that certain claims do not meet the requirements of the EPC, it is justifiable to give the proprietor an opportunity to delete these offending claims from further auxiliary requests. A discussion of requests containing such offending claims would not make much sense. To refuse the new second auxiliary request solely on the ground that it was filed too late would be a too formalistic approach in the present case, in particular as the claims of the new second auxiliary request were, apart from the deletion of two claims, identical with the claims of a previously filed auxiliary request. Thus,

the new second auxiliary request could hardly take the other parties by surprise.

7.3.2 The fact that the new auxiliary request was not filed as a direct replacement of the previously withdrawn 1st auxiliary request but as the second auxiliary request cannot be seen as an abuse of procedure since the new second auxiliary request is narrower in scope than the first auxiliary request. Thus, the finally presented order of auxiliary requests is only logical.

7.3.3 In view of the above, the second auxiliary request was admitted into the proceedings for consideration.

8. *Amendments*

8.1 Claim 1 of the second auxiliary request (section XI, above) is based on Claim 1 as originally filed and Claim 1 as granted, respectively, requiring, in addition, that the organic diisocyanate prepolymer referred to in line 1 has "a free toluene diisocyanate monomer level of below 0.4 percent by weight". The remaining Claims 2 to 10 are identical with Claims 2 to 10 of the first auxiliary request.

8.2 It may be convenient to recall at this juncture that the organic diisocyanate prepolymer claimed in Claim 1 as originally filed and in Claim 1 as granted (section I, above), respectively, comprises a first prepolymer component (a) and a second component (b). It is the first prepolymer component (a) that has a free toluene diisocyanate monomer level of below 0.4 percent by weight and not the **claimed** "overall" organic diisocyanate prepolymer. By way of contrast, the other

independent claim to a prepolymer, namely Claim 7 as originally filed and Claim 7 as granted (section I, above), respectively, requires that the **claimed** prepolymer has a free toluene diisocyanate monomer level of below 0.4 percent by weight. Thus, the claims as originally filed and as granted, respectively, clearly distinguish between a low TDI content relating to a component of the claimed prepolymer and a low TDI content relating to the claimed prepolymer itself.

8.3 There is no explicit disclosure in the application as originally filed that the claimed "overall" prepolymer of Claim 1 as originally filed has a free TDI content of below 0.4% by weight. However, the respondent took the view that various passages in the patent specification supported the amendment of Claim 1.

8.3.1 The first passage relied upon by the respondent (page 3, lines 13 to 16, corresponding to page 5, lines 21 to 27 of the application as originally filed) reads as follows: "*The invention discloses an isocyanate-terminated prepolymer prepared with both toluene diisocyanate (TDI) and an aliphatic diisocyanate such as an isomeric mixture of 1,1'-methylene-bis-(4-isocyanatocyclohexane) [H12MDI, e.g. Desmodur W], said prepolymer being low in free TDI monomer and optionally low in free aliphatic diisocyanate monomer*". This passage evidently describes the combination of features as required in the prepolymer of Claim 7. The prepolymer according to Claim 7 is prepared with both TDI and an aliphatic diisocyanate such as H12MDI and the resulting prepolymer has a free TDI content of below 0.4% by weight. This view is further reinforced by the sentence immediately following this passage

which states: "*Other examples of aliphatic diisocyanate that may be employed include the various pure geometric isomers of H12MDI; isophorone diisocyanate (IPDI); and 1,4-cyclohexane diisocyanate (CHDI) and mixtures thereof.*" IPDI and CHDI are explicitly listed as alternative aliphatic diisocyanates in Claim 7 but not in Claim 1. A passage relating to a different embodiment cannot, however, support the amendment of the prepolymer of Claim 1.

Quite apart from that, even it one accepts, in favour of the respondent, that this passage relates also to the prepolymer of Claim 1, this passage refers merely to a prepolymer being **low** in free TDI monomer. A free TDI content of below 0.4% by weight is not mentioned. Hence, this passage cannot even in principle support the amendment of Claim 1.

8.3.2 As regards the passage on page 3, lines 39 to 40, corresponding to page 7, lines 14 to 18 of the application as originally filed ("*In the practice of this invention, an organic diisocyanate, such as toluenediisocyanate, is reacted with high molecular weight polyester or polyether polyol to produce a prepolymer having free TDI below 0.4% by weight.*"), this passage clearly relates to prepolymer component (a) of Claim 1 itself. Since there is no reference to a second component, and in particular not to the specific aliphatic diisocyanate component (b)(i) or (b)(ii) of Claim 1, the board cannot accept this passage as a valid support for the amendment of Claim 1. It is not allowable to apply the level of free TDI explicitly disclosed for prepolymer component (a) also to the "overall" prepolymer of Claim 1, in particular because

the basis for calculating the percentage of free TDI in the "overall" prepolymer (including component (b)) is different from the basis for calculating the percentage of free TDI in component (a) (not containing component (b)).

8.3.3 As regards the references to page 11, lines 26 to 27 ("*Examples 1, 1', 2 and 3 show the benefits of prepolymers prepared with both TDI and H12MDI and having low levels of free TDI monomer.*")and page 18, lines 4 to 5 ("*Thus, the compositions described (H12MDI/TDI prepolymers with low levels of free TDI monomer, suitable curing for curing with MCDEA) are unique in providing* …"), one may concede that the level of TDI monomer referred to in these passages relates to an overall prepolymer according to Claim 1, nevertheless, these passages merely refer to a low level and not to the particular value in amended Claim 1. The free TDI content of approximately < 0.1% disclosed for Examples 1, 1', 2 and 3 (Table I) and for Examples 7 to 10 (Table III), can also not support an upper limit of 0.4% as required in amended Claim 1 for the "overall" prepolymer.

8.4 In summary, the amendment of Claim 1 is neither explicitly nor implicitly derivable from the application as originally filed. Hence, the respondent's second auxiliary request has to be refused for non-compliance with Article 123(2) EPC.

Third auxiliary request

9. *Procedural matter*

9.1 Since the third auxiliary request was filed only 5 days before the oral proceedings (section VII, above), both the appellant and the other party requested that, in view of the late filing, this auxiliary request be not admitted to the proceedings.

9.2 The board has no doubt that the third auxiliary request was a serious attempt by the respondent to overcome the objections raised in the communication accompanying the summons to oral proceedings. Since, furthermore, the amendment in the third auxiliary request (section XI, above) was simple and clear enough to be understood immediately and created as little extra work as possible both for the other parties and the board, the board decided to admit the third auxiliary request into the proceedings.

10. *Amendments*

10.1 Claims 1 to 6 correspond to Claims 1 to 6 of the main request, except that in line 1 of Claim 1 the word "comprising" is substituted by "consisting of". Claims 7 to 9 correspond to Claims 8 to 10 of the main request.

10.2 It appears that, from a granted claim which defined a prepolymer in an essentially inclusive way ("comprising"), an amended claim has arisen which defines the prepolymer in an essentially exclusive way. However, the restriction in Claim 1 to an organic

diisocyanate prepolymer **consisting of** components (a) and (b) is almost annihilated by the definition of component (a), ie "a first prepolymer component **comprising** …". The board agrees with the appellant that, in the present case, the concurrent use of "consisting of" and "comprising" in Claim 1 introduces an ambiguity as to the true nature of the matter for which protection is sought, contrary to the requirements of Article 84 EPC. Thus, for this reason alone, Claim 1 and, consequently, the third auxiliary request, is not allowable.

10.3 Quite apart from that, there is no disclosure in the application as originally filed to an organic diisocyanate prepolymer consisting of components (a) and (b) only. Nor was it contested by the respondent that the documents of the application as originally filed contained no explicit mention of prepolymers consisting of only the components (a) and (b).

The board also cannot accept the respondent's argument that the amendment is supported by the examples in the patent in suit. Admittedly, Examples 1, 1', 2, 3 and 7 to 10 use an organic diisocyanate prepolymer consisting of components (a) and (b)(i). However, the organic diisocyanate prepolymers of these examples only exemplify component (b)(i) but not component (b)(ii). Furthermore, the prepolymer is always used in combination with a specific curative, ie MCDEA. Thus, in the board's view, a person skilled in the art would consider the information regarding the components of the organic diisocyanate prepolymer as being limited to the very specific instance of a prepolymer containing component (b)(i) used in combination with a specific

curative. There is no hint in the application as originally filed which would support the generalization of these examples, namely that the information is valid for all components (b) of the prepolymer and that the limiting context of a specific curative could be ignored.

10.4 Consequently, the subject-matter of Claim 1 not only lacks clarity (Article 84 EPC) but also cannot be derived in a clear and unambiguous way from the disclosure of the application as originally filed (Article 123(2) EPC). Hence, the third auxiliary request has to be refused.

Fourth auxiliary request

11. *Amendments*

11.1 Claim 1 of the fourth auxiliary request corresponds to Claim 8 as originally filed and Claim 8 as granted (section XII, above), except that the claim lists now the features of Claim 1 as originally filed instead of referring to the organic diisocyanate prepolymer of Claim 1.

11.2 Claim 2 corresponds to Claim 9 as originally filed and Claim 9 as granted, respectively, and is now dependent upon Claim 1.

11.3 Thus, the claims of the fourth auxiliary request meet the requirements of Article 123(2) and (3) EPC. Nor was any objection under Article 123 EPC raised by the appellant and the other party against the claims.

12. *Novelty*

12.1 The PU elastomer of Claim 1 is the reaction product of the organic diisocyanate prepolymer as defined in Claim 1 as originally filed with a curative containing MCDEA.

12.2 According to D1, Adiprene® L-325 produces high quality vulcanizates having excellent low-temperature flexibility, abrasion resistance, hydrolytic stability and low compression set when cured with 4,4'-methylene-bis-(2-chloroaniline) (MBOCA). Curing with MCDEA is not suggested in D1. D7 and D21 describe the prepolymer itself but not the curing of the prepolymer.

12.3 Thus, the most relevant document for the subject-matter of Claim 1 is D3, a sales brochure which lists in the table on page 3 various TDI-polyether-systems. One of these systems is Adiprene® L-325 in combination with the curatives Curalon M or Luvocure® MUT. As regards the composition of Adiprene® L-325, reference is made to section 5.1 to 5.3, above. As is apparent from Page 6 of D3, there exist five different types of Luvocure® MUT of which four are modified MCDEA. During the opposition procedure, the appellant has provided evidence (D22) that Luvocure® MUT/A, one of the types referred to in D3 as being modified MCDEA, is a mixture of MCDEA (75%) with two other diamine curatives (25%). Nevertheless, it is not clear from D3 which type of Luvocure® MUT was offered and/or sold in combination with Adiprene® L-325. Consequently, D3 does not clearly and unambiguously disclose the subject-matter of Claim 1.

12.4 As regards the disclosure of D2, this document refers in column 3, lines 61 to 62 to MCDEA as a possible curative for the prepolymer claimed in D2. However, as set out in section 5.4, above, D2 does not disclose the prepolymer required to make the PU elastomer.

12.5 Consequently, the subject-matter of Claim 1, and, by the same token, the subject-matter of Claim 2, is novel over the cited prior art.

13. Inventive step

13.1 According to page 18, lines 3 to 10 of the patent in suit, the compositions described (H12MDI/TDI prepolymers with low level of free TDI monomer, suitable for curing with MCDEA) are unique in providing resistance to cracking during the cure stage, long pour life, low levels of toxic, volatile free TDI monomer in the prepolymer and excellent dynamic properties in the elastomer.

13.2 As mentioned in section 12.3, above, D3 discloses various TDI-polyether-systems with curative(s), and in particular Adiprene® L-325 in combination with the curatives Curalon M or Luvocure® MUT. Under the heading "Gießbare Polyurethane" on page 3 it is mentioned that the TDI-polyether systems have excellent dynamic properties. Thus, D3 is an item of prior art in the technical field concerned, disclosing technical effects and intended use most similar to the subject-matter of Claim 1. Furthermore, the explicitly indicated combination of Adiprene® L-325 and Luvocure® MUT has more features in common with the claimed subject-matter than the disclosure of D1, which was considered by the

opposition division as the closest prior art. Hence, the board considers D3 to represent the closest prior art.

The respondent based its argumentation on D13 as the closest prior art which disclosed a curable composition comprising a polyether polyol endcapped with TDI and having a free TDI content of less than 0.45% and MBOCA. According to the respondent, this document was the correct starting point for the assessment of inventive step since it related to the use of a prepolymer with a reduced TDI content. However, the prepolymer used to prepare the PU elastomer of Claim 1 contains no restriction with respect to the level of free TDI monomer (section 5.3, above). In fact, the commercial product Adiprene® L-325 meets the requirements of the prepolymer set out in Claim 1. Thus, the low level of free TDI monomer cannot be a criterion for choosing the closest prior art. Hence, the respondent's argumentation based on D13 as the closest prior art must fail.

13.3 The various combinations of TDI prepolymer and curative listed in D3 yield products with excellent dynamic properties, low-temperature elasticity and good hydrolytic stability (page 3 under the heading "Gruppencharakteristika"). As regards the prepolymer Adiprene® L-325, the use of the curative Curalon M or a curative of the Luvocure® MUT type is suggested to achieve these properties. There is no evidence in the patent in suit that one of these curatives, in particular a Luvocure® MUT type comprising MCDEA, yields superior results. Thus, the objective technical problem to be solved by the patent in suit can only be seen in

providing PU elastomers having the properties referred to in D3.

13.4 In order to solve this problem, D3 itself suggests the use of various curatives which can be equally applied, including a curative comprising MCDEA. Thus, when trying to solve the objective technical problem, a person skilled in the art would inevitably arrive at something falling within the scope of Claim 1. Consequently, the subject-matter of Claim 1 is not based on an inventive step (Article 56 EPC).

14. It follows from the above that the fourth auxiliary request has to be refused.

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 R. Young