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D E C I S I O N
of 9 September 1999

Case Number: T 0792/97 - 3.3.3

Application Number: 90119526.3

Publication Number: 0480090

IPC: C08G 18/10

Language of the proceedings: EN

Title of invention:
Polyisocyanate compositions and their use in the preparation of
flexible polyurethane foams

Patentee:
Enichem S.p.A.

Opponent:
01: Bayer AG, Leverkusen Konzernverwaltung RP Patente Konzern
02: Imperial Chemical Industries PLC

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes) - implicit disclosure (no)"
"Inventive step (yes) - non-obvious combination of known
features"

Decisions cited:
T 1002/92, T 0686/91, T 0644/97

Catchword:
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Case Number: T 0792/97 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 9 September 1999

Appellant I:
(Opponent 0I)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office dated 4 June 1997, issued
in writing on 18 June 1997 rejecting the
oppositions filed against European patent
No. 0 480 090 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: R. Young
J. C. M. De Preter

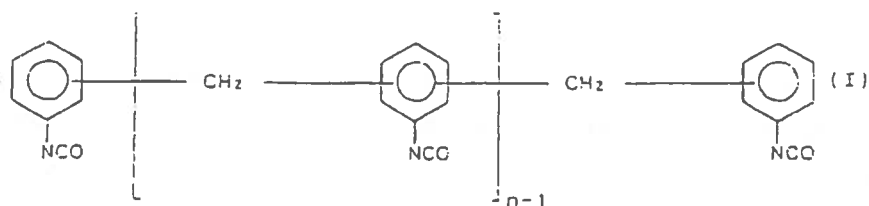
Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 480 090, relating to "Polyisocyanate compositions and their use in the preparation of flexible polyurethane foams", with eight claims, in respect of European patent application No. 90 119 526.3, filed on 11 October 1990 was published on 25 January 1995 (Bulletin 95/04). Claim 1 reads as follows:

"Polyisocyanate compositions comprising:

(a) from 90 to 50% by weight of a reaction product of at least one organic diisocyanate and at least one polyether-polyol obtained from C₁ - C₆ - alkylene oxides and having an average functionality of at least 2 and an average molecular weight of from 1000 to 8000, said reaction product having a content of free NCO groups of from 26.5 to 33% by weight; and

(b) from 10 to 50% by weight of a mixture of polymethylene-polyphenyl-polyisocyanates of general formula (I):



wherein n is an integer of at least 1,

the mixture of polymethylene-polyphenyl-polyisocyanates having an average functionality of from 2.6 to 2.8."

Claims 2 to 7 are dependent claims directed to elaborations of the polyisocyanate composition according to Claim 1.

Claim 8, an independent claim, is worded as follows:

"Use of the compositions according to any one of claims 1 to 7 for the preparation of flexible polyurethane foams."

II. Two Notices of Opposition were filed, one by Bayer AG (Opponent OI), on 15 September 1995 and another by ICI PLC (Opponent OII), on 2 October 1995, each on the grounds of both lack of novelty and lack of inventive step. The oppositions were supported *inter alia* by the documents:

D1: DE-A-3 818 769;

D2: EP-A-0 010 850; and

D8: Buethe et al., "Flexible Polyurethane Molded Foams Based on MDI", Proceedings of the SPI 6th International Technical/Marketing Conference, San Diego, California, 1983, pages 156 to 160.

By letter received on 2 May 1997, Opponent OI introduced the additional ground of insufficiency of disclosure pursuant to Article 100(b) EPC, which, however, was withdrawn during oral proceedings.

III. By a decision given at the end of oral proceedings held on 4 June 1997 and issued in writing on 18 June 1997, the Opposition Division rejected the oppositions.

According to the decision, the claimed subject-matter was novel, in particular in the light of D1, since the latter did not disclose the combination of (a) a prepolymer with an amount of NCO groups of 26.5 to 33 wt% and (b) a mixture of polymethylene-polyphenyl-polyisocyanates (polymeric MDI) having a functionality of 2.6 to 2.8, nor that these two components had to be combined in relative amounts according to Claim 1 of the patent in suit.

As to inventive step, the comparative examples using TDI (toluene diisocyanate) for the prepolymer, which had been late-filed, by Opponent OI, on 2 May 1997, to show that the problem addressed by the patent in suit, of obtaining flexible, open cell foams which did not need post-treatments, could not be solved by the entire group of compositions defined in Claim 1, had been performed under different conditions and therefore did not form a fair comparison or convincing evidence that the problem was not actually solved over the whole range claimed. Furthermore, no portion of the state of the art mentioned the problem of avoiding the post-treatments of the flexible foams. Since, moreover, there was no anticipation, in particular in D1, of the requirements (a) and (b) of Claim 1, it had to be concluded that the use of these features to solve that problem was not rendered obvious by the combination of documents cited.

As regards the argument of Opponent OII, which was based on the choice of D2 as closest state of the art, which disclosed polyisocyanate compositions differing from those of Claim 1 of the patent in suit in that they had at most 26 wt% of NCO groups, the comparative data in the patent in suit provided a fair comparison and showed that the distinguishing feature solved the problem of increasing the number of open cells in the foam and, therefore, of avoiding the post-treatments.

To arrive at this solution was not simply a matter of deriving a correlation between functionality of the polyisocyanate and cell opening in PU-foams, from D8 or the corresponding common general knowledge, but on the contrary, to carry out a sequence of steps which involved ignoring a part of the teaching of D8, and which could only be imagined with the help of hindsight. This was not the most obvious solution.

IV. On 17 July 1997, a Notice of Appeal against the above decision was received from Opponent OII (Appellant II), the prescribed fee having been paid on the same day. This was followed by a Statement of Grounds of Appeal, filed on 2 October 1997, in which Appellant II argued that the combination of D8 with D2 was valid, since the teaching of D8 applied equally to a one-shot or a prepolymer system. Hence, the solution claimed, even if not the "most obvious", was still obvious in the sense of Article 56 EPC.

V. Furthermore, on 24 July 1997, a Notice of Appeal was received from Opponent OI (Appellant I), the prescribed fee also being paid on the same day. This was followed by a Statement of Grounds of Appeal, filed on 24 October 1997 by fax, in which Appellant I referred additionally to six documents, numbered D8 to D13, and argued in substance as follows:

- (a) The possibility, according to Claim 1 of D1, of mixing the reaction product of components (a1) and
- (b) with urethane group-free polyisocyanates having a content of MDI monomer isomers of 40 to 100 wt%, was novelty destroying for the subject-matter of Claim 1 of the patent in suit, since the calculated content of MDI monomers corresponding to the claimed functionality of the polymeric MDI (2.6 to 2.8) was anticipated by the range of diisocyanate monomer in the urethane-free MDI

component disclosed in D1. Furthermore, applying hydroxyl number calculations to prepolymers having NCO contents lying in the area of overlap between D1 and Claim 1 of the patent in suit (26.5 to 30%) resulted in prepolymer compositions which, when mixed with the required amounts of a polymeric MDI, resulted in a series of compositions having a total diisocyanate NCO content falling within the range disclosed for this parameter in D1. Hence, the subject-matter of Claim 1 lacked novelty.

- (b) As to inventive step, the remaining documents showed that it was obvious to control the extent to which open cells were formed by varying the proportion of MDI monomer and to choose a functionality of the polymeric MDI within the terms of the patent in suit.

The written confirmation filed on 27 October 1997 was accompanied by sets of tabulated results, of which Tables 2 to 5 showed calculated values relating to argument (a), and Table 1 showed the results of a comparative experiment, relating to argument (b), in which the use of toluene diisocyanate (TDI) as organic diisocyanate according to the teaching of the patent in suit did not prevent foam shrinkage, even though it was mixed with polymeric MDI. Thus, the effect relied upon was not obtained.

VI. The Respondent (Patentee) disagreed, in a submission filed on 14 September 1998, with the arguments of the Appellants, for the reasons given in the decision under appeal, and emphasised in particular:

- (a) The NCO content in D1 applied to the entire mixture of prepolymer and polymeric MDI, whereas NCO content in Claim 1 of the patent in suit referred only to the prepolymer in the mixture.

Nor did the calculations filed by Appellant I demonstrate that the polymeric MDI's disclosed in D1 necessarily had the claimed functionality of 2.6 to 2.8. Consequently, D1 did not disclose the selection of features required in the patent in suit, which was thus novel over D1.

- (b) As to inventive step based on a combination of D2 and D8, the latter teaching had to be seen as being in two parts, one being a background part, and one being a product development part. The former part, which referred to the older technical field without the use of prepolymers, was concerned with the ratio of pure MDI/polymeric MDI. There was no suggestion that this applied to the latter part, which referred to prepolymers of pure MDI in admixture with polymeric MDI. On the contrary, the latter (product development) part taught how to reduce the risk of cell openness by controlling the ratio of 4,4'- and 2,2'- MDI isomers. Thus D2 was not combinable with D8 since the two documents related to different fields. Even if they were combined, the changes would be concerned with the MDI isomers rather than the isocyanate functionality. The remaining documents cited in this connection would equally not lead to the claimed combination.
- (c) As regards the comparative tests filed by Appellant I, further data would be filed in the near future by the Respondent. In the meantime, however, a new set of Claims 1 to 7 was filed as an auxiliary request.

With a further submission filed on 28 June 1999, the Respondent filed experimental data to show that the compositions used by Appellant I, when applied according to the conditions exemplified in the patent

in suit, provided the relevant effect, and furthermore argued that the compositions in the data supplied by Appellant I had been prepared under different conditions from those exemplified in the relevant Example 7 of the patent in suit, in particular in that no auxiliary blowing agent had been used.

VII. Oral proceedings were held before the Board on 9 September 1999. At the beginning of the oral proceedings, the Board questioned whether Mr Baken, the representative for Appellant II (ICI PLC) in the proceedings so far, was still appearing on behalf of that party, in view of a statement, in a letter received by the EPO on 16 August 1999, that an assignment of the rights of this party in the Opposition, to another company, would be filed. No such assignment having, however, so far been received. Mr Baken confirmed that he was still appearing on behalf of the original party, i.e. Appellant II (ICI PLC).

During the course of the oral proceedings, Appellant I filed a document showing further tabulated results, headed "Mischungen aus Präpolymer A und Komponente B". It was introduced into the proceedings under Article 114(1) EPC.

Documents numbered D8 to D13 were excluded, by the Board, under Article 114(2) EPC from consideration as late-filed, except for one (D11), which corresponded to D8 already considered in the proceedings before the Opposition Division, as were the experimental results filed by the Respondent with the submission of 28 June 1999.

VIII. The Appellants requested that the decision under appeal be set aside, and the patent in suit revoked in its entirety.

The Respondent requested as main request, that the appeals be dismissed, or, as auxiliary request, that the patent be maintained on the basis of the set of Claims 1 to 7 filed on 14 September 1998.

Reasons for the Decision

1. The appeal is admissible.
2. *Late-filed submissions*
 - 2.1 Of the documents D8 to D13 referred to in the Statement of Grounds of Appeal of Appellant I, D11 corresponds to D8 considered in the proceedings before the Opposition Division. Consequently, the documents numbered D8, D9 and D10 by Appellant I are more correctly numbered D9, D10 and D11 respectively, D12 and D13 remaining unchanged.
 - 2.2 Documents thus renumbered D9 to D13 were cited for the first time in appeal, and must be regarded therefore as late-filed. None of D9 to D11, which are extracts from general texts on polyurethanes and thus represent common general knowledge, appeared to add anything significant to what is already said in D8. Although somewhat different aspects were dealt with in D12 and D13, which thus went beyond the framework of the procedure so far, the relevance of the contents of these documents did not seem to be such as to be highly likely to lead to the revocation of the patent in suit (T 1002/92, OJ EPO 1995, 605). This preliminary view of the Board, expressed at the oral proceedings, was not contested by the parties. Consequently, the Board decided to exclude all the late-cited documents from consideration under Article 114(2) EPC.

2.3 The tabulated results headed "Mischungen aus Präpolymer A und Komponente B", filed at the oral proceedings were, however, argued merely to be a different presentation of the results already on file. To this extent they represented a new argument, but did not go beyond the factual framework of the proceedings thus far. Nor did the Respondent raise any objection to their introduction. Consequently, they were introduced into the proceedings under Article 114(1) EPC.

2.4 The experimental data filed by the Respondent on 28 June 1999 were foreshadowed in the submission of 14 September 1998. Nevertheless, the period of almost a year which was allowed by the Respondent to elapse before filing the results meant that the Appellants had too little time to repeat the experiments of the Respondent. Consequently, the latter data were excluded from the proceedings under Article 114(2) EPC.

3. *Novelty*

Novelty was contested solely in relation to the disclosure of D1.

3.1 According to D1, liquid, urethane group containing mixtures of polyisocyanates with an NCO-content of 15 to 30% by weight for preparing polyurethane foams are obtained by reacting:

(a1) polyisocyanates or their mixtures of the MDI (diphenylmethane)-type with a content of diisocyanate monomers of 50 to 100% by weight, with

- (b) deficient amounts of a polyether-polyol having an average hydroxyl equivalent weight of 500 to 3000 and an average hydroxyl functionality higher than 4,

and optionally mixing the reaction product of (a1) and (b) with

- (a2) urethane group-free polyisocyanates or mixtures thereof having a content of diisocyanatophenylmethane isomers of 40 to 100% by weight, with the proviso that the total content of diisocyanatophenylmethane isomers in components a1) and a2) amounts to 50 to 95% by weight and the content of higher than difunctional polyisocyanates of the MDI type in the two starting components amounts to 5 to 50% by weight (Claim 1).

The foams have low density but good mechanical properties, especially tensile strength and elongation at break, without the necessity of using a physical blowing agent (page 2, lines 30 to 45). The polyisocyanate mixture preferably has a NCO content of 20 to 28% by weight (page 4, lines 39 to 41).

According to Example 2 in conjunction with Example 1, a flexible polyurethane foam is prepared by reacting a MDI prepolymer having a free NCO content of 25.3% (B-component) with a polyol composition comprising:

- 100 parts of a polyetherpolyol of OH-number 28 prepared by propoxylation of sorbitol and subsequent ethoxylation of the product (ethylene oxide content = 13%);
- 3.4 parts water;
- 1.0 part commercial amine catalyst;
- 1.0 part methyldicyclohexylamine ;

0.3 part triethylamine;
0.6 part commercial aliphatic polyamine crosslinker;
0.5 part commercial polyetherpolysiloxane stabiliser;
2.0 part polyetherpolyol of OH-number 36, obtained by propoxylation of glycerin and subsequent ethoxylation (ethylene oxide content = 73%).

3.2 The Board concurs with the finding in the decision under appeal that the reference to "30 or 28 wt%" NCO groups in D1 applies to the entire mixture and not to the prepolymer only. It also concurs that there is no disclosure of a combination of a prepolymer component having a NCO content within the range of 26.5 to 33% by weight with an MDI component having a NCO functionality within the range of 2.6 to 2.8, as required, let alone any indication that such components should be mixed in the amounts specified in Claim 1. On the contrary, the prepolymer exemplified in D1 has an NCO content of only 25.3%, and the functionality of the MDI component is not mentioned at all.

3.2.1 The argument in the written submission of Appellant I (Section V.(a), above), that the calculated content of MDI monomers corresponding to the functionality of the polymeric MDI (2.6 to 2.8) specified in Claim 1 was anticipated by the range of diisocyanate monomer in the urethane-free MDI component disclosed in D1, is not convincing, because it is based on assumptions concerning the relative proportions of di-, tri- and higher homologues in a specific sample of MDI, which have not themselves been shown necessarily to be fulfilled in the specific compositions disclosed in D1. A similar deficiency is to be found in the calculated amount of diisocyanate MDI from the functionality of component (b) in the patent in suit,

since both a maximum functionality of six is assumed, and also a particular value for the NCO content of the polymeric MDI is assumed, neither of which is directly and unambiguously derivable from D1.

Similar considerations apply to the tabulated results in the document "Mischungen aus Präpolymer A und Komponente B", after this has been clarified by correction of the admitted error "Gesamt-MDI" in the fourth column to read "Gesamt-NCO", i.e. total NCO. Here, it is evident that a specific NCO content has been assumed for the MDI component.

Consequently, neither the calculations in the Statement of Grounds of Appeal of Appellant I, nor those tabulated in the document filed by the same party at the oral proceedings are apt to demonstrate the extent of the disclosure of D1.

3.2.2 Even if the assumptions had been regarded as justified, however, all the calculated values are generated from information in the patent in suit and are not from a specific disclosure in D1. Far from showing that the relevant features claimed are disclosed in D1, they merely show that, with the assumptions made, certain values of the features of Claim 1 of the patent in suit fall within broad ranges disclosed in D1. Consequently, the most that they show is that certain ranges of single features of the claimed compositions may overlap the corresponding ranges disclosed in D1.

3.2.2.1 The argument of Appellant I at the oral proceedings, that the subject-matter claimed in the patent in suit represented a broad selection within D1, was based on the tabulated data in the document filed at the oral proceedings. This is not reliable, however, for the reasons given (section 3.2.1, last two paragraphs, above).

3.2.2.2 Even if the tabulated figures were to be accepted at face value, however, the values of total NCO corresponding to the claimed "prepolymer only" NCO contents in the fourth column do not all lie within the range disclosed in D1, as was admitted by Appellant I at the oral proceedings. On the contrary, about 50% of the total NCO values are above 30%, the upper limit of total NCO content claimed in D1. The same applies to the more preferred range of 20 to 28% referred to by Appellant I. Consequently, the claimed subject-matter does not fall wholly within the disclosure of D1. It is not, therefore, to be regarded as a selection from D1.

3.2.2.3 Even if one were to consider the area of overlap of total NCO contents as set out in the tabulated results, this would represent the range from 27.2% to 30% as opposed to 15 to 30%, i.e 2.8% on 15%. This cannot be regarded as occupying the major proportion of the disclosure of D1. Even taking the preferred range in D1, of 20 to 28%, the "selection" in the area of overlap corresponds to 0.8% on 8%, or 10% of the total. Consequently, the area chosen, to the extent that it overlaps the disclosure of D1 at all, represents a small fraction of the disclosure of D1.

3.2.2.4 The argument that the examples of D1 were not far removed from the claimed range of NCO, put forward by Appellant I at the oral proceedings, is also not convincing, because none of the examples in D1 uses component (b) according to Claim 1 of the patent in suit. Consequently, the examples of D1 are indeed far removed from the claimed subject-matter.

3.2.2.5 In summary, the subject-matter claimed in the patent in suit has not been shown to disclose, explicitly or implicitly, the combination of features specified in Claim 1 of the patent in suit. Even the extent of any overlap meets the criteria generally applied for a narrow selection.

3.2.3 In other words, the subject-matter claimed in the patent in suit is novel over D1.

3.3 Lack of novelty was not alleged in relation to any of the other documents cited.

3.4 Hence, the subject-matter claimed in the patent in suit is held to be novel.

4. *The patent in suit; the technical problem*

The patent in suit is concerned with polyisocyanate compositions and their use in the preparation of flexible polyurethane foams, for example for car seats, by reaction with polyols under conventional conditions (page 2, lines 3, 4 and 30, 31; page 4, lines 44 to 46).

4.1 Such compositions are known, however, from the prior art, in particular D2, which is considered, in line with the finding in the decision under appeal, to represent the closest state of the art.

According to D2 (Claim 1), a polyisocyanate composition comprises:

- A. from 90 to 50% by weight of a reaction product of diphenylmethane diisocyanate and a polyoxyalkylene polyol having an average functionality of from 2 to 3, the content of free NCO groups in said reaction product ranging from 8 to 26% by weight; and
- B. from 10 to 50% by weight of a composition containing from 30 to 65% by weight of diphenylmethane-diisocyanate and from 70 to 35% by weight of polymethylene-polyphenyl-polyisocyanates having a functionality higher than 2.

According to the illustrative example, a polyisocyanate blend is made by mixing 84 parts by weight of a prepolymer having an NCO content of 18% made by reacting an 80:20 mixture of diphenylmethane-4,4'- and 2,4'- diisocyanates with polypropylene glycol of molecular weight 2000, with 16 parts by weight of a crude diphenylmethane diisocyanate containing 55% of diisocyanatodiphenylmethane isomers and having an NCO content of 30.7%. This blend is mixed, at an isocyanate index of 105, with a polyol masterbatch containing: 100 parts of an ethylene oxide tipped oxypropylated glycerol having a molecular weight of 5300, 2.4 parts of water, 0.8 parts of a 33% solution of triethylene diamine, 0.3 parts of a 70% solution of bis(2- dimethylaminoethyl) ether, 0.1 part of dibutyltin dilaurate, 1.0 part of a silicone oil and 5 parts of trichlorofluoromethane. The reaction mixture is introduced into a mould and allowed to cure for 6 minutes. After demoulding, the product is well cured and is very resistant to surface marking (page 7, line 20 to page 8, line 11).

- 4.2 The foams obtained from these compositions display, however, according to the patent in suit (page 2, lines 34 to 36), very closed cell structures, so that further treatments - such as beating or mangling - are required in order to break the cells of the foam and promote the escape of the foaming gases remaining inside the cells.
- 4.3 Consequently, the technical problem arising from this state of the art is to define a polyisocyanate composition capable of yielding, when foamed under conventional conditions, moulded flexible polyurethane foams with a very open structure, which consequently do not require any successive mangling or pressing operations.
- 4.4 The solution proposed according to Claim 1 of the patent in suit is to start from modified polyisocyanates having a content of free NCO groups in the range of from 26.5 to 33% by weight.
- 4.5 The examples and comparative examples in the patent in suit, in particular Comparative Examples 1 and 2, and illustrative Examples 4, 5 and 6 show that, when the percentage of free NCO groups is increased from a level corresponding to that exemplified in D2 (18%), through 23%, to a level within the terms of the patent in suit (27%, 29% or 30.6%), a foamed resin produced therefrom for car seats of standard geometry having a bulk density of 45 g/l has, in the first two cases a very closed foam structure, and in the last three cases a very open foam structure not requiring further mechanical treatment (Example 7, pages 4 and 5, and Table, page 6).

4.5.1 The argument of Appellant II at the oral proceedings, that the comparative data in the patent in suit did not provide a fair comparison, because the ratio, in Comparative Example 3, of prepolymer (component (a)) to polymethylene-polyphenyl-polyisocyanate (component (b)) was 1:1, whereas in the other examples, in particular Example 4, it was about 2:1, is not convincing to the Board, because the relative amounts of the components (a) and (b) are not closely regulated according to Claim 1 of the patent in suit, and both ratios fall within the range claimed. In any case, the remaining examples and comparative examples have a very similar ratio for the components (a) and (b) and still demonstrate the desired effect to be obtained within the claimed range of free NCO groups in component (a).

4.5.2 The further argument of Appellant II at the oral proceedings, that the comparative experimental data filed on 14 October 1996, i.e. during the proceedings before the Opposition Division, showed that other parameters than those claimed were responsible for the effect of degree of openness of the foams obtained, is equally unconvincing to the Board, because none of these examples operates within the range of polymethylene-polyphenyl-polyisocyanate (MDI) functionality of 2.6 to 2.8 used according to the patent in suit. On the contrary, none of the experiments filed has a MDI functionality above 2.32. Consequently, these experiments are irrelevant to any assessment of the effectiveness of the claimed measures in solving the technical problem arising.

4.5.3 Finally, the argument of Appellant I, on the basis of an experimental report that the use of TDI as organic diisocyanate according to the teaching of the patent in suit did not prevent foam shrinkage, (Section V., last paragraph, above), so that the effect relied

upon was not obtained over the whole range claimed, is not convincing, because the foaming step in these experiments was performed under conditions at variance with the procedure set out in the relevant Example 7, in particular in that they were carried out without the use of a conventional fluorocarbon blowing agent. Claim 1 is not, however, directed to a method of making a foam, but rather to a polyisocyanate composition for use in such a method. The skilled person wishing to prepare a foam according to the patent in suit would in any case follow the instructions given in the patent in suit. According to the latter, conventional conditions are used, in particular as to the use of suitable foaming agents (page 2, lines 30 to 32). Finally, such a fluorocarbon is used in the relevant Example 7.

Whilst D1 admittedly exemplifies the formation of foams without the use of fluorocarbon blowing agents, it refers to this as being made possible by the use of untypically high quantities of water, and thus presents the absence of a physical blowing agent as unusual (page 2, lines 36 to 40). A more conventional process is on the contrary represented by the closest state of the art, D2, in which the use of such a blowing agent is illustrated in the worked example.

Consequently, the omission, from the experiments filed by Appellant I, of the relevant blowing agent corresponds, in the Board's view, to a divergence not only from the conditions exemplified in the patent in suit, but also from conventional standard practice. It follows that the experimental data filed by Appellant I are not convincing evidence that compositions claimed in the patent in suit are not capable of delivering the desired effect over the whole range claimed.

The onus was, however, on the Appellants at this stage to demonstrate that the claimed measures were not effective. This they have not done.

4.6 In summary, the Board finds it credible that the claimed measures provide an effective solution of the technical problem.

5. *Inventive step*

In order to assess the question of inventive step, it is necessary to establish whether the skilled person would have had any incentive to increase the content of NCO in the prepolymer component (A) according to D2 from the maximum of 26% by weight disclosed therein to at least 26.5% as required by the solution of the technical problem.

5.1 Whilst the acknowledgment of D2 in the application as filed and forming the basis of the patent in suit states that the foams generated according to D2 are very closed, and thus identifies the problem arising from putting into practice the teaching of D2, there is no mention in D2 of cell openness. Consequently, there is no hint in D2 itself to take any measure to increase the cell openness of the foams, let alone to make the modification necessary to arrive at the solution of the technical problem.

5.2 Nor is there any other reason derivable from the disclosure of D2 which would lead the skilled person to consider increasing the NCO content of the prepolymer component. On the contrary, the upper limit of 26% is specified in Claim 1 and thus amounts to an essential feature of the disclosure of D2. It cannot be regarded as a normal option for the skilled person to depart from a disclosure in respect of an

essential feature, if only because the results of doing so are not in any practical sense predictable. Consequently, there is no hint to the solution of the technical problem in D2.

5.3 Document D8 is an account of certain technical problems encountered in the introduction of MDI based flexible foams into the world marketplace.

One problem was the negative effect of the presence of 4,4'- pure MDI isomer, which produced a highly symmetric polyurea which precipitated and opened the cell walls of the rising foam, leading to an inefficient use of blowing agent. This could be ameliorated by enrichment with 2,4'-isomer (page 156, left column, "Background" to page 157, left column, first paragraph).

Another problem was that, whilst giving flexible foams with good properties, the isocyanates used were not stable over long periods, i.e. the pure MDI could "freeze" out of solution at ambient temperatures. Thus a stable prepolymer of pure MDI was prepared, from which blends could be made with polymeric MDI to produce flexible foams. Several prepolymers were prepared to study the effect of polyol composition on the resulting foams' mechanical properties (page 157, left column, last paragraph).

By careful selection of the appropriate ratio of prepolymer and polymeric MDI, the elongation of the resulting foams could be accurately predicted (page 157, right column, "Product Development", first paragraph).

- 5.3.1 Whilst it is true that D8, unlike D2, specifically mentions the degree of cell openness of flexible polyurethane foams, it refers to this as an undesirable side effect arising with a pure MDI/polymeric MDI mixture. There is no mention of prepolymers in this connection. Consequently, the skilled person would have no reason to regard this disclosure as relevant to his purpose.
- 5.3.2 Even if the skilled person were, nevertheless, for some reason to consult the disclosure of D8, this teaches the enrichment of the pure MDI with added with 2,4' isomer. Consequently, there is no incentive to modify the total NCO content of the prepolymer component.
- 5.3.3 The argument of Appellant II, that the teaching of D8 to improve cell openness by increasing the ratio of pure MDI to polymeric MDI was equally applicable to a one-shot system or a prepolymer system (Section V., above) is not supported by the wording of D8. On the contrary, the issue of cell openness is dealt with in the first section "Background", dealing with monomeric/polymeric MDI mixtures, there having been no reference to prepolymers in this context. On the contrary, the only purpose of preparing the prepolymers, referred to later in the text of D8, was to stabilise the MDI species against precipitation over long periods. In any case, there is no suggestion to alter the NCO content of the prepolymer for any reason, let alone to provide cell openness.
- 5.3.4 Consequently, there is no hint to the solution of the stated problem in D8.
- 5.4 The disclosure of D1 fails to mention the degree of openness of the foams it discloses, or indeed open-celled foams at all.

The argument of Appellant I, that the reference to "low density foams" on page 2, lines 30/31 of D1 amounted to a reference to open celled foams was disagreed with not only by the Respondent but also by Appellant II, who did not see the terms "low density" and "open-celled" as synonymous. Nor does the Board have any reason to suppose that the teaching of D1 is concerned with providing a particularly open-celled foam. On the contrary, the concern in D1 is to provide a foam with good mechanical properties, such as tensile strength and elongation to break (page 2, lines 41 to 45). Consequently, D1 cannot contribute to the solution of the technical problem underlying the patent in suit.

- 5.5 The criticism, by Appellant II, of the statement in the decision under appeal concerning the "most obvious solution" (also Section V., above) was based on an assertion, repeated during the oral proceedings before the Board, according to which the degree of openness of the foam was directly dependent on the total functionality of the prepolymer and MDI components, rather than on the features claimed. This in turn was based, to a large extent, on the experimental data filed on 14 October 1996, during the proceedings before the Opposition Division. These data have, however, been found to be irrelevant to the claimed solution (section 4.5.2, above). Even if it were accepted, to the advantage of Appellant II, that the results of these experiments illustrated another type of dependency of cell openness on overall NCO functionality, it has not been shown that such a dependency was known to the skilled person at the relevant filing date. Consequently, the skilled person would not have been in a position to take advantage of it as a basis for action in modifying

the disclosure of D2 to solve the technical problem. As it is, the new presentation, by Appellant II, of the behaviour of cell openness appears to be a result of modifying the teaching of the patent in suit to resemble the prior art, rather than *vice versa*.

- 5.5.1 Even if the skilled person had been aware that reducing the total NCO functionality would improve cell openness in the context of the claimed systems, this would simply have led him to seek some way of reducing the NCO functionality in the compositions according to D2. The most obvious way to do this is not, however, to increase the percentage NCO content of the prepolymer, since this measure, taken alone, would actually **increase** the total NCO functionality. Thus, even if the arguments of Appellant II are accepted in full, their effect is to lead away from the claimed subject-matter.
- 5.5.2 In summary, the criticism of the decision under appeal by Appellant II is unjustified.
- 5.6 In view of the above, it is evident that the solution of the technical problem claimed in the patent in suit does not arise in an obvious way starting from D2.
- 5.7 Nor would the result have been different, if one had taken D1 as the starting point for the assessment of inventive step, as favoured by Appellant II at the oral proceedings, for the following reasons.
- 5.7.1 The disclosure of D1 is less relevant than that of D2, since the technical problem described in the patent in suit is not related to anything derivable from it (section 5.4, above).

- 5.7.2 The technical problem arising from a "closest state of the art" disclosure, such as D1 here, which is irrelevant to the claimed subject-matter in the sense that it does not mention a problem that is at least related to that derivable from the patent specification, has a form such that its solution can practically never be obvious, because any attempt by the skilled person to establish a chain of considerations leading in an obvious way to the claimed subject-matter gets stuck at the start. The consequence is that the respective claimed subject-matter is non-obvious in the light of such art (T 644/97 of 22 April 1999, following T 686/91 of 30 June 1994, neither published in OJ EPO).
- 5.7.3 Consequently, the subject-matter according to Claim 1 of the patent in suit does not arise in an obvious way from the state of the art, whether starting from D2 or from D1.
- 5.7.4 In other words, the subject-matter of Claim 1 involves an inventive step in the sense of Article 56 EPC, as does that of dependent Claims 2 to 7. Since Claim 8 is directed to a use of the composition according to Claim 1, its subject-matter, by the same token, also involves an inventive step.

Order

For these reasons it is decided that:

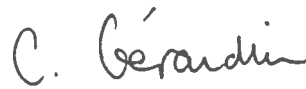
The appeals are dismissed.

The Registrar:


E. Görgmaier



The Chairman:



C. Gérardin

