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D E C I S I O N
of 31 January 2002

Case Number: T 0633/99 - 3.3.3

Application Number: 92915357.5

Publication Number: 0588981

IPC: C08G 18/12

Language of the proceedings: EN

Title of invention:

A process for preparing a microcellular polyurethane elastomer from a soft-segment isocyanate-terminated prepolymer and microcellular polyurethane elastomer obtained thereby

Patentee:

THE DOW CHEMICAL COMPANY, et al

Opponent:

BASF Aktiengesellschaft, Ludwigshafen
Huntsman International LLC

Headword:

-

Relevant legal provisions:

EPC Art. 56, 114(2)

Keyword:

"Inventive step (yes) - ex post facto analysis, non-obvious combination of known features"
"Late submitted material - evidence admitted (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0633/99 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 31 January 2002

Appellant: BASF Aktiengesellschaft, Ludwigshafen
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 April 1999
rejecting the oppositions filed against European
patent No. 0 588 981 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: R. Young

Members: A. Däweritz
J. Van Moer

Summary of Facts and Submissions

- I. The grant of European patent No. 0 588 981 in respect of European patent application No. 92 915 357.5, based on International patent application No. PCT/US92/04954, filed on 11 June 1992 and claiming priority of 13 June 1991 of an earlier application in the United States of America (714799), was announced on 14 May 1997 (Bulletin 1997/20) on the basis of two sets of claims. The set for the Contracting States BE, CH, DE, DK, FR, GB, GR, IT, LI contained 10 claims ("set A"), and the set for the Contracting State ES contained 9 claims ("set B"), Claims 1 to 8 and 9 of which were identical to Claims 1 to 8 and 10, respectively, of "set A".

The independent claims of "set A" as granted read as follows:

- "1. A process for preparing a microcellular polyurethane polymer which has a density of from 100 to 1000 kilograms per cubic meter by intimately contacting under reaction conditions, in the presence of a blowing agent comprising water, an active hydrogen containing substance consisting of a polyol comprising a polyether polyol and/or a polyester polyol and optionally a chain-extending agent with an isocyanate composition characterized in that the isocyanate composition has an isocyanate equivalent weight of from 180 to 300 and comprises in from at least 50 weight percent an isocyanate terminated prepolymer wherein said prepolymer is obtained by reaction of an organic polyisocyanate comprising 4,4'-methylene diphenylisocyanate in from at least 70 percent by total weight of polyisocyanate with

an isocyanate-reactive composition that comprises:

(a) 1,2-dipropylene glycol, tripropylene glycol, trimethylolpropane, glycerine, mixtures thereof, and adducts thereof with propylene oxide that have a molecular weight of from 60 to 300; and

(b) a polyoxyalkylene polyol or mixtures thereof which has an average functionality, based on that of its initiator, of from 2 to 4 isocyanate reactive hydrogen atoms per molecule and a molecular weight of from 3000 to 12000,

wherein (a) and (b) are present in a parts by weight ratio of from 0.01:1 to 0.25:1, wherein the blowing agent comprises water in an amount of from 0.05 to 2 weight percent based on total weight of polyether and polyester polyol and optional chain-extending agent, and wherein the isocyanate composition is present in an amount to provide from 0.8 to 1.3 isocyanate groups per isocyanate reactive hydrogen atom of the polyol and water present."

"9. A microcellular polyurethane polymer prepared by the process of any one of the preceding claims."

"10. A two component microcellular polyurethane polymer forming system for preparing a microcellular polyurethane polymer by the process of claim 1 which comprises:

(a) from 40 to 60 percent by total weight of the system of an isocyanate composition which has an

isocyanate equivalent weight of from 180 to 300 wherein the isocyanate composition comprises an isocyanate-terminated prepolymer in from at least 50 weight percent and wherein said prepolymer is obtained by reaction of an organic polyisocyanate comprising 4,4'-methylene diphenylisocyanate in from at least 70 weight percent by total weight of polyisocyanate with an isocyanate-reactive composition that comprises

(i) 1,2-dipropylene glycol, tripropylene glycol, trimethylolpropane, glycerine, mixtures thereof and adducts thereof with propylene oxide that have a molecular weight of from 60 to 300, and

(ii) a polyoxyalkylene polyol or mixtures thereof which has an average functionality, based on that of its initiator, of from 2 to 4 isocyanate-reactive hydrogen atoms per molecule and a molecular weight of from 3000 to 12000;

wherein (i) and (ii) are present in a parts by weight ratio of from 0.01:1 to 0.25:1; and

(b) from 60 to 40 percent by total weight of the system of a polyol composition containing a polyether polyol or polyester polyol and from 0.04 to 2 parts water per 100 parts polyol."

Claims 2 to 8 concerned specific embodiments of the process of Claim 1.

II. Notices of Opposition were filed by

- (i) Opponent 01: BASF AG on 11 February 1998 (O-1) and
- (ii) Opponent 02: Imperial Chemical Industries (O-2) on
16 February 1998

in which revocation of the patent in its entirety was requested on the grounds of lack of novelty within the meaning of Article 54 (1) and (2) EPC and inventive step within the meaning of Article 56 EPC.

The objections were supported by eight documents, two of which played a role in the present appeal proceedings:

D1: US-A-4 374 210 and

D2: EP-A-0 314 347.

III. By decision announced orally on 12 March 1999 and issued in writing on 15 April 1999, the Opposition Division rejected the oppositions.

- (i) In the decision, novelty was acknowledged, because none of the documents relied upon by the Opponents to support their novelty objections and representing state of the art in the sense of Article 54 EPC disclosed the specific composition defined in Claim 1 in suit.
- (ii) For the assessment of inventive step, the Opposition Division held D1 to represent the closest state of the art and defined the technical problem underlying the invention as to provide a method for preparing microcellular polyurethane polymers which permitted the use of water as a

blowing agent whilst providing for polymers having desirable processing and physical properties.

The Opposition Division accepted that the examples of the patent in suit demonstrated that this technical problem had been solved.

According to the decision, there was no hint in D1 which would lead the skilled person to modify the features of this document in order to arrive at the process as claimed in Claim 1. Nor could any of the remaining documents, in combination with D1, lead to the subject-matter of Claim 1. In particular, D2 taught to use a ratio of low to high molecular weight (**MW**) polyols which was the reverse of that indicated in Claim 1 of the patent in suit. This conclusion held true for Claims 2 to 8, appendant to Claim 1, and for product Claims 9 and 10, as well.

IV. On 2 June 1999, a Notice of Appeal was lodged by Opponent 01 (Appellant) against this decision with simultaneous payment of the prescribed fee.

In the Statement of Grounds of Appeal, received on 31 July 1999, the Appellant requested that the decision be set aside and the patent be revoked in its entirety for lack of inventive step.

In substance, it referred to D1 and D2 both of which were deemed to represent equally the closest state of the art.

Examples 20 and 21 of D2 disclosed the preparation of microcellular polyurethanes having a density within the claimed range by means of similar amounts of water as a

blowing agent. Having regard to the similar Shore A hardness values of the products in the examples of the patent in suit and of D2, the difference between the process of D2 and the one according to the patent in suit could not be based on the different ratios between the low and high MW polyols (a) and (b) in the preparation of the polyisocyanate prepolymer composition.

D1 included the preferred use of (a) and (b) in combination with each other in the preparation of the prepolymer as demonstrated by the preferred combination of a high MW polyol (b) with a minor amount of a low MW glycol (a). Although the document did not disclose specific amounts of water to prepare microcellular products, this could be determined by a skilled person in routine tests, or directly from D2. D1 offered much more information than was accepted by the Opposition Division. Thus, the features deemed in the decision to be missing in D1 could be derived by a skilled person from its description or from obvious routine tests. Moreover, all information missing in D1 could also be obtained from D2 to arrive directly at the teaching of the patent in suit, including a direct reference to a mixture of low and high MW isocyanate-reactive compounds.

The Appellant concluded that each of D1 or D2 by themselves or in combination with each other led directly to the teaching of the patent in suit, irrespective from which of the documents the skilled person had started. Therefore, the subject-matter claimed lacked an inventive step.

V. In their counterstatement, dated 27 March 2000, the

Respondents (Proprietors) supported the decision under appeal and disputed all aspects in the Statement of Grounds of Appeal and requested that the appeal be dismissed.

In substance, it was emphasised *inter alia* that a skilled person could not arrive at the method claimed without making an inventive effort and without taking an inadmissible hindsight approach based on the knowledge of the patent in suit.

In particular, D2 considered a ratio of low to high MW polyols above 6 as being essential which was the reverse of the ratio (0.01:1 to 0.25:1) required by the invention. Furthermore, D1 and D2 taught the use of totally different starting materials and procedures, a fact which did not enable a skilled person to combine these documents in a meaningful manner.

The products of D2 differed fundamentally from those according to the invention by both composition and properties. Moreover, as it was common knowledge that softer materials showed longer demould times and a high abrasive wear, it would not have been obvious to simply replace the polyol component, because it was to be expected that this would adversely affect numerous other factors. Contrary to these expectations, the particular process according to the patent in suit led to highly flexible elastomers providing high load bearing capacity combined with good abrasive wear resistance and short demoulding times.

Similarly to Example E on page 11 of the patent in suit, hard segment prepolymers were used in Examples 20 and 21 of D2, which were then further processed by

means of fluorocarbon R-11 as the main blowing agent. If R-11 was replaced by water, the product properties deteriorated, especially the demoulding time increased (Example F in the patent in suit).

According to the Respondents, an essential property of polyurethane elastomers, e.g. for use as shoe-soles, was flexural fatigue performance, and the products prepared according to the patent in suit were improved in this respect to a surprising degree in comparison to the products according to D2.

VI. On 14 November 2000, the Assignment of the opposition, communicated to the EPO by letter dated 27 October 1999, from ICI (O-2; the party as of right in this appeal) to Huntsman ICI Chemicals LLC was recorded by the EPO as taking effect from 28 October 1999. Furthermore, the change of name of the latter to Huntsman International LLC, which had been communicated to the EPO by letter dated 7 February 2001, was notified by the EPO as having been entered on 10 March 2001.

VII. Oral proceedings were held on 31 January 2002. As announced by letter dated 27 December 2001, the party as of right did not attend these proceedings.

(i) Both attending parties maintained their positions as presented in their written submissions and reiterated their respective arguments in more detail. The initial novelty objection was not maintained by the Appellant.

In the course of the oral proceedings, the Respondents submitted an auxiliary request wherein

the blowing agent was further specified in each Claim 1 of both sets of claims. Moreover, they filed two sheets of experimental data further to support their case. The Appellant objected to both submissions due to their late filing and stated that it was not in a position to comment thereon in substance.

(ii) The Appellant emphasised its position as follows:

1. Examples 20 and 21 of D2 proved that water in an amount as defined in Claim 1 of the patent in suit had already been used in the preparation of microcellular polyurethane products such as shoe-soles. As demonstrated by (comparative) Example E, which corresponded to this closest state of the art, in comparison to Examples 11 and 12 in the same table of the patent in suit, all the mechanical properties according to that prior art were comparable with or even better than those achieved in accordance with the claimed process except for the hardness of the product.

Apart from the requirement that water was used as a blowing agent in the amounts defined in Claim 1, the claims were completely open to the use of any other blowing agents in any amounts. Therefore, any arguments referring to the use of water as the predominant blowing agent were meaningless. The same argument would be true for chain-extenders.

It followed that the technical problem to be overcome by the claimed subject-matter could only be seen in providing a softer product or to provide an alternative process for the preparation of microcellular polyurethane products. Further advantages had not been demonstrated in the patent in suit and could therefore not be taken into consideration in the assessment of an alleged inventive step.

2. In D2 the weight ratio of the low and high MW polyether polyols was described to be above 6, which was the only difference between D2 and the claimed subject-matter. However, this fact could not be considered to be an obstacle which would have prevented the skilled person from considering lower ratios in preparing softer products in order to solve technical problems other than the particular problem addressed in D2 of avoiding high viscosities of the prepolymer.
3. Thus, with respect to the technical problem of product hardness, the skilled person was well aware that other weight ratios of short- and long-chain polyols could be used. This was evident from D1, which gave a clear teaching to deviate from such a high ratio whenever a soft product was to be obtained.

(iii) The Respondents disputed these arguments essentially as follows:

1. The arguments of the Appellant were based on a piecemeal hindsight consideration of

individual features of the claimed process, of different properties of the products obtainable therein and - in the knowledge of the patent in suit - of the teaching in D2. The claimed process was, however, a specific unobvious combination of features each of which was, admittedly, *per se* known in the art. It was denied that the claimed process differed from D2 only in that a softer product was to be made, because it was well known in the art to be impossible to modify one certain property, such as hardness, separately whilst retaining all other properties unchanged. Thus, in general, softer products showed poorer abrasive wear resistance. Moreover, the use of water as a blowing agent normally resulted in inferior physical properties of the product (patent in suit: page 2, lines 37/38). The technical problem was therefore to allow the use of water as a blowing agent (or according to the auxiliary request as the predominant blowing agent) and, at the same time, to obtain a product still having desirable processing and physical properties.

2. Although Example E could be accepted to represent, in principle, the closest state of the art according to D2, it could not be directly compared to the other examples in Table 3 of the patent in suit (comparative Examples F, and Examples 11 and 12). These examples differed in more aspects than would be acceptable for valid comparative tests in accordance with established jurisprudence.

Comparative Examples E and F were to demonstrate the general, well-known trend that the use of water resulted in products having impaired properties, in particular with respect to brittleness and demoulding time.

3. Moreover, on the effective date of the patent in suit, the skilled person knew only D1 and D2, but not the comparative examples in the patent specification, and D2 as such did not provide any incentive to go directly against its unambiguous teaching and to deviate from the ratio of low and high MW polyols of above 6 in the manufacture of isocyanate-terminated prepolymers. The document rather offered other conceivable options for modifications in order to achieve a soft-segmented less hard polyurethane. Thus, instead of modifying the hard prepolymer, this prepolymer could be reacted with long-chain polyols in order to incorporate soft segments in the polyurethane.

4. D1 referred to polyurethanes in general. None of its examples described the use of blowing agents or microcellular products. All the individually disclosed products had a density above the range in Claim 1 of the patent in suit. Only in column 9, was a general reference made to the preparation of microcellular or cellular polyurethanes by means of any blowing agents including water. Nothing was said there, however, about the

properties of microcellular products. The document dealt with a completely different problem, that of increasing the output in reaction injection moulding (**RIM**). The processing features disclosed in D1 resulted in hard products (such as car bumpers), they could not directly be transferred to the preparation of microcellular products.

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

The Respondents requested that the appeal be dismissed and that the patent be maintained as granted or, alternatively, on the basis of the auxiliary request filed during the oral proceedings.

The Party as of right did not make a substantive request.

Reasons for the Decision

1. The appeal is admissible.
2. *Procedural matters*
 - 2.1 The auxiliary request submitted by the Respondents during the oral proceedings involved the introduction in both Claims 1 of sets "A" and "B" of the feature "and provides for at least 50 mole percent of the entirety of the blowing requirement" (page 12, line 55 and page 14, line 10 of the patent specification, after

"polyol and optional chain-extending agent, "). This request was admitted to be discussed in the oral proceedings in view of the fact that the amendment involved the introduction of a feature which was simple in itself, restricted the scope of the claim and had indeed been present in Claim 1 of the application as originally filed. Hence, the Board considered that the extent of justifiable surprise to the Appellant at its introduction must be rather limited.

2.2 The same could not be said of the additional experimental data filed in the course of the oral proceedings, which the Appellant had not seen before, let alone been given an opportunity to react to. Since, furthermore, the Respondents admitted, at the oral proceedings, that these data had already been available at the time its submission dated 27 March 2000 was under preparation, without having been filed with the submission, it was evident that there was no justification for their being filed only at the oral proceedings. Consequently, these data were excluded from consideration under Article 114(2) EPC.

2.3 The following considerations concern the main request of the Respondents unless otherwise stated. This corresponds to the text of the patent in suit as granted.

3. *Novelty*

Novelty was no longer disputed by the Appellant. The Board does not see any reason either to deviate from the finding of the Opposition Division as regards novelty in the decision under appeal.

4. *Problem and Solution*

4.1 The patent in suit concerns a process for preparing a microcellular polyurethane elastomer containing soft segments and its product.

4.2 Document D2, which the Board considers to represent the closest state of the art, relates to polyisocyanate prepolymer compositions and their use in the preparation of polyurethane or polyurea-polyurethane or polyurea articles, in particular integral skin foams, flexible foams, RIM elastomers and microcellular elastomers, having good physical properties associated with short demoulding times. At the same time, high viscosities of the prepolymers are to be avoided in order to overcome serious processibility problems in practice, in particular in RIM (page 2, lines 1 to 5 and 13 to 35, in particular 26/27 and 34/35).

4.2.1 In order to overcome these problems, the prepolymers are prepared from organic polyisocyanates reacted with low and high MW isocyanate-reactive compounds in a weight ratio of above 6:1 (Claim 1, last line).

4.2.2 The high MW polyfunctional isocyanate-reactive compounds have a MW of about 1 000 to 10 000 and include polyols, polyamines, imino-functional compounds, enamine-containing compounds and mixtures thereof. The low MW isocyanate-reactive compounds have a MW of about 60 to 1 000 and can be selected from hydroxy compounds, amino compounds, hydroxyamino compounds, imino-functional and/or enamine-containing compounds and mixtures thereof (page 3, lines 13 to 17; page 5, lines 18 to 25). A variety of possible examples for each group of these isocyanate-reactive compounds

is described in the document (page 3, line 18 to page 5, line 17; page 5, lines 27 to 55).

- 4.2.3 The final products of D2 are prepared by reacting this prepolymer composition (A) with an isocyanate-reactive component (B) comprising (i) at least one high MW isocyanate-reactive compound, (ii) at least one low MW isocyanate-reactive compound, and two optional components: (iii) at least one blowing agent and (iv) other additives. The constituents of component (B) are further specified to include e.g. soft-block components such as polyols, polyamines, imino-functional compounds, enamine-containing compounds and mixtures thereof having molecular weights of at least 1 000; and chain-extenders including compounds of the same classes and having molecular weights of below 1 000 (page 6, lines 28 to 42).
- 4.2.4 When foam-forming conditions are desired, the suitable blowing agents used include gases which are dissolved or dispersed in the mixture such as air, carbon dioxide or nitrogen, or inert liquids having boiling points not exceeding 100°C, such as hydrocarbons as well as chlorinated and/or fluorinated hydrocarbons. The foam-forming gas may also be generated by including water in the reaction mixture (page 7, lines 20 to 33).
- 4.2.5 In the relevant Examples 20 and 21, polyurethane microcellular shoe-sole elastomers are prepared from polyisocyanate prepolymers which have been obtained according to Example 8. According to the latter, the

prepolymers, in each case, fulfil the requirement of Claim 1 under consideration of at least 70 % of 4,4'-MDI (methylenedi(phenylisocyanate)), based on the total isocyanate.

In the following step, ie the manufacture of the elastomer, this prepolymer is then reacted with an 8.4:1 (weight : weight) mixture of an ethylene oxide tipped polyoxypropylene polyol based on glycerol and diethylene glycol, having an OH number of 38, and 1,4-butanediol in the presence of a combination of trichlorofluoromethane and water being used in amounts of 6.33 and 0.18 parts by weight, respectively, as blowing agents. This corresponds to a water amount of 0.19 in terms of weight percent as defined in Claim 1 under consideration.

4.2.6 However, the isocyanate prepolymers used in Examples 20 and 21, respectively, differ from the prepolymers defined in Claim 1 under consideration in that they are prepared by reacting the above polyisocyanate with a mixture of dipropylene glycol and a glycerol based polypropylene oxide polyether polyol having an OH-number of 32 in a weight ratio of 8:1 as opposed to a weight ratio of from 0.01:1 to 0.25:1 as required by Claim 1.

4.2.7 In Table 5 of D2, the microcellular shoe-soles of these examples are characterised by their specific gravity, Shore A-hardness, tensile strength, elongation at break and flex life.

The values of the properties listed in this table cannot all be directly compared with the relevant data in the tables of the patent in suit. In particular, the

flex life is given in D2 in terms of % cut/50 000 cycles as opposed to the flexural resistance in the patent in suit in terms of mm crack growth/30 000 or 100 000 cycles at 20 °C. Furthermore, abrasion loss values are not mentioned in Table 5 of D2 at all.

4.3 During the oral proceedings, the Appellant argued, however, that in view of the strong similarity in the prepolymers and the blowing agent, used in Examples 20 and 21 of D2 and in comparative Example E of the patent in suit, the data given in relation to flexibility and abrasion loss in comparative Example E should be considered as representing the closest state of the art and compared with the results of Examples 11 and 12 in Table 3 of the patent in suit.

4.3.1 Whilst a closer examination shows that the prepolymer composition according to comparative Example E is reacted with a co-reactant composition which is not comparable in all respects with the polyol composition used in Examples 11 and 12 which are according to the claimed subject-matter, these differences do not correspond to limiting features in Claim 1 of the patent in suit.

4.3.2 In view of these facts and arguments, the results obtained according to comparative Example E in the patent in suit, which is further away from the claimed subject-matter than Examples 20 and 21 of D2, the prepolymers of which contained soft segments, though in lower amounts than the range as defined in the patent in suit, have been considered by the Board in a "worst case scenario" for the Respondents as being at least indicative of what might have been obtained if the

relevant parameters of the products according to Examples 20 and 21 of D2 had in fact been measured.

It is clear from Table 3 of the patent in suit that the shoe-sole products of comparative Example E are inferior as regards hardness to those according to the patent in suit, as was indeed admitted by the Appellant during the proceedings.

4.4 In the light of these data also, the technical problem objectively arising was therefore that stated in the patent in suit, namely to define a process for preparing microcellular polyurethane elastomers which permits the use of water as a blowing agent (auxiliary request: predominant blowing agent) whilst still providing for polymers having a desirable combination of processing and physical properties including abrasion resistance (page 2, lines 37 to 42; page 3, lines 36 to 38).

4.5 The solution of this problem proposed by Claim 1 of the patent in suit was to alter the ratio of low to high MW polyol components in the preparation of the prepolymer from above 6:1 to be in the range of from 0.01:1 to 0.25:1.

It can be seen from the relevant data of the examples and comparative examples provided in Tables 1 to 3 of the patent in suit that the desired properties of the products are achieved with use of water even as the sole blowing agent.

Consequently, it is credible to the Board that the claimed measure is effective to solve the above technical problem.

5. *Inventive step*

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

5.1 As admitted by the Appellant, the above comparative Example E in Table 3 of the patent in suit is further remote from the claimed subject-matter than the said Examples 20 and 21 in D2 due to the absence of any high MW polyol in the preparation of the prepolymer. There is, however, no basis available for assuming that the relevant parameters of the products according to the said Examples 20 and 21, if they had been measured, would have been any closer to those of Examples 11 and 12 according to the patent in suit. The onus of proof was on the Appellant to do this, which it has not discharged.

5.1.1 The argument of the Appellant that all the skilled person had to do when starting from D2 and wishing to solve the stated technical problem was to include soft segments in the prepolymer is not convincing, since (i) there is no basis for assuming that by changing this one variable the balance of a complex spectrum of relevant physical properties would remain unaffected, and (ii) D2 teaches specifically against taking this particular measure.

5.1.2 In particular, the skilled person could not expect that, by going against the specific, central teaching of D2 and providing a major, instead of a minor proportion of soft segments in the prepolymer, the deterioration in the abrasion wear resistance which would normally be associated with such a measure would

in fact give way to a highly favourable balance of relevant physical properties, especially low abrasion loss with high flexibility, which could be maintained even when water was the predominant blowing agent.

5.1.3 On the contrary, it is only with the benefit of hindsight, in the Board's view, that the taking of the measure forming the distinguishing feature of the claimed subject-matter over the disclosure of D2 (section 4.2.6, above) becomes associated with the successful solution of the relevant technical problem.

5.1.4 This is particularly evident, since the skilled person was faced with the situation that the document offers other possibilities to modify its prepolymer and the final polyurethane product within the ambit of its central teaching, e.g. with respect to the softness if so desired, by making specific choices with respect to

- the polyisocyanates (page 2, line 47 to page 3, line 12), the high MW isocyanate-reactive compounds (page 3, line 13 to page 5, line 15), the low MW isocyanate-reactive compounds (page 5, lines 18 to 55), the functionalities of the starting compounds (Claim 1; page 2, line 42; page 3, line 15; page 5, line 20) in the preparation of the NCO-terminated prepolymer;
- the possible isocyanate-reactive components to be reacted with the above NCO-terminated prepolymer (page 6, lines 38 to 42).

5.1.5 For these reasons, the Board has come to the conclusion that D2 by itself does not provide an incentive to modify its teaching in such a way to arrive at

something within the wording of Claim 1 of the patent in suit in order to solve the above technical problem.

5.2 It remains to be decided whether D1 would have provided any incentive to do so.

5.2.1 Document D1 aims at a process for the production of polyurea-polyurethane mouldings. This process allows to feed two streams in a wide range of proportions including close to equal proportions to the high pressure mixing heads used in RIM processing in order to achieve the maximum output per unit of time from the RIM head. The first stream comprises an isocyanate-terminated prepolymer, the other is a blend of the polyol and the diamine plus the catalyst and any other conventional additives normally employed in making compositions of the type in question (column 3, lines 44 to 60). At the same time, this procedure results in an increased gel time of the reaction mixes and permits a greater degree of latitude to the operator than was available due to the extremely short reaction times which characterised the hitherto known one-shot procedure. It is thus evident that D1 aims to overcome various limitations of previous RIM processes (column 2, lines 8 to 41).

5.2.2 The products are characterised by structural strength properties such as impact strength, tensile strength, hardness, heat resistance, modulus, and tear strength, and find a wide range of utility, particularly in the moulding of auto parts (column 10, lines 4 to 13). However, the document is completely silent about flexural and abrasion resistance.

5.2.3 It follows, that D1 deals with a technical problem

essentially different from the technical problems considered in D2 and in the patent in suit (sections 4.2, 4.2.1 and 4.4, *supra*). Therefore, the skilled person did not have any reason to contemplate a combination of the two documents in order to overcome the relevant technical problem.

5.2.4 Furthermore, in this document, neither the influence of water when used as a blowing agent as opposed to the other types of blowing agents nor the importance of selecting a specific combination of constituents of the isocyanate prepolymer, ie the low molecular weight polyol and the polyoxyalkylene polyol in a particular weight ratio, have been referred to with respect to the properties of the polyurethane products (column 9, line 56 to column 10, line 3; column 3, lines 2 to 8 and column 4, lines 23 to 27). Thus, even if the skilled person were, for some reason, to consider the disclosure of D1 in this connection, it contains no hint to the combination of a water containing blowing agent with the measure forming the solution of the technical problem (section 4.5, above).

6. It follows that the process of Claim 1 would not be obvious to a person skilled in the art in view of the documents relied upon by the Appellant, whether considered in isolation or in combination. Consequently, the subject-matter of Claim 1 involves an inventive step.

7. By the same token, the subject-matter of Claims 2 to 8, which relate to preferred embodiments of the process of Claim 1, also involves an inventive step.

8. The above reasons and conclusions apply equally to the

microcellular polymer according to Claim 9 of "set A" and the two component system as claimed in Claim 10 of "set A" and Claim 9 of "set B", since these claims are subject to all the limitations of the composition of the prepolymer defined in Claim 1.

9. Since the main request of the Respondents is allowable, there is no need for the Board further to consider the auxiliary request of the Respondents.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young