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D E C I S I O N
of 22 April 1996

Case Number: T 0881/92 - 3.3.3

Application Number: 88110370.9

Publication Number: 0298359

IPC: C08G 18/50

Language of the proceedings: EN

Title of invention:

Elastomers prepared from n-(Polyoxyalkyl)-n-(alkyl)amines

Applicant:

UNION CARBIDE CORPORATION

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (affirmed)"

"Choice of closest state of the art - definition of technical problem"

Decisions cited:

T 0119/82; T 0150/82; T 0026/85; T 0242/85; T 0246/91
T 0495/91

Catchword:

-



Case Number: T 0821/92 - 3.3.3

DECISION
of the Technical Board of Appeal 3.3.3
of 22 April 1996

Appellant: UNION CARBIDE CORPORATION
39 Old Ridgebury Road
Danbury
Connecticut 06817 (US)

Representative: Wuesthoff, Franz, Dr.-Ing.
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Decision under appeal: Decision of the Examining Division of the European Patent Office dated 13 May 1992 refusing European patent application No. 88 110 370.9 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: R. Young
J. A. Stephens-Ofner

Summary of Facts and Submissions

I. European application No. 82 110 370.9, relating to "Elastomers prepared from n-(Polyoxyalkyl)-n-(alkyl)amines", filed on 29 June 1988 and published under No. 0 298 359 was refused by a decision of the Examining Division dated 13 May 1992, for lack of inventive step having regard to the disclosures of the documents:

- D1: US-A-3 352 439 (correctly numbered: US-A-3 359 243);
- D2: US-A-4 448 904;
- D3: EP-A-81 701; and
- D4: WO-A-86/05795.

II. According to the decision, D4 was considered to be the closest state of the art and disclosed a process for the manufacture of polyurea elastomers using secondary amine terminated polyethers having a level of amination up to 100%. The experimental data which had been submitted were based, however, on a comparison with primary amine terminated polyethers (rather than secondary amine terminated polyethers) and could not therefore be considered to have been made with the closest state of the art.

Whilst it was correct that D4 related to a prepolymer process, the use, according to the application in suit, of a one-shot process for the manufacture of polyurea elastomers belonged to the general knowledge of the skilled person and furthermore D1, D2 and D3 disclosed the manufacture of polyurea elastomers by reacting secondary amine terminated polyethers with a polyisocyanate in the presence of a chain extender.

The essential difference between the process of D4 and that of the application in suit was therefore the selection of specific secondary amino terminated polyethers from those known in D4. Since, however, this had not been demonstrated to lead to unexpected properties in the elastomers obtained, the selection was arbitrary and an inventive step consequently could not be acknowledged.

III. On 13 July 1992, a Notice of Appeal against the above decision was filed, the prescribed fee being paid on the same day.

In the Statement of Grounds of Appeal filed on 11 September 1992, the Appellant argued essentially as follows:

- (a) The process of D4 was a prepolymer process which differed substantially from the one-shot process with which the application in suit was concerned. In particular, the one-shot process concerned the direct way to the product, whereas with the prepolymer process an intermediate was first obtained.
- (b) The only effect associated with the use of secondary amine-terminated polyethers in D4 was that more stable prepolymers could be formed. It was thus the intermediate which permitted greater flexibility in processing. This product, namely the prepolymer, was not, however, the elastomer obtained according to the application in suit.

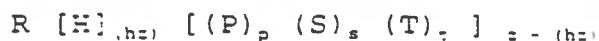
Thus D4 dealt with the problems accompanying the preparation of elastomers by a totally different approach. There was no basis in law for comparing the process of D4 with the claimed one.

- (c) Even if the skilled person had been well aware of the two types of process, it was not obvious to transfer a teaching concerning a one-shot process without incentive to a prepolymer process.
- (d) Although D1, D2 and D3 might disclose the use of secondary amine terminated polyethers for use in a one-shot process, these were not the same as those amine terminated polyethers defined in Claim 1 of the application in suit.
- (e) Whilst both processes might yield comparable products, the objects underlying the two processes could not be equated.

IV. A communication was issued on 10 October 1995, setting out the result of an interview held between the Representative of the Appellant and the Rapporteur of the Board on 5 October 1995, in which a number of preliminary issues concerning the wording of the claims had been discussed.

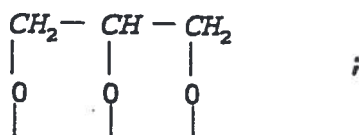
V. On 22 November 1995, the Appellant filed a revised set of Claims 1 to 5 to be considered as sole request. This was followed, on 6 December 1995 and 11 December 1995, by further revised sets of Claims 1 to 5 in replacement thereof. Claim 1 of the final set reads as follows:

"A process for the preparation of polyurea and/or polyurethane-urea elastomers, by:
 reacting a N-(polyoxyalkyl)-N-(alkyl)amine with an isocyanate in the presence of a chain extender wherein the
 N-(polyoxyalkyl)-N-(alkyl)amine is of the formula:

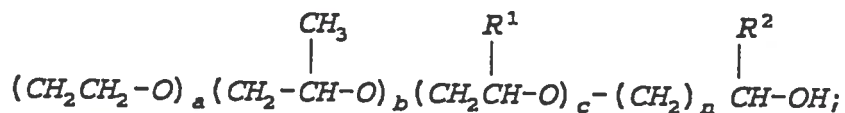


wherein:

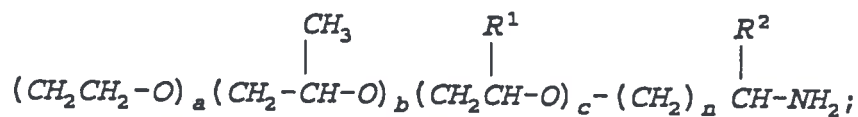
R is an initiator radical based on a compound containing Zerewitinoff active hydrogen atoms, preferably having from 2 to 5 carbon atoms, especially



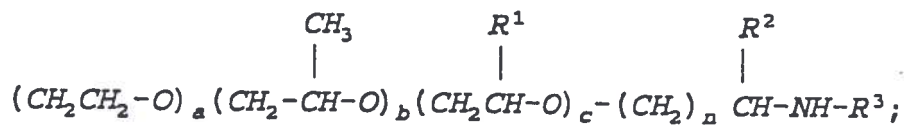
H is the group represented by the formula:



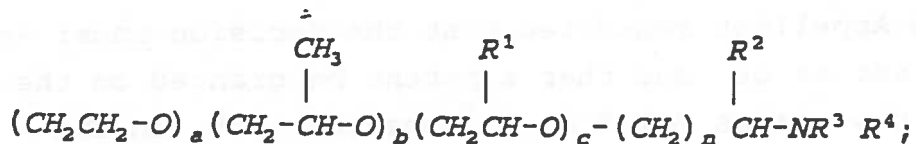
P is the group represented by the formula:



S is the group represented by the formula:



T is the group represented by the formula:



R¹ is an alkyl group containing from 2 to 18 carbon atoms, preferably 2 carbon atoms;

R² is hydrogen or an alkyl group containing up to 18 carbon atoms;

R³ and R⁴ are independently an alkyl group containing from 2 to 12 carbon atoms, preferably 2 to 6 carbon atoms, and

a is 0 to 175;

b is 20 to 175;

c is 0 to 30;

n is 1 to 3;

h is from 0 to 0.7;

p is from 0 to 0.5;

s is from 0.5 to 1;

t is from 0 to 0.15; the sum of p, s and t must equal 1.0;

z is 2 to 6, with the proviso that when z is 2 and a is 0 then b must be greater than 22."

Dependent Claims 2 to 4 relate to elaborations of the process according to Claim 1, and Claim 5 reads as follows:

"A reaction injection molding elastomer produced in accordance with the process of claims 1 to 4."

- VI. The Appellant requested that the decision under appeal be set aside, and that a patent be granted on the basis of the claims filed on 11 December 1995. In the alternative, he requests oral proceedings.

Reasons for the Decision

1. The appeal is admissible.
2. The text of the patent application forming the subject of the appeal consists of Claims 1 to 5 filed on 11 December 1995 and the description as originally filed.

Claim 1 differs from the original version by a narrower definition of the parameter b, which is now restricted to a preferred range, as well as an explicit statement that the sum of p, s and t must add up to 1.0. These amendments are supported by the description on page 4, line 56 and page 5, lines 34 of the application as published (page 8, line 8 from the foot of the page, and page 10, lines 7 and 8 from the foot of the page of the description as originally filed, respectively). Claims 3 and 4 have been amended to remove an inconsistency with Claim 1. Claim 5 has been amended to remove the reference to a cast elastomer. The remaining Claim 2 is unchanged compared with the version as originally filed.

Consequently, there are no objections under Article 123(2) EPC to the amended claims.

A. Process Claims 1 to 4

3. The application in suit is concerned, in its process aspect, with the preparation of polyurea and/or polyurethane-urea elastomers, by reacting (a) an amine terminated polyether with (b) an organic isocyanate in the presence (c) of a chain extender (Claim 1). This type of process is sometimes termed a "one-shot" process, because the polymer product is formed spontaneously on admixture of the components (a) to (c).

According to the application in suit, such amine terminated polyethers, which were known to the prior art, for instance in the document D4A: US-A-3 654 370, were primary amine terminated polyethers. A high molecular weight material of this class, having a molecular weight of about 5 000 and made by amination of a propylene oxide based triol with ammonia had become commercially available and used in reaction injection molding (RIM) elastomers for automotive body panels. A major limitation had been its very high reactivity, however, which limited the shot size and therefore the size of the resulting part. There was therefore a need for a more processable polyurea RIM system (page 2, lines 27 to 42).

Thus, the rapidity of the reaction in RIM, which is a one-shot reaction, is the basis of the technical problem acknowledged in the application in suit.

4. A key issue to be decided in this appeal is whether the decision under appeal was correct in holding that D4 was the closest state of the art, and in particular whether it represented a closer state of the art than that already acknowledged in the application, involving the use of primary amine terminated polyethers in a one-shot process (section 3., above).

4.1 The Boards of Appeal have held on more than one occasion that an objective definition of the technical problem to be solved should normally start from the technical problem actually described by the Applicant. Only if it turns out that an incorrect state of the art was used to define the technical problem or that the technical problem disclosed has in fact not been solved, can an inquiry be made as to which other technical problem objectively existed (see T 0246/91 of 14 September 1993, No. 4.4 of the Reasons for the Decision, and T 0495/91 of 20 July 1993, No. 4.2 of the Reasons for the decision, neither published in the OJ EPO).

Whilst both of these decisions concern granted patents, their legal principles are clearly not limited to post-grant proceedings.

4.2 Consequently, the questions which need to be addressed in this appeal are (a) whether the technical problem described in the application is solved and (b) whether this was the correct problem to consider. The latter question boils down to whether D4 represents a closer piece of the state of the art than that already acknowledged in the application in suit.

4.3 (a) Compared with the state of the art acknowledged in the application in suit, the technical problem objectively arising is to provide improved process control in the preparation of polyurea elastomers using a one-shot technique.

The solution proposed according to Claim 1 of the application in suit is to replace the primary amine terminated polyoxyalkylene ethers by the defined N-(polyoxyalkyl)-N-(alkyl)amines, which are characterised by at least 50% of the terminal amine groups being secondary amine groups ("s" in the general formula is at least 0.5).

It can be seen from the experimental data in the application in suit, especially the comparison between polymer #1 and Comparative Polymer A (page 10, Table 1), that the moulding, in a conventional RIM machine, of an N-(polyoxyalkyl)-N-(alkyl)amine having 50% primary and 50% secondary amine termination as defined in Example 1 provided a plaque having a higher degree of mixing (no striations) and improved flow characteristics in the mould as shown by the absence of stretch marks, as compared with a corresponding plaque produced using commercially available amine species with 100% primary amine termination (a mixture of Jeffamine™ T-5000 and diethyltoluene diamine, hereinafter DETDA, in a weight ratio of 100:44; page 8, lines 24 to 26 and page 10, lines 1 to 12). The product made using polymer #1 also showed, after post-curing, a lower variation of shear modulus with temperature, thus indicating a better high temperature performance (continuation of Table 1 on page 11) compared with the conventional product.

Thus, the stated object of providing amines with a reactivity which is slow enough to allow for a well controlled reaction, yet fast enough to be commercially acceptable is evidently fulfilled (page 3, lines 22 to 31).

These results are corroborated by the comparative test report contained in the Affidavit of R. M. Gerkin, filed on 10 May 1991 with the submission dated 8 May 1991, in

which a secondary amine terminated polyether (containing 82% secondary amine, and corresponding to Example 5 of the application in suit) reacted slowly enough that the mould cavity was fully filled and produced a high quality product, whereas the corresponding species with essentially 100% primary amine termination (Jeffamine™ T-5000) reacted so quickly that it gelled and failed completely to fill the mould cavity and thus resulted in a product which was poorly mixed.

Thus, it is credible that the proposed measures provide an effective solution of the technical problem identified and presented in the application in suit.

- 4.4 Since condition (a) in section 4.2, above, is evidently fulfilled, it only remains to investigate condition (b), i.e. to assess whether D4 represents a closer state of the art than the one acknowledged in the application.
- 4.5 According to D4, which relates to a process for preparing polyurea and/or polyurea-polyurethane polymers, particularly non-cellular or microcellular elastomeric and structural polyureas, an amine functional compound having an equivalent weight of at least 400 is reacted with an excess of a polyisocyanate to form an isocyanate-terminated prepolymer or quasi-prepolymer which has an isocyanate content of from 3 to 12 percent by weight. This prepolymer is then reacted with an isocyanate reactive material to form a polyurea and/or polyurethane polymer (page 1, opening paragraph, and Claim 1).
- 4.5.1 Preferred amine functional compounds are primary or secondary amine-terminated polyethers containing an average of from 1 to 4 amine groups per molecule (page 6, lines 27 to 31). The production of secondary amine-terminated polyethers is stated to be described in

particular in US-A-4 152 353 and US-A-4 153 581 (page 7, lines 14 to 20). According to the latter documents (hereinafter D4C and D4D, respectively), an alcohol, aldehyde or ketone or mixture thereof, for example polypropylene glycol, is contacted, in the presence of a catalyst composition, for instance of Ni, Cu and Fe (D4C) or Co, Cu and Fe (D4D), with an aminating agent, which may be ammonia, or a primary or secondary amine, to obtain primary, secondary or tertiary amines respectively, the use of ammonia being exemplified.

4.5.2 Further according to D4, due to the great reactivity of the amine functional compound, it tends to form polymers of significant molecular weight upon contact with the polyisocyanate, which broadens the molecular weight distribution and affects the properties of the polymer. The reaction, which is usually almost instantaneous, is conducted until substantially all the amine groups have reacted with the polyisocyanate (page 10, lines 7 to 16; page 11, lines 14 to 19).

4.5.3 Stability of the resulting prepolymer is generally favoured by the use of less reactive polyisocyanates and less than quantitatively aminated amine functional compounds. Secondary amine-terminated amine functional compounds form more stable prepolymers than do primary amine terminated materials (page 12, lines 1 to 18).

Highly reactive isocyanates typically form stable prepolymers with primary amine terminated compounds having a degree of amination of 25 to 85%, and with secondary amine terminated materials having a degree of amination of 25 to 100% (page 13, lines 13 to 21).

- 4.5.4 The polymer produced may exhibit a glass transition temperature which is 5 to 20°C lower than that exhibited by a similar polymer prepared according to a one-shot process, and the heat distortion temperature, measured according to a heat sag test is usually significantly higher than that of conventionally prepared urea-containing polymers of similar flexural modulus, so that the polymers are processable over a wider temperature range (page 4, line 29 to page 5, line 10).
- 4.5.5 According to Example 1, an aminated polyoxypropylene diol containing 50 percent primary amine groups, 37 percent methylamine (secondary amine) groups and 3 percent hydroxyl groups, prepared according to the process described in D4C is added to hexamethylene diisocyanate (HMDI) to yield a prepolymer having a -NCO content of 8.9 percent. This prepolymer has a gel time of 30 sec. when reacted with DETDA, the resulting elastomer having a glass transition temperature of -55°C, compared to an expected value of -40°C (pages 18, 19).
- 4.5.6 Hence, although secondary amine terminated polyethers having a degree of amination of up to 100% (page 13, lines 18 to 21; section 4.5.3, above) are referred to in D4, only those having a measure of secondary amine termination up to about 37% (Example 1) are explicitly disclosed in individualised form suitable for forming the basis of a practical comparison.
- 4.5.7 Furthermore, even the references to the methods of preparation of such secondary amine terminated polyethers in D4C and D4D, referred to in D4, although mentioning both primary and secondary amine terminated polyethers, exemplify only the use of ammonia as aminating agent, which would result in essentially only primary amine terminated species being obtained.

4.5.8 Indeed, according to a submission of the Appellant, filed on 10 May 1991, attempts to apply the methods of D4C and D4D to obtain higher proportions of secondary amine terminated polyethers had not been successful in achieving more than the approximately 37% secondary amine groups reported in Example 1 of D4 (cf. submission, paragraph bridging pages 9 and 10).

The latter submission, which is of considerable significance to the outcome of the appeal, whilst not being supported by concrete experimental evidence, has nevertheless not been contested, or indeed even commented upon, in the decision under appeal, and is furthermore consistent with the complete absence, from the cited documents, of any individualised disclosure of an amine terminated polyether having a proportion of secondary amine termination substantially more than this level. Accordingly, the Board has no reason to doubt the accuracy of the submission.

4.5.9 In any case, these secondary amine terminated polyethers are not disclosed in D4 for direct use in the formation of a polyurea or polyurethane/urea elastomer product, but only for the formation of an isocyanate terminated prepolymer, in which all the active hydrogen atoms present in the amine groups have been consumed by reaction with isocyanate.

Thus, there is no disclosure in D4 of the relevant effect with which the application in suit is concerned, namely the speed of reaction, in direct (one-shot) polymer formation techniques such as RIM, of these active hydrogen atoms with isocyanate, which is the factor limiting process control (section 3, above).

On the contrary, an important aim of the prepolymer process according to D4 is to avoid problems arising in RIM processes (page 3, lines 3 to 15).

In other words, those amine terminated polyethers which, according to D4, have structural approximation to those defined in Claim 1 of the application in suit (i.e. those containing about 37% secondary amine groups), are not disclosed for a comparable use.

4.5.10 The finding in the decision under appeal, that one-shot processes belong to the general knowledge of the skilled person is beside the point, since there is no suggestion in D4 or elsewhere that the skilled person would understand the same technical considerations to apply to the prepolymer process, or even that the two processes were interchangeable in the sense of providing an identical product. On the contrary, it is stated in D4 that the products of a corresponding one-shot process differ in their characteristics of glass transition temperature and heat sag behaviour from those of the prepolymer process.

4.5.11 In this connection, the only amine chain extender which is described in D4 in an individualised form suitable for forming the basis of a comparison test with the claimed subject-matter is DETDA (Examples 1 to 5). This is, however, a primary amine which, furthermore, being aromatic, lies further from the claimed subject matter than the aliphatic primary amine polyethers belonging to the state of the art acknowledged in the application.

Consequently, D4 does not form a closer state of the art than that acknowledged in the application in suit itself.

- 4.6 To read D4 as disclosing the use of the secondary amine terminated polyethers as reactants directly in a one-shot process would represent a radical departure from, not to say a direct contradiction of, what is actually stated in D4.

To insist on using such a modification of the disclosure of D4 as a starting point in assessing patentability, as was done in the decision under appeal (Reasons, paragraph 2)c)), is, moreover, to impose an arbitrarily generated variant lying substantially closer to the claimed subject-matter than D4 as the basis for comparison.

Such a variant does not, however, belong to the state of the art within the meaning of Article 54 EPC, since it has not been made available to the public before the relevant filing date (T 0026/85, OJ EPO 1990, 022). Logically, therefore, it cannot constitute "the closest state of the art" in the sense the term is used in the application of the problem and solution approach.

Hence, the requirement for a comparison test of the kind demanded in the decision under appeal was not justified.

- 4.7 The further finding of the decision under appeal, that the essential difference from the process D4 was the selection of specific secondary amine terminated polyethers from those disclosed in D4 is inappropriate, because the level of secondary amine termination evidently achievable according to D4 is not high enough to embrace that characterising the solution of the stated problem (section 4.5.8, above).

Consequently, the secondary amine terminated polyethers used in the process according to the application in suit are not to be understood as a selection from those disclosed in D4.

4.8 In summary, the comparative test provided by the Appellant (section 4.3, above) constitutes, in the Board's view, a fair comparison with the closest state of the art, and the effect can properly be taken into account in the assessment of inventive step.

5. *Novelty*

The decision under appeal does not allege lack of novelty in respect of the process Claims 1 to 4. Nor does the Board see any ground for raising such an objection.

Consequently the subject-matter of Claims 1 to 4 is considered to be novel.

6. *Inventive step*

In view of the conclusions reached in section 4 etc., above, the question which has to be answered is whether the skilled person would have expected improved process control in a one-shot process for preparing polyurea elastomers to result from replacing the essentially 100% primary amine terminated polyethers in the one-shot reaction by such polyethers in which at least 50% of the terminal amine groups are secondary amine groups.

6.1 There is, of course, no suggestion to make such a replacement in the state of the art acknowledged in the application in suit. This applies in particular to the use of polyoxyalkylene amines produced according to the

process of D4A, in which the reductive amination of polyoxyalkylene alcohols is done using ammonia, and therefore results in the formation of primary amines (section 3, above).

- 6.2 As to the other documents cited, the relevant behaviour of both primary and secondary amine terminated polyethers as disclosed in D4 is covered by a single statement, according to which "Due to the great reactivity of the amine functional compound it tends to form polymers of significant molecular weight on contact with the polyisocyanate" (page 10, lines 7 to 10; section 4.5.2, above).

Consequently, the skilled person would have had no reason from the disclosure of D4 to expect that amines having a high proportion of secondary amine groups would provide a more controlled reaction and thus a solution of the stated problem.

- 6.3 The disclosures of the remaining documents D1, D2 and D3 cited, which have not been analysed in detail in the decision under appeal do not come closer. In particular, they do not recognise a distinction between the reactivity of primary and secondary amine groups with isocyanates in the context of a one-shot process.

Consequently, no hint to the solution of the technical problem is available from these documents either.

In summary, the subject-matter of Claim 1 does not arise in an obvious way starting from the state of the art acknowledged in the application.

- 6.4 Even if one had assumed D4 to be the closest state of the art, however, the result would not have been different, for the following reasons.

- 6.4.1 There is no pointer in D4 to the direct use in a one-shot reaction of the secondary amine terminated polyethers (sections 4.5.9, 6.2, above).
- 6.4.2 Nor is there any specific incentive to depart from the disclosure of D4 to increase the proportion of secondary amine termination beyond about 37% (section 4.5.8, above).

On the contrary, even if, in spite of the absence of any particular such incentive, the skilled person had nevertheless for some reason attempted to maximise the proportion of secondary amine termination using the teaching available from D4 and his general knowledge, he would not, according to the evidence of the Appellant have been able to achieve more than about 37% secondary amine groups.

- 6.4.3 The statement that secondary amine terminated polyethers generally form more stable prepolymers than do primary amine terminated polyethers (D4, page 12, lines 9 to 14) might have provided an incentive for the skilled person to use such a secondary amine terminated polyether in the general (prepolymer) process of D4, but not to modify the basic teaching of this citation. According to D4, use of the prepolymers would have resulted in a two-step process involving the use of a sterically hindered chain extender (Examples 1 to 5), which is evidently different from the solution of the stated problem.
- 6.4.4 Once again, the disclosures of D1, D2 and D3 are more remote.

Hence, the solution of the technical problem does not arise in an obvious way, even starting from D4 as the closest state of the art.

6.5 In summary, regardless of whether the starting point is the state of the art acknowledged in the application or the content of D4, the subject-matter of Claim 1, and, by the same token, that of Claims 2 to 4 does not arise in an obvious way. The subject-matter of these claims thus involves an inventive step.

B. Product Claim 5.

7. Claim 5 is a product-by-process claim. It is, therefore, according to the jurisprudence of the Boards of Appeal, to be interpreted as a claim to a polyurea elastomer per se, characterised only by the features conferred upon it by the process by which it was produced (T 0150/82, OJ EPO 84, 309; T 0248/85, OJ EPO 86, 261).

7.1. According to a still earlier decision, referred to in T 0150/82, cited above, the effect of a process manifests itself in the result, i.e. in the product in chemical cases, together with all its internal characteristics and the consequences of its history of origin, e.g. quality, yield and economic value (T 119/82, OJ EPO 84, 217).

In the present case, therefore, the subject-matter of Claim 5 is a polyurea elastomer product having all the internal characteristics conferred upon it by the RIM process which produced it, in particular its composition, and specifically that aspect of its composition attributable to the use of a higher proportion of secondary amine groups to primary amine groups in the starting material, and to the use of a one-shot process to produce it.

7.2 Once again, the question arises as to whether the acknowledged prior art or the document D4 forms the closest state of the art. Each will be considered in turn.

7.3 On the one hand, compared with the state of the art acknowledged in the application, the technical problem is to be seen in the provision of a polyurea elastomer product of improved quality.

The solution proposed according to Claim 5 of the application in suit is to provide the product by means of the process according to Claim 1.

Using the same comparisons referred to in section 4.3, above (better mixing and therefore higher quality), furthermore, it is credible to the Board that the problem is effectively solved by the claimed product.

7.4 The product is novel, because none of the cited documents teaches the preparation of a polyurea elastomer from amine polyethers having a proportion of secondary amine termination of at least 50%, this composition being reflected in the internal characteristics of the resulting product.

7.5 As to the question of inventive step, none of the documents D1, D2 or D3 discloses or suggests increasing the proportion of secondary amine termination for any purpose, let alone to obtain a polyurea product of improved quality.

7.6 In the disclosure of D4, in which the prepolymers may be prepared from secondary amine terminated polyethers already having a proportion of secondary amine termination around 37%, there is equally no suggestion that increasing this proportion of secondary amine to 50% or above would improve the quality of the products.

Consequently, the subject-matter of Claim 5 does not arise in an obvious way starting from the acknowledged state of the art.

7.7 On the other hand, no comparisons of the type mentioned in section 4.3, above have been instituted with the polymer products according to D4. To the extent that no improvement in quality has been demonstrated, D4 could be considered to be a closer state of the art.

Compared with the products disclosed in D4, therefore, the technical problem would then have to be stated in less ambitious terms, i.e. to provide further useful polyurea polymer products.

The solution would be to provide an elastomer product having all the internal characteristics provided by the one-shot process of Claim 1.

7.8 Whilst an improvement is not required compared with the products of D4, nevertheless it is evident that the distribution, in a polymer product, of groups derived from the secondary amine terminated polyethers, which are used, according to the one-shot process, as a chain extender component will inevitably be different from that in a product produced according to D4, in which all the secondary amine groups are located within an isocyanate-terminated prepolymer, the latter then being reacted, according to D4, with a conventional chain-extender. It is in any event made clear in D4 that the

prepolymers react to form polymer products which are different in their physical properties from the corresponding products produced in a one-shot process (page 4, line 29 to page 5, line 10).

Hence, the composition of the product according to the application in suit will evidently bear a "fingerprint" of the one-shot process used to produce it. This will differ from that conferred by a process as defined in D4.

Consequently, there is no self evident way in which a product having precisely the characteristics produced according to Claim 5 could be prepared except by a one-shot process according to Claim 1. Such a one-shot process has, however, been found to be inventive (section 6 etc., above).

To this extent, the product itself must by the same token also be inventive.

- 7.9 Even if it were assumed, against the interests of the Appellant, that this were not so, and the only "recognisable difference from the product of D4 lay in the higher proportion of secondary amine groups of the amine terminated polyethers used in its preparation, it is, for the reasons already given in relation to the process aspect, not obvious to depart from the disclosure of D4 or, a fortiori, from that of D1, D2 or D3, to provide a proportion of secondary amine groups more than about 37% (sections 4.5.7, 4.5.8, above).

Hence, regardless of whether the state of the art acknowledged in the application or that represented by D4 is taken as the starting point, the subject-matter of Claim 5 does not arise in an obvious manner. It therefore involves an inventive step.

8. Since, however, the description of the application in suit still requires to be adapted to the claims, in particular in respect of a number of inappropriate references to prepolymer and cast elastomer processes, it will be necessary to remit the case to the Examining Division.

Order

For these reasons it is decided that:


1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order to grant a patent on Claims 1 to 5 filed on 11 December 1995, and a description yet to be adapted.

The Registrar:



E. Gorgmaier

The Chairman:



C. Gérardin