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D E C I S I O N
of 5 September 1996

Case Number: T 0884/93 - 3.3.3

Application Number: 89301854.9

Publication Number: 0335499

IPC: C08G 18/10

Language of the proceedings: EN

Title of invention:

Method of producing thermoplastic elastomers having alternate crystalline structure for use as binders in high-energy compositions.

Applicant:

Thiokol Corporation

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 84, 123(2)

Keyword:

"Clarity - yes"

Decisions cited:

T 0938/90; T 0860/93

Catchword:

-



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Boards of Appeal

Chambres de recours

Case Number: T 0884/93 - 3.3.3

DECISION
of the Technical Board of Appeal 3.3.3
of 5 September 1996

Appellant: THIOKOL CORPORATION
2475 Washington Boulevard
Ogden Utah 84401 (US)

Representative: Bankes, Stephen
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18 South End
Kensington
London W8 5BU (GB)

Decision under appeal: Decision of the Examining Division of the
European Patent Office dated 28 May 1993 refusing
European patent application No. 89 301 854.9
pursuant to Article 97(1) EPC.

Composition of the Board:

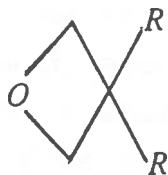
Chairman: C. Gérardin
Members: R. Young
J. A. Stephens-Ofner

Summary of Facts and Submissions

- I. European patent application No. 89 301 854.9, entitled "Method of producing thermoplastic elastomers having alternate crystalline structure for use as binders in high-energy compositions", filed on 24 February 1989 and published under No. 0 335 499 was refused by a decision of the Examining Division dated 28 May 1993, because Claim 1 did not meet the requirements of Article 84 EPC relating to clarity.

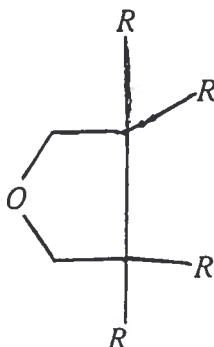
Claim 1 on which the decision was based belonged to a set of Claims 1 to 11 filed on 6 March 1993 with a letter dated 3 March 1993. Claim 1 read as follows:

"A method of preparing a thermoplastic elastomer having A blocks and at least one B block, wherein said A blocks each have a molecular weight from 3000 to 12,500 and are crystalline at temperatures below 60°C and said B block(s) has a molecular weight not exceeding 50,000 and is amorphous at temperatures above -20°C, said A blocks and B block each being polyethers derived from monomers of oxetane and its derivatives having the general formula:



wherein the R groups are the same or different and are selected from moieties having the general formulae:
-(CH₂)_nX, where n is 0-10 and X is selected from -H, -NO₂, -CN, -Cl, F, -O-alkyl, -OH, -I, -ONO₂, -N(NO₂)-alkyl, -C≡CH, -Br, -CH=CH(H or alkyl), -O-CO-(H or alkyl), -CO₂-(H or alkyl), -N(H or alkyl)₂, -O-(CH₂)₁₋₅-O-

$(\text{CH}_2)_{0-8}-\text{CH}_3$, and $-\text{N}_3$, and/or tetrahydrofuran and its derivatives having the general formula:



wherein the R groups are the same or different and are selected from moieties having the general formulae:
 $-(\text{CH}_2)_n\text{X}$, where n is 0-10 and X is selected from $-\text{H}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{Cl}$, F , $-\text{O-alkyl}$, $-\text{OH}$, $-\text{I}$, $-\text{ONO}_2$, $-\text{N}(\text{NO}_2)\text{-alkyl}$, $-\text{C}\equiv\text{CH}$, $-\text{Br}$, $-\text{CH}=\text{CH}(\text{H or alkyl})$, $-\text{O-CO-}(\text{H or alkyl})$, $-\text{CO}_2\text{-}(\text{H or alkyl})$, $-\text{N}(\text{H or alkyl})_2$, $-\text{O-}(\text{CH}_2)_{1-5}\text{-O-}(\text{CH}_2)_{0-8}\text{-CH}_3$, and $-\text{N}_3$, the method comprising

providing hydroxyl terminated A blocks which are crystalline at temperatures below 60°C and separately providing hydroxyl terminated B blocks which are amorphous at temperatures above -20°C ,

end-capping said A blocks and said B blocks by separately reacting each of said A blocks and B blocks with a diisocyanate in which one isocyanate moiety is at least five times as reactive with the terminal hydroxyl groups of each of the blocks as the other isocyanate moiety, whereby the more reactive isocyanate moiety tends to react with terminal hydroxyl groups of the blocks, leaving the less reactive isocyanate moiety free and unreacted, said end-capping being carried out in a solvent for the polymer which does not react with free isocyanate groups,

mixing said end-capped A blocks and said end-capped B blocks together at approximately the stoichiometric ratios that they are intended to be

present in the thermoplastic elastomer, and reacting said mixture with a linking compound having two isocyanate-reactive groups which are sufficiently unhindered to react with the free isocyanate groups of said end-capped polymer."

Claims 2 to 11 are directed to elaborations of the method according to Claim 1.

II. According to the decision, three particular features in Claim 1 were held to be objectionable under Article 84 EPC and hence the claim was unallowable, essentially as follows:

- (a) The feature that B should be amorphous above -20°C did not exclude the possibility that B blocks might be crystalline **under** -20°C and thus **under** 60°C , in which case the B blocks would fall under the definition of the A blocks. In a similar manner, the feature that blocks A must be crystalline under 60°C did not exclude that the A blocks might be amorphous above 60°C and thus above -20°C .

Thus the subject-matter for which protection was sought was not clearly defined, since no difference could be made between blocks A and B.

- (b) The feature that "one isocyanate group of the diisocyanate should be five times as reactive with the terminal hydroxyl groups of each of the blocks as the other isocyanate group" was also unclear because the relative reactivity was dependent on the temperature and the reactant used and its concentration; furthermore, the method for the determination of the reactivity parameter was not indicated in Claim 1.

- (c) The feature that the isocyanate groups of the linking compound were "sufficiently unhindered to react..." was unclear.

III. On 26 July 1993, a Notice of Appeal was filed, the prescribed fee being paid on the following day. In the Statement of Grounds of Appeal, filed on 25 September 1993, the Appellant argued substantially as follows:

- (i) As regards feature (a), a polymer which was crystalline at 60°C would not become amorphous upon cooling down below -20°C, since the crystalline state was the lower energy state. Similarly, a polymer which was amorphous below -20°C would not suddenly become crystalline upon being heated up towards 60°C, for the same reason. The point of the limitation was to make clear that over a broad range of temperature, which included normal ambient temperatures, the A block would be crystalline and not molten, and the B block would be amorphous and not crystalline, the elastomers being of known type.
- (ii) With regard to feature (b), the only reaction conditions which were relevant in the context were those under which the end capping reaction was carried out. A person skilled in the art would know what sort of reaction conditions to use, and could select suitable diisocyanate compounds having the required differential reactivity between the isocyanate groups.
- (iii) With regard to feature (c), the Appellant was prepared unconditionally to delete the words "are sufficiently unhindered to," from Claim 1.

The Statement of Grounds of Appeal was accompanied by three auxiliary requests, the main request corresponding to the claims before the Examining Division subject to a minor amendment.

IV. The Appellant requested that the decision under appeal be set aside, and that a patent be granted:

- (i) as main request, on the basis of the "present" claims, i.e. Claims 1 to 11 submitted with the letter dated 3 March 1993, subject to the deletion, from the last three lines of Claim 1, of the words "are sufficiently unhindered to"; or
- (ii) as first auxiliary request, with Claim 1 as amended in Annex I accompanying the Statement of Grounds of Appeal;
- (iii) as second auxiliary request, with Claim 1 as amended in Annex II accompanying the Statement of Grounds of Appeal (page 3); or
- (iv) as third auxiliary request, with Claim 1 incorporating the amendments of both the first and the second auxiliary requests.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. *Admissibility of amendments (Article 123(2) EPC)*
 - 2.1 The claims differ from those considered by the Examining Division only by the deletion, from Claim 1, of the words "are sufficiently unhindered to".

Although the deleted phrase appears consistently in the application as originally filed in the context of the isocyanate-reactive groups of the linking compound, it is clear that, if the linking agent is to be effective in the process, it must in any case be free of any feature which would vitiate its linking function. In other words, the requirement of being "sufficiently unhindered" is only one aspect of a general suitability which the linking compound must in any case exhibit.

Furthermore, Claim 1 would normally be interpreted as excluding linking agents which were unsuitable, whether for steric or other reasons.

Accordingly, the definition of the linking agents and hence of the effective scope of Claim 1 is the same both before and after the deletion.

Consequently, the deletion does not involve an extension of the subject-matter beyond the content of the application as filed in the sense of Article 123(2) EPC.

- 2.2 For the rest, the Board concurs with the implicit finding of the decision under appeal that no objection under Article 123(2) EPC arises in respect of the claims under consideration.

Consequently, the amended claims are held to meet the requirements of Article 123(2) EPC.

3. *Clarity (Article 84 EPC)*

The question of whether the clarity requirement of Article 84 EPC is met is to be determined by considering the claim to be read, at the filing date, by the person skilled in the art, in the light of his general knowledge and any knowledge derived from the available state of the art. Furthermore, save in the case of a claim which is self-contradictory, it should be construed in its proper context, i.e. in the light of the description (T 0860/93, OJ EPO 1995, 047; Reasons for the decision, points 5.4 to 5.7).

- 3.1 As regards feature (a), the question of whether the morphological characteristics of the A and B blocks might no longer be distinguishable at temperatures outside the range defined in Claim 1 has no relevance to the clarity of the claim, since the temperatures at which they must be distinguishable are clearly defined in the claim, and it has not been disputed that between these temperatures the blocks are in fact distinguishable.

Consequently, feature (a) does not lack clarity in the above sense.

- 3.2 As regards feature (b), it must be emphasised that the parameter in question is the relative reactivity and not the absolute reactivity. In the case of a relative quality, however, according to the decision cited

above, no explicit description of such a method is needed. Decision T 0938/90 of 25 March 1992 (not published in OJ EPO), cited in the decision under appeal in this connection, refers in contrast to the definition of an absolute value of a parameter (the melt viscosity) and is thus irrelevant.

Furthermore, as regards the alleged variability of reactivity between two isocyanate groups depending on temperature, reactant and concentration, the terms of reference in Claim 1 are those of the linking reaction itself, in which the above parameters are necessarily predetermined by the skilled person and thus do not need to be separately defined.

It is in any case clear from the context of the feature in the claim itself that the essence of the requirement is that the end-capping (involving the more reactive NCO group) should proceed preferentially, leaving the less reactive NCO group free and unreacted.

Thus the relative reactivity feature, taken in its context, is defined, without any element of contradiction in the claim, from two different and complementary aspects: extent and function.

In this connection, the only relevant prior art technique cited in the application for achieving such block-linking (none was cited in the decision under appeal) is one using phosgene (cf. published application, page 3, line 9). However, in the case of phosgene, both reactive groups will evidently have exactly the same reactivity.

Consequently, the skilled person reading the subject-matter for which protection is sought in the light of his knowledge of the state of the art would only have to be able to distinguish between the "five times"

greater reactivity required by Claim 1 and the zero times greater reactivity exhibited by the prior art to understand the claimed subject-matter without any element of doubt.

In the Board's view, the skilled person would be able to ascertain unambiguously a distinction of this magnitude.

Consequently, the feature (b) does not lack clarity either, once again in the sense adverted to in Section 3.0, above.

- 3.4 As far as feature (c) is concerned, the phrase objected to has been deleted from Claim 1, and consequently the basis of the objection has been removed.
- 3.5 In summary, none of the individual objections under Article 84 EPC raised and found to be valid in the decision under appeal can be maintained against the claims of the main request. The appeal must therefore succeed.
- 3.6 In view of the above, it is not necessary to consider the three auxiliary requests.
4. Since, however, the main emphasis in the decision under appeal was on the absence of close prior art, but only at the date of the decision, it is evident that the deliberations of the Examining Division in relation to the prior art have not yet been completed, so that the request of the Appellant for grant of a patent is premature.
5. It is therefore necessary to refer the case back to the Examining Division for completion of the examination.

Order

For these reasons it is decided that:

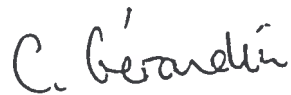
1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order for the examination to be resumed on the basis of Claims 1 to 11 of the main request.

The Registrar:



E. Gorgmeier

The Chairman:



C. Gérardin

C. Gérardin