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# Datasheet for the decision of 3 April 2014

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| **Case Number:** | T 1779/10 - 3.3.03 |
| **Application Number:** | 04759147.4 |
| **Publication Number:** | 1611177 |
| **IPC:** | C08G18/66, C08G18/76, D01F6/70 |
| **Language of the proceedings:** | EN |

**Title of invention:**
MELT SPUN TPU FIBERS AND PROCESS

**Patent Proprietor:**
Lubrizol Advanced Materials, Inc.

**Opponent:**
BASF SE

**Headword:**

**Relevant legal provisions:**
RPBA Art. 13(1)
EPC Art. 54(2), 56

**Keyword:**
Main and first auxiliary request: (admitted)
Fresh ground for opposition - not admitted to the proceedings
Late filed clarity objection - not admitted to the proceedings
Novelty (yes)
Inventive step (no) - obvious alternative

**Decisions cited:**
G 0010/91

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**
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**Case Number: T 1779/10 - 3.3.03**

# DECISION
## of Technical Board of Appeal 3.3.03
## of 3 April 2014

| | |
|---|---|
| **Appellant:**<br>(Opponent) | BASF SE<br>67056 Ludwigshafen (DE) |
| **Representative:** | Féaux de Lacroix, Stefan<br>Isenbruck Bösl Hörschler LLP<br>Patentanwälte<br>Toulouser Allee 3<br>40211 Düsseldorf (DE) |
| **Respondent:**<br>(Patent Proprietor) | Lubrizol Advanced Materials, Inc.<br>9911 Brecksville Road<br>Cleveland, OH 44141-3247 (US) |
| **Representative:** | Von Kreisler Selting Werner - Partnerschaft<br>von Patentanwälten und Rechtsanwälten mbB<br>Deichmannhaus am Dom<br>Bahnhofsvorplatz 1<br>50667 Köln (DE) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 15 June 2010 concerning maintenance of the European Patent No. 1611177 in amended form.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | B. ter Laan |
| **Members:** | F. Rousseau |
| | C. Brandt |

## Summary of Facts and Submissions

I. The appeal by the opponent lies from the interlocutory decision of the opposition division posted on 15 June 2010 maintaining European patent No. 1 611 177 (application No. 04 759 147.4) in amended form.

II. Claims 1, 5, 6, 9, 17, 18 and 19 of the patent as granted read as follows:

"1. A thermoplastic polyurethane polymer comprising the one-shot reaction product of:

(a) at least one hydroxyl terminated polyether intermediate having a number average molecular weight of at least 1200 Daltons;
(b) at least one polyisocyanate; and
(c) at least one hydroxyl terminated chain extender;

wherein said polymer formed by reacting (a), (b), and (c) is crosslinked with at least one crosslinking agent made by reacting (i) a hydroxyl terminated polyol selected from the group consisting of polyester, polycaprolactone, polycarbonate and mixtures thereof; and (ii) at least one polyisocyanate."

"5. The thermoplastic polyurethane polymer of claim 1 wherein said crosslinking agent is a polyester crosslinking agent, preferably the reaction product of a hydroxyl terminated polyester and a diisocyanate."

"6. The thermoplastic polyurethane polymer of claim 5, wherein said hydroxyl terminated polyester is the reaction product of a dicarboxylic acid and at least one glycol."

"9. The thermoplastic polyurethane polymer of claim 6, wherein said glycol is a mixture of at least one branched glycol and at least one straight chain glycol."

"17. A fiber consisting of the thermoplastic polyurethane polymer of any of claims 1 to 16."

"18. The fiber of claim 17, wherein said fiber has a size of from 20 to 240 denier."

III. An opposition had been filed in which revocation of the patent on the grounds of Article 100(a) EPC (lack of novelty as well as lack of an inventive step) and Article 100(c) EPC was requested. The ground of opposition under Article 100(c) EPC was withdrawn during the oral proceedings before the opposition division.

IV. The contested decision was based on a set of claims submitted with letter of 25 February 2010 as main request. According to those claims the use of a cross-linking agent made by reacting a hydroxyl terminated polyester polyol and at least one polyisocyanate was mandatory. In the contested decision novelty was acknowledged as neither D1 (EP-A-0 922 719) nor D2 (WO 02/068534) disclosed the claimed combination of a polyether based thermoplastic polyurethane with the polyester based isocyanate cross-linking agent. As regards inventive step, the problem solved by the claimed subject-matter over the closest prior art D2 was to provide a thermoplastic polyurethane composition that allowed long time running in the melt spinning of fibres before fibre breakage was experienced. In view of that unexpected technical effect associated with the particular combination of polyether thermoplastic polyurethane and polyester cross-linking agent, the presence of an inventive step was acknowledged.

V. On 25 August 2010, the opponent (appellant) lodged an appeal against the above decision, the prescribed fee being paid on the same day. With the statement setting out the grounds for the appeal, received on 21 October 2010, the appellant submitted a new document D6 (EP-A-0 972 864). No further submissions were filed, either in response to submissions of the respondent (patent proprietor) or to the communication by the Board.

VI. By letter of 2 May 2011 the respondent (patent proprietor) submitted experimental report D7 and a new set of claims on the basis of which maintenance of the patent was sought.

VII. Oral proceedings before the Board were held on 3 April 2014 in the course of which the compliance of claim 1 submitted with letter of 2 May 2011 with Article 123(2) EPC was discussed. That set of claims was then replaced by two sets of claims forming the basis for the respondent’s main and first auxiliary requests.

VIII. Claim 1 of the main request submitted during the oral proceedings read as follows:

“1. A thermoplastic polyurethane polymer comprising the one-shot reaction product of:

> (a) at least one hydroxyl terminated polyether intermediate having a number average molecular weight of at least 1200 Daltons;
> (b) at least one polyisocyanate; and
> (c) at least one hydroxyl terminated chain extender;
>
> wherein said polymer formed by reacting (a), (b), and (c) is crosslinked with at least one crosslinking agent made by reacting (i) a hydroxyl terminated polyester polyol and (ii) a diisocyanate, wherein said hydroxyl terminated polyester is the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and at least one straight chain glycol."

The auxiliary request submitted during the oral proceedings differs from that of the main request in that in claim 1 the dicarboxylic acid used for the synthesis of the hydroxyl terminated polyester is defined to be adipic acid.

IX. The appellant's arguments relevant for the present decision may be summarized as follows:

a) The new requests were late filed and should not be admitted to the proceedings as the patent proprietor should immediately have submitted claims meeting the requirements of Article 123(2) EPC.

b) The independent claims did not define the dicarboxylic acid used for the preparation of the hydroxyl terminated polyester to be adipic acid, although this was mandatory in the application as filed when a mixture of at least one branched glycol and at least one straight chain glycol was employed for preparing said polyester. Therefore, claim 1 of the main request extended beyond the content of the application as filed (Article 123(2) EPC).

c) The deletion of granted claims 5 and 24 was not occasioned by a ground of opposition and was thus not admissible in view of Rule 80 EPC.

d) The coexistence in claim 1 of the contradicting expressions “hydroxyl terminated polyester polyol” and “hydroxyl terminated polyester” resulted from an amendment to the patent in suit. It rendered the subject-matter of claim 1 unclear, contrary to the requirements of Article 84 EPC.

e) The objection developed in the written phase that the claimed subject-matter was anticipated by D1 was withdrawn.

f) The subject-matter of claim 1 lacked novelty over D2, because one of the preferred cross-linkers, Diprane® 5184, was a diisocyanate-terminated polyester glycol derived from butylene/hexylene adipate, "butylene" referring to a straight carbon chain and "hexylene" to a branched compound.

g) As regards inventive step, D2 represented the closest prior art. None of the comparative tests provided in the patent in suit and in D7 demonstrated a technical effect arising from the use of a mixture of at least one branched glycol and at least one straight chain glycol for the production of the hydroxyl terminated polyester.

Hence, the problem solved by the claimed subject-matter was merely to provide an alternative polyurethane suitable for spinning.

h) The use of a hydroxyl terminated polyester derived from a mixture of at least one branched glycol and at least one straight chain glycol in order to solve that problem was obvious in view of D1 and D6 which suggested that polyesterols derived from a mixture of straight chain glycols and branched glycols were useful as cross-linking agents in the formation of thermoplastic polyurethane polymers suitable for spinning. Hence, the claimed subject-matter lacked an inventive step.

X. The respondent's arguments relevant for the present decision may be summarized as follows:

a) The additional amendments contained in the new requests were in response to concerns expressed in the oral proceeding by the Board, that claim 1 did not meet the requirements of Article 123(2) EPC. Therefore, the new main and auxiliary requests should be admitted to the proceedings.

b) The deletion of claims 5 and 24 as granted was caused by an objection under Article 123(2) EPC against amendments that had been introduced in order to overcome the ground of opposition of lack of novelty. That deletion was thus occasioned by a ground of opposition and complied therefore with Rule 80 EPC.

c) The expression "said hydroxyl terminated polyester" unambiguously designated the "hydroxyl terminated polyester polyol". Moreover, any lack of clarity with respect to claim 1 of the main request had already been present in the granted claims. Since lack of clarity was not a ground of opposition, claim 1 of the main request could not be objected to on that basis.

d) The ground of opposition under Article 100(c) EPC had been withdrawn during the opposition proceedings. The objection that new claim 1, which corresponded to claim 9 as granted, did not comply with Art. 123(2) EPC constituted therefore a fresh ground of opposition. It should not be introduced to the proceedings because the respondent (patent proprietor) did not give their consent (G 10/91).

e) D2 did not unambiguously disclose that Diprane® 5184 was derived from a mixture of a straight chain glycol and branched glycol. In that respect, the appellant bore the burden of proof. That commercial compound was merely defined in D2 as being "derived from butylene/hexylene adipate"; the terms "butylene" and "hexylene" could stand for either a linear carbon chain or a branched chain. Since there was no indication in D2 which one was meant, novelty had to be acknowledged.

f) As regards inventive step, the closest prior art was represented by the composition of D2 comprising the preferred polyether based cross-linking agent.

g) Starting from the composition of D2 comprising a polyester cross-linking agent as closest prior art, the problem to be solved was to provide a polymer that allowed improved spinnability and resulted in the formation of fibres with improved elongation. The solution to that problem resided in the selection of a polyester polyol derived from a mixture of a straight chain glycol and a branched glycol.

h) As demonstrated in D7 by the comparison of examples 5 to 7 and comparative examples 2 to 4, that problem was effectively solved.

i) Neither D2 alone nor a combination of D2 with the available prior art suggested to use a polyester polyol cross-linking agent derived from a mixture of straight chain glycol and branched glycol in order to solve the problem as defined above.

j) D6 was cited in the contested patent and could have been submitted earlier. Moreover, the fact that it was mentioned in the patent in suit did not necessarily mean that it was prima facie relevant for the invention disclosed therein. D6 did not provide any teaching going beyond that based on the documents already on file, in particular concerning the mixture of straight chain glycol and branched glycol. Moreover, D6 even taught away from a one-shot process when spinning stability was sought. D6 did not suggest that a mixture of straight chain glycol and branched glycol could solve the problem of fibre breakage. For these reasons, D6 should not be admitted to the proceedings.

k) Even if the problem to be solved was merely to provide an alternative, the solution was not obvious since none of the documents suggested to use a mixture of straight chain glycol and branched glycols.

The subject-matter of claim 1 was thus inventive.

XI. The appellant (opponent) requested that the decision under appeal be set aside and the patent be revoked.

XII. The respondent (patent proprietor) requested that the patent be maintained in amended form on the basis of the claims according to the main request (claims 1 to 27) or alternatively on the basis of the auxiliary request (claims 1 to 26), both requests filed during the oral proceedings on 3 April 2014.

XIII. The Board announced its decision at the end of the oral proceedings.

## Reasons for the Decision

1. The appeal is admissible

*Admissibility of the main request*

2. During the oral proceedings the appellant raised for the first time the objection that amended claim 1 submitted by the respondent with the rejoinder of 2 May 2011, did not meet the requirements of Article 123(2) EPC for lack of the mandatory requirement that the polyisocyanate should be a diisocyanate.

After deliberation, the Board concluded that the subject-matter of claim 1 submitted with letter of 2 May 2011 was an intermediate generalization extending beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC. The same held true for process claim 17 which had been limited with respect to the use of the polyester hydroxyl terminated polyol as defined in granted claim 26 without specifying the mandatory use of a diisocyanate defined in granted claim 24.

2.1 Claim 1 of the new main request, submitted immediately after the objection under Article 123(2) EPC had been raised, has, in comparison to the previous claims, only been amended by specifying that the polyisocyanate is a diisocyanate. This amendment in the two independent claims, with the consequential necessary deletion and renumbering of dependent claims, therefore constitutes an immediate and appropriate answer to the new objection raised by the appellant during the oral proceedings.

2.2 The other amendments to the independent claims aim at overcoming the objection of lack of novelty over D2, which was not disputed, and thus are not objectionable under Rule 80 EPC. Accordingly, the consequential deletion of various dependent claims, in particular claims 5 and 24 as granted, is also occasioned by a ground of opposition, in the sense that it does not have the mere purpose of fixing a shortcoming of the patent as granted, but is a corollary amendment to the restriction of claim 1 aiming at overcoming a ground of opposition.

2.3 For those reasons, the main request is admitted to the proceedings (Article 13(1) RPBA).

*Art. 123(2) and 123(3) EPC*

3. The appellant argued for the first time during the oral proceedings on appeal that the feature of claim 1 that

the glycol is “a mixture of at least one branched glycol and at least one straight chain glycol” had been disclosed in the application as filed only in combination with the use of adipic acid, the use of which, however, was not mandatory in present claim 1.

3.1 Having regard to the dependency of claim 9 of the granted patent on claim 6, itself dependent on claim 5, which again was dependent on claim 1, the subject-matter defined by claim 1 of the present request is identical to that of claim 9 of the granted patent. Therefore, the objection that the subject-matter defined by claim 1 of the main request extends beyond the content of the application as filed amounts to an objection in that sense against claim 9 as granted.

3.2 The ground of opposition under Article 100(c) EPC had initially been raised by the opponent in relation only to claims 17 and 18 as granted and had been withdrawn at the oral proceedings before the opposition division (see point 1 of the minutes and point 6 of the facts and submissions of the contested decision). The opposition division did not continue examination of that ground of opposition.

3.3 According to point 18 of the reasons of G 10/91 the introduction of a new ground of opposition at the appeal stage is only possible with the agreement of the patent proprietor. In the present case, not only was the ground of opposition under 100(c) EPC withdrawn before the opposition division, but the objection had been directed against claims 17 and 18 of the patent in suit and had not even addressed the combination of features defined in claim 9 as granted.

In view of the above, the appellant’s objection is to be seen as a new ground of opposition which in view of G 10/91 cannot be admitted to the appeal proceedings without the consent of the respondent, which was not given. Therefore, the objection pursuant to Art 100(c) EPC is not admitted to the proceedings.

4. Further amendments to the claims as granted were not objected to under Article 123(2) EPC and the Board does not see any reason to have a different opinion. In view of the restricted definition of the cross-linking agents in the independent claims, the amended subject-matter is also in keeping with the requirements of Article 123(3) EPC.

5. The objection of lack of clarity of claim 1 of the new main request in view of an alleged contradiction between the terms “hydroxyl terminated polyester polyol” and "hydroxyl terminated polyester" undisputedly could have been raised earlier with respect to claim 1 of the previous main request, which also contained both terminologies alongside each other. Moreover, as indicated in point 3.1 above, the subject-matter defined by present claim 1 is that defined by claim 9 of the granted patent. Under these circumstances the Board is not empowered to examine the clarity of present claim 1, as any ambiguity concerning the meaning of this claim was already present in the claims as granted. Having regard to the fact that the Appellant’s objection was belated, the Board in the exercise of its discretion under Rule 13(1) RPBA does not allow it to the proceedings.

As a preliminary remark prior to the assessment of novelty and inventive step it is sufficient in the present case to note that the hydroxyl terminated polyester component polyol used for preparing the crosslinking agent is, without any ambiguity, further characterized to be the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and one straight chain glycol (i.e. a mixture of diols), the wording polyol implicitly defining that this reaction product has hydroxyl end groups.

*Novelty*

6. The appellant did not maintain the objection of lack of novelty in view of D1. The Board has no reason to consider that D1 anticipates the claimed subject-matter, as D1 does not disclose the combined use of a polyether polyurethane prepolymer and a hydroxyl terminated polyester polyol that is the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and at least one straight chain glycol.

6.1 D2 describes a polyurethane elastomeric fibre obtainable by bulk melt spun polymerization of A. a polyurethane and B. an isocyanate-terminated polyether or polyester (claim 1).

A preferred polyurethane (A) is prepared by reacting a diisocyanate with a hydroxyl terminated polyether having *inter alia* a weight average molecular weight of at least 1500, and a glycol chain extender (claim 8). The polyether polyurethane (A) used in the examples is indicated as "Estane® 58280" (page 7, lines 28 to 30). It is not disputed that said polyurethane (A) corresponds to the polymer obtainable by the one-shot reaction of components (a), (b) and (c) defined in claim 1 of the main request.

6.2 Preferred isocyanate-terminated polyesters (B) are "*Diprane® 5128, which is derived from functional ethylene adipate and MDI and Diprane® 5184 which is derived from butylene/hexylene adipate and MDI*" (page 7, lines 7 to 14), wherein MDI stands for 4,4-methylene diphenyl diisocyanate (page 1, line 30).

Even if in Diprane® 5184 the "hexylene", may refer to the units derived from a branched glycol having six carbon atoms, 2-methyl-2,4-pentanediol, it is undisputed that it may also refer to the straight chain glycol 1,6-hexanediol. This is confirmed by D1, a document in the same field as D2, which discloses two polyesterols based on 1,6-hexanediol, namely "*1,6-hexanediol-neopentylglykol-polyadipate*" and "*1,6-hexanediol-1,4-butanediol-polyadipate*"(D1, paragraph [0021]). Thus the use of "hexylene" in the context of polyester polyol components is not necessarily synonymous for units derived from 2-methyl-2,4-pentanediol. There is moreover no evidence, e.g. in the form of a datasheet, describing that at the date of filing of D2 the commercial product sold under the name Diprane® 5184 was in fact derived from a mixture of branched glycol and straight chain glycol.

Hence, with the mere reference to Diprane® 5184, D2 does not clearly and unambiguously disclose the use of a hydroxyl terminated polyester being the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and at least one straight chain glycol.

6.3 In view of the above, the subject-matter now being claimed complies with Article 54 EPC.

*Inventive Step*

The closest prior art

7. The patent in suit is directed to thermoplastic polyurethane (TPU) compositions for making melt spun elastic fibres, such as spandex (paragraph [0001]).

According to paragraph [0006], the patent aims at providing TPU polymers made from polyether intermediates having a higher molecular weight while retaining the positive effects of TPU polymers made with low molecular weight polyether intermediates.

7.1 Such melt spun TPU elastomeric fibres obtained from polyether intermediates are known from D2, which was regarded as the closest prior art document by the parties as well as the opposition division.

7.1.1 D2 discloses the reaction of polymers obtainable by the one-shot reaction of components (a), (b) and (c) as defined in claim 1 of the main request with a isocyanate-terminated polyether or polyester cross-linking material. Examples of preferred isocyanate-terminated polyester additives (B) are Diprane® 5128 derived from functional ethylene adipate and MDI and Diprane® 5184 derived from butylene/hexylene adipate and MDI (see point 6.2 above).

The resulting melt-spun fibres are described to exhibit improved heat resistance and hysteresis loss compared to dry-spun fibres, while still maintaining all the favourable properties of dry-spun fibres (page 3, lines 1 to 9 and page 4, lines 28 to 30). D2 is silent on the problems related to pressure build-up in the spinneret or fibre breakage.

7.1.2 Although there was no disagreement on D2 as the closest prior art document, the parties were divided as to whether the most suitable starting point within the disclosure of D2 was the polyether TPU reacted with a polyether based cross-linking agent or the polyether TPU reacted with a polyester based cross-linking agent.

According to the Case Law of the Boards of Appeal, the closest prior art for the purpose of assessing inventive step is generally that which corresponds to a purpose or effect similar to that of the invention and requiring the minimum of structural and functional modifications (Case Law of the Boards of Appeal of the European Patent Office, 7th edition, 2013, I.D.3.1). As stated above (point 7.1.1), D2 does not provide any indication of problems related to fibre breakage. The preference of the isocyanate-terminated polyether cross-linking material Hyperlast® 5130 expressed on page 7, lines 14 to 15, is not linked to any effect of less fibre breakage compared to the isocyanate-terminated polyester cross-linkers Diprane® 5128 and Diprane® 5184, which are also indicated as preferred compounds (page 7, lines 7 to 14).

7.1.3 Having regard to structural similarities between the claimed compositions and those disclosed in D2, the isocyanate-terminated polyether cross-linking material Hyperlast® 5130, which does not contain any polyester repeating unit, is more remote than the isocyanate-terminated polyester additives Diprane® 5128 and Diprane® 5184, which comprise ethylene adipate and butylene/hexylene adipate repeating units, respectively (see point 6.2 above).

7.1.4 Therefore, the part of the disclosure of D2 according to which use is made of an isocyanate-terminated polyester cross-linking material, in particular Diprane® 5128 and Diprane® 5184, is considered to represent the closest state of the art and hence the starting point for analysing inventive step.

The problem

8. As stated above (point 7) the patent in suit aims at providing TPU polymers made from polyether intermediates having a higher molecular weight while retaining the positive effects of TPU polymers made with low molecular weight polyether intermediates (paragraph [0006]). In view of D2, the respondent defined the problem underlying the patent in suit as to provide a thermoplastic polyurethane polymer that undergoes a longer spinning time before fibre breakage occurs and results in fibres having improved elastic properties. As the solution to that problem, the patent in suit proposes the thermoplastic polyurethane polymer according to claim 1, characterised in that the cross-linking agent is made by reacting a diisocyanate and a hydroxyl terminated polyester which is the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and at least one straight chain glycol.

8.1 The solution to that problem as defined in the claims, differs from D2 in that the cross-linking agent is made by reacting a diisocyanate and a hydroxyl terminated polyester which is the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and at least one straight chain glycol.

8.2 The patent in suit does not provide any evidence showing an effect due to the difference with the closest prior art. In examples 3 to 6 of the granted patent polyester based cross-linkers were tested. All the results obtained with those cross-linkers were considered to be satisfying, also in example 3 in which Diprane® 5128 was used, i.e. one of the cross-linkers used in the closest state of the art. Moreover, the elastic properties of the fibres spun with Diprane® 5128 in example 3 (now comparative) were indicated to be excellent. However, the patent in suit was silent about the corresponding properties of the fibres spun with the other polyester-based cross-linking agents tested in the patent in suit (examples 4 to 6). Therefore, the patent in suit offers no evidence of any advantage or effect having its origin in the feature distinguishing the invention from the closest state of the art.

8.2.1 The comparisons provided with D7 use cross-linkers based either on a polyether (comparative example 1) or on polyesters selected from poly(ethylene glycol adipate) (comparative example 2), poly(methyl propane diol adipate) (comparative example 3) or poly(neopentyl glycol adipate) (comparative example 4). The cross-linkers tested in D7 in accordance with the present claims are based on poly(neopentyl glycol/1,4-butanediol adipate) (examples 5 and 7) and poly(neopentyl glycol/1,6-hexanediol adipate) (example 6). Thus, D7 does not provide any comparison with a cross-linker based on a butylene/hexylene adipate polyester, Diprane® 5184 used in D2. Even if the cross-linker used in comparative example 2 of D7 (ethylene glycol adipate repeating units) were to be held representative of Diprane® 5128, also mentioned in D2, none of the examples in accordance with the present claims is based on ethylene glycol. Therefore, on the basis of D7 it is not possible to assess the influence of repeating units derived from a branched glycol on a polyester based cross-linker the polyester part of which consists of repeating units from ethylene glycol and adipic acid, such as Diprane® 5128. Nor does D7 provide a comparison with a polyester having as diol component only one of the straight diols employed in examples 5 (1,4-butanediol) and 6 (1,6-hexanediol) on the basis of which one could gather information on the influence of a branched diol. Therefore, the comparisons offered by D7 are not suitable for demonstrating any advantage or effect due to the feature distinguishing the invention from the closest state of the art, i.e. the use of a cross-linking agent made by reacting a diisocyanate and a hydroxyl terminated polyester which is the reaction product of a dicarboxylic acid and a mixture of at least one branched glycol and at least one straight chain glycol (see Case Law supra, I.D.10.9).

8.3 Since the alleged advantages lack the required experimental support, the technical problem as defined in point 7 above needs to be reformulated (see Case Law *supra*, I.D.4.2). Consequently, in the light of the above, the problem underlying the patent in suit can only be seen as providing further TPU polymers suitable for melt spinning.

*Obviousness*

9. It remains to be decided whether the solution to the problem underlying the patent in suit, namely the use of a cross-linking agent made by reacting a diisocyanate and a hydroxyl terminated polyester which is the reaction product of a dicarboxylic acid and a

mixture of at least one branched glycol and at least one straight chain glycol, is obvious in view of the state of the art.

9.1 The information of document D2 is not confined to the use of the isocyanate-terminated cross-linking additives Diprane® 5184 based on poly(butylene/hexylene adipate) (page 7, lines 10-14) or to the use of isocyanate-terminated cross-linking additives based on poly(butylene adipate glycol), poly(ethylene adipate glycol) and mixtures or copolymers thereof (page 6, lines 14-16), but encompasses the general class of isocyanate-terminated polyester additives as disclosed in claim 1 and page 7, lines 7-10 of D2, in particular those based on copolyesters as suggested by the above cited passages.

9.2 D6 had been submitted with the statement setting out the grounds of appeal as an alternative closest prior art to D2. Only during the oral proceedings before the Board was it cited for the first time by the appellant in combination with D2, allegedly suggesting the claimed solution when starting from D2 as the closest prior art. Although well aware of the technical content of that document, as demonstrated by the debates before the Board and illustrated by the summary of that document in paragraph [0006] of the patent in suit, the respondent requested that the submission based on D6 in combination with D2 be not admitted to the proceedings as being belated.

9.2.1 It follows from the above that the purpose of relying on D6 in the oral proceedings was not to provide an entirely new approach with regard to inventive step, but to complete the Appellant’s submissions with respect to the question whether, starting from D2, the use of an isocyanate-terminated polyester cross-linking additive based on a copolyester obtained with a mixture of at least one chain branched glycol and at least one straight chain glycol, was suggested to the skilled person with the aim of providing further TPU polymers suitable for melt spinning. Although that submission indisputably could have been made well in advance to the oral proceedings, it constitutes a response to the respondent’s amendment of the claims filed with the rejoinder, which now require the use of said type of isocyanate-terminated polyester cross-linking additive.

9.2.2 As to the relevance of the appellant’s submission, D6 concerns a process for producing polyurethane elastic yarn from hydroxy-terminated prepolymers and isocyanate terminated prepolymers (claim 1). Example 7 of D6 describes an elastic yarn produced with a hydroxy terminated prepolymer whch is a reaction product of diphenyl methane diisocyanate, polytetramethylene glycol and butylene glycol and an isocyanate terminated prepolymer which is produced from DMI and poly(ethylene/propylene adipate), i.e. a copolyester. Isocyanate terminated prepolymers based on polyester condensates of branched glycols are also addressed in D6 as shown in point 11.3 below. Moreover, D6 is cited in paragraph [0006] of the patent in suit. Hence, D6 is highly relevant for the question whether the use of isocyanate-terminated polyester cross-linking additives based on a copolyester obtained with a mixture of at least one chain branched glycol and at least one straight chain glycol was obvious to the skilled person wishing to provide further TPU polymers suitable for melt spinning.

9.2.3 As the parties were capable of providing detailed submissions and it was possible to deal with the above issue during the oral proceedings, the Board decided to exercise its discretion (Article 13(1) RPBA) and to admit the respondent's argument based on the combination of D6 with D2 as the starting point, to the proceedings.

9.3 Modifying the diol or the dicarboxylic acid of one of the polyester components in the isocyanate-terminated additives exemplified in D2 while remaining within the general class of polyester taught in that document, was well within the routine practice of the skilled person, faced with the mere problem of providing further TPU polymers suitable for melt spinning. Variations of the polyesterol part of the isocyanate-terminated additive such as to include a branched glycol, e.g. neopentyl glycol or 3-methyl-1,5-pentanediol are considered to be possible in view of the teaching provided in paragraph [0035] of D6 according to which the isocyanate terminated prepolymer includes "*condensates of dihydric alcohols such as ethylene glycol, propylene glycol, butylene glycol, hexanediol, neopentyl glycol, 3-methyl-1,5-pentanediol and dicarboxylates such as adipic acid and sebacic acid*".

9.4 D1 also indicates in paragraph [0011], [0012] and [0019] that polyesterols to be reacted with isocyanates for the preparation of isocyanate-terminated additives that are used for the preparation of melt spun TPU fibres (claim 6 and paragraph [0008]) can be based on diols such as ethylene glycol, 1,3-propandiol, 1,4-butandiol, 1,5-pentandiol, 1,6-hexandiol, 2,2-dimethylpropandiol-1,3 (i.e. neopentyl glycol) taken alone or in combination. Specific examples of those polyersterols such as poly(ethylene glycol adipate), poly(1,4-butanediol adipate), poly(ethylene glycol-1,4-butanediol adipate), poly (1,6-hexanediol-neopentylglycol-adipate) and poly(1,6-hexanediol, 1,4-butanediol adipate) are provided in paragraph [0021] of D1.

9.5 Thus, it follows that for merely providing further TPU polymers suitable for melt spinning, regardless of whether a longer spinning time before fibre breakage occurs and fibres having improved elastic properties are obtained, the use of a mixture of straight and branched diols for preparing the polyesterol part of the isocyanate-terminated polyester cross-linking additive, in particular a poly(1,6-hexanediol-neopentylglycol-adipate) would, in view of either D6 or D1, be regarded as a feasible and therefore obvious solution.

*Auxiliary Request*

10. The filing of the auxiliary request submitted together with the main request is, for the same reason as provided for the Main Request, considered to be a fair attempt to overcome the objection under Article 123(2) EPC raised by the appellant during the oral proceedings. It is therefore also admitted to the proceedings (Article 13(1) RPBA).

11. Claim 1 of that request differs from the main request only in that the dicarboxylic acid used for the preparation of the hydroxyl terminated polyester is specified to be adipic acid. That amendment does not provide any further distinguishing feature over the cross-linker of the closest prior art Diprane® 5128 and Diprane® 5184 the polyester part of which is already based on a polycondensate of adipic acid. Moreover, the finding concerning the absence of comparative data demonstrating the alleged improvement brought about by

a mixture of branched and straight chain glycol is still valid for the cross-linkers so defined. Considering that D1 and D6 also suggest to use of polyesterols based on adipic acid (see above points 12.3 and 13), it must be concluded that the amendment made in claim 1 has no effect on the assessment of inventive step given above.

Therefore, the subject-matter according to claim 1 of the auxiliary request is obvious and does not involve an inventive step. The auxiliary request is therefore not allowable.

## Order

**For these reasons it is decided that:**

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

I. Aperribay B. ter Laan

Decision electronically authenticated