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Datasheet for the decision of 29 May 2009

Case Number: T 0030/07 - 3.3.03

Application Number: 00953909.9

Publication Number: 1259558

IPC: C08G 63/78

Language of the proceedings: EN

Title of invention:
Continuous process for producing poly(trimethylene terephthalate)

Patentee:
E.I. DU PONT DE NEMOURS AND COMPANY

Opponent:
ZIMMER A.G.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 113(1), 114(2), 123(2)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Main request - added subject-matter - no (after amendment)"
"main request - maintenance in amended form"
"New ground of opposition - approval - yes"

Decisions cited:
G 0010/91, T 1002/92, T 0793/93, T 0270/94, T 0644/97, T 0095/07

Catchword:

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Case Number: T 0030/07 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 29 May 2009

Appellant: (Opponent)	ZIMMER A.G. Borsigallee 1 D-60388 Frankfurt/Main (DE)
Representative:	Meyer-Dulheuer, Karl-Hermann Dr. Meyer- Dulheuer & Partner Patentanwaltskanzlei Barckhausstrasse 12-16 D-60325 Frankfurt am Main (DE)
Respondent: (Patent Proprietor)	E.I. DU PONT DE NEMOURS AND COMPANY 1007 Market Street Wilmington DE 19898 (US)
Representative:	Hirsch & Associés 58, avenue Marceau F-75008 Paris (FR)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office dated 14 December 2006 and posted 29 December 2006 rejecting the opposition filed against European patent No. 1259558 pursuant to Article 102(2) EPC 1973.**

Composition of the Board:

Chairman: R. Young
Members: M. C. Gordon
C.-P. Brandt

Summary of Facts and Submissions

Related cases:

This case is related to T 95/07-3303. The underlying patent applications were filed on the same day, claiming the same priority date. Both cases were heard by the Board on the same day. The patent in suit in the present case differed from that in T 95/07-3303 in the presence of a further feature, i.e. the claimed subject matter was of narrower scope. Accordingly much of the argumentation and reasoning in decision T 95/07 applies to this case. Where appropriate references will be made to the findings of that decision.

I. Mention of the grant of European Patent No. 1 259 558 with the title "Continuous Process for Producing Poly(trimethylene terephthalate)" in the name of E.I. du Pont de Nemours and Company in respect of European patent application No. 00953909.9, filed on 10 August 2000 as international application No. PCT/US00/21779, published as WO 01/58981 A1 on 16 August 2001, and claiming a priority date of 11 February 2000 from US 09/502 642 was announced on 28 April 2004 (Bulletin 2004/18) on the basis of 15 claims.

Claim 1 read as follows:

1. A continuous process for the production of poly(trimethylene terephthalate) comprising the steps of:

(a) continuously feeding a liquid feed mixture to a flasher, the liquid feed mixture comprising a catalyst and at least one of bis-3-hydroxypropyl terephthalate and low molecular weight polyesters containing propylene groups and terephthalate groups, and the liquid feed mixture having a mole ratio of propylene groups to terephthalate groups of 1.1 to 2.2;
(b) continuously vaporizing by-products in the flasher and removing them from the flasher as a first stream of gaseous by-products, and continuously withdrawing a liquid flasher reaction product having a mole ratio of propylene groups to terephthalate groups of less than about 1.5 from the flasher;
(c) continuously feeding the liquid flasher reaction product to a prepolymerizer, and continuously polymerizing the flasher reaction product in the prepolymerizer to form a poly(trimethylene terephthalate) prepolymer and a second stream of gaseous by-products;
(d) continuously withdrawing the poly(trimethylene terephthalate) prepolymer from the prepolymerizer, the prepolymer having a relative viscosity of at least about 5;
(e) continuously feeding the poly(trimethylene terephthalate) prepolymer to a final polymerizer, and continuously polymerizing the poly(trimethylene terephthalate) prepolymer in the final polymerizer to form a higher molecular weight poly(trimethylene terephthalate) and a third stream of gaseous by-products; and
(f) continuously withdrawing the higher molecular weight poly(trimethylene terephthalate) from the final polymerizer, the higher molecular weight poly(trimethylene terephthalate) having a relative viscosity of at least about 17.

Claims 2 to 15 were dependent claims.

II. A notice of opposition to the patent was filed on 26 January 2005 by Zimmer AG.

The grounds of opposition pursuant to Art. 100(a) EPC (lack of novelty, lack of inventive step) and Art. 100(b) EPC (insufficiency of disclosure) were invoked.

The following documents, *inter alia* were cited in the notice of opposition:

D1: EP-A-1 046 662, a document comprised in the state of the art pursuant to Art. 54(3) EPC (cited in case T 95/07-3303 as D1);

D3: Value table of the correlation between relative viscosity and intrinsic viscosity of poly(trimethylene terephthalate) (cited in case T 95/07-3303 as D11);

D4: DE 197 05 249 A1 (cited in case T 95/07-3303 as D4)

D5: US-A-2 727 882 (cited in case T 95/07-3303 as D3)

D9: US-A-4 110 316 (cited in case T 95/07 as D2)

During the course of the opposition procedure, with a letter dated 13 October 2006 the opponent cited four further documents:
D14: Schumann, Heinz-Dieter *et al*, "Polyester producing plants: principles and technology", Verl. Moderne Industrie,(1996) (Die Bibliothek der Technik: Bd. 132) pp. 26-31;
D15: US-A-4 100 142
D16: US-A-5 340 909 (cited in case T 95/07-3303 as D9)
D17: Ullmann's Encyclopedia of Industrial Chemistry, 5th edition, vol A21, (1992), pp. 342-348.

Further with a letter dated 12 December 2006 the opponent cited an experimental report:
D18: "Exhibit 6: Certified Experimental Results", a document which had been submitted by the party designated Opponent I (Solotex Corporation) in the opposition proceedings leading to case T 95/07-3303 and cited in that case as "D6".

III. By a decision announced on 14 December 2006 and issued in writing on 29 December 2006 the opposition division rejected the opposition.

(a) *Documents considered in the procedure*
The opposition division did not admit to the procedure the four documents, designated D14-D17 and cited with the letter dated 13 October 2006 as these were not considered to be *prima facie* relevant (Art. 114(2) EPC).

(b) *Art. 83 EPC*
According to the decision the patent in suit met the requirements of Art. 83 EPC.

(c) *Art. 54(3) EPC*

According to the decision comparative example 4 of D1 did not disclose the features of removal of streams of gaseous by-products from the flasher, the prepolymeriser and the final polymeriser. Further it was held that example 6 of D1 did not anticipate the subject matter of claim 1 of the patent in suit since the intrinsic viscosity of the precondensate leaving the prepolymeriser was not disclosed (cf step (d) of claim 1 of the patent in suit). In particular it could not be concluded that the viscosity of this prepolymer was the same as that obtained in example 4 of D1 since different monomer ratios had been employed in the two examples, nor could the viscosity be inferred from the information in D1.

(d) *Art 56 EPC*

The decision held that the closest prior art was D4. This was the sole disclosure of the production of poly(trimethylene terephthalate) (hereinafter "PTT") by direct esterification and aimed, like the patent in suit at the production of PTT containing low amounts of acrolein and allyl alcohol.

The subject matter of claim 1 differed from D4 mainly in that the whole process was carried out continuously whereas according to D4 the process was exclusively carried out batchwise. Further there was no disclosure of a flasher in D4 and no disclosure of the propylene to terephthalate mole ratio for the products leaving the reactors described and thirdly no indication of the removal of gaseous by-products.

In the absence of any comparative examples

relating to the examples of D4 the technical problem could only be seen in the provision of a further preparation process of PTT with low amounts of acrolein and allyl alcohol by-products. The argument of the opponent that, starting from the batch process of D4, the skilled person would find in D5 an incentive to perform the same process in a continuous mode and thus arrive at the same process as defined in claim 1 of the patent in suit was held not to be convincing. D5 dealt with a continuous process for the preparation of a polyester. However D5 related exclusively to the preparation of polyethylene terephthalate (hereinafter "PET") and did not contemplate the use of other monomers, e.g. propanediol as employed in D4 and in the patent in suit. Further D5 did not come close to the technical problem underlying the patent in suit, namely reduction of by-product concentration in the final polymer. Hence the skilled person could not find in D5 any general guidance to apply the continuous process of D5 to the specific polymer preparation of D4.

Further, it was held that even if the continuous preparation of polyesters in general, and that of PTT in particular had been known at the priority date of the patent in suit, this did not necessarily render any continuous preparation process of PTT obvious. The specific teaching of D5 could not be ostensibly transferred to the process of D4 in order to arrive at the subject matter claimed in the patent in suit.

With regard to an objection based on D9 as the closest prior art, the decision held that this

document was also primarily concerned with the preparation of PET and did not mention the reduction of by-products. Accordingly D9 was not regarded as being a promising springboard for the assessment of inventive step.

(e) Accordingly the opposition was rejected.

IV. An appeal against this decision was filed on 8 January 2007 by the opponent. The prescribed fee was paid on the same day.

V. The statement of grounds of appeal was filed on 21 April 2007.

(a) The objection of lack of novelty (Art. 54 EPC) was maintained in view of the disclosure of example 4 or 6 of D1.

Inter alia with respect to the viscosity of the prepolymer of example 4 of D1 it was submitted, with reference to the co-pending case T 95/07-3303, that the intrinsic viscosity of 0.26 dl/g disclosed in (comparative) example 4 of D1 corresponded to that specified in operative claim 1, i.e. a relative viscosity of at least 5. In particular it was argued that in case T 95/07-3303 the party Opponent I (Solotex Corporation) had submitted as "Exhibit 6"/D6 the aforementioned D18 (see section II above) experimental data which established that an intrinsic viscosity of 0.26 dl/g corresponded to a relative viscosity of 6.64922. In contrast, Opponent II in that case, who is the sole opponent in the present case, had submitted theoretical data, i.e. the above mentioned D3 (D11 in the parallel case), which data diverged from the experimental data. The

theoretical data were stated to be less reliable than those which had been determined experimentally. Based on the experimental data it had to be concluded that the viscosity of the prepolymer reported in comparative example 4 of D1 fell within the scope of operative claim 1.
Further the finding of the decision under appeal that example 6 of D1 did not disclose the intrinsic viscosity was disputed (see section III.(c) above).

(b) With regard to inventive step it was disputed that the development of a continuous process for the preparation of PTT could be inventive.
Reference was made to:
D19: US-A-5 599 900 (cited as D17 in case T 0095/07-3303)
which document was cited in the patent in suit and was mentioned on the cover page under "References Cited". This document was also cited in D1.
The continuous process for the preparation of PTT disclosed in D19 included the step of removal of gaseous by-products. The removal of acrolein and allyl alcohol in processes for producing PTT, as taught *inter alia* by D4, was such an inevitable and standard measure that many patent documents did not even mention it.
The decision under appeal had even acknowledged that the continuous production of PTT, and the removal of by-products produced in the reaction was known at the priority date of the patent in suit.

(c) The ground of opposition pursuant to Art. 100(b)/ 83 EPC (cf section II above) was not pursued in the Statement of Grounds of Appeal.

VI. The patent proprietor, now the respondent, replied in a letter dated 12 November 2007.

Dismissal of the appeal was rejected. Further five sets of claims forming a first to a fifth auxiliary request were submitted, the wording of which is not of relevance for the present decision.

(a) With regard to novelty and in particular feature (d) of claim 1 (see section (I) above) it was submitted that there was no support for the submission of the appellant/opponent that example 6 of D1 disclosed a PTT prepolymer having an IV of 0.26 dl/g. It was noted that example 6 differed from (comparative) example 4 in three respects and hence it could not be concluded that the viscosity of the prepolymer reported in comparative example 4 was necessarily obtained in example 6. Further it was not possible based on the information contained in D1 to infer the intrinsic viscosity of the prepolymer in example 6.

(b) With regard to inventive step it was submitted that D19 represented the closest prior art as it was the only document which described a continuous process for the preparation of PTT. This process, which was conducted at atmospheric pressure, included the removal of propylene glycol and other volatile reaction by-products through the use of an inert gas that flowed counter-currently. The process was operated as a closed-loop system which integrated propylene glycol recovery and recycling. In contrast the process according to the patent in suit was not a closed-loop system.

Further D19 did not provide a process which reduced emissions of organic by-products but a

process which converted organic by-products to non-toxic products. There was no mention of allyl alcohol or acrolein in D19, hence D19 did not explicitly teach withdrawal of these by-products.
The technical problem underlying the invention was formulated as being to provide a continuous process for the production of PTT in which the production of by-products such as acrolein and allyl alcohol was minimised and in which the molecular weight of the final PTT polymer was maximised. This problem was solved by the process of operative claim 1, as was evident from Tables I, II and III of the patent.
D19 taught away from the use of a vacuum, and neither taught the molar ratio of propylene to terephthalate groups of 1.1-2.2 nor the molar ratio of less than about 1.5 in the liquid flasher reaction product.
D19 did not provide any indication regarding values of the polymer viscosity that could be obtained by its process and did not suggest the relative viscosity of the prepolymer of at least 5 nor the intrinsic viscosity of the polymer of at least about 0.55 dl/g.
Considering the combination of D19 and D4, it was submitted that D4 related to a batch process for preparing PTT. D4 did not identify process parameters as a potential lever for reducing the level of acrolein and ally alcohol but taught a solution based on the addition of a phosphorous compound.
With respect to the combination of D19 and D9 it was submitted that the skilled person would not consider D9 as this document was directed to a

continuous process for preparing PET, not PTT. PET and PTT had different physical and chemical properties. D9 did not teach the reduction of vapours of organic by-products but taught to recycle these.

Similarly D5 was directed to glycols in general and to PET in particular. There was no reference in D5 to PTT. In any case D5 taught that the process thereof generated a very high amount of volatile by-products which was the opposite of the technical effect achieved by the invention.

In conclusion it was submitted that the objective technical problem was the reduction of allyl alcohol and acrolein. The only document which solved this problem was D4, which involved the addition of a phosphorous compound. The solution of the invention was not based on the addition of a chemical compound. Part of the solution was the relative viscosity of the prepolymer of at least 5 which was not suggested by D4.

VII. On 18 March 2009 the Board issued a summons to attend oral proceedings.

VIII. The appellant/opponent made a further submission by letter dated 8 April 2009.

(a) Reference was made, for the first time in the appeal proceedings, to the documents D14-D17 (see section II above).

It was requested that these documents be admitted to the procedure.

(b) With regard to inventive step it was submitted that, by common consent, D19 represented the

closest state of the art. D19 taught that both continuous and batch processes were known as alternatives for the preparation of PTT.
Further D19 explicitly disclosed the removal of gaseous by-products that arose in PTT production, i.e. also acrolein and allyl alcohol by means of the stream of inert gas. Thus the further aim of the patent in suit, i.e. reduction of the content of allyl alcohol and acrolein as much as possible had also been solved in the prior art.
The relevance of D19 was not changed by the fact that it related to a process carried out under atmospheric pressure and not under vacuum. It was known, e.g. from D16 that the production of PTT under vacuum could be carried out under reduced pressure.
It was submitted that the intrinsic viscosity of the prepolymer and the relative viscosity of the final polymer could not support an inventive step, as these were conventional, as confirmed by D9 which disclosed precisely these viscosities for the pre- and final polymers in the case of PET.
With regard to D4 it was submitted that the molar proportions exiting the flasher were known from D15 for polyesters in general and for PTT in particular, reference being made to D19. Although the removal of gaseous by-products from the prepolymeriser and final polymeriser was not disclosed in D4, it was known from D15 and D19 that this was a conventional measure.

IX. Oral proceedings were held on 29 May 2009.

(a) *Art 123(2) EPC*

The Board drew attention to the objections raised and submissions made pursuant to Art. 123(2) EPC in the parallel case T 95/07-3303 (see decision T 95/07 sections III.(a), V.(a), VI, VII, XIII.(a) of the Facts and Submissions and section 3 of the Reasons) and noted that the same defects appeared to arise in the present case. Art. 100(c) EPC had however not been invoked as a ground of opposition.
The respondent/patent proprietor indicated that it gave its approval for consideration of this ground (cf G 10/91, OJ EPO 1993, 420, Part 3 of the Opinion and part 18 of the Reasons) and proposed to amend the claim to take account of this objection.
The appellant/opponent stated that it had no objections to the respondent/patent proprietor making the indicated amendment.

After a break, the respondent/patent proprietor submitted an amended claim 1 in which feature (a) had been amended to read as follows, additions compared to claim 1 as granted being indicated in **bold**, deletions by ~~strikethrough~~:
"(a) continuously feeding a liquid feed mixture to a flasher, the liquid feed mixture comprising a catalyst and at least one of bis-3-hydroxypropyl terephthalate and low molecular weight polyesters **of propanediol** ~~containing propylene groups~~ and terephthalate groups, and the liquid feed mixture having a mole ratio of propylene groups to

terephthalate groups of 1.1 to 2.2;"

It was clarified that this claim, together with claims 2-15 of the patent as granted constituted the (new) main request.

(b) *Art. 54 EPC*

The Board observed that claim 1 of the main request had all the features of claim 1 in the parallel case T 95/07-3303, with an additional feature, i.e. the presence of the flasher, and hence was of narrower scope than claim 1 in the parallel case.

The appellant/opponent indicated that it maintained its objection of lack of novelty and submitted that the feature of the flasher was anticipated by the disclosure of D1, as had been held in the decision under appeal. It was further submitted that, contrary to the findings of the decision under appeal, D1 did disclose in comparative example 4 the presence of a first stream of gaseous by-products. This was derivable from example 6 of D1 which disclosed that the trimethylene glycol (1,3-propanediol) consisted of recycled TMG from vapour condensers- which demonstrated that vapours were withdrawn from the reaction system.

The respondent/patent proprietor referred to the conclusions reached in case T 95/07-3303 that the subject matter of the - broader - claim 1 in that case had been held to be novel over the disclosure of D1 due to the viscosity of the intermediate product, which conclusion should apply equally in the present case.

The appellant/opponent referred to the documents rejected by the opposition division as late filed and noted that as yet the Board had given no indication as to whether these were to be admitted to the present procedure (i.e. D14-D17 - see sections II and VIII.(a) and (b) above). It was submitted that D15 related to a continuous process for the production of high molecular weight polyethylene terephthalate, and defined *inter alia* the viscosity of the prepolymers and the molar proportions of monomers, and requested that D15 be admitted to the procedure.

After a break for deliberation the Board announced its decision D15 was not admitted to the procedure. It was also announced that the claims of the main request met the requirements of Art. 54 EPC, reference being made to the findings of T 95/07.

(c) *Art. 56 EPC*

The appellant/opponent referred to the finding of the decision under appeal that the reduction of allyl alcohol and acrolein was known from D4, and it was submitted that the effect of reducing the amount of by-products reported in D4 was superior to that achieved according to the process of the patent in suit. It was recalled that the decision under appeal held that the technical problem underlying the patent was only to provide a further process as there was no evidence (e.g. comparative examples) showing any improvement with respect to the teaching of D4 (see also section III.(d) above).

It was further submitted that D19 established, contrary to the position taken in the decision under appeal, that continuous processes for the production of PTT were generally known. Hence this aspect could not support an inventive step.
It was also submitted that D19 constituted the closest state of the art.
The respondent/patent proprietor referred to the conclusions reached in case T 95/07-3303.

X. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 1 259 558 be revoked.

The respondent (patent proprietor) requested that the decision under appeal be set aside and the patent be maintained on the basis of the new main request (claim 1 as filed during the oral proceedings and dependent claims 2-15 as granted), or, in the alternative that the patent be maintained on the basis of one of the sets of claims according to first, second, third, fourth or fifth auxiliary request, filed with letter dated 12 November 2007, in that order.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of D15*
At the oral proceedings the appellant/opponent requested that D15, submitted during the opposition procedure after the expiry of the 9 month opposition period be admitted to the procedure (see sections II,

III.(a), VIII.(a) and IX.(b) above).
This document, which was not cited in the notice of opposition, or in the statement of grounds of appeal relates to according to claim 1 to a process for developing high molecular weight polyester by a direct esterification. According to claim 3 the polyester is PET.
The section of the description entitled "Background of the Invention" explains that the invention relates to a continuous, integrated multistep process for producing high molecular weight polyester. However the only polyester referred to in D15 is PET. No reference is made, even in general terms to other polyesters, or monomers other than those required for the production of PET.
According to T 1002/92 (OJ EPO 1995, 605), reasons, part 3.4, new facts, evidence and related arguments [going beyond those presented in the notice of opposition] should only very exceptionally be admitted if such new material is prima facie highly relevant in the sense that it is highly likely to prejudice maintenance of the European patent in suit.

Although D15 relates to a continuous process for production of a polyester, its teaching is restricted to a different polyester to that of the patent in suit. Further there is no reference, even in general terms, to PTT or even to the specific pair of monomers required to produce this polyester.
Thus since D15 relates to a process for the preparation of a different material to that specified in the claims of the patent in suit, it is not *prima facie* relevant.
Accordingly, following the principles set out in T 1002/92, D15 is not admitted to the procedure.

3. *Main request*

3.1 *Art. 123(2) EPC*

3.1.1 Although this was not one of the grounds of opposition invoked in the statement pursuant to Art. 99(1) EPC, the respondent/patent proprietor gave its approval to consideration of this ground by the Board (see section IX.(a) above).

3.1.2 Part (a) of claim 1 of the main request reads the same as claim 1 of the application as filed (see section IX.(a) above).

3.1.3 Accordingly the defect identified by the Board has been addressed.

3.1.4 No further objections pursuant to Art. 123(2) EPC were raised by the opponent and the Board has no further objections of its own in this respect.

3.1.5 Accordingly the main request meets the requirements of Art. 123(2) EPC.

3.2 *Art. 54 EPC*

As noted in the reference to "related cases" above, the subject matter of the claims is more restricted than that underlying case T 95/07-3303 due to the presence of a further feature, namely the flasher.
Accordingly the reasons and conclusions in respect of novelty set out in section 4.2 of decision T 95/07 apply to the present case.

It is therefore concluded that the main request meets the requirements of Art. 54 EPC.

3.3 *Art. 56 EPC*

Similarly the reasons and conclusions in respect of inventive step set out in section 4.3 of decision T 95/07 are applicable to the present case.
It is therefore concluded that the main request meets the requirements of Art. 56 EPC.

4. Under these circumstances it is not necessary to consider the auxiliary requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the new main request (amended claim 1 as filed during the oral proceedings and dependent claims 2-15 as granted).

The Registrar: The Chairman:

E. Görgmaier R. Young