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D E C I S I O N
of 25 January 2000

Case Number: T 0106/99 - 3.3.6

Application Number: 94912845.8

Publication Number: 0692038

IPC: D01F 6/60

Language of the proceedings: EN

Title of invention:

Preparation of poly(m-phenylene isophthalamide) filaments

Applicant:

E. I. DU PONT DE NEMOURS AND COMPANY

Opponent:

-

Headword:

Hydrogen chloride removal/DU PONT

Relevant legal provisions:

EPC Art. 56, 84, 123(2)

Keyword:

"Clarity (yes) - well recognised meaning in the art"
"Inventive step (no, main request) - application of a well
known feature"
"Inventive step (yes, auxiliary request)"

Decisions cited:

-

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0106/99 - 3.3.6

D E C I S I O N
of the Technical Board of Appeal 3.3.6
of 25 January 2000

Appellant: E.I DU PONT DE NEMOURS AND COMPANY
1007 Market Street
Wilmington
Delaware 19898 (US)

Representative: Abitz, Walter, Dr.-Ing.
Patentanwälte Abitz & Partner
Poshingerstrasse 6
D-81679 München (DE)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 9 September 1998
refusing European patent application
No. 94 912 845.8 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: P. Krasa
Members: G. N. C. Rath
C. Rennie-Smith

Summary of Facts and Submissions

I. This appeal is from the Examining Division's decision refusing the European patent application No. 94 912 845.8 (publication number WO 94/23099), which related to the preparation of poly(m-phenylene isophthalamide) filaments, on the grounds that the subject-matter of the then pending claims 1 to 6 lacked an inventive step in view of documents

(1) DE-A-2 313 308,

(2) US-A-4 342 715,

(3) US-A-3 063 966,

(7) SU-A-0 494 036 (translation into English) and

(8) Kirk-Othmer Encyclopaedia of Chemical Technology, 3rd. ed., vol.13; John Wiley & Sons, New York (US); page 702(1981).

The Appellant submitted document

(9) H. H. Yang, Aromatic High Strength Fibers, 1989, John Wiley & Sons, Inc., page 202, page 206.

The Board referred also to

(12) Encyclopaedia of Polymer Science and Technology, Plastics, Resins, Rubbers, Fibers, volume 7, page 712, page 716.

II. During oral proceedings, which were held on 25 January

2000, the Appellant submitted two sets of claims as new Main Request (Claims 1 to 5) and new Auxiliary Request (Claims 1 to 3).

Claim 1 of both the new Main and the new Auxiliary Request read as follows:

"A process for preparing poly(m-phenylene-isophthalamide) filaments by reacting m-phenylene diamine with isophthaloyl chloride in an amide solvent to produce poly(m-phenylene isophthalamide) in an HCl-containing amide solution and removing the HCl from the solution by contacting the solution with a weakly basic ion exchange resin; characterized by

- (a) passing the polymer solution through a bed of the ion exchange resin and collecting a clear HCl-free amide solution of the polymer as effluent;
- (b) removing amide solvent from the effluent as necessary to attain suitable viscosity and concentration of the solution for spinning; and
- (c) spinning the salt-free solution to form filaments."

Dependent Claims 2 and 3 of the new Main Request specify the amide solvent and the exchange resin, respectively.

Claim 4 of this request read as follows:

"A process according to Claim 1 wherein the HCl-containing polymer solution is divided and a major

portion is passed through a bed of a weakly basic ion exchange resin to remove HCl

- (a) combining the HCl-free effluent of polymer in amide solvent with the remaining HCl-containing polymer solution
- (b) neutralizing the remaining HCl of the combined solutions by addition of lime;
- (c) removing solvent as necessary to attain suitable viscosity and concentration of the solution for spinning; and
- (d) spinning the solution to form filaments."

Claim 5 is dependent on Claim 4; in the process according to Claim 5, a stoichiometric excess of m-phenylene diamine is used.

Claims 2 and 3 of the new Auxiliary Request are identical to Claims 2 and 3 of the new Main Request.

III. The Appellant relying, inter alia, on document (9) submitted in essence that the subject-matter of the application in suit was inventive since it was not obvious to use a salt free polyamide solution for spinning. He requested that the decision under appeal be set aside and that a patent be granted on the basis either of the new Main or Auxiliary Request filed during oral proceedings.

IV. At the end of the oral proceedings the Board's decision was announced.

Reasons for the Decision

- 1. *Main request*
- 1.1 Articles 84 and 123(2) EPC
- 1.1.1 Claim 1

Apart from editorial amendments, Claim 1 differs in essence from Claim 1 as originally filed in that the ion exchange resin has been qualified as "weakly basic", the amide solution as "clear HCl-free", the solution to form filaments as "salt-free".

The expression "weakly basic" finds its support on page 2, line 33 as originally filed, the expression "clear HCl-free" on page 2, line 37 and page 5, line 14 as originally filed. As to the expression "salt-free" Example 5, page 6, line 29 as originally filed explicitly mentions that the spinning solution is "salt-free". Moreover, the Board notes that the description as filed does not mention the possibility of adding salt to the spinning solution (see in particular the passage starting on page 2, line 37 and ending on page 3, line 37).

The Board is satisfied that the requirements of Article 123(2) EPC are met.

The expression "weakly basic" in relation with the ion exchange resin is considered as clear since the expression has a well-recognised meaning in this particular art (see e.g. document (12), page 712 and

716).

The Board is satisfied that the requirements of Article 84 EPC are met.

1.1.2 Claims 4 and 5

Apart from editorial amendments, Claims 4 and 5 differ from Claims 4 and 5 as originally filed in that the ion exchange resin has been qualified as "weakly basic".

With respect to the requirements of Articles 84 and 123(2) EPC, the considerations set forth above in point 1.1.1 apply also in relation to Claims 4 and 5.

1.2 Novelty

The Board is satisfied that none of the cited documents discloses the process according to Claims 1 to 5 of the main request; the subject-matter of Claims 1 to 5 is, therefore, novel; since novelty was not an issue during the examination procedure, a detailed reasoning is not necessary.

1.3 Inventive step

1.3.1 The technical problem and the solution

1.3.1.1 The application in suit relates to a process for manufacturing poly(m-phenylene isophthalamide)(abbreviated by MPD-I) filaments by condensing isophthaloylchloride (ICl) with m-phenylene diamine (MPD) in dimethylacetamide (DMAC).

- 1.3.1.2 A process for producing filaments, *inter alia*, from solutions of high molecular weight MPD-I in DMAc is disclosed in document(3) (column 2, lines 3 to 11 in combination with e.g. example XIV). The hydrogen chloride formed in the course of the polycondensation reaction between ICl and MPD is removed by the addition of calcium hydroxide resulting in clear polymer solutions containing large amounts of calcium chloride which solutions may be dry spun (column 18, lines 5 to 16).
- 1.3.1.3 High amounts of salts, usually of calcium chloride, in the spinning solution are, however, disadvantageous as they hinder the removal of the solvent during the spinning process (application in suit page 1, lines 13 to 17 and page 2, lines 21 to 24).
- 1.3.1.4 Thus in respect to document (3), which the Board takes as the starting point for evaluating inventive step, the technical problem to be solved can be defined as to provide MPD-I spinning solutions not containing high amounts of salts such as calcium chloride.
- 1.3.1.5 The solution to the said existing technical problem is a process as defined in Claim 1 of the application in suit which as an essential feature comprises the use of a weakly basic ion exchange resin as an acid acceptor to remove the hydrogen chloride.
- 1.3.1.6 In view of example 5 of the application in suit according to which the salt-free solution consisting of 24% MPD-I polymer solids in DMAc obtained in example 4 was spun and drawn into a fibre, the Board is satisfied that the problem underlying the

application in suit is indeed solved by the process according to Claim 1.

- 1.3.1.7 It remains to be decided whether or not the use of a weakly basic ion exchange resin for removing HCl from the polycondensate solution involves an inventive step.

During oral proceedings, the Appellant conceded that the use of an ion exchange resin as an acid acceptor for removing contaminating acids from solvent systems including non aqueous ones was generally known, e.g. from document (8) (page 702, lines 19 to 22), and was exemplified by the disclosure of document (7). However, he submitted that a skilled person would not have expected that the completely salt-free polyamide solution resulting from the ion exchange resin treatment could be used directly for spinning since according to the prior art minor amounts of salt were deemed to be necessary for obtaining satisfactory spinning results (see e.g. document (1), page 3, lines 2 to 4; document (2), column 8, lines 3 to 8; document (9), page 202, last paragraph).

The Board can accept this argument; whereas the use of a ion exchange resin as an acid acceptor for the removal of the harmful hydrogen chloride was obvious for those skilled in the art in view of citation (8) and no inventive merits can be seen in selecting a weakly basic ion exchange resin for such purpose, it was not obvious for the skilled person to use the salt-free solution resulting from the purification step in the spinning step.

1.3.1.8 For this reason, the Board concludes that the process of Claim 1 involves an inventive step as do the dependent Claims 2 and 3 directed to specific embodiments of the process of Claim 1.

1.3.1.9 However, Claim 4, which while using a "dependent language" is an independent claim, relates to a process comprising in addition to the ion exchange treatment the neutralisation with lime of (part of) the hydrogen chloride formed during the polycondensation reaction (feature b)). The calcium chloride formed by this neutralisation step remains in the spinning solution. Therefore, the argument that a skilled person would not have availed himself of the polymer solution resulting from the ion exchange treatment in view of the complete absence of any salt, is not valid for the process of Claim 4. Consequently, the Board finds that the subject-matter of Claim 4 does not involve an inventive step and that, therefore, the main request is not allowable.

2. *Auxiliary request*

Since Claims 1 to 3 of the auxiliary request are identical to Claims 1 to 3 of the main request, the requirements of Articles 84, 123, 52 (1) and 54, 56 EPC are met (see points 1.1 to 1.3.1.9)

The auxiliary request no longer comprises the unacceptable Claims 4 to 6 of the main request and is, therefore, allowable.

When the description is amended, attention will have to be paid in particular to the use of appropriate

units and to the deletion of the term "preferably" in the description (page 2, line 34).

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 with Claims 1 to 3 according to the Auxiliary Request and a description to be adapted thereto.

The Registrar:

The Chairman:

G. Rauh

P. Krasa