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File Number: T 515/89 - 3.3.3  
Application No.: 83 104 072.0  
Publication No.: 0 092 843  
Title of invention: Process for producing an aromatic polyester fiber

Classification: D01F 6/84

DECISION  
of 17 November 1992

Applicant: Sumitomo Chemical Company, Limited  
Opponent: BASF Aktiengesellschaft, Ludwigshafen  
Hoechst Aktiengesellschaft, Frankfurt

Headword:

EPC Article 56

Keyword: "Inventive step - no" - "Document justifiably submitted in response to official objection and forming basis for first-instance decision should not be excluded at appeal stage" (point 2 of Reasons)



Case Number : T 515/89 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 17 November 1992

Appellant :  
(Proprietor of the patent)

Sumitomo Chemical Company, Limited  
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JP-Osaka 561 (JP)

Representative :

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Respondents :  
(Opponent)

BASF Aktiengesellschaft, Ludwigshafen  
- Patentabteilung - C6 -  
Carl-Bosch-Straße 38  
W-6700 Ludwigshafen (DE)

Hoechst Aktiengesellschaft, Frankfurt  
- Ressortgruppe Patente, Marken und Lizenzen -  
W-6230 Frankfurt am Main 80 (DE)

Decision under appeal:

Decision of the Opposition Division of the  
European Patent Office of 14 April 1989, issued  
on 2 June 1989 revoking European patent  
No. 0 092 843 pursuant to Article 102(1) EPC.

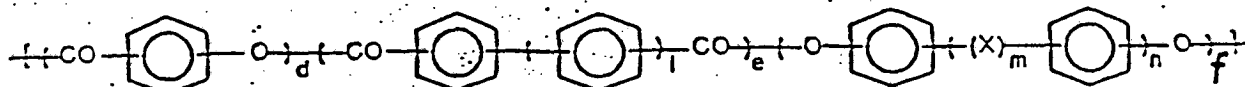
Composition of the Board :

Chairman : F. Antony  
Members : R. Lunzer  
M. Aúz Castro

Summary of Facts and Submissions

I. European patent No. 92 843 was granted on 30 July 1986 on the basis of application No. 83 104 072.0 filed on 26 April 1983, having a priority date of 28 April 1982 derived from Japanese Application No. 71840/82. The single independent Claim 1 was in the following form:

"A process for producing an aromatic polyester fiber of high strength and high modulus of elasticity characterised by grinding a polyester constituted by recurring units represented by the general formula A:



wherein X is an alkylene group of 1 to 4 carbon atoms, -O-, -S-, -SO<sub>2</sub>- or -CO-, l, m and n each are 0 or 1, unit d: unit e is in the range of 1 : 5 to 20 : 1, unit e: unit f is in the range of 9 : 10 to 10 : 9, wherein in unit d a carbonyl group and an oxy group, in unit e two carbonyl groups, and in unit f two oxy groups are in meta or para position to each other, respectively, so that the ground particles have an average particle diameter of 0.5 mm or smaller and no particles having diameters of 3 mm or larger are contained therein, heat-treating these particles from 0.5 to 30 hr at a temperature between 100 and 350°C at which the particles do not fuse, melt-spinning the heat-treated particles at 250 to 450°C when the particles have such a melt property that a temperature range for the particles to possess a shear rate of 51/sec (4800 Pa·s as melt viscosity) under a shear stress of 0.245 M Pa is 200 to 350°C, and thereafter heat-treating the resulting fiber for 0.5 to 50 hr at a temperature between 250 and 450°C at which the fiber does not fuse."

II. Oppositions were filed by BASF AG, and by Hoechst AG, respectively on 25 and 30 April 1987, the Respondents to the present appeal, on the ground of Article 100(a) alleging particularly lack of inventive step (Article 56 EPC). The Opponents relied in particular on the following documents:

- (1) DE-A-2 507 066
- (3) EP-A-0 022 344
- (5) US-A-4 183 895
- (11) JP-A-43223/1975 and,
- (12) DE-A-2 704 315 which was filed after the end of the opposition period, and five weeks prior to the oral proceedings before the Opposition Division.

Document (12) was cited by BASF in its letter dated 8 March 1989 in response to a communication from the EPO of 5 December 1988 which had questioned the significance of document (3) because it was concerned with a different polymer from those covered by the patent in suit.

III. By its decision given orally on 14 April 1989 and issued in writing on 2 June 1989, the Opposition Division revoked the patent, holding that the process steps of the alleged invention were all known, having been disclosed in one or more of the above-mentioned cited documents, and that in particular, starting with document (1), the skilled worker would obviously apply to the process there disclosed the additional solid phase polymerisation step, such as is described in document (12). Accordingly, the patent was revoked.

IV. An appeal against that decision was lodged by the Appellant (patentee) on 10 August 1989, the appeal fee paid on the same day, and the Grounds of Appeal were filed on 12 October 1989. In the Statement of Grounds of Appeal,

as well as in further written submissions filed in response to the Respondents' arguments, and during oral proceedings held on 17 November 1992, the Appellant argued that document (12) was late adduced, and ought not to be taken into account on appeal because it lacked relevance. Insofar as it disclosed a solid phase polymerisation treatment applied to polymers of the kind here in issue, that disclosure was confined to two comparative examples which were intended to teach the reader what he should not do. The document was therefore inherently irrelevant to the issue of inventiveness.

The present invention involved a number of process steps, of which the significant step, which distinguished it from the closest prior art, document (1), was heating the polymer when in a finely divided condition so as to drive off volatile components remaining from the polymerisation step. The upper limit of the increase in molecular weight resulting from heat treatment of the ground polymer particles, was expressed in terms of a parameter called the "flow temperature" in the description (page 3, last paragraph), and referred to as the "melt property" in Claim 1, and was a temperature of 350°C. It imposed a limitation which differentiated the process of the invention from the prior art processes involving solid phase polymerisation. Such solid phase polymerisation steps were described in each of documents (3), (5) and (12). But, as was apparent from the small temperature increase following the heat treatment shown in Example 1 at page 4, line 52 of the patent in suit, there was only negligible increase in molecular weight when carrying out a process in accordance with the invention, in contrast with the known solid phase polymerisation processes which would be used only where it was intended to increase the molecular weight of the polymer.

V. The counterstatements of the Respondents can be summarised as follows: They argued that no advantage could be shown over the process disclosed in document (1), which showed that satisfactory products could be produced by the method there disclosed. If the skilled worker in attempting to put its teaching into effect had run into problems during spinning, such as foaming or gelation, he would know from his common general knowledge in this art that the treatment step there disclosed, which involved grinding the solid polymer to a fine particle size, and holding it for 8 hours at normal temperature and under a pressure of 133 mbar (pages 16 to 17), needed simply to be replaced by a treatment which would be more effective for the removal of volatile components. That could be done by increasing the fineness of grinding before heat treatment, or by increasing the duration, temperature, or vacuum level, of the ensuing treatment. An increase in any one of those could be expected to have the desired effect. Furthermore, although the Appellant argued that the relevant process step in accordance with the alleged invention could be distinguished from the known solid phase polymerisation step by virtue of its being a gentler treatment, carried out for a shorter time at a lower temperature, in fact the wide limits of time and temperature defined in Claim 1 completely overlapped those known in the art to be effective for solid phase polymerisation.

VI. At the oral proceedings the Appellant introduced two Auxiliary Requests. By its first Auxiliary Request, the time of treatment in the above-mentioned step defined in Claim 1 was reduced to 0.5 to 5.0 hours, and the treatment temperature range was reduced to 100 - 300°C. The second Auxiliary Request was the same as the first, save that the temperature range was made 150 - 300°C.

VII. The Appellant requested that the decision under appeal be set aside, and that the patent be maintained as granted as its Main Request; alternatively on the basis of one or other of its two Auxiliary Requests filed at the oral proceedings. The Respondent Hoechst requested that the appeal should be dismissed. The Respondent BASF was not represented at the oral proceedings, but had requested dismissal of the appeal in its letter of 27 August 1992.

#### Reasons for the Decision

1. The appeal is admissible.
2. Relevant documents

At the opening of the oral proceedings, the Board indicated that document (12) had been justifiably introduced by BASF to meet an objection made in a communication by the Opposition Division (see II. above), and therefore it ought not to be excluded on the ground of its late filing. Furthermore, even if it had been open to objection on the ground of its late filing, as it had played an important role in the decision the subject of the present appeal, it would be impractical to disregard it at the appeal stage. The Board therefore admitted it into consideration in spite of some reservations as to its degree of relevance.

3. Novelty

Lack of novelty was not alleged on appeal. Having reviewed all the cited documents, the Board is satisfied that none of them discloses a process involving all of the steps

disclosed in Claim 1 of the Main Request. Therefore the subject-matter of Claim 1 is novel within the meaning of Article 54 EPC.

4. The closest prior art

The Board regards document (1) as being the closest prior art. Document (11) was said to be the Japanese equivalent thereof, which is discussed in the patent in suit at page 2, line 61 to 65. No translation of document (11) was available to the Board, but its equivalence could be seen from a comparison of the chemical formulae. In Example 1 (document (1) page 16) there is disclosed the production of a polymer, the composition of which falls within the product features of Claim 1 of the patent in suit. The polymer when produced is cooled, and ground to a particle size of 20 to 160 mesh (corresponding to 0.1 to 0.85 mm), and this ground product is held for 8 hours under vacuum at an absolute pressure of 133 mbar. The temperature at which it is so held is not disclosed, and is interpreted by the Board as being ambient. It is then extruded at 350°C, and held under vacuum for 24 hours at 230°C with very little change in characteristics. After holding in air at 320°C for 4 hours, the molecular weight had increased to more than 100,000. Thus all the process steps in accordance with Claim 1 of the patent in suit are disclosed, apart from the fact that in document (1) when concerned with the treatment of the solid polymer, the grinding is less severe, and it is held under vacuum, but without heating.

4. Problem and its solution

4.1 At page 2, lines 61 to 65, the patent in suit identifies its starting point as being that a problem was encountered with polymers of the kind described in document (11)

(=1)): spinning difficulties were encountered due to foaming and gelation. The alleged invention identifies the source of that problem as residing in the fact that volatiles, in particular certain amounts of solvent, remain in the solid polymer. At page 3, lines 25 to 26 it is proposed that polymerisation should be carried out in such a way that little or no solvent is used, and at lines 32 to 40 the important process step here under consideration is described. It is proposed to drive off substances causing foaming by grinding the solid polymer to an average particle diameter of 0.5 mm, and then heating below the fusion temperature in the range of 100 to 350°C, preferably 150 to 300°C. The extent of this treatment is indicated at page 3, line 57 to page 4, line 7, expressed in terms of "flow temperature" a melt property which is indicative of melt viscosity, which in turn reflects molecular weight.

- 4.2 It is reported at page 4, lines 59 - 60 that the fibre when so treated could be wound stably, and it had a uniform surface, showing no signs of foaming nor burning. The effectiveness of this solution to the problem posed by the prior art has not been contested, and the Board has no reason to doubt that it is an effective solution to that problem, if and when it occurs.

5. Inventiveness

- 5.1 The issue of inventiveness turns on whether a skilled person, having as his starting point the disclosure of document (1), and confronted with the problem of overcoming spinning difficulties would have adopted the heat treatment of the ground polymer, which feature alone distinguishes the alleged invention from what is disclosed in document (1).

- 5.2 A point at issue between the parties was whether the cause of the spinning difficulties, viz. foaming and gelation, was a phenomenon known to the skilled person at the relevant priority date, or was discovered for the first time by the Appellant. If it had been a known phenomenon, the Board would have no hesitation in answering that question in the affirmative. The Board considers that problems of foaming during spinning would suggest to the skilled worker at once that the cause might reside in the presence of volatile residues, such as solvents etc., and he would know how such volatile materials are conventionally removed.
- 5.3 If, however, the above mentioned phenomenon was found for the first time by the Appellant, the situation would present itself in a somewhat different light as set out in the following paragraph.
- 5.4 The Board agrees with the Appellant to the extent that it is not self-evident that a solid phase polymerisation step needs to be introduced, such as those disclosed in documents (3), (5) and (12). However, the introduction of such a process step is a well known option for the purpose of increasing molecular weight, which is not excluded by the widely defined limits of Claim 1 in accordance with the Main Request. In fact, document (5), which at col. 2, lines 48 to col. 3, line 16 refers to polymers of the kind here in issue, states at col. 5, lines 5 to 11 that there is a need to achieve a balance when heat treating before spinning, depending on the degree of polymerisation desired. The treatment should be such as will allow extrusion without decomposition, especially without the formation of gaseous products, but not to cause such an increase in molecular weight as would give rise to extrusion difficulties.

5.5 Regarding the Appellant's argument that it is not the intention of the alleged invention to bring about any significant degree of solid phase polymerisation, it is observed by the Board that Example 1 of the patent in suit shows a certain although small increase in molecular weight, reflected by the flow temperature increase from 279°C to 290°C, even when the polymer was held for only 4 hours at 210°C (page 4, line 52). As the claim in accordance with the Main Request extends to heating for up to 30 hours at up to 350°C, a considerable degree of solid phase polymerisation is inherently covered in Claim 1. The limits there expressed can be compared with the disclosure of document (3), which in the paragraph bridging pages 11 and 12 describes a solid phase polymerisation process conducted at a temperature of 260°C for 10 to 12 hours, albeit using a different polymer, and with document (12), which in Comparative Examples 1 and 2 at pages 39 to 40 discloses a treatment of a polymer having a composition the same as those of the alleged invention for 9 hours at 270°C. These conditions fall well within Claim 1 in accordance with the Main Request, although they are much more severe than those disclosed in Example 1 of the patent in suit.

5.6 Thus, in the view of the Board, the step defined in Claim 1, even though qualified by the functional feature of an upper flow temperature limit of 350°C, does not exclude the well known solid phase polymerisation steps which are disclosed in documents (3), (5) and (12). Even supposing in the Appellant's favour that the phenomenon of foaming was not known, the Board finds Claim 1 in accordance with the Main Request to be lacking in any inventive step.

6. Auxiliary Requests

By both the Auxiliary Requests, the Appellant has attempted to restrict the severity of the heat treatment step, reducing the time limit to a maximum of 5 hours, and the upper temperature limit of the heat treatment to 300°C. The lower temperature limits - 100°C in the first, and 150°C in the second Auxiliary Request - being irrelevant for these considerations, both auxiliary Requests can be dealt with at the same time. That these amendments are admissible for the purposes of Article 123(2) and (3) is not in doubt, since the preferred upper temperature limit (as well as the lower limit of the second Auxiliary Request) are disclosed at page 3, lines 36 to 37 of the patent as granted (the sentence bridging pages 5 and 6 of the description as originally filed), while all Examples disclose heat treatments of 5 hours or less, an upper time limit of 5 hours being found in Example 4 (pages 17 to 18 of the original text; granted version at page 7, line 52). Relative to the times of treatment referred to in connection with documents (3) and (12) already mentioned in paragraph 5.5 above, it is evident that a milder treatment is covered by Claim 1 in accordance with these amendments. However, as Claim 1 even in accordance with the Auxiliary Requests embraces a treatment of the finely ground solid polymer which are appreciably more severe than the mild conditions exemplified, the Board finds for the reasons given above that there can be no inventive step in the claim as so restricted.

7. Conclusion

The subject-matter of Claim 1 of the patent in suit, whether in accordance with the Main Request or with one or other of the two Auxiliary Requests, does not involve any inventive step, and thus fails to comply with the

essential requirement of Article 56 EPC. The dependent Claims 2 to 5 fall with the main claim. The appeal must therefore be dismissed.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:

  
E. Görgmaier

The Chairman:

  
F. Antony