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File Number: T 201/89 - 3.2.4

Application No.: 80 105 143.4

Publication No.: 0 046 815

Title of invention: Continuous spin-draw polyester process

Classification: D01D5/08

D E C I S I O N  
of 10 September 1991

Proprietor of the patent: ALLIED CORPORATION

Opponents: I. HOECHST AKTIENGESELLSCHAFT  
II. AKZO N.V.

Headword:

EPC Articles 100(b), 56

Keyword: "Sufficiency (confirmed)"  
"Inventive step (confirmed)"

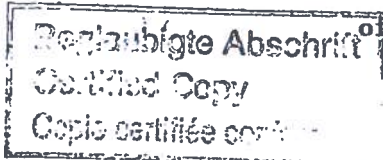
Headnote



Case Number : T 201/89 - 3.2.4

**D E C I S I O N**

of the Technical Board of Appeal 3.2.4  
of 10 September 1991



**Appellant I :**  
(Opponent I)

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**Decision under appeal :**

Decision of Opposition Division of the European  
Patent Office dispatched on 31.01.89 rejecting  
the opposition filed against European patent  
No. 46815 pursuant to Article 102(2) EPC.

**Composition of the Board :**

**Chairman :** C.A.J. Andries  
**Members :** H.J. Seidenschwarz  
W. Moser

## Summary of Facts and Submissions

I. European patent No. 46815 concerning a "continuous spin-draw polyester process" and comprising ten claims was granted on 29 January 1986 in response to European patent application No. 80 105 143.4 filed on 29 August 1980.

II. Claim 1 as granted reads as follows:

"A process for the simultaneous spin-drawing of one or more ends of multifilament, continuous filament, synthetic polyester industrial fiber, comprising the steps of:

- (a) supplying a melt of polyester polymer to a spinning unit;
- (b) extruding the melt through a spinnerette having a plurality of extrusion orifices to form filaments;
- (c) advancing the filaments through a quenching zone;
- (d) lubricating the filaments;
- (e) passing the lubricated filaments over a forwarding roll system maintained at a temperature of less than 50°C;
- (f) subsequently passing the filaments through a steam impinging draw point localizing jet to heat the filaments substantially immediately above their second order transition temperature;
- (g) passing the filaments over a pair of draw rolls;
- (h) passing the filaments over a relax roll system; and
- (i) winding up the filaments, characterised by, in combination:
  - (1) advancing the extruded filaments from step (b) through a substantially stationary column of air contained in a heated sleeve having a temperature of above 200°C to 450°C before advancing the filaments through a quenching zone in step (c);

- (2) employing steam at a temperature of 482°C to 580°C in the localizing jet in step (f);
- (3) maintaining at least one of the draw rolls at a temperature of between 190°C and 237°C in step (g);
- (4) maintaining the relax roll system at a temperature of 60°C to 135°C and the yarn tension at 0.4 to 2.0 grams per denier in step (h); and
- (5) winding up the filaments at a tension of 0.06 to 0.6 gram per denier in step (i)."

III. Two oppositions were filed against the European patent requesting it be revoked on the grounds of lack of novelty (Article 54 EPC), inventive step (Article 56 EPC) and insufficient disclosure of the invention in the European patent as granted (Article 100(b) EPC).

The following documents were referred to:

- D1: US-A-4 070 432
- D2: US-A-3 452 132
- D3: US-A-4 113 821
- D4: DE-B-1 288 734
- D5: US-A-4 003 974
- D6: Abstract of JP-A-134 385 filed on 25.11.74 and published on 26.05.76 (= JP-A-51 060 728)
- D7: US-A-3 650 879
- D8: GB-A-1 395 810
- D9: GB-A-1 115 143
- D10: US-A-3 423 809
- D11: US-A-4 043 008
- D12: Dipl.-Phys. Heinrich Schmieder:  
"Minimalkriterium für die Fadenspannung bei schnelllaufenden Fäden"; Melliand Textilberichte 9/1977, pages 708-710.

- IV. The Opposition Division rejected the oppositions by the decision dispatched on 31 January 1989.
- V. On 18 March 1989 and on 25 March 1989, respectively, the Appellants I and II (Opponents I and II) filed appeals against the decision, paying the appropriate fees simultaneously. The Statements of Grounds were received on 9 June 1989 (facsimile, confirmed on 10 June 1989) and 16 May 1989, respectively.
- VI. Oral proceedings took place on 10 September 1991. The Appellants' and the Respondent's (Proprietor's) submissions can be summarised as follows:

(i) Having regard to Article 100(b) EPC:

According to the Appellants' view, it is the temperature of the filament rather than that of the steam employed in the draw point localizing jet in step (f) of Claim 1 and the temperature maintained in the relax roll system in step (h) of Claim 1 which are important for the reduction of thermal shrinkage. This relationship can be clearly derived from Figure 9 in document D2 and from the table summarizing the results of the test according to Example 3 in document D1. It is necessary to indicate in the patent in suit the residence time of the filament at the draw point localizing jet and on the relax roll system. Furthermore, the results obtained by the subject-matter according to Claim 1 as granted are dependent on other parameters concerning the material to be spun and drawn (cf. e.g. document D2, column 43 to 46) as well as on the device used in the continuous spin-draw process.

Since said patent does not contain any further details of the draw point localizing jet and relax roll system, it is impossible to determine the temperature of the filament and, therefore, the features (2) and (4) present in Claim 1 give no technical teaching to the person skilled in the art for carrying out the invention. Consequently, the European patent in suit lacks sufficient disclosure.

The Respondent maintains that Claim 1 of the patent as granted defines the invention, that the description gives the information which the person skilled in the art needs to carry out the invention and that there is no requirement for the patent specification to provide the technical details which are the common general knowledge of the person skilled in the art. This person skilled in the art is aware of the prior art and finds said technical details in corresponding documents, e.g. in the documents cited in the description of the patent in suit.

(ii) Having regard to Article 56 EPC:

In the opinion of the Appellants the subject-matter of Claim 1 of the patent as granted differs from the closest prior art as represented by document D1 or equally document D5 only by different ranges of the temperatures and the yarn tensions in the steps (b), (f), (g), (h) and (i) of the claimed process. The values as specified in the features (1), (3), (4) and (5) of the characterising part of said Claim 1 lie within ranges which are normal in the prior art as known from the documents D1, D5 and D12. They would, therefore, be obvious to the person skilled in the art.

The Appellants submit that the ranges for the temperature provided according to the features (2) and (3) in the steps (f) and (g) of Claim 1 are actually above those mentioned in the prior art as disclosed by the documents D1, D6 and D11. However, the person skilled in the art knows, e.g. from documents D1 (Example 3) and D2 (column 4, lines 45 to 49; column 5, lines 39 to 43 and Figure 9), that raising the steam temperature in the draw point localizing jet and/or in the relax roll system or raising the yarn temperature would result in a decreased thermal shrinkage. Furthermore, also the documents D5 (column 2, lines 41 to 47), D6 and D11 (column 2, lines 18 to 21) teach the person skilled in the art that the steam temperature has to be raised if the yarn temperature has to be kept at the highest possible level, namely above the second order transition temperature of the yarn.

The Respondent argues that the invention lies in the combination of the features (1) to (5) set out in the characterising portion with the steps (a) to (i) in the pre-characterising portion of Claim 1 of the patent as granted to produce a synthetic polyester industrial fiber having the properties as mentioned in the description of the patent specification, which properties by far exceed those provided in the closest prior art according to the document D1 or document D5. There is nothing in any combination of the documents cited by the Appellants which shows that it would be obvious to the person skilled in the art to provide the specific combination of process features defined in said Claim 1.

- VII. The Appellants request that the decision under appeal be set aside and that the European patent No. 46815 be revoked.

The Respondents' requests are:

(a) main request:

- that the appeals be dismissed (which implies that the patent be maintained as granted);

(b) first auxiliary request:

- that the patent be maintained on the basis of set A of claims filed with letter dated 19 February 1988;

(c) second auxiliary request:

- that the patent be maintained on the basis of set B of claims filed with letter of 19 February 1988.

#### Reasons for the Decision

1. The appeals are admissible.
2. Closest state of the art

Each of the documents D1 and D5 discloses a process for the simultaneous spin-drawing of continuous filament synthetic fibers from industrial polyester polymer, which comprises the steps (a) to (i) and the step of advancing the extruded filaments from step (b) through a stationary column of air before advancing the filaments through the quenching zone in step (c).

The process details in the step between the steps (b) and (c) and in the steps (f), (g), (h) and (i) (which correspond with the process details (1) to (5) as claimed in Claim 1 of the patent as granted) as disclosed in the aforementioned documents are as follows:



(1) Temperature range of the stationary column of air:

100° to 330°C: Document D1 (column 2, lines 14 to 17);

Metal wall temperature of the heated zone:

250° to 350°C: Document D5 (column 3, lines 64 and 65; Example II: 300°C - column 5, line 35);

(2) Temperature range of the steam employed in the localizing jet:

275° to 360°C: Document D5 (column 2, lines 46 and 47);

(3) Temperature range maintained on the draw rolls:

130° to 190°C: Document D1 (column 2, lines 37 to 40);

225° to 250°C: Document D5 (Claim 1; Example II: 235°C - column 5, line 41);

(4) Temperature range and yarn tension range maintained on the relax roll system:

235° to 255°C

0.04 to 0.10 g/d: Document 1 (column 2, lines 41 to 46);

unheated or about 80°C

0.09 to 0.15 g/d: Document 5 (column 5, lines 3 to 5; column 3, lines 23 to 25; Claim 1), and

(5) Tension maintained during the winding up:

0.075 g/d: Document D1 (column 6, lines 10 to 12).

The aforementioned documents describe further conditions which are involved in the steps of the known processes. Such conditions are in particular:

- the height of the heated sleeve in the step following step (b);
- the height of the quenching zone in step (c), the temperature and speed of the filaments passing the quenching zone and the humidity in said zone;
- the various lubrication factors in step (d);
- the steam pressure employed in the draw point localizing jet in step (f);
- the residence time of the filaments on the draw rolls and the draw ratio in step (g);
- the residence time of the filament on the relax rolls and the operating speed of said relax rolls in step (h), and
- the wind-up speed.

Finally, reference is made to the draw point localizing jet as a "conventional steam jet" (cf. document D1, column 6, lines 4 and 5) and as a "jet enclosure as disclosed, for example, in ..." (cf. document D5, column 2, lines 48 and 49).

Document D1, which is indicated in the description of the patent in suit (cf. EP-B-0 046 815, page 2, lines 21 and 22) as a disclosure of a known process, or document D5 represents, therefore, in fact the prior art which comes closest to the subject-matter of Claim 1 of the patent as granted.

### 3. Problem and solution

3.1 In the prior art processes for reducing thermal shrinkage of polyester yarns this reduction normally can be achieved only by sacrificing strength or mechanical quality, increasing ultimate elongation or elongation at break, or by the expensive alternative of a separate operation following drawing, such as annealing or some other form of heat treatment (cf. EP-B-0 046 815, page 2, lines 15 to 18).

It follows from the description of the patent in suit (cf. page 2, lines 39 and 40, 42 and 43; page, 3, lines 40 to 47; page 7, lines 1 to 3; page 9, line 1) and from the submissions of the Respondent during the oral proceedings on the closest prior art that the technical problem to be solved by the invention is to provide a process which permits the production of a polyester yarn which has a reduced thermal shrinkage and an improved dimensional stability with no adverse yarn property changes such as lowered strength or increased elongation, and which does not need further treatment after it is spun.

According to the description (cf. page 3, lines 44 and 45), the dimensional stability is the sum of elongation at break in terms of percentage and thermal shrinkage in terms of percentage (% U.E. + % T.S.).

3.2 This problem is solved by the features of Claim 1, particularly by the combination of the features (2) and (3) in the characterising portion of this claim. The examples given in the description illustrate significantly the influence of the relatively high steam temperature in the draw point localizing jet and that of the temperature maintained in at least one of the draw rolls.

The examples 1 to 8 and 10, which are controls, as well as the examples 9, 11 and 12, which illustrate the invention according to Claim 1 (contrary to the information given in the granted patent on page 4, lines 23 to 26; but confirmed by the Respondent during the oral proceedings) show that the dimensional stability is improved by increasing, firstly, the draw point localizing jet temperature and, secondly, the draw roll temperature. From the examples it can clearly be observed that an increase in the draw point localizing steam jet temperature reduces thermal shrinkage without adversely affecting other properties of the yarn, in particular without increasing elongation (% U.E.) or decreasing strength (U.T.S.) and that an increase of the draw roll temperature reduces elongation, thus resulting in an overall reduction of % U.E. + % T.S.

The combination of the features (2) and (3) with the other features specified in Claim 1 yields a continuous process for the production of continuous filament polyester industrial fiber having a high dimensional stability. A major advantage of this process is the ability to produce also a product from a polymer with low intrinsic viscosity of 0.68 to 0.78 which is cheap to produce as it requires less energy than high intrinsic viscosity polymer, gives increased capacity from the same equipment, and results in lower COOH, desirable for improved thermal stability.

4. Novelty

None of the documents cited in the proceedings before the European Patent Office discloses a process according to Claim 1 of the patent as granted. To give reasons in detail is unnecessary since during the oral proceedings the Appellants did not dispute any more novelty with respect to the state of the art known from the available documents.

Hence the subject-matter of said Claim 1 is novel within the meaning of Article 54 EPC.

5. Sufficiency of the disclosure

The objection of insufficiency of the disclosure of the European patent as granted is insofar inconsistent with the submissions of the Appellants, insofar that they allege that the subject-matter of said patent does not involve an inventive step in view of the teaching of the documents D1 or D5. These documents are acknowledged by the Appellants to be the relevant documents each describing the known process from which the subject-matter of the patent in suit starts (cf. above section VI.(ii)) and which involves the conditions of continuously spinning and drawing filaments (cf. above section 3). In particular, the Appellants have not contested

- that the conditions put forward in these documents were unsuitable for carrying out the known process, and
- that the reference to "a conventional steam jet" in document D1 (column 6, lines 4 and 5) or to "a jet enclosure as disclosed, for example, in US patent No. 3 452 132" in document D5 (column 2, lines 48 and

49) was insufficient to enable the person skilled in the art reading the description of the patent in suit to put the invention into practice making use of the other conditions mentioned above and of his knowledge.

However, the condition as specified in step (f) of Claim 1 of the patent as granted, to heat the filaments substantially immediately above their second order transition temperature, provides the person skilled in the art with the information he needs to adapt the filaments' speed through the draw point localizing jet or the residence time of said filaments in said jet in such a manner that the temperature of the filaments is kept as intended. That this information is common general knowledge for the person skilled in the art is supported by the fact that also document D1 does not contain further details in this respect. Therefore, the Board is satisfied that the reference in this document to a "conventional steam jet" constitutes a sufficient disclosure and that the patent as granted does indeed disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 83 EPC).

Moreover, the Appellants did not provide any evidence that the information given in the description of the patent in suit, namely that the relax roll system is maintained at the minimum temperature which is necessary to maintain the temperature equilibrium during processing (page 4, lines 21 and 22), and that it rotates at 2592 m/min (page 5, lines 5 and 6), are insufficient for the person skilled in the art to calculate the residence time of the filaments on the relax roll system which is necessary for a proper release of the filaments' tension on the basis of the parameters which are conventional in the known processes.

In order to prove insufficiency of disclosure, the burden of proof is in fact upon the Appellants to establish on the balance of probabilities that the person skilled in the art reading the whole document and using his common general knowledge would be unable to carry out the invention (cf. decision T 182/89, OJ EPO 1991, 391). The mere statement that only the indication of the filament's temperature or, respectively, of the residence time of the filament at the draw point localizing jet and on the relax roll system would give the information necessary for carrying out the invention is in principle inadequate to discharge that burden.

With regard to the Appellants' objection that the subject-matter as granted depends also on further parameters and details concerning the material to be spun and the apparatus for carrying out the claimed process, the Board is of the opinion that the person skilled in the art does not need more detailed information because it is well within the scope of his knowledge to choose suitable conditions dependent on the specific situations and this within the limits given in Claim 1 of the patent as granted. Therefore, with the information given in the description including the prior art therein indicated, the invention is disclosed in a manner sufficiently clear and complete, so that said person skilled in the art has no difficulty in producing continuous filament synthetic fibers from industrial polyester polymer.

Furthermore, an independent claim should state only the essential features of an invention (cf. Rule 29(3) EPC), but not prescribe down to the smallest detail to the person skilled in the art what he should do to find the most suitable solution.

Thus no ground for insufficiency under Article 100(b) EPC arises.

6. Inventive step

On the question whether or not the state of the art present in the file could suggest the subject-matter according to Claim 1 of the patent as granted, the following is to be observed:

- 6.1 It is generally known in the state of the art that the thermal shrinkage of polyester fiber is primarily dependent on the highest temperature that the fiber has reached, e.g. from document D1 and D2.

Example 3 given in document D1 concerns only the heat treatment of a drawn yarn by passing the filaments over a heated roll system maintained at a temperature in the range of about 235°C to 255°C and not the heat treatment in a drawing point localizing jet.

According to document D2, for the purpose of heating the filaments substantially instantaneously to a temperature of at least the second order transition temperature, it is desirable to use the heat transfer capability of condensing steam. The general steam temperature ranges from 200° to 300°C (cf. Example II), from 150° to 250°C (cf. Examples I, III, IV and V) or is 380°C (cf. Example VI), although temperatures of up to 450°C have been used "with no adverse effects". The indication in this document that a major factor in the heating effect is that the condensation of steam on the filaments is combined with the specific warning that excessive superheating of the steam should be avoided (cf. column 4, lines 27 to 50; column 5, lines 51 to column 6, line 22). This is, however, contrary to the patent in suit, which



makes use of a non-condensing steam jet operated at a relatively high temperature, thus ensuring that the steam is superheated and does not condense upon the filaments (cf. EP-B-0 046 815, page 2, lines 27 to 30). Furthermore, document D2 does not suggest that the use of steam at a high temperature in a draw point localizing jet results in a reduced shrinkage of the obtained yarn, without a significant effect on the other yarn properties (e.g. the sum of % U.E. + % T.S.).

Therefore, the documents D1 and D2 cannot be read as suggesting a steam temperature of 482° to 580°C as specified in Claim 1 of the patent in suit, let alone as suggesting to use such a temperature range in order to solve the indicated problem (cf. section 3.1 above).

The documents D5, D6 and D11 also do not give any hint to the person skilled in the art to raise the steam temperatures employed in the conventional processes to the aforementioned temperature range to obtain not only a reduced shrinkage but also dimensionally stable polyester industrial fiber since

- document D5 (column 2, lines 41 to 47) only recommends to employ steam at a temperature in the range of 275° to 360°C so that the yarn can be drawn while heated to a temperature in the range of 75° to 250°C;
- document D6 relates to the heat treating of cooled filaments with a hot gas flash without giving much further specific disclosure of the process performed and the results obtained by it, so that a person skilled in the art would not expect to solve the indicted problem, and

- document D11 (column 2, lines 18 to 21) relates to a noise reduction system for use in conjunction with a draw point localizing jet where the treating fluid has temperatures in the range of 250° to 500°C without mentioning any reasons for this wide temperature range. No suggestion can be found in this document that the temperature range as defined in Claim 1 of the patent as granted has a beneficial effect on the specific claimed material, let alone that it provides a solution for the indicated problem.

6.2 According to the closest prior art, the temperatures at which at least one of the draw rolls is maintained, are between 130° and 190°C (document D1) or 225° to 250°C (document D5), which temperatures overlap the corresponding temperature range as specified in Claim 1 of the patent in suit in its lower and higher ranges. The prior art documents, however, do not contain any information with respect to the effect of the draw rolls maintained at the mentioned temperatures on the elongation at break (% U.E.). The person skilled in the art reading these documents would have therefore no incentive to move from the temperatures set out in said documents to the specific temperature range of the invention in suit.

6.3 It follows from the above, that neither of the teachings disclosed by each of the documents D1, D2, D5, D6 and D11 taken alone nor a combination of their teachings suggests the combination of the specific temperature ranges for the steam employed in the draw point localizing jet and for the draw rolls as defined in Claim 1 of the patent as granted (cf. features (2) and (3)). This combination is essential for a decrease in the sum of the thermal shrinkage and the elongations at break of the filaments, thus yielding an improved dimensional stability of these filaments.

- 6.4 Furthermore, the parameters concerning the temperature of the heated sleeves and the relax roll systems as well as the tensions maintained in the relax roll systems and by the winder and disclosed by the documents D1 and D5, are widely spread (cf. above section 2). These parameters are, partly, considerably below and above the size ranges as specified in the features (1), (4) and (5) according to Claim 1, or partly they overlap said ranges. These different parameters, therefore, do not give to the person skilled in the art a clear teaching in the sense of which parameters would be suitable in combination with the parameters employed in the features (2) and (3) of Claim 1 of the patent as granted for the solution of the technical problem to be solved, namely to improve the dimensional stability of filaments produced from industrial polyester polymers.
- 6.5 Document D12, which deals only with general considerations of the yarn tension at high yarn speed, and the other available documents give likewise no hint to the subject-matter of Claim 1 of the patent as granted. Their teachings could not, either alone or in combination with the teachings discussed under points 6.1 to 6.4 above, lead the person skilled in the art to a process according to Claim 1 of the patent as granted.
- 6.6 To summarise, the Appellants have failed to provide any convincing evidence for their objection that the subject-matter of Claim 1 of the patent as granted is not inventive, since the employment of one or more conventional steps in a process will not make the complete process conventional. The fact that an individual feature or a number of features were known in other different specific processes does not conclusively show the obviousness of a combination of these features in another

process (following the decision T 37/85, OJ EPO 1988, 86).

- 6.7 Hence, the subject-matter of Claim 1 of the patent as granted involves also an inventive step within the meaning of Article 56 EPC.
7. In view of the above, the patent can be maintained with Claim 1 and the dependent Claims 2 to 10 as granted.
8. Under these circumstances, there is no need to consider the auxiliary requests of the Respondent.

### Order

For these reasons, it is decided that:

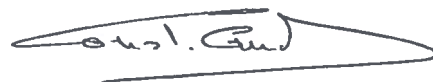
The appeals are dismissed.

The Registrar



N. Maslin

The Chairman



C. Andries



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W.M. 12.11.91  
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