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**D E C I S I O N**  
**of 9 March 2005**

**Case Number:** T 0116/03 - 3.2.6

**Application Number:** 95942206.4

**Publication Number:** 0799331

**IPC:** D01D 5/08

**Language of the proceedings:** EN

**Title of invention:**

Process for manufacturing continuous polyester filament yarn,  
use of the yarn and cord made therefrom

**Patentee:**

Akzo Nobel N.V.

**Opponent:**

Zimmer Aktiengesellschaft

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 52(1), 54(1), 56, 100(a), (b)

**Keyword:**

"Novelty - yes"

"Inventive step - yes"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0116/03 - 3.2.6

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.6  
of 9 March 2005

**Appellant:** Zimmer Aktiengesellschaft  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 21. November 2002  
rejecting the opposition filed against European  
patent No. 0799331 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** P. Alting van Geusau  
**Members:** G. C. Kadner  
M. J. Vogel

## Summary of Facts and Submissions

I. The mention of grant of European patent No. 0 799 331 with 18 claims in respect of European patent application No. 95 942 206.4 claiming a NL-priority from 23 December 1994 and filed on 20 December 1995 was published on 27 September 2000.

Independent claims 1, 8 and 12 read as follows:

"1. A process for manufacturing filament yarns for technical applications by spinning a polymer over 90% of the chains of which are composed of ethylene terephthalate units, with the spinning process having the following elements:

- extruding the polymer in the molten state through a spinneret plate,
- passing the thus formed filaments through a heated zone and a cooling zone in that order,
- fixing the filament speed,
- drawing the filaments to a length of 1,5 to 3,5 times their original length, and
- winding the resulting filament yarn,

with all elements being covered in a single process pass, characterised in that

- the polymer has a relative viscosity ( $\eta_{rel}$ ) of 2,04 to 2,60
- prior to being drawn the filaments have a crystallinity between 5 and 16%, and
- the winding speed of the yarn is larger than 6000 m/min.

8. Use of a polyester filament yarn obtained by a process according to any of the preceding claims and having a:

- breaking tenacity  $\geq 650$  mN/tex,
- elongation at break  $> 10\%$ , and
- breaking toughness  $> 40$  J/g,

to make a cord having a:

- breaking tenacity of more than 570 mN/tex
- a dimensional stability of more than 110, and
- a quality factor  $Q_f$  of more than 50.

12. Cord comprising polyester filaments, characterised in that the cord has the following properties::

- breaking tenacity  $\geq 570$  mN/tex
- dimensional stability  $> 110$ , and
- quality factor  $Q_f > 50$ ."

II. Notice of opposition was filed against this patent with a request for revocation based on the grounds of Article 100(a) and (b) EPC.

By decision posted on 21 November 2002 the Opposition Division rejected the opposition.

The Opposition Division was of the opinion that against the background of his general knowledge a person skilled in the art could certainly arrive at a process or cord within the scope of the invention without undue experimentation.

Novelty was given because the closest prior art represented by D2 failed to disclose in addition to the precharacterising features the combination of characterising features of claim 1. Further since no lead to the combination of process steps in a single-pass could be derived from the cited documents the subject-matter of claim 1 was considered to be based on an inventive step. Apart from claim 6 which was objected to under Article 100(b) EPC, the grounds for opposition against claims 2 to 18 had not been substantiated, and since the Opposition Division did not see a reason why these claims should not prima facie comply with the requirements of the EPC these claims were also maintained.

III. Notice of appeal was lodged against this decision by the Appellant (Opponent) on 24 January 2003 together with payment of the appeal fee.

The statements of grounds of appeal was filed on 31 March 2003.

IV. In a communication pursuant to Article 11(1) of the Rules of Procedure of the Boards of Appeal dated 21 December 2004 sent together with the summons to oral proceedings the Board submitted that according to its preliminary opinion the subject-matter claimed appeared to be novel, and that discussion during oral proceedings would thus focus on inventive step.

V. Oral proceedings were held on 9 March 2005. From the documents cited in opposition proceedings the following were considered again:

- D1: EP-A-0 546 859
- D2: US-A-4 491 657
- D3: A Study of Structural Development in the High Speed Spinning of Poly(Ethylene Terephthalate); H. H. George et al.; Polymer Engineering and Science, Vol. 23, No. 2 (1983); pages 95 to 99
- D4: Polyethylene Terephthalate Fibers Spun at High Wind-Up Speeds Compared with Drawn Fibers; H. Brody; J. Macromol. Sci.-Phys. B 22 (3) (1983); pages 407 to 423
- D6: WO-A-91/07 529
- D7: EP-A-0 080 906
- D16: Methods for Estimating Intrinsic Viscosity; Fred W. Billmeyer, jr.; Journal of Polymer Science, Vol. IV, pages 83 to 86, 1949

The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 799 331 be revoked.

The Respondent (Patentee) requested that the appeal be dismissed and that the patent be maintained as granted.

VI. In support of its requests the Appellant essentially relied upon the following submissions:

The subject-matter of claim 1 was not novel when compared with the process disclosed in D2. This document described a direct spin-drawing process (column 6, lines 55 to 60; figure 2) with a winding speed of the drawn yarn of more than 6,500 m/min (column 7, line 22). On the basis of the intrinsic viscosity (IV) of 0.80 to 1.40 dl/g (column 3, line 28)

the crystallinity had a value of between 5% and 16%, which followed from a calculation based on D6 having regard to the fact that the molecular weight and the birefringence index  $\Delta_N$  shown in table IV (page 18) were in a comparable range. The corresponding crystallinity according to table IV was 7% and 13% for birefringence index values  $\Delta_N$  of 0.055 and 0.069. Moreover, the polymers used in D2 and D6 were the same and had the same property parameters as that of the patent in suit.

The claimed invention was also obvious by a combination of the teachings of D2 with D6. Starting from D2 the problem to be solved consisted in yielding a higher yarn quality when carrying out the process with winding speeds of more than 6500 m/min. The key to achieve an appropriate solution was disclosed in D6 (page 5, lines 26 to 29; page 11, line 33 et seq.), where an identical polyethylene terephthalate was used. The skilled person was taught to keep the crystallinity of the undrawn yarn in the range of 3% to 15%, and when applying that in the one-pass process known from D2, the process according to claim 1 was arrived at without the involvement of an inventive step.

VII. The arguments of the Respondent are summarised as follows:

The novelty objection with regard to D2 was not justified because D2 did not disclose any value of the crystallinity of the undrawn filaments. Since there was no strict correlation between crystallinity and birefringence index (see e.g. D1, page 4, lines 18 to 24; D3, page 98, left col., lines 6 to 8; D4, page 413, table 1), this distinguishing feature could not be

derived from D2 when using D6 in the manner proposed by the Appellant.

The process disclosed in the example of D2 was a two-step process with the spun yarn being wound on a bobbin before being drawn, and the winding speeds after drawing were much lower than 6000 m/min. Therefore the process according to D2 was not comparable with that as claimed in the patent in suit.

The claimed solution involved an inventive step since the cited prior art pointed away from the invention. Particularly, in D6 (page 1, line 29) document D2 was cited and the difficulties arising therefrom were explained. The solution according to D6 was the reduction of the spinning and winding speeds. Therefore D6 could not lead in an obvious manner to the claimed solution applying a winding speed of more than 6000 m/min in a single pass process. Additionally, in D7 (page 27, lines 10 et seq.) the disadvantages of high winding speeds were set out resulting in significant breaking of yarn and bad operability, and the recommendation to solve these problems was a reduction of the winding speed. Contrary to that teaching the inventors recognized that the crystallinity of the undrawn yarn was the crucial parameter to achieve high winding speeds and thus high productivity in combination with high yarn quality.

### **Reasons for the Decision**

1. The appeal is admissible.



2. *Sufficiency of disclosure (Article 100(b) EPC)*

Lack of enabling disclosure was no longer asserted in appeal. The Board considers the reasons given in this respect by the Opposition Division in its decision (point 12 of the reasons) to be correct.

3. *Novelty*

3.1 Novelty was denied with regard to D2 which document discloses a process for manufacturing filament yarns for technical applications by spinning a polymer over 90% of the chains of which are composed of polyethylene terephthalate units. The Appellant was of the opinion that all steps and features of claim 1 were - at least implicitly - disclosed in D2.

D2 describes two alternatives for performing the process one of which is carried out in a direct spinning process and the other one is a two-step drawing method in which the filaments as spun are first wound on a bobbin and afterwards are drawn at a lower speed than that corresponding to the spinning speed. The examples given in D2 are all related to the two-step drawing method. Therefore for the consideration of novelty only the disclosure concerning the direct spinning process should be taken into account.

It was acknowledged by the parties that the features of the precharacterising portion of claim 1 are disclosed in D2. Some of the features of the characterising portion are also known from that prior art document. Assuming that the subject-matter of claim 1 also concerns the single pass process, when converting the

relative viscosity values in claim 1 of 2,04 to 2,6 applying all eight formulas given in D16, this range results in values of between about 1,0 and 1,40 dl/g which is fully covered by the range disclosed in D2 being 0,80 to 1,40 dl/g (column 3, lines 66 to 67). The process is carried out at a winding speed of not less than 6500 m/min. Consequently these two features concerning the relative viscosity and the winding speed can be considered to be disclosed in D2 in a single pass process.

D2 does not explicitly disclose a value of crystallinity because it is completely silent about the crystallinity of the filaments prior to be drawn. The Appellant contended that the claimed range of crystallinity was implicitly disclosed in D2.

However, even taking all the arguments of the Appellant into consideration, the Board does not see a clear and unambiguous disclosure of that feature in D2 since there is no strict correlation between crystallinity and birefringence index. In this regard the Board fully adopts the reasons given by the Opposition Division in the decision under appeal (section 13 (A) paragraph (b) on pages 6 to 7). The basis for the Appellant's correlation is merely based on assumptions rather than unequivocal proof. Moreover, the respondent filed WO-A-03/060 206 to show that the Appellant's assumptions in respect of the direct correlation between crystallinity and birefringence index were at least incorrect in view of this prior art document. Reference can also be made to D6 in which it is stated that one must focus on fundamental properties such as undrawn yarn crystallinity and melting point elevation

and not on undrawn birefringence alone (page 17, lines 13 to 16)

Hence the process according to claim 1 meets the requirement of novelty (Article 54(1) EPC).

- 3.2 With respect to the alleged lack of novelty of the use of a polyester filament according to claim 8 and of a cord comprising polyester filaments according to claim 12 the Appellant relied upon the contention that they could not be novel since the process for obtaining them was not novel without providing further substantiation for this contention.

The Board holds that, since the process of claim 1 is novel as stated in point 3.1 above, the Appellant's arguments concerning lack of novelty of the subject-matter of claim 8 and 12 are not persuasive.

#### 4. *Inventive step*

- 4.1 The closest prior art is represented by D2 which discloses a process for manufacturing filament yarns for technical applications by spinning a polymer over 90% of the chains of which are composed of polyethylene terephthalate units according to the precharacterising portion of the claim.
- 4.2 The technical problem underlying the patent in suit is to achieve a process which makes it possible to manufacture polyester filament yarn for technical applications at high winding speeds which overcomes the disadvantages of the prior art. In particular it is desired to achieve a process at a winding speed in the

range of 6500 m/min which is mentioned in D2, however no teaching was given there how to achieve a reliable process and resulting high tenacity yarn.

- 4.3 A solution to that problem is provided by the process including the combination of features of claim 1.
- 4.4 Although D2 mentions a process which should be carried out at a winding speed not less than 6500 m/min, in the absence of the necessary control parameters no enabling teaching is disclosed to achieve filaments in a single pass process in that document. The examples which relate to fibers having the desired characteristics are all attained in a two-step drawing method. The skilled person trying to carry out the direct spin-drawing process following the teachings of D2 would therefore have to look for practicable solutions in the state of the art.
- 4.5 D6 relates to the production of a drawn polyethylene terephthalate yarn for technical applications from a polymer and also refers to the two possibilities of the yarn being drawn offline or being drawn in a continuous integrated spin-draw process. The crystallinity of the undrawn yarn is identified as an operation control parameter, and it is recommended to select a value of between 3% and 15%. In the introduction to that document the yarn attained by the process of D2 is referred to.

Example II in connection with Table IV (page 18) and Table V (page 21) shows that tenacity decreases with raising spinning speeds in the single pass process. As a consequence and as solution to this problem it is

proposed to lower the spinning speed below that mentioned in D2 (page 16, lines 29 to 35). Consequently the solution according to D6 leads away from a process with the claimed combination of features using a winding speed of higher than 6000 m/min in combination with the other control parameters.

4.6 A continuous spin-draw process for the production of polyethylene terephthalate yarn is also mentioned in D7 (page 20, line 14 to page 21, line 8). It is clearly stated that when the taking off speed of the drawn yarn exceeds 5500 m/min the operability decreases drastically. Therefore that document also cannot serve to lead to a process carried out at a winding speed of more than 6000 m/min.

4.7 The further documents which were not relied upon again by the Appellant are more remote from the invention than the prior art discussed above. Consequently the process according to claim 1 cannot be obvious with regard to of other documents either and therefore involves an inventive step within the meaning of Article 56 EPC.

4.8 Lack of inventive step of the subject-matter of claim 8 and 12 was not substantiated by the Appellant. The particular value of dimensional stability of more than 110 is not produced in the cords according to the prior art, and a quality factor is not mentioned there. Also when calculating the quality factor with the values disclosed in D2, D6 or D7 with the formula given in the patent (page 5, line 41) the value of more than 50 is not arrived at, and there is no indication that the

claimed polyester filament yarn and the cord,  
respectively, have the properties claimed.

- 4.9 In view of the above findings the Board comes to the conclusion that the proposed solution to the technical problem underlying the patent in suit defined in independent claims 1, 8 and 12 is novel and inventive and complies with the criteria of patentability (Article 52(1) EPC).

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau