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**Datasheet for the decision
of 7 November 2018**

Case Number: T 1603/15 - 3.3.06

Application Number: 08847642.9

Publication Number: 2205780

IPC: D01F6/60, D01F6/80, D01D5/16

Language of the proceedings: EN

Title of invention:
HIGH TENACITY LOW SHRINKAGE POLYAMIDE YARNS

Patent Proprietor:
Invista Technologies S.à.r.l.

Opponents:
PHP Fibers GmbH
Evonik Degussa GmbH

Headword:
Polyamide yarns/Invista Technologies

Relevant legal provisions:
EPC Art. 52(1), 54, 56, 84, 123(2)
RPBA Art. 13

Keyword:

Inventive step - (no) - Main Request, First and Second
Auxiliary Requests

Late-filed auxiliary requests - admitted (yes) - filed in
reaction to the Board's communication

Third Auxiliary Request - admissible (yes) - inventive step
(yes)

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 1603/15 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 7 November 2018

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 15 July 2015
rejecting the opposition filed against European
patent No. 2205780 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman J.-M. Schwaller
Members: G. Santavicca
 R. Cramer

Summary of Facts and Submissions

- I. The appeal lies from the decision of the Opposition Division rejecting the opposition filed against **European patent No. 2 205 780** pursuant to Article 101(2) EPC.
- II. The patent as granted comprises 16 claims, independent claims 1 and 5 reading respectively as follows:

"1. A multifilament polyamide yarn having a tenacity measured according to ASTM D885, equal to or greater than 80 cN/tex, a hot air shrinkage measured at 177°C according to ASTM D4974 of less than 5% and a linear density no greater than 940 decitex."

"5. A spin-draw process for manufacturing the yarn described by claim 1 comprising the steps:

- a. extruding molten nylon at a formic acid relative viscosity from about 40-85 through a multi-capillary spinneret into a plurality of filaments which are then directed through a quench zone;*
- b. coalescing the filaments into a multifilament yarn and applying lubricating spin finish to said yarn;*
- c. directing the yarn, by means of at least one feed roll, to a draw zone consisting of at least two pair of driven draw rolls, each roll within a pair rotating at the same peripheral speed, and each pair rotating at a relatively higher peripheral speed than the pair preceding it;*
- d. causing the yarn to form at least two wraps around each said pair of draw rolls;*
- e. maintaining the yarn at a temperature of 160°-245°C as it passes over the at least two pairs of draw rolls by heating the immediate zone surrounding the said*

pairs of rolls with hot, dry air or by heating the rolls, or by a combination of both;

f. controlling the relative peripheral speeds of the rolls between each pair of draw rolls and the following pair of draw rolls, and controlling the temperature of the yarn as it passes over the at least two pairs of draw rolls, so as to impart an increasing extent of draw to the yarn as it traverses each pair of draw rolls and finally achieves a total yarn draw ratio of 4.2 - 5.8;

g. directing the yarn to a tension relaxation and control zone consisting of a first driven tension relaxation roll and a second driven tension control roll wherein said first roll is rotating at a lower peripheral speed relative to the final pair of draw rolls that the yarn just exited, thereby achieving a relaxation ratio of 9 to 16.5%, and rotating at a lower rate than said second roll, such that the ratio of peripheral speeds of the second to the first roll in the tension relaxation and control zone is 1.01 to 1.07, and so as to maintain a stable yarn tension in the tension relaxation and control zone that is higher than that experienced by the yarn as it exits the draw zone;

h. directing the yarn through an interlacing jet; and

i. directing the yarn to a wind-up roll rotating at a relatively higher peripheral speed than the second roll of the tension relaxation and control zone so as to maintain a stable yarn tension during wind-up, and such that the yarn traversing the tension relaxation and control zone is at a higher tension than the yarn exiting the last pair of draw rolls and at a lower tension than that of the yarn as it is wound on the wind-up roll."

The following items of evidence were *inter alia* relied upon during the opposition proceedings:

D1: EP 0 423 808 A

D2: US 5 240 667 A

D7: EP 1 666 647 A

D9: US 5,356,680 A

D13: US 5,558,826.

- III. With its statement of grounds of appeal, the **Appellant** (Opponent 1) filed further items of evidence and *inter alia* argued that the yarn according to Claim 1 as granted lacked novelty and inventive step over those of *inter alia* D7 taken as the closest prior art, and that the process according to granted Claim 5 lacked an inventive step over the disclosure of D2 taken as the closest prior art, in view of D1.
- IV. Opponent 2 (which is only **party as of right** pursuant to Article 107 EPC) raised additional Article 100(b) and (c) EPC objections and *inter alia* lack of inventive step of the process of Claim 5 on the basis of D2 as the closest state of the art in combination with D13.
- V. With its response dated 30 March 2016 to the statement, the **Respondent** (Patent Proprietor) maintained as its Main Request the patent as granted, and filed First to Fourth Auxiliary Requests (allegedly already pending before the Opposition Division).

The Third Auxiliary Request consists of only Claim 1, which is identical to Claim 5 as granted.

- VI. Opponent 2 announced that it would not attend the set oral proceedings.
- VII. In a communication expressing its provisional opinion, the board *inter alia* held the claimed yarn to lack an inventive step over D7 taken as the closest prior art.
- VIII. With letter dated 29 October 2018, the **Respondent** withdrew its First, Second and Fourth Auxiliary Requests on file, filed new First and Second Auxiliary Requests and submitted further items of evidence, including a declaration (D24) by one of the inventors and four documents (D25 to D28) referred to in that declaration.
- IX. Claim 1 according to the new First and Second Auxiliary Requests reads as follows:

*"1. A one piece, woven airbag comprising:
an uncoated woven fabric characterized by an air permeability in the range of 1 to 10 l/dm²/min comprising a multifilament polyamide yarn having a tenacity measured according to ASTM D 885 equal to or greater than 80 cN/tex, a hot air shrinkage measured at 177°C according to ASTM D 4974 of less than 5% and linear density no greater than 940 decitex; or
a coated woven fabric characterized by an air permeability of less than 2 l/dm²/min comprising a multifilament polyamide yarn having a tenacity measured according to ASTM D 885 equal to or greater than 80 cN/tex, a hot air shrinkage measured at 177°C according to ASTM D 4974 of less than 5% and linear density no greater than 940 decitex and further comprising a coating wherein the coating is applied at a loading in the range of 5 to 130 g/m² and wherein said coating comprises a polymer selected from the group consisting*

of silicones, polyurethanes, and mixtures and reaction products thereof."

- X. Oral proceedings took place in the announced absence of the duly summoned Opponent 2. Inventive step of the yarn according to Claim 1 as granted and of the airbag according to Claim 1 of the First or Second Auxiliary Request over D7, possibly taken in combination with common general knowledge, was discussed with the parties. In respect of one-piece airbags, the Appellant submitted document D29: "*The Story of the One Piece Woven (OPW) Airbag*" in "Dornier Insider" No. 9, June 1999.

The appellant then stated that he no longer objected to the maintenance of the patent in amended form on the basis of the Third Auxiliary Request on file.

- XI. At the closure of the debate, the parties' requests were as follows:

The **Appellant** requested that the decision under appeal be set aside and that the patent be revoked.

The **Respondent** requested that the appeal be dismissed (Main Request) or, alternatively, that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the First or Second Auxiliary Request filed with letter of 29 October 2018, or of the Third Auxiliary Request filed with letter of 30 March 2016.

The **Party as of right** shared, in writing, the request of the Appellant that the patent, as granted or amended, be revoked in its entirety.

Reasons for the Decision

1. *Procedural matters*

- 1.1 The announced absence of Opponent 2 at the oral proceedings is governed by Rule 115(2) EPC and Article 15(3) RPBA, according to which, *inter alia*, the duly summoned party "may then be treated as relying only on its written case".

The Appellant in its statement of appeal did not contest the findings of the Opposition Division on the grounds of opposition under Article 100(b) and (c) EPC. Since Opponent 2 did not appeal the decision, and so is only **party as of right** pursuant to Article 107 EPC, its objections under Article 100(b) and (c) EPC are thus outside the scope of the present appeal and not considered in these proceedings.

- 1.2 Declaration D24 and documents D25 to D28 were filed in reaction to objections raised in the Board's communication. Since these submissions did not take the Appellant by surprise, the Board did not object to their admission into the proceedings.

2. *Main Request (patent as granted) - Inventive step*

2.1 *The invention*

The invention relates to the preparation of high tenacity, low shrinkage polyamide yarns. In particular, such a combination of physical properties is achievable by extruding molten nylon polymer in a coupled spin-draw process which includes a subsequent tension relaxation and control step prior to winding. Such yarns can be used in the manufacture of woven and knit

fabrics, which are especially useful for automotive airbags (paragraph [0002] of the patent in suit).

2.2 *The closest prior art*

D7 (paragraph [0001], first sentence) relates to a low shrinkage polyamide fibre for use as a yarn of a fabric for airbags, as well as to an uncoated fabric for airbags produced using these yarns. In view of this identity of technical field and objective, it was undisputed that D7 is a suitable starting point for assessing the inventiveness of the claimed invention according to the problem-solution approach.

2.3 *The technical problem underlying the invention*

At the oral proceedings before the Board, the respondent argued that D7 did not disclose the claimed yarn having the defined shrinkage of less than 5% measured at 177°C for 2 minutes but accepted that, in the absence of any comparative values over D7, the technical problem could only be formulated as the provision of a further high tenacity and low shrinkage yarn.

2.4 *The solution*

The proposed solution to this problem is the multifilament polyamide yarn defined in Claim 1 at issue, which is characterised *inter alia* by a hot air shrinkage **measured at 177°C according to ASTM D4974** of less than 5%.

2.5 *The success of the solution*

It is undisputed that the claimed multifilament yarn

effectively solves the above technical problem. This is in particular apparent from the examples in the patent in suit.

3. *Obviousness*

3.1 It remains to be decided whether the skilled person starting from the closest prior art D7, faced with the technical problem posed, would arrive in an obvious manner to a yarn with low shrinkage as defined in Claim 1 at issue.

3.2 D7 (Claim 8) concerns a low shrinkage polyamide fiber, which has the following physical properties:

- (1) a dry heat shrinkage of 3 - 6 % at 190°C for 15 minutes,
- (2) a tenacity of at least 9.0 g/d,
- (3) an elongation of at least 20%,
- (4) a birefringence of less than 0.065, and
- (5) a fineness of 200 - 1000 deniers.

In its Examples 2 and 3, D7 discloses yarns having respectively a linear density of 630 or 420 denier, a tenacity of 9.4 or 9.5 g/d and a dry heat shrinkage measured at 190°C for 15 minutes of 4.6% or 4.4%.

3.3 It is not in dispute that the tenacity and the fineness defined in Claim 8 and illustrated in Examples 2 and 3 of D7 fall under the respective properties defined in Claim 1 at issue. It is instead in dispute whether the dry heat shrinkage defined in D7 falls under the terms of Claim 1 at issue, because in view of the different methods of measurement used the corresponding values are not immediately comparable.

3.4 In D7 the procedure for the measurement of the

shrinkage is described in paragraphs [0062] and [0063] as follows: "A sample was kept under a standard atmosphere (20°C and 65% relative humidity) for 24 hours and then its length (L_0) at 0.1 g/d load was measured. The sample was kept in a 190°C dry oven for 15 minutes under a non-tension condition, and left outdoors for 4 hours, and then its length (L) at 0.1 g/d load was measured. The shrinkage (%) of the sample was calculated from the following formula:
$$AS (\%) = (L_0 - L) / L_0 \times 100."$$

- 3.5 This procedure differs from the one mentioned in the patent in suit (paragraph [0074]) in that it is carried out **at higher temperature** (190°C vs 177°C), **for a longer time** (15' vs 2') and **without** tension, and whereby the shrunk yarn is then "left outdoors for 4 hours" before measuring again its length.
- 3.6 The Respondent argued that D7 did not disclose a meaningful, comparatively probative value for the dry heat shrinkage, especially in view of the fact that the sample was "left outdoors for 4 hours", i.e outside of the laboratory, and so left under non-standard and non-repeatable conditions of temperature and humidity for all steps, which impacted on the regain of the yarn.
- 3.7 For the Board, the statement "left outdoors for 4 hours" in D7 may not be given the meaning of "out of the laboratory", hence exposure under any variable weathering conditions, because this would contradict the fact that the statement in dispute is inserted in the description of a standard procedure for D7, which thus must be repeatable. Indeed, the only sensible technical meaning to be given to "outdoors" in this context is "out of the oven", hence under the standard conditions of the laboratory mentioned in the procedure

of D7. This meaning was confirmed by the Appellant, which declared at the oral proceedings that the correct translation from the original in Korean language to the English language was that the sample "was taken out of the oven".

- 3.8 Therefore the Board considers that D7 is highly relevant per se, for the following reasons:
- D7, paragraph [0036], third sentence, discloses directly and unambiguously that the "dry-heat shrinkage measured at 190°C for 15 minutes is **1%** (emphasis added by the Board) higher than that measured at 160°C for 30 minutes", which implies that the heat shrinkage value measured at e.g. 177°C, especially after two minutes, is necessarily lower than those mentioned in the examples of D7;
 - the lack of tension used in the method of paragraph [0054] of D7 implies a higher heat shrinking, compared to the tensioned methods of ASTM-D4974-04 (D15), referred to in the patent in suit;
 - apart from casting doubts, the fact of leaving outside of the oven the shrunk yarn under the conditions mentioned in paragraph [0062] of D7 (namely 20°C and 60% humidity), which represent standard conditions for testing synthetic fibres according to D27 (page 716, lines 11-13), has not been shown to give rise to any significant effect proving any appreciable divergence in the extent of shrinkage, not even by D25. D25 concerns the longitudinal swelling of the nylon filament upon immersion in water (see in particular points 7 and 8 thereof), a test condition however not disclosed by D7.
- 3.9 Summing up, all the test conditions used in the procedure of D7 for determining the shrinkage at high temperature are more severe than those used in the test

procedure of the patent in suit (see D15), so that the conditions used in D7 should lead to a higher yarn shrinkage than that produced by the tension/condition mentioned in D15.

- 3.10 Notwithstanding the severity of the test conditions used in D7, the mentioned shrinkage values of its yarns of Examples 2 and 3 are nevertheless less than 5%.
- 3.11 In view of this disclosure of D7, the Board is convinced that the yarn defined in Claim 1 at issue, if novel over D7, nevertheless has a comparable shrinkage with those illustrated by Examples 2 and 3 of D7.
- 3.12 As D7 discloses the importance of the low shrinkage for the production of airbag fabrics (e.g. in paragraph [0039], last sentence) and the means (relaxation conditions) to achieve low values thereof, the skilled person starting from D7, and faced with the technical problem posed, would have arrived in an obvious manner to a yarn with a low shrinkage as defined in Claim 1 at issue for use in the production of fabrics for airbags.
- 3.13 Therefore, Claim 1 according to the Main Request lacks an inventive step over D7, and, for this reason, the Main request is not allowable.

4. *First and Second Auxiliary Request*

4.1 *Admittance*

These requests had been filed some days before the oral proceedings, but in reaction to the Board's communication. The Appellant was able to react and to argue against them. The Board thus decided to admit these requests into the proceedings (Article 13 RPBA).

4.2 *Inventive step (Article 56 EPC)*

The invention relates to a one piece, woven airbag comprising an uncoated or a coated woven fabric made from the high tenacity, low shrinkage polyamide yarns of granted Claim 1, hence to automotive airbags (patent in suit, paragraph [0002]).

4.3 *The closest prior art*

At the oral proceedings, the Appellant invoked D1 or D7 as the closest prior art.

As D7 (paragraphs [0002] to [0005], [0009], [0041] to [0048] and Example 5) also relates to the production of woven, uncoated fabrics for airbags, whilst D1 merely mentions "airbags" in its background of the invention (page 2, line 10), without disclosing any production thereof, D7 remains the closest prior art for assessing inventive step according to the problem-solution approach.

4.4 *The technical problem*

At the oral proceedings, upon consideration of the alleged distinctions of the claimed subject-matter over D7 (such as "one-piece", air permeability and differently measured shrinkage), the Respondent invoked as the technical problem the provision of an airbag comprising a yarn of high tenacity with low shrinkage at higher more demanding temperature.

4.5 *The proposed solution*

One of the solutions defined in Claim 1 at issue to this technical problem is the **one piece, woven airbag**

comprising an uncoated woven fabric characterised by an air permeability in the range of **1 to 10 l/dm²/min** comprising a multifilament polyamide yarn having a tenacity measured according to ASTM D 885 equal to or greater than 80 cN/tex, a hot air shrinkage **measured at 177°C according to ASTM D 4974** of less than 5% and linear density no greater than 940 decitex.

4.6 *The success of the solution*

- 4.6.1 For the Board, it is immediately apparent that the problem identified above contains elements (the production of airbags) mentioned in the patent in suit (e.g. paragraphs [0009] to [0016]).
- 4.6.2 However, the said elements were not disclosed in relation to D7, which was not acknowledged in the application as filed, and so was not considered when formulating the original technical problem. In the patent (paragraph [0019]), the technical problem only focuses on "improved procedures for efficiently producing multifilament polyamide yarns", not on an improved yarn or uncoated fabrics therefrom over those known from D7.
- 4.6.3 It is further not apparent that sufficient evidence is on file in this respect, in so far as the comparative examples of the patent in suit do not concern D7, nor a particular effect across the whole breadth of Claim 1.
- 4.6.4 Moreover, as already established *supra* for the Main Request, the yarn of D7 has at least a comparable shrinkage at a higher temperature.
- 4.6.5 Thus, starting from D7, the problem has to be reformulated less ambitiously, namely as the provision

of a further airbag which can be cut from one piece of fabric, while simultaneously exhibiting a sufficiently high tenacity so that it resists tearing and bursting and stretching when deployed.

4.6.6 For the Board, this objective problem is effectively solved over D7 by the claimed airbag and takes into account the problems described in the application as filed, on which the contested patent was granted.

4.7 *Obviousness of the solution*

4.7.1 It remains to be decided whether the skilled person starting from the fabrics for airbags disclosed in D7 and wishing to provide further airbags which can be cut from one piece of fabric, while simultaneously exhibiting a sufficiently high tenacity in order to resist tearing, bursting and stretching when deployed, would have been motivated by D7 itself, or under consideration of common general knowledge, or by any other document, and would have arrived in an obvious manner at a one piece airbag as claimed.

4.7.2 D7 discloses in general ([0041] and [0043]) and in particular (Example 5) the preparation of an uncoated fabric fulfilling the low permeability requirement for airbag.

4.7.3 For the board, it is immediately apparent from the above passages that D7 discloses weaving procedures for tight fabrics for an airbag, which also apply to the yarns of its Examples 2 and 3, which have a lower shrinkage than those of Example 1 of D7 and used in the production of the fabric illustrated in D7, which is at least comparable, as established for the Main Request, with that of the claimed yarns.

- 4.7.4 D7 also discloses (paragraphs [0047], [0068], [0069] and Table 2) that the respective, uncoated woven fabric disclosed in the said passages of D7 respectively have an air permeability of less than $1.0 \text{ cm}^3/\text{cm}^2/\text{sec}$ (which appears to correspond to less than $6 \text{ l}/\text{dm}^2/\text{min}$, but measured according to a different Standard, namely ASTM D737, not in the appeal proceedings).
- 4.7.5 Therefore, the subject-matter making the first alternative of Claim 1 differs from the airbag disclosed by D7 in the following three instances:
(1) **one piece, woven airbag**, comprising an
(2) uncoated woven fabric characterized by an air permeability in the range of **1 to 10 l/dm²/min**,
(3) comprising a multifilament polyamide yarn having a hot air shrinkage **measured at 177°C according to ASTM D 4974** of less than 5%.
- 4.7.6 It has been established for the Main Request that feature (3), if at all differentiating, is obvious over D7 taken alone, in so far as according to D7 its yarn is suitable for making uncoated fabrics of low permeability for airbags, as it has a balance of comparable properties including low shrinkage tension.
- 4.7.7 Concerning feature (2), if differentiating (because only the determination is differently made), it has been invoked since the beginning of the opposition proceedings that the claimed air permeability of the uncoated fabric of the airbag is generally known (e.g. by Opponent 2, in its notice of opposition, Point V.C, with reference to D9, published well before D7; see background of the invention, column 1, lines 20-25). Thus, the claimed permeability, if not implied by D7 disclosing that its woven uncoated fabric has the low

air permeability required for airbags, is nevertheless obvious.

- 4.7.8 As regards the first distinction (one-piece airbag), especially after the filing of D29 at the oral proceedings (undisputedly showing that one-piece airbags produced by weaving with rapier weaving machines in multiple side by side bags were known at least since 1995), it is apparent to the Board that the skilled person starting from D7 (disclosing the use of rapier weaving machines for weaving its yarns, e.g. in paragraph [0041]) would obviously want to use the woven, uncoated fabrics of D7 also for the production of one-piece airbags.
- 4.7.9 Consequently, D7 taken in combination with common general knowledge on airbags obviously leads the skilled person to the claimed one-piece airbags made from uncoated, woven fabrics obtained from yarns of high tenacity and low shrinkage as disclosed by D7, which so lacks inventive step under Article 56 EPC.
- 4.7.10 It follows that the First and Second Auxiliary Requests are not allowable either.

5. *Third Auxiliary Request*

- 5.1 At the oral proceedings, the Appellant withdrew all its outstanding objections against the inventive step of the claimed process.
- 5.2 As regards the objection of lack of an inventive step on the basis of D2 in combination with D13, advanced by Opponent 2 against Claim 5 as granted (thus against Claim 1 of this request), the Board shares the position

of the Respondent there against as detailed in points 7.8 to 7.13 of its letter dated 16 October 2013.

5.3 Consequently, the Third Auxiliary Request complies with the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of the claims according to the third auxiliary request filed with letter of 30 March 2016 and a yet to be adapted description.

The Registrar:

The Chairman:



D. Magliano

J.-M. Schwaller

Decision electronically authenticated