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**Datasheet for the decision  
of 22 April 2021**

**Case Number:** T 0987/17 - 3.3.06

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**Language of the proceedings:** EN

**Title of invention:**

Polyamide-based multilayer tube for transferring fluids

**Patent Proprietor:**

ARKEMA FRANCE

**Opponent:**

Evonik Operations GmbH

**Headword:**

Polyamide-based multilayer tube/Arkema

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

Inventive step - main request (no)

**Decisions cited:**

T 1188/00

**Catchword:**



**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

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**Case Number: T 0987/17 - 3.3.06**

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.06**  
**of 22 April 2021**

**Appellant:** ARKEMA FRANCE  
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**Respondent:** Evonik Operations GmbH  
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**Decision under appeal:** **Interlocutory decision of the Opposition**  
**Division of the European Patent Office posted on**  
**2 February 2017 maintaining European Patent No.**  
**1717022 in amended form.**

**Composition of the Board:**

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

## Summary of Facts and Submissions

I. The appeal of the patent proprietor is against the interlocutory decision of the Opposition Division to maintain **European patent No. 1 717 022** in amended form on the basis of auxiliary request 1 filed with letter of 18 November 2016.

II. In the contested decision the subject-matter of claim 1 as granted, reading as follows:

*"1. Multilayer tube comprising, in its radial direction from the outside inwards:*

- a layer (1) made of nylon-11 or nylon-12 polyamide; and*

- an intermediate layer (2) comprising by weight, the total being 100 %:*

- 50 to 100% of at least one polyamide A1 of formula X, Y/Z or 6, Y2/Z, in which*

- X denotes residues of an aliphatic diamine having from 6 to 10 carbon atoms,*

- Y denotes residues of an aliphatic dicarboxylic acid having from 10 to 14 carbon atoms,*

- Y2 denotes residues of an aliphatic dicarboxylic acid having from 15 to 20 carbon atoms*

- Z denotes at least one unit chosen from:*

- . residues of a lactam,*

- . residues of an  $\alpha,\Omega$ -aminocarboxylic acid, and*

- . a unit X1, Y1, in which X1 denotes residues of a diamine and Y1 denotes residues of a diacid,*

- the weight ratios  $Z/(X+Y+Z)$  and  $Z/(C6+Y2+Z)$  being between 0 and 15%, and*

- 0 to 50% of nylon-11 or nylon-12 polyamide;*

*the layers being successive and adhering to one another without a coextrusion tie layer, said layer (2) being*

*the inner layer intended to be in contact with the fluid transported",*

was found to be obvious over the disclosure of document D3 (US 2004/0071913 A1).

- III. With its grounds of appeal, the appellant filed comparative tests D9. In response thereto, the opponent/respondent filed a further document (D10: EP 1 162 061 A1).
- IV. Following the provisional opinion of the board, the appellant *inter alia* filed two further comparative tests D9bis and D10.
- V. The respondent requested not to admit them as being late filed.
- VI. In a further communication, the board informed the parties that it did not intend to admit the comparative tests D9bis and D10 as their late filing was unjustified.
- VII. During the oral proceedings, which took place on 22 April 2021, the admittance of the comparative tests D9bis and D10 as well as the issue of inventive step over D3 taken as the closest prior art were discussed, in particular the technical effects shown by comparative examples D9, the transposition of these effects across the breadth of claim 1 and the question whether the effects were foreseeable for the skilled person. The final requests of the parties were as follows:

The **Appellant**/patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted.

The **Respondent**/opponent to dismiss the appeal.

### **Reasons for the Decision**

1. Admittance of late filed items of evidence
  - 1.1 The admittance of comparative tests D9 and of **document** D10 being at the board's discretion under Article 12(4) RPBA 2007, since the tests D9 were filed in reaction to the decision under appeal, objecting to the lack of comparison over PA-6,6, the board decided to admit them into the proceedings. Similarly, **document** D10 having been filed in immediate reaction to the filing of D9 and of the new effect allegedly proven thereby, it was also admitted.
  - 1.2 The admittance of **comparative tests** D9bis and D10 is at the discretion of the board under Article 13(2) RPBA 2020 because they have been filed after notification of the summons to oral proceedings.
  - 1.3 According to Article 13(2) RPBA, an amendment to appellant's appeal case made after after such notification shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.
  - 1.4 The appellant, with letter of 9 April 2021, has sought to provide such reasons. However, for the board they are not sufficient and convincing for the following reasons:

1.4.1 These late filed tests have neither been filed in reaction to the decision under appeal, nor do they arise from an amendment of the respondent's case in appeal proceedings, let alone can they be considered as a reaction to the board's notification, since they concern a comparison over a preferred embodiment (PA 6/12) of the polyamide defined in claim 1 and [0006] of closest prior art D3, also mentioned as "advantageous" in [0028] of D3, which prior art was already under discussion during the opposition proceedings, so that they could (and should) have been provided earlier, e.g. at the latest with the grounds of appeal.

In fact, in its grounds of appeal the patent proprietor (first page, last paragraph; second page, first paragraph) contested the passage in the decision under appeal where the polyamides of [0022] in D3 (including PA6 and PA6,6) were identified as preferred, and it jumped to [0125] and [126] of D3, which concern polyamide/polyolefin blends, and so the second embodiment mentioned in [0006] and claim 1 of D3, but not the closest embodiment, namely the "polyamides" defined in claim 1 or [0006]. Finally, the PA6,6 used in its comparative tests D9 (although not considered as preferred by D3) in combination with polyolefin EPRm is not the preferred polyamide mentioned in [0126] either (this being PA6).

It follows from the foregoing that, if the appellant wanted to provide comparative tests over the preferred polyamide of D3, it should also have provided with its grounds of appeal a comparison over the polyamides disclosed in paragraphs [0023] to [0028] of D3, hence over PA6/12 mentioned as advantageous.

1.4.2 Therefore, the board exercised its discretion and decided not to admit late filed comparative tests D9bis and D10 into the proceedings (Article 13(2) RPBA).

## 2. Inventive step

2.1 The patent ([0001] and [0002]) concerns a polyamide-based multilayer tube for transporting fluids, in particular those for taking fuel from the tank to the engines of motor vehicles.

2.1.1 According to the patent ([0003]), for safety and environmental protection reasons, these tubes are required to exhibit both good mechanical properties, such as pressure resistance, vibration resistance and flexibility, with good impact behaviour when cold and at high temperature. These tubes must also have good resistance to engine lubrication oils and fuels.

2.1.2 Still according to the patent ([0004]), the known polyamide-based tubes necessarily are multilayered because no polymer or polymer blend exists that has simultaneously the mechanical resistance and the resistance to the products transported. However, in most multilayer structures it is necessary to have adhesive layers in order to join the various polymer layers together.

## 2.2 Closest prior art

2.2.1 It is common ground that D3 discloses the closest prior art. The board has no reason to take a different stance as paragraphs [0001] and [0003] of this document relate to "polyamide hoses for compressed air" (i.e. "tubes for transferring fluids" as defined in the patent) and addresses the problems (see [0003]) arising from the



use of layered tubes made of nylon-11 or-12 for the outer layers and of nylon-6, containing plasticiser, residual caprolactam and maleic-anhydride-grafted EDPM and polyethylene, for the inner layers, whereby the nylon-11 or -12 outer layers are bonded to nylon-6 inner layers with a tie-layer such as nylon 6,12. The problems addressed include sufficient mechanical properties and their degradation due to exudation of plasticiser producing stiffened nylon-6 and residual caprolactam causing delamination.

- 2.2.2 Thus, D3 pertains to the same general technical field as the patent and addresses at least the good mechanical properties' problems.
- 2.2.3 Moreover, the two-layers structure as disclosed in e.g. claim 1 of D3 has a structure similar to that defined in claim 1 as granted.
- 2.2.4 In the decision under appeal, the tube of claim 6 of D3 was considered to be the closest embodiment. In its grounds of appeal, the patent proprietor argued that this was indeed a first selection made by the Opposition Division. However, in response to the board's opinion, considering instead that the embodiment of claims 6 and 1 was directly and unambiguously disclosed as such, the appellant no longer disputed that it could be taken as the closest prior art embodiment for assessing inventive step. For the board, this structure being directly and unambiguously disclosed in claim 6 and including the features of claim 1 is the best closest embodiment. That PA-11 or PA-12 is a preferred material for the outer layer is confirmed in [0136] of D3.

2.2.5 The closest embodiment of claim 6 thus discloses a multilayer tube with an outer layer of PA-11 or PA-12 and an inner layer chosen from polyamides (the first alternative material mentioned for the inner layer), polyamide/polyolefin blends with a polyamide matrix, copolymers having polyamide blocks and polyether block, and blends of polyamide with copolymers having polyamide blocks and polyether blocks, with the proviso that inner and outer layers are not PA-11 or PA-12.

2.2.6 The multilayer tube of claim 6 of D3 does not further specify the nature of the polyamide to be used, let alone does it directly and unambiguously disclose the polyamide A1 defined in claim 1 at issue.

Until the oral proceedings it was not in dispute that the claimed tubes differ from those of D3 only in the chemical nature of the inner layer (see e.g. statement of grounds of patent proprietor, page 2, point 2; letter of 29 March 2021, point 2.2, fifth paragraph). At the oral proceedings, the appellant invoked a further distinguishing feature over D3, namely that the claimed tube was prepared "*without a coextrusion tie layer*".

The board however notes that neither claim 1 nor [0006] of D3 require the presence of such a "tie layer", which according to [0138] of D3 is in fact defined as entirely optional. It follows that this feature cannot be acknowledged as a further distinguishing feature.

### 2.3 Technical problem

In its grounds of appeal, the patent proprietor formulated the technical problem to be solved over D3 as "to provide multilayer tubes having improved

mechanical properties and improved (inter-layer) adhesion" in particular in view of the results in the comparative tests D9.

At the oral proceedings, on the basis of the results shown in D9, the appellant invoked only "good (inter layer) adhesion" in addition to "improved mechanical properties".

#### 2.4 Solution

As a solution to the problem underlying the alleged invention, the patent as granted provides the multilayer tube according to claim 1, which is in particular characterised by the presence of

- *an intermediate layer (2) comprising by weight, the total being 100 %:*

- *50 to 100% of at least **one polyamide A1 of formula X, Y/Z or 6, Y2/Z, in which X denotes residues of an aliphatic diamine having from 6 to 10 carbon atoms, Y denotes residues of an aliphatic dicarboxylic acid having from 10 to 14 carbon atoms, Y2 denotes residues of an aliphatic dicarboxylic acid having from 15 to 20 carbon atoms Z denotes at least one unit chosen from:***
  - . *residues of a lactam,*
  - . *residues of an  $\alpha,\Omega$ -aminocarboxylic acid, and*
  - . *a unit X1, Y1, in which X1 denotes residues of a diamine and Y1 denotes residues of a diacid, the weight ratios  $Z/(X+Y+Z)$  and  $Z/(C6+Y2+Z)$  being between 0 and 15%, and*
- *0 to 50% of nylon-11 or nylon-12 polyamide; the layers being successive and adhering one another without a co-extrusion tie layer.*

## 2.5 Success of the solution

2.5.1 As D3 was not acknowledged in the application from which the patent at issue was granted, this prior art document was not considered when formulating the technical problem to be solved originally. As apparent from [0003] and [0006] of the patent, as well as from the comparison in the original examples over a tube made of two layers of PA-11, the technical problem was simply formulated as to provide a multilayer tube having good mechanical properties such as pressure resistance, vibration resistance, and flexibility, with good impact behaviour when cold and at high temperature, as well as good resistance to engine lubrication oils and fuels. There is however no mention of an improvement, let alone of an improved adhesion. Thus, the technical problem invoked by the appellant in its statement and at the oral proceedings has been formulated for the first time in appeal proceedings.

2.5.2 The board notes that it is established case law (see e.g. **T 1188/00** of 30 April 2003) that a formulation of a more ambitious technical problem first alleged in the opposition/appeal proceedings cannot be used to substantiate inventive step unless it is plausibly demonstrated that the alleged improved effect could be achieved across the whole scope of the claim. The burden of proof however lies with the proprietor in this respect.

2.5.3 Therefore, in the case at issue, the board has strong reservations that the problem is effectively solved across the breadth of claim 1 at issue, because:  
- a technical problem based on an improvement in adhesion may not be allowed, as having not been formulated originally;

- the comparative tests in the patent are not made over a tube according to D3, but over a two-layers tube of only PA-11;
- the closest embodiment of claim 6 of D3 is open as to the nature of the polyamide and neither requires the presence of e.g. elastomers such as the EPRm used in D9, nor of a tie layer;
- although D9 shows an improvement for the particular tube J, having PA6,10 and polyolefin as the inner layer material, there are no comparative example in D9 with polyamides as such, i.e. without elastomers, let alone with the co-polyamides disclosed under "polyamides" in D3;
- comparative test D8 (filed in opposition with letter of 26 May 2015) does not concern PA6,6 but PA6, mentioned not only in [0022] of D3 but also in [0126]. Moreover, the tubes tested do not differ only in the kind of PA but also in their material formulation, such as the different amount of elastomer, plasticiser and stabiliser, and the results show that the presence of polyolefin or of a further polyamide such as PA11 greatly influences the mechanical properties such as the crash test at low temperature (shock), in so far as a PA-6,10\* has a result in such a test which is slightly lower than the threshold for acceptance (47 vs 50, compared to 20 for the PA-6,10 with elastomer), although using only 10% of PA11. Hence, as already expressed in the communication in preparation for oral proceedings, it has **not** been plausibly shown that the claimed multilayer tube has improved mechanical properties over the multilayer hoses of claims 1 and 6 of D3 across the whole breadth of claim 1 at issue.

2.5.4 Nevertheless the board assumes *arguendo*, in favour of the appellant, that in view of D3 the formulation of the technical problem to be solved can be seen - as

invoked by the appellant at the oral proceedings - in the provision of "a multilayer tube *inter alia* (see [0003] of the patent) exhibiting improved impact behaviour when cold and good (inter layer) adhesion upon coextrusion".

2.5.5 The board also assumes in favour of the appellant that the single improvement shown in D9 is transposable and thus achieved across the entire breadth of claim 1 at issue, so that the technical problem invoked by the appellant would be effectively solved.

2.6 Obviousness of the proposed solution

2.6.1 It remains to be assessed whether the skilled person starting from D3 and facing the above problem would have been motivated to implement the generic closest embodiment disclosed in D3, claims 1 and 6, over the whole teaching of D3 and thereby would have arrived in an obvious way at a multilayer tube as defined in claim 1 at issue.

2.6.2 For the board the relevant disclosure in respect of the "inner" layer and homo-polyamides of the claimed type X,Y is found in paragraphs [0006], [0019], [0021] and [0022], more particularly [0021] of D3.

According to [0019] and [0021], the polyamide defined in claim 1 and in [0006] of D3 encompasses not only the PA-6,6 mentioned in [0022] as exemplary, but also the polyamides obtained from the reaction of diamines, such as hexamethylene diamine (C<sub>6</sub>), and e.g. sebacic (C<sub>10</sub>) or dodecanedicarboxylic acids (C<sub>12</sub>), i.e. *inter alia* PA-6,10 and PA-6,12, both falling under claim 1 at issue and being tested in the comparative examples of the appellant. All of the polyamides unambiguously

implied by [0021], including PA6,10 and PA6,12, are however on the same level of preference as PA6,6 within D3.

2.6.3 Thus, the question which arises is whether the skilled person faced with the problem posed, in particular improved shock resistance and good adhesion, was motivated and so would have used for the inner layer any of PA-6,10 or PA-6,12 as the "polyamides" mentioned first in claim 1 and in [0006] of D3.

2.6.4 As regards the improved shock resistance shown by D9, the board accepts the respondent's argument that this was foreseeable from D4 (EP 1 216 825 A2)/paragraph [0002] lines 12-17), which discloses that polyamides PA6 and PA6,6 have less impact resistance than *inter alia* PA6,12.

2.6.5 The appellant's counter-argument that the structure of the polyamides of D4 is different from those of claim 1 at issue, and so the combination of D3 and D4 was retrospective, is not convincing, because paragraph [0002] of D4 concerns the general background and thus the same technical field as D3 and the patent and concerns general properties of the materials for the inner layer such as chemical resistance, mechanical properties and temperature resistance, so that it concerns a known background/knowledge of the skilled person in the technical field at issue.

2.6.6 Furthermore, as regards the alleged "good adhesion" shown by D9, the board shares/accepts the respondent's argument that D4/paragraph [0004], lines 27-29, discloses that in coextruded bilayer tubes having one layer of PA11 or PA12, polyamides such as PA6 and PA6,6 have no or not good (inter-layer) adhesion.

Furthermore, that D10/paragraph [0028], lines 39-41, discloses that polyamides such as PA6,12 and PA6,10 exhibit good, resistant and long-lasting (inter-layer) adhesion to PA11 or PA12.

2.6.7 The appellant's counter-argument that the structures of D4 and D10 are different from those of claim 1 at issue and comprise a barrier layer of EVOH, and thus that the combination with D10 is retrospective, is not convincing, in so far as [0028], first sentence, of D10 states "dass Polyamide aus der Gruppe aus [...], Homopolyamid 612 (= **Polyamid 612**), **Polyamid 610**, [...], gleichzeitig eine gute, beständige und dauerhafte Haftung sowohl zu EVOH als auch zu Polyamid 12 oder Polyamid 11 sicherstellen", i.e. that polyamides 6,10 and 6,12 have good adhesion properties towards PA11 and PA12. Hence, paragraph [0028] of D10 does not disclose specific structures but general adhesion properties between known polyamides. Finally, D10 concerns the same technical field as the patent (see [0001], first two lines), i.e. multilayer tubes for transferring fuel (Kraftstoff) (as well as the general requirements for multilayer fuel tubes, the outer layer of which is PA11 or PA12 (see paragraphs [0009] and [0010])). As to D4 (e.g. paragraph [0004]), it discloses a coextruded **bilayer** tube (see line 26) for transferring fluids such as fuel and concerns the inter-layer adhesion thereof.

2.6.8 Therefore, the skilled person working in the technical field of the patent, starting from D3 and considering the disclosure of its paragraph [0021], would have used polyamides such as PA6,12 for implementing the inner layer of the multilayer tube according to claims 1 and 6 of D3 in the expectation of achieving improved shock resistance and good inter-layer adhesion with PA11 or PA12 over the polyamides such as PA6,6 encompassed in



[0021] of D3, in view of his background knowledge on the general properties of the polyamides for multilayer tubes for transferring fluids as apparent from D4 and D10. Thereby it would have arrived in an obvious way at a multilayer tube with an outer layer of PA11 or PA12 and an intermediate layer made of e.g. PA6,12, i.e. a polyamide A1 as defined in claim 1 at issue.

2.6.9 The board thus concludes that the subject-matter of claim 1 as granted was obvious over D3 taken as the closest prior art (Article 56 EPC).

2.7 Since the ground of opposition under Article 100(a) EPC (lack of an inventive step) prejudices the maintenance of the patent as granted, the (sole) request on file of the appellant cannot be allowed.

## Order

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

The appeal is dismissed.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated