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D E C I S I O N
of 22 October 2003

Case Number: T 0707/98 - 3.3.7

Application Number: 91307611.3

Publication Number: 0476836

IPC: B32B 27/08

Language of the proceedings: EN

Title of invention:
Biaxially oriented laminated film

Patentee:
KUREHA KAGAKU KOGYO KABUSHIKI KAISHA

Opponent:
W. R. Grace & Co - CONN.

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0707/98 - 3.3.7

DECISION
of the Technical Board of Appeal 3.3.7
of 22 October 2003

Appellant:
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Respondent:
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 26 May 1998
revoking European patent No. 0476836 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: R. E. Teschemacher
Members: P. A. Gryczka
B. J. M. Struif

Summary of Facts and Submissions

- I. The mention of the grant of European patent No. 0 476 836 in respect of European patent application No. 91 307 611.3, filed on 19 August 1991, was published on 15 November 1995.
- II. A notice of opposition was filed on 15 August 1996 in which revocation of the patent in its entirety was requested on the grounds of added subject-matter (Article 100(c) EPC) and lack of an inventive step (Article 100(a) EPC).

The following documents were cited *inter alia* during the opposition proceedings:

D1: EP-A 0 331 509

D2: US-A 4 188 443

- III. In a decision issued in writing on 26 May 1998, the Opposition Division revoked the patent. That decision was based on an amended set of claims 1 to 10 (sole request). Claim 1 read as follows:

"A biaxially oriented laminated film which comprises:

- (i) a surface layer of a polyester produced by polycondensing
 - (a) one or more aromatic dicarboxylic acids including not less than 88 mol% terephthalic acid and
 - (b) a dialcohol containing ethylene glycol as the main ingredient,
- (ii) an intermediate layer of a polyamide having a melting point of from 160°C to 210°C; and

(iii) a heat-sealing layer of an α -polyolefin having a melting point of from 110°C to 150°C; the thickness of the polyester layer being less than the thickness of the polyamide layer." (emphasis added on the difference with claim 1 as granted).

In its decision the Opposition Division held that:

- (a) The objection under Article 100(c) EPC was fully overcome by the correction of a printing error in claim 1.
- (b) Novelty of the claimed subject-matter was not disputed and none of the available prior art documents was prejudicial to said novelty.
- (c) With regard to inventive step, the film according to example 7 of D1 represented the closest prior art.
- (d) The preferred films according to the opposed patent differed from D1 only in that the outer layer was a polyester layer instead of a polyolefin layer. The comparative tests in the opposed patent did not demonstrate that the alleged effects of the invention were actually due to said distinguishing feature. Consequently, the technical problem to be solved was only the provision of a further heat-shrinkable film as an alternative to that of D1.

- (e) In the examples of D2 both outer layers could be made of polyester, wherein one of them had the same function as the thin polyolefin layer of the film of example 7 of D1. The skilled person would therefore expect that by substituting the thin polyolefin layer of example 7 of D1 by a polyester layer of the same thickness disclosed in the examples of D2, the properties of the resulting film would still be comparable.
- (f) The subject-matter of claim 1 of the opposed patent was consequently not based on an inventive step.

IV. The Proprietor (Appellant) filed a notice of appeal against the above decision. With the statement setting out the grounds of appeal dated 24 September 1998, the Appellant filed the results of a comparative test.

In the letter dated 19 April 2000, the Appellant referred to the further document:

D4: JP-A-58 175 658 in the form of its English translation

With a letter dated 30 September 2003 the Appellant filed five auxiliary requests.

V. By letter dated 27 September 2003, the Respondent (Opponent) submitted the further document:

D5: Japanese patent N° Sho 55-3137 (1980), in the form of its English translation

VI. Oral proceedings took place on 22 October 2003.

VII. The Appellant's arguments can be summarised as follows:

- (a) D1 or alternatively D4 could be taken as closest prior art document.
- (b) Experimental evidence demonstrated that the films according to the patent in suit had improved packaging properties when compared to the films of D1. Thus, the technical problem underlying the invention in the opposed patent was not only to provide an alternative to the films of D1, but to improve their packaging properties and transparency after heat sterilisation.
- (c) D2 did not specifically concern food packaging and could not be combined with D1. Furthermore, replacing the thin polyethylene layer of example 7 of D1 by a thin polyester layer of D2 was not obvious since the resulting polyamide/polyester film laminate was known to be difficult to stretch.
- (d) The problem underlying the opposed patent started from the fact that biaxially stretching polyester/polyamide laminate films was known to be difficult. This problem was not mentioned in D1, but was addressed in D4 which could thus be considered as an appropriate starting point. The stretching processability of the films disclosed in D4 was however not satisfactory and the opposed patent solved that problem by using a polyamide having a specific melting point, by ensuring that the polyester layer was thinner than the polyamide layer and by including a heat sealing layer of an olefin resin with an appropriate melting point.

None of these requirements could be deduced from the cited prior art.

- (e) Consequently, the claimed subject-matter involved an inventive step.

VIII. The Respondent's arguments can be summarised as follows:

- (a) D1 addressed the problems of stretchability, heat sealing properties and transparency and aimed therefore at the same objectives as the patent in suit. D1 was thus the closest prior art document.
- (b) No improvements were shown in comparison with the closest prior art. The technical problem solved by the laminated film of the disputed patent was therefore only the provision of a further heat-shrinkable film as an alternative to that of D1.
- (c) By replacing one of the polyolefin layers of the film of example 7 of D1 by a polyester layer according to D2, the skilled person would have arrived at the claimed subject-matter. There was no prejudice against stretching of polyamide/polyester laminates, since D4 and D5 disclosed the successful stretching of this type of films.
- (d) No inventive step could be acknowledged even if the claimed films presented advantages over the closest prior art, since according to D2 films having a polyester or copolyester layer had improved optical clarity, hot seal strength,

sealability, and additionally improved scratch resistance if that layer was an outer layer.

- (e) The claimed subject-matter was also obvious from the combination of D1 with D4 which disclosed biaxially stretched films comprising a laminate of polyethylene terephthalate (PET) and a polyamide having a melting point of 150°C or less. As the film of D1 had already excellent sealing properties, the skilled person would have recognised that the heat-sealability of the polyamide layer was not crucial and that polyamides having a higher melting point could be used.
- (f) The claimed subject-matter was also obvious from the combination of D1 with D5. According to example 2 of D5, a film laminate with the structure PET/adhesive/nylon-12 had good packaging properties. It was therefore obvious to modify the film of example 7 of D1 by replacing one of the polyolefin layers by a PET layer to improve the packaging properties.
- (g) Even if D4 was considered as the closest prior art, this document in combination with D1 would still render the claimed subject-matter obvious.
- (h) The subject-matter of the patent in suit was also not inventive if D5 was considered as the closest prior art document, since it was obvious to the skilled person to add a polyolefin layer to the film of example 2 of D5 in order to produce films with improved sealability.

- (i) Consequently, the claimed subject-matter did not involve an inventive step.

IX. The Appellant requested that the decision under appeal be set aside and that the patent be maintained in the version underlying the decision under appeal (main request) or on the basis of one of the auxiliary requests filed with the letter dated 30 September 2003.

X. The Respondent requested that the appeal be dismissed.

Reasons for the Decision

- 1. The appeal is admissible.

Main request

- 2. The findings in the decision under appeal that the amendment in claim 1 had overcome the objection under Article 100(c) EPC and that the claimed subject-matter was novel have not been challenged by the Respondent. The Board sees no reason to take a different view.

Inventive step

- 3. The patent in suit concerns biaxially oriented laminated films suitable for packaging.
 - 3.1 The Respondent and the Opposition Division considered example 7 of D1 as representing the closest prior art. Since also the Appellant addressed D1 as a suitable starting point the Board considers it as appropriate to

start the assessment of inventive step from that prior art document.

3.1.1 D1 relates to a heat-shrinkable laminated film comprising at least two layers, namely a mixed aliphatic polyamide resin layer (A) comprising 55 to 90 wt% of an aliphatic polyamide resin having a crystalline melting point of 175 to 240°C, and 45 to 10 wt% of an aliphatic polyamide resin having a crystalline melting point of from not less than 120°C to less than 175°C, and a mixed resin layer (B) comprising a saponified ethylene-vinyl acetate copolymer (EVOH resin) as the main constituent (claim 1).

The heat-shrinkable laminated film can further comprise another thermoplastic resin, preferably at least one olefin resin layer (page 3, lines 42 to 45; claim 7). The olefin resin layer may be disposed either between the layer (A) and the layer (B), or preferably on one side or both sides of the laminated film of the layers (A) and (B). By laminating the olefin resin layer, it is possible to improve the extrusion property, dimensional stability, and to provide the laminated film with an excellent sealing property (page 4, lines 2 to 6).

According to example 7 a film composed of the following six layers was produced:

- first layer (polyolefin resin layer): very low density polyethylene; thickness 4 µm;
- second layer (adhesive layer): carboxylic acid modified ethylene-vinyl acetate-acrylic acid copolymer; thickness 2 µm;

- third layer (EVOH resin layer): mixture of saponified ethylene-vinyl acetate; thickness 6 μm ;
- fourth layer (polyamide resin layer): mixture of nylon 6-66 copolymer and nylon 6-69 copolymer in a ratio 7/3; thickness 12 μm ;
- fifth layer (adhesive layer): carboxylic acid modified ethylene-vinyl acetate-acrylic acid copolymer; thickness 2 μm ;
- sixth layer (polyolefin resin layer): mixture of very low density polyethylene and ethylene- α -olefin copolymer in a ratio 9/1; thickness 20 μm (paragraph bridging pages 4 and 5; table 1 at pages 6 and 7; table 2 at page 8).

The film of example 7 shows a heat shrinkage of 27% and 28% in respectively the longitudinal and transverse length; its stretchability is rated very good and its dimensional stability is defined as practicable (tables 2 and 3, pages 8 and 9). The amount of oxygen which permeates through the film at 30°C is 65 $\text{cm}^3/\text{m}^2.\text{day}.\text{atm}$.

3.1.2 According to D1 the lamination of an EVOH resin layer and a polyamide resin layer did not always produce a film having satisfactory stretchability and heat-shrinkability (page 2, lines 23 to 24). Thus, D1 aims at a laminated film with an EVOH resin layer and a polyamide resin layer having not only high gas barrier property and heat resistance, but also being excellent in stretchability, heat-shrinkability and dimensional stability. For that purpose D1 teaches the use of a

mixed polyamide resin layer comprising, in a specific weight ratio, two different polyamide resins having specific crystalline melting points (page 2, lines 34 to 42).

The laminated films of D1 can be used as food packaging films which do not produce any ply separation during a high-temperature treatment in a sterilization and heat shrinkage process and have also a good adhesiveness with the content (page 4, lines 48 to 57).

Problem and solution

3.2 In a test report of the Appellant, the properties of a film which is prepared in accordance with example 7 of D1 are tested under the conditions set out in the opposed patent (Annex III of the Appellant's letter dated 24 September 1998). The results observed are compared with those mentioned in the patent in suit for the film according to example 4 (table 3, page 7).

3.2.1 The experimental data show that the stretching processability, the packaging properties and the transparency after shrinkage of the film according to the opposed patent are better than those of the film according to example 7 of D1, while maintaining at the same level the oxygen permeability, heat shrinkage and heat sealing property. Whereas the stretching processability is improved from "3" to "4" on the rating scale and the transparency after shrinkage from "2" to "3", the packaging properties of the film of the opposed patent are rated with "3", which represents a considerable improvement when compared to those of the prior art film which are rated "1". In accordance with the opposed patent, the improved packaging properties

(rating "3") mean that during a packaging operation involving a pillow type packaging machine at a speed of 10 m/min, the film according to the opposed patent does not adhere to the sealing bar and stable packaging and bag forming were achieved, whereas the film prepared according to the prior art (rating "1") is unsuitable for automatic packaging, stable packaging and bag forming being impossible in view of the adhesion of the film to the sealing bar, or its shrinkage (table in Annex 3; patent in suit, page 8, lines 1 to 36).

- 3.2.2 The Respondent and the Opposition Division argued that the Appellant has not demonstrated that the improvement of properties were due to the distinguishing feature of the claimed films with regard to the closest prior art, said difference being only the chemical nature of one of the outer layers.

It has never been contested that the film of example 4 of the patent in suit not only differs from the closest prior art with respect to its outer layer. However, the data provided by the Appellant show unambiguously that the packaging properties of the film according to the closest prior art are not satisfactory, in particular since it does not meet the requirements for automatic packaging. Furthermore, not only the film of example 4, but also all the exemplified films of the patent in suit have good packaging properties (rating "3") and do not show the drawbacks of the films of D1 (examples 1 to 4, table 3, page 7). Since the Respondent has not shown any evidence to the contrary, it can be accepted that the films within the ambit of the claims have improved packaging properties when compared to the

closest prior art film. Consequently, any additional evidence from the Appellant is not required.

- 3.2.3 Hence, the problem underlying the patent in suit over D1 may be seen in providing a biaxially oriented film which has improved packaging properties and transparency after shrinkage, as well as adequate oxygen permeability, heat shrinkage and heat sealing properties.
- 3.2.4 That problem is solved by a biaxially oriented laminated film comprising a surface layer of a specific polyester produced from dicarboxylic acids including not less than 88 mol% of terephthalic acid, an intermediate layer of a polyamide having a melting point of from 160°C to 210°C, and a heat-sealing layer of an α -polyolefin having a melting point of from 110°C to 150°C, whereby the thickness of the polyester layer is less than the thickness of the polyamide layer (claim 1).
- 3.2.5 As shown in Examples 1 to 4 of the patent in suit, the melting point of the polyamide and the ratio between the thickness of the polyamide layer and the thickness of the polyester layer have a positive effect on the characteristics of the laminated film. In contrast thereto, in Comparative Example 1, since the content of terephthalic acid of PET-3 (polyester layer) is only 80 mol%, the film adheres to the sealing bar, the dimension stability is poor and a shrinkage of not less than 8% is caused. In Comparative Example 2, since the melting point of PA-2 (polyamide layer) is as low as 135°C, the variation in the dimensions of the film and in the load of the extruder is great and the

stretchability is unstable. In addition, the film thickness is not uniform. In Comparative Example 3, since the thickness of the polyester layer (PET-1) is larger than the thickness of the polyamide layer (PA-1), stretching of the film is impossible. In Comparative Example 4, since the melting point of the polyamide layer (PA-3) is as high as 265°C, stretching of the film is impossible. In Comparative Example 5, where the two outer layers are made of a polyolefin, the packaging property and the transparency after shrinkage are poor (Table 3, page 7; page 8, lines 40 to 50).

- 3.2.6 Consequently, the examples of the patent in suit show that the technical problem as defined herein above has effectively been solved by the biaxially oriented film according to claim 1.

Obviousness

- 3.3 It remains to be decided whether the claimed subject-matter is obvious with regard to the documents on file.
- 3.3.1 The Respondent argued that it was obvious for the skilled person to replace one of the outer polyolefin layers of the film according to example 7 of D1 by the thin polyester layer of the film of example 4 of D2 and to arrive thereby to the claimed oriented films.
- 3.3.2 Although D1 mentions the possibility of laminating other thermoplastic resin layers on the EVOH layer and the polyamide layer, such as olefin resins (page 3, lines 42 to 45, example 7), the document neither discloses nor suggests films comprising an external polyester layer. There is no hint in D1 to a polyester

layer as such, nor any suggestion which would provide an incentive to exchange one of the outer olefin layers.

3.3.3 D2 discloses a heat shrinkable, multi-layer, flexible, thermoplastic packaging film comprising: (a) at least three layers of polymeric material; (b) at least one of said layers being an inner layer and comprising a polymer selected from the group consisting of: (i) homopolymers, copolymers, and terpolymers of ethylene and (ii) blends of ethylene homopolymers or copolymers with butylene homopolymers or copolymers, said inner layer comprising 50% to 90% of the total thickness of said laminate; (c) another of said layers comprising a polymer selected from the group consisting of polyesters and copolyesters, said layer being stretch oriented (claim 1). In the examples different laminated films are disclosed which may include one or two polyester layers in the form of an outer and/or inner layer. According to example 4, specifically mentioned by the Respondent, a five layer film with the following structure is disclosed: polyester / ethylene-vinyl acetate copolymer (EVA) / polyester / EVA / ethylene-propylene copolymer (EP). This film is suitable when one of its surfaces needs the hardness and scratch resistance provided by the polyester (example 4, column 7).

However, D1 and D2 neither refer to films containing simultaneously polyamide and polyester layers nor provide any suggestion to use a specific thickness ratio of said layers in order to improve the stretchability of the films. Furthermore, according to D2, unbalanced films, characterised by the presence of layers having different properties, are less

satisfactory than films of balanced nature where the layers are made of materials having compatible properties, in particular shrink properties (example 6, paragraph bridging columns 7 and 8). This teaching does not provide a suggestion to the skilled person to replace one of the polyolefin layers in the film of example 7 of D1 by a polyester layer, as he would introduce into the film a layer having different shrink and stretching properties and thus increase the unbalanced nature of the film.

Consequently, there is no incentive in D2 to modify the films of D1 in a direction as claimed.

- 3.3.4 D4 discloses a laminated biaxially stretched film comprising a PET film and a polyamide copolymer film, having a melting point of not more than 150°C, laminated on at least one side of said PET film (claim 1). A modified polyolefinic resin layer can be used as adhesive (page 6, lines 6 to 8). The films may further comprise a polyethylene film laminated thereon (page 9, second paragraph). Although there is no general teaching in relation to the thickness of the layers, in all the examples of D4 the thickness of the PET layer (140 µm, 120 µm) is considerably larger than the thickness of the polyamide layers (30 µm, 50 µm; examples 1 and 2).
- 3.3.5 D5 discloses composite films obtained by laminating (A) a polyethylene terephthalate film and (B) the film of a non-(A) polymer whose stretching temperature is in the range from 70°C to 120°C, across an interposed adhesive whose main component is selected from urethane-modified polyester, polyalkyleneimine, alkylated titanium, and self-crosslinking acrylic resin, and by subsequently

subjecting the laminate to a monoaxial or biaxial stretch (claim 1). D5 does not disclose the possibility of adding to the films, containing simultaneously a polyamide and a polyester layer, an outer polyolefin layer as required by the patent in suit. Furthermore, in the exemplified films of D5 the thickness of the polyester layer is larger than the thickness of the polyamide layer (example 1, PET layer: 450 μm , nylon 6 layer: 30 μm ; example 8, PET layer: 35 μm , nylon 12 layer: 25 μm ; comparative example PET layer: 450 μm , nylon 6 layer: 40 μm).

- 3.3.6 Comparative example 3 of the patent in suit shows however that when the thickness of the PET layer is larger than the thickness of the polyamide layer stretching is impossible. Consequently, there is no hint in D4 or D5 to modify the films of D1 in the direction as claimed.
- 3.3.7 Therefore, the replacement of one of the polyolefin layers of the film of D1 by a polyester layer of a film disclosed in D4 or D5 is not obvious for a skilled person.
- 3.3.8 Consequently, the claimed subject-matter involves an inventive step when starting from D1 as the closest state of the art.
- 3.4 No other conclusion is reached when starting from D4 or D5 as the closest prior art document.
- 3.4.1 According to the patent in suit, laminated films consisting of a polyamide resin layer and a polyester resin layer are not easy to stretch and it is difficult

to heat-seal them in automatic packaging. As a countermeasure polyolefins are used as heat-sealing layer and, as the layers have different degrees of orientation, an adhesive layer is inserted between them. It is however still impossible to obtain thereby films with a high interlaminar strength and a sufficient sealing strength and a transparency which are not reduced after sterilisation processes (page 2, lines 5 to 24).

The solutions proposed to these problems by different prior art documents are not satisfactory in terms of their heat-sealing properties, transparency and their ability to be stretched (page 2, lines 25 to 38).

Consequently, the patent in suit is concerned with solving the problems linked to stretched polyester films (page 2, lines 57 and 58).

- 3.4.2 D4, which is cited in the application as originally filed (page 2, last paragraph) mentions the problems linked to the stretching of polyester(PET)/polyamide films and aims at providing a simple method for manufacturing PET/polyamide multi-layer biaxially stretched films (page 4, lines 7 to 9; second paragraph).
- 3.4.3 D5 relates also to problems similar to those of D4, linked to the processability and properties of films comprising a polyester layer (PET) and a layer made of polyamide. Whereas the films of D4 may contain a polyolefin layer (see point 3.3.4 above), D5 does not disclose the possibility of adding to the films containing simultaneously a polyamide and a polyester layer an outer polyolefin layer as required by the

patent in suit. The layer structure of the films of D4 is thus closer to the claimed subject-matter than the layer structures disclosed in D5. D4 is thus a better starting point than D5 for the assessment of inventive step.

- 3.4.4 Since the claimed relation of the thickness of the polyester layer to the polyamide layer has a positive effect on stretchability (see point 3.2.5 above), the technical problem when starting from D4 as the closest prior art could be defined as providing films having better stretchability properties.
- 3.4.5 The examples of the patent in suit which are all characterised by a high rating of the stretching processability show that this technical problem has effectively been solved by the biaxially oriented film according to claim 1.
- 3.4.6 Whilst D4 mentions the difficulty of stretching a film comprising polyester and polyamide layers (page 4, lines 7 and 8), the patent in suit provides evidence as to the importance of the relative thickness of the polyester and the polyamide layer for the stretchability of the films. If the thickness of the polyester layer is less than the thickness of the polyamide layer the stretchability of the film is improved (see point 3.2.5 above). As mentioned above (points 3.3.4 and 3.3.5), D4 and D5 disclose only films wherein the thickness of the polyester layer is larger than the thickness of the polyamide layer. The teaching of D4 and D5 with respect to the thickness of the layers is thus clearly opposite to the requirements of the opposed patent. Thus, it cannot be assumed, as

argued by the Respondent, that the adjustment of the thickness was solely based on routine experimentation.

D1 and D2 do not refer to films containing simultaneously polyamide and polyester layers so that the information that the stretchability of such films would be improved by using a specific ratio of thickness of the layers made of these components cannot be derived from these documents.

Consequently, the claimed thickness requirement cannot be derived from D4 or from any of the other cited documents.

3.4.7 Therefore also when starting from D4 as closest prior art, the Respondent has not convincingly shown that the claimed subject-matter does not involve an inventive step. In these circumstances it can be left open whether the melting point of the polyamides according to the opposed patent provides a further distinction over D4.

3.4.8 The same considerations as outlined under points 3.4.3 to 3.4.6 apply when starting from D5 as the closest prior art.

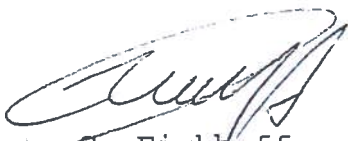
3.5 From the above it follows that the claimed subject-matter involves an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent in the following version:
 - claim 1 as granted with the amendment submitted in the letter of 7 March 1997
 - claims 2 to 10 as granted
 - description pages 2 to 8 as granted.


The Registrar:



C. Eickhoff



The Chairman:



R. E. Teschemacher

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