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D E C I S I O N
of 7 August 2001

Case Number: T 0392/98 - 3.3.3

Application Number: 93100018.6

Publication Number: 0554654

IPC: C08J 7/04

Language of the proceedings: EN

Title of invention:
Polyester Film

Applicant:
Mitsubishi Polyester Film Corporation

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84

Keyword:
"Clarity (yes) - obvious interpretation"
"Novelty (yes) - no implicit disclosure"
"Inventive step (yes) - unobvious parameter"

Decisions cited:
-

Catchword:
-



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Boards of Appeal

Chambres de recours

Case Number: T 0392/98 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 7 August 2001

Appellant: Mitsubishi Polyester Film Corporation
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Tokyo (JP)

Representative: Ter Meer Steinmeister & Partner GbR
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 24 October 1997
refusing European patent application
No. 93 100 018.6 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: R. Young
Members: P. Kitzmantel
J. C. M. De Preter

Summary of Facts and Submissions

- I. This appeal, which was filed on 10 December 1997, lies against the decision of the Examining Division posted on 24 October 1997, refusing European patent application No. 93 100 018.6 filed on 4 January 1993 in the name of DIAFOIL HOECHST CO., LTD. (now Mitsubishi Polyester Film Corporation) and published under No. 0 554 654. The appeal fee was paid together with the Notice of Appeal and the Statement of Grounds of Appeal was filed on 3 March 1998.
- II. The decision under appeal was based on sets of claims of a main and of three auxiliary requests.

(i) Claim 1 of the main request read as follows:

"A polyester film which is biaxially oriented and again oriented in the machine direction and having a coating layer formed on at least one surface of said film, wherein the polyester of the polyester resin film is a polyethylene terephthalate at least 80 % of repeating units of which are ethylene-terephthalate units, polyethylene naphthalate at least 80 % of repeating units of which are ethylene-naphthalate units, or poly-1,4-cyclohexane dimethylene terephthalate units at least 80 % of repeating units of which are 1,4-cyclohexane dimethylene-terephthalate units, and wherein said coating layer contains at least 50 % by weight of a water-soluble or water-dispersible polyester resin, characterized in that said

water-soluble or water-dispersible polyester resin has a glass transition temperature of 20°C to 70°C, and that said polyester film has a F_5 strength value of at least 127.4 N/mm² (13 kgf/mm²) in the machine direction."

- (ii) Claims 1 of the first and second auxiliary requests differed from Claim 1 of the main request by the deletion of the passage "or poly-1,4-cyclohexane dimethylene terephthalate units at least 80 % of repeating units of which are 1,4-cyclohexane dimethylene-terephthalate units" and by the additional deletion of the passage "polyethylene naphthalate at least 80 % of repeating units of which are ethylene-naphthalate units", respectively.
- (iii) Claim 1 of the third auxiliary request read as follows:

"A polyester resin film which is biaxially oriented and again oriented in the machine direction and having a coating layer of a thickness of from 0.03 to 2 µm formed on at least one surface of said film, wherein the polyester of the polyester resin film is a polyethylene terephthalate at least 80 % of repeating units of which are ethylene-terephthalate units, and wherein said coating layer contains at least 50 % by weight of a water-soluble or water-dispersible polyester resin having an anionic group in an amount of from 0.05 to 8 % by weight based on the weight of the resin, characterized in that said water-soluble or water-dispersible polyester resin has

a glass transition temperature of 20°C to 70°C, that said coating layer has standing-up protuberances consisting of a water-soluble polymer selected from the group consisting of cellulose, gelatin, polyacrylic acid or its salts and polystyrenesulfonic acid or its salts, in an amount of 1 to 50 % by weight, based on the weight of the coating layer, and that said polyester film has a F_5 strength value of at least 127.4 N/mm² (13 kgf/mm²) in the machine direction."

- (iv) The decision under appeal refused the main and first auxiliary requests on the ground that their respective Claims 1 contravened Article 123(2) EPC; Claim 1 of the second auxiliary request was refused, because its subject-matter was anticipated by document

D1: EP-A-0 188 620;

and the third auxiliary request was refused because the subject-matter of its Claim 1 was considered to lack inventive step over D1 in combination with

D3: US-A-4 568 600 or

D4: US-A-4 233 352.

- (v) Apart from the substantial objections, the decision under appeal also drew attention to some deficiencies of the claims under Article 84 EPC, *inter alia* that the term "standing-up protuberances" lacked clarity and that cellulose

was not a water-soluble polymer.

III. At the oral proceedings held on 7 August 2001 the Appellant submitted as its main request an amended version of the former third auxiliary request.

Claim 1 of this request differs from the same claim of said third auxiliary request by the insertion of the symbol "(t)" between the passages "having a coating layer of a thickness" and "of from 0.03 to 2 μm " as well as by the replacement after the term "that said coating layer has standing-up protuberances" of the words "consisting of water-soluble polymer" by "provided by a water-soluble polymer".

Claims 2 to 4 and 6 of the main request are identical to the same claims of the former third auxiliary request, and Claim 5 is amended by deletion of the redundant feature "the thickness (t) of said coating layer is from 0.03 to 2 μm ".

The auxiliary request differs from the main request only by the deletion, from Claim 1, of the alternative "cellulose" from the definition of the water-soluble polymer.

IV. The written and oral arguments of the Appellant may be summarized as follows:

- (i) The subject-matter of Claim 1 was novel and inventive over the cited prior art, which neither disclosed nor suggested the claimed solution of the existing technical problem, i.e. the provision of a high strength polyester film having good surface adhesion properties to

magnetic paint, adhesive or ink and which was particularly useful as a base film of a magnetic recording medium such as a videotape.

- (ii) Both D1 and D3 failed to recognize the critical importance for the restretching step of the glass transition temperature (Tg) of the water-soluble or water-dispersible polyester resin (hereinafter "polyester coating resin") being in the range of 20° to 70°C; Comparative Example 2 of the application in suit showed that the use of a polyester coating resin whose Tg was below that temperature range caused the film to adhere to the heating roll during the restretching step.

- (iii) Moreover, the discontinuities of the films according to D3 were formed by the presence of fine particles and not by protuberances of water-soluble polymer (hereinafter "water-soluble coating resin"); and the worm-like nodules of the films according to D4 required the presence of polysiloxane or styrene butadiene rubber.

- (iv) Concerning the Examining Division's objections under Article 84 EPC, the Appellant maintained that the term "standing-up protuberances" was clear and that the skilled person would understand that the reference to cellulose meant their water-soluble derivatives.

V. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 6 submitted as main request at the oral

proceedings or in the alternative on the basis of Claims 1 to 6 submitted as auxiliary request at the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. *Amendments*

- 2.1 The features of Claim 1 are supported by the statements in the original application which are indicated in brackets:

- (i) polyester film which is biaxially oriented; coating layer on at least one surface of said film containing at least 50 % by weight of a water-soluble or water-dispersible polyester resin (Claim 1),
- (ii) polyester of the polyester resin film is a polyethylene terephthalate at least 80 % of repeating units of which are ethylene-terephthalate units (page 3, lines 1 to 3),
- (iii) coating layer of a thickness of from 0.03 to 2 μm (page 10, lines 4 to 5),
- (iv) water-soluble or water-dispersible polyester resin of coating layer having an anionic group in an amount of from 0.05 to 8 % by weight based on the weight of the resin (page 6, line 18 to

page 7, line 3),

- (v) water-soluble or water-dispersible polyester resin having a glass transition temperature of 20°C to 70°C (Claim 1; page 4, lines 5 to 9),
- (vi) coating layer having standing-up protuberances (Claim 2),
- (vii) standing-up protuberances of water-soluble polymer selected from the group consisting of cellulose, gelatin, polyacrylic acid or its salts and polystyrenesulfonic acid or its salts (page 7, lines 21 to 24),
- (viii) standing-up protuberances in an amount of 1 to 50 % by weight, based on the weight of the coating layer (page 8, lines 1 to 4),
- (ix) polyester film having a F_5 strength value of at least 127.4 N/mm² (13 kgf/mm²) in the machine direction (page 22, lines 13 to 16).

2.2 The further Claims 2 to 6 are supported by the statements in the original application which are indicated in brackets:

- Claim 2 (Claim 3),
- Claim 3 (page 8, lines 12 to 16).
- Claim 4 (Claim 4),
- Claim 5 (Claim 5), and

- Claim 6 (page 11, line 18 to page 12, line 2).

2.3 The requirements of Article 123(2) EPC are therefore complied with by all claims.

3. *Clarity*

3.1 In the Board's view, the term "standing-up protuberances" in Claim 1, which was criticized as unclear by the Examining Division, complies with the requirements of Article 84 EPC. The skilled person immediately understands that this term describes a surface structure having elevations which are separated by indentations.

The clarity of this term is not affected by the somewhat vague statements concerning the formation of the standing-up protuberances by "specific phase separation or orientation properties" in the third paragraph on page 7 of the application in suit, because the manner of their formation is not among the claimed features.

3.2 The Board is also convinced that the identification of "cellulose" as one of the members from the group of the water-soluble coating resins is consistent with the requirements of Article 84 EPC, because, on a fair reading, the skilled person will immediately recognize that unmodified cellulose, which is not water-soluble, cannot be meant and that the reference to cellulose must relate to its water-soluble derivatives. This interpretation is supported by the identification of methyl cellulose, hydroxyethyl cellulose and carboxymethyl cellulose as "cellulose type water soluble polymers" in column 5, lines 1 to 5 of D3, the

document representing the closest prior art (cf. point 6.1 below), as well as by the exemplification of the same water-soluble cellulose derivatives in D4, column 3, lines 44 to 47.

4. *State of the art*

4.1 Document D1

This document relates to an easily-adhesive polyester film comprising a polyester base film, possibly a polyethylene terephthalate film, and a coating layer formed on one side of the base film, the coating layer having a thickness of between 0.001 to 1 μm and comprising a mixture containing 70 to 99.9 % by weight of a water soluble copolyester comprising as one comonomer component an alkali metal salt of an ester-forming aromatic sulfonic acid and a higher fatty acid wax (Claims 1 and 4; page 5, lines 5 to 8; page 7, lines 21 to 28). According to page 7, lines 2 to 17 - but not according to the worked Examples - the biaxially stretched film is restretched in machine direction.

The film has excellent bondability and improved blocking properties and is *inter alia* useful as base film for a magnetic recording medium (abstract; page 12, lines 9 to 17).

4.2 Document D3

This document relates to a thermoplastic resin base film for a magnetic recording medium comprising a thermoplastic resin film, e.g. a biaxially oriented polyethylene terephthalate film, and a discontinuous

film adhering closely to at least one surface of said thermoplastic resin film, said discontinuous film having a thickness of not larger than 500 angstroms and comprising a polymer blend containing fine particles having a particle size of 30 to 500 angstroms, said polymer blend comprising 20 % to 95 % by weight of a water-soluble polyester copolymer and 80 % to 5 % by weight of a water-soluble polymer having at least one hydroxyl group in the recurring unit thereof (preferably, cellulose type water-soluble polymers: column 5, lines 1 to 5) said fine particles being contained in an amount of 5 % to 50 % by weight based on the amount of said polymer blend, wherein fine protrusions are formed on said discontinuous film due to the presence of said fine particles therein (Claims 1 and 3).

While according to column 7, lines 38 to 55 the biaxially drawn polyester film may be drawn again in the first drawing direction, this was not done according to the worked Examples.

Magnetic recording media prepared with such base films provide excellent electromagnetic transformation performance and durability and are resistant against peeling of the magnetic film from the base film even under high temperature and high humidity conditions (column 8, lines 44 to 51).

4.3 Document D4

This document relates to a polyester film, e.g. a polyethylene terephthalate film, useful as base film for high recording density magnetic tape, at least one surface of which is covered with worm-like nodules

containing a mixture of an essentially water-soluble polymer and at least one water-emulsifiable polymer selected from the group consisting of (A) polysiloxane having a molecular weight of about 30,000 - 1,000,000 and (B) styrene butadiene rubber having a molecular weight of about 20,000 - 1,000,000, the weight ratio of said water-soluble polymer to said water-emulsifiable polymer in the mixture being about 1-100 : 5-50 (Claims 1 and 4).

According to column 4, line 65 to column 5, line 13 the uniaxially oriented film, which is coated with the afore-mentioned mixture, before being subjected to heat setting, is stretched in the transverse direction and possibly again in the machine direction achieving thereby a lengthwise break-up of the worm-like nodules which had been formed by the transverse stretching.

5. *Novelty*

5.1 Document D1

As acknowledged in the decision under appeal, the subject-matter of present Claim 1 is novel over D1 because that document does not disclose standing-up protuberances of a water-soluble polymer.

5.2 Document D3

5.2.1 The disclosure of this document encompasses biaxially oriented polyethylene terephthalate films having a discontinuous coating layer of a maximum thickness of 0.05 μm (= 500 angstroms) comprising fine particles, which are embedded in a mixture of a polyester coating resin and a water-soluble coating resin. Neither the

thickness value, nor the obligatory presence of particles distinguish the films of D3 from those according to the application in suit, because the upper thickness limit of 0.05 μm is within the claimed range of 0.03 to 2 μm and the presence of filler particles corresponds to a preferred embodiment of the application (cf. Claims 5 and 6).

- 5.2.2 It is evident from Figures 1 and 2 and column 6, lines 31 to 46 of D3 that the discontinuous coating layer forms elevations and indentations which constitute standing-up protuberances.
- 5.2.3 The general specification of D3 does not disclose the Tg of the polyester coating resin, nor the F₅ strength value (i.e. tensile strength at 5% elongation: cf. page 25, third paragraph of application in suit) of the final film.
- 5.2.4 The only worked example comprising detailed information (Example 1) uses as polyester coating resin a copolymer prepared from 40 mol% terephthalic acid, 33 mol% isophthalic acid, 20 mol% adipic acid, 7 mol% 5-sodium sulfoisophthalate, 40 mol% diethylene glycol and 60 mol% ethylene glycol, but does not indicate the copolymer's Tg.
- 5.2.5 In the Appellant's submission one should rather assume that the Tg was under the lower limit of 20°C according to present Claim 1, because the use of isophthalic and adipic acid units must, in comparison with terephthalic acid units, lead to a lowering of the Tg. This was shown by the Tg of only 38°C of the resins used according to Example 2 of the application in suit made from 75 mol% terephthalic acid, 17 mol% isophthalic

acid, 8 mol% sodium sulfoisophthalate, 65 mol% ethylene glycol and 35 mol% diethylene glycol as compared with the much higher Tg of 61°C of the resins used according to Example 1 made from 92 % terephthalic acid, 8 mol% sodium sulfoisophthalate, 75 mol% ethylene glycol and 25 mol% diethylene glycol (cf. page 30, second paragraph; page 31, first paragraph; page 35, Table 1 of the application in suit).

5.2.6 In the absence of any evidence to the contrary, the Board accepts this reasoning, because common general knowledge suggests that the Tg of the polyester coating resin used according to Example 1 of D3 should be considerably lower than that of 38°C of the polyester coating resin of Example 2 of the application in suit, because of its content of 20 mol% of adipic acid units, which replace a similar amount of aromatic diacid units. Aliphatic units are, however, bound to lower the Tg of the copolyester. This common general knowledge is e.g. set out in "Encyclopedia of Polymer Science and Engineering", vol. 12 (1988), pages 1 to 4 where it is stated that linear acyclic polyesters having repeating units $-O(CH_2)_xO-CO(CH_2)_yCO-$ exhibit Tg's from -70° to -30°C (cf. page 4, last paragraph).

5.2.7 Moreover, the films which are prepared according to Example 1 of D3 are not restretched in machine direction and do not therefore exhibit a F_5 strength value of at least 127.4 N/mm² as required by Claim 1 of the application in suit. This is confirmed by Figure 3 on page 200 of document

D7: Encyclopedia of Polymer Science and Engineering,
volume 12, pages 198 to 200 (1988),

according to which F_5 tensile stress values of this order can only be obtained (curve C) when the polyethylene terephthalate films are "supertensilized", i.e. have been subjected to "overdrawing" or to a third drawing step (cf. page 199 last paragraph). In the Board's opinion the tensile **stress** values referred to in Figure 3 of D7 can be compared with the tensile **strength** values according to present Claim 1, because both seem to result from the same measurement of traction-related stress (cf. page 25, lines 7 to 12).

5.2.8 It follows that the **explicit** disclosure of D3 does not comprise a film having an F_5 strength value of at least 127.4 N/mm².

5.2.9 Nor is such an embodiment within D3's **implicit** disclosure, because the pointer to an optional third stretching step in the longitudinal direction (= restretching step) in the general part of D3's description (column 7, lines 48 to 52; column 8, lines 16 to 23) is incompatible with the use, according to Example 1 of D3, of a polyester coating resin having a Tg below the temperature range of 20° to 70°C specified in present Claim 1, as set out in points 5.2.5 and 5.2.6 supra.

This is concluded from the fact that the film according to Comparative Example 2, which comprises a polyester coating resin having a Tg of only 3°C, could not be continuously restretched because it adhered to the heating roll for restretching (cf. page 32, last paragraph to page 33, second paragraph).

5.2.10 The above conclusion thus rules out that the restretching feature from the general part of the

description is "read into" Example 1, because this would unjustly expand the disclosure of D3 beyond its factual limits.

5.3 Document D4

The subject-matter of present Claim 1 is novel over the disclosure of this document, because the coating layer ("worm-like nodules") of the films according to D4 does not comprise a water-soluble coating resin, but instead uses water-emulsifiable polysiloxanes or styrene butadiene rubbers.

5.4 The subject-matter of present Claim 1 is therefore novel over the citations. Owing to their dependency on Claim 1, the same applies to Claims 2 to 6.

6. *Closest prior art, problem and solution*

6.1 In the Board's judgment, D3 represents the closest state of the art, because it discloses polyester films having all the features of present Claim 1, but for the Tg of the polyester coating resin and the F₅ strength value of at least 127.4 N/mm² (cf. point 5.2 supra).

Document D1 is further away from the subject-matter of the application in suit, because it does not disclose a coating layer comprising standing-up protuberances provided by a water-soluble coating resin.

6.2 According to the information on page 2, third paragraph of the description, the problem underlying the application in suit is the provision of a biaxially oriented polyester film having a coating layer thereon, which has a good surface adhesion property and high

strength.

- 6.3 In view of the disclosure of D3 the afore-mentioned problem objectively narrows down to the provision of such films having very high strength (i.e. an F_5 strength value of at least 127.4 N/mm^2) and which can be stably, continuously produced.

It goes without saying that the films must also meet the requirements imposed by their ultimate use, e.g. as base films of magnetic recording media (*inter alia*: good adhesion of magnetic layer, low blocking, low white powder formation, good electromagnetic conversion characteristics, low skew).

- 6.4 This objective technical problem is to be solved by the films according to present Claim 1 and especially by the use of a polyester coating resin having a glass transition temperature T_g of 20° to 70°C .

- 6.5 In view of the evidence comprised by Examples 6 and 7 as well as by Comparative Example 2 of the application in suit, the Board is satisfied that this problem has effectively been solved by the films according to present Claim 1.

Examples 6 and 7 (cf. pages 36 and 37) both make use of a polyester coating resin prepared from 92 mol% of terephthalic acid, 8 mol% of sodium sulfoisophthalate, 75 mol% ethylene glycol and 25 mol% diethylene glycol, which has a T_g of 61°C (i.e. the same polyester coating resin used in Example 1, page 30, second paragraph).

Example 6 reports that the coated film was stretched in transverse direction at 110°C at a draw ratio of 3.5

times and again in machine direction at 120°C at a draw ratio of 1.1 times (cf. page 36, third paragraph). The film according to Example 7 was prepared in the same manner.

For both Examples it is reported that the films "had good adhesion and process stability" (page 67, lines 2 and 3 from foot; page 37, lines 10 to 12).

Tables 3 and 4 on pages 39 and 40 summarizing the test results of the films according to Examples 6 and 7 demonstrate that these films were satisfactory in all respects (cf. point 6.3 supra).

7. *Obviousness*

7.1 While document D3 teaches how to produce polyester films having very high strength, namely by restretching of the biaxially drawn film in the longitudinal (machine) direction (cf. point 4.2 supra), this document is devoid of any information as to the conditions to be met by the coating layer, including the Tg of the polyester coating resin, in order to allow the film to be continuously and stably restretched.

Nor is there any worked Example in D3 from which such conditions could be inferred, because none of the examples (the comparative examples inclusive) discloses a restretching step.

In view of this lack of information and considering further that the Tg of the polyester coating resin used according to the only concretely exemplified embodiment (Example 1) is deemed to be below 20°C, D3 cannot

suggest the solution of the existing technical problem which lies in the use of a polyester coating resin having a Tg in excess of 20°C.

Even if, on reworking Example 1 of D3 with the modification of an additional restretching step, the skilled person had discovered that the film sticks to the heating roll, he could not expect, on the basis of the disclosure of D3, that the solution to this problem lay in the adaptation of the Tg of the polyester coating resin, because D3 does not comprise any clue in that respect.

7.2 Nor can the missing information be gained from D1 or D4:

7.2.1 D1, which relates to films having a polyester resin coating, contains a general reference to a secondary machine direction stretching (cf. page 7, lines 12 to 17), but does not realize this measure in any of the worked Examples. Thus, in spite of the fact that, in view of the high terephthalic acid content of the polyester coating resins used according to the Examples (cf. Table 1, page 11 to page 12, line 7), their Tg is likely to be in the range of 20° to 70°C (cf. third paragraph of Section 2.3 of the decision under appeal), there is no information in D1 as to the impact of this feature on the performance of the film during a subsequent restretching operation. The skilled person cannot, therefore, draw any conclusion from D1 with regard to any possible correlation between the Tg of the polyester coating resin and the restretching requirements.

7.2.2 Although D4 exemplifies the production of restretched

polyester films, it cannot advise the skilled person with regard to any possible correlation between the restretching requirements and the Tg of a polyester coating resin, because its disclosure does not encompass the use of such resins. Rather the worm-like nodules covering the base film only comprise a water-soluble coating resin and a polysiloxane or styrene butadiene rubber.

- 7.3 The subject-matter of present Claim 1 is therefore non-obvious over the cited prior art and is thus in compliance with the requirements of Article 56 EPC.
- 7.4 In the circumstances, the same conclusion applies to the subject-matter of the dependent Claims 2 to 6.
8. The claims of the main request are thus in agreement with the requirements of the EPC and there is consequently no need to deal with the claims of the auxiliary request.
9. In view of the extensive amendment of Claim 1, the description needs to be carefully adapted. Embodiments which are no longer covered by the claims should be excised. In this respect attention is drawn to the fact that Examples 6 and 7 are the only ones which are still within the scope of Claim 1.

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 grant a patent on the basis of claims 1 to 6 submitted as main request at the oral proceedings and after any necessary consequential amendment of the description.

The Registrar:

The Chairman:

E. Görgmaier

R. J. Young