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Datasheet for the decision of 4 March 2011

Case Number: T 1578/09 - 3.3.09

Application Number: 01941175.0

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IPC: B32B 27/34

Language of the proceedings: EN

Title of invention:
Low-temperature impact-resistant polyamide-based stretch-oriented multilayer film

Patentee:
Kureha Corporation

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Novelty, Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1578/09 **-** 3.3.09

D E C I S I O N
of the Technical Board of Appeal 3.3.09
of 4 March 2011

Applicant: Kureha Corporation
Appellant: 3-3-2, Nihonbashi-Hamacho, Chuo-ku
Tokyo 103-8552 (JP)

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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 26 March 2009 refusing European patent application No. 01941175.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: W. Sieber
Members: W. Ehrenreich
K. Garnett

Summary of Facts and Submissions

I. European patent application No. 01 941 175.0 filed on 22 June 2000 as International application No. PCT/JP01/05349 in the name of ***Kureha Kagaku Kogyo Kabushiki Kaisha*** - now ***Kureha Corporation*** - was refused by the examining division with its decision announced orally on 3 February 2009 and issued in writing on 26 March 2009.

The decision was based on claims 1 to 15 according to the main request and sets of claims according to auxiliary requests 1, 1A, 2, and 2A.

Independent claims 1 and 13 of the main request read as follows:

"1. A stretch-oriented multilayer film, comprising at least three layers including a surface layer (a) comprising a thermoplastic resin, an intermediate layer (b) comprising a polyamide resin and a surface layer (c) comprising a sealable resin, said multilayer film exhibiting an impact energy of at least 1.5 Joule at a conversion thickness of 50 µm at - 10°C."

"13. A process for producing a stretch-oriented multilayer film, comprising the steps of:

- co-extruding at least three species of melted thermoplastic resins to form a tubular product comprising at least three layers including an outer surface layer (a) comprising a thermoplastic resin other than polyamide resin, an intermediate layer (b)

comprising a polyamide resin and an inner surface layer (c) comprising a sealable resin,

- cooling with water the tubular product to a temperature below a lowest one of the melting points of the thermoplastic resin, the polyamide resin and the sealable resin constituting the layers (a), (b) and (c),
- re-heating the tubular product to a temperature which is at most the lowest one of the melting points of the thermoplastic resin, the polyamide resin and the sealable resin constituting the layers (a), (b) and (c),
- vertically pulling the tubular product while introducing a fluid into the tubular product to stretch the tubular product in the vertical direction and the circumferential direction, thereby providing a biaxially stretched tubular film,
- folding the tubular film,
- again introducing a fluid into the folded tubular film to form a tubular film,
- heat-treating the tubular film from its outer surface layer (a) with steam or warm water until a relaxation ratio reaches at least 20 % in at least one of the vertical direction and the circumferential direction, and
- cooling the heat treated tubular film to provide a stretch-oriented multilayer film, characterised in having a thickness of 40-250 µm and exhibiting an impact energy of at least 1.5 Joule at a conversion thickness of 50 µm at -10°C and an actual impact energy at -10°C of at least 1.6 Joule."

Claims 2 to 12 and 14, 15 were dependent claims.

The independent claims according to the auxiliary requests were amended in several respects by introducing the following features:

- the actual impact energy at -10°C of at least 1.6 Joule (claims 1 of auxiliary requests 1, 1A);
- the actual impact energy at -10°C of at least 3 Joule (claims 1 of auxiliary requests 2, 2A);
- the stretching ratios of at least 2.9 times in a vertical and at least 3 time in a circumferential direction (claims 12 of auxiliary requests 1, 1A, 2, 2A);
- the method of measuring the actual impact energy according to ASTM 3763 with modification of the clamp opening diameter to 38 mm and specification of the test temperature to -10°C (claims 1 of auxiliary requests 1A, 2A).

II. In the annex to the summons to attend the oral proceedings the examining division referred to the decisive points which needed to be discussed in the oral proceedings scheduled for 3 February 2009 (Rule 116 (1) EPC). In particular the following points were referred to:

(a) clarity of the claims;
(b) novelty, in particular over D1 (EP-A 974 452);
(c) inventive step.

As to the issue of clarity, the examining division in particular pointed out that the feature relating to the impact energy was a physical parameter which could not be considered to be a distinguishing feature vis à vis the prior art. Rather, it defined a "result to be

achieved", which was objectionable under Article 84 EPC. Reference was made to the Guidelines C-III, 4.7 and 4.7a.

As to novelty, the examining division referred in particular to D1 and reasoned that the process for producing the multilayer film in D1 fell within the scope of the process claims 13 to 15 of the main request since there was an explicit disclosure on page 7, lines 1 to 5 that the relaxation ratio could be as high as 25%, a value which was in the claimed range of at least 20%. Consequently, the film obtained by the process of D1 should have the same physical properties as the claimed film.

Similar considerations also applied to the claims of auxiliary requests 1 and 2.

III. With its decision the examining division refused the application because, in its view, the independent claims of all requests lacked clarity, contrary to Article 84 EPC.

The decision was based on the following reasons:

Main request

According to the description it is essential that layer (a) comprises a thermoplastic resin other than polyamide resin (emphasis by the board). This feature was absent in claim 1.
The specific method of measuring the impact energy disclosed on page 33, line 19 to page 34, line 19 and the measuring conditions given in ASTM 3763-86 to which

reference is made on page 33, lines 19 to 22 deviate from each other, in particular in respect of the circular opening of the pair of clamps (3.8 vs. 7.6 cm in diameter) as well as the temperature at which the impact energy is measured.
Furthermore, Claim 1 attempted to define the claimed subject-matter in term of a result to be achieved by using the parameter "impact energy". This parameter was, however, not clearly and unambiguously disclosed either in the claim alone or when interpreting this parameter in the light of the description.

Auxiliary request 1

Claim 1 related to an "actual impact energy at -10°C of at least 1.6 Joule". The test method for determining the actual impact energy was not defined. As the actual impact energy seemed to depend on the film thickness and no linear correlation between film thickness and the actual impact energy existed, this feature could not be exactly determined.

Auxiliary requests 1A, 2, 2A

The objections to the previous requests also applied in principle to the method for measuring the actual impact energy which had been introduced into claim 1 of auxiliary requests 1A and 2A and the specification of the actual impact energy introduced into claims 1 of auxiliary requests 1A, 2, 2A.

According to the minutes of the oral proceedings, the decisive issues were thoroughly discussed in the hearing.

IV. On 22 May 2009 the applicant (hereinafter: the appellant) filed an appeal against the decision of the examining division and paid the prescribed fee on the same day. The statement of the grounds of appeal was received on 2 July 2009.

The appellant maintained its requests filed in the examination proceedings and provided arguments intended to overcome the clarity objections on which the decision was based. Arguments were also put forward relating to the questions of novelty and inventive step, in particular vis à vis documents:

D1 EP-A 0 974 452;
D2 WO-A 99/56951; and
Dp WO-A 99/55528.

The appellant further requested reimbursement of the appeal fee owing to a procedural violation in that the examining division refused the application for new reasons which were not referred to in the annex to the summons to attend oral proceedings, as required in Rule 116(1) EPC, but which has been discussed for the first time in the oral hearing.

V. In a communication issued on 1 February 2011 the board provided its provisional observations on clarity, and novelty over documents D1 and Dp. In response to the board's communication the appellant submitted two sets of claims as basis for a main and an auxiliary request, which replaced all previous requests.

VI. During the oral proceedings held before the board on 4 March 2011 the appellant filed a set of claims 1 to 14 as basis for a new main request replacing all previous requests. The description was adapted to the new main request.

The request for reimbursement of the appeal fee was withdrawn.

Independent claims 1 and 13 of the new main request read as follows:

"1. A stretch-oriented multilayer film, comprising at least three layers including a surface layer (a) comprising a thermoplastic resin other than polyamide resin, an intermediate layer (b) comprising a polyamide resin and a surface layer (c) comprising a sealable resin, said multilayer film exhibiting an impact energy of at least 1.5 Joule at a conversion thickness of 50 µm at - 10°C, wherein the impact energy is determined according to ASTM D3763-86 modified as follows:

(i) in an environment of -10°C, a sample of stretch-oriented multilayer film cut into a square of 10 cm x 10 cm is disposed horizontally and sandwiched between a pair of clamps each having a 3.8 cm-dia. circular opening with its surface layer (a) directed upwards,

(ii) onto the sample film at the opening, a plunger of 4 kg in weight and having a hemispherical tip portion of 1.27 cm in diameter is dropped at a speed of 333.33 cm/sec to measure a load applied

to the dropping plunger and a displacement by a sensor from which a displacement-load curve is obtained,

(iii) based on the curve, a maximum load until the breakage is read as an impact strength (F_{IP} (N), and an energy absorbed by the film until the breakage is calculated to obtain an impact energy (E_{IP} (J)),

(iv) five sample films from each product film are subjected to the above measurement, and the average values are taken as measured values,

(v) based on the above-measured impact energy (E_{IP} (J)) for a sample having a thickness t (µm), an impact energy normalized at a thickness of 50 µm (E_{IP50} (J)) is calculated according to the following equation:

$$E_{IP50}\ (J) = E_{IP}\ (J) \times (50/t).$$

"13. A process for producing a stretch-oriented multilayer film, comprising the steps of:

• co-extruding at least three species of melted thermoplastic resins to form a tubular product comprising at least three layers including an outer surface layer (a) comprising a thermoplastic resin other than polyamide resin, an intermediate layer (b) comprising a polyamide resin and an inner surface layer (c) comprising a sealable resin,

• cooling with water the tubular product to a temperature below a lowest one of the melting points of

the thermoplastic resin, the polyamide resin and the sealable resin constituting the layers (a), (b) and (c),

- re-heating the tubular product to a temperature which is at most the lowest one of the melting points of the thermoplastic resin, the polyamide resin and the sealable resin constituting the layers (a), (b) and (c),
- vertically pulling the tubular product while introducing a fluid into the tubular product to stretch the tubular product at ratios of at least 2.9 times in a vertical direction and at least 3 times in a circumferential direction, thereby providing a biaxially stretched tubular film,
- folding the tubular film,
- again introducing a fluid into the folded tubular film to form a tubular film,
- heat-treating the tubular film from its outer surface layer (a) with steam or warm water until a relaxation ratio reaches at least 20 % in at least one of the vertical direction and the circumferential direction, and
- cooling the heat treated tubular film to provide a stretch-oriented multilayer film exhibiting an impact energy of at least 1.5 Joule at a conversion thickness of 50 µm at -10°C as defined in Claim 1."

VII. The appellant's arguments may be summarized as follows:

The introduction of the features into claim 1, namely that the layer (a) comprises thermoplastic resin other than polyamide resin and of the method of measuring the impact energy overcame the objections as to lack of clarity. As regards the objection of the examining division that the claimed subject-matter was defined in terms of a result to be achieved by using the parameter

"impact energy", it pointed out that the invention could not be adequately defined in any other way, the parameter reflected the physical consequences of the orientation of the polymer chains, and the method of measuring the parameter was clear.

Concerning novelty the appellant argued that films according to claim 1 with an impact energy of at least 1.5 Joule at a conversion thickness of 50 µm at -10°C were not disclosed in any of the cited documents and that the combination of the specified stretch ratios of at least 2.9 in the vertical and at least 3 times in the circumferential direction with the relaxation percentage of at least 20% according to process claim 13 was not indicated in D1.

As to inventive step the appellant argued that it was not obvious from the prior art to provide a multilayer film with the impact energy as claimed in claim 1 by the process steps indicated in claim 13, including in particular the combination of the specific stretching ratios and the relaxation ratio, in order to arrive at an improved impact resistance and pinhole property at low temperatures of the film as shown in the examples and comparative examples of the application.

VIII. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request filed during the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. Amendments - Article 123(2) EPC

The amendments to claim 1, i.e. the exclusion of the polyamide resin for the surface layer (a), the introduction of the method for measuring the impact energy with the information that this method is a modification of ASTM D3763-86, and the equation for normalizing the impact energy E_{IP} measured for a certain thickness at a thickness of 50 µm are derivable from page 4, lines 20 to 26 and page 33 line 19 to page 34, line 19 of the application as filed. The stretching ratios of at least 2.9 times in a vertical and at least 3 times in a circumferential direction introduced into claim 13 are disclosed in original claim 14. The amendments, therefore meet the requirements of Article 123(2) EPC.

3. Clarity - Article 84 EPC

3.1 In the board's judgment, the above amendments to claim 1 also overcome the clarity objections referred to in the appealed decision.

3.2 In particular with regard to the parameter "impact energy" objected to by the examining division, Claim 1 of the appellant's request indicates a method of measurement of the impact energy on the basis of the standard norm ASTM D3763-86, which is accessible to a skilled person, and also specifies which modifications of the norm have to be made in order to determine the

impact energy of the multilayer film of a certain thickness at a temperature of -10°C. Furthermore, the equation is given in the claim for how to normalize the impact energy value measured for a film having a certain thickness t (µm) - i.e. the actual impact energy of the film - at a thickness t of 50 µm as required by claim 1.
The parameter indicated in claim 1 is therefore clear and represents a technical feature of the claimed film which has to be considered when assessing novelty and inventive step of the film.

3.3 As regards the examining division's objection that claim 1 attempts to define the claimed subject-matter by the result to be achieved, the board, in agreement with the appellant, considers that it is not possible to define the film according to the present invention in more concrete structural terms, i.e. in terms of the particular structure of the materials/polymers constituting the film as suggested by the examining division. As explained by the appellant, the only difference in the structures of the claimed films over those of the prior art is the organization of the macromolecular chains in the multilayer films. This is achieved by a process as claimed in claim 13 involving the combination of a high degree of stretching and a high degree of relaxation heat treatment. This difference in structure can only be adequately defined in terms of the physical consequences and this is exactly why the appellant has relied on the impact energy to characterize the claimed film. Since, furthermore, the application as filed clearly teaches how the claimed films can be obtained by explicitly stating the process for making such films, the

examining division's objection with regard to the parameter "impact energy" as being merely a result to be achieved is not justified.

3.4 From the above the board concludes that the requirements of Article 84 are met.

4. Novelty

4.1 Novelty of the film claimed in claim 1

None of the multilayer films disclosed in the cited prior art is characterised by the parameter indicated in claim 1, i.e. the impact energy at a conversion thickness of 50 µm at -10°C. It has therefore to be assessed whether or not the claimed impact energy of at least 1.5 Joule at a conversion thickness of 50 µm at -10°C is an inherent property of the multilayer films of the prior art. For the assessment of novelty D1 and Dp are of particular relevance because the multilayer films disclosed therein are manufactured by process steps which are similar to those indicated in claim 13.

In this respect, it is therefore necessary to consider the physical data for the films and comparative films as they vary according to their processing conditions as set out in Table 2 of the original application. The following conclusions can be drawn therefrom:

(a) Comparison of the film of example 4 with that of comparative example 1:

The film of example 4 has the same layer composition as that of comparative example 1, has a slightly enhanced thickness (40 µm vs. 38.5 µm) and is stretched at a similar stretching ratio (MD/TD = 3/3.2 vs. 3.1/3.2).
However, the relaxation percentage differs considerably: for the film of example 4 it lies within the claimed range (MD/TD = 20/20) but for the film of comparative example 1 it lies outside the claimed range (MD/TD = 10/10). The impact energy of the film of example 4 lies within the claimed range (2.8 Joule at -10°C, normalized at 50 µm), whereas the film of comparative example 1 has an impact energy below the claimed range (1.2 Joule).

From that the conclusion can be drawn that the relaxation heat treatment has a considerable influence on the impact energy of the film.

(b) The conclusion in (a) above is confirmed when comparing the films according to examples 5 and 6 (both according to the invention).

It is apparent from this comparison that equal stretching and relaxation conditions, both being in the claimed range (stretch ratio MD/TD = 3.2/3.2; relaxation temperature and percentage 90°C and 20/20 in MD/TD), result in a normalized impact energy which is within the claimed range (2.2 vs. 2.0 Joule) although the composition and thickness of the films differ (example 5: 6^{th} layer composed of LLDPE, thickness 52 µm; example 6: 6^{th} layer composed of SVL, thickness 46 µm).

The board therefore accepts that the impact energy of the film as claimed in claim 1 of at least 1.5 Joule at a conversion thickness of 50 µm at -10°C is due to the combination of the stretching ratio (MD/TD = at least 2.9/3) and the relaxation percentage of at least 20% either in MD or TD applied during processing of the film as claimed in claim 13.

At least one of the above conditions required in claim 13 is not fulfilled during the preparation of the multilayer films described in D1 and Dp. According to the examples of D1 (Table 2) both the stretching ratio and the relaxation percentage are below the claimed range (e.g. MD/TD = 2.7/2.7 and 10/10), and according to Dp (Tables 3 to 7) at least the relaxation percentage is too low (e.g. 10/10, 5/10 or 5/5).
For the reasons set out above, the board concludes that the impact energy of the films disclosed in D1 and Dp must be outside the range of at least 1.5 Joule as claimed in claim 1.

The film of claim 1 is therefore novel over the prior art.

4.2 Novelty of the process of claim 13

Claim 13 requires that:

(i) the tubular product is stretched at ratios of at least 2.9 times in the vertical and at least 3 times in the circumferential direction; and
(ii) the tubular film is heat-treated with steam or warm water until a relaxation ratio reaches at

least 20% in at least one of the vertical and the circumferential directions.

The pertinent prior art D1 requires:

(i) a stretching ratio of preferably 2 - 4 times, more preferable 2.5 - 4 times in each of vertical or machine directions (page 6, paragraph [0039]; and
(ii) a relaxation ratio of 0 - 25%, preferably 5 - 20% (pages 6/7, paragraph [0040]).

Therefore a selection of ranges out of two lists in D1 has to be made in order to arrive at the combination of the ranges (i) and (ii) claimed in claim 13. Such a selection is not novelty-destroying according to the established jurisprudence of the boards of appeal.

4.3 Because none of the other documents cited discloses the film according to claim 1 and the process for its preparation according to claim 13 the claimed subject-matter is novel over the prior art.

5. Inventive step

5.1 The application as filed

According to the application as filed the aim of the invention is to provide stretch-oriented multilayer films for packaging purposes having an improved low-temperature impact resistance (page 10, lines 1 to 6 of the application as filed). According to claims 1 and 13 of the appellant's request this aim is achieved by providing a film according to claim 1 having an impact energy of at least 1.5 Joule at a conversion thickness

of 50 µm at -10°C, which can be prepared by the process steps according to claim 13 including a combination of high degree of stretching (MD/TD = at least 2.9/3) with a high degree of relaxation heat treatment (at least 20% in at least one of the MD or TD).

5.2 The closest prior art

D1 is considered to represent the closest prior art. This document is concerned with stretch-oriented multilayer films for packaging purposes having improved automatic filling and back-seaming properties (Table 3 in conjunction with paragraphs [0064] to [0069]).

As mentioned above under novelty, the claimed film differs therefrom in that the impact energy is at least 1.5 Joule at a conversion thickness of 50 µm at -10°C.

5.3 The problem to be solved

The experimental evidence as shown in the examples and comparative examples of the application (Tables 2 to 4) demonstrates that the films possessing the impact energy values as claimed show an improved low-temperature impact strength, combined with an improved anti-pinhole property and a low broken-bag percentage in comparison with films possessing impact energy values outside the claimed range.

Therefore, the problem to be solved is seen in the provision of packaging films having an improved impact strength and anti-pinhole property.

5.4 Obviousness

None of the other documents of the prior art addresses this problem or contains information which would prompt a skilled person to enhance the impact energy of the films of the prior art to values as claimed in claim 1 by applying process steps including the combination of high stretching ratio with a high relaxation percentage as claimed in claim 13 in order to solve the problem posed.

The film of claim 1 and the process of claim 13 are therefore not obvious.

6. The claims according to the appellant's request are therefore allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the following basis:

   (a) Claims 1 to 14 according to the main request filed during the oral proceedings;
   (b) The amended description pages 1 to 49 (including page numbered 4A) as filed during the oral proceedings;
   (c) Fig 1 as originally filed (Sheet 1/1 as originally filed).

The Registrar The Chairman

G. Röhn W. Sieber