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D E C I S I O N
of 7 March 2006

Case Number: T 0788/04 - 3.2.05

Application Number: 95905924.7

Publication Number: 0734316

IPC: B29C 49/22

Language of the proceedings: EN

Title of invention:
Multilayer preform and container with polyethylene naphthalate (PEN), and method of forming same

Patentee:
CONTINENTAL PET TECHNOLOGIES, INC.

Opponent:
PEPSICO, INC.

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84, 54, 56

Keyword:
"Addition of subject-matter (no)"
"Clarity (yes)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0788/04 - 3.2.05

D E C I S I O N
of the Technical Board of Appeal 3.2.05
of 7 March 2006

Appellant I: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 5 April 2004 concerning maintenance of European patent No. 0734316 in amended form.

Composition of the Board:

Chairman: H. M. Schram
Members: P. Michel
R. Moufang

Summary of Facts and Submissions

I. Appellants I and II (opponent and patent proprietor respectively) lodged appeals against the interlocutory decision of the Opposition Division maintaining European patent No. 0 734 316 in amended form.

In the decision under appeal, it was held that the grounds of opposition submitted by appellant I did not prejudice the maintenance of the patent as amended in accordance with the auxiliary request of appellant II filed during oral proceedings before the Opposition Division.

II. Oral Proceedings were held before the Board of Appeal on 7 March 2006.

Appellant I requested that the decision under appeal be set aside and the European Patent No. 0 734 316 be revoked.

Appellant II requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of claims 1 to 26 filed at the oral proceedings.

III. Claims 1 and 23 of the sole request of appellant II read as follows:

"1. A method of forming a container (10) having a substantially transparent multilayer sidewall (15), including forming at an elevated temperature a preform (110) having a substantially amorphous and transparent multilayer sidewall-forming portion (114,116) including

a first layer (134) of a first polymeric material and a second layer (130) of a second polymeric material, cooling and then reheating and expanding the preform to form the container, characterised in that:

the first polymeric material is a strain-crystallizable homopolymer, copolymer or blend of polyethylene naphthalate (PEN), and the second polymeric material is high copolymer PET, or a blend of high copolymer PET and PEN, which remains substantially transparent when stretched at a temperature within the orientation temperature range of the first polymeric material;

cooling is performed to room temperature and then reheating of the first and second layers (130,134) is performed within the orientation temperature range of the first polymeric material, and

expanding of the preform (116) is performed within the orientation temperature range of the first polymeric material to form a container (10) having a substantially transparent multilayer sidewall (15), the sidewall (15) having a strain-crystallized first polymeric material layer (34)."

"23. A unitary expanded multilayer container (10) having inner and outer exterior layers (32,34) of a first polymeric material including a strain-crystallizable homopolymer, copolymer or blend of polyethylene naphthalate (PEN), and an interior core layer (30) of a second polymeric material, characterised in that the first polymeric material comprises on the order of 80-100% PEN and 0-20% PET by total weight of the layer, and the second polymeric material is a substantially noncrystallizable high copolymer polyethylene terephthalate (PET), or a blend

of substantially noncrystallizable high copolymer PET and PEN, and the rate of thermal crystallization of the second polymeric material is substantially less than that of the first polymeric material within the orientation temperature range for strain-crystallization of the first polymeric material, and wherein the exterior layers (32,34) are strain-crystallized and the container (10) is substantially transparent."

IV. The following documents are referred to in the present decision:

D1: JP-A-04039024, together with an English translation thereof, references herein being made to the translation.

D6: Modern Plastics Encyclopedia 92, Mid-October Issue 1991, pages 46 to 48.

D12: The Wiley Encyclopedia of Packaging Technology, John Wiley & Sons, 1986, pages 58 to 60.

V. The following abbreviations are used in the present decision:

PEN: polyethylene naphthalate

PET: polyethylene terephthalate

PETG: copolymer of polyethylene terephthalate modified with on the order of 30% cyclohexane dimethanol

VI. In written and oral proceedings, appellant I argued essentially as follows:

The term "high copolymer PET" as used in claim 1 was only disclosed in the application as filed in combination with the feature of the PET being non-crystallised. In the absence of a reference in claim 1 to the PET being non-crystallised, the requirements of Article 123(2) EPC are not fulfilled.

There is no disclosure in the application as filed of the feature of claim 23 according to which "the rate of thermal crystallization of the second polymeric material is substantially less than that of the first polymeric material within the orientation temperature range for strain-crystallization of the first polymeric material". For this reason as well, the requirements of Article 123(2) EPC are not satisfied.

The term "high copolymer PET", used in claims 1 and 23, is unclear, since it is merely defined by the result to be achieved. Moreover, the patent in suit does not make it clear what is meant by the term "high" in the expression "high copolymer PET".

The subject-matter of claims 1 and 23 lacks novelty in view of the disclosure of document D1. This document discloses that the core PET layer can be copolymerised with other dicarboxylic acids, including napthalenedicarboxylic acid, as disclosed at page 4, lines 25 to 42. Whilst there is no reference in document D1 to "high copolymer PET", the use of the term "high" cannot serve to distinguish the subject-

matter of claims 1 and 23 over the disclosure of document D1, since the term is not clear.

Document D1 refers to a blow moulding temperature for the PET layer of up to 130°C (page 5, line 36). This is within the orientation temperature range for PEN, which is between the glass transition temperature of about 123°C and the melting temperature of about 267°C. The subject-matter of claim 1 is thus not novel.

Insofar as the subject-matter of claim 1 is regarded as being novel in view of the disclosure of document D1, it does not involve an inventive step.

The differential heating method of document D1 is difficult to execute in view of the necessity of avoiding overheating of the core layer. It is thus necessary to find an appropriate PET material. As stated in the patent in suit at page 3, lines 32 to 41, it is known that a high copolymer content prevents haze in a stretch blow moulded PET container. Similarly, document D6, page 48, first column, fourth and seventh paragraphs, states that PETG copolymer remains clear when used in blow moulded bottles.

The same arguments apply to claim 23. The ranges specified in this claim for the first material include 100% PEN. Since the PETG layer of document D6 is clear, it is implicit that it is not crystallised.

At page 5, lines 34 to 38, of document D1, blow moulding temperatures of from 100 to 130°C are proposed. This is higher than the range of 90 to 100°C discussed for the prior art at page 2, lines 17 to 18,

of document D1. This is an indication that a high copolymer content enables the use of a higher orientation temperature.

VII. In written and oral proceedings, appellant II argued essentially as follows:

The opening paragraph of the application as filed (published version) at page 1 makes it clear that the invention is concerned with the provision of one or more layers in addition to a PEN layer which is able to withstand the high orientation temperature of PEN while maintaining container transparency. Whilst strain-induced crystallisation can occur, this does not affect transparency, since the crystals are not sufficiently large as to produce haze.

The paragraph at page 10, lines 3 to 19, of the application as filed (published version) is concerned with avoiding thermal crystallisation in the PET layer. The reference in claim 1 to the second polymeric material remaining substantially transparent implies that thermal crystallisation is avoided, but does not exclude strain crystallisation, which does not affect transparency.

The feature of claim 23, according to which "the rate of thermal crystallization of the second polymeric material is substantially less than that of the first polymeric material within the orientation temperature range for strain-crystallization of the first polymeric material" is implicit from the remaining features of the claim and therefore does not introduce any subject-matter not present in the application as filed.

The requirements of Article 123(2) EPC are thus satisfied.

The term "high copolymer PET" is used in claim 1 in combination with the technical effect that the material "remains substantially transparent when stretched at a temperature within the orientation temperature range of the first polymeric material". This effect is readily testable as described at page 11, line 26 to page 12, line 3 of the application as filed (published version).

As discussed in document D6, page 47, middle column, copolyesters have a reduced tendency to crystallise as compared with monopolyesters. At page 48, lines 11 to 35, it is disclosed that, by varying the ratios of the acids, the copolyesters have varying properties. It is not, however, possible to set an arbitrary limit on the amount of copolyester present in high copolymer PET for use in the method according to claim 1, since the properties depend upon unspecified process variables and the type of apparatus used.

The term "high copolymer PET" is thus clear.

The subject-matter of claims 1 and 23 is novel.

Document D1 does not disclose the features of claim 1 according to which "the second polymeric material is high copolymer PET, or a blend of high copolymer PET and PEN, which remains substantially transparent when stretched at a temperature within the orientation temperature range of the first polymeric material and reheating of the first and second layers and expanding

of the preform are performed within the orientation temperature range of the first polymeric material".

Document D1 is the closest prior art. In this document, it is stated at page 2, lines 17 to 29, that conventional heating does not work, there being a 40°C difference between the optimum stretch blowing temperature range of PET and that of PEN. As a solution to this problem, it is proposed to modify the method and apparatus used so as to obtain differential heating of the layers.

The patent in suit offers a different solution to the same problem. Whilst using a conventional heating arrangement and method, a different material is used for the PET layer, that is, an increased copolymer content is used so as to enable the layer to withstand the orientation temperature of PEN. This solution is not suggested in the prior art. In particular, it is not suggested that a PET layer could be heated above the glass transition temperature of PEN, that is, above its orientation temperature range.

Document D6 is not concerned with stretch blow moulding. The passage cited by appellant I at page 48 relates to extrusion blow moulding, in which no stretching occurs, so that the PETG remains amorphous.

Document D12 states at page 58, top left, that PETG is tailored for extrusion blow moulding. There is no suggestion to use PETG in stretch blow moulding.

Document D1 itself at page 4, lines 29 to 31, limits the amount of copolymer to 20%, thus excluding PETG.

The passage in the patent in suit at page 3, lines 32 to 41, refers to a monolayer PET container. The term "high" as used to refer to the copolymer content is only relative to other monolayer PET containers.

Reasons for the Decision

1. *Amendments*

1.1 The term "high copolymer PET" is used in claim 1 in conjunction with the definition that the high copolymer PET, or a blend of high copolymer PET and PEN, "remains substantially transparent when stretched at a temperature within the orientation temperature range of the first polymeric material". The term is thus construed as requiring that the copolymer content is sufficiently high as to obtain the desired result in terms of transparency of the material.

Construing the term in this way, the application as filed (published version) discloses the use of high copolymer PET at page 10, lines 5 to 19. This passage discloses that the effect of a high copolymer content is to decrease the crystallisation rate, so that the degree of thermal crystallisation is not sufficient to cause crystals to form which would cause hazing of the material.

1.2 Claim 23 specifies that the first polymeric material comprises on the order of 80-100% PEN and 0-20% PET by total weight of the layer, and the second polymeric material is a substantially non-crystallizable high

copolymer polyethylene terephthalate (PET) or a blend of substantially non-crystallizable high copolymer PET and PEN. Owing to the fact that the second polymeric material is substantially non-crystallizable and the first material is thermally crystallizable, as indicated at page 12, penultimate paragraph, of the application as filed, it follows that the rate of thermal crystallization of the second polymeric material will be low compared with that of the first polymeric material.

Taken in isolation, the feature of claim 23, according to which "the rate of thermal crystallization of the second polymeric material is substantially less than that of the first polymeric material within the orientation temperature range for strain-crystallization of the first polymeric material" is not disclosed in the application as filed, as admitted by appellant II. However, in the context of claim 23 as amended, this feature does not provide a technical contribution to the subject-matter of the claim over and above that represented by the remaining features of the claim.

Hence, this feature does not introduce any additional subject-matter into the claim and the requirements of Article 123(2) EPC are thus satisfied.

2. *Clarity*

As stated above in paragraph 1.1, the term "high copolymer PET" is construed as requiring that the copolymer content is sufficiently high as to obtain the desired result in terms of transparency of the

material. Transparency can be determined as described in the patent in suit at paragraph [0027].

Claim 1 does not, however, merely specify a result to be achieved. The claim specifies a starting material together with method steps which specify *inter alia* that the high copolymer PET contained in the second layer is heated to a temperature within the orientation temperature range of the first polymeric material.

Claim 1 is thus clear, and satisfies the requirements of Article 84 EPC.

3. *Novelty*

Document D1 discloses a multilayer bottle having outer and inner layers of PEN and a core layer of PET. As noted at page 2, lines 17 to 29, there is a difference in the optimum stretch blowing temperatures of PET and PEN of about 40°C. In order to solve this problem, the preform is heated from outside and inside, so that, whilst the outer PEN layers are heated to a temperature within the optimum stretch blowing temperature of PEN, the core layer remains within the optimum stretch blowing temperature of PET (page 5, lines 29 to 38). In the passage at page 5, lines 34 to 38, it is disclosed that the PET layer is heated to 100-130°C, whilst the inner and outer PEN layers are heated to 130-150°C.

The method of document D1 thus does not include the step of reheating of the preform so that the reheating of the PET layer is performed within the orientation temperature range of the first polymeric material, that is, PEN, as specified in claim 1.

At page 4, lines 26 to 37, document D1e discloses that the PET can be copolymerised with "other dicarboxylic acids and/or other glycols in an amount of no more than 20 mol%." This disclosure does not constitute an implicit disclosure of a non-crystallisable resin. There is thus no disclosure in document D1 of a PET layer being "a substantially noncrystallizable high copolymer polyethylene terephthalate (PET) or a blend of substantially noncrystallizable high copolymer PET and PEN", as specified in claim 23.

The subject-matter of claims 1 and 23 is thus novel.

4. *Inventive step*

4.1 Closest prior art

The closest prior art is represented by document D1, whose disclosure is discussed in section 3 above.

A problem associated with the method of Document D1 is that it requires the use of a heat source within the preform and careful control of the heating conditions so as to avoid excess heating of the core layer.

4.2 Object of the invention

The object of the invention is accordingly to provide a simplified method of forming a transparent multilayer container and a transparent multilayer container which enables a simplification of the method of manufacture.

4.3 Solution

According to claim 1 of the patent in suit, this problem is solved by using a PET layer comprising high copolymer PET, or a blend of high copolymer PET and PEN, which remains substantially transparent when stretched at a temperature within the orientation temperature range of the first polymeric material (that is, the PEN layer), reheating of the first and second layers is performed within the orientation temperature range of the first polymeric material, and expanding of the preform is performed within the orientation temperature range of the first polymeric material.

Reheating of the PET layer to within the orientation temperature range of the first polymeric material is not suggested by the prior art.

Document D6 teaches at page 47, left hand column, fourth complete paragraph, reheating of PET preforms to a temperature just above the glass transition temperature. The same teaching is also found in document D12 at page 58, left hand column, second complete paragraph.

The passage in the patent in suit at paragraphs [0006] and [0007] is concerned with a known container having a single layer of a PET copolymer and acknowledges that a high copolymer content prevents visual crystallisation. There is, however, nothing in document D1 which would suggest departing from the method of document D1 by reheating of the PET layer to a temperature within the orientation temperature range of the first polymeric material.

According to claim 23 of the patent in suit, this problem is solved by the use of a core layer comprising a substantially non-crystallizable high copolymer polyethylene terephthalate (PET) or a blend of substantially non-crystallizable high copolymer PET and PEN. The choice of such a layer enables the container to be formed by the method of claim 1.

Document D6 discloses at page 48, left hand column, penultimate paragraph, that PETG can be extrusion blow moulded to form containers. There is, however, no suggestion that the material would be a candidate for the core layer of the container formed by the method of document D1.

PETG is also mentioned in the first paragraph of page 58 of document D12. This is, however, the last paragraph of a section of the document concerned with extrusion blow moulding, and it is stated that PETG has been tailored to the extrusion blow moulding process. Document D12 thus does not provide any incentive to use PETG or a blend of PETG and PEN as the PET layer of document D1.

The subject-matter of claims 1 and 23 thus involves an inventive step.

Claims 2 to 22 and 24 to 26 are directly or indirectly appendant to either claim 1 or claim 23 and relate to preferred embodiments of the subject-matter of claims 1 and 23, respectively. The subject-matter of these claims thus also involves an inventive step.

5. The description has been amended for consistency with the claims. The amendments do not have the effect of introducing subject-matter extending beyond the content of the application as filed, and thus comply with the requirements of Article 123(2) EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of the following documents:

   (a) claims 1 to 26 as filed at the oral proceedings;

   (b) description: pages 3 to 9 as filed at the oral proceedings; and

   (c) drawings: Figures 1 to 10 as granted.

The Registrar: The Chairman:

M. Dainese H. Schram