

**Internal distribution code:**

- (A)  Publication in OJ  
(B)  To Chairmen and Members  
(C)  To Chairmen  
(D)  No distribution

**DECISION**  
of 18 February 2004

**Case Number:** T 0874/01 - 3.3.3

**Application Number:** 93306276.2

**Publication Number:** 0586109

**IPC:** C08L 23/10

**Language of the proceedings:** EN

**Title of invention:**  
Polypropylene compositions and films thereof

**Patentee:**  
SUMITOMO CHEMICAL COMPANY LIMITED

**Opponents:**  
Fina Research S.A.  
Basell Polyolefine GmbH  
BOREALIS A/S  
ExxonMobil Chemical Co.

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54(2), 56, 108, 123(2)(3)  
EPC R. 65(1)

**Keyword:**  
"Form of appeal (opponent I) - missing statement of grounds"  
"Novelty - implicit disclosure (main request: yes; first  
auxiliary request: no)"  
"Inventive step - problem and solution (first auxiliary  
request: yes)"

**Decisions cited:**  
T 0672/96

**Catchword:**  
-



Case Number: T 0874/01 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 18 February 2004

**Appellant:** Basell Polyolefine GmbH  
(Opponent 02) Brühler Strasse 60  
D-50389 Wesseling (DE)

**Representative:** Seelert, Stefan, Dr.  
Basell Polyolefine GmbH -F 206-  
D-67056 Ludwigshafen (DE)

**Appellant:** BOREALIS A/S  
(Opponent 03) Lyngby Hovedgade 96  
DK-2800 Lyngby (DK)

**Representative:** Kador & Partner  
Corneliusstrasse 15  
D-80469 München (DE)

**Appellant:** ExxonMobil Chemical Co.  
(Opponent 04) 5200 Bayway Drive  
Baytown, Texas 77520 (US)

**Representative:** UEXKÜLL & STOLBERG  
Patentanwälte  
Beselerstrasse 4  
D-22607 Hamburg (DE)

**Respondent:** SUMITOMO CHEMICAL COMPANY LIMITED  
(Proprietor of the patent) 5-33, Kitahama 4-chome,  
Chuo-ku  
Osaka-shi,  
Osaka 541-0041 (JP)

**Representative:** Dixon, Donald Cossar  
Wilson Gunn Gee  
Chancery House  
Chancery Lane  
London WC2A 1QU (GB)

**Other Party:**  
(Opponent 01)

Fina Research S.A.  
Zone Industrielle C  
B-7181 Seneffe (Feluy) (BE)

**Representative:**

Roufosse, Micheline C.  
Atofina Research  
Département Brevets  
Zone Industrielle C  
B-7181 Seneffe (Feluy) (BE)

**Decision under appeal:**

Interlocutory decision of the Opposition  
Division of the European Patent Office dated  
16 May 2001 and issued in writing on 11 June  
2001 concerning maintenance of European patent  
No. 0586109 in amended form.

**Composition of the Board:**

**Chairman:** P. Kitzmantel  
**Members:** A. Däweritz  
J. Van Moer

## Summary of Facts and Submissions

- I. The grant of European patent No. 0 586 109 in respect of European patent application No. 93 306 276.2, filed on 9 August 1993 and claiming priority of 11 August 1992 of an earlier application in Japan (214040/92), was announced on 11 November 1998 (Bulletin 1998/46). The patent contained 14 claims.

Claims 1, 3 to 5 and 14 as granted read, respectively, as follows:

- "1. A polypropylene composition comprising 100 parts by weight of a crystalline propylene polymer, produced by polymerization using a Ziegler Natta catalyst containing Ti, Mg and Cl as the essential components, said crystalline propylene polymer having a molecular weight distribution (Mw/Mn) of less than 5.0 and from 0.0001 to 1.0 part by weight of a crystal nucleating agent, the composition having a crystallization temperature at least 1.5°C higher than the crystallization temperature of the crystalline propylene polymer."
- "3. A polypropylene composition as claimed in Claim 1 or 2, wherein the crystalline propylene polymer is a crystalline propylene homopolymer or a crystalline propylene- $\alpha$ -olefin copolymer.
4. A polypropylene composition as claimed in Claim 3, wherein the crystalline propylene- $\alpha$ -olefin copolymer is a propylene-ethylene copolymer, a propylene-butene-1 copolymer or a propylene-ethylene-butene-1 copolymer.

5. A polypropylene composition as claimed in Claim 3, wherein the crystalline propylene- $\alpha$ -olefin copolymer has an  $\alpha$ -olefin content of from 2.0 to 30% by weight."

"14. A polypropylene film obtained by melt-extruding a polypropylene composition as claimed in any preceding claim."

The remaining dependent Claims 2 and 6 to 13 related to specific embodiments of the polypropylene composition.

II. On 10 and 11 August 1999, respectively, four Notices of Opposition were filed in which revocation of the patent in its entirety was requested. According to the Notice of Opposition of Opponent 01 (O-01), the claimed subject-matter was not patentable on the grounds set out in Article 100(a) and (b) EPC, since it did not meet the requirements of Articles 54, 56 and 83 EPC. In the Notices of Opposition of Opponents 02 and 03 (O-02 and O-03), objection of lack of novelty and lack of inventive step were raised (Article 100(a) EPC, in conjunction with Articles 54 and 56 EPC). Opponent 04 (O-04) impugned the patent in suit on the basis of Article 100(a) in conjunction with Article 56 EPC. The Oppositions relied on 29 documents including

D3: US-A-3 207 739,

D5: EP-A-0 320 150,

D6: JP-A-61-034 039 (English translation, filed by O-02 on 16 March 2001),

D8: H. N. Beck et al., Journal of Appl. Polym. Sc., 9,  
pages 2131 to 2142 (1965),

D12: J. Jansen, Plastics Additives Handbook, Hanser  
Publ. 1985, page 671 to 683,

D16: G. Lux, Speciality Plastics Conference '88,  
Zürich, pages 139 to 162,

D22: M. C. Sacchi et al., Macromolecules 1991, 24,  
pages 6823 to 6826, and

D28: C. C. Carroll, Modern Plastics, 9/1984, pages 108  
to 112.

By letter dated 14 March 2001 and in the course of oral  
proceedings held before the Opposition Division on  
16 May 2001, Auxiliary requests I and II, respectively,  
were submitted.

Claim 1 of "Auxiliary request II" as amended read as  
follows:

- "1. A polypropylene composition comprising 100 parts  
by weight of a crystalline propylene- $\alpha$ -olefin  
copolymer having an  $\alpha$ -olefin content of from 2.0  
to 30% by weight, produced by polymerization using  
a Ziegler Natta catalyst containing Ti, Mg and Cl  
as the essential components, said crystalline  
propylene- $\alpha$ -olefin copolymer having a molecular  
weight distribution (Mw/Mn) of less than 5.0 and  
from 0.0001 to 1.0 part by weight of a crystal  
nucleating agent, the composition having a

crystallization temperature at least 1.5°C higher than the crystallization temperature of the crystalline propylene- $\alpha$ -olefin copolymer."

This amendment of Claim 1 resulted in Claims 3 and 5, as granted (section I, above), being deleted, and the remaining claims being renumbered and amended, accordingly, by adaptation of the references to previous claims. Moreover, the expression "propylene polymer" was replaced by "propylene- $\alpha$ -olefin copolymer" at each occurrence in Claims 2, 4, 5 and 11, as renumbered in part.

III. In an interlocutory decision orally announced at the end of the oral proceedings and issued in writing on 11 June 2001, the patent in suit as amended according to Auxiliary request II was held to meet the requirements of the EPC.

In particular, it was found that the invention referred to in the patent in suit was disclosed in a manner sufficiently clear and complete as required in Article 83 EPC (Article 100(b) EPC). Moreover, the combination of the features of Claim 1 was not mentioned in any one of the cited documents. Nor did the novelty objections raised by O-01 on the basis of alleged prior use prevail, since the C<sub>2</sub> fraction in the polypropylene referred to in this connection was lower than 2% by weight as required in Claim 1.

On the basis of page 2, lines 40 to 42 of the patent in suit, the technical problem was seen in the provision of a polypropylene composition and a film thereof having a good transparency and showing small

dependencies of the transparency on the film-forming conditions and film thickness without reduction of the inherent characteristics of the polymer.

The solution of this problem as defined in Claim 1 was not addressed in any one of the cited documents, amongst which D16 was considered as representing the closest state of the art.

This document referred to the relationship between a tight molecular weight distribution of propylene polymers (eg Mw/Mn of 4.5) and their mechanical and optical properties. However, it did not teach how to solve the problem of providing a composition showing a small dependency of the transparency on the film-forming conditions.

The decision under appeal further held that the other documents cited did not suggest the combination of features as defined in Claim 1 in order to solve this problem or they did not even refer to this aspect of the problem.

Consequently, the decision held that the patent in the version of Auxiliary Request II and the invention to which it related met the requirements of the EPC.

- IV. Against this interlocutory decision, Notices of Appeal were filed by the Opponents on 31 July 2001 (Appellant/O-01), on 8 August 2001 (Appellants/O-03 and O-04), and 20 August 2001 (Appellant/O-02). The respective prescribed fees were paid on the same dates. The Statement of Grounds of Appeal of Appellant/O-03 was received on 10 October 2001, that of Appellant/O-04 on



12 October 2001 and that of Appellant/O-02 on 22 October 2001.

In a letter dated 8 January 2002, Appellant/O-01 referred to its Notice of Appeal and, in view of its failure to submit the Statement of Grounds of Appeal in due time, requested re-establishment of rights under Article 122 EPC and completed the omitted act.

By Interlocutory Decision dated 9 September 2002 (not published in the OJ EPO), this request was rejected.

In the course of the opposition and appeal proceedings, the name and the identity of Appellant/O-02 changed (telefax dated 16 March 2001 and letter dated 19 August 2002, respectively). Moreover, Appellant/O-04 changed its name (Notice of Appeal dated 6 August 2001).

V. In their Notices of Appeal, Statements of Grounds of Appeal and further letters dated 13 and 19 January 2003 as well as 13 February 2004, the Appellants further pursued their initial requests for revocation of the patent in suit in its entirety for the grounds of lack of novelty and lack of inventive step on the basis not only of the 29 documents already cited during the opposition proceedings but also with reference to five additional documents, including:

D30: EP-A-0 309 138 and

D34: EP-A-0 211 650.

VI. By letters dated 27 February 2002 and 30 January 2004, the Respondent disputed all the arguments submitted by the Appellants and, with the latter, filed clear copies of the Main request (corresponding to the above previous Auxiliary request II, section II, above) and of three new Auxiliary requests; independent Claims 1 and 11 of the "1<sup>st</sup> Auxiliary Request" reading as follows:

"1. A polypropylene composition comprising 100 parts by weight of a crystalline propylene- $\alpha$ -olefin copolymer wherein the crystalline propylene- $\alpha$ -olefin copolymer is a propylene-ethylene-butene-1 copolymer having an  $\alpha$ -olefin content of from 2.0 to 30% by weight produced by polymerization using a Ziegler Natta catalyst containing Ti, Mg and Cl as the essential components, said crystalline propylene- $\alpha$ -olefin copolymer having a molecular weight distribution (Mw/Mn) of less than 5.0 and from 0.0001 to 1.0 part by weight of a crystal nucleating agent, the composition having a crystallization temperature at least 1.5°C higher than the crystallization temperature of the crystalline propylene- $\alpha$ -olefin copolymer."

"11. A polypropylene film obtained by melt-extruding a polypropylene composition as claimed in any preceding claim."

The remaining dependent Claims 2 to 10 are based on Claims 2 and 6 to 13 of the granted version of the patent in suit. In Claims 6 and 9, the references to previous claims have been adapted to the new numbering. Furthermore, the expression "propylene polymer" was

replaced by "propylene- $\alpha$ -olefin copolymer" at each occurrence in Claims 2 to 4 and 10.

The second and third auxiliary requests played no decisive role in the further proceedings.

VII. Oral proceedings were held on 18 February 2004 in the presence of all five parties.

- (a) At the beginning of the proceedings, the Chairman informed the parties about the Interlocutory decision dated 9 September 2002, dealing with the request of Appellant/O-01 for re-establishment of rights under Article 122 EPC, and gave the decision on the admissibility of the appeal of Appellant/O-01.
- (b) The novelty objections raised with respect to the subject-matter of Claim 1 of the Main Request, a composition *per se*, were based on D6 and D30, respectively, in combination with common general knowledge as shown by secondary documents D3, D8, D12, D22 and D28. It was argued that the only features not explicitly disclosed in each of these documents were the product-by-process feature defining the polymerisation catalyst and the minimum increase in crystallisation temperature ( $\Delta T_c$ ), both of which were deemed inappropriate to distinguish Claim 1 from that prior art.

These arguments were disputed by the Respondent, who argued that the specific type of catalyst was used in the patent in suit to achieve an increased stereoregularity of the product disclosed in

neither document. With respect to the  $\Delta T_c$  feature, it argued that the figures referred to in support of the objection all related to homopolymers rather than to the copolymer as defined in the claim.

- (c) With regard to the 1<sup>st</sup> Auxiliary Request, an objection under Article 123(2) EPC was raised on the basis of the argument that the percentage of  $\alpha$ -olefin had not originally been disclosed in relation to the terpolymer of propylene, ethylene and butene-1. As regards novelty, in addition to those arguments on the basis of D6 and D30 raised against the main request, reference was in particular made to D6, page 3, 3<sup>rd</sup> paragraph, referring to copolymers "of propylene with  $\alpha$ -olefins other than propylene, such as ethylene and butene-1".

The Respondent disputed these submissions on the basis of the argument that none of the documents related to a terpolymer. Thus, in Example 3 of D6, at least one additional step was necessary to arrive at the specific terpolymer in Claim 1.

- (d) As to the question of inventive step of the 1<sup>st</sup> Auxiliary Request, it was argued by the Appellants/Opponents that all features with the exception of the specific terpolymers had already been known from D30. However, since the butene content was not defined in the claim, the required presence of butene in the polymer was not meaningful, nor would butene affect clarity. Moreover, it had been well-known to use such

terpolymers for films (D5: page 3, lines 8 to 10). Therefore, the choice of the alternative polymer, in order to provide the known advantages, would have been obvious, in particular, when taking into account the teaching of D6 as referred to in section VII(c), above. Moreover, D34 demonstrated in the passage from column 1, line 49 to column 2, line 4 that the problem to achieve good clarity would not be solved in the full scope of Claim 1, ie for all nucleating agents. Furthermore, D16 demonstrated for propylene random copolymers that haze was dependent on the cooling conditions (chill-roll temperature and thickness).

These arguments were disputed by the Respondent who relied on the examples and comparative examples in the patent in suit to show that each of the features in Claim 1 affected the properties of the product and demonstrated that only within the definitions of the claim the technical problems (as evidenced by increased haze) normally occurring when thick films were made at high speeds were reliably overcome. Moreover, none of the cited documents indicated that these problems would be solved by a terpolymer. There was not even a clear and unambiguous hint to terpolymers in any one of the documents. Furthermore, no reason had been given why different documents should be combined with each other.

VIII. The Appellants requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeals be dismissed and that the patent be maintained on the basis of the main request or any of the three Auxiliary Requests filed with the letter dated 30 January 2004.

## Reasons for the Decision

### 1. Admissibility of appeals

1.1 Since the formal requirements for appeal have been fulfilled by Appellants/O-02, O-03 and O-04, their appeals are admissible (section IV, above).

1.2 Article 108 EPC requires that, within four months after the date of notification of an appealed decision, a written statement setting out the grounds of appeal must be filed. However, no such statement has been received in good time from Appellant/O-01, who had filed a Notice of Appeal on 31 July 2001 and had paid the prescribed fees on the same day. By letter dated 8 January 2002, the party completed the omitted act and requested re-establishment of rights under Article 122 EPC. In the Interlocutory Decision T 874/01 dated 9 September 2002 (not published in OJ EPO), this request was refused.

Consequently, the appeal by Appellant/O-01 is inadmissible (Rule 65(1) EPC), and this party is a party as of right (Article 107 EPC, last sentence).

1.3 Since the Appellants/O-2 to O-4 and the Party as of right/O-1 argued along the same lines during the appeal proceedings, their arguments can be dealt with together

and, therefore, these parties will further be referred to hereinafter as the "Opponents".

2. *Procedural matters*

In the Statements of Grounds of Appeal filed by the three Appellants/O-2 to O-4, five additional documents have been cited against the patent in suit.

Documents D30 and D34 have been taken into account in the appeal proceedings under Article 114(1) EPC, because they were apparently relevant to the questions of novelty and inventive step.

*Main Request*

3. *Novelty*

The Opponents contested the novelty of the polypropylene composition of Claim 1 on the basis of documents D30 and D6, respectively, in combination with common general knowledge as shown by D3, D8, D12, D22 and D28.

- 3.1 Document D30 discloses a container comprising a biaxially oriented propylene-ethylene random copolymer resin having an ethylene content of between 0.5 and 8% by weight, based on the weight of the resin, a melt flow rate (MFR) of greater than 50 g/10 min (Claim 1) and a molecular weight distribution (MWD) expressed in terms of an Mw/Mn ratio of between 2.0 to about 2.5 (page 3, lines 3 to 7). The container is prepared by stretch-blow moulding a preform obtained from the above

resin in order to biaxially orient the resin into the shape of the container (Claim 3; page 3, lines 9 to 12).

The container has "exceptional clarity, strength, stiffness and wall thickness properties" (page 2, lines 2 to 5). In order to improve clarity, a small amount, in general less than 1, preferably between about 0.1 to about 0.5% by weight, based on the weight of the resin, of a nucleating agent may be added to the polymer (page 3, lines 7/8; page 4, lines 12 to 18; Examples 1 to 7).

Preferred resins are obtained by reacting a resin having a high molecular weight and low MFR under intense mixing with an organic peroxide to lower its molecular weight and, thereby, to increase its MFR and to narrow its MWD (page 3, lines 53 to 56).

In Examples 1 to 7, a series of ethylene-propylene copolymers having an ethylene content of about 2.15% by weight, MFR values ranging from 2 to 74 g/10 min and Mw/Mn ratios of from 3.13 to 2.11 were prepared by reacting them with a peroxy-ether, then blended with 0.25% by weight of a sorbitol nucleating agent and further common additives and moulded on an injection stretch-blow moulding machine into containers (page 6, line 26 to page 7, line 14).

As admitted by the Opponents, D30 is silent about the "product-by-process feature" ("produced by polymerization using a Ziegler-Natta catalyst containing Ti, Mg and Cl") and the required increase of the crystallisation temperature of the composition in comparison to the polymer *per se* ( $\Delta T_c$ ).



3.2 Document D6 relates to a polypropylene composition capable of effectively preventing deflexions in moulded forms (page 1, last paragraph). The polymer used includes the homopolymer and (block, random, graft etc.) copolymers of propylene with  $\alpha$ -olefins other than propylene, such as ethylene and butene-1. An important feature of the polymers is a narrow molecular weight distribution in terms of an  $M_w/M_n$  ratio of at most 5, preferably 2 to 4 (page 3, 3<sup>rd</sup> paragraph), which can eg be adjusted by pyrolysis of the polymer in the presence of a radical generator (eg peroxide) or by controlling the polymerisation by means of a molecular weight adjusting agent such as hydrogen (paragraph bridging pages 3 and 4).

The second mandatory component of the composition of D6 is a nucleating agent in an amount of 0.05 to 1, preferably 0.1 to 0.5, parts by weight per 100 parts by weight of the propylene polymer. The nature of these agents is not particularly limited (Claim; page 5, 3<sup>rd</sup> and 4<sup>th</sup> paragraphs).

Example 3 describes compositions of an ethylene-propylene block copolymer ( $M_w/M_n = 3.5$ ) and 1,3,2,4(dimethylbenzylidene)sorbitol in amounts of 0.1, 0.3 and 0.5 parts by weight per 100 parts by weight of the polymer. The polymer had been obtained by kneading an ethylene-propylene copolymer (ethylene content = 2.6% by weight, melt index = 1.4) with an organic peroxide.

On the basis of these facts, it was argued by the Opponents that the composition of this example explicitly met all the definitions and features of

Claim 1, except for the "product-by-process feature" and  $\Delta T_c$ , which, however, as with regard to D30, were implicitly fulfilled by this example.

3.3 As pointed out by the Opponents and according to established jurisprudence, a product is not rendered novel merely by the fact that it is produced by means of a new process. Hence, the meaningfulness of these features for the product *per se* must be examined.

3.3.1 According to the Respondent, the specific type of catalyst as defined in Claim 1 was used to increase the stereoregularity of the product. However, as emphasised by the Opponents, this latter property is not explicitly addressed in the patent in suit.

Therefore and in view of Table I in D22 (page 6824) wherein the polymerisation of propylene with a catalyst containing Mg, Ti and Cl yielded a product with an isotacticity index of (only) 45, the Board accepts the argument of the Opponents, that the use of a catalyst containing Ti, Mg and Cl does not necessarily provide a polymer having a high stereoregularity (ie high isotacticity), but that the presence or absence of internal and/or external electron donors play an important role in this respect, as eg also shown in Tables I and II of D22.

Hence the catalyst cannot serve to distinguish the claimed subject-matter of Claim 1 from the prior art.

3.3.2 According to the Opponents, the other feature  $\Delta T_c \geq 1.5^\circ\text{C}$  not explicitly mentioned in D6 and D30 cannot serve this purpose either, because it would inevitably and

automatically be fulfilled when an additive was incorporated which qualified as a "nucleating agent", or in other words, when the additive gave rise to the effects which a skilled person would normally expect, such as forming a high number of small spherulites and reducing the tendency to supercooling. Four documents, D3, D8, D12 and D28, were referred to by the Opponents in support of this point of view and in order to demonstrate that the assertions concerning the  $\Delta T_c$  feature were common general knowledge.

Moreover, according to publication D8, the peak temperature (ie the temperature corresponding to the crystallisation temperature as defined in D12) of polypropylene in DTA is reproducible to  $\pm 1^\circ\text{C}$  (page 2135, lines 19 to 22), which, in the interpretation of the Opponents, showed that a definition requiring a minimum difference  $\Delta T_c$  of at least  $1.5^\circ\text{C}$  was meaningless.

- 3.3.3 Technical Handbook D12 (Chapters 17.3 and 17.4, pages 674 to 676) deals with the characterisation of the activity of nucleating agents and the influence of these agents on characteristics of partly crystalline polymers. Thus, in differential thermal analysis (DTA, DSC), the crystallisation of a polymer melt is traced at a constant rate of cooling, and the temperature is determined at which the crystallisation rate reaches its maximum, ie the heat released by the crystallising melt climbs to a peak. This temperature, generally referred to as the crystallisation temperature ( $T_c$ ) increases with increasing nucleus density, ie with increased activity of the nucleating agent. Thus, in Figure 2 (page 674) the DSC crystallisation diagrams for polypropylene (a) without a nucleating agent and (b)

with 1% of sodium p-tert.butylbenzoate as the nucleating agent at a cooling rate of 8°C/min shows a  $\Delta T_c$  by far exceeding 1.5°C; according to the Opponents: in the range of about 15 to 20°C. A similar pattern is shown in Figure 5 of D8, page 2136, (a  $\Delta T_c$  of more than 15°C with 0.25% aluminium dibenzoate).

This finding is also confirmed in D28, wherein the addition of an effective nucleating agent such as DBS (dibenzylidene sorbitol) to a polypropylene caused an increase of the peak crystallisation temperature of about 15°C (page 110, middle column, lines 1 to 4). Moreover, Figure 1 on the same page shows that  $T_c$  reaches a minimum in polypropylene compositions (either homo- or copolymers) containing a nucleating agent in an amount within the range defined in this claim.

In D3 (column 9, lines 7 to 18) reference is made to a "much higher"  $T_c$  of a given nucleated polymer sample (homo- or copolymer; column 1, lines 62 to 64), eg a rise from 115 to 135°C was observed in a polypropylene sample upon the addition of an effective amount of a nucleating agent, eg 0.3 % by weight of sodium benzoate.

- 3.4 In view of these facts, the Board concurs with the interpretation of the term "nucleating agent" as relied upon by the Opponents which is in line with decision T 672/96 of 21 April 1999 (not published in OJ EPO; in particular points 2.4.1 and 2.6.1 of the reasons).

On the basis of the information in D3, D12 and D28, the Board is thus convinced that an increase of the  $T_c$  of at least 1.5°C is the inevitable consequence of the addition, in amounts which serve the purpose, of any

nucleating agent. A corresponding  $T_c$  increase is therefore implicit to the embodiments covered by Example 3 of D6 and Examples 1 to 7 of D30 which use, respectively, up to 0.5 parts by weight and 0.25% by weight of sorbitol nucleating agents. The validity of this conclusion is furthermore heightened by the inaccuracy of  $\pm 1^\circ\text{C}$  of the  $T_c$  values determined by DTA as set out in D8 (section 3.3.2, above) which *de facto* almost annihilates the nominal  $T_c$  increase of  $1.5^\circ\text{C}$  to be achieved according to present Claim 1.

- 3.5 Consequently, the Board has come to the conclusion that the two above-mentioned features in Claim 1 which are not explicitly disclosed in D30 or D6 cannot serve to establish novelty of Claim 1 over either D30 or D6.

Therefore, the Main request cannot prevail.

*First Auxiliary request*

4. *Article 123(2) and (3) EPC*

An objection was raised that Claim 1 of this request did not comply with the requirements of Article 123(2) EPC, because, in the application as originally filed and in the granted version of the patent in suit, there had been no connection between the specific composition of the propylene-ethylene-butene-1 polymer (referred to hereinafter as the "terpolymer") and the percentage of  $\alpha$ -olefin contained therein.

The relevant features now incorporated in Claim 1 were disclosed in original Claims 3, 4 and 5. However, Claim 5 was appendant only to Claim 3. Therefore, no

connection was seen by the Opponents between the features of original Claim 4 (the terpolymer) and of original Claim 5 (the percentage of  $\alpha$ -olefin). Moreover, the respective passages in the description (application: page 4, lines 12 to 26; patent in suit: page 3, lines 2 to 9) corresponded to the wording of these claims and, furthermore, ethylene was not an  $\alpha$ -olefin.

During the oral proceedings, the Opponents conceded that, although in the strict chemical sense, ethylene was not an  $\alpha$ -olefin, the skilled reader understood that the definition of the monomers in the patent in suit included ethylene.

Since it is evident from the above claims and passages in the description that the crystalline propylene- $\alpha$ -olefin copolymer is one of two alternatives of the polymer used according to original Claim 1, which preferably contains the  $\alpha$ -olefin in amounts of from 2.0 to 30% by weight, since the terpolymer is a preferred example for such a copolymer, and since these findings are also supported by six out of seven examples in the patent in suit as granted (Table 2), the Board is satisfied that Claim 1 complies with Article 123(2) EPC and, as the amendment of the claim further narrows the extent of protection conferred by the claims, also with Article 123(3) EPC.

5. *Novelty*

The Opponents maintained their novelty objection also with respect to this auxiliary request on the basis of D6 and D30 (sections 3.1 and 3.2, above).

5.1 The main argument with regard to D6 was based on the statement "... copolymers ... of propylene with  $\alpha$ -olefins other than propylene, such as ethylene and butene-1 (page 3, 3<sup>rd</sup> paragraph) and on Example 3.

However, the Board is convinced that the two specific compounds mentioned as examples for  $\alpha$ -olefins in the above passage are part of an enumeration of feasible comonomers and that this statement in D6 does not refer to a terpolymer of propylene, ethylene and butene-1. Even less does this passage point to a terpolymer having an  $\alpha$ -olefin content of from 2.0 to 30% by weight.

Therefore, document D6 does not anticipate the subject-matter of Claim 1.

5.2 In D30, only propylene-ethylene random copolymer resins are taken into consideration. The document does not give the slightest hint to terpolymers. Therefore, it cannot challenge the novelty of Claim 1 either.

5.3 Consequently, the composition of Claim 1 complies with Article 54 EPC.

## 6. *Problem and solution*

The patent in suit relates to polypropylene compositions having an excellent transparency which can be further processed to thick films.

6.1 Whilst in the opposition proceedings D16 was considered to represent the closest state of the art, it played only a marginal role in the discussion in the oral proceedings before the Board. The Opponents unanimously

chose D30 as the starting point for their discussion on inventive step, because Claim 1 was not confined to the preparation of films, but rather related to compositions, in general. Since the compositions of D30 provided clear containers, clear films could also be obtained therefrom. Moreover, having regard to the fact that the walls of containers would, in general, be thicker than films, the technical problem common to D30 and the patent in suit resided in the occurrence of decreasing cooling efficiency with increasing thickness and increasing speed in film formation. This provided more time for growing crystals and caused more haze.

Moreover, both D30 and the patent in suit addressed the same field of the art, such as packaging of food.

The only difference of the subject-matter of Claim 1 to D30 was seen in the choice of the alternative polymer in order to achieve the known advantages.

- 6.2 As already pointed out above (sections 3.1 and 5.2, above), D30 relates specifically to propylene-ethylene copolymers having particular properties used in a multi-step process to provide clear, glossy, strong and stiff containers of biaxially oriented propylene-ethylene polymers (page 2, lines 2 to 5 and 47/48). In the examples of D30, containers having an average wall thickness of about 20 mils (0.5 mm) were prepared from compositions containing propylene copolymers having ethylene contents of 2.15% by weight and molecular weight distributions ranging from 3.13 to 2.11 at MFR values of from 2 to 74 g/10 min and additives including 0.25% by weight of a sorbitol derivative as the nucleating agent. The containers were manufactured in a



three stage apparatus wherein the injection moulding, stretch-blow moulding and ejection stages were run concurrently on three different batches. The rate limiting step for the cycle time (ie the time between ejection of containers from the apparatus) was the injection moulding stage. In Table III, the haze, gloss, tensile strength, flexural modulus and drop impact properties of the final containers are given.

Nothing is said about the haze at different cooling times or different thicknesses of the container walls. However, in the document, the use of a polymer having a higher MFR is discussed in relation to the cycle time in the manufacture of the container, in that a high MFR causes lower melt and crystallisation temperatures of the polymer, so that the apparatus can be run at lower temperatures with less heat to be removed from the preform and the container to reach the desired solidification and crystallisation (page 5, lines 14 to 16 and 51 to page 6, line 2).

6.3 In accordance with the introduction of the patent in suit, the technical problem may be seen in the provision of a further polypropylene composition having an excellent transparency and showing a small film-forming condition dependency and a small thickness dependency of the transparency without reducing the preferred characteristics which a polypropylene film inherently possesses (page 2, lines 19/20 and 40 to 42).

6.4 This technical problem is solved by a composition comprising 100 parts by weight of a crystalline propylene-ethylene-butene-1 copolymer and 0.0001 to 1.0 parts by weight of a crystal nucleating agent as

defined in Claim 1. In view of the results of Examples 2 to 6 and the comparative example of the patent, which have not been disputed, the Board is satisfied that the above technical problem is effectively solved by the claimed subject-matter.

The argument on the basis of D34 (column 1, line 49 to column 2, line 4), that the problem would not be solved within the full scope of Claim 1, is not convincing, because it is only based on a statement referring to propylene polymers, in general, but not the terpolymer as defined in Claim 1. Nor has any evidence been provided that this statement would be valid for all propylene polymers, let alone for the terpolymer. Under these circumstances, the onus of proof for this statement was, however, on the Opponents, which have not discharged this burden.

7. *Inventive step*

It remains to be decided whether the solution found was obvious to a person skilled in the art having regard to the state of the art relied upon by the Respondent.

- 7.1 As already pointed out above, the teaching of D30 concerns containers made in a multi-step process which, after the moulding of a preform, requires the mandatory step of injection stretch-blow moulding to obtain the container. Moreover, the document refers only to ethylene-propylene random copolymers characterised by their ethylene content, their MFR and their MWD. No mention is made of copolymers containing moieties derived from further monomers. Nor does the document refer to the influence of different thicknesses of the

container walls on its transparency (clearness, haze). It rather suggests to use polymers having a high MFR which would thus allow to reduce the processing temperatures in order to reduce the necessary cycle times, ie the document relates to a different problem.

Consequently, document D30 by itself does not provide an incentive to solve the above technical problem in a way so as to arrive at something within the scope of Claim 1.

7.2 Hence, it remains to be decided whether one or more of the other citations provides or contributes to the claimed solution to the above problem.

7.2.1 In D16, reference is made to a tight MWD of eg 4.5, in one instance only, ie in relation to the different crystallisation behaviour of conventional standard polypropylene ("ST-PP") and controlled rheology polypropylene ("CR-PP") which are, according to the context, the respective homopolymers. Elsewhere in the document, MWD is referred to only as being "tight" or "broad". It was supposed that the different crystallisation behaviour might be the reason for getting better optical properties with CR-PP films which showed a lower degree of crystallinity than ST-PP films. However, exact statements about this relation would be difficult, because, dependent on the cooling condition, polypropylene would always show a structure between smectic and spherulitic (page 144, line 18 to page 145, line 9).

Films made from polypropylene homopolymers of about the same molecular weight showed a clear increase of the

rate of crystallinity with increased MWD. Such distinctly marked differences could not be seen with random copolymers, presumably due to the influence of the comonomer on the possibility of making such measurements (page 146, lines 6 to 16).

In Figure 6 of D16, CR-PP and ST-PP homopolymer films are compared with respect to their haze relative to the chill-roll temperature. The increase in haze with higher chill-roll temperatures are not so pronounced in the CR-PP films as compared to those of ST-PP.

Films made of two propylene-ethylene copolymers containing 4 and 6 mol% of ethylene, respectively, both having a tight MWD, show better haze behaviour with increased thickness than films of corresponding copolymers with broad MWD (Figure 7). Then it is stated in general terms that these properties correlated very well with values presented for homopolymers, and reference was made to Figure 6.

However, the document is silent about any details in this respect. Nor does it address the details and other characteristics of Claim 1 under consideration. Thus, no mention is made of the terpolymer and the required Mw/Mn ratio. Nor is reference made to the addition of a nucleating agent.

The undisputed results in the examples in the patent in suit show, however, the criticality not only of the Mw/Mn ratio of the terpolymer, but also that of the amount of the nucleating agent. Hence, it follows that D16 neither provides an incentive to solve the relevant technical problem by using a terpolymer as defined in

Claim 1 nor adding a nucleating agent so as to arrive at something within the scope of Claim 1. Nor does it provide an incentive to modify the teaching of D30 in order to solve the existing technical problem.

7.2.2 In D3, a number of properties of crystalline polymers are addressed, including clarity and impact strength of highly crystalline polypropylene, which require improvement. In column 6, line 59 *et seq.*, reference is made to a number of different polymers, in particular crystalline polypropylene and other crystallisable hydrocarbon polymers, and more particularly  $\alpha$ -olefin polymers and copolymers such as "linear polymers of ethylene, 1-butene, 4-methyl-1-pentene, and 1-hexene, crystalline copolymers of propylene with ethylene, 1-butene and the like, and crystalline polystyrene". However, the Board is convinced that this enumeration of feasible monomers does not point specifically to a terpolymer of propylene, ethylene and butene-1, let alone to such a terpolymer having an  $\alpha$ -olefin content of from 2.0 to 30% by weight.

Consequently, the document does not suggest to solve the relevant technical problem by means of a solution within the ambit of Claim 1.

7.2.3 Document D5 discloses a process for producing an ultra-high MFR propylene polymer, which in the absence of any post-reactor treatment has an MWD which is not inversely proportional to the MFR. Further properties aimed at in the document are high melt strength, melt elasticity, and shear sensitivity of the polymers which are to be used for the manufacture of non-woven fabrics by "melt blown" processes (Claim 1; page 2, lines 2

to 5). Although a general reference is made to homo-, co- and terpolymers of propylene with ethylene and/or one or more other  $\alpha$ -olefins (page 3, lines 8 to 10), only homopolymers were prepared in the examples and comparative examples. Therefore, this document neither concerns the relevant technical problem, nor is it able to contribute to its solution.

7.2.4 Document D6 has already been discussed in sections 3.2 and 5.1, above. It concerns a different problem, ie the prevention of deflexions in the moulded forms. Consequently, it cannot provide any teaching as to the relevant technical problem either.

7.2.5 Documents D8, D12 and D28 relate to nucleating agents and their effect on polypropylene compositions, in general. In none of them, the relevant technical problem has been considered, nor was there any suggestion to prepare a composition as defined in Claim 1.

7.3 It follows that none of the cited documents by itself or in combination with a further document or further documents provides an incentive to overcome the relevant technical problem by a composition as defined in Claim 1.

Therefore, the subject-matter of this claim involves an inventive step.

8. By the same token, the film of Claim 11 which comprises the above composition, and the compositions according to Claims 2 to 10 appendant to Claim 1 are also novel and involve an inventive step.
  
9. Since the First Auxiliary Request of the Respondent is successful, there is no need to consider the further auxiliary requests.

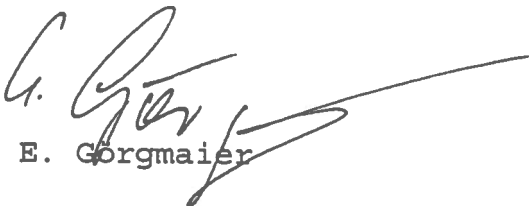
**Order**

**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 on the basis of Claims 1 to 11 of the First Auxiliary Request, after any necessary consequential amendment of the description.

The Registrar:

The Chairman:

  
E. Gorgmaier

  
P. Kitzmantel

