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**D E C I S I O N**  
**of 13 September 2005**

**Case Number:** T 0424/04 - 3.3.03

**Application Number:** 95934156.1

**Publication Number:** 0785954

**IPC:** C08F 2/00

**Language of the proceedings:** EN

**Title of invention:**

-

**Patentee:**

Borealis Technology Oy

**Opponent:**

Basell Technology Company B.V.

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56, 100(b), 114(2)

**Keyword:**

"New ground of opposition - not admitted"

"Non-admission of late-filed documents (confirmed)"

"Inventive step (yes)"

**Decisions cited:**

G 0010/91, T 0219/83, T 0182/89, T 0640/91, T 0989/93

**Catchword:**

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Case Number: T 0424/04 - 3.3.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.03  
of 13 September 2005

**Appellant:** Basell Technology Company B.V.  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office dated  
3 December 2003 and posted 22 January 2004  
rejecting the opposition filed against the  
European patent No. 0785954 pursuant to  
Article 102(2) EPC.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** C. Idez  
C. Heath

## Summary of Facts and Submissions

I. The grant of the European patent No. 0 785 954 in the name of Borealis Technology OY in respect of European patent application No. 95 934 156.1, based on International patent application PCT/FI95/00558 filed on 10 October 1995 and claiming priority of the FI patent application No. 944761 filed on 11 October 1994 was announced on 27 December 2000 (Bulletin 2000/52) on the basis of 12 claims.

Independent Claims 1, 7, 11 and 12 read as follows:

"1. A composition of two propylene/ $\alpha$ -olefin copolymers having a high molecular weight and a broad molecular weight distribution and an improved comonomer distribution, characterized in that the composition comprises a mixture of copolymers A) and B), wherein copolymer A) is a copolymer of propylene and a C<sub>2</sub>-C<sub>12</sub>- $\alpha$ -olefin comonomer (not being propylene) with a high molecular weight defined by a melt flow rate MFR<sub>2</sub> from 0.005 to 0.8 and a comonomer content of 3 to 10 weight-%, copolymer B) is a copolymer of propylene and a C<sub>2</sub>-C<sub>12</sub>- $\alpha$ -olefin comonomer (not being propylene) having a lower molecular weight and a lower comonomer content than copolymer A), and wherein the final propylene/ $\alpha$ -olefin copolymer composition has a comonomer content less than the comonomer content of copolymer A), a melt flow rate MFR<sub>2</sub> of 0.05 to 2.5, a melt flow rate ratio MFR<sub>10</sub>/MFR<sub>2</sub> of 15 to 40 and a molecular weight distribution MWD of 6 to 15, and a weight ratio between the copolymers A) and B) of 40/60 to 70/30.

2. A composition of two propylene/ $\alpha$ -olefin copolymers having a high molecular weight and a broad molecular weight distribution and an improved comonomer distribution, characterized in that the composition is a mixture of copolymers obtainable according to stages A) and B) which are as follows:

A) copolymerization of propylene and a  $C_2$ - $C_{12}$ - $\alpha$ -olefin comonomer (not being propylene) by means of Ziegler-Natta catalyst system producing a high molecular weight copolymer having a melt flow rate  $MFR_2$  from 0.005 to 0.8 and a comonomer content of 3 to 10 weight-%, and

B) copolymerization of propylene and the  $C_2$ - $C_{12}$ - $\alpha$ -olefin comonomer (not being propylene) by a polymerization reaction in one or several other reactors including the copolymer from stage A) for producing a lower molecular weight copolymer than that of stage A) and

wherein the final propylene/ $\alpha$ -olefin copolymer composition is having a comonomer content less than the comonomer content of the copolymer of stage A), a melt flow rate  $MFR_2$  of 0.05 to 2.5, a melt flow rate ratio  $MFR_{10}/MFR_2$  of 15 to 40 and a molecular weight distribution MWD of 60 [sic] to 15 and a weight ratio between the copolymers from stage A) and from stage B) being 40/60 to 70/30.

7. A process for the production of a propylene/ $\alpha$ -olefin copolymer composition having a high molecular weight and a broad molecular weight distribution and an improved comonomer distribution, characterized in that A) propylene and a  $C_1$  [sic]- $C_{12}$ - $\alpha$ -olefin comonomer (not being propylene) are copolymerized in the presence of a Ziegler-Natta catalyst system in a first stage, whereby a high molecular weight copolymer having a melt flow rate  $MFR_2$  from 0.005 to 0.8 and a comonomer content of 3

to 10 weight-% is produced, followed by a second stage B) where more of propylene and a C<sub>2</sub>-C<sub>12</sub>- $\alpha$ -olefin comonomer (not being propylene) are copolymerized in one or several other reactors including the copolymer from stage A) and the comonomer concentration being lower than in stage A), producing a copolymer with a lower molecular weight than that of the copolymer of stage A), and providing a final propylene/ $\alpha$ -olefin copolymer composition having a comonomer content less than that of the copolymer of stage A), a melt flow rate MFR<sub>2</sub> of 0.05 to 2.5, a melt flow rate ratio MFR<sub>10</sub>/MFR<sub>2</sub> of 15 to 40 and a molecular weight distribution MWD of 6 to 15, wherein the weight ratio between the copolymers from stage A) and from stage B) is 40/60 to 70/30.

11. Use of the composition according to any of claims 1 to 6 in blow molding or in film, foam or fibre preparation.

12. Use of the composition according to any of claims 1 to 6 in pipe, fitting or profile preparation."

Claims 3 to 6, and 8 to 10 were dependent claims.

II. On 26 September 2001, a Notice of Opposition against the patent was filed by Basell Technology Company B.V. The Opponent requested revocation of the patent in its entirety on the ground of lack of inventive step (Article 100(a) EPC).

The opposition was supported by the following documents:

D1: US-A-4 500 682;

D2: US-A-5 140 062; and

D3: US-A-4 950 720.

III. By a decision announced orally on 3 December 2003, and issued in writing on 22 January 2004, the Opposition Division rejected the opposition.

According to the decision, the documents filed with the letter dated 6 October 2003 of the Opponent:

D4: Kirk Othmer, Encyclopedia of Chemical Technology, Third Edition, Volume 16 (1981), pages 455-457;

D5: Journal of Applied Polymer Science, Vol. 14, (1970), pages 1651-1653; and

D6: JP-A-59 172 507 and English translation thereof;

were found *prima facie* not relevant for the final decision of the case because they all related to propylene homopolymers and were not allowed into the proceedings.

Concerning inventive step, document D1 was considered as the closest state of the art, since it disclosed polypropylene compositions presenting the most technical features in common with the claimed composition.

According to the decision, D1 disclosed a polypropylene composition obtained in multistage polymerization process, comprising a high molecular weight (HMW) fraction and a low molecular fraction (LMW) and exhibiting a  $MFR_2$  of 0.03 to 2.

D1 however did not disclose the specific comonomer distribution of the claimed compositions of the patent in suit, i.e. that the comonomer be present in both the HMW and LMW fractions and that the amount of comonomer be lower in the LMW.

The technical problem, starting from D1 was then seen in the provision of polypropylene compositions for use as a pipe material having good creep resistance, good mechanical properties and improved odour and taste properties.

The decision held that D1 was not concerned with the manufacture of pipes and was directed to compositions having improved sheet or blow moldability for use mainly in the manufacture of bottles with uniform thickness.

The decision further stated that there was no disclosure in the examples of D1 of compositions comprising two copolymers, or having the lower comonomer content in the LMW fraction. It held that the use of Example 10 of D1 as a starting point for solving the technical problem as done by the Opponent, would be based on hindsight reasoning.

According to the decision, documents D2 and D3 did not disclose or suggest the use of two copolymers with the lower comonomer content in the LMW fraction for obtaining polypropylene compositions useful as a pipe material having good creep resistance, good mechanical properties and improved odour and taste properties. Thus, neither D1 alone nor its combination with D2 or D3 would suggest the claimed subject-matter.

Consequently, the Opposition Division decided to reject the opposition.

IV. A Notice of Appeal was filed on 22 March 2004 by the Appellant (Opponent) with simultaneous payment of the requested fee.

In the Statement of Grounds of Appeal filed on 1 June 2004, the Appellant requested that documents D4 to D6 be introduced into the proceedings.

It also argued essentially as follows:

- (i) The technical problem underlying the patent in suit was to provide propylene copolymer compositions having improved mechanical properties, namely creep and toughness in pipe materials and good processability, namely extrudability.
- (ii) These properties would be considered as beneficial in pipes but also in blow molding, in film, foam, fibre, or profile preparation.



- (iii) The solution was to produce random propylene copolymers with broad MWD and high molecular weight and improved comonomer distribution using high yield catalyst in two or several reactors at different reaction conditions.
- (iv) The avoidance of formation of low molecular weight fractions affecting taste and odour represented a bonus effect.
- (v) The compositions of D1 showed superior sheet moldability post processability and blow moldability, and led to products having good quality. Blow molding was referred to in the claims of the opposed patent.
- (vi) It was known that the pipes and sheets belonged to the same technical field (cf. D4; Table 1, page 456). Furthermore it was known from D4 that the optimal MWD for pipes and sheets was 8 to 10.
- (vii) Thus, D1 addressed the same problem as the patent in suit, improved processability and final properties for comparable applications.
- (viii) In view of document D6 (Example 4, Table 1) the compositions of Examples 8 and 10 of D1 were expected to have a MWD of 10. The MFR could be determined from the intrinsic viscosity as indicated in D5. Thus, Example 10 of D1 disclosed all the features of the claimed compositions with the

exception of the presence of comonomer in the LMW fraction.

- (ix) D1 taught to use different amounts of comonomer in the fractions having different molecular weight.
- (x) Thus, the skilled person would have been motivated to introduce minor amounts of comonomer in the LMW fraction.
- (xi) Thus Claims 1 to 12 lacked inventive step in view of D1 and common general knowledge.
- (xii) Starting from D1, in view of the teaching of D2 and D3 to use a high ethylene content in the high molecular weight fraction, it would also have been obvious to use a Ziegler-Natta catalyst comprising  $MgCl_2$  supported tetravalent Ti compounds as taught in D2 and D3 to arrive at the composition of the patent in suit.

V. In its letter dated 21 October 2004, the Respondent (Patentee) argued essentially as follows:

- (i) Documents D4 to D6 were not relevant and should not be introduced into the proceedings.
- (ii) The aim of the patent in suit was to provide propylene random copolymer for pipes having good processability, including good extrudability, good mechanical properties,

in particular creep resistance and toughness and at the same time improved taste and odour.

- (iii) The achievement of good taste and odour properties did not represent a bonus effect.
- (iv) The distribution of comonomer in both the HMW molecular and the LMW fractions represented a key feature of the claimed invention.
- (v) D1 addressed none of the problems associated with the manufacture of pipes.
- (vi) Thus, D1 was not an appropriate starting point for the problem-solution approach. Hence the subject-matter of the patent in suit was inventive over D1.
- (vii) Even if document D4 would be considered it would not render D1 more relevant.
- (viii) Table 1 of D4 only gave a very general overview of propylene homopolymers for a wide range of applications. No applications for sheets or tubes were given in Table 1.
- (ix) Furthermore D1 was silent on the following features defined in Claim 1 of the patent in suit:

- (a) both HMW and LMW fractions were copolymers of propylene and a C<sub>2</sub>-C<sub>12</sub>- $\alpha$ -olefin comonomer;
  - (b) a comonomer content of 3 to 10 weight-% in the HMW;
  - (c) a lower comonomer content in the LMW than in the HMW;
  - (d) the MFR<sub>2</sub> of the HMW from 0.005 to 0.8;
  - (e) a melt flow rate ratio MFR<sub>10</sub>/MFR<sub>2</sub> of 15 to 40 for the final composition, and
  - (f) a MWD in the range of 6 to 15 for the final composition.
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- (x) In particular, features (a), (b) and (c) were key features of the claimed invention.
  - (xi) D1 disclosed three alternatives for introducing the comonomer, i.e. either in one of the HMW or LMW fractions, or in both fractions.
  - (xii) D1 was completely silent as to whether the amount of comonomer should be greater in HMW fraction.
  - (xiii) It was not possible from D5 to calculate the MFR of the polymers of D1, since D5 referred only to specific propylene homopolymers.

- (xiv) The analysis of the Appellant based on Examples 8 and 10 of D1 was an inadmissible *ex post facto* analysis.
- (xv) D2 did not teach that the comonomer should be incorporated in both fractions, let alone that it should be introduced in greater amounts in the HMW fraction.
- (xvi) D3 was concerned with a reactor blend of a propylene/olefin random copolymer with a propylene homopolymer.
- (xvii) Thus, the subject-matter of the patent in suit involved an inventive step over the prior art relied on by the Appellant.

VI. In its letter dated 6 September 2005, the Appellant requested that the ground of opposition according to Article 100(b) EPC be introduced into the proceedings. In that respect it argued that the patent in suit did not provide sufficient information as to determine the MWD of the claimed compositions. As support for its line of arguments it submitted the following document:

D7: "Experiences with Interlaboratory GPC Experiments";  
Macromol. Symp. Vol. 110;(1996); pages 15-32.

VII. Oral proceedings were held before the Board on 13 September 2005.

At the oral proceedings, the Patentee having indicated that it did not agree with the introduction of the new ground of opposition (i.e. Article 100(b) EPC), the

discussion was firstly focussed on the question of the admission of the late filed documents D4 to D6 into the procedure.

(i) In that respect, the arguments submitted by the Parties may be summarized as follows:

(i.a) By the Appellant:

(i.a.1) Even if documents D4 to D6 related to homopolymers of propylene, they were nevertheless very relevant.

(i.a.2) In view of the very low amount of comonomers in the propylene copolymers of the composition according to the patent in suit, the skilled person would have considered that the teachings in these documents concerning the similarity of requirements for the manufacture of sheets and pipes (cf. D4), the relationship between the  $MFR_2$  and the intrinsic viscosity (cf. D5), and the relationship between the intrinsic viscosities of components of propylene polymers blends and the MWD of the blend (cf. D6) would also apply to the copolymers used in the claimed compositions according to the patent in suit.

(i.b) By the Respondent:

(i.b.1) Documents D4 to D6 were even less relevant than document D1, which itself was not concerned with the technical problem underlying the patent in suit.

(i.b.2) Thus, the Opposition Division was correct when deciding not to admit them into the proceedings.

(i.b.3) Propylene homopolymers had different properties than propylene copolymers. Teaching which was valid for homopolymers could not be simply transferred to copolymers.

(i.b.4) Contrary to the submissions of the Appellant the amount of comonomer in the copolymers of the claimed compositions could not be neglected, since it could be as high as 10% by weight.

The Board, after deliberation, having informed the Parties that it considered that the Opposition Division had correctly applied its discretion not to admit documents D4 to D6 into the proceedings, and that therefore the request for introducing these documents at the appeal stage was refused, the discussion moved to the assessment of inventive step in respect of documents D1 to D3.

(ii) The arguments submitted by the Parties in that respect may be summarized as follows:

(ii.a) By the Appellant:

(ii.a.1) Document D1 was also concerned with improvement of extrudability of propylene polymer compositions (cf. column 2, lines 18 to 27).

(ii.a.2) The compositions disclosed in D1 comprised a high molecular component and a low molecular weight component (column 2, lines 39 to 40).

(ii.a.3) The relative amounts of the high molecular weight fraction and the low molecular weight fraction, the  $MFR_2$ , and the content of comonomer of the compositions of D1 fell within the requirements set out for these features for the compositions of the patent in suit.

(ii.a.4) In view of the relationship set out in D1 between the  $MFR_2$  and the HMI, i.e. the  $MFR_{10}$  (column 2, line 47), it was clear that the ratio between the  $MFR_{10}/MFR_2$  would be greater than 25.

(ii.a.5) In view of the use of  $TiCl_3$  as catalyst in the slurry polymerization process of D1, it was evident that MWD of the obtained compositions would also be in the range as required by the patent in suit.

(ii.a.6) In view of the intrinsic viscosity of the HMW component of the blends of D1, the  $MFR_2$  of this component would inevitably be in the range required for this feature in the patent in suit. This also would be evidenced from the comparison between Example 1 of D2 and Example 4 of D1.

(ii.a.7) Consequently, the only difference between the compositions of the patent in suit and those disclosed in particular in the Examples 8 to 9 of D1 would be the fact that the LMW component also contained a comonomer in a lower amount than the HMW component.

(ii.a.8) The comparison between the sag properties of the sheets made from the compositions of Example 8 and 9 of D1 clearly showed that these properties were



improved when a lower amount of comonomer was present in the HMW component.

(ii.a.9) Sag properties were related to physical and mechanical properties of the blends, which were also relevant in the manufacture of pipes. Sag properties were linked with the MWD and would be improved by using compositions exhibiting a broad MWD.

(ii.a.10) In that respect the compositions of D1 could be used for the same applications (cf. column 2, lines 21 to 27) as those mentioned in the patent in suit (cf. paragraph 18 thereof).

(ii.a.11) Thus, starting from D1 the technical problem must be seen in the provision of propylene polymers compositions having improved physical and mechanical properties.

(ii.a.12) The improvement of taste and odour was merely a bonus effect related to the reduction of the content of the low molecular weight fraction.

(ii.a.13) D1 further taught that a comonomer may be present in both HMW and LMW components (column 4, lines 27 to 29).

(ii.a.14) Document D2 which was closely related to D1 (same inventor) also dealt with the problem of improving the sag properties of sheets (column 2, lines 32 to 61).

(ii.a.15) According to the process of D2, in the first steps hydrogen was used as a molecular weight

regulator, and the amount of ethylene was limited to 0 to 5 wt%, while in the further steps the ethylene was used in a relatively large amount (column 4, line 55 to column 5, line 13).

(ii.a.16) Thus, D2 clearly taught the manufacture of compositions comprising a LMW component having a low ethylene content, and a HMW component having a higher ethylene content.

(ii.a.17) Consequently, the combination of D1 with D2 would render the claimed subject matter obvious.

(ii.b) By the Respondent:

(ii.b.1) The patent in suit was concerned with the problem of providing propylene polymer compositions having a good extrudability and allowing the production of pipes having in combination good mechanical properties (toughness, creep resistance) and good odour and taste properties.

(ii.b.2) There was no link between the creep resistance which was a long term property related to use during several years of the pipes, and the sag which was an immediate indication of the further processability of the sheets. Furthermore, pipes were directly obtained by extrusion, while in D1 the aim was to improve the post processability (thermoforming, blow molding) of the extruded articles (sheets, parisons).

(ii.b.3) Document D1 was concerned with a technical problem which was not related to the one addressed by the patent in suit. Thus, the claimed subject-matter

would be inevitably non obvious in the light of such prior art.

(ii.b.4) D1 was silent on the  $MFR_2$  of the high molecular weight component, on the MWD of the composition and on  $MFR_{10}/MFR_2$  ratio thereof.

(ii.b.5) D1 was in particular totally silent on one of the key features of the compositions according to the patent in suit, i.e. the relative content of comonomers in the HMW and in the LMW fraction.

(ii.b.6) The presence of comonomers in both components improved the miscibility of the components and thus the pressure resistance of the pipes made from the compositions, while a lower amount of comonomer in the LMW components allowed the obtaining of good taste and odour properties.

(ii.b.7) The presence of comonomers in the propylene polymers of the compositions of D1 was only optional (column 4, lines 19 to 22). Thus, relying on the specific Examples 8 to 9 of D1 was clearly based on hindsight.

(ii.b.8) Furthermore, according to D1 comonomer might be present either in one of the HMW component or the LMW component, or in both of these components (column 4, lines 26 to 28).

(ii.b.9) Thus, D1 could not have suggested to incorporate comonomers in both the HMW and the LMW components, let alone to incorporate them in a higher amount in the HMW component than in the LMW component

to solve the technical problem underlying the patent in suit.

(ii.b.10) Document D2 was, as D1, concerned with the post processability of sheets. D3 related to compositions comprising a propylene homopolymer and a propylene copolymer having improved brittleness. Thus, even if combined with D1, they could not render the claimed subject-matter obvious.

VIII. The Appellant requested that the decision under appeal be set aside and that the European patent 0 785 954 be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained.

### **Reasons for the Decision**

1. The appeal is admissible.

#### *Procedural matters*

2. As appears from the Summary of Facts and Submissions, the Board was faced with the following procedural issues arising from the written statements of the Appellant, i.e. (i) the request for introduction of the of ground of opposition under Article 100(b) EPC), and (ii) the request for the introduction of documents D4 to D6 into the proceedings.

2.1 Concerning the first issue (i), it is noted by the Board that an objection under Article 100(b) EPC has

neither been raised against the granted patent by the Opponent, nor dealt with in the appealed decision.

- 2.2 Furthermore, as indicated above in paragraph VII, the Patentee (Appellant) has not given its approval for the introduction of this new ground of opposition.
- 2.3 Under these circumstances and in view of the principles set out in the decision G 10/91 (OJ EPO, 1993, 420; Headnote 3), according to which fresh grounds for opposition may be considered in appeal proceedings only with the approval of the patentee, the Board can only come to the conclusion that the introduction of the ground of opposition under Article 100(b) EPC cannot be allowed.
- 2.4 Concerning the second issue (ii), the Board notes that the introduction of the documents D4 to D6 into the opposition procedure has not been allowed by the Opposition Division.
- 2.5 When using its discretion under Article 114(2) EPC, the Opposition Division has considered that these late filed documents were *prima facie* not relevant for the final decision of the case because all these documents related to polypropylene homopolymers.
- 2.6 As stated in the decision T 640/91 (OJ EPO, 1994, 918; Headnote 3), a Board of Appeal should only overrule the way in which a first instance department has exercised its discretion in a decision in a particular case if the Board comes to the conclusion that the first instance department in its decision has exercised its discretion according to the wrong principles, or

without taking into account the right principles, or in an unreasonable way.

2.7 In that context, the Board, having considered the documents D4 to D6 which, as correctly indicated in the decision under appeal, only relate to polypropylene homopolymers, while the compositions according to the patent in suit are concerned with propylene copolymers, is satisfied that the Opposition Division did not misuse its discretion under Article 114(2) EPC when it elected to disregard documents D4 to D6.

2.8 Consequently, the Board decided not to allow the introduction of the documents D4 to D6 into the proceedings (Article 114(2) EPC).

*Prior art*

3. As indicated above in Section III, the Appellant (Opponent) relied on documents D1 to D3 as support for its objection of lack of inventive step.

3.1 Document D1 relates to a polypropylene composition which is superior in the post-processability for forming sheets as well as to the blow moldability, and also to a process for producing the same. More particularly it relates to a high melt-viscoelastic polypropylene composition obtained by polymerizing propylene at multiple stages so that the resulting polypropylene composition may consist of polymer proportions of two sections having a definite difference between the molecular weights (column 1, lines 8 to 15).

As indicated in D1 sheets produced by processing known polypropylene have various drawbacks that at the time of molding by heat for post-processing, the resulting sheet sags rapidly. Since the sag of wide sheets is large, only small-type molded products could have been produced. When known polypropylene is used for blow molding, since the sag of parison at the time of the molding is large, the thickness of the resulting-molded products is non-uniform and hence blow molding process can be applied only to small-type products (column 1, lines 23 to 37).

Thus, as mentioned in D1, one of its objects is to provide a polypropylene composition having a superior sheet-moldability and blow moldability which are deficient in known polypropylene, and a process for producing the same. Another object of D1 is to extend the application field of polypropylene sheet molded products and blow molded products and make production of molded products of good quality easier (column 2, lines 18 to 26).

3.2 According to D1, this problem is solved by providing a polypropylene composition which is characterized in that:

- (1) said composition is obtained by polymerizing propylene at multiple stages by the use of a catalyst comprising a titanium trichloride composition and an organoaluminum compound and a molecular weight modifier;
- (2) the resulting final polymer composition comprising a HMW portion (A) and a LMW portion (B) has a melt flow index (MI) of 0.03 to 2.0 g/10 minutes, and

between this melt flow index and a melt flow index (HMI) (10.2 kg/10 minutes, 230°C) as measured under 5 times the load applied in the measurement of the former melt flow index, there is the following relationship:

$$\log \text{HMI} \geq 0.922 \log \text{MI} + 1.44 \quad (1); \text{ and}$$

- (3) said final polymer composition consists of 40 to 60% by weight of a polypropylene portion corresponding to said HMW portion and 60 to 40% by weight of a polypropylene portion corresponding to said LMW portion, the intrinsic viscosity of the HMW portion,  $[\eta]_H$ , and that of the LMW portion  $[\eta]_L$ , having the relationship:

$$3.0 \leq [\eta]_H - [\eta]_L \leq 6.5 \quad (\text{Claim } 1).$$

- 3.3 According to D1 propylene may be used together with another monomer within a range which is not harmful to satisfaction of the object of the compositions disclosed therein. For example, ethylene, butene-1, hexene-1, 4-methylpentene-1, and vinyl compounds such as styrene, vinylhexane, or divinylbenzene may be used as comonomers. The copolymerization may be carried out with either one of the above-mentioned portions (A) or (B) or both of (A) and (B). In the case of ethylene as comonomer, its amount in the composition is in the range of 1 to 15% by weight, preferably 2 to 10% by weight (column 4, lines 18 to 35). More particularly, in its Examples 8 and 10 D1 discloses propylene compositions having an ethylene content of 3.2% by weight and comprising a HMW component containing ethylene as comonomer in an amount of respectively 6.2 (Ex. 8) or 6.4% by weight (Ex. 10) and one propylene homopolymer as LMW component. In its Example 9 it



further discloses a composition having an ethylene content of 8.3% by weight and comprising a HMW component containing ethylene as comonomer in an amount of 64% by weight and two homopolymers of lower molecular weight.

- 3.4 Document D2 is concerned with a continuous process for producing high melt viscoelastic ethylene-propylene copolymers.

An object of D2 is to provide copolymers having better impact strength than those obtained by known methods and being suited for post-finishing sheets, blow molding due to better sag properties and injection molding (column 1, lines 32 to 61; column 5, lines 14 to 21).

In that respect D2 provides a process wherein (1) polymerization of propylene as the major component is first performed in two or more polymerizers (ethylene content of monomers to be supplied is 0 to 5 wt%), using 3 or more polymerizers connected in series and polymerization of monomers containing ethylene in a relatively large amount is then performed in one or more remaining polymerizers (ethylene content in the monomers to be supplied is 10 to 100 wt%) and (2) wherein the catalyst to be used and the hydrogen as a molecular weight regulator are supplied in a first tank by the whole amounts in which the catalyst and hydrogen (except for those consumed on the way) are transferred in order into a second and subsequent tanks, together with the reaction mixture (slurry). According to D2, the molecular weight of a polymer produced in each polymerizer can be freely controlled on a practical

- level by continuously withdrawing a gas from the gaseous phase of the polymerizers of the second tank or a tank(s) subsequent thereto, without providing any special facilities such as for degasification (column 4, line 55 to column 5, line 12).
- 3.5 Document D3 relates to a modified polypropylene which, in its overall concept, comprises a reactor blend of a higher molecular weight propylene/olefin random copolymer with a lower molecular weight substantially isotactic homopolypropylene. According to D3, by reactor blend, it is meant an in situ blend produced by polymerizing one or more monomers in the presence of another polymer. The resulting reactor product is a highly dispersed blend of the various polymers in which the components are mechanically inseparable (column 3, lines 4 to 14).
- 3.6 As stated in D3, highly isotactic homopolypropylene is characterized by a high value of meso diads [m], a high degree of crystallinity and a low portion of material that is soluble in hydrocarbon solvents at or slightly above room temperature. Desirable properties of these highly isotactic homopolypropylenes include high tensile strength, hardness and high melting point. Undesirable properties include brittleness and low impact strength, particularly at lower temperatures. Highly isotactic homopolypropylene is also difficult to process in, for example, film application requiring biaxial stretching of the polymer (column 1, line 60 to column 2, line 2).
- 3.7 Consequently, the aim of D3 is to provide a polypropylene composition which incorporates the best

of the modulus, tensile, hardness and melting point properties characteristic of high isotactic content while concurrently improving upon the brittleness, impact and processing properties of the polymer (column 2, lines 14 to 19). Thus, D3 provides modified propylene composition comprising a reactor blend of higher molecular weight propylene/olefin random copolymer and a lower molecular weight substantially isotactic homopolypropylene, wherein said homopolypropylene comprises an isotactic content of at least about 97% meso diad units, said modified polypropylene further comprising: a copolymer/homopolypropylene weight ratio of from about 1:20 to about 20:1; a copolymer/homopolypropylene melt flow ratio of from about 1:1 to about 1:100; an olefin content up to about 5.0 mol%, said olefin being selected from one or more of ethylene and alpha-olefins of the formula  $\text{CH}_2=\text{CH-R}$ , wherein R is a hydrocarbon group having at least two carbon atoms; and an average of up to about 50 chain disruptors per 1000 propylene repeat units, said chain disruptors comprising racemic polypropylene diads and said olefin incorporated into a polypropylene chain wherein said olefin is incorporated into the upper end of the molecular weight distribution of said modified polypropylene (claim 1).

The modified polypropylenes according to D3 have wide ranging physical properties suitable for a variety of applications. For example, those having an MWD of from about 5 to about 10 can be extruded or coextruded by any one of a number of well-known processes for use in film applications (column 9, lines 16 to 22). While the modified polypropylenes of D3 are especially suited for oriented film applications, they may also be utilized

for molded and extruded products (column 5, lines 17 to 20).

4. *Problem and solution*

4.1 The patent in suit relates to propylene copolymer compositions. Such compositions are known from documents D1, D2 and D3.

4.2 As disclosed in the specification of the patent in dispute, its object is to provide propylene copolymer compositions for the manufacture of pipes, which have good extrudability, and which allow the manufacture of pipes exhibiting good mechanical properties (in particular creep resistance), in combination with good odour and taste properties (page 2, lines 32 to 51).

4.3 As indicated in the decision T 989/93 of 16 April 1997, not published in OJ EPO; Reasons, point 12), the closest state of the art should normally be represented by a document which deals with the same problem, but in the absence of such a document, the starting point for evaluating inventive step should be searched for in a document relating to a similar technical problem, or at least to the same or a closely related technical field as the patent in suit.

4.4 In this connection, it is, however, immediately evident in view of the disclosure of D1 to D3, that none of these documents is explicitly concerned either with the problem of good extrudability, or with the manufacture of pipes, let alone with the problem of creep resistance, odour and taste thereof.

- 4.5 It is further evident that document D1 is focussed on the problem of avoidance of sag in order to improve the post processing of sheets (e.g. by thermoforming) and the blow molding of parisons.
- 4.6 In that respect, the Board notes that the Appellant has argued that there was a link between the problem of avoidance of sag in sheets and that of obtaining of good creep properties in pipes in that these problems are related to the same physical properties of the polypropylene compositions. However, this submission was not supported by evidence provided by the Appellant, which has the onus of proof (cf. T 182/89, OJ EPO, 1991, 391), and was refuted by the Respondent on the grounds that no link can be discerned between sag and creep, since, on the one hand, sag refers to an immediate thermal deformation behaviour, while, on the other hand, creep is related to a long term mechanical behaviour.
- 4.7 Since the Board is unable to establish the facts of its own motion, it is the party whose argument rests on these alleged facts who loses (cf. for instance T 219/83, OJ EPO 1986, 211, last two paragraphs of section 12 of the Reasons). Consequently, the Appellant's argument on this issue must fail.
- 4.8 Nor can the further argument of the Appellant be accepted, that there is a similarity in the technical problems underlying D1 and the patent since the compositions of D1 and those of the patent in suit are both suited for blow molding (cf. patent in suit, page 3, paragraph [0018]). This is because the fact that the compositions of the patent in suit, whose main purpose is to allow the manufacture with good

extrudability of pipe materials having good mechanical (creep resistance), odour and taste properties, could also, in addition, be used in blow molding, does not reciprocally imply that compositions specifically designed for blow molding (D1) would evidently be also suitable for the manufacture of pipes.

- 4.9 Consequently, D1 is neither explicitly nor implicitly concerned with the problem of manufacturing by extrusion pipes having good mechanical properties, in particular creep resistance, and good taste and odour properties
- 4.10 Nevertheless, the Board concurs with the conclusion of the Opposition Division, that, among documents D1 to D3, it is D1 which discloses propylene compositions having explicitly the most features in common with those according to the patent (i.e. content of comonomers, relative contents of LMW and HMW components, and melt index  $MFR_2$ ).
- 4.11 Since, evidently, D1 belongs to the same technical field (i.e. propylene polymer compositions) as the patent in suit, it thus meets the minimum requirements set out in decision T 989/93 in order to be used as a starting point for the assessment of inventive step.
- 4.12 Thus, starting from D1, the technical problem may be seen as the provision of a polypropylene composition having good extrudability for the manufacture of pipe material having good mechanical properties, in particular creep resistance and good taste and odour properties.

4.13 The solution proposed by the patent in suit is to provide a polypropylene composition as defined in Claim 1, in which both the HMW and the LMW components are propylene copolymers and in which the comonomer content is higher in the HMW component than in the LMW component.

4.14 In view of Examples 1 to 4 of the patent in suit and of the Experimental Report submitted by the Patentee with its letter dated 9 July 2002, the Board is satisfied that the claimed problem is effectively solved by the claimed measures.

5. *Inventive step*

5.1 It remains to be decided whether the claimed subject-matter was obvious to a person skilled in the art having regard to the prior art relied on by the Appellant.

5.2 As indicated above in paragraph 4.9 above, D1 is totally silent on the problem of manufacturing by extrusion pipes having good mechanical properties, in particular creep resistance, and good taste and odour properties.

5.3 Thus, D1 itself cannot provide a hint to the solution of the technical problem proposed by the patent in suit.

5.4 Nor could a combination of D1 with D2 and/or D3 lead in an obvious way to the claimed subject-matter, since D2 and D3 are both not concerned with the manufacture of pipes.

5.5 It thus follows from the above that the subject-matter of Claim 1 involves an inventive step starting from D1 as closest state of the art (Article 56 EPC).

By the same token the same conclusion applies to the subject-matter of independent Claim 2 and of dependent Claims 3 to 6 which are explicitly or implicitly limited to the relevant subject-matter of Claim 1.

It further applies to the subject-matter of independent Claim 7 and of dependent Claims 8 to 9 which deal with a process for making a propylene composition within the ambit of Claim 1, and to the subject-matter of independent Claims 11 to 12 which are directed to uses of a composition according to Claims 1 to 6.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young