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D E C I S I O N
of 31 January 2006

Case Number: T 0802/04 - 3.3.03

Application Number: 98108923.8

Publication Number: 0885926

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Language of the proceedings: EN

Title of invention:

Propylene polymer blends, processes of producing the same, and polypropylene resin compositions

Patentee:

Chisso Corporation

Opponent:

THE DOW CHEMICAL COMPANY

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 84, 114(2), 123(2), 123(3)
RPBA Art. 10b(1)

Keyword:

"Late filed document - not admitted"
"Inventive step (yes)"
"Closest state of the art"

Decisions cited:

T 0686/91, T 0585/92

Catchword:

-



Case Number: T 0802/04 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 31 January 2006

Appellant: THE DOW CHEMICAL COMPANY
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office dated
17 March 2004 and posted 30 April 2004
concerning maintenance of European patent
No. 0885926 in amended form.

Composition of the Board:

Chairman: R. Young
Members: C. Idez
E. Dufrasne

Summary of Facts and Submissions

I. The grant of the European patent No. 0 885 926 in the name of Chisso Corporation in respect of European patent application No. 98 108 923.8, filed on 15 May 1998 and claiming priority of the JP patent applications JP 132176/97 and JP 132177/97 both filed on 22 May 1997, was announced on 21 March 2001 (Bulletin 2001/12) on the basis of 8 claims.

Independent Claims 1, 3 and 6 read as follows:

"1. A propylene polymer blend comprising (A) a propylene- α -olefin random copolymer with a propylene content of 90 to 99% by weight and (B) a propylene- α -olefin random copolymer with a propylene content of 55 to 90% by weight, wherein the intrinsic viscosity ($[\eta_B]$) of the copolymer B ranges from 1.3 to 3.5 dl/g, the ratio ($[\eta_B]/[\eta_A]$) of the intrinsic viscosity ($[\eta_B]$) of the copolymer B to the intrinsic viscosity ($[\eta_A]$) of the copolymer A ranges from 0.5 to 1.3 and a product ($\eta_B/\eta_A \times (W_A/W_B)$) of the intrinsic ratio ($[\eta_B]/[\eta_A]$) of both copolymers and the weight ratio (W_A/W_B) of both copolymers ranges from 1,0 to 4,5 said intrinsic viscosity ($[\eta_B]$) of the copolymer B being derived from the following equation

$$[\eta_B] = \{ [\eta_{\text{WHOLE}}] - (1 - W_B/100) [\eta_A] \} / (W_B/100)$$

wherein $[\eta_{\text{WHOLE}}]$ represents the intrinsic viscosity of the propylene polymer blend, W_B represents the weight % of the propylene- α -olefin random copolymer (B) and $[\eta_A]$ represents the intrinsic viscosity of the propylene- α -

olefin random copolymer (A) as determined in tetralin at 135°C.

3. A process of producing the propylene polymer blend of Claim 1 which comprises in sequence:

(a) carrying out a first polymerization step wherein propylene and other α -olefins than propylene are copolymerized in a vapor phase in the presence of a catalyst for a stereoregular olefin polymerization which comprises a combination of a titanium-containing solid catalyst component having an average particle size of 20-300 μm , an organoaluminum compound of the formula $\text{AlR}^1_m\text{X}_{3-m}$ wherein R^1 is a hydrocarbyl group of 1-20 carbons, X is a halogen atom and m is a positive number of $3 \geq m \geq 1.5$, and an organosilicon compound of the formula $\text{R}^2_x\text{R}^3_y\text{Si}(\text{OR}^4)_z$ wherein R^2 and R^4 is a hydrocarbyl group, R^3 is a hydrocarbyl group or a hydrocarbyl group containing a hetero atom, X, Y and Z have a relationship of $0 \leq X \leq 2$, $1 \leq Y \leq 3$, $1 \leq Z \leq 3$, and $X+Y+Z=4$, to produce 90 to 50% by weight of a propylene- α -olefin random copolymer (A) based on the total weight of the polymer blend and then

(b) carrying out a second polymerization step wherein propylene and other α -olefins than propylene are copolymerized to produce 10 to 50% by weight of a propylene- α -olefin random copolymer (B) having a propylene content of 55 to 90% by weight, based on the total weight of the polymer blend.

6. A polypropylene resin composition which comprises 99 to 99.9999% by weight of the propylene polymer blend of Claim 1 and 1 to 0.0001% by weight of an α -crystal nucleating agent."

Claims 2, 4, 5, and 7 to 8 were dependent claims.

II. A Notice of Opposition was filed on 20 December 2001 by The Dow Chemical Company, in which revocation of the patent in its entirety was requested on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC).

The grounds of opposition were supported by the following documents:

D1: EP-A-0 588 581;

D2: EP-A-0 457 455;

D3: US-A-4 728 705;

D4: Ch. Paulik et al; "Weiche, zähelastische PP-Copolymere"; Kunststoffe, Vol. 86 (1996) Nr.8, pages 1144-1147;

D5: Polypropylene Handbook, Edited by E.P. Moore, Jr., Carl Hanser Verlag, Munich, 1996, pages 190-192, 244-245; and

D6: EP-A-0 863 183.

III. By a decision announced orally on 17 March 2004 and issued in writing on 30 April 2004 the Opposition Division held that the grounds of opposition did not prejudice the maintenance of the patent in amended form. The decision of the Opposition Division was based on Claims 1 to 7 submitted as main request with letter dated 5 March 2004 of the Patent Proprietor.

Claims 1 and 3 read as follows:

"1. A propylene polymer blend comprising (A) a propylene/ethylene random copolymer with a propylene content of 90-99% by weight and (B) a propylene- α -olefin random copolymer with a propylene content of 55-90% by weight, wherein the intrinsic viscosity ($[\eta_B]$) of the copolymer B ranges from 1.3-3.5 dl/g, the ratio ($[\eta_B]/[\eta_A]$) of the intrinsic viscosity ($[\eta_B]$) of the copolymer B to the intrinsic viscosity ($[\eta_A]$) of the copolymer A ranges from 0.6-1.2 and a product ($(\eta_B/\eta_A) \times (W_A/W_B)$) of the intrinsic ratio ($[\eta_B]/[\eta_A]$) of both copolymers and the weight ratio (W_A/W_B) of both copolymers ranges from 1.0-4.5 said intrinsic viscosity ($[\eta_B]$) of the copolymer B being derived from the following equation

$$[\eta_B] = \{ [\eta_{\text{WHOLE}}] - (1 - W_B/100) [\eta_A] \} / (W_B/100)$$

wherein $[\eta_{\text{WHOLE}}]$ represents the intrinsic viscosity of the propylene polymer blend, W_B represents the wt.-% of the propylene/ α -olefin random copolymer (B) and $[\eta_A]$ represents the intrinsic viscosity of the propylene/ethylene random copolymer (A) as determined in tetralin at 135°C

3. A process of producing the propylene polymer blend of Claim 1 which comprises in sequence:

(a) carrying out a first polymerization step wherein propylene and ethylene are copolymerized in a vapor phase in the presence of a catalyst for a stereoregular olefin polymerization which comprises a combination of a titanium-containing solid catalyst component having

an average particle size of 20-300 μm and a particle uniformity of not more than 2.0, an organoaluminum compound of the formula $\text{AlR}^1\text{X}_{3-m}$ wherein R^1 is a hydrocarbyl group of 1-20 carbons, X is a halogen atom and m is a positive number of $3 \geq m \geq 1.5$, and an organosilicon compound of the formula $\text{R}^2\text{X}\text{R}^3\text{Y}\text{Si}(\text{OR}^4)_Z$ wherein R^2 and R^4 is a hydrocarbyl group, R^3 is a hydrocarbyl group or a hydrocarbyl group containing a hetero atom, X, Y and Z have a relationship of $0 \leq X \leq 2$, $1 \leq Y \leq 3$, $1 \leq Z \leq 3$, and $X+Y+Z=4$, to produce 90-50% wt.-% of a propylene/ethylene random copolymer (A) based on the total weight of the polymer blend and then (b) carrying out a second polymerization step wherein propylene and other α -olefins than propylene are copolymerized to produce 10-50% wt.-% of a propylene/ α -olefin random copolymer (B) having a propylene content of 55-90 wt.-%, based on the total weight of the polymer blend."

Claims 2 and 4 to 7 corresponded to Claims 2 and 5 to 8 as granted, respectively.

According to the decision, this set of Claims met the requirements of Article 123(2) and 123(3) EPC, and according to the minutes of the oral proceedings the Opponent had no objection on the basis of Articles 84, 123(2), and 123(3) EPC regarding these claims.

Concerning novelty, the Opposition Division took the view the subject-matter of the claims was novel over document D1, since from the general disclosure of D1 several selections had to be made to arrive at the claimed combination of features, i.e. the selection of (1) a propylene/ α -olefin random copolymer as

component A, (2) of ethylene as comonomer in this copolymer, (3) of a particular range for the intrinsic viscosity $[\eta_B]$, and a particular range for the ratio $([\eta_B]/[\eta_A])$, even if there was a significant overlap.

The subject-matter of the claims was also considered as novel over the combination of the Examples 1, 4, 5, 6, C1 and C3 of D1, whose compositions differed only in that a propylene homopolymer instead of random propylene/ethylene copolymer was used as component A, and the passage on page 3, lines 27-29, since there was no argument why the skilled reader would substitute the homopolymer in component A in the examples by a copolymer having small amounts of α -olefin.

According to the decision, novelty was also given over document D2. D2 disclosed propylene polymer compositions comprising (A) a homopolymer phase and (B) a copolymer phase comprising a copolymer of ethylene and propylene having preferably 35-50 wt% ethylene (i.e. 50-65 wt% propylene) and wherein the ratio of the intrinsic viscosities determined in decalin $([\eta_B]/[\eta_A])$ was from 0.7-1.3, and the intrinsic viscosities of the products or phases were typically between 0.7-7 dl/g. The Opposition Division considered that even if the compositions of Examples 2 and 7 of D2 were seen, as submitted by the Opponent in view of document D6 as disclosing all the viscosity parameters of present Claim 1, there still remained the difference that the claimed polymer blend comprised a propylene/ethylene random copolymer with 1-10 wt% of ethylene as component A instead of a propylene homopolymer. Thus, according to the decision, although D2 disclosed in Claim 4 a composition wherein the homopolymer phase contained up

to 6 wt% ethylene, without a clear suggestion in the description to replace the homopolymer in component A by a copolymer, this information could not be combined with specific examples for taking away the novelty of the claimed subject-matter.

The decision further stated that, due to the novelty of the polypropylene blend according to Claim 1, the novelty of the subject-matter of process Claim 3 was hence given over document D3.

Concerning inventive step, the decision stated that the objective problem was to provide a propylene polymer blend with optimized properties with respect to transparency, stress-whitening resistance and low-temperature impact resistance. Document D4 was the only document which addressed all these three properties and which was also directed to a propylene polymer blend comprising two random copolymer phases.

The solution proposed in the patent in suit was a propylene polymer blend comprising two random copolymer phases with defined compositions and having specific viscosity parameters, i.e. the intrinsic viscosity of component B $[\eta_B]$, the ratio $[\eta_B]/[\eta_A]$ and the product $([\eta_B]/[\eta_A]) \times (W_A/W_B)$.

According to the decision, D4 did not suggest that these parameters were of relevance for having the optimized properties. D4 taught a lot of factors which could be varied depending on the desired application (cf. page 1145, first column under "Molekulares Design"), but D4 did not give a clear indication that

the skilled reader would select the specific parameters as claimed.

Thus, the Opposition Division came to the conclusion that D4, even in combination with D1 or D2, did not arrive at the specific combination of features as claimed, and that inventive step had to be acknowledged.

IV. A Notice of Appeal was filed on 25 June 2004 by the Opponent (Appellant). The prescribed fee was paid on the same day.

With the Statement of Grounds of Appeal filed on 9 September 2004, the Appellant submitted a new document:

D7: Journal of Applied Polymer Science; Vol. 14, (1970), pages 1651-1653.

It also argued essentially as follows:

(i) Concerning novelty:

(i.1) Sample 2 of Example 1 of D2 referred to a polypropylene impact copolymer composition comprising a propylene homopolymer phase and a copolymer phase.

(i.2) The propylene content of the copolymer was 64.9 wt%., which fell within the range specified in Claim 1 of the patent in suit for copolymer (B).

(i.3) Claim 1 of the patent in suit also required the intrinsic viscosity of copolymer B, as determined in tetralin, to be from 1.3 to 3.5 dl/g.

(i.4) The calculations provided by the Opponent and based on Tables A, B, C and D submitted with its letter dated 19 January 2004, on the equation set out on page 6 of D2 concerning the intrinsic viscosity ratio and on documents D6 and D7, showed that Sample 2 of Example 1 of D2 fell within the scope of Claim 1 except that the sample did not explicitly mention the ethylene content of the propylene homopolymer phase.

(i.5) It could clearly be seen, however, that the homopolymer phase in D2 routinely contained a small amount of ethylene.

(i.6) It was therefore clear in the light of the passage on page 4, lines 49 to 57 of D2 and in the light of claim 4 of this document, that one skilled in the art would read the disclosure of Sample 2 of Example 1 as indicating that the homopolymer phase would contain a small amount of ethylene of up to 6 wt%.

(i.7) The Opposition Division had misunderstood the teaching of D2 in that it referred to the replacement of the homopolymer phase in Sample 2 of Example 1 of D2 by a copolymer phase.

(i.8) However, Claim 4 of D2 did not teach the replacement of the homopolymer phase by a copolymer phase, but indicated that the homopolymer phase contained a small amount of ethylene but was,

nevertheless, still designated as being a homopolymer phase.

(i.9) Thus, Sample 2 of Example 1 of D2, in combination with the general teaching of the reference, was novelty destroying for the subject-matter of Claim 1.

(ii) Concerning inventive step:

(ii.1) Inventive Step over D1

(ii.1.1) D1 disclosed all the features within the scope of Claim 1 with the exception of the feature that component A contained 1 to 10 wt% ethylene.

(ii.1.2) In part 5 of its submissions of 7 October 2002 the Patentee had argued that by including 10 wt% of ethylene into component A, a blend having excellent stress-whitening resistance and transparency could be obtained.

(ii.1.3) The arguments of the Patentee in view of Example 1 and Comparative Example 1 of the patent in suit were not pertinent, since these examples did not differ only by virtue of the amount of ethylene in the homopolymer phase.

(ii.1.4) In the absence of any technical effect which could be ascribed to the use of ethylene in the copolymer phase, Claim 1 of the patent in suit lacked inventive step as being an obvious alternative to what was described in D1.

(ii.1.5) Furthermore, the skilled reader of D1 would inevitably be motivated from the disclosure of D4 to incorporate a small amount of ethylene in the polypropylene homopolymer phase.

(ii.1.6) It was clear from page 1145 of D4 that polypropylene copolymers having two random ethylene/propylene copolymer phases (Raheco copolymers) had better optics, and little or no tendency to stress-whitening.

(ii.1.7) The choice of from 1 to 10 wt% ethylene was a routine amount bearing in mind that Figure 3 at the top of page 1145 of D4 indicated that suitable amounts were from 4 to 8 mol %.

(ii.1.8) Document D5 also taught (page 244) that if a comonomer was added there was reduced crystallisation tendency resulting in lower haze and higher clarity.

(ii.1.9) Consequently, to increase the transparency of the blends disclosed in D1 it would have been obvious to one skilled in the art to ensure that the homopolymer phase contained an ethylene comonomer in an amount of from 1 to 10 wt%.

(ii.2) Inventive Step over D2

(ii.2.1) The propylene polymer compositions of D2 exhibited, as also acknowledged by the Patentee, good impact strength, improved stress-whitening resistance and good appearance such as gloss and clarity (see page 5, lines 45 to 47 of D2).

(ii.2.2) Starting from D2, the objective problem to be solved in the light of the disclosure of D2 was to provide a propylene polymer blend having good transparency.

(ii.2.3) For the reasons given in the discussion of D1, one skilled in the art would have known that replacing homopolymer A with a copolymer with a small amount of ethylene would improve the transparency based on the disclosures of D4 and D5.

(ii.3) Inventive Step over D4

(ii.3.1) D4 provided a propylene polymer blend of a random copolymer matrix and an ethylene propylene rubber dispersed therein. It provided compositions having an excellent balance of transparency, stress-whitening and lower temperature impact strength (see Table 1 on page 1145).

(ii.3.2) The objective problem to be solved over D4 was hence simply to provide alternative propylene polymer blends.

(ii.3.3) D4 disclosed (Figure 3 on page 1146) a matrix containing 4 to 8 mol % ethylene (corresponding to about 3 to 5 wt%), and a rubber content, i.e. a copolymer dispersed phase content, of 15 to 35 wt% (corresponding to a continuous or matrix phase content of 65 to 85 wt%).

(ii.3.4) These compositions exhibited a W_A/W_B ratio of respectively 3, 2.3, and 1.9.

(ii.3.5) The ratio of the intrinsic viscosities was about 1.

(ii.3.6) Thus, the novel features over D4 were the ethylene content of component B and the viscosity of component B.

(ii.3.7) D4 (left hand column of page 1145) referred to controlling the properties of the composition by means of these two factors.

(ii.3.8) Furthermore D1 and D2 gave both of these properties as being preferred properties.

(ii.3.9) Thus, the invention claimed in the patent in suit lacked inventive step.

V. With its letter dated 1 April 2005, the Respondent (Patentee) submitted the following documents:

D8: Graph showing correlations between MFR and intrinsic viscosities using data from D6.

D9: Graph showing correlations between MFR and intrinsic viscosities using data from D7, and D6.

D10: Declaration made by Mr. Takanori Nakashima submitted at the USPTO during the prosecution of the US patent application corresponding to the patent in suit.

The Respondent requested in its letter:

(a) that the appeal against the decision of the Opposition Division be rejected; and

(b) in case that the request under (a) should not be granted the patent be maintained in further amended form according to any of the pending auxiliary requests.

The Respondent also argued essentially as follows:

(i) Concerning novelty:

(i.1) The subject-matter of Claim was novel over Sample 2 of Example 1 of D2 since the composition of Sample 2 contained a propylene homopolymer, where Claim 1 required the presence of a propylene/ethylene random copolymer (A).

(i.2) Furthermore, the Opponent had not established that Sample 2 met the parameter requirements set out in claim 1.

(i.3) The Opponent had previously argued that the skilled person could derive the intrinsic viscosity of the copolymer component (B) on the basis of melt flow rate (MFR) data via a correlation between intrinsic viscosity and MFR derived from D6.

(i.4) A correlation between MFR and intrinsic viscosity might possibly apply for the specific polymers described in D6 but could not be generalized.

(i.5) Moreover, the correlation obtained from D6 itself was incorrect, and thus not applicable in the present case.

(i.6) The correlation as provided by the Opponent as Fig. 1 of the opposition brief dated 21 December 2001, included in one and the same plot the data for the individual components (A) and (B) of the block copolymer as well as that of the final block copolymer itself.

(i.7) D8 showed to the contrary that no common correlation for all three individual polymers is obtained, but rather different ones, each applying for only one of the specific materials.

(i.8) From the viscosity ratios listed in Table 1 of D2 and the correlation between MFR and intrinsic viscosity derived (in an inappropriate manner) from D6 it was not possible to determine the intrinsic viscosity of the present copolymer component (B).

(i.9) Furthermore, D6 was not a prior art document as it has been published after the priority dates of the patent. Thus, no evidence had been provided so far that the skilled person had been aware of any correlation between MFR and intrinsic viscosity as alleged by the Opponent.

(i.10) The intrinsic viscosity strongly depended on the solvent used. This could be seen from the data disclosed in e.g. Table 1 of D7. Hence, the data disclosed for Sample 2 of Example 1 of D2 using decalin as a solvent could not be compared with present

claim 1, which required that the intrinsic viscosity be measured in tetralin.

(i.11) The Opponent had made a calculation using the document D7, which had been cited in the grounds of appeal for the very first time, while it was not in the proceedings before.

(i.12) D7 was irrelevant and should not be admitted into the proceedings.

(i.13) D7 described a MFR-intrinsic viscosity correlation for polypropylene homopolymers.

(i.14) Such a correlation obtained for insufficiently defined specific materials could not be generalized as being applicable to any type of polypropylene homopolymers, let alone to propylene copolymers with other α -olefins.

(i.15) D9 showed that the correlations derived from D6 or D7 were artificial and could not be transferred to the present case.

(ii) Concerning inventive step

(ii.1) In respect of D1:

(ii.1.1) In document D10, Example 2 and Comparative Example 4 were compared with a new Supplementary Comparative Example (SCE).

(ii.1.2) Comparative Example 4 differed from present Claim 1 in that the copolymer composition was outside

the claimed range for $(\eta_B/\eta_A) \times (W_A/W_B)$ of 1.0-4.5, while SCE fulfilled all requirements of claim 1 except that it contained a polypropylene homopolymer instead of the claimed propylene/ethylene copolymer (A).

(ii.1.3) The comparison of Example 2 with SCE showed that the absence of ethylene in the polymer component (A) resulted in a molded article that is inferior in transparency (haze) and stress-whitening resistance, while it had a higher Izod impact strength.

(ii.1.4) The comparison between comparative Example 4 and SCE showed that SCE had a better Izod impact strength and stress-whitening resistance, but was even worse as regards the transparency.

(ii.1.5) This showed that the individual requirements of claim 1 served different purposes, and that a product as claimed having the desired excellent balance of transparency (haze), Izod impact strength and stress-whitening resistance could be obtained only if all requirements of present claim 1 were met.

(ii.1.6) This claimed combination of features could not be derived from D1, which furthermore did not at all mention the present aspects of transparency and stress-whitening resistance.

(ii.1.7) Starting from the disclosure of D1, the skilled person would not have any incentive to combine D1 with D4 to arrive at the claimed invention.

(ii.1.8) D1 only mentioned the aspect of impact resistance and was silent with regard to the other aspects. Thus, no information whatsoever was available from D1 as regards the potential improvement of the balance of the properties of concern.

(ii.1.9) D4 did not refer to the transparency and the information given in D4 was very general.

(ii.1.10) A potential improvement of the balance of the presently relevant properties was not derivable from D4.

(ii.1.11) Thus, D1 alone or in combination with D4 did not provide any useful hint to the skilled person that the specific combination of features as defined in claim 1 of the patent would give rise to the unexpected improvement of the balance of different properties as shown by the claimed composition and evidenced by D10.

(ii.2) Starting from D2

(ii.2.1) D2 differed from claim 1 not only in that in D2 a propylene homopolymer was used instead of the claimed propylene/ethylene copolymer (A), but also in that the required intrinsic viscosity and other parameters obtained from this were not derivable from D2.

(ii.2.2) The arguments provided in connection with D1 would also apply.

(ii.3) Starting from D4:

(ii.3.1) The reasons for acknowledging an inventive step over D4 in combination with either D1 or D2 as given in the decision under appeal were clear and convincing.

VI. With its letter dated 14 December 2005, the Appellant submitted the following documents:

D4a: English translation of D4.

D11: E. Seiler; "Properties and applications of recycled polypropylene"; Recycling and Recovery of Plastics, edited by Dr. Johannes Brandrup, Carl Hanser Verlag, 1995, page 599.

It also argued essentially as follows:

(i) Concerning inventive step:

(i.1) In its counterstatements, the Patentee had argued that the problem underlying the alleged invention was to provide an excellent balance between transparency, impact strength and stress-whitening resistance for a propylene polymer blend.

(i.2) Showing that an allegedly improved balance of properties had been achieved was in itself not sufficient to establish an inventive step.

(i.3) It was clear that one skilled in the art starting from at least D1 would have been taught how to modify the compositions described therein in order to achieve improvements in all of these properties.

(i.4) D1 disclosed all features within Claim 1 with the exception of the feature that component A contained 10 wt% ethylene.

(i.5) D1 further indicated that it was possible to include a small amount of ethylene in the propylene phase (page 3 lines 27 to 29).

(i.6) Although a propylene homopolymer might be preferable from the point of view of heat resistance and rigidity, the patent in suit was, of course, not concerned with either of these parameters.

(i.7) Therefore, one skilled in the art had no reason to retain component A in the form of the propylene homopolymer.

(i.8) D4a described the advantages of having a propylene copolymer as the continuous phase, i.e. better appearance, which was greater transparency, better stress-whitening resistance, and better low temperature impact strength (cf. page 2, column 1, last passage on page 1 of D4a).

(i.9) Suitable amounts of ethylene comonomer were illustrated in Fig.3 of D4 which provided ethylene contents of the matrix of 4, 6, and 8 mole %.

(i.10) Therefore, the subject-matter of the claims of the patent in suit lacked inventive step over a combination of D1 and D4.

(i.11) The last paragraph on page 599 of D11 confirmed the teaching in D4a that including a copolymer matrix rather than a homopolymer matrix improved the stress-whitening resistance and toughness properties of the composition.

(ii) Concerning the "pending" auxiliary requests:

(ii.1) It was not clear what auxiliary requests were relied on by the Respondent.

(ii.2) It could only be supposed that they corresponded to the auxiliary requests submitted during the oral proceedings before the Opposition Division.

VII. Oral proceedings were held before the Board on 31 January 2006.

At the beginning of the oral proceedings, the Respondent having specified that the "pending" auxiliary requests referred to in its letter dated 1 April 2005 were the auxiliary requests submitted at the oral proceedings before the Opposition Division, the Appellant indicated its opposition to the admission of these requests into the proceedings.

Concerning the main request, the Appellant indicated firstly that it had no formal objections against these claims, and secondly that it did not maintain its objection of lack of novelty of the subject-matter of

these claims in view of Sample 2 of Example 1 of D2. The discussion then focussed on the question of inventive step of the subject-matter of the claims of the main request.

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

(i) By the Appellant:

(i.1) D1 represented the closest state of the art. The compositions of D1 (cf. Example 1, 4, 5, 6 and Comparative Examples 1 and 3) had the most technical features in common with those of the patent in suit. They only differed from the claimed composition in that a homopolymer instead of a random copolymer was used as matrix.

(i.2) D1 clearly related to the problem of impact strength at low temperature. It was also concerned with the appearance of films made therefrom.

(i.3) Properties such as stress-whitening and transparency would fall under the generic term "appearance".

(i.4) In any case, the reduction of stress whitening would represent a highly desirable feature in the art of polypropylene compositions, so that the fact that D1 did not expressly refer to this problem would not disqualify D1 as closest state of the art.

(i.5) D1 also mentioned the use of a comonomer such as ethylene in the matrix component (page 3, lines 27 to

29). The amount of ethylene to depress the melting point of the homopolymer to 157°C would be in the range 1 to 10 weight %.

(i.6) Starting from D1 the technical problem might be seen in the provision of compositions having a balance of properties in terms of transparency, impact strength at low temperature and stress-whitening.

(i.7) D4 (D4a) dealt with polypropylene compositions showing this balance of properties. It was clear that the "Raheco" compositions exhibited all these properties.

(i.8) The "Raheco" compositions corresponded to compositions according to the patent in suit.

(i.9) The compositions of D1 corresponded to the type "Heco" also disclosed in D4.

(i.10) It was evident from Table 1 of D4 (D4a) that the transparency and the impact strength at low temperature of the "Raheco" compositions were better than those of the "Heco" compositions.

(i.11) It was also clear that the presence of a comonomer in the matrix component had a positive influence on the stress-whitening.

(i.12) D4 also disclosed in Fig.3 Raheco type composition I which the matrix component contained 4, 6 and 8 mol% of ethylene. The reference to a high amount of comonomer at lines 4 to 5 of the right-hand column on page 1145 of D4 should be interpreted in that

context and was not in contradiction with the "small amounts" of comonomer mentioned at line 29 of page 3 of D1.

(i.13) The disclosure of D4 was also confirmed by that of document D11.

(i.14) Thus, the claimed subject-matter would have been obvious in view of the combination of D1 with D4.

(i.15) The Opposition Division had taken D4 as the closest state of the art, but D4 contained no detailed information concerning technical aspects such as the intrinsic viscosity of the components, the ratio of their intrinsic viscosity, and relationship between the ratio of their intrinsic viscosity and the ratio of weight amount in the composition.

(i.16) The combination of D4 with D1 could not lead to a different conclusion than the combination of D1 with D4 when assessing inventive step.

(i.17) In any case starting from D4, the technical problem could only be seen in the provision of alternative compositions of the Raheco type. The claimed compositions exhibited the same balance of properties as promised by D4.

(i.18) The comparison between Example 2 of the patent in suit and the additional comparative example in D10 was not relevant since many parameters had been modified.

(i.19) It had hence not been shown by the Patentee that the specific parameters set out in Claim 1 of the main request led to unexpected properties.

(ii) By the Respondent:

(ii.1) D1 was silent on the stress-whitening and on transparency of the compositions disclosed therein, and hence could not constitute a basis for developing compositions having a balance of such properties.

(ii.2) D4 was concerned with stress-whitening, transparency and impact strength at low temperature.

(ii.3) D11 was late filed and should not be admitted into the proceedings.

(ii.4) The technical problem underlying the patent in suit was to provide compositions having very good transparency and a very good resistance to stress-whitening in combination with an acceptable level of impact strength at low temperature.

(ii.5) The "Raheco" compositions referred to in D4 represented an improvement in that respect over the "Heco" compositions also referred to in D4.

(ii.6) With this aim in view, the skilled person would not start from "Heco" type compositions (i.e. D1) but from the most recent development in that respect, i.e. "Raheco" type compositions as disclosed in D4.

(ii.7) Thus, D4 represented the closest state of the art.

(ii.8) The combination of D4 with D1 would not suggest the claimed compositions.

(ii.8.1) According to the general disclosure of D1 the intrinsic viscosity of the component B could be between 2.5 and 4.5, the ratio of the intrinsic viscosity was in the range 0.8 to 1.7. These ranges did not correspond to the respective ranges required by Claim 1 of the main request.

(ii.8.2) In view of document D5 (fig 6.6), the maximal amount of ethylene in the ethylene-propylene copolymer would be less than 1% in order to obtain a melting point of 157°C. Furthermore D1 referred to the use of ethylene or butene.

(ii.8.3) D1 did not even mention the relationship between the ratio of intrinsic viscosity and the ratio of weight amounts of the respective components of the composition.

(ii.8.4) D1 was not concerned with transparency and stress-whitening.

(ii.8.5) Thus, D1 could not suggest the specific combination of parameters set out in Claim 1.

(ii.8.6) While the specific examples referred to by the Appellant might disclose the parameters set out in Claim 1 of the main request in terms of intrinsic viscosity, viscosity ratio, and relationship between intrinsic viscosity ratio and weight ratio, there was no evidence as to whether these parameters would not be

modified if a comonomer such as ethylene would be incorporated in the matrix component.

(ii.8.7) The Examples of the patent in suit clearly showed that there was an improvement in the balance of properties when working inside the scope of Claim 1. This was also shown by document D10.

(ii.8.8) The Appellant had not submitted any evidence in order to show that this was not the case. The burden of proof was on the Appellant if it intended to challenge the effects achieved by the compositions of the patent in suit.

(ii.8.9) The combination of D4 with D1 could not be equivalent to the combination of D1 with D4, since the formulation of the technical problem and the reasoning depended on the starting point used.

VIII. The Appellant requested that the decision under appeal be set aside, and that the European patent No. 885 926 be revoked.

The Respondent requested that the appeal be dismissed, or in the alternative, that the patent be maintained on the basis of auxiliary requests 1 to 4 as filed on 17 March 2004.

Reasons for the Decision

1. The appeal is admissible.

2. *Procedural matters*

2.1 As indicated in Section VII(ii.3) above, at the oral proceedings before the Board, the Respondent requested that document D11 be not admitted into the proceedings.

2.2 Document D11 was filed by the Appellant with its letter dated 14 December 2005.

2.3 As mentioned above in Section IV, the Notice of Appeal of the Appellant was received on 25 June 2004. Consequently the new Rules of Proceedings of the Boards of Appeal (below RPBA) according to the decision of the Administrative Council of 12 December 2002 (OJ EPO 2003, 61) apply to the present case.

2.4 In that context, according to Article 10(b)(1) RPBA, any amendment to a party's case after it has filed its grounds of appeal may be admitted and considered at the Board's discretion.

2.5 It thus follows that the filing of document D11 by the Appellant with its letter dated 14 December 2005 indisputably represents an amendment to its case in the sense of Article 10(b)(1) RPBA and that the admission of this document is, hence, at the discretion of the Board.

2.6 Independently of the fact that there was, in the Board's view, no justification for the very late introduction of this document, the Board, having examined the relevance of document D11, decided not to admit this document into the proceedings (Article 114(2) EPC).

2.7 During the written phase of the appeal proceedings (cf. Section V (i.12) above), the Respondent requested that the document D7 submitted by the Appellant with the Statement of Grounds of Appeal be not admitted into the proceedings.

2.8 Concerning this document neither the Appellant nor the Respondent referred to it during the oral proceedings held before the Board, and the Board saw no need to consider it in the present decision. Thus, it was not necessary to decide on its admissibility into the proceedings.

2.9 As mentioned above in Section VII, the Appellant requested that the auxiliary requests of the Respondent be not admitted into the proceedings. Since for the reasons set below, there was no need for the Board to consider these auxiliary requests, it was also not necessary to decide on their admissibility into the proceedings.

Main request

3. *Wording of the claims*

3.1 This set of Claims has been considered as meeting the requirements of Article 123(2) and 123(3) EPC by the Opposition Division. According to the minutes of the oral proceedings before the Opposition Division the Opponent had no objection on the basis of Articles 84, 123(2), and 123(3) EPC regarding these claims.

3.2 No objections have been raised by the Appellant (Opponent) either in the written phase of the appeal proceedings or at the oral proceedings before the Board against the claims on file in respect of these requirements. Nor does the Board see any reason to do so.

4. *Novelty*

4.1 Whilst lack of novelty has been alleged by the Appellant only in view of Sample 2 of Example 1 of document D2 in the course of the written phase of the appeal proceedings, it indicated at the oral proceedings before the Board, that it did not further challenge the novelty of the subject-matter of the patent in suit.

4.2 Novelty of the claimed subject-matter has also been acknowledged by the Opposition Division, and the Board sees no reason to depart from that view.

4.3 Thus, the subject-matter of Claims 1 to 7 must be regarded as novel over the cited prior art (Article 54 EPC).

5. *Closest state of the art, the technical problem*

5.1 The patent in suit relates to polypropylene blends comprising two propylene random copolymers. Such blends are disclosed in documents D4 and D1.

- 5.2 While document D4 has been considered as the closest state of the art by the Opposition Division in the decision under appeal and by the Respondent, the Appellant, at the oral proceedings, has used D1 as starting point for the assessment of inventive step.
- 5.3 Document D4 refers to polypropylene compositions ("Raheco" polymers) which are a combination of a random ethylene-propylene copolymer matrix and an ethylene-propylene rubber polymerized in a reactor cascade. As indicated in D4 these compositions exhibit good toughness at low temperature, little or no tendency to stress-whitening, and transparency (page 1144, right-hand column, line 8 to page 1145, left-hand column, line 13; page 1145, left-hand-column, line 62 to page 1146; middle column, line 25; Fig. 2). It further compares the properties of the "Raheco" polymers with those of heterophasic polypropylene systems whose matrix component is a PP homopolymer ("Heco" polymers) (Table 1).
- 5.4 D4 gives no information, however, either on the intrinsic viscosity of the components of the Raheco copolymers or on the ratio of their intrinsic viscosities. It further does not mention the relationship between the ratio of the intrinsic viscosity and the weight ratio of both components, as set out in Claim 1 of the patent in suit.
- 5.5 D1 relates to polypropylene block copolymers and films thereof which are free of fish eyes and have good appearance, and excellent low-temperature impact resistance, heat resistance, and blocking resistance (page 2, lines 1 to 3).

- 5.6 According to D1, the polypropylene block copolymer is obtained, using a Ziegler-Natta catalyst, by polymerizing in a first step monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 80% by weight of the total polymer amount in the substantial absence of inert solvent first and then, in a second step, polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene-propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount of from 20 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the intrinsic viscosity of component B $[\eta]_B$ being at least 2.0 dl/g, and the ratio $[\eta]_B / [\eta]_A$, where $[\eta]_A$ is the intrinsic viscosity of the component A, being 1.8 or less; the intrinsic viscosity being determined at 135°C in tetralin (Claim 1; page 5, lines 10 to 18).
- 5.7 According to D1, component A is preferably a propylene homopolymer having a melting point of at least 160°C from the point of view of heat resistance and rigidity but if component A has a melting point of 157°C or higher, the polymer may be a copolymer of propylene and a small amount of an α -olefin such as ethylene or butene-1 (page 3; lines 27 to 29).
- 5.8 According to D1, the ethylene content of the component B is preferably in the range of from 25 to 45% by weight from the point of view of appearance and impact resistance and the intrinsic viscosity of B is preferably at least 2.5 dl/g, and more preferably in the range of from 2.5 to 4.5 dl/g. It is also necessary

that the ratio $[\eta]B/[\eta]A$ is 1.8 or less. If this ratio is over 1.8, the appearance of the film is impaired due to the occurrence of fish eyes, whereby the film cannot be used for commercial purposes. This ratio is preferably in the range of from 0.8 to 1.7 from the point of view of low-temperature impact resistance and appearance (page 3, lines 37 to 44).

- 5.9 Examples 1, 4, 5, and 6 and Comparative Examples 1 and 3 of D1 disclose the preparation of polypropylene block copolymer compositions comprising a propylene homopolymer and a ethylene-propylene copolymer and it had not been contested by the Respondent that the compositions disclosed in these specific examples meet all the requirements set out in Claim 1 of the patent in suit with the exception of the feature that component A according to the patent in suit contains 1 to 10 wt% ethylene.
- 5.10 As mentioned in paragraph [0011] of the patent in suit, the aim of the invention is to provide propylene polymer blends having excellent balance of transparency, stress-whitening and low temperature impact resistance.
- 5.11 Whilst it might be true, as submitted by the Appellant, that the compositions of D1 have the most technical features in common with those of the patent in suit, it is, however, evident, in the Board's view, on the one hand, that D1 is not concerned with the problems of transparency and stress-whitening, and, on the other hand, that D4 indisputably relates to the problems of transparency, stress-whitening and impact strength at low temperature in respect to blends comprising two random ethylene-propylene copolymers.

5.12 In this connection, the Board cannot accept the argument of the Appellant that the term "appearance" in D1 inherently encompasses properties such as transparency and low stress-whitening, since D1 clearly links the claimed excellent appearance of the blends described therein with the absence of fish eyes (page 2, lines 16 to 18; page 3, lines 40 to 42). Nor can the Board, in the absence of evidence from side of the Appellant, accept its further argument that the obtaining of polypropylene compositions having low stress-whitening represents an implicit and constant desideratum in the field of polypropylene blends.

5.13 As stated in the decision T 686/91 of 30 June 1994 (not published in OJ EPO; Reasons point 4), in the determination of the closest state of the art ex post facto considerations should be avoided and therefore a document not mentioning a technical problem that is at least related to that derivable from the patent specification, does not normally qualify as a description of the closest state of the art on the basis of which the inventive step is to be assessed, regardless of the number of technical features it may have in common with the subject-matter of the patent concerned.

5.14 In that context, the Board can therefore only come to the conclusion that it is D4 and not D1 which must be regarded as the closest state of the art.

5.15 Starting from D4, the technical problem might hence be seen in the provision of polypropylene blends having an improved balance of transparency, stress-whitening and

- impact strength at low temperature, i.e. an increased transparency and lower stress-whitening while maintaining impact strength at low temperature at a good level.
- 5.16 The solution proposed according to the patent in suit is to provide a blend of two ethylene-propylene random copolymers which fulfil the specific requirements in terms of intrinsic viscosities and relationship between their weight ratio and intrinsic viscosity ratio as set out in Claim 1.
- 5.17 The Board observes that the compositions of Examples 1 to 7 of the patent in suit exhibit a haze between 43 and 48% in combination with a stress whitening of 10.5 to 14 mm, and an impact strength at -20°C of 3 to more than 50 kJ/m^2 , while the compositions of the Comparative Examples 2, 4, 5, 6, and 7 of the patent in suit in which two copolymers are used as taught by D4 exhibit a haze between 50 to 92%, a stress whitening between 10 and 22 mm and an impact strength at -20°C between 2,7 and 7 kJ/m^2 .
- 5.18 This shows, in the Board's view, that the compositions according to the patent in suit in contrast to compositions according to D4, achieve a better balance of properties in terms of transparency (lower haze), stress-whitening and impact strength at low temperature.
- 5.19 In that respect, the Board cannot accept the argument of the Appellant that many parameters have been changed between the compositions of the examples according to the patent in suit and those of the comparative examples, so that this would render such a comparison

irrelevant. This is firstly because this comparison is made between compositions inside the scope of the claims and compositions according to D4 outside the scope of the claims, and it is hence relevant to show that the compliance with all the requirements set out in Claim 1 in terms of intrinsic viscosities and relationship between the intrinsic viscosity ratio and the weight ratio of components A and B are essential to obtain the desired balance of properties. Furthermore, if the Appellant intended to challenge the results achieved by the compositions according to the patent in suit, this is an issue which would normally be decided in the light of relevant experimental evidence. No such evidence was provided by the Appellant, which in the present case has the onus of the proof (cf. T 585/92 OJ EPO 1996, 129; Reasons 3.2).

5.20 Thus, under these circumstances, the Board can only come to the conclusion that the technical problem is effectively solved by the claimed measures.

6. *Inventive step*

6.1 It remains to be decided whether the solution proposed in the patent in suit was obvious in view of the prior art referred to by Appellant, i.e. the documents D4, D1 and D2.

6.2 As indicated above in paragraph 5.4 and as admitted by the Appellant (cf. Section VII (i.15) above), D4 gives no information either on the intrinsic viscosity of the components of the compositions or on the relationship between the intrinsic viscosity ratio and the weight ratio of both components. D4 itself cannot, therefore,

provide any hint to the solution of the technical problem.

- 6.3 Even if one would consider that the Examples 1, 4, 5, and 6 of D1 disclose all the features of the claimed compositions according to the patent in suit with the exception of the feature that component A contains 1 to 10 wt% ethylene, it cannot nevertheless be contested that D1 gives absolutely no information on a possible influence of these features on transparency and stress-whitening of propylene polymer blends. Thus, the combination of D4 with D1 cannot render obvious the subject-matter of Claim 1 of the patent in suit.
- 6.4 Document D2 relates to polypropylene compositions comprising a homopolymer phase and a copolymer phase having good impact strength at low temperature, resistance to stress-whitening, and being useful in the production of molded and extruded articles, shaped containers, and films having good clarity (Claim 1, page 2, lines 1 to 3; page 5, lines 43-46). According to D2, the ratio of the intrinsic viscosity of a copolymer phase to the intrinsic viscosity of a homopolymer phase (both determined in decalin at 135°C) is from 0.7/1 to 1.3/1 (Claim 1; page 5. lines 13 to 15) and the homopolymer phase might include up to 6 % by weight of ethylene (Claim 4). However, independently of the question as to whether the intrinsic viscosity ratio would be the same when determined in decalin at 135°C (D2) or in tetralin at 135°C (patent in suit), it is nevertheless evident that D2 does not disclose either the specific range of the intrinsic viscosity in tetralin of the copolymer or the specific relationship between intrinsic viscosity ratio and weight ratio of

both phases. Consequently, D2 cannot offer to the skilled person a hint to the solution of the technical problem.

6.5 It follows from the above that the subject-matter of Claim 1 and by the same token that of dependent Claim 2 involve an inventive step.

The same conclusion applies for the subject-matter of independent Claim 3 and dependent Claim 4 which are directed to a process for the manufacture of a blend according to Claim 1, and for the subject-matter of independent Claim 5 and dependent Claims 6 to 7 which are directed to a composition comprising a blend according to Claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young