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Datasheet for the decision of 5 April 2006

Case Number: T 0023/04 - 3.3.03

Application Number: 91303886.5

Publication Number: 0457455

IPC: C08F 297/08

Language of the proceedings: EN

Title of invention:
Polymer compositions

Patentee:
UNION CARBIDE CHEMICALS & PLASICS TECHNOLOGY CORPORATION

Opponent:
Novolen Technology Holdings C.V.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123(2), 123(3)

Keyword:
"Novelty - selection - (yes)"
"Inventive step - (yes)"
"Reformatio in peius - (no)"
"Amendments necessary and appropriate - (yes)"

Decisions cited:
G 0009/92

Catchword:
-

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Case Number: T 0023/04 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 5 April 2006

Appellant: (Opponent)	Novolen Technology Holdings C.V. Oostduinlaan 75 NL-2596 JJ The Hague (NL)
Representative:	De Hoop, Eric Octrooibureau Vriesendorp & Gaade B.V. P.O. Box 266 NL-2501 AW Den Haag (NL)
Respondent: (Patent Proprietor)	UNION CARBIDE CHEMICALS & PLASTICS TECHNOLOGY CORPORATION 39 Old Ridgebury Road Danbury Connecticut 06817-0001 (US)
Representative:	Hayes, Adrian Chetwynd Boult Wade Tennant Verulam Gardens 70 Gray's Inn Road London WC1X 8BT (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office dated 19 May 2003 and posted 17 October 2003 concerning maintenance of the European patent No. 0457455 in amended form.**

Composition of the Board:

Chairman: R. Young
Members: M. Gordon
E. Dufrasne

Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 0 457 455 in respect of European patent application No. 91 303 886.5 in the name of Shell Oil Company, later assigned to Union Carbide Chemicals & Plastics Technology Corporation, was announced on 3 July 1996 (Bulletin 1996/27) on the basis of 16 claims.

Claims 1, 6, 7, 10, 12 and 16 read as follows:

"1. A polypropylene impact copolymer composition which comprises a homopolymer phase predominantly comprising a propylene homopolymer and a copolymer phase predominantly comprising a copolymer of ethylene and propylene, wherein the ratio of the intrinsic viscosity of the copolymer phase to that of the homopolymer phase is from 0.7/1 to 1.3/1, the intrinsic viscosities being determined according to ASTM D 1601-78 in decalin at 135°C, that of the copolymer phase ($[\eta]_{copol}$) being derived from the intrinsic viscosity of the composition ($[\eta]_{prod}$) in accordance with the formula:

$$[\eta]_{copol} = \frac{[\eta]_{prod} - (1-F_c)[\eta]_{homo}}{F_c}$$

where $[\eta]_{homo}$ is the intrinsic viscosity of the homopolymer phase and F_c is the fraction of the composition which is copolymer.

6. A composition according to any one of the preceding claims wherein the composition is obtainable by a two-stage polymerization process.

7. A composition according to claim 6 wherein the two-stage polymerization process is a gas phase process

wherein predominantly propylene is initially polymerized to form the homopolymer phase and the product of the initial polymerization is contacted with a mixture of propylene and ethylene to form the copolymer phase, the polymerizations being conducted in the presence of an olefin polymerization catalyst and the molecular weight at least one of the homopolymer phase and the copolymer phase being controlled to provide said intrinsic viscosity ratio.

10. A composition obtainable by visbreaking a polypropylene impact copolymer composition as claimed in any one of the preceding claims to provide a visbroken composition having a melt flow of from 2 to 200 according to ASTM-1238, condition L.

12. A composition according to any one of the preceding claims which further comprises a nucleating agent.

16. Shaped articles of a composition as claimed in any one of the preceding claims."

Claims 2-5 defined preferred embodiments of the composition of claim 1. Claims 8 and 9 defined preferred embodiments of the process of claim 7. Claim 11 restricted the viscosity ratio of the composition of claim 10. Claims 13-15 defined preferred embodiments relating to the nucleating agent.

II. Opposition against the grant of the patent was filed on 3 April 1997 by BASF AG. The opposition was subsequently transferred to Novolen Technology Holdings C.V. as a consequence of a transfer of business assets

from BASF AG, the transfer taking effect from 3 December 2001.

The opposition was based on the grounds pursuant to Article 100(a) EPC, specifically that the subject matter claimed was neither novel nor founded on an inventive step.

The opposition relied *inter alia* on the following prior art citations:

D4: JP-A-146 953/88 (Considered in the form of an English translation)

D11: R. Greco *et al.* "Polyolefin blends: 2. Effect of EPR composition on structure, morphology and mechanical properties of iPP/EPR alloys"; Polymer **28** (1987) pp 1929-1936.

III. In a decision announced orally on 19 May 2003 and issued in writing on 17 October 2003 the opposition division held that the patent could be maintained in amended form on the basis of a main request of 15 claims filed with a letter dated 14 March 2003.

The claims according to this request differed from those as granted in that claim 1 specified the content of copolymer phase (10-50% by weight based on the total composition) and further specified the content of ethylene in the copolymer phase (35 to 75% by weight).

The decision under appeal held that the claims of this request met the requirements of Articles 123(2) and (3) EPC.

Novelty was acknowledged since it was held that the disclosure in D4 of an ethylene content of the copolymer component of 20-80 weight % was too vague to anticipate the content of 35-75 weight % ethylene claimed.

It was further held that the content of ethylene in the copolymers of the examples of D4 could not be derived by reference to impact strength data in D11, as had been submitted by the opponent.
With regard to inventive step, the problem to be solved was formulated, in accordance with page 2, lines 3, 4 and 40-44 of the patent in suit as being to provide compositions having improved resistance to stress whitening as well as good impact strength.
D4 was the closest prior art. This document was not concerned with said problem, the underlying problem of D4 being to provide compositions excellent in impact resistance, rigidity and flowability. The narrower range of the comonomer content of the copolymer component, compared to D4, was considered, together with the other parameters chosen, to contribute to the solution of said problem and the effect of the selection to be surprising and hence to support the presence of an inventive step.

IV. An appeal against this decision was filed by the opponent on 16 December 2003, the requisite fee being paid on the same date. It was requested that the decision under appeal be set aside and the patent revoked.

V. Together with the statement of grounds of appeal, received on 27 February 2004 the appellant introduced a further document:
D12: EP-A-433 990. This was prior art pursuant to Article 54(3) EPC for the contracting states BE, DE, ES, FR, GB, IT and NL.

(a) With regard to novelty, it was argued that the subject matter of claim 1 as maintained by the opposition division was anticipated by the disclosure of examples 2-5 of D12. Further objections of lack of novelty based on D12 were raised in respect certain of the other claims. It was further submitted that the subject matter claimed lacked novelty in view of the disclosure of D4. Although D4 did not disclose the content of ethylene in the copolymer, this information could be derived from the Tg values reported in D4 with reference to the information contained in D11. D11 concerned copolymers prepared using catalysts comparable to those employed in D4. From the data in D11 relating the Tg values of the copolymers to the monomer compositions thereof it was possible to ascertain the monomer compositions of the copolymers of D4.

(b) Regarding inventive step it was submitted that D4 represented the closest prior art. This was held to disclose copolymers having an ethylene content between more than 20 weight % and less than 35 weight %. Such compositions would be understood to have lower impact strength and probably improved stiffness and stress whitening resistance as compared to the compositions of the patent in suit. From D11 it was known that poor impact strength was a consequence of a lower ethylene content of the copolymer phase. It would be recognised that the impact strength of the compositions of D4 at an ethylene level of 20-35 weight % was insufficient. It would be immediately apparent to address this problem by using an

ethylene-propylene copolymer having an ethylene content in the upper region of the range of 20 to 80 wt% disclosed in D4.

VI. The respondent (patentee) submitted, together with the response received on 6 August 2004, further sets of claims forming a main and a first and second auxiliary request. It was requested that the decision under appeal be set aside and the patent maintained on the basis of said main request, in the alternative, on the basis of the first or second auxiliary requests.

(a) Claim 1 of the main request corresponded to claim 1 as upheld by the opposition division, but modified by introduction of four disclaimers to take account of examples 2-5 of D12. Independent claim 3 of the main request corresponded to claim 1 as upheld by the opposition division with the additional feature that a nucleating agent be present. This claim did not contain disclaimers. The main request further contained an independent claim 17 directed to a process for preparing a polypropylene impact composition having the product features of claim 1 as upheld by the opposition division together with process features essentially corresponding to those of claim 7 as granted. Further, four claims dependent thereon were proposed. A claim corresponding to granted independent claim 10 was not present.

(b) The respondent submitted that the newly filed claim 1 was novel with regard to D12 due to the disclaimers. The subject matter of claim 3, which

did not contain the disclaimers, was not anticipated since D12 did not disclose the presence of nucleating agents. Process claim 17 was novel since D12 related to a slurry process, not a gas phase process as defined. With regard to the objection based on D4 and D11, the respondent submitted that the correlation between Tg and ethylene content relied upon was invalid. In this respect reference was made to differences in the process conditions (temperature, solvent) and the fact that in D4 the copolymer was prepared in the presence of the propylene homopolymer whereas in D11 the copolymer was prepared in the absence of any polypropylene. Further the Tg reported in D11 related only to the ethylene-propylene copolymer while that reported in D4 concerned the composition of ethylene-propylene copolymer together with the polypropylene phase. Regarding inventive step, the finding that D4 represented the closest prior art was not challenged. It was disputed that D4 and D11 would be combined as proposed by the appellant. D4 referred to composition obtained by *in situ* polymerisation, the copolymer being prepared in the presence of the homopolymer whereas D11 related to blends of the components. The problem underlying the patent in suit was to improve resistance to stress whitening, which problem was not addressed in D4. It had not been explained why the compositions of D4 would be expected to have improved stress whitening.

VII. The board issued on 25 January 2006 a summons to oral proceedings. In a communication from the board dated

31 January 2006 the provisional view was expressed that the disclaimers with respect to D12 had been correctly formulated. With regard to the newly introduced process claims it was indicated that the admissibility of these would have to be examined with regard to the requirement of Article 123(3) EPC and also with respect to the prohibition of *reformatio in peius* since the patent proprietor was not an appellant.

The board provisionally considered that the novelty objection based on a correlation of data between D4 and D11 was not valid.

With regard to those claims lacking the disclaimers but specifying the presence of a nucleating agent it was noted that according to D11 the ethylene-propylene copolymer component could itself exhibit nucleating activity. Hence it would be necessary to examine whether this feature could confer novelty with respect to D12.

With regard to the restriction of the content of ethylene in the copolymer, and in view of the case law developed with regard to selection inventions, it was stated that it would be necessary to examine whether this feature could confer novelty with respect to the broader range disclosed in D4.

With regard to inventive step it was noted that since the patent in suit identified the intrinsic viscosity (hereinafter "IV") ratio as significant for attaining the desired improvement in stress whitening, and in view of the fact that this ratio was exhibited by some of the compositions of D4, this problem had potentially already been solved in the prior art, meaning that a different technical problem would have to be formulated.

VIII. The respondent submitted in a letter dated 3 March 2006 further sets of claims forming a main and nine auxiliary requests. A further document was submitted:

D13: Ser van der Ven, "Polypropylene and other Polyolefins, Polymerization and Characterization"; Studies in Polymer Science 7. Elsevier, Amsterdam, 1990, pp. 317-321.

(a) Claim 1 of the main request read as follows:

"1. A polypropylene impact composition which comprises a homopolymer phase predominantly comprising a propylene homopolymer and from 10% to 50% based on the weight of the total impact copolymer composition of a copolymer phase predominantly comprising a copolymer of ethylene and propylene wherein the copolymer phase contains from 35 to 50% by weight of ethylene based on total copolymer phase, and wherein the ratio of the intrinsic viscosity of the copolymer phase to that of the homopolymer phase is from 1.0/1 to 1.3/1, the intrinsic viscosities being determined according to ASTM D 1601-78 in decalin at 135°C, that of the copolymer phase ($[\eta]_{copol}$) being derived from the intrinsic viscosity of the composition ($[\eta]_{prod}$) in accordance with the formula

$$[\eta]_{copol} = \frac{[\eta]_{prod} - (1-F_c)[\eta]_{homo}}{F_c}$$

where ($[\eta]_{homo}$) is the intrinsic viscosity of the homopolymer phase and F_c is the fraction of the composition which is copolymer; with the proviso that the composition does not consist of 72 weight percent of a propylene homopolymer phase

containing 0.5 weight percent ethylene and having an intrinsic viscosity of 1.87 dl/g and 28 weight percent of a propylene copolymer phase containing 39 weight percent of ethylene and having an intrinsic viscosity of 2.16."

Dependent claim 2 specified the composition according to claim 1 further comprising a nucleating agent, corresponding to granted claim 12, cited in section I above.

Independent claim 3 corresponded to claim 1, with the difference that instead of the disclaimer the final phrase of the claim read:

"and wherein the polypropylene impact composition further comprises a nucleating agent".

Claims 4 and 5 specified restrictions with respect to the content, in ppm, of nucleating agent in the compositions of claims 2 and 3. Claim 6 specified that the nucleating agent in the compositions according to claims 2 to 5 was sodium benzoate. Claims 4 to 6 corresponded to the granted claims 13 to 15 respectively.

Claim 7 specified that the homopolymer phase could contain up to 6.0 weight percent ethylene, corresponding to granted claim 4.

Claim 8 restricted the IV ratio to 1.0/1 to 1.2/1, corresponding to granted claim 5.

Claims 9 and 10 corresponded to the granted claims 6 and 7, cited in section I above.

Claim 11, dependent on claim 10, specified that both stages be conducted in the presence of a fluidized bed olefin polymerization catalyst, corresponding to granted claim 8.

Claim 12, dependent on claims 10 or 11 specified the addition of molecular hydrogen to control the

molecular weight corresponding to granted claim 9. Claims 13 and 14 corresponded respectively to granted claims 10 and 11.
Claim 15 corresponded to granted claim 16 cited in section I above.
Independent process claim 16 read as follows:
"16. A process for preparing a polypropylene impact composition which comprises a homopolymer phase predominantly comprising a propylene homopolymer and from 10% to 50% based on the weight of the total impact copolymer composition of a copolymer phase predominantly comprising a copolymer of ethylene and propylene wherein the copolymer phase contains from 35 to 50% by weight of ethylene based on total copolymer phase, and wherein the ratio of the intrinsic viscosity of the copolymer phase to that of the homopolymer phase is from 1.0/1 to 1.3/1, the intrinsic viscosities being determined according to ASTM D 1601-78 in decalin at 135°C, that of the copolymer phase ($[\eta]_{copol}$) being derived from the intrinsic viscosity of the composition ($[\eta]_{prod}$) in accordance with the formula:

$$[\eta]_{copol} = \frac{[\eta]_{prod} - (1-F_c)[\eta]_{homo}}{F_c}$$

where ($[\eta]_{homo}$) is the intrinsic viscosity of the homopolymer phase and F_c is the fraction of the composition which is copolymer;
wherein a two-stage gas-phase polymerization process is carried out wherein predominantly propylene is initially polymerized to form the homopolymer phase and the product of the initial polymerization is contacted with a mixture of propylene and ethylene to form the copolymer phase,

the polymerizations being conducted in the presence of an olefin polymerization catalyst and the molecular weight of at least one of the homopolymer phase and the copolymer phase being controlled to provide said intrinsic viscosity ratio."

The dependent process claims 17-20 specified the same features as claims 11-14 of the main request (indicated above), however in relation to the process of claim 16.

(b) The submissions of the respondent may be summarised as follows:

(i) A procedural request for remittal of the case to the opposition division was made for the case that the board should consider the introduction of process claims not appropriate. With respect to the prohibition of *reformatio in peius* it was submitted that the amendments made were a consequence of the citation of D12, of which it had only been possible to take account at the appeal stage since it had not been cited previously. Hence the introduction of process claims should be permitted.

(ii) With regard to the requirements of Article 123(3) EPC in respect of the process claims, it was argued these were derived *inter alia* from composition claims defining process features and thus should properly be read as product by process claims. Carrying out this process would necessarily result in

a composition within the scope of granted claim 1, meaning there was no increase in the scope of protection.

(iii) With regard to the question of whether the presence of a nucleating agent would confer novelty, it was submitted that the wording of the claims, in particular the word "further" indicated that this was not a component intrinsic to the composition but an additional component to the previously recited components, added after formation of the composition.

(iv) With regard to D4, it was argued that the requirements for novelty based on the criteria for a selection were met with regard both to the general disclosure and with regard to the examples thereof.
Compared to the general disclosure of D4 it was argued that selections had been made at least with respect to the disclosures of the ethylene content of the copolymer component of 20 to 80% and of the IV ratio of 0.5/1 to 2.0/1. Neither of the claimed ranges of these parameters, which required an IV ratio of 1.0/1 to 1.3/1 and a copolymer phase ethylene content of 35 to 50 % by weight was disclosed individually, let alone in combination.
With respect to the examples of D4, in particular the ethylene content of the copolymer, it was argued, with respect to the data in Table 6.3 of D13 which showed

values of Tg for a homologous series of block copolymers differing only in rubber fraction ethylene content that the Tg values of -20 to -44°C reported in the table of D4 corresponded to an ethylene comonomer content of around 80% or higher or around 20% or lower, showing that the examples of D4 did not anticipate the ethylene content defined in the claims.

It was further argued, with respect to the examples, that the requirements for a novel selection were also met since the claimed range of ethylene content of 35 to 50 wt% spanning a range of 15 wt% was narrow compared to the disclosure of 20-80 wt% in D4, spanning a range of 60 wt%. The claimed range was also far removed from the end points of the known range (20 and 80 wt%). The evidence of samples 6 and 8 of the patent in suit established that the claimed range of ethylene content was not an arbitrarily chosen specimen but made a technical contribution since it resulted in an improvement in stress whitening resistance.

(v) With regard to inventive step, it was argued that D4 failed to teach anything about stress whitening. The IV ratio alone was not sufficient to achieve this - other parameters, in particular the ethylene content had to be controlled as illustrated by samples 6 and 8 of the patent.

IX. Oral proceedings were held before the board on 5 April 2006.

(a) With regard to the formulation of the claims with respect to Article 123 EPC and the prohibition of *reformatio in peius*:

(i) The appellant acknowledged that the claims according to the main request, including process claim 16, did not result in an increase of the scope of protection as compared to the claims upheld by the opposition division. It was submitted that the respondent was employing three alternative "approaches" to address the issues arising from citation of D12 - introduction of a disclaimer (claim 1), introduction of a further feature (claim 3) or formulating process claims (claim 16). A single one of these - the route represented by claim 1 - would however be sufficient to overcome the objections. There was a contradiction between claims 1 and 16 since a product excluded from the scope of claim 1 by a disclaimer was encompassed by claim 16.

(ii) The respondent submitted a new main request to the effect that the case be remitted to the opposition division in order that the issues arising from the citation of D12 could be dealt with by the first instance. The remaining requests were upheld, it however being indicated in general terms

that it was intended to modify and/or reorder certain of the auxiliary requests.

(b) Regarding novelty,

(i) With respect to the ethylene content of the copolymer employed in D4 the appellant submitted that it was not possible to derive this by correlation of the reported Tgs with those disclosed in D13. The respondent stated that this conclusion applied equally to D11.

(ii) With regard to the issue of novelty by selection, and the content of ethylene in the copolymer, the appellant submitted that samples 5 and 6 of Example 1 of the patent in suit showed that the ethylene content had no effect on stress whitening. D4 taught that an IV ratio of around unity was required. Although D4 was silent on stress whitening, it was possible that the compositions had this property.
The respondent observed that the samples 5 and 6 invoked by the appellant had different IV ratios, invalidating the comparison. Two factors were important for attaining good stress whitening - the IV ratio and the content of ethylene in the copolymer as could be derived from the examples of the patent in suit.
The respondent further submitted that D4 disclosed a broader range of IV ratios than defined in the patent in suit, and taught

only that this ratio should get closer to unity. Most examples of D4 had IV ratios outside the range now claimed. Stress whitening was not even mentioned in D4. The claimed subject matter represented a selection from two lists - one selection in respect of the IV ratio and the other in respect of the ethylene content.

(iii) With regard to the issue of the nucleating agent, the respondent referred to the written submissions relating to the meaning of "further comprises". The statement in D11 regarding the nucleating effect of the ethylene/propylene copolymer represented an inference or a theory, but was not presented as a fact. This theory had since been discredited.

(c) Regarding inventive step, the appellant submitted that since the IV ratio was disclosed in D4 the problem of reducing stress whitening had already been solved. The technical problem as set out in the patent was therefore not correct. The only distinction with regard to D4, the ethylene content of the copolymer phase, had not been shown to give rise to any technical effect. The skilled person would be attracted to D4 by the reported properties. In repeating this teaching inevitably a composition in the central part of the disclosed range would be employed. If problems with stress whitening arose, further experiments would be carried out. It would be found that the best

results were obtained in the central part of the range.

The respondent submitted that a novel technical effect over D4 had been shown. D4 contained no information about stress whitening. The examples of D4 could not be repeated as certain data - the ethylene content of the copolymer phase - was lacking. D4 contained no teaching that balancing the IV ratio and ethylene content of the copolymer would lead to improved stress whitening. There was no motivation to carry out any modification of the composition of D4 to improve stress whitening.

X. The final requests of the parties were:

The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 457 455 be revoked.

The respondent (patentee) requested that the decision under appeal be set aside and the case remitted to the first instance for further prosecution or in the alternative that the patent be maintained on the basis of the main request or the first to ninth auxiliary requests filed with the letter dated 3 March 2006.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of the amended claims according to the main request*

2.1 Article 123(2) and (3) EPC.

The appellant has not raised any objections to the claims of the main request pursuant to Articles 123(2) or (3) EPC. Nor has the board any objections of its own.

2.2 Reformatio in peius

Although the appellant acknowledged at the oral proceedings that the claims according to the main request did not result in an extension of the scope of protection provided, as compared to the claims of the main request upon the basis of which the opposition division maintained the patent, it was challenged, with respect to the case law relating to *reformatio in peius* whether the amendments were appropriate and necessary.

2.2.1 As established by the Enlarged Board of Appeal in Decision G 9/92 (OJ EPO 1994, 875) the aim of an appeal is to eliminate an adverse effect as follows from Article 107 EPC (paragraph 9 of the reasons of G 9/92). Therefore, as set out in paragraph 2 of the Order and Headnote II of G 9/92:

> "*If the opponent is the sole appellant against an interlocutory decision maintaining a patent in amended form, the patent proprietor is primarily restricted*

> *during the appeal proceedings to defending the patent in the form in which it was maintained by the Opposition Division in its interlocutory decision. Amendments proposed by the patent proprietor as a party to the proceedings as of right under Article 107, second sentence, EPC, may be rejected as inadmissible by the Board of Appeal if they are neither appropriate nor necessary".*

This means that a non-appealing party may not seek to improve its position compared to that which was decided by the first instance which would be contrary to the principle of prohibition of *reformatio in peius*.
Therefore it is necessary to examine the amendments proposed by the respondent in the light of two aspects (cf. paragraph 16 of the Reasons of G 9/92):
- whether they extend beyond the scope of the claims upon the basis of which the first instance decided that the patent could be maintained;
- whether they are appropriate and necessary to address the issues arising from the appeal.

2.3 Upon filing the appeal, the appellant cited a document - D12 - that hitherto had not been part of the proceedings. This document was prior art pursuant to Article 54(3) EPC for a number of the contracting states designated in the patent in suit.
Since D12 was introduced only at the appeal stage, the issues resulting from the citation thereof arose from the appeal. In its response to the statement of grounds of appeal, the respondent proposed amendments to take account of this new document.
To employ the terminology of the appellant, three "approaches" were employed by the respondent in order to address the issues arising from the introduction of

D12 at the appeal stage, corresponding to independent claims 1, 3 and 16:

- disclaimer(s) were introduced into independent product claim 1 to take account of the disclosure of four of the examples of D12;
- independent claim 3 lacked the disclaimer(s) but required that the composition further comprised a nucleating agent;
- independent process claim 16 defined a process for preparing a composition having the properties defined in independent product claim 1, without including the disclaimer(s) of claim 1.

2.4 The scope of the amended claims submitted by the respondent - reformatio in peius

Common to all these three "approaches", i.e. claims 1, 3 and 16 were restrictions, as compared to the claim 1 upheld by the opposition division, of the subject matter claimed in terms of the properties of the composition. Specifically, the proportion of ethylene in the copolymer phase was limited to 35-50% by weight whereas claim 1 as maintained by the opposition division specified 35 to 75% by weight. Further the IV ratio of 1.0/1 to 1.3/1 was restricted compared to the range of 0.7/1 to 1.3/1 in the claims as upheld by the opposition division. However these restrictions alone were not sufficient to take account of the presence of D12.

2.4.1 The subject matter encompassed by claims 1 and 3 was thus further restricted by the disclaimer and the requirement for the presence of a nucleating agent

respectively, corresponding to the first and second "approaches".
The third "approach", i.e. formulation of process claim 16 is based upon the product by process claim in the patent as granted (claim 6) and upon the product by process claim as upheld by the opposition division (claim 5). The scope of protection afforded by this process claim is restricted in two respects as compared to the claims (product and product-by-process) as upheld by the opposition division. Firstly, there are the restrictions with regard to the constitution of the composition noted above. Further, pursuant to Article 64(2) EPC such a process claim only provides protection for the product that is directly obtained by the defined process. Thus compared to the product by process claims in the set of claims maintained by the opposition division, which afforded absolute protection to the product regardless of how obtained the protection afforded by the present process claim is limited.

2.4.2 Accordingly it is concluded the claims of the main request do not result in an extension in the scope of protection with respect to the claims as upheld by the opposition division meaning that to this extent at least the amendments do not contravene the prohibition of *reformatio in peius*.

2.5 The appropriateness and necessity of the amendments

The second aspect to be considered is whether these amendments are appropriate and necessary, i.e. whether they arise from the appeal, specifically the issues raised by introduction of D12.

2.5.1 The three independent claims are of different, if (to an extent) overlapping, scope:
The scope of product claim 1 is reduced by effect of the disclaimer, resulting in a "gap" or "void" in the scope thereof.
Product claim 3 covers the entire composition covered by product claim 1 including that portion excluded by the disclaimer, the scope thereof however is restricted in that the presence of a nucleating agent is mandatory, thus excluding from protection compositions lacking a nucleating agent.
The product resulting from the process of independent claim 16 is subject to neither of these exclusions, however the protection afforded by this claim extends solely to the products directly obtained by the defined process and does not cover the products *per se*.

2.5.2 Thus each of the three independent claims provides a - different - partial remedy of the consequences arising from citation of D12. While there is some overlap between the scope of protection afforded by the three independent claims none of the independent claims is of identical scope meaning that there is no duplication and no redundancy within these claims. It is also apparent from the foregoing analysis that the amendments made result directly from the issues arising as a result of the introduction of D12.

2.5.3 A patentee is normally free to draft its specification in any manner considered appropriate, subject to the requirements of the EPC. The requirements of *reformatio in peius* may involve restrictions on this inherent freedom of the - non-appealing - patentee so that the

patentee does not improve its position compared with that if no appeal had been filed, but it does not imply any right of the appealing party to dictate the form such amendments may take, and certainly not to prescribe a form of amendment which would be maximally disadvantageous for the patentee. In the present case, the board considers that the three approaches adopted represent a fair balance, under the circumstances, between the need to meet the attack based on D12, on the one hand, and not completely to lose, on the other hand, the subject matter represented by the process features defined in claims 6 and 7 as granted.

2.5.4 Thus the Board is satisfied that the amendments made, in particular the formulation of three independent claims of differing scope, were appropriate and necessary to address the objections arising from the appeal.

2.6 It is therefore concluded that the claims of the main request are admissible with regard to the requirements of Article 123(2) and (3) EPC and in view of the prohibition of *reformatio in peius*, in particular in view of Decision G 9/92, specifically the requirement that the amendments made be appropriate and necessary to take account of the issues arising from the appeal.

2.7 In view of the fact that the claims of the main request are formally admissible, it is apparent that the issues arising from the introduction of D12 have not rendered it necessary to remit the case to the opposition division for further prosecution.
Accordingly the request of the respondent for such remittal is refused.

3. *The patent in suit*

The patent in suit relates, according to the main request recited above, to a polypropylene impact composition which comprises a homopolymer phase predominantly comprising a propylene homopolymer and an ethylene-propylene copolymer phase. It is required that a certain proportion of the copolymer phase be present (10-50 wt% of the total composition), that the ethylene content of the copolymer phase be 35-50% by weight of said copolymer phase, and that the ratio of the IV of the two phases (determined by a defined method) be in the range 1.0/1-1.3/1.

3.1 The technical problem

According to page 2 lines 3 and 4 the invention sets out to provide polymer compositions having good impact strength, stiffness and exhibiting improved resistance to stress whitening. It is explained at page 2 lines 24 to 27 that stress whitening occurs under circumstances such as on ejecting parts from moulds, in the forming of articles from sheet stock at temperatures in the vicinity of melting and below and in the general situation of impacting or bending of fabricated parts during production, assembly or during the intended application.

3.2 The solution to said technical problem

According to the independent claims of the main request reproduced in section VIII.a above, the above problem is solved by providing a polypropylene impact

composition, or a process for preparing such a composition, the composition having the specified ratio of IV of the copolymer phase to the homopolymer phase (1.0/1 to 1.3/1) and the specified content of ethylene in the copolymer phase (35 to 50% by weight).

3.2.1 According to the data in Table I, all the compositions having the IV ratio outside the claimed range (samples 1, 3, 9, 10 and 12) exhibit, with one exception, worse stress whitening performance than those compositions having the required ratio. The exception is provided by the pair sample 9 and sample 8. Sample 9 exhibits a ratio of 1.4, stress whitening diameter 1.12 at the condition 11.52 kg-cm whereas Sample 8 has a ratio of 1.3 and exhibits a stress whitening diameter of 1.14. However it is apparent that the proportion of ethylene in the copolymer in sample 8 (56.8 wt%) is outside the claimed range.

3.2.2 With regard to the ethylene content of the copolymer phase, attention is directed to the sample pair 6 and 8 which exhibit the same IV ratio, similar content of copolymer (17.6 and 16.3 wt% respectively) but differing ethylene contents, namely 41.1 wt% and 56.8 wt% respectively. The ethylene content of sample 6 is within the claimed range, while that of sample 8 lies outside. Sample 6 exhibits better stress whitening resistance than sample 8.

3.2.3 It is therefore established that the technical problem defined in the patent in suit has in fact been solved by the claimed measures.

4. *Novelty*

Novelty was challenged in respect of the disclosures of D4 (Art. 54(2) EPC) and D12 (Art. 54(3) EPC).

4.1 D4 relates to a propylene resin composition comprising:
(A) a crystalline polypropylene component which according to page 5 lines 15 and 16 of the translation is a homopolymer or a "substantially propylene homopolymer" containing 2 wt% or less of ethylene or other olefin units,
(B) an ethylene-propylene random copolymer, and
(C) a nucleating agent.
According to claim 1 the weight proportion between components (A) and (B) is from 55:45 to 95:5, the glass transition temperature of component (B) is -30°C or lower and the nucleating agent is present in an amount of 0.005 to 1 part by weight based on 100 parts by weight of the total weight of components (A) and (B). The ratio of IV of the components (A) and (B) is in the range of from 0.5 to 2.0 (claim 1), preferably in the range of 0.7 to 1.7 (description page 7 line 6).
The technical problem underlying D4 is to provide propylene resin compositions suitable for moulding materials in the fields of household electric appliances and automobiles, which compositions are excellent in mechanical properties such as impact resistance (especially surface impact resistance) and rigidity (page 2 lines 1-5).
It is taught that IV ratios outside the broader range result in compositions with reduced surface impact resistance and/or rigidity. As a means for controlling the IV ratio it is further taught that this can be forced to approach unity closer by performing a

decomposition treatment with peroxide (visbreaking - page 12 lines 9-12)).
Copolymer component (B) may contain from 20 to 80 weight % ethylene units, but no specific values are specified (page 5 line 24).
According to the examples of D4, the composition is prepared by carrying out polymerization of propylene in a first stage, removing unreacted propylene and in a second stage feeding in a propylene-ethylene mixture. Hydrogen is added in both stages, the added quantity of hydrogen being controlled to attain a predetermined IV ratio. According to the Table the resulting composition consists of 80 weight % of crystalline polypropylene and 20 wt% of the copolymer. The illustrative examples 1-5 of D4 report compositions having IV ratios of 1.3, 1.1, 0.9, 0.9 and 1.6 respectively. The content of ethylene in the copolymer component of the obtained compositions is not reported.

4.1.1 Regarding the ratio of IV of the homopolymer phase and the copolymer phase, D4 teaches that better results are obtained if this ratio "approaches" unity. It is however not stated to what extent it should "approach" unity, i.e. how close to unity it should be. Further, D4 permits this ratio to encompass unity, i.e. have limits above and below unity. In contrast, the ratio as defined in claims 1 and 3 of the main request is specified to lie in a range bounded only on one side by unity.
Therefore neither of the limits of the range defined in claims 1 and 3 of the main request is disclosed in the discussion of the range in D4. Further the distribution of the range defined according to claims 1 and 3 of the

main request, with one limit being coincident with unity, is not disclosed in D4.

4.1.2 With regard to the monomer composition of the copolymer phase of D4, the appellant has submitted that this feature can be deduced from the Tg reported in the examples of D4 by reference to D11.
D11 relates to the provision of blends of polypropylene and ethylene-propylene copolymers. In contrast to the compositions of D4, in the compositions of D11 the two components are prepared separately and then combined.
D11 contains a table correlating the Tg of the separately prepared, i.e. pure ethylene-propylene copolymers with the monomer composition.
The data for Tg reported in D4 however apply to the entire composition, i.e. the combination of polypropylene, ethylene/propylene copolymer and nucleating agent. Further as a result of the preparation method employed in D4 (see above), in contrast to D11 at no time will the ethylene-propylene copolymer be present in a pure, isolated form.
Thus the Tgs reported in D4 and D11 refer to different polymer compositions and for this reason cannot be correlated with each other.
As a consequence of this, it is not possible on the basis of the data relating to Tg and monomer composition of isolated ethylene-propylene copolymers in D11 to draw any conclusions concerning the comonomer content of the copolymers present in the composition of D4 on the basis of the Tg values reported for the entire propylene resin composition.
Similarly, D13 cited by the respondent in the letter of 3 March 2006 reports the Tg of pure ethylene-propylene copolymers as a function of the ethylene content and

for the same reasons can yield no information about the monomer content of the copolymer component of the compositions exemplified in D4.
Therefore the evidence advanced does not demonstrate that the monomer content of the copolymer component of D4 is within the range claimed according to claim 1 of the main request.

4.1.3 Accordingly, compared to the teaching of D4 the subject matter according to the claim 1 or claim 3 of the main request is restricted in respect of the range of two features, neither of which restrictions is disclosed in D4.

4.1.4 As to the question of whether such (double) selection is purposive, it is evident from the analysis of the samples given in sections 3.2.1 and 3.2.2 above, that the ranges defined for the two parameters in question are indeed significant for the effectiveness of the solution to the technical problem.

(a) In this connection, the appellant submitted at the oral proceedings (section IX.b.ii above) that the evidence of samples 5 and 6 of Example 1 of the patent in suit would show that the feature of the ethylene content of the copolymer phase had no effect.

(i) Sample 5 relates to a composition in which the IV ratio is 1.2, the content of copolymer rubber is 21.7 wt% and the content of ethylene in the copolymer fraction is 53.6 wt%. Sample 6 relates to a composition having a different IV ratio (1.3), a

different proportion of copolymer (17.6) and a different content of ethylene in the copolymer (41.1). The reported stress whitening performance for samples 5 and 6 is 0.99 cm and 1.04 cm respectively at a loading of 11.52 kg-cm and 1.47 and 1.42 respectively at the higher loading of 23.04 kg-cm.

(ii) In view of the fact that the compositions of samples 5 and 6 differ in more respects than only the content of comonomer in the copolymer, namely since there also exist differences in the IV ratio and the proportion of copolymer, it is not possible to draw any conclusions as to the existence or absence of an effect resulting from the content of comonomer in the copolymer in respect of this pair of samples.

(iii) Accordingly the evidence of these two samples does not support the position of the appellant that the defined comonomer content is devoid of any effect (is not purposive).

(b) Consequently, and in view of the evidence set out in sections 3.2.1 and 3.2.2 above, the board comes to the conclusion that each of the two features not disclosed in D4 is purposive for the solution of the relevant technical problem.

4.1.5 It is therefore concluded that the disclosure of D4 does not anticipate the subject matter of claim 1 or claim 3 of the main request.

4.1.6 D4 does not disclose a gas phase polymerization process as defined in claim 16 of the main request. Accordingly, the subject matter of this claim is novel with respect to the disclosure of D4.

4.1.7 Accordingly the subject matter of independent claims 1, 3 and 16 of the main request is novel with respect to the disclosure of D4. By the same token, this conclusion also applies to the dependent claims 2, 4-15 and 17-20.

4.2 D12, a document which is prior art pursuant to Article 54(3) EPC discloses in examples 2-5 compositions of polypropylene and ethylene-propylene block copolymers. The copolymer is present in amounts of 22, 24, 28 and 43 weight % of the total for examples 2, 3, 4 and 5 respectively. The corresponding ethylene contents are 45, 40.2, 39 and 36 and the IV ratios are 0.86, 0.91, 1.16 and 0.86, again in the indicated order. The examples of D12 employ a solution process to prepare the compositions. In a first step the polypropylene component is prepared. Then ethylene is admitted and the copolymer formed *in situ*.

4.2.1 It has not been challenged that the disclaimer introduced into claim 1 of the main request correctly delimits the claimed subject matter from the disclosure of D12 and the board is satisfied that this is in fact the case.
Consequently the subject matter of claim 1 is novel with respect to the disclosure of D12.

4.2.2 As was noted by the board in its communication, the question to be answered appeared to be whether, in the light of a statement in D11 that ethylene-propylene copolymers exhibited a nucleating affect, the requirement in claim 3 of the main request that the composition further contain a nucleating agent (which claim does not contain any disclaimers to this disclosure) can confer novelty.

(a) According to page 1931 of D11 it is observed that the spherulite dimensions of the polypropylene phase are smaller in the case of the blends, on the basis of which it is "inferred" that the copolymer acts as a nucleating agent. There is no evidence in D11 which would allow it to be concluded whether this inference was in fact correct.

According to submissions of the respondent, which were not contradicted by the appellant, the statement in D11 corresponded to a theory which has since been disproven.

In the light of the nature of the statement in D11 and the - uncontested - submissions of the respondent the board is satisfied that there is no teaching in D11 that the ethylene-propylene copolymer does act as a nucleating agent for the polypropylene phase, and therefore the presence of this component in the compositions of D11 does not anticipate the feature in claim 3 of the main request that a nucleating agent be present.

4.2.3 As noted above (4.2) D12 discloses a solution process. Claim 16 of the main request defines a gas phase

process and therefore this subject matter is not anticipated by the disclosure of D12.

4.2.4 The subject matter of independent claims 1, 3 and 16 of the main request is therefore novel with respect to the disclosure of D12.

4.3 It is consequently concluded that the subject matter of independent claims 1, 3 and 16, and of the dependent claims 2, 4-15 and 17-20 of the main request is novel.

5. *Inventive step*

As noted in section 3.1 above, the technical problem set out in the patent in suit is to improve the stress whitening resistance of compositions of polypropylene and ethylene/propylene copolymers. The evidence of the examples, in particular as discussed in sections 3.2.1 and 3.2.2 above indicates that this problem is effectively solved by the measures defined by the independent claims.
By common consent D4 represents the closest prior art. It remains to be decided whether the features contributing to the solution of this problem involve an inventive step with regard to this closest prior art D4.

5.1 Regarding the specified IV ratio of the two components, as explained in paragraph 4.1.1 above, D4 contains no teaching to select the claimed range of this parameter. Further, there is no recognition in D4 that this feature makes any contribution to improving resistance to stress whitening. On the contrary, D4 is silent on this property.

Accordingly, D4 neither teaches the range of IV ratios now defined, nor does D4 provide any hint which would lead the skilled person to adjust this parameter to lie within the claimed range to improve the resistance to stress whitening of the compositions.

5.2 Regarding the ethylene content of the copolymer component, for the reasons explained in section 4.1.2 there is no suggestion in D4 to employ an ethylene content of the copolymer as claimed for any reason at all, let alone for the specific purpose of improving the resistance to stress whitening of the compositions.

5.3 In summary, not only does D4 not contain any teaching relating to stress whitening resistance, but there is nothing in D4 which would lead the skilled person to select either the claimed IV ratio or the claimed copolymer constitution to improve this property.
Accordingly, it is concluded that the solution to the technical problem underlying the patent in suit, as defined according to independent claims 1, 3 and 16 of the main request is not derivable in an obvious manner from the prior art and thus involves an inventive step pursuant to Article 56 EPC.
This conclusion applies *a fortiori* to the subject matter of the dependent claims 2, 4-15 and 17-20.

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 20 of the main request filed with the letter dated 3 March 2006, and after any necessary consequential amendment of the description.

The Registrar: The Chairman:

E. Görgmaier R. Young