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**Datasheet for the decision  
of 10 February 2010**

**Case Number:** T 0144/07 - 3.3.03

**Application Number:** 98937811.2

**Publication Number:** 1002809

**IPC:** C08F 210/06

**Language of the proceedings:** EN

**Title of invention:**

Propylene/ethylene random copolymer, molding material, and  
molded article

**Patent Proprietor:**

Chisso Corporation

**Opponents:**

Basell Polyolefine GmbH  
Novolen Technology Holdings C.V.

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56  
RPBA Art. 12(1)

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Inventive step - problem and solution (yes)"  
"Basis of appeal proceedings (the case as submitted in the  
statement of grounds of appeal)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0144/07 - 3.3.03

**DECISION**  
of the Technical Board of Appeal 3.3.03  
of 10 February 2010

**Appellant:**  
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**Decision under appeal:**

Interlocutory decision of the Opposition Division of the European Patent Office of 9 November 2006 and posted 28 November 2006 concerning maintenance of European patent No. 1002809 in amended form.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** A. Däweritz  
H. Preglau

## Summary of Facts and Submissions

I. The grant of European patent No. 1 002 809 in respect of European patent application No. 98 937 811.2, filed on 13 August 1998 and claiming the priorities of 15, 15 and 28 August 1997 and of 19 September 1997 of four earlier applications filed in Japan (22033597, 22033697, 23193097 and 25440997), respectively, was announced on 12 May 2004 (Bulletin 2004/20). The patent was granted with twenty claims, including the following independent claims:

**1. A propylene/ethylene random copolymer characterized in that:**

an ethylene content (Ew) is 0.1-10 wt%,  
a relationship between an isolated ethylene content (E<sub>1</sub>) and the ethylene content (Ew) is represented by the following equation:

$$E_1 > 0.85-0.01 Ew$$

2,1- and 1,3-propylene units present in a polymer chain are 0-1 mol%,  
a weight average molecular weight (Mw) is in the range of 40,000-1,000,000, and  
a ratio (Mw/Mn) of the weight average molecular weight (Mw) to a number average molecular weight (Mn) is in the range of 1.5-3.8.

7. A propylene composition comprising the propylene/ethylene random copolymer of Claim 1 and a desired additive component.
8. A propylene/ethylene random copolymer composition comprising the propylene/ethylene random copolymer of Claim 1, an  $\alpha$ -crystal nucleating agent in an amount of 0.0001-1 part by weight based on 100 parts by weight of the copolymer and a desired additive component.
9. A propylene/ethylene random copolymer composition comprising the propylene/ethylene random copolymer of Claim 1, a radical generator in an amount of 0.001-0.5 part by weight based on 100 parts by weight of the copolymer and a desired additive component.
12. A molded article formed from the propylene composition of Claim 7.
13. A film formed from the propylene composition of Claim 7.
14. A composite polypropylene film comprising a film layer formed from the propylene composition of Claim 7 and other polypropylene film layer.
15. A stretched, multi-layer polypropylene film having a heat-seal layer comprising a film layer formed from the propylene composition of Claim 7 on at least one surface of a base layer comprising a film containing a crystalline polypropylene as a main component.
19. An injection-molded article formed from the propylene composition of Claim 7.
20. An injection-molded article formed from the propylene/ethylene random copolymer composition of Claim 8.

The remaining Claims 2 to 6, 10, 11 and 16 to 18 were all dependent and were appendant to preceding claims.

In this decision, any reference to passages in the patent in suit as granted will be given underlined in squared brackets, eg [Claim 1]. References in

underlined italics concern passages in the application as originally filed, eg Claim 1. "EPC" refers to the revised text of the EPC 2000, the previous version is identified as "EPC 1973". Quoted passages remained unchanged/uncorrected.

II. On 11 February 2005, two Notices of Opposition were filed by Opponents O-01 and O-02, each of which requested revocation of the patent in its entirety on the basis of objections of lack of novelty and lack of inventive step (Articles 100(a), 54, and 56 EPC 1973). These objections were based on altogether twenty-one patent documents, publications and other (experimental and measurement) data. By the end of the opposition proceedings, the number of citations had increased to 26, including

D4, EP-A-0 890 590,

D7: EP-A-0 629 632,

D17: EP-A-0 776 913,

D18: EP-A-0 668 157,

D25: M.D. Baijal *et al.*, "*Melt Flow Rate - Intrinsic Viscosity Corelation for Polypropylene*", Journal of Applied Polymer Science, 14, 1970, pages 1651 to 1653, and

D26: US-A-5 597 881.

Additionally, O-01 had raised the objection of insufficiency of disclosure (Articles 100(b) EPC 1973).

(1) However the objections of insufficiency and lack of novelty were no longer maintained with regard to a new Main Request, which had been filed by the Patent Proprietor with its letter dated 7 November 2006 and had further been amended at oral proceedings on 9 November 2006. Nor were any objections raised at the hearing with regard to the requirements of Articles 83,

84, 123(2) or 123(3) EPC 1973 (Minutes, Nos. 1 and 2; and Interlocutory decision, announced at the end of the oral proceedings and issued in writing on 28 November 2006, No. 2.1 of the reasons). An Auxiliary Request, additionally filed with the above letter did not play any role in the opposition proceedings.

(2) The amended version of the new Main Request, which contained seven claims, read as follows:

- "1. *A film formed from a propylene/ethylene copolymer composition comprising:  
a propylene/ethylene random copolymer having the following features:*
  - (i) *the ethylene content (Ew) is 0.1 -10 wt%,*
  - (ii) *the relationship between the isolated ethylene content (E<sub>1</sub>) and the ethylene content (Ew) is represented by the following equation:  
$$E_1 > 0.85 - 0.01 Ew$$*
  - (iii) *2,1-and 1,3-propylene units present in the polymer chain are 0.2-0.5 mol%,*
  - (iv) *the weight average molecular weight (Mw) is in the range of 40,000-1,000,000,*
  - (v) *the ratio (Mw/Mn) of the weight average molecular weight (Mw) to the Number average molecular weight (Mn) is in the range of 1.5-3.8, and*
  - (vi) *the MFR, as determined at a temperature of 230 °C and a load of 21.18 N according to condition 14 in Table 1 of JIS K7210, is 20(g/10min) or higher, and*  
*an additive component.*
2. *The film of Claim 1, wherein the propylene/ethylene random copolymer has a melting point (Tm) in the range of 100-160 °C.*
3. *A composite polypropylene film comprising a film layer of the film of Claim 1 and other polypropylene film layer.*
4. *A stretched, multi-layer polypropylene film having a heat-seal layer comprising a film layer of the film of Claim 1 on at least one surface of a base layer comprising a film containing a crystalline polypropylene as a main component.*
5. *The multilayer polypropylene film of Claim 4 wherein the crystalline polypropylene has not less than 75% of an isotactic index (I.I).*
6. *The multi-layer polypropylene film of Claim 4 or 5 wherein the crystalline polypropylene has a melt flow rate (MFR) of 0.1-10g/10 min.*
7. *The multi-layer polypropylene film of any one of Claims 4-6 which is biaxially oriented."*

(3) The discussion at the oral proceedings focused on the remaining issue of inventive step on the basis of

Examples 3 and 5 of D26, which had been considered by both Opponents as the closest prior art, in combination with an experimental report of O-02 (D27) as filed with its letter dated 11 September 2006, and on Example 4 of D18, which had been considered by the Patent Proprietor as being a better starting point for this discussion. Reference was also made in the discussion to D4 and D17.

III. In the interlocutory decision, the Opposition Division held that *"Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention."*

(1) More particularly, the Opposition Division accepted the opponents' view (section II(1), above), that the above Main Request as amended did not contravene Articles 54, 83, 84, 123(2) and 123(3) EPC 1973 (Nos. 2.1 to 3.2 of the reasons).

(2) With regard to the question of inventive step, the Opposition Division concurred with the opinion of the Patent Proprietor that D18 was the closest piece of prior art. According to the Patent Proprietor, Example 4 of D18 disclosed all features of the operative Claim 1 except for feature (vi), the MFR which had been too low (Minutes, page 2, lines 4 to 7).

(3) Besides, the Opposition Division also referred to Examples 3 and 5 of D26 considered by the Opponents as closest state of the art. However, this document did not, according to the decision, mention films.

(4) The technical problem to be solved with respect to either starting point was seen by the Opposition Division in the provision of a film with a very good combination of anti-blocking properties, sealing properties and haze without any need for making use of

an anti-blocking agent. Moreover, [Example 8] demonstrated that this problem had been solved.

(5) With regard to either D18 or D26 as closest state of the art, the Opposition Division took the view that none of the cited documents suggested the solution for this problem as disclosed in the patent in suit.

(6) Consequently, the Opposition Division concluded that the subject-matter of the claims according to the Main Request involved an inventive step and that the grounds for opposition raised by the Opponents did not prejudice the maintenance of the patent in suit in its amended form.

IV. On 29 January 2007, an unsigned Notice of Appeal against the above interlocutory decision was filed by O-01 with simultaneous payment of the appeal fee. A signed copy of the Notice was received together with the Statement of Grounds of Appeal (SGA) on 28 March 2007. The Appellant requested that the decision under appeal be set aside, that the patent in suit be revoked and, as a precautionary measure, that oral proceedings be held.

(1) In its SGA, the sole point raised by the Appellant with regard to D7, a new document (D28) and a new experimental report (Annex A) (both as identified at the end of this section), concerned the assertion, that the requirements of Article 56 EPC 1973 were not met by the claims as allowed by the Opposition Division. In particular, reference was made to the second or third propylene copolymers of D7 (D7, page 8, lines 9 to 22 and 23 to 33, respectively), its Examples 5 and 9 and to a number of properties mentioned in this context, including rigidity, transparency, heat resistance, heat-sealing and anti-blocking properties.

D28: C. Maier et al., "Polypropylene - The definitive User's Guide and Databook", Plastics Design Library, 1998, chapter 3 "Additives" (1<sup>st</sup> page) and

Annex A: "Repetition of examples 5 and 9 of EP 629 632", ie of D7, and including the following Table 1:

Table 1

	MFR	E <sub>1</sub>
Sample A	24.2 g/10'	0.82
Sample B	59.8 g/10'	0.84

(2) These additional values, which, as admitted by the Appellant ("the missing features"), were not disclosed in D7, and further parameters derived from Examples 5 and 9 (D7: page 34, lines 35 to 36; page 38, lines 16 to 17 and page 54, Table 2) were compiled on page 3 of the SGA in Tables B and A, respectively:

Table A

ex	Ethylene Content % by mol	Ethylene Content Ew % by weight	Mw/Mn	2,1 propylene units	1,3 propylene units
5	8.7	6.0	2.46	0.12	<0.03
9	7.9	5.4	2.33	0.10	<0.03

Table B

ex	Isolated ethylene content E1	0.85-0.01Ew	MFR
5	0.82	0.79	24.2
9	0.84	0.80	59.8

(3) The only difference between the claimed subject-matter and that of D7 was seen by the Appellant in feature (iii) of Claim 1 (section II(2), above). However, the amounts of the 2.1 and 1.3-propylene units "were very close to the lower limit of the claimed range" (SGA, page 4, Table C):

Table C

	2,1	3,1	Ranges	Difference with respect to The main claim of the opposed patent
Ex 5	0.12	<0.03	0.12-0.15	0.08-0.05
Ex 9	0.10	<0.03	0.10-0.13	0.10-0.07

so that the differences between these values and the lower limit of the range "*are so small that it is hard to find a technical effect linked to this difference even because they would be comprised in the error of the measure*" (SGA, page 4, below Table C).

(4) Moreover, since [page 6, lines 13 to 15] stated only that these insertions had an influence on the melting point of the copolymer and an effect on the heat resistance of a moulded article comprising the copolymer, neither technical effect could, in the Appellant's opinion, be correlated with films. In other words, the Appellant saw no technical effect which could be linked to the above difference, so that no technical problem to be solved could be defined and, therefore, the main claim of the opposed patent could not be considered as involving an inventive step. Moreover, the Appellant argued that, if the melting point and the mouldability were affected by feature (iii) throughout the whole range of the claim, a lower amount of 2,1- and 3,1-insertions would give rise to a higher melting point and vice versa and "*Thus the claimed range is completely arbitrary since there is not any particular effect that can be achieved only within it*" (SGA, page 3, last two paragraphs and page 4, lines 1 and 2).

(5) Finally the Appellant pointed out with regard to the additive component in the claimed film, that the addition of additives to polypropylene resins such as stabiliser, antioxidant, anti-blocking or slip agents was well-known in the art as shown eg by D28.

V. In its rejoinder dated 23 October 2007, the Respondent refiled a clean copy of the Main Request which had formed the basis of the decision under appeal (section II(2), above) and additionally submitted an

Auxiliary Request, differing therefrom only by the narrower range of "0.1 - 5 wt%" in feature (i) of Claim 1. Moreover, the Respondent filed two annexes, one titled "Annex 1 - Repetition of Examples 5 and 9 of D7 EP-A-0629632)" (wherein 6.8 g of polymer having an ethylene content of 8.8 mol % and 2.2 g of polymer having an ethylene content of 7.8 mol %, respectively, and the following properties had been obtained):

Products	MFR (g/10 min)	E <sub>1</sub>
Product of Example 5	10.5	0.81
Product of Example 9	18.5	0.83

and the other titled "Annex 2" and showing a graph correlating [η] and MFR data of polypropylene homopolymers as disclosed in D25 (section II, above) and an equation deduced from the graph.

(1) Moreover, the Respondent disputed not only the Appellant's arguments, viz. that melting point and heat resistance could not be correlated with films, but also, on the basis of the data reported in its own Annexes 1 and 2, the validity of the MFR values in Annex A (sections IV(1) and IV(2), above). Whilst acknowledging that the E<sub>1</sub> values concerning the isolated ethylene content in both experimental reports were "highly similar", it asserted that the MFR values in the Appellant's Annex A were "by far too high" in comparison with its own values. These data of both parties were compiled in Table 1 on page 3 of the rejoinder:

Table 1

Example No.	Isolated ethylene content E <sub>1</sub>		Melt Flow Rate MFR	
	Appellant	Patentee	Appellant	Patentee
5	0.82	0.81	24.2	10.5
9	0.84	0.83	59.8	18.5

(2) These MFR values in Table 1, above, were furthermore compared with MFR values, which had been

calculated by the Respondent by means of the equation in Annex 2, as mentioned above, from the  $[\eta]$  values provided in Examples 5 and 9 of D7. These data were presented in Table 2 on page 4 of the rejoinder:

Table 2

Example No.	$[\eta]$ (dl/g)	MFR (g/10 min) (Correlation Equation)	MFR (g/10 min) (Patentee)	MFR(g/10 min) (Appellant)
5	1.66	9.2	10.5	24.2
9	1.39	19.7	18.5	59.8

From the comparison of these data, the Respondent concluded that its own MFR values "*roughly correspond to the data obtained when starting from the intrinsic viscosity values  $[\eta]$  expressly indicated in D7 and using the correlation equation*" (of Annex 2). "*This shows that the MFR values determined by the Patentee are reliable and based on a faithful reproduction of Examples 5 and 9 of D7.*" (rejoinder: page 5, lines 1 to 5).

This argument was, in the Respondent's opinion, further supported by Example 22 of D7 providing on its page 51, lines 14 and 21 both the  $[\eta]$  (1.4 dl/g) and MFR (17.8 g/10 min) values of one copolymer. The application of the above correlation equation to the  $[\eta]$  value of 1.4 gave an MFR value of 19.1 g/10 min "*comparable to the value ... reported in D7*" (17.8), thus showing, that "*the correlation method provides a reasonable estimate. In particular, the data of D7 are further indication that the MFR values which the Appellant has purportedly determined for Examples 5 and 9 are by far too high.*" (rejoinder: page 5, last four lines of paragraph 2).

(3) The Respondent concluded from these considerations that the subject-matter of Claim 1 differed from Examples 5 and 9 of D7 in no less than three features:

- "*Feature (iii), ie the 2,1- and 1,3-ethylene units present in the polymer chain are 0.2 to 0.5 mol %*";

- *"feature (vi), i.e. the MFR, if measured using the method recited in the claim, is  $\geq 20$  (g/10 min)"; and*
- *"the presence of an additive component."*

(4) The technical problem to be solved with regard to examples 5 and 9 of D7 was seen by the Respondent in the provision of a propylene/ethylene (herein below: "P/E") copolymer-based film having improved anti-blocking properties (rejoinder: page 6, item 1.2).

(5) Moreover, the Respondent pointed out with reference to [page 5, lines 30 to 31], that *"the heat resistance of a film is of significant importance to certain utility aspects of the films. Specifically, the film for use in retort use requires sufficient heat resistance."*, and referred to *"exemplary retort goods"* such as some rice, soup and meat products. Owing to the specific ethylene content as defined in feature (i) of Claim 1, the heat resistance of its films was classified as *"excellent"*. With reference to [page 6, lines 13 to 15], [0166] to [0170] and [0173], the Respondent further argued that the specific amount of 2,1- and 1,3-propylene units (feature (iii)) in the copolymer resulted in improved anti-blocking properties of a film according to Claim 1 of the Main Request, as shown in [Example 8]. Hence, the technical problem had, according to the Respondent, indeed been solved (rejoinder: pages 6 and 7, item 1.2).

(6) Starting from Examples 5 and 9 of D7, to which specific reference had been made by the Appellant (section IV(1), above), the Respondent then argued (on page 7, penultimate paragraph) that *"a skilled man would not have increased the MFR of the corresponding copolymers to lie in the claimed range of  $\geq 20$  (g/10 min) with a reasonable expectation to obtain, when forming a composition comprising that copolymer along with an additive component into a film, a film having superior anti-blocking*

properties.". Nor would D7 suggest, whilst mentioning anti-blocking properties of films in the context of its second and third propylene copolymer (as referred to in the SGA; cf. section IV(1), above), that satisfying the MFR requirement and the further features of Claim 1 by the P/E copolymer would solve the relevant problem underlying the claimed subject-matter. In connection with the second and third copolymers, D7 disclosed only  $[\eta]$  values in the range of 0.1 to 20 and 0.1 to 12 dl/g, respectively (D7: page 8, lines 15/16 and 30/31, respectively). However, it would be evident from the correlation equation shown and illustrated in Annex 2, that (only) an  $[\eta]$  of "roughly  $\leq 1.38$ " would correspond to the claimed MFR range of  $\geq 20$  g/10 min, and none of the polymers in the worked examples of D7 had an  $[\eta]$  value in a range corresponding to an MFR of  $\geq 20$  g/10 min. The  $[\eta]$  values shown in Table I(I) would generally be higher than 1.38.

Moreover, there was, according to the Respondent, no discernable reason why one of average skill in the art should increase the amount of inverted propylene units in the copolymers of Examples 5 or 9 of D7 to a value within the range of 0.2 to 0.5 mol %.

(7) *"Taking account of the above, the Opposition rightfully acknowledged the presence of an inventive step for the film according to Claim 1 of the Main Request."* (SGA, page 8, paragraph 3).

(8) As to the new Auxiliary Request, the Respondent argued that the ethylene content in Examples 5 or 9 of D7 was higher than defined in feature (i) of Claim 1 ( $0.1 \leq E_w \leq 5$  wt%), so that the film claimed in this request differed from D7, in particular its Examples 5 and 9 by no less than four technical features, ie those

mentioned in section V(3), above, and, furthermore, feature (i) of its Claim 1 (rejoinder: pages 8 and 9, item II). Nor had D7 been aware of any correlation of the ethylene content in the P/E copolymers and the heat resistance of a film made therefrom.

VI. In reply to the summons to oral proceedings issued by the Board on 12 November 2009, the Respondent withdrew its auxiliary request for oral proceedings in its letter dated 30 December 2009 and simultaneously informed the Board that it would not attend the hearing. Opponent 02, Novolen Technology Holdings C.V., being a party as of right, informed the Board with its letter dated 14 January 2010 that it would not attend the oral proceedings. It had not made any submissions in substance during these appeal proceedings.

In its letter dated 25 January 2010, the Appellant also withdrew its request for oral proceedings and informed the Board that it would not attend the hearing. It made no further comments in substance.

VII. In view of the fact that the parties had duly been summoned, the Board decided to continue the proceedings in the absence of the parties and to hold the oral proceedings as scheduled (Rule 115(2) EPC).

Consequently, the oral proceedings were held on 10 February 2010 in the absence of the parties.

VIII. The respective requests as on file were as follows:

The Appellant (O-01) requested that the decision under appeal be set aside and the patent in suit be revoked in its entirety.

The Respondent requested that the appeal be dismissed or, in the alternative, that the decision under appeal be set aside and that the patent in suit be maintained

with Claims 1 to 7 according to the Auxiliary Request filed with the rejoinder dated 23 October 2007.

### **Reasons for the Decision**

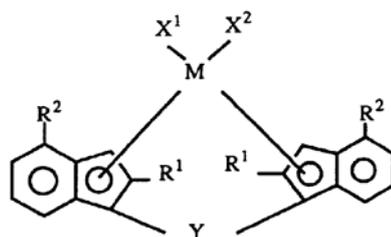
1. The appeal is admissible.

#### *Main Request*

2. In view of the facts that (i) the wording of the claims according to this Main Request is identical to the wording of the Main Request on which the decision under appeal had been based, (ii) no objection was raised in the SGA with respect to any one of Articles 54, 83, 84, 123(2) and 123(3) EPC 1973 and (iii) the Opposition Division had accepted that the Main Request had complied with these Articles (sections II(1), II(2), III(1) and V, above), the Board has no reason to deviate from this conclusion of the Opposition Division.
3. Moreover, it is conspicuous to the Board that the Appellant has not provided any argument in its SGA to show that the decision under appeal had been wrong.
4. Therefore, the Board has no reason (i) to query the findings in the decision under appeal or (ii) to reconsider the issue of inventive step beyond the case as presented by the Appellant in its SGA, ie beyond the arguments based on D7 as the basic document (Article 12(1) RPBA).
5. *Problem and solution*
  - 5.1 The patent in suit concerns a film formed from a P/E copolymer composition comprising a P/E random copolymer and an additive component.
  - 5.2 Document D7 is titled "*Novel transition metal compound for use as a polymerization catalyst*". In its first to third

aspects, the document deals with the transition metal compound as such, with catalysts for the polymerisation of olefins, which are based on these metal compounds, and a process for olefin polymerisation in the presence of these catalysts (D7: Claims 1 to 7).

5.2.1 More particularly, the claimed novel transition metal compounds are metallocene compounds of transition metals of Groups IVa, Va or VIa of the periodic table with two indenyl ligands further linked to each other by a divalent group Y which may be, for instance, an optionally substituted hydrocarbon group or a Si- or Ge-containing group (cf. D7: page 9, line 2 to page 12, line 39). These compounds, which are comprised in the polymerisation catalyst as component (A), are represented by the following formula (I)



(I)

5.2.2 To the Board, it is evident from this formula (I) as shown and as further explained on page 9 of D7, that, firstly, this compound has a symmetry plane containing the metal atom M (cf. the examples of such compounds as listed on page 10, lines 16 to 58 and page 11, lines 1 to 40 of D7, all having the structure of a *Y-bis{1-(2-R<sup>1</sup>-4-R<sup>2</sup>-indenyl)}zirconium dichloride*. The metallocene as used in [Comparative Example 2] had a similar structure, but contained instead of the 4-R<sup>2</sup> substituents of formula (I), above, 4,5-benzo-groups).

5.2.3 Secondly, six different types of catalysts are described in D7 (page 6, line 50 to page 7, line 37), all which comprise the above metallocene as component (A) and at least one compound (B) selected from (B-1)

an organoaluminium oxy-compound and (B-2) a compound which reacts with the above metallocene compound to form an ion pair. This combination is referred to as the "*first olefin polymerization catalyst according to the invention*" (D7: page 6, lines 50 to 56). The further five types of these catalysts are further described in D7 on page 6, line 57 to page 7, line 37. They refer to different combinations of the above two components (A) and (B) with a fine particle carrier and an organo-aluminium compound (C) and/or "*a prepolymerized olefin polymer produced by prepolymerisation*".

The different types of catalysts and their respective preparation are further described in more detail in D7 (page 12, line 58 to page 19, line 47).

5.2.4 Thirdly, when used in a process for (co)polymerising an olefin, these catalysts allow to obtain "*an olefin polymer having high stereoregularity and low in the amount of inversely inserted units*" (D7: page 5, lines 1/2). The different polymerisation processes are described in a rather cursory manner on page 19, line 53 to page 20, line 30 of D7.

5.3 The polymers, which can be manufactured by means of the catalyst of D7, form a further aspect of D7. Such a polymer has a large molecular weight, narrow molecular weight and composition distributions and, if it is made from an  $\alpha$ -olefin of 3 or more carbon atoms, furthermore high stereoregularity, low amounts of inversely inserted units, good heat resistance and rigidity (D7: page 7, lines 40 to 44). This statement concerned the polymeric products of D7, ie homopolymers, copolymers and elastomers, in general, not particularly those obtained in Examples 5 and 9, to which specific reference has been made by the Appellant.

The only properties of the resulting films as obtained in these two examples, which have been provided in D7's Table 2, are the melting point and two heat seal-starting temperatures (without and after preceding heat treatment; D7: page 29, lines 37 to 49).

- 5.3.1 More particularly, a "*first propylene homopolymer*", obtainable by means of the "*first olefin polymerization catalyst*" (section 5.2.3, above), has been referred to as having excellent rigidity, heat resistance, surface hardness, glossiness, transparency and impact strength (D7: page 7, lines 45 to 50 and 58 to page 8, line 1).
- 5.3.2 A "*second propylene homopolymer*" is characterised by (i) a triad tacticity of propylene units (determined by means of  $^{13}\text{C}$ -NMR) of  $\geq 99\%$ ; a proportion of inversely inserted propylene units (2,1-insertion; determined by means of  $^{13}\text{C}$ -NMR) of  $\leq 0.20\%$ ; and (iii) an  $[\eta]$  value (measured in Decalin/decahydronaphthalene at  $135^\circ\text{C}$ ) of 0.1 to 20 dl/g and as having the same properties as the above first propylene homopolymer (D7: page 8, lines 2 to 8).
- The above methods and conditions were also used for the determination of the data of the further polymers of D7 concerning tacticity (i), the proportion of inverse insertion (ii) and the intrinsic viscosity (iii).
- 5.3.3 Under the heading of "*Propylene copolymer*", D7 refers to three differently characterised types of copolymers (D7: page 21, line 26 to page 25, line 1).
- 5.3.4 A "*first propylene copolymer*" is referred to on page 7, lines 51 to 57) only as the copolymerisation product of propylene with at least one kind of  $\alpha$ -olefin selected from ethylene and an  $\alpha$ -olefin having 4 to 20 C-atoms by means of the first catalyst mentioned in section 5.2.3, above. On page 21, lines 38 and 39, the  $\alpha$ -olefins are further specified as ranging from ethylene to 1-decene.

5.3.5 Furthermore, on its page 8, lines 34 to 44, D7 refers to a propylene elastomer made up of 50 to 95 mol % of propylene and 5 to 50 mol % of ethylene units and having a triad tacticity of  $\geq 90.0\%$ ; the proportion of inversely inserted propylene units ranging from 0.05 to 0.5% and an  $[\eta]$  value of 0.1 to 12 dl/g.

5.3.6 In its SGA (section IV(1), above), particular reference was made by the Appellant to second and third propylene copolymers as described on page 8, lines 9 to 33 of D7.

5.3.7 The "*second propylene copolymer*" (i) contains ethylene units in an amount of  $\leq 50$  mol % and has (ii) a triad tacticity of  $\geq 98.0\%$ ; (iii) a proportion of inversely inserted propylene units of  $\leq 0.20\%$  and (iv) an  $[\eta]$  value in the range of 0.1 to 20 dl/g.

On page 21, line 44 to page 22, line 17, further details of this copolymer are given: preferably 5 to 40, more preferably 10 to 30 mol % of ethylene units; an optional presence of further units derived from other  $\alpha$ -olefins and dienes; the proportion of inversely inserted propylene units preferably being  $\leq 0.18\%$ , more preferably  $\leq 0.15\%$ ;  $[\eta]$  being in a preferred range of 0.5 to 10, more preferably 1 to 5 dl/g.

The following properties of copolymers having an ethylene content is  $\leq 5$  mol % are referred to: surface hardness, transparency, rigidity, heat resistance, impact strength and heat-sealing, anti-blocking and anti-bleeding properties. Transparency, environmental aging property, impact strength and effectiveness in improving heat-sealing property at low temperature are mentioned in connection with copolymers with  $\geq 5$  mol % of units derived from an  $\alpha$ -olefin other than propylene.

5.3.8 The "*third propylene copolymer*" of D7 containing 95 to 99.5 mol % propylene units and 0.5 to 5 mol % ethylene

units has, according to the above passage on page 8, a triad tacticity of  $\geq 95.0\%$ , a proportion of inversely inserted propylene units of 0.05 to 0.5% and an  $[\eta]$  value in the range of 0.1 to 12 dl/g.

The third copolymer is further characterised as having a preferred composition of 95 to 99 mol % propylene units and 1 to 5 mol % ethylene units, with 95 to 98 mol % propylene and 2 to 5 mol % ethylene units being even more preferred. Moreover, comonomer units of other olefins may be present in an amount of  $\leq 5$  mol %. The triad tacticity is preferably  $\geq 97.0\%$ . Moreover, it is preferred that the proportion of inversely inserted propylene units is in the range of 0.05 to 0.4%, more preferably 0.05 to 0.3%, and that the  $[\eta]$  value is 0.5 to 12 dl/g, more preferably 1 to 12 dl/g (D7: page 22, lines 18 to 27).

The properties of the third copolymer differ from those of the second copolymer with  $\leq 5$  mol % ethylene units in that the impact strength is not mentioned.

- 5.3.9 The amount of 1,3-inserted propylene units in "*the propylene copolymer of the invention*" is desirably  $\leq 0.05\%$  ([page 22, lines 28/29]).
- 5.3.10 In view of the above passages in D7, it is conspicuous to the Board that the general description of D7 does not clearly and unambiguously refer to, let alone explicitly disclose P/E-copolymers showing the specific combination of all the features (i) to (vi) as defined in Claim 1 of the Main Request. Thus, no reference is made in any part of the general description to the "*isolated ethylene content ( $E_1$ )*" and the "*MFR*" (features (ii) and (vi) of Claim 1), which have been acknowledged by the Appellant as being "*the missing features*" (SGA, page 3, the two lines above Table B).

5.3.11 This explains why the Appellant relied specifically on (a) Examples 5 and 9 of D7, both of which describe the preparation of specific copolymers by copolymerisation of propylene and ethylene, and (b) its own experimental report Annex A (see section IV(1), above), which, in the Appellant's opinion, (i) provided the above features of the given polymers missing from both examples of D7 (Table 1, section IV(1), above) and (ii) made it possible to compare the properties of the copolymers of those examples (completed by Table B of the SGA; section IV(2), above) with the required properties of the P/E-copolymers as defined in Claim 1.

5.3.12 However, even the combination of these additional data with those in Examples 5 or 9 of D7 does not provide all six features (i) to (vi) of Claim 1, because feature (iv) concerning "Mw" is still missing.

Instead of "Mw", D7 refers to the intrinsic *viscosity*  $[\eta]$  of its copolymers, which is based on the measurement of the *viscosity* of a polymer solution extrapolated to a polymer concentration of zero. In other words, it is correlated with the *viscosity* average molecular weight  $M_v$ . It is, however, common general knowledge, that the molecular weight of a given polymer can be measured in different ways/by different methods resulting in different (ie weight, number, viscosity and Z/centrifuge) average molecular weights, which are usually denoted as  $M_w$ ,  $M_n$ ,  $M_v$  (or  $M_\eta$ ) and  $M_z$ , respectively. It is also common general knowledge that these average values of a given polymer are different from each other (cf. D24: Table I). This is also shown by feature (v) of Claim 1 concerning the ratio  $M_w/M_n$  (=  $M_w/M_n$ ) which serves as a measure of another property of such polymers, ie their molecular weight distribution/

polydispersity. In summary, feature (iv) of Claim 1 concerning the weight average molecular weight " $M_w$ " or " $M_w$ " was never considered in D7, nor was it provided in Annex A or Annex 1 (sections IV(1) and V, above).

5.3.13 In any event, as acknowledged by the Appellant, the polymers described in Examples 5 and 9 of D7 do not fulfil feature (iii) of Claim 1, in that their proportion of 2,1- and 1,3-propylene units is less than required for the film claimed in the patent in suit, however small these differences are.

5.3.14 Moreover, there are significant discrepancies between the MFR values (feature (vi) in Claim 1) as reported by the parties in their experimental reports Annex A and Annex 1, respectively, which were commented on in detail by the Respondent (cf. Table 1 in section V(1) and section V(2), above). The arguments presented in the rejoinder to this item have not, however, been disputed, let alone refuted by the Appellant (sections V(1) and VI, above, last paragraph).

5.3.15 As shown in Table 1 (cf. section V(1), above) even the additional  $E_1$  values provided in the experimental reports, which were accepted by the Respondent as being highly similar, showed a certain degree of variation upon reworking Examples 5 and 9, respectively. As commonly known, certain variations cannot completely be avoided in repetitions of chemical experiments of this kind because of fluctuations in the marginal conditions, such as eg in the feed and the purity of the different starting compounds including the monomers, the catalyst system, the water and the further additives eg hydrogen etc., in the shape, equipment and surfaces of the reaction vessels, in the temperature control affecting the reaction temperature curve etc. All of these

variables affect the outcome of the experiment. On page 3 of the SGA, the Appellant only stated: "*The applicant repeated examples 5 and 9 (see annex A) in order to measure the missing features, the results are set forth in the following table B*", however, without providing any measurements of the further parameters concerning the other features of Examples 5 or 9 of D7 or any yields (cf. Table A directly above the statement quoted above).

By contrast, Annex 1 of the Respondent included at least the yields and the ethylene contents  $E_w$  of the polymers obtained in the two reworked examples, which can be compared with the corresponding values in the respective examples of D7. Thus, in Example 5 of D7, 6.63 g of P/E-copolymer having an ethylene content of 8.7 mol % had been obtained, in Annex 1, the respective values were 6.8 g and 8.8 mol %. In Example 9 of D7, the corresponding pair of data was 2.08 g and 7.9 mol % vs. 2.2 g and 7.8 mol % in Annex 1.

5.3.16 Based on these findings, the Board is of the opinion that, based on the data provided in Annex A (section IV(1), above) and in Annex 1 (section V, above), respectively, it cannot be concluded that any of these experiments are, in fact, true repetitions of Examples 5 and 9 of D7 which could be validly taken as representing the disclosure of D7.

However, the burden of proof concerning the alleged close similarity of the copolymers of D7 and the P/E-copolymer of the claimed film (section IV(3), above), in particular with regard to the  $M_w$  and the MFR (features (iv) and (vi) of Claim 1), has clearly been on the opposing Appellant. Consequently, the Board comes to the conclusion that this burden has not been discharged by the Appellant.

5.3.17 By contrast, the above findings in sections 5.3.11 to 5.3.15, above, demonstrate in a clear way, that the Appellant's argument (section IV(3), above), that the polymers of D7 would differ from those of the patent in suit only in one property, ie feature (iii) of Claim 1, is not valid.

Therefore, the Board does not only concur with the Respondent in that the claimed subject-matter differs from the teaching in D7 by features (iii) and (vi) and by the presence of an additive component (section V(3), above), but, rather, sees, in the absence of any clear information in D7 in this respect, a further difference in the specific weight average molecular weight of the polymer as defined in feature (iv) of Claim 1.

5.4 In the new approach in its SGA to the issue of inventive step, the Appellant argued that no technical problem could be defined with regard to the allegedly sole difference between the claimed subject-matter and the disclosure in D7, in particular its Examples 5 or 9, because the application would not provide a basis for the correlation of the heat resistance and high melting point of the moulded article with films. Moreover it concluded that, for this reason, there was no inventive step (section IV(4), above).

5.4.1 However, in [0013] to [0015] (page 5, lines 12 to 25), reference is made to "... a wide variety of molding fields" and to "... a heat-seal layer having excellent heat-sealing and anti-blocking properties"; the passage in [0019] (page 7, lines 14 to 17) describes "The first embodiment of molding materials ..." being a propylene composition comprising the P/E random copolymer and a desired additive component, and an explanation of "the molded articles according to the present invention include films, ...

which are formed from the above first molding materials, the propylene compositions" can be found in [0022] (page 8, lines 3 to 7). This is, furthermore, *expressis verbis* confirmed in the subsequent paragraphs [0023] (page 8, lines 8 to 10) and [0024] (page 8, lines 11 to 14). In the latter passage, reference is made to "a film layer formed from the above first molding materials, ...".

5.4.2 Altogether three different moulding materials are referred to in the specification. The first moulding material comprises the P/E-copolymer and an additive component ([0058]/page 25, lines 1 to 5). The second differs therefrom by the additional presence of a certain amount of  $\alpha$ -crystal nucleating agent ([0065]/page 27, lines 15 to 24) which renders the material suitable for the "manufacture of molded articles according to various molding methods such as injection, extrusion and blow molding methods" ([0078]/page 34, lines 13 to 16). Many polyolefin films are manufactured in industrial practice by blow moulding. The third moulding material ([0079]/page 34, lines 17 to 25) is a composition wherein a prescribed amount of a radical generator is incorporated into the first moulding material. This allows to control the MFR in order to impart certain properties to the moulded articles, including films ([0079] to [0081], [0089] to [0091]/page 34, line 17 to page 35, line 9, page 37, lines 3 to 25).

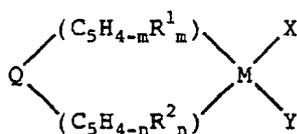
5.4.3 These facts are, moreover, confirmed by [Examples 1 to 3], describing "(A) Propylene/ethylene random copolymer" ([page 13, line 30]/page 42, line 9). These copolymers were then used to prepare "(B) Molding materials" ([page 17, line 1]/page 52, line 17), which were further processed to "(C) Formed articles" ([page 18, line 30]/page 56, line 19), including, according to [Examples 7 and 8], different films.

- 5.4.4 In view of these findings, the Board cannot agree to the Appellant's argument in section 5.4, above.
- 5.5 Consequently, the question of whether there had been any problem at all related to feature (iii) (sections IV(4) and 5.3.17, above) or whether, as regards the allegedly small deviation in this respect from the range defined in Claim 1 (cf. section IV(3), above), a problem had, indeed, been solved, is not the relevant question for the assessment of inventive step over D7.
- 5.5.1 Whilst the description of the patent in suit referred, as properties to be achieved, to good stiffness, heat resistance, transparency, elasticity, heat-seal strength, anti-blocking behaviour without needing an anti-blocking agent and a low content of extractables with boiling n-pentane (cf. [0001], [0015], [page 5, lines 30/31], [page 5, last line] to [page 6, line 1], [page 6, lines 13 to 15], [0110], [0161], [0164], [0165], [0171] to [0174]), the Opposition Division had identified the technical problem to be solved with regard to D18 or D26 as residing the provision of a film with a very good combination of anti-blocking properties, sealing properties and haze (section III(4), above).
- 5.5.2 In its rejoinder (sections V(4) and V(5), above), the Respondent saw the technical problem to be solved with regard to D7 in the provision of a film having improved anti-blocking properties and referred, moreover, to the importance of the heat resistance of its films, necessary for certain applications of the films eg in retort uses (section V(5), above).
- 5.5.3 Whilst, as shown in sections 5.3.1 to 5.3.8, above, D7 refers to a broad range of properties of its copolymers

and also refers to the suitability of some copolymers and elastomers *inter alia* for films (see eg D7: page 29, lines 12 to 17), the sole properties provided in its Examples 5 and 9 are the melting point of the respective polymers and the heat seal-starting temperatures of the films made therefrom (section 5.3, above).

- 5.5.4 In view of the experimental data provided in the specification and demonstrating which of the properties referred to section 5.5.1, above, could indeed be achieved in comparison with D7, the relevant technical problem to be solved with regard to this document can be seen in the provision of films on the basis of P/E-copolymers having suitable melting points, whereby the films show a good combination of elasticity (cf. the Young's modulus), haze, heat-seal strength, anti-blocking behaviour and low n-pentane extractables rendering them suitable for food packaging (cf. [Tables 3 and 4], [0165] and [0174]).
- 5.6 The solution offered in Claim 1 for reaching this goal as referred to in section 5.5.4, above, relates to a film, the P/E copolymer of which is defined in terms of the following six features: (i) a total content of ethylene E<sub>w</sub> of 0.1 to 10 wt%; (ii) an amount of isolated ethylene units in the copolymer chain (E<sub>1</sub>) fulfilling the equation  $E_1 > 0.85 - 0.01 \cdot E_w$ ; (iii) the amount of 2,1- and 1,3-propylene units present in the polymer chain being 0.2 to 0.5 mol %; (iv) an M<sub>w</sub>-value being in the range of  $4 \cdot 10^4$  to  $10^6$ ; (v) an M<sub>w</sub>/M<sub>n</sub>-value of from 1.5 to 3.8; and (vi) an MFR<sub>230°C/21.18N</sub> value of  $\geq 20$ . As described in [0017], [0018], [0032] and [0033], the copolymer can be prepared by means of a supported metallocene catalyst comprising a transition metal

compound and an aluminoxane or their reaction product on a fine particle support and an organoaluminium compound, wherein the metallocene compound has a structure represented by the following general formula with the proviso that the position of the R<sup>1</sup> and R<sup>2</sup> substituents on the respective cyclopentadienyl rings gives a configuration free of any symmetry plane containing the transition metal atom (as opposed to D7, cf. section 5.2.2, above):



5.7 Moreover, as shown in the worked examples, films having the desired properties were apparently obtained in accordance with the claims. Thus, the data in [0146] and [Table 1], [Table 3] in combination with [0164] and [0165] and [Example 8] ([Table 4] in combination with [0171] to [0174] concerning Young's modulus (stiffness), heat resistance, transparency (haze), melting point, heat-seal strength, blocking behaviour and content of extractables (with boiling n-pentane) demonstrate that the relevant technical problem (cf. section 5.5.4, above) has, in fact, been solved.

6. *Inventive step*

6.1 It remains to be decided whether the claimed invention found can be derived in an obvious way from the cited documents.

6.2 As pointed out above, D7 relates to different kinds of polymers being either propylene homopolymers, propylene elastomers or propylene copolymers containing, besides propylene, ethylene and/or an  $\alpha$ -olefin of 3 or more carbon atoms, wherein when ethylene is present the copolymer may have an ethylene content of  $\leq 50$  mol %. It

has not been convincingly shown that the list of the above different types of polymers (sections 5.3 to 5.3.9, above) would have encompassed P/E-copolymers having a total ethylene content of 0.1 to 10 wt% and fulfilling at the same time the other features (ii) to (vi) of Claim 1, which would provide films with the properties as mentioned in section 5.5.1, above.

- 6.2.1 Even those films of Examples 5 and 9 of D7, specifically referred to by the Appellant in its SGA (section IV(1) to IV(4) and 5.3.10, above) have neither been shown to fulfil the requirements of the operative claims concerning the respective polymers and the presence of an additive, nor actually to have the desired combination of properties (sections 5.3.11 to 5.3.17 and 5.5.3, above), which, by contrast, could be achieved in [Examples 7 and 8], viz. low haze, good Young's modulus, the good heat-seal strength, low n-pentane extractables and low degrees of blocking.
- 6.2.2 As pointed out in section 5.5.3, above, the only properties specifically addressed in D7 in connection with the polymers of Examples 5 and 9 and their films were melting points and heat seal-starting temperatures. In particular, D7 is completely silent about pentane extractables. Thus, there is not the slightest suggestion, let alone a clear teaching as to provide a film having a composition possessing, in particular, a low n-pentane extractability in combination with the other desired properties as addressed in section 5.5.4, above, viz. low blocking and good heat-seal strength.
- 6.2.3 Therefore, the Board takes the view that D7 by itself does not provide any incentive to solve the above relevant technical problem, by modifying the third copolymer of D7 and combining it with an additive, and

- thereby to arrive at something within the ambit of Claim 1.
- 6.3 Nor does D28, additionally referred to by the Appellant, contribute to the solution of the above relevant technical problem. It only mentions that commercial propylene resins (of unspecified composition and physical properties) contain various additives to stabilise the material during and after processing and to modify properties of the resin for use in a particular application. The document then mentions a number of different classes of such additives, including, besides others, nucleating agents and anti-block agents, and it points out that specific applications may require a combination of additives packages. This disclosure does not, however, provide any suggestion as to how the copolymers of Examples 5 or 9 of D7 might or should be modified in order to achieve a film having the desired properties mentioned above.
7. In view of the above facts and findings, the Board has, therefore, come to the conclusion that the claimed subject-matter in accordance with the Main Request is based on an inventive step. In view of the findings in sections 2 to 4, above, the Board takes, consequently, the view that the objections raised during the opposition and appeal proceedings do not prejudice the maintenance of the patent in suit.
- Auxiliary Request*
8. Since the Main Request of the Respondent has prevailed there is no need to consider its Auxiliary Request.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young