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D E C I S I O N
of 7 July 2004

Case Number: T 0222/02 - 3.3.3

Application Number: 95301147.5

Publication Number: 0669348

IPC: C08F 210/06

Language of the proceedings: EN

Title of invention:

Propylene random copolymer and film laminate thereof

Patentee:

SUMITOMO CHEMICAL COMPANY LIMITED

Opponent:

Basell Polyolefine GmbH
Basell Technology Company B.V.

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 87, 88

Keyword:

"Novelty (yes)"
"Inventive step (yes) - problem and solution"

Decisions cited:

-

Catchword:

-



Case Number: T 0222/02 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 7 July 2004

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office dated 5 December 2001
and issued in writing on 27 December 2001
rejecting the opposition filed against European
patent No. 0669348 pursuant to Article 102(2)
EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

I. The grant of European patent No. 0 669 348 in respect of European patent application No. 95 301 147.5, filed on 22 February 1995 and claiming the priorities of 25 February 1994 and 26 October 1994 of two earlier patent applications in Japan (28461/94 and 262357/94), respectively, was announced on 10 June 1998 (Bulletin 1998/24) on the basis of 6 claims, the independent Claims 1 and 5 thereof reading as follows:

- "1. A propylene random copolymer comprising a propylene component and an α -olefin component having 4 to 10 carbon atoms, wherein
- (A) the content of said α -olefin component is in a range of 6 to 40 % by weight,
 - (B) the intrinsic viscosity $[\eta]$ measured in tetralin at 135°C is not lower than 0.45 dl/g and not higher than 5.0 dl/g,
 - (C) the melting point (T_m) measured by a differential scanning calorimeter and the content of 20°C xylene soluble fraction (CXS) fulfil a relationship of

$$T_m \leq 140 - 35.693 \times \log_{10}(\text{CXS}),$$

- (D) the signal arising from a structure having two or more methylene units $-(\text{CH}_2)-$ in a molecular chain of said propylene random copolymer is detectable by ^{13}C -NMR spectroscopy, and
- (E) said random copolymer is obtainable via a catalytic system comprising essential catalytic components of:

- (1) a group IVB transition metal compound having one or more cyclopentadienyl groups,
- (2) a compound reacting with said transition metal compound to form a stable anion, and
- (3) an organoaluminum compound.

5. A film laminate obtainable by laminating a propylene random copolymer according to any of Claims 1 to 4 upon a base layer."

The remaining Claims 2 to 4 and 6 are dependent claims relating to elaborations of the subject-matter of the respective preceding independent claims.

II. On 10 March 1999, Notices of Opposition were filed by two Opponents in which revocation of the patent in its entirety was requested, by Opponent 1 on the grounds of Article 100(a) EPC, because the subject-matter of the claims lacked patentability within the terms of Articles 52 to 57 EPC, and Article 100(b) EPC, because the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. Opponent 2 referred to grounds for opposition under Articles 52(1), 54 and 56 EPC, ie for the grounds of lack of novelty and of inventive step. In the Notices of Opposition, reference was made altogether to twenty documents including the following (numbering according to the decision under appeal):

- D1: EP-A-0 668 157 (cited under Article 54(3) EPC and published on 23 August 1995),
- D3: EP-A-0 464 684,
- D4: EP-A-0 395 055,
- D5: EP-A-0 318 049,
- D6: JP-A-62-119 212,
- D8: "JP-62-119 212" (Notice of Opposition of Opponent 2, EPO Form 2300.3, Publications: "1"),
- D9: English translation, referred to by Opponent 2 and in the decision under appeal as the translation of D8 (EPO Form 2300.3: "of (D1) JP-62-119 212"),
- D12 WO-A-94/28039 (cited under Article 54(3) EPC and published on 8 December 1994), and
- D14: EP-A-0 495 099.

III. In a decision announced orally at the end of oral proceedings on 5 December 2001 and issued in writing on 27 December 2001, the oppositions were rejected.

(a) In the decision, the objection of insufficient disclosure, which concerned feature (D) of the claimed random copolymer, and which had been raised by Opponent 1, was refuted, because the patent in suit contained sufficient information for the skilled person to carry out the analytical method required to verify whether feature (D) was fulfilled, and because this method had been known to the skilled person on the filing date.

(b) The objections of lack of novelty and of lack of inventive step did not prevail either.

(i) Thus, novelty was acknowledged vis-à-vis each of D1, D12 and D14, because, according

to the evidence on file, process feature (E) relating to the use of a three-component catalyst system in the preparation of the claimed copolymer manifested itself in a measurable property of the final product (transparency) allowing to distinguish the claimed copolymer from the prior art products, as demonstrated by the difference in haze of the products obtained in Example 5 and Reference 8 of the patent in suit. The products of D5, D8/D9 and D14, respectively, referred to by the Opponents did not meet requirement (C) of contested Claim 1 concerning the melting point, and D5 was silent with regard to transparency and blocking resistance.

- (ii) With regard to inventive step, it was held, on the basis of D9, which had been agreed to by all parties as representing the closest state of the art, because it related to the same problem to be solved, that the Opponents had not shown why it would have been obvious to arrive at something having the "properties of all the components". Nor was an incentive provided by the document to use the specific catalyst system according to Claim 1.

- (iii) Neither was the alternative approach, based on a combination of D5 and D4, held to render the claimed subject-matter obvious, because both documents were less relevant than D9.

(c) In summary, it was, therefore, held in the decision under appeal that the subject-matter of the claims of the granted patent met the requirements of Articles 54, 56 and 83 EPC.

IV. On 26 February 2002, a Notice of Appeal was filed by the Opponent 2 (Appellant) with simultaneous payment of the prescribed fee.

In the Statement of Grounds of Appeal, received on 18 April 2002, and in further letters dated 8 May 2002 and 7 May 2004, respectively, the Appellant further pursued its objections of lack of novelty and lack of inventive step.

(a) To this end, reference was made to two documents already submitted, but not admitted during the oral proceedings before the Opposition Division and annexed to the minutes of those oral proceedings:

D21: J.C.W. Chien *et al.*, Applied Organometallic Chemistry, Vol. 7 (1993), pages 71 to 74, ("Annex B"),

D22: Affidavit by A. Pelliconi ("Annex A") to show that the correlation between intrinsic viscosities (" $[\eta]$ " or "I.V.") measured in two different solvents, was
"I.V. Tetralin (135°C) = 0.8 I.V. Decalin (135°C)"

and a further patent document:

D23: EP-A-0 682 042 (cited under Article 54(3) EPC and corresponding to WO-A-95/14717 published in Japanese on 1 June 1995).

- (b) Moreover, two experimental reports were submitted, which referred to "Repetitions" of Example 7 of D14 and of Example 3 of D23, respectively, and to some properties of the respective products (the product data of the latter example were supplemented with the letter dated 8 May 2002). For each of these "Repetitions", the following particulars of the final polymer were given: butene content, $\eta_{\text{Tetralin}, 135^{\circ}\text{C}}$, CXS, T_m , T_m calculated according to feature (C), and whether or not feature (D) was met.
- (c) The objection of lack of novelty of the subject-matter claimed in the patent in suit was maintained with respect to each of D9, D12 and D14 and raised with regard to D23 on the basis that product features (A) to (D) were either explicitly or implicitly disclosed in the respective document, whilst process feature (E) could not serve to delimit the claimed product from prior art products.

Thus, the mol percentages given in D9, D14 and D23 were recalculated by the Appellant for butene-1 as the comonomer to weight percent in order to demonstrate that feature (A) of Claim 1 was fulfilled, whilst D12 referred already to weight percent.

Furthermore, reference was made to D22 and Annex 2 as filed in the Notice of Opposition of Opponent 2,

respectively, in order to show that $[\eta]$ -values measured at 135°C in decalin as given in D14, D9 and D23 and the melt flow index disclosed in D12, respectively, met the requirements of feature (B) of the contested Claim 1 (cf. section I, above).

With reference to feature (C) of Claim 1 (the melting temperature T_m), the Appellant pointed to the melting points of individual polymers in one example of each of D14, D12 and D23, to the correlation between T_m and the composition of the polymer in terms of mol percentage (D12 and D14) and concrete T_m ranges (D9 and D23), respectively. Although it was conceded that the solubility value measured in boiling n-pentane (D14) could not directly be correlated to a specific CXS value, the two values would usually be comparable with each other, and the relationship of feature (C) would largely be satisfied when substituting the boiling n-pentane solubility value for the CXS value. Hence, the requirements of feature (C) of Claim 1 were fulfilled, in the Appellant's view, by D9, D12, D14 and D23.

With regard to feature (D) of Claim 1, the Appellant stated that (i) it was well known to the skilled person that isolated regio-irregular propylene groups resulting from 2,1- and 1,3-insertions of the monomer in the molecular chain were the inevitable result of the use of transition metal compounds having one or more cyclopentadienyl groups (for simplicity reasons, the term of "metallocene" will be used herein below for this type of compounds) as catalysts in the polymerisation of propylene; that, (ii) as a

consequence, propylene polymers obtained by using metallocene-based catalysts did contain sequences of two or more methylene units in the molecular chain; and that (iii) these sequences were commonly detected by ^{13}C -NMR analysis (D14, D9 and D12). Furthermore, the ^{13}C -NMR measurement in D9, wherein no such groups had been found, was criticised for inaccuracy.

In Claim 1 of the patent in suit, feature (E) related to a *process feature*, viz. the use of a catalytic system comprising three components, ie a metallocene, a cocatalyst and an organoaluminium compound in the preparation of the claimed copolymers, whereby a borate cocatalyst was used instead of an aluminoxane cocatalyst as used in D14. Moreover, compounds corresponding to the third organoaluminium component as defined in the patent in suit were commonly used as scavengers in polymerisations and were optional components of the catalytic system of D14 (Statement of Grounds of Appeal: page 5, lines 34 to 39). However, novelty of the claimed polymer could only be established if evidence had been provided that modification of the process parameters resulted in different products. In the absence of such evidence, it had to be concluded that the copolymers of Claim 1 were not novel over those according to D14.

Whilst the decision under appeal had held, on the basis of Example 5 and Reference 8 in the patent in suit, that the claimed product was distinguishable from the copolymers of the prior art due to the preparation by means of the

different catalyst, the Appellant asserted to have shown that these experiments could not be considered to be valid comparative trials, because of different conditions in the polymerisation and in the measurement of haze, and, therefore, they did not provide evidence that process feature (E) gave distinct differences in the properties of the products. Thus, it had not convincingly been shown that an increase of haze had its origin in the distinguishing feature of the patent in suit, ie the use of a borate cocatalyst. Nor had the Patentee demonstrated that any effect related to the use of such a catalytic system.

With respect to D9 and D12, the same reasons were invoked in relation to feature (E). Moreover, D23 mentioned catalyst components corresponding to those used in the patent in suit, and the products of this document were excellent in transparency, heat sealability and blocking resistance.

- (d) According to the Appellant, the technical problem expressly stated in the patent in suit was to obtain a propylene copolymer "'which has excellent blocking resistance [i.e. *intrinsic viscosity* $[\eta]$ *higher than 0.45 dl/g*] and transparency [i.e. *low xylene soluble content*] and substantially maintains favorable low-temperature heat-sealing properties [i.e. *low melting points*] ... for improvement in printing properties' (page 2, lines 48-50, comments added)". This meant that it was directed to the improvement of the balance of the "above-underlined" properties, by lowering the T_m of polypropylene, without producing at the same

time a copolymer having a high xylene solubility, which had many drawbacks (Statement of Grounds of Appeal: item 3.2).

With regard to this problem, it was the view of the Appellant that the subject-matter claimed lacked an inventive step with respect to the closest state of the art, D14, in view of D21, which described the use of borate catalysts in polypropylene polymerisation, because no surprising/unexpected effect or improvement had been demonstrated by the Proprietor, which could be related to the use of the catalyst system according to feature (E) and could serve to distinguish the claimed product from prior art products or to render it inventive (cf. section IV(c), penultimate paragraph, above).

Thus, the Appellant asserted that D14 disclosed propylene random copolymers meeting each of the product features (A) to (D) and taught that the use of metallocene-based catalysts in propylene copolymerisation reactions resulted in polymers having low melting points, narrow molecular weight distribution, excellent heat-sealing properties and anti-blocking properties.

Moreover, borates represented the only cocatalyst alternative to the aluminoxane cocatalyst used in D14. "Therefore, it would have been obvious to use a metallocene catalyst of D14 in association with the only alternative cocatalyst known in the art, ie borates of D21, with the expectation of obtaining propylene copolymers having analogous

properties as the ones known in the state of the art" (Statement of Grounds of Appeal: page 11, paragraphs 6 and 7).

The same approach could be used starting from any of documents D1, D3, D4, D5 and D9 (Statement of Grounds of Appeal: page 11).

- V. In reply to the appeal ("Letter 1" dated 16 September 2002 and "Letter 2" dated 4 June 2004), the Respondent disputed the arguments of the Appellant and the conclusions drawn from its two experimental reports (section IV(b), above). The "Repetitions" were criticised as not being true repetitions of Example 7 of D14 and Example 3 of D23. To this end, reference was made to the differences in the 1-butene content, the measured and calculated $[\eta]$ -values and the melting points of the polymers reported (Letter 1: page 2, Tables 1 and 2) and in the reactor and the amounts of ingredients added to the reaction mixture (Letter 2: pages 4 and 5, Tables II and III). Nor had the Appellant provided evidence for its allegations concerning the variables (reaction time and temperature, etc.) said to affect transparency. Moreover, the Respondent also disputed the validity of the equation as presented in D22 and the correlation in Annex 2 (cf. the paragraph relating to feature (B) in section IV(c), above).

Emphasis was additionally put on the significance of feature (E), and on the differences in haze of the two products of Example 5 and Reference 8. The validity of these experiments was affirmed by the Respondent, because the reaction conditions in Reference 8 had been

chosen so that features (A) to (D) of its product were as close as possible to those obtained in Example 5.

Annexed to Letter 2 were five new sets of claims corresponding to Auxiliary Requests 1 to 5.

The Respondent also raised the question of relevancy of D23, in particular with respect to the question of whether it was entitled to the priority claimed.

VI. On 7 July 2004, oral proceedings were held in the presence of the Appellant and the Respondent but in the absence of Opponent 1/the Party as of right. In these proceedings, the discussion about the issues of novelty and inventive step focused on the Main Request.

(a) At the beginning of the oral proceedings, the Board raised the question of whether D9 was a valid prior art document, since - according to its front sheet - it was the translation of the examined patent application JP-B-6-104 698 which had been published for opposition on 21 December 1994, ie after the two priority dates claimed by the patent in suit.

In reply thereto, the Appellant argued that D9 had never been objected to before in this respect, that it was highly relevant for novelty, because there was a high probability that the claimed subject-matter at issue was anticipated by this document and that the particulars concerning the features of the products of D9 would certainly be described in the same way as in D6. In summary, it expressed the opinion that D9 could differ from D6,

the corresponding pre-published unexamined patent application, only in narrower claims. Finally, it requested that D9 should be considered by the Board in these proceedings as representing the disclosure of the prior art document D6.

These arguments were, however, disputed by the Respondent according to whom it was not true that only the claims could have been changed in the examination of D6. Therefore it requested that D9 not be accepted as a valid prior art document.

After deliberation, the Board informed the parties that it was not prepared to accept D9 as prior art, nor, therefore, to accept any submissions based thereon. Instead, the Abstract of D6 could be used.

- (b) Since the Appellant had announced its intention to rely on D23 for the discussion of novelty and the Respondent had submitted that the document was "only citable against material in the present application which is entitled to either of the two claimed priorities if the material in D23 is entitled to the priority claim" (Letter 2: page 6, middle paragraph "Relevance of D23"), the question was dealt with of whether Claim 1 of the patent in suit was entitled to either one of the priority dates of 25 February 1994 or 26 October 1994 and also of whether D23, in particular its Example 3, was entitled to its own priority date of 29 November 1993. In fact, the validity of the priority claim of the patent in suit was not disputed by the Appellant.

Therefore, both parties were provided by the Board with copies of the English translation of the Japanese priority document of D23, which had been available to the public by online file inspection (<http://www.epoline.org>) already before the oral proceedings, and they were given the opportunity, during a break of the proceedings, to check the document in this respect. Whilst expressing thereafter the opinion (i) that the general teaching of D23 was contained in the priority document, ie that an organoaluminium oxy-compound and/or a compound capable of forming an ion pair by reacting with the metallocene, such as a borate, could equally be used in the catalyst system, (ii) that both documents referred to the same properties of the products including transparency and (iii) that the degree of 2,1-insertion had been determined in all examples of the priority document and of D23, the Appellant was unable to direct the Board's attention to a counterpart in the priority document to Example 3 of D23, and, instead, withdrew its novelty objection on the basis of document D23.

Nevertheless, both parties requested that D23 be considered in the proceedings as a witness document for the purpose of argument. Thus, whilst the Appellant referred to D23 to show that organo-aluminium oxy-compounds ("aluminoxanes") and compounds reacting with the metallocene to form an ion pair were equivalent, the Respondent put emphasis on the fact that the aluminoxane did not react with metallocene to form an ion pair and,

hence, did not fulfil feature (E) (D23: page 4, lines 41/42).

- (c) Novelty was discussed by the parties mainly along the lines previously presented in writing. The arguments of the parties as far as they are relevant to this decision and differ from or further supplement the written submissions are summarised herein below:

With regard to the Patent Abstract of Japan of D6, emphasis was put by the Respondent on the statement that the product was "free from the signal of two adjacent methylene chains between two adjacent tert-carbon atoms in the main chain measured by ^{13}C -NMR...". The Appellant, however, argued that this statement did not mean that 2,1-insertion, which was, in fact, an inevitable error when using a metallocene catalyst, had not taken place in D6, but that this passage referred to a measurement different from feature (D), ie a measurement determining a structural element wherein two adjacent methylene groups were linked on each side to a pair of (= adjacent) tertiary carbon atoms, which could form due to two subsequent 2,1-insertions of propylene in polymerisations using eg homogeneous vanadium Ziegler-Natta catalysts, known at that time. This argument was, however, disputed by the Respondent who wondered why (i) this passage was to be interpreted in a way completely different from what had been discussed before in this respect and (ii) more than one error should occur at a time and was even to be expected.

The objection that the claimed copolymer was anticipated by document D14 was maintained by the Appellant, in particular, with respect to features (A) to (C) on the basis of the passage on page 6, lines 38 to 48 and Example 7 of the document. Thus, it was argued that - after conversion of the respective measuring values - features (A) and (B) were evidently complied with and that the melting point in the example clearly met feature (C). The missing feature (D) was said to be inherently fulfilled by the copolymer prepared by means of the catalyst system formed from Hf metallocenes, aluminoxanes and optionally organoaluminium compounds as mentioned in D14 (page 15, lines 34 to 39). The difference in the cocatalyst (aluminoxane instead of borate) was deemed irrelevant for feature (E) of the product claim relating to the copolymer, because D23 (page 4, lines 41/42) showed *expressis verbis* that that the two compounds could be used for the same purpose.

The results of the repetition of Example 7 were again disputed by the Respondent. The technical expert of the Appellant explained the reasons for the modifications of the example which were due to the inevitable use of different equipment. He confirmed that the "Repetition" had been carried out with the best of their efforts. The only critical ratio affecting the properties of the polymer, the Al/Hf ratio, had, however, been the same in the repetition and in Example 7. In any case, the differences in the properties of the resulting polymer were small.

The latter assessment was contested by the Respondent who further argued that the repetition of the example of D14 had not been scaled down properly, and that a specific combination of features, as used in the "Repetition", which had been selected from the broad teaching of D14, was not enough to prove lack of novelty with regard to this document. Moreover, the Respondent did not accept that it had been established by the Appellant that the product of D14 fulfilled features (B), (C) and (D) according to Claim 1 under consideration. In connection with feature (C), there was no justification for the correlation of the solubles in boiling n-pentane and the CXS-value.

As regards D12, reference was made by the Appellant to the alleged overlap or identity of the features in D12 and features (A) and (B) of Claim 1. With regard to feature (E) it was pointed out that the polymerisation of the monomers was carried out by means of a catalyst composed of a metallocene and aluminoxanes optionally in combination with alkyl aluminium compounds (page 3, lines 31 to 46; page 7, lines 28 to 30) which also led to feature (D) automatically being fulfilled. In particular, Example 4 was mentioned, because the reported melting point of 121°C nearly fulfilled the equation in feature (C) of Claim 1 (the calculated melting point was 120.1°C).

- (d) The additional arguments to inventive step presented by the parties in the oral proceedings

and relevant to the decision may be summarised as follows:

In view of the properties aimed at in the patent in suit (page 2, lines 43/44 and 48 to 50) and those disclosed in D14 (page 3, lines 7 to 10 and page 13, lines 53 to 57) which showed that the document related to the same technical field and aimed at the same properties, namely good heat-sealing and anti-block properties, D14, in particular its Example 7, was considered by the Appellant as representing the closest state of the art and the technical problem to be solved was seen in the provision of an alternative propylene copolymer also having a good balance of properties. According to the Appellant, the only difference between the teachings was the use of a different cocatalyst in the patent in suit, which, however, had been known from D21, which offered the use of a borate cocatalyst as the better alternative (abstract of D21). Hence, it was obvious to modify the catalytic system of D14 to arrive at the solution offered by the patent in suit.

Moreover, according to the Appellant, the comparison of Example 5 and Reference 8 in the patent in suit as used in the decision under appeal was not well founded, because there was a huge difference in these experiments in the amount of cocatalyst and the patent in suit had recognised that aluminoxane was difficult to remove and undesirably affected the optical properties of the resulting random copolymer (page 2, lines 31/32). Consequently, a higher haze

was to be expected in Reference 8. Consequently, no technical effect which could be based on to the modification of the catalyst used in D14 had been shown by the Respondent.

Whilst, in principle, the Respondent agreed that the patent in suit also aimed at a good balance of properties, in the sense that low temperature heat-sealing was achieved and anti-blocking in a reasonable frame was maintained, reference was additionally made by this party to the improvement in transparency as demonstrated by Example 5 and Reference 8 in the patent in suit.

With regard to D21, the Respondent was of the opinion that no indication could be found in this document that by combining the teachings of D14 and D21, a product would be obtained showing the whole host of properties as demonstrated in the table of the patent in suit, unless by hindsight.

VII. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained as granted (Main Request) or, in the alternative, to set aside the decision under appeal and to maintain the patent on the basis of one of Auxiliary Requests 1 to 5, each filed with the letter dated 4 June 2004.

Reasons for the Decision

1. The appeal is admissible.
2. Since all the parties had been summoned to the oral proceedings in due time, the proceedings were continued in the absence of the Party as of right in accordance with Rule 71(2) EPC.

Main Request

3. Before the issues of novelty and inventive step can be decided, the legal and factual framework has to be determined.
 - 3.1 Since the Respondent raised no objection to the late-filed documents D21 and D22 being considered in the proceedings and both parties requested the introduction of D23, the Board decided to admit these documents for consideration.
 - 3.2 Since the cited documents D1 and D12 have publication dates of 23 August 1995 and 8 December 1994, respectively, ie later than the priority dates claimed in the patent in suit, it has to be determined whether the patent as granted is entitled to these priority dates (Articles 87 and 88 EPC).

In view of Claims 1, 2 and 5 and paragraph [0018] of the English translation of the previous Japanese Patent Application No. 6-262357 (262357/94), submitted on 6 April 1995, the Board is satisfied that Claim 1 is entitled to at least the priority date of 26 October 1994. This finding is also valid for the further claims

of the patent as granted, all of which have their basis in the further claims and paragraph [0028] of the above priority document as presented in the translation.

Consequently, documents D1 and D12 only form state of the art in the sense of Article 54(3) EPC.

- 3.3 The novelty objection on the basis of Document D23, having a publication date in the sense of Articles 158(1) to (3) EPC of 1 June 1995, was withdrawn by the Appellant, after it had become apparent that Example 3 of D23 relied upon was not present in the priority document (section VI(b), above). Since the Board was unable to discern any other basis on which such an objection could be pursued, it did not consider it necessary under Article 114(1) EPC, further to investigate D23.
- 3.4 Document D9 was filed by Opponent 2 with its Notice of Opposition as the "English language translation of (D1) JP-62-119212" (which was renumbered in the course of the opposition proceedings: "D8"; see section II, above).
- 3.4.1 In the decision under appeal, D9 was identified as the closest state of the art for the assessment of inventive step (section III(b)(ii), above).
- 3.4.2 After the Appellant had been requested by the Registrar of the Board by telephone on 19 December 2003 to re-file a number of cited documents, *inter alia* the following copies were received with the letter dated 19 December 2003 (marked with their respective document number in handwriting):

JP-B2-6-104698, "...(illegible)... D8" and the English translation "document D9".

In the letter itself, however, reference was made to "D8: JP-A-62-119212".

It is, however, evident from the information on its front page:

(19) Japanese Patent Office (JP)

(12) Examined Patent Publication (B2)

(11) Publication of patent application
No. Hei 06(1994)-104698

(24)(44) Published for opposition on 21 December 1994

document D9

that D9 is not the translation of the JP-A- referred to in this letter as D8 (or in the decision under appeal: as D6), but the translation of JP-B2-6-104698. This document was, however, published for opposition on 21 December 1994, ie after the second priority date of the patent in suit. Consequently, neither the JP-B-document nor D9 are part of the relevant state of the art in the sense of Article 54(2) EPC.

3.4.3 Since the above JP-B2-document was, however, derived from the previous patent application D6, the Appellant requested that the translation should, nevertheless, be considered in these proceedings, because (i) it was highly relevant for novelty, (ii) it contained further important features and (iii) it could differ from D6 only in a narrower wording of the claims. These assertions and the request were, however, contested by the Respondent (section VI(a), above).

3.4.4 Only the following documents relevant to this issue, ie D6 (in the form of its abstract in English), the copy of D8 (ie of JP-B2-6-104698) in Japanese and the English translation D9, had been made available to the Board up to the date of the oral proceedings. Hence, the Board could not verify the assertions of the Appellant concerning the content of D6.

3.4.5 Consequently, and in view of the arguments of the Respondent, the Board decided not to take D9 into account nor to accept any submissions based on this translation (section VI(a) above).

4. *Novelty*

In view of the above facts and of the arguments raised by the Appellant in these appeal proceedings, only the documents D1, D6 (English abstract), D14 and D12 are to be considered in the assessment of novelty of the claimed subject-matter.

4.1 The Patent Abstract of Japan of D6 identifies the random copolymer by its composition (40 to 90 mol% of propylene and 10 to 60 mol% of α -olefin having 4 to 20 carbon atoms), an intrinsic viscosity $[\eta]$ (measured in decalin at 135°C) of 0.5 to 6 dl/g, a molecular weight distribution M_w/M_n of ≤ 3 , a melting point of 40 to 140°C and a crystallinity of 1 to 50% , both measured by differential scanning calorimeter (DSC). The copolymer has a standard deviation of compositional distribution of ≤ 10 mol% and contains $\leq 1\%$ by weight of components soluble in boiling methyl acetate and $\leq 4 \cdot [\eta]^{-1.2}\%$ by weight of components soluble in 1:1 (volume/volume) acetone/n-decane mixtures at 10°C. Whilst, however, there is no hint as to the solubility

in cold xylene (CXS), nor to the dependency of the melting point on the CXS-value, it is *expressis verbis* required that the copolymer be "free from the signal of two adjacent methylene chains between two adjacent tert-carbon atoms in the main chain measured by ¹³C-NMR spectrum".

4.1.1 Whilst the Respondent put emphasis on the above result of the ¹³C-NMR spectroscopy which was directly contrary to the requirement of feature (D) of Claim 1, the only argument of the Appellant in the oral proceedings was based on a particular interpretation of the significance of the "signal" referred to (section VI(c), above) together with the assertion that signals of the kind referred to in feature (D) of Claim 1 would inevitably be detectable.

4.1.2 The Board cannot concur with the opinion of the Appellant that the expression "between two adjacent tert-carbon atoms" would require the presence of a pair of tertiary carbon atoms (ie methin groups) directly linked on each side to the adjacent methylene groups. Rather, the Board is of the opinion that such a situation would have been worded: "between two adjacent pairs of tertiary carbon atoms".

Nor is the explanation convincing, which was given by the technical expert of the Appellant during the oral proceedings to support the above interpretation of this feature by his party. The Board does not find any basis in D6 for the assumption that this feature had been introduced to distinguish its copolymers from products obtained by the polymerisation of propylene using homogeneous vanadium Ziegler-Natta catalysts (ie a

specific type of non-metallocene catalysts) which, according to the expert, repeatedly caused subsequent 1,2-/2,1-/1,2-/2,1-insertions of propylene units to give a pair of methin groups directly linked to a pair of methylene groups, this latter pair in turn then being linked to a further pair of methin groups. Rather, the Board accepts the argument of the Respondent that no information can be derived from D6 indicating the necessity of this sequence of specific errors for obtaining certain properties and that it would be strange to expect that more than one such error occurred at a time.

Consequently, the Board is satisfied that D6 requires a property of the copolymer (no signals in ^{13}C -NMR indicating subsequent methylene groups between adjacent methin groups) and hence excludes the possibility of feature (D) of Claim 1 being fulfilled.

4.1.3 In view of these facts and findings, there is no need further to consider other features of Claim 1, such as the dependency of the melting point on the CXS-value, as mentioned before, because, for the above reasons alone, D6 does not anticipate the subject-matter of this claim.

4.2 Document D14 relates to different embodiments, copolymers of ethylene and two different types of random copolymers of propylene, the second of which requires the presence of 0.5 to 9.5 mol% of ethylene moieties. However, the patent in suit (page 3, lines 48/49) tolerates only small quantities of ethylene "as long as the ethylene does not damage the physical properties of the resulting copolymer". In

fact, the Appellant focused its arguments on the other, ie the first, type of propylene random copolymers. Nor does the Board see any reason to deviate from this approach.

4.2.1 The embodiment of D14 relevant for this case is defined in its Claim 3 and on page 6, lines 38 to 48. It relates to propylene random copolymers containing (i) 90-99 mol% units derived from propylene and 1-10 mol% of units derived from C₄-C₂₀ α-olefins, and having (ii) an intrinsic viscosity [η] of from 0.5 to 6 dl/g, measured in decalin at 135°C, (iii) a melting point T_m, measured by DSC, falling within the range of the formula $90 < T_m < 155 - 3.5(100-P)$, wherein P is the propylene content in mol% in the copolymer, (iv) a M_w/M_n ratio of less than 3.5 and (v) a boiling trichloroethylene-insoluble content of less than 5 % by weight. Moreover, the copolymers desirably have a soluble portion in boiling n-pentane in an amount of less than 3 % by weight (page 14, lines 11 to 13).

Copolymers of this type are made by copolymerising propylene and the above α-olefins at a temperature of 40 to 100°C in the presence of a catalyst being formed from [A] a hafnium compound having as a ligand a multidentate compound in which at least two groups selected from among cycloalkadienyl groups or substituted groups thereof are linked together via lower alkylene groups, [B] an organoaluminium oxy-compound (Claim 4 and page 6, lines 49 to 56) and optionally [C] an organoaluminium compound (page 15, lines 34 to 39).

The polymers *per se* are reported to have excellent heat-sealing properties at low temperatures, and films made therewith are said to exhibit excellent heat-sealing properties even when they have small amounts of the copolymerised α -olefin, and hence are excellent in anti-blocking properties and have excellent stiffness (page 13, lines 52 to 56).

According to the description, 1-butene is the especially preferred α -olefin in the preparation of the relevant first type of propylene random copolymers (page 13, line 35), which type is illustrated by Examples 6 and 7 (out of 17 examples of the document). However, no information is given in these examples about the above asserted physical properties.

4.2.2 Besides the contentions based on the general description with regard to the intrinsic viscosity values which could easily be converted in a value according to feature (B), feature (D) which would be the inherent result of the use of catalyst (E) and the solubility in boiling n-pentane which would be comparable to the CXS-value (all of which were disputed by the Respondent), the arguments of the Appellant focused on Example 7 to prove lack of novelty vis-à-vis D14. In particular, the example was to show that all of features (A) to (E) of Claim 1 were met by its polymer (sections IV(c) and VI(c), above).

4.2.3 Example 7 describes a modification of the experiment of Example 6, wherein the reaction conditions including the catalyst, polymerisation temperature (50°C) and time (0.5 h) are given. The catalyst system used in both of these examples consisted of $1.25 \cdot 10^{-3}$ mmol

(1.25 μmol) ethylene-bis(indenyl)hafnium dichloride and 5 mg atom in terms of Al atom (5 mmol) of methylaluminum-oxane, ie the catalyst is different from the catalyst defined in feature (E) of contested Claim 1. Nor did the composition of the polymer resulting from Example 6 (2.2 mol% = 2.9 weight% of butene units) meet feature (A) of the patent in suit, whilst it was undisputed between the parties that this feature was complied with in Example 7 (D14: 5.6 mol% = 7.33 weight%; Statement of Grounds of Appeal: page 3, line 16; cf. Letter 1 of the Respondent: Table 1, left column).

4.2.4 However, Example 7 and the whole of D14 are completely silent about feature (D) of Claim 1 and about the CXS value, which is an important factor in the formula of feature (C) and directly linked to the melting point. Instead, the melting points of the polymers of D14 depend only on the propylene contents. Moreover, the Appellant, on whom the onus of proof had lain to prove its case, has not discharged this burden with regard to its contention that the solubility in n-pentane would usually be comparable to the CXS-value so that it could be used to determine whether feature (C) was fulfilled. The document does not even provide any hint to a interdependency between the solubility of the polymer in any solvent and its melting point.

Consequently, it has not conclusively been shown that the disclosure in the general description or Example 7, as published, would anticipate the subject-matter of the contested Claim 1.

4.2.5 In view of the fact that its previous arguments on the basis of Example 7 had not been successful in the

opposition proceedings, the Appellant had filed an experimental report ("Repetition of Example 7 of EP-A-0 495 099 (D14)") to strengthen its position by supplementing Example 7 with additional features (section IV(b), above; Statement of Grounds of Appeal: page 5, lines 13 to 15).

The "Repetition of Example 7" included, however, on the one hand, deviations from the composition of the reaction mixture and from the reaction conditions as disclosed in Example 7 of D14, but it maintained, on the other hand, the Al/Hf ratio as used in Example 7 of D14, which according to the Appellant was the only crucial requirement for a true repetition. Nevertheless, the "Repetition" resulted in properties of the final copolymer which were significantly different from those of the copolymer of Example 7 (cf. Letter 1 of the Respondent, in particular the comparison of data in its Table 1, which had been compiled from polymer data on page 3 of the Statement of Grounds of Appeal and from the above "Repetition"). In fact, the butene-contents of the two copolymers differed by more than 3 weight%, the $[\eta]$ -value, calculated by the Appellant for the polymer of Example 7 (the validity of this calculation had also been disputed by the Respondent), was nearly double as high (2.36 dl/g) as that reported for the "Repetition" (1.19 dl/g), and the melting points differed by more than 7°C.

Therefore, the Board cannot accept the above "Repetition" to be a true repetition of Example 7 of D14.

4.2.6 However, it is conspicuous to the Board that there are similarities between the above "Repetition" and Reference 8 in the patent in suit. In particular, in both the "Repetition" and Reference 8, the experiments were carried out - at the same temperature (50°C) - with a catalytic system composed of the same metallocene, ethylene-bis(indenyl)hafnium dichloride, and an at least similar aluminoxane (cf. the broad definition of such compounds in D14: page 9, line 46 to page 12, line 10). Significant in this connection, furthermore, are the magnitudes of the amounts of the aluminoxane and the metallocene used: in the "Repetition": 5 mg atom (mmol) of the aluminoxane (in terms of Al) and $1.25 \cdot 10^{-3}$ mmol (1.25 μ mol) of metallocene; in Reference 8: 10.9 mmol aluminoxane (in terms of Al) and 4.4 μ mol of metallocene, as conceded by the Appellant during the oral proceedings. These values, when expressed in terms of the Al/Hf ratio, are equal to "4000" in the "Repetition" and to "2480" in Reference 8.

Hence, Reference 8 is, in the Board's view, at least as representative for D14 as the above "Repetition of Example 7".

Furthermore, Reference 8 seen together with Example 5 of the patent in suit provides even more information useful for the assessment of the relevance of D14. Mention can thus be made of the properties listed in Table 1 of the patent in suit, demonstrating that the polymers of Example 5 and Reference 8, which show very close similarity of their features (A) to (D), nevertheless differ significantly from one another in their transparency (haze values measured according to

the same standard; patent in suit: page 6, lines 40 to 42). Hence, it can be derived from this comparison, as already explained in the decision under appeal (item II.3.8), that process feature (E) of Claim 1 in the patent in suit "manifests itself in a measurable property of the final polymer" and can therefore serve to distinguish polymers from one another. It follows that this can also be assumed for the polymer obtained in the "Repetition" (cf. Appellant's argument in section VI(d) paragraph 3, above).

4.2.7 For all these reasons, the Board accepts that identity of the polymers according to Claim 1 of the patent and those disclosed in D14 has not been demonstrated. They differ from one another at least in the property linked to feature (E) of Claim 1, transparency, irrespective of whether there may be any overlaps in some other definition of the copolymers.

4.3 Like D14, D12 differs from the patent in suit in that its random copolymers are prepared with a catalytic system composed of a metallocene and an organoaluminium oxy-compound (aluminoxane), with the option further to add alkyl aluminium compounds (cf. Example 4). Moreover, D12 is completely silent with respect to transparency or clarity or haze of its products. This document only refers to flexibility and reduced crystallinity and heat-sealing temperatures (page 1, lines 19 to 21 and 33 to 36 in conjunction with page 2, lines 1 to 4). Consequently, the above findings about feature (E) of Claim 1 of the patent in suit are also valid, by analogy, for the product of D12.

Consequently, it has not been convincingly shown that the copolymer of D12 anticipates the subject-matter claimed in Claim 1 of the patent in suit.

- 4.4 As to the question of novelty, no comments were given by the parties on the further documents considered in the decision under appeal, in particular D1, nor does the Board see any reason to deviate from the findings of the Opposition Division in this respect.

Consequently and in view of the above findings, the Board has come to the conclusion that the subject-matter of Claim 1 under consideration is novel.

5. *Problem and solution*

The patent in suit relates to a propylene random copolymer and a film laminate thereof.

- 5.1 As set out above in detail with regard to novelty (sections 4.2 to 4.2.7, *supra*), D14 refers *inter alia* to such random copolymers, which are said to have low melting points, excellent heat-sealing properties and anti-blocking properties, and to be useful for films having excellent heat-sealing properties even when containing small amounts of copolymerised α -olefin (section 4.2.1, above). This document was regarded by the Appellant as representing the closest state of the art, a point of view, which was not disputed by the Respondent. Nor does the Board see any reason to take a different position in this respect.

- 5.2 For the definition of the technical problem to be solved by the patent in suit with respect to D14, the

Appellant referred to the same passage in the patent in suit as the decision under appeal ("page 2, lines 48 to 50"; in the decision under appeal, item II.6: "page 2, lines 48 to 54"; cf. section IV(d), above). According to this passage, the technical problem may be seen in the provision of a "propylene random copolymer having excellent blocking resistance and transparency and substantially maintaining favorable low-temperature heat-sealing properties to a corona discharge treatment for improvement in printing properties". All of these aspects have, in fact, been addressed in Table 1 of the patent in suit giving the results of the examples and of further (comparative) reference examples, ie heat-sealing temperatures before and after corona discharge treatment, blocking and total haze.

- 5.3 Whilst, in view of the properties of the propylene random copolymer of D14 (section 5.1, *supra*) and an asserted failure to show an unexpected/surprising effect by the Respondent, the technical problem to be solved could only be seen, according to the Appellant, in the provision of an alternative copolymer having high blocking resistance and low-temperature heat-sealing properties, the Respondent argued that the problem concerned the improvement of the balance of these properties and, on the basis of the results of Example 5 in comparison to Reference 8 in Table 1 of the patent in suit, additionally the improvement of the transparency of the product.

Transparency of the propylene- α -olefin random copolymers according to its Claim 3 is not referred to in D14. On the contrary, this property is considered only with regard to the ethylene random copolymers, ie

another embodiment of this disclosure (Claim 1; page 9, lines 44/45). Reference is only made to the heat-sealing properties at low temperatures of the propylene- α -olefin random copolymers and to the heat-sealing properties, the anti-blocking properties and the stiffness of films made therefrom (page 13, lines 52 to 56). In particular, Examples 6 and 7 are completely silent in respect of transparency.

In view of these facts, the Board accepts the argument of the Respondent that the technical problem includes the aspect of improving the transparency.

Thus, the technical problem objectively arising from D14 may be seen as the provision of a propylene random copolymer having improved transparency, whilst maintaining, at the same time, high blocking resistance and low-temperature heat-sealing properties.

- 5.4 According to the patent in suit, the above problem is solved by a propylene random copolymer as defined in Claim 1 (features (A) to (E)).

Moreover, as stated above, Reference 8 in Table 1 of the patent in suit is at least as representative for D14 as the "Repetition of Example 7", as annexed to the Statement of Grounds of Appeal (sections 4.2.5 and 4.2.6, above). Whilst both Example 7 of D14 and its "Repetition" are silent with respect to haze, Reference 8 clearly demonstrates that the haze (ie lack of transparency) of a propylene- α -olefin copolymer, although meeting the requirements of features (A) to (D), whereby these properties had been made as similar as possible to those of Example 5 in accordance with

Claim 1, was significantly higher (ie had a poorer transparency) than the product of Example 5. As already held in the decision under appeal, this improvement can be attributed to the use of the different catalytic system according to feature (E) of Claim 1 in the preparation of the random copolymer, whilst maintaining the other properties at least in an acceptable frame (cf. sections III(b)(i), 4.2.6 and 5.3, *supra*).

5.5 Consequently, the Board is satisfied that the above relevant technical problem is effectively solved in all its aspects by the claimed copolymer as defined by its features (A) to (E).

6. *Inventive step*

It remains to be decided whether the claimed solution would have been obvious to a person skilled in the art.

6.1 As discussed above, D14 is silent with respect to transparency of its propylene- α -olefin random copolymers. Consequently, it cannot and does not provide any teaching how or in what way all the aspects of the technical problem (section 5.3, above) can be solved; in other words: that and how transparency can be improved whilst maintaining the other properties, *viz.* heat-sealing properties and anti-blocking properties, in an acceptable frame. Even less did D14 provide any incentive to solve this problem by deviating from its teaching with respect to feature (E) in such a way so as to arrive at something within the scope of Claim 1.

The argument of the Appellant that the poorer transparency in Reference 8 was to be expected due to the higher amounts of aluminoxane used (cf. section VI(d), above) is not convincing in view of the similarities already established between Reference 8 and the "Repetition of Example 7" wherein the aluminoxane to catalyst ratio was similarly high as or even higher than in Reference 8 to the disadvantage of the Respondent (section 4.2.6, above).

Besides, no information about the further properties of the polymers according to D14 in comparison to those in Table 1 of the patent in suit, eg heat-sealing properties and anti-blocking properties, and, in particular, their transparency/haze values, can be derived from D14, nor has any been provided by the Appellant, on whom the onus of proof for its case had lain.

In other words, D14, itself, does not provide a teaching which would lead the skilled person to a copolymer within the scope of Claim 1.

6.2 In the oral proceedings, the arguments of the Appellant to the question of inventive step focused exclusively on D14 and D21. Therefore, it has *a priori* to be examined whether D21 suggests a solution for the relevant technical problem.

6.3 In document D21, low-temperature isospecific polymerisation of propylene catalysed by alkyl-zirconocene-type 'cations' was examined. However, these examinations were limited to the homopolymerisation of propylene and the determination of the activity and

stereoselectivity (ie isotacticity of the resulting polymer) of a number of ion-pair catalysts (formed from zirconocenes and borates) in this reaction. The isotacticity was measured in terms of "IY", ie the percentage by weight of iso-polypropylene insoluble in refluxing heptane. The only further features of the resulting homopolymers disclosed are the melting point and the weight average molecular weight. The document is, however, completely silent with respect to copolymerisation, the solubility in cold xylene and the relation of this feature to the melting point, and inverted insertion of propylene into the polymer chain to yield groups fulfilling feature (D). Nor does the document contain any reference to heat-sealing or anti-block properties, let alone to transparency.

Hence, this document neither deals with the relevant technical problem (section 5.3, above), nor does it provide any suggestion to solve that problem in all its aspects, let alone to do so by modification of the teaching of D14 in a manner so to arrive at something within the ambit of Claim 1, namely a propylene- α -olefin random copolymer.

6.4 Consequently, the Board is satisfied that the solution of the technical problem represented by the propylene- α -olefin random copolymer of Claim 1 does not arise in an obvious way from the above state of the art.

6.5 The general argument of the Appellant that documents D1, D3, D4, D5 and D9 (which were said to inherently meet all the requirements (A) to (D) of the opposed Claim 1 without providing any detailed explanations for this allegation) could likewise be used as a starting point

for the assessment of inventive step (Statement of Grounds of Appeal: page 11), is not suitable to demonstrate in a convincing way that there is no inventive step - either for the reason that neither D1 nor D9 were published in due time (sections 3.1 and 3.4 to 3.4.4, above) or, in the case of those documents which were, for reasons analogous to those presented above with respect to the combination of D14 and D21.

6.6 The subject-matter of Claim 1 is, therefore, based on an inventive step.

6.7 By the same token, this conclusion is also valid for the film laminate according to Claim 5 which includes all the features and limitations of Claim 1, and for the elaborations in the dependent Claims 2 to 4 and 6.

Auxiliary Requests

7. Since the appeal fails already in relation to the Main Request of the Respondent, there is no need to consider any one of the Auxiliary Request 1 to 5.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young