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Datasheet for the decision of 5 February 2021

Case Number: T 0150/17 - 3.3.03

Application Number: 10745274.0

Publication Number: 2480606

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Language of the proceedings: EN

Title of invention:
PROPYLENE POLYMER COMPOSITIONS

Patent Proprietor:
Basell Poliolefine Italia S.r.l.

Opponents:
Borealis AG
Total Research & Technology Feluy
Lummus Novolen Technology GmbH

Relevant legal provisions:
EPC Art. 56
RPBA Art. 12(4)

Keyword:
Inventive step - Main request and first auxiliary request (no)

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Case Number: T 0150/17 - 3.3.03

DECISION
of Technical Board of Appeal 3.3.03
of 5 February 2021

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Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 29 November 2016 concerning maintenance of the European Patent No. 2480606 in amended form.**

Composition of the Board:

Chairman	D. Semino
Members:	D. Marquis
	R. Cramer

Summary of Facts and Submissions

I. The appeals of the patent proprietor and of opponents 1-3 lie from the decision of the opposition division posted on 29 November 2016 concerning the maintenance of European patent No. 2 480 606 in amended form on the basis of the first auxiliary request filed during the oral proceedings on 17 October 2016.

II. Claim 1 as granted read as follows:

"1. A propylene polymer composition comprising (percent by weight):

A) 74%-84% of a propylene homopolymer having a Polydispersity Index (P.I.) value of from 4.6 to 10, a fraction insoluble in xylene at 25 °C, higher than 90 %, and a MFR L (Melt Flow Rate according to ISO 1133, condition L, i.e. 230°C and 2.16 kg load) from 110 to 200 g/10 min;
B) 16%-26%, of a copolymer of propylene with from 39% to 48%, of ethylene derived units;

the composition having an intrinsic viscosity of the fraction soluble in xylene at 25 °C comprised between 2.5 and 4.0 dl/g; and a MFR L (Melt Flow Rate according to ISO 1133, condition L, i.e. 230°C and 2.16 kg load) from 30 to 80 g/10 min".

III. The decision of the opposition division was based *inter alia* on the following documents:

E3: WO 2011/036016
E4: WO 2004/087807

E5: Propylene handbook, Editor N. Pasquini, Hanser, published 2005, pages 308-316
E6: WO 01/90208
E7: Christelle Grein, et al., "High flow PP/EPR blends for the automotive industry: Basic correlations between EPR composition and application properties", SPE ANTEC 2009 (June 22-24)
E11: US 7,649,052 B2
E12: US 2005/0038208 Al
E15: US 2009/0209706 Al
E16: Grein et al., "Impact Modified Isotatic Polypropylene with Controlled Rubber Intrinsic Viscosities: Some New Aspects About Morphology and Fracture", Journal of Applied Polymer Science, Vo. 87, pages 1702-1712 (2003)
E18: M. Gahleitner et al., "Polypropylene-based Model Compounds as Tools for the Development of High-impact-ethylene-propylene Copolymers", Intern. Polymer Processing XVII (2002), 4, pages 1-7
E20: G. Cecchin et al., "Polypropylene Product Innovation by Reactor Granule Technology", Macromol. Symp. 173, pages 195-209 (2001)
E21: J.C. Chadwick et al. "Influence of Ziegler-Natta Catalyst Regioselectivity on Polypropylene Molecular Weight Distribution and Rheological and Crystallization Behaviour", Macromolecules 2004, 37, pages 9722-9727

IV. The decision of the opposition division was based on the claims as granted as the main request and on the first auxiliary request filed as second auxiliary request on 19 September 2016 and re-filed and renumbered during the oral proceedings. Claim 1 of the first auxiliary request differed from claim 1 of the main request in that the composition was further defined by having an "Izod impact strength measured at

23°C higher than 5 KJ/m^2".

V. The decision of the opposition division, as far as it is relevant to the present appeals, can be summarized as follows:

Main request (claims as granted)

Novelty

- Claim 1 of the main request did not enjoy the two earliest priority dates. The earliest valid priority for claim 1 was 17 November 2009 such that E3 was prior art according to Article 54(3) EPC for claim 1 of the main request. The general teaching of E3 disclosed propylene polymer compositions for which the ranges defining the amounts in matrix and rubber, the intrinsic viscosity of the xylene soluble fraction, the polydispersity index, the melt flow rate, the fraction of the matrix insoluble in xylene and the ethylene content of the rubber fraction all overlapped the corresponding ranges according to claim 1 of the main request. There was no reason why a skilled person would not have seriously contemplated working in the overlapping ranges of E3, in particular because these ranges were preferred ranges in E3. Claim 1 of the main request therefore lacked novelty over E3.

First auxiliary request

Novelty

- E3 did not disclose compositions having an Izod impact strength according to claim 1 of the first auxiliary request in combination with all other parameters so that novelty over E3 was given.

Inventive step

- E4 was a suitable closest prior art document. Claim 1 differed from the compositions in tables 1 and 2 of E4 in that the melt flow rate of the matrix was 110-200 g/10 min and the melt flow rate of the composition was 30-80 g/10 min. The melt flow rate of the composition of example 1 of E4 was 21 g/10 min. The problem was to provide improved heterophasic propylene copolymer compositions with good impact properties. E4 taught melt flow rates of at most 35 g/10 min that only partially overlapped with the range according to claim 1 of the first auxiliary request. There was however no teaching in E4 that would have led the skilled person to a composition comprising a matrix with a melt flow rate of 110-200 g/10 min and an Izod impact strength higher than 5 kJ/m^2. On the contrary, E16 and E18 taught away from such a composition. Also combinations of E4 with E6, E7, E11, E12 and E15 did not lead to the compositions according to claim 1 of the first auxiliary request. An inventive step was therefore to be acknowledged. The same result was obtained starting from E15 as the closest prior art.

VI. The patent proprietor and the opponents 1-3 lodged appeals against that decision. The patent proprietor submitted three sets of claims as second to fourth auxiliary requests with their reply to the statements of grounds of appeal of the opponents dated 23 August 2017. Opponent 1 submitted *inter alia* with their statement of grounds of appeal the following document:

E22: H.J. Radusch, P. Doshev, G. Lohse, Phase behavior and mechanical properties of heterophasic polypropylene ethylene/propylene copolymer systems, Polymer 2005, 50, 4, pages 279-285

VII. The parties were summoned to oral proceedings. Issues to be discussed at the oral proceedings were then specified by the Board in a communication dated 3 January 2020.

VIII. Oral proceedings were held on 5 February 2021, the parties being connected remotely by videoconference.

IX. The patent proprietor's arguments, insofar as relevant to the present decision, may be summarised as follows:

Main request - Inventive step

- E4 was the closest prior art. Claim 1 of the main request differed from example 1 of E4 in the melt flow rates MFR_2 of the propylene homopolymer (A) and of the composition as a whole.

- The examples of Tables 1 and 2 of the patent in suit were according to claim 1 of the main request. In particular, the polydispersity index of a given composition was the fingerprint of the catalyst used, as shown in E4, E20 and E21 wherein succinate based catalysts lead to a polydispersity of the produced polymer of 6 whereas phthalate based catalysts lead to a polydispersity of the produced polymer of 4.3. Since in the examples of the patent in suit and in example 1 of E4 a succinate based catalyst had been used, the polydispersities of the components A) disclosed in these processes had to be 6 as well. Besides, since the same succinate based catalyst had been used in the preparation of all the examples and comparative examples in the patent in suit, the polydispersity index of all components A) disclosed in Table 2 had to be 6. The polydispersity index of the compositions disclosed in Tables 1 and 2 of the patent in suit was thus according to claim 1 of the main request and the same in all examples and comparative examples.

- Also, the intrinsic viscosity of the xylene soluble fraction produced in the examples of the patent in suit was in fact disclosed in Table 2 but its value was erroneously reported under component B). That was an obvious mistake since the intrinsic viscosity of the xylene soluble fraction could not be determined on component B) as that component was produced in the matrix component A) and it was also virtually impossible to isolate the rubber component B) from the matrix in order to determine its intrinsic viscosity. The value of intrinsic viscosity of the xylene soluble fraction reported for component B) in Table 2 could thus only correspond to that of the xylene soluble fraction of the whole composition. The examples and comparative examples of the patent in suit could therefore be used to demonstrate the presence of an effect over the closest prior art E4.

- The examples and comparative examples of the patent in suit showed that the compositions according to claim 1 of the main request led to improved properties. In particular, the compositions of example 2 of the patent in suit and example 1 of E4 were very close to each other, the only difference in the process being related to the hydrogen amount fed to the reactor, to the melt index of the matrix and to the adjustment of the composition according to the requirements of E4. The rubber contents in the compositions of example 2 of the patent in suit and of example 1 of E4 were very similar (20 wt.-% in example 2 in Table 2 of the patent in suit and 19 wt.-% in example 1 in Table 1 of E4) and so were their ethylene contents (44 wt.-% in example 2 in Table 2 of the patent in suit and 45 wt.-% in example 1 in Table 1 of E4).

- There was however a difference between example 2 of the patent in suit and example 1 of E4 in the intrinsic viscosity of the xylene soluble fraction (3.20 dl/g wt.-% in example 2 in Table 2 of the patent in suit and 2.86 dl/g in example 1 in Table 1 of E4). That difference was however irrelevant for the Izod impact strength of the composition. Indeed Figure 5.10 of E5 showed that the Izod impact strength of a propylene composition remained constant, even when the intrinsic viscosity of the rubber was increased, for any value above 2.8 dl/g.

- The only relevant parameters for the Izod impact strength of the polypropylene composition were the melt flow rates of the matrix component A) and of the polypropylene polymer composition. In example 2 of the patent in suit the melt flow rate of the matrix component A) was 138 g/10 min and the melt flow rate of the composition was 55 g/10 min, within the ranges of 110-200 g/10 min for matrix component A) and 30-80 g/10 min for the composition as defined in operative claim 1. In the case of example 1 of E4 the melt flow rate of the matrix component A) was 50.2 g/10 min and that of the composition was 21 g/10 min, both being outside the ranges of operative claim 1. The Izod impact strength at 23°C of the propylene polymer composition according to example 2 of the patent in suit (7.2 KJ/m^2 in Table 2) was significantly higher than that of the composition according to example 1 of E4 (6.6 KJ/m^2 in Table 2). A more modest improvement of the Izod impact strength at 0°C could also be observed. These improvements resulted from the differences in melt flow rates of these two compositions.

- The problem was the provision of improved heterophasic propylene copolymer compositions with good impact properties, as defined in the contested decision.

- There was no pointer towards the selection of specific ranges of melt flow rates of the matrix component A) and of the composition in E4. Even the slight overlap between the preferred range of melt flow rate for the composition in E4 (0.5-45 g/10 min) and that defined in operative claim 1 would not have led the skilled person to raise that melt flow rate in order to improve the impact properties of the composition.

- There was no indication of an improved Izod impact strength caused by the selections of higher values of melt flow rates of the matrix component A) and of the composition as defined in operative claim 1 in E6. Also, the examples of E6 differed in their polydispersity indexes such that any effect in E6 would not have necessarily been attributed to the melt flow rate by the skilled person.

- E15 disclosed the combination of high melt flow rates of the matrix component A) and of the composition but it did not suggest that these melt flow rates would lead to an improvement of the Izod impact strength. On the contrary, table 2 of E15 showed that all the examples according to E15 had an inferior Izod impact strength as compared to comparative example H which had a lower melt flow rate.

- That teaching of E15 was also confirmed by E18 (Figure 3) which showed that an increase of melt flow rate would result in a decrease of Izod impact strength. A comparable teaching was also found in E16 (Figure 4).

- The selection of the melt flow rate of the matrix component A) and of the composition as defined in the ranges defined in operative claim 1 was thus inventive over the closest prior art E4.

- An inventive step had also to be acknowledged should the problem be defined as the provision of an alternative starting from E4.

First auxiliary request - Inventive step

- The argumentation of inventive step provided for claim 1 of the main request equally applied to claim 1 of the first auxiliary request.

Second to fourth auxiliary requests - Admittance

- An argumentation of inventive step had been provided for the second to fourth auxiliary requests in the reply to the statement of grounds of appeal. That argumentation was sufficiently substantiated to ensure admittance of the auxiliary requests into the proceedings.

X. The opponents' arguments, insofar as relevant to the present decision, may be summarised as follows:

Main request - Inventive step

- E4 represented the closest prior art. In particular, example 1 of E4 differed from claim 1 of the main request in the melt flow rate MFR_2 with regard to the propylene homopolymer (A) and in the final propylene polymer composition. The propylene homopolymer (A) of example 1 of E4 had a melt flow rate MFR_2 of 50.2 g/10 min (table 1) instead of a melt flow rate MFR_2 in the range of 110 to 200 g/10 min as required by claim 1 of the main request. Also, the final propylene polymer composition of example 1 of E4 had a melt flow rate MFR_2 of 21 g/10 min, outside the range of 30 to 80 g/10 min defined in claim 1 of the main request.

- The compositions according to example 1 of E4 displayed similar mechanical properties, especially in view of impact strength, to the inventive examples of the opposed patent. These properties were reached with the same amount of rubber (copolymer of propylene (B)) but with lower intrinsic viscosity of the xylene soluble fraction

(2.86 dl/g in example 1 of E4 vs. 3.11 dl/g and 3.20 dl/g, respectively for examples 1 and 2 of the patent in suit). However it was general knowledge that with higher intrinsic viscosity of the rubber the impact of the final composition increased (Figure 5 of E16). E4 reached the same impact behavior with lower intrinsic viscosity. Also, since the examples of the opposed patent did not disclose the values of polydispersity index of the propylene homopolymer (A) nor the values of intrinsic viscosity of the composition, these examples could not demonstrate the presence of an effect over E4. Also, no evidence had been provided that the polydispersity index of the propylene homopolymer (A) prepared in the examples of the patent in suit was according to operative claim 1. The opposed patent could thus not claim any advantage over example 1 of E4.

- Accordingly the objective problem in the light of E4 was to provide an alternative heterophasic propylene copolymer.

- It was general knowledge of the skilled person that by increasing the melt flow rate MFR_2 the processability of the composition was improved. E4 also disclosed melt flow rates MFR_2 in the range of 0.5 to 45 g/10 min for the propylene polymer composition, a range which overlapped the claimed range of 30 to 80 g/10 min. It was further known to the skilled person that the melt flow rate of the final propylene polymer composition was driven by the molecular weight of its components, i.e. of the matrix and the rubber. Thus with increasing melt flow rate MFR_2 of the matrix or with decreasing intrinsic viscosity of the rubber the final melt flow rate could be increased, as shown in E16 and E18. A slight change of intrinsic viscosity considerably influenced the impact behavior (Figure 5 of E16) whereas the change of melt flow rate MFR_2 of the matrix in the range of interest (MFR_2 in the range of 20 to 45 g/10 min) had very little effect.

- Thus, a skilled person confronted with the problem of providing alternative compositions would have increased the melt flow rate MFR_2 of the matrix without deteriorating the impact properties of the composition.

- E6 and E15 described heterophasic propylene copolymers having a high final melt flow rate MFR_2 and a high melt flow rate MFR_2 for the matrix. Furthermore, in both documents the heterophasic propylene copolymers contained a matrix and a rubber in the claimed amounts. The amount of ethylene in the rubber of the heterophasic propylene copolymer of E15 was also according to the claimed subject matter. It was especially referred in this regard to the examples of E6 and E15, respectively. Accordingly, the skilled person would have considered the teaching of E6 and/or E15 as E6 and E15 were concerned with similar heterophasic systems as in E4. Claim 1 of the main request therefore lacked inventive step.

- With regard to the argumentation in support of inventive step of the patent proprietor it had to be noted that the reference with Figure 5-10 in E5 was not relevant since the teaching shown there only concerned the Izod impact strength at -30°C which did not correspond to the temperature range of the Izod where the patent proprietor alleged to provide an improvement by the variation of the melt flow rate. Also, the prior art showed that the intrinsic viscosity had a significant impact on Charpy fracture energy (E16, Figure 5) or on molecular weight (E5, Figure 5.1) of the composition which was paramount to the Izod impact strength. E22 (Figure 6c) showed that a variation of the melt flow rate of the matrix component of the composition did not influence the impact performance of the composition. In that regard any effect seen on the Izod impact strength in the patent in suit resulted from differences in the intrinsic viscosity of the xylene soluble fraction rather than from the melt flow rate of the composition.

First auxiliary request - Inventive step

- Claim 1 of the first auxiliary request differed from claim 1 of the main request in that the composition had an Izod impact strength measured at 23°C of higher than 5 kJ/m^2. The propylene polymer composition according to example 1 of E4 which represented the closest prior art had an Izod impact strength measured at 23°C of 6.6 kJ/m^2, that is according to claim 1 of the first auxiliary request. Therefore the first auxiliary request lacked inventive step for the same reasons as the main request.

Second to fourth auxiliary requests - Admittance

- The second to fourth auxiliary requests were filed with the statement of grounds of appeal of the patent proprietor but no argumentation was provided regarding how they were meant to overcome the pending objections, in particular with regard to inventive step. Admitting these requests meant that any inventive step argumentation would be heard for the first time during the oral proceedings before the Board. For this reason the second to fourth auxiliary requests should not be admitted into the proceedings.

XI. The appellant/patent proprietor requested that the decision under appeal be set aside and the patent be maintained as granted (main request), or in the alternative be maintained on the basis of the claims of the first auxiliary request filed on 17 October 2016 and held allowable by the opposition division (and thus that the appeals of the opponents be dismissed), or in a further alternative that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of one of the second to fourth auxiliary requests filed with the letter of 23 August 2017.

XII. The appellants/opponents requested that the decision under appeal be set aside and that the patent be revoked.

Reasons for the Decision

Main request

1. Inventive step

1.1 The patent in suit concerns propylene polymer compositions having an optimum balance of properties (paragraph 1). In particular, the propylene polymer compositions allegedly achieve improved values of Izod impact strength at 23°C, 0°C and -20°C and maintain the same flexural modulus with respect to a composition having the same content of A) and B) with B) having the same ethylene content (paragraph 9).

1.2 Document E4 discloses a composition comprising a propylene homopolymer and a copolymer of propylene with ethylene derived units (claim 1 or page 1, lines 21-31). The compositions in E4 are described as having high rigidity and good impact resistance (page 1, lines 16-17). E4 therefore discloses a polypropylene composition being in the same field and also attempting to solve the same technical problem as that addressed in the opposed patent, i.e. an optimum balance of properties and in particular improved impact properties. E4 was the document representing the closest prior art in the contested decision. E4 and in particular its example 1 was considered to be the closest prior art by the parties during the appeal proceedings before the Board. The Board sees no reason to depart from the selection of E4 as appropriate starting point for the assessment of inventive step of the main request.

1.3 E4 discloses in example 1 a propylene composition (page 15 and Table 1 and page 19, Table 2) comprising 81 wt.-% (sum of propylene homopolymers from the 1st and 2nd reactor) of a propylene homopolymer and 19 wt.-% of an ethylene propylene copolymer produced in the 3rd reactor. The homopolymer of the composition of example 1 has a polydispersity index of 6 and an amount of xylene insolubles of 97.6 wt.-% (Table 1). The propylene copolymer of that composition has an ethylene content of 45 wt.-% (Table 1). Furthermore, the intrinsic viscosity of the xylene soluble fraction of the composition of the polymer of example 1 of E4 in Table 1 is 2.86 dl/g. It was also not in dispute between the parties at the oral proceedings before the Board that the product resulting from the second reactor in example 1 of E4 for which the melt flow rate is 50.2 dg/min (equivalent to g/10 min) in Table 1 corresponded to the propylene homopolymer A) according to operative claim 1. The melt flow rate of the whole composition, 21 g/10 min, is also provided in Table 2 of E4.

1.4 The composition of claim 1 of the main request therefore differs from the composition according to example 1 of E4 in that the propylene homopolymer A) has a melt flow rate of 110 to 200 g/10 min and the composition comprising the propylene homopolymer A) and the propylene copolymer, also referred as the rubber component by the parties in appeal, has a melt flow rate of 30 to 80 g/10 min.

1.5 With regard to the effect of these distinguishing features, the contested decision mentions that the examples of the patent in suit showed good Izod impact strength values at 23°C, 0°C and -20°C, comparable with those of example 1 of E4, at significantly higher melt flow rate values for the matrix as well as for the composition (fourth paragraph, page 13 of the decision). The problem defined by the opposition division in the contested decision was then to provide improved heterophasic propylene copolymer compositions with good impact properties (first paragraph, page 14 of the decision).

1.6 In the appeal proceedings the patent proprietor maintained the problem laid out in the contested decision and justified its formulation by a direct comparison of example 2 of the patent in suit with example 1 of E4 and alternatively by the effect allegedly shown in the examples and comparative examples of the patent in suit. With regard to the comparison submitted by the patent proprietor, the first question that the Board has to answer is whether it can be acknowledged that the examples of the patent in suit are according to operative claim 1 since neither the description nor the Table of the patent in suit appears to disclose the values of polydispersity index of the propylene homopolymer A) as well as the values of intrinsic viscosity of the xylene soluble fraction of the compositions produced.

1.7 The patent proprietor considered that the compositions described in the patent in suit fulfilled the requirements set out in operative claim 1, namely that the polydispersity index of the propylene homopolymer A) was from 4.6 to 10 and that the intrinsic viscosity of the xylene soluble fraction of the composition was between 2.5 and 4.0 dl/g.

1.7.1 The polydispersity index (P.I.) of the propylene homopolymer A), it was argued, was in direct relation with the nature of the catalyst used during the preparation of that polymer. To that extent, the patent proprietor cited the values of polydispersity index disclosed in Table 2 of E20 for one phthalate based catalyst system (P.I. of 4.3) and one succinate catalyst system (P.I. of 6), and referred to two further succinate based catalyst systems in Table 2 of E21 for which the polydispersity index should be in the range of 4.6 to 10 and to the succinate based catalyst of example 1 of E4 (P.I. of 6). However, none of E20, E21 or E4 in fact explicitly teaches that the polydispersity index of a propylene homopolymer can be inferred from the nature of the catalyst nor did the patent proprietor provide a textbook knowledge in support of that allegation. The patent proprietor did not show that the alleged relation between polydispersity index and catalyst was indeed valid and part of the common general knowledge. Rather, the patent proprietor solely relied on a few measurements of the polydispersity index taken in isolation from compositions and process parameters disclosed in E20, E21 and E4 and based their conclusion that the compositions of the patent in suit should have a polydispersity index of 6 on the same value found in example 1 of E4 and in Table 2 of E20. In the absence of any evidence of that, the argument of the patent proprietor is speculative in nature. Furthermore it was made for the first time at the oral proceedings before the Board, that is at the last possible stage of the proceedings, so that its validity could not be further investigated. On the basis of what was made available to the Board by way of verifiable facts, the Board cannot conclude that the polydispersity index of the propylene homopolymer of the examples of the patent in suit had to be in the range of 4.6 to 10.

1.7.2 With regard to the intrinsic viscosity of the xylene soluble fraction of the whole composition, the patent proprietor argued that the values of that property were reported in Table 2 of the patent in suit, albeit erroneously under component b) while these values actually could only have been measured on the composition. It was in particular argued that the intrinsic viscosity of the xylene soluble fraction could in fact not be determined on the propylene copolymer b) shown in Table 2 of the patent in suit because the propylene copolymer b) was produced in the matrix of component a) and could thus not be obtained in isolated form to perform a measurement of its intrinsic viscosity. It is however apparent from E11, which is a US patent of the patent proprietor, that the intrinsic viscosity of the xylene soluble fraction of propylene copolymers produced in the course of a sequential polymerization process analogous to that used in the patent in suit can be determined (be it by direct measurement or by inference). In particular that parameter is reported for all the examples in Table 2 of column 11 even though in E11 the ethylene-propylene elastomeric copolymer(s) (two for some compositions) were produced in the propylene homopolymer matrix as in the patent in suit. With regard to the intrinsic viscosity, E11 discloses that it was measured under the conditions that happen to be the same as in the patent in suit (E11: column 7, lines 12/13 and patent in suit: paragraph 31). Since the intrinsic viscosity of the xylene soluble fraction of the propylene copolymer that corresponds to component B) in the patent in suit (named component b) in Table 2) can be determined in the case of the compositions of E11, which are similar to the compositions according to the patent in suit, there is no reason to assume that the intrinsic viscosity of the xylene soluble fraction reported for component B) in Table 2 of the patent in suit corresponds to the value of any other component or composition than component B) itself.

1.7.3 The Board thus concludes that the patent in suit does not disclose the values of polydispersity index of the propylene homopolymers A) and the values of the intrinsic viscosity of the xylene soluble fraction of the compositions disclosed in the examples of the patent in suit and it has not been shown that the values of these two parameters could be derived from the patent in suit or any other document. Any effect shown in the examples according to operative claim 1 can thus not be causally linked to any particular feature of the claim since that effect may also have resulted from the variations of any of the polydispersity index of the propylene homopolymers A) or the intrinsic viscosity of the xylene soluble fraction of the compositions or of the combination of these two features the values of which are not reported in the patent in suit. Comparisons of the compositions according to the examples of the patent in suit with compositions according to the examples of E4 can for the same reasons not establish the presence of an effect causally linked to the selection of the melt flow rate in the range defined in operative claim 1 since that effect could equally result from variations of the polydispersity index of the propylene homopolymers A) or of the intrinsic viscosity of the xylene soluble fraction of the composition, both of which not being disclosed in the patent in suit.

1.7.4 The patent proprietor argued that the intrinsic viscosity of the xylene soluble fraction of the composition would in fact not affect the Izod impact strength of the compositions. In particular it was argued on the basis of Figure 5.10 of E5 that the effect of the intrinsic viscosity of the xylene soluble fraction of the elastomeric component of an heterophasic composition on the Izod impact strength of the composition would be negligible in the range that was defined in operative claim 1 (2.5 to 4.0 dl/g). That argument implies that the intrinsic viscosity of the xylene soluble fraction of the elastomeric component would not be a relevant factor for the Izod impact strength and could thus be disregarded in the discussion of the presence of an improvement of that property over the composition of example 1 of E4. Figure 5.10 of E5 however only concerns the influence of the intrinsic viscosity of the xylene soluble fraction of the elastomeric component on the Izod impact strength at -30°C. The improvement relied upon by the patent proprietor in the formulation of the problem however concerned the Izod impact strength measured at 23°C and to a lesser extent at 0°C, as that can also be derived from Table 2 of the patent in suit. There is in E5 no teaching regarding the effect the intrinsic viscosity of the xylene soluble fraction of the elastomeric component could have on the Izod impact strength of the composition at any temperature above -30°C. It can thus not be concluded on the basis of E5 and from the arguments of the patent proprietor that the intrinsic viscosity of the xylene soluble fraction of component B) disclosed in Table 2 of the patent in suit had a negligible impact on the Izod impact strength at 23°C and at 0°C. In other words, the variations of the intrinsic viscosity of the xylene soluble fraction of the elastomeric component of the composition cannot be set aside in the discussion of inventive step and any improvement of the Izod impact strength at 23°C and at 0°C for the compositions reported in Table 2 of the patent in suit cannot be solely attributed to the variations of the melt flow rates of the propylene homopolymer A) and of the composition.

1.7.5 Besides, it was argued that since all the compositions of the examples of the patent in suit had been obtained from the same catalyst and essentially in the same conditions, the polydispersity index and the intrinsic viscosity of the xylene soluble fraction of the composition were not the relevant parameters that would cause the improvement of the Izod impact properties reported in Table 2. That argument however is speculative since even if it is assumed that for all the examples of the patent in suit the intrinsic viscosity of the xylene soluble fraction of the composition is within the range of 2.5-4.0 dl/g as defined in operative claim 1, there may still be significant variations of that parameter in the range of 2.5-4.0 dl/g between each example that cannot be simply disregarded. In that regard, the examples of the patent in suit do not show that any effect on the properties of the compositions produced can unequivocally be seen as being causally linked to the variations of the melt flow rate parameter and that the intrinsic viscosity of the xylene soluble fraction of the composition, which is another essential feature of operative claim 1, can be disregarded.

1.8 It follows that the examples in the patent in suit and in the closest prior art E4 relied upon by the patent proprietor do not allow to conclude that an effect can be attributed to the distinguishing features over operative claim 1, namely to the melt flow rate of the the propylene homopolymer A) in the range of 110 to 200 g/10 min and to the melt flow rate of the composition comprising the propylene homopolymer A) and the propylene copolymer, also referred as the rubber component by the parties in appeal, in the range of 30 to 80 g/10 min in operative claim 1.

1.9 Thus the problem is to be formulated as the provision of further propylene polymer compositions.

1.10 The skilled person, looking for further propylene polymer compositions, would consider variations of the composition already known from example 1 of the closest prior art E4 on the basis of what was known in the art. Example 1 of E4 describes the preparation of an heterophasic composition based on a propylene homopolymer analogous to component A) according to operative claim 1 and a propylene copolymer analogous to component B) according to operative claim 1. In example 1 of E4 the melt flow rate of the propylene homopolymer is 50.2 g/10 min (Table 1) and that of the heterophasic composition 21 g/10 min, both values being below the lowest values of the ranges 110 to 200 g/10 min and 30 to 80 g/10 min respectively defined for the propylene homopolymer A) and the composition in operative claim 1.

1.11 Beyond the value disclosed for example 1 of E4 (Table 1) the melt flow rate of the propylene homopolymer is not further addressed in E4 so that there is no reason to assume that it is particularly limited as long as its value makes technical sense in the context of E4. The prior art discloses similar compositions in which a propylene homopolymer matrix having higher melt flow rates was successfully used. For instance, the use of propylene homopolymers of higher melt flow rates in polypropylene heterophasic compositions showing a balance of mechanical properties are disclosed in E6 and/or E15, as shown below. As to the other differentiating feature of operative claim 1 over example 1 of E4, the melt flow rate value of the composition being in the range of 30 to 80 g/10 min, E4 already teaches that it can be comprised in the range of 0.5-45 g/10 min, a range that overlaps that of operative claim 1. Also, the documents E6 and E15, which disclose analogous propylene polymer compositions, teach ranges of that melt flow rate that also overlap with the range according to operative claim 1 (melt flow rate of the composition between 2-100 g/10 min in E6, page 11, lines 7-8; melt flow rate of the composition greater than about 60 g/10 min in paragraph 16 of E15).

1.11.1 E6 discloses propylene block copolymers comprising from 50 to 80 wt.-% of a propylene homopolymer, and from 20 to 50 wt.-% of a propylene copolymer (claim 1). Examples 1 and 2 of E6 provide heterophasic propylene copolymer containing a propylene homopolymer with a melt flow rate of 190 and 180 g/10 min respectively and an ethylene propylene rubber (EPR) with an intrinsic viscosity of 3.73 and 3.98 dl/g respectively (Tables I, III and IV). The melt flow rate of the final product is 51 and 31 g/10 min respectively (Table I).

1.11.2 In E15 also, samples A and B (page 12, table 2) are propylene polymer compositions comprising a homopolymer and a copolymer of propylene with ethylene. The melt flow rates of the propylene homopolymers are disclosed as being 139 and 153 dg/min (equivalent to 139 and 153 g/10 min) and the melt flow rates of the final composition are 78 and 74 g/10 min respectively (Table 2).

1.11.3 Both E6 and E15 describe heterophasic compositions based on a propylene homopolymer having a melt flow rate that is significantly higher than that disclosed in example 1 of E4 and that is well within the range of 110-200 g/10 min defined in operative claim 1. In that regard, the melt flow rates of the heterophasic compositions in these documents are also higher than the melt flow rate of example 1 of E4 and are in the range of 30-80 g/10 min defined in operative claim 1. E6 and E15 therefore hint at heterophasic compositions wherein the melt flow rates of both the propylene homopolymer component and of the composition are simultaneously within the ranges according to operative claim 1. In particular the composition according to example 2 of E6 has a melt flow rate (31 g/10 min) that is also according to the preferred range disclosed in the third paragraph on page 2 of E4.

1.11.4 The patent proprietor argued that the composition according to example H of E15 would have led the skilled person away from the range of 110-200 g/10 min for the melt flow rate of the propylene homopolymer defined in operative claim 1. In particular, it was argued that the best heterophasic composition in terms of ISO Notched Izod at 23°C (8.3 kJ/m^2) was the composition according to example H which had a melt flow rate of the propylene homopolymer of 61 g/10 min. In that regard, the value of ISO Notched Izod disclosed in Table 2 for example H is only marginally better than for examples A and B (7.14 kJ/m^2 and 8.03 kJ/m^2). It is thus doubtful whether the improvement of ISO Notched Izod of example H, while the ISO Notched Izod of examples A and B was still good, would have led the skilled person away from the teaching of examples A and B especially since the problem posed over E4 in the present case is to find further propylene polymer compositions. Besides, example H, which is characterized as a comparative example not according to the disclosure of E15 (paragraph 172) is disclosed to have a content of volatiles (125 µg/g) that is significantly worse than for examples A and B (47.7 µg/g and 55.6 µg/g respectively in Table 2). It is thus also doubtful that the skilled person would have turned to example H rather than to examples A and B.

1.12 Therefore, starting from the composition according to example 1 of E4, the skilled person looking for further propylene polymer compositions would have considered compositions in which the melt flow rates of the propylene homopolymer A) and of the composition are according to the ranges disclosed operative claim 1 as being obvious alternatives.

1.13 The Board concludes that claim 1 of the main request lacks an inventive step over E4 as the closest prior art.

First auxiliary request

2. Inventive step

2.1 Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the composition is further defined by having an "Izod impact strength measured at 23°C higher than 5 kJ/m^2".

2.2 That feature of operative claim 1 however is already fulfilled by the composition of example 1 of E4 since the Izod impact strength for that composition is 6.6 kJ/m^2 (Table 2). In that regard, claim 1 of the first auxiliary request does not differ from the composition of example 1 of E4 any further than claim 1 of the main request. As accepted by the parties, who did not provide additional arguments, the same reasoning and the same conclusion of lack of inventive step as outlined for claim 1 of the main request therefore apply to claim 1 of the first auxiliary request.

Second to fourth auxiliary requests

3. Admittance

3.1 The second to fourth auxiliary requests were filed by the patent proprietor with the reply to the statements of grounds of appeal of the opponents. With regard to the reasons for filing these requests and why they would overcome objections retained against higher ranking requests, the last paragraph of the reply only mentions that the arguments of inventive step given for the main request would apply *a fortiori* to claim 1 of the second and third auxiliary requests in which the range of values for the intrinsic viscosity of the xylene soluble fraction has been limited to 3.0-4.0 dl/g and 3.0-3.5 dl/g respectively, thereby further differentiating the claimed invention from example 1 of E4 and requiring an additional selection. That would be even more so for claim 1 of the fourth auxiliary request wherein the range of values for the melt flow rate of the composition was restricted so as to exclude the values of the examples of E15.

3.2 It is apparent that the appellant only generically addressed claim 1 of the second to fourth auxiliary request in terms of the distance created by the limitations with no argumentation on the consequences of the amendments on the presence of effects, the formulation of the technical problem and obviousness, thereby mainly relying on the argumentation provided for the main request.

3.3 The Board indicated in section 5.1.3 of the preliminary opinion dated 3 January 2020 that it was unclear which effects were supposed to result from the limitation performed in claim 1 of these requests and how the amendment could contribute to an inventive step with regard to the closest prior art E4 or E15. The patent proprietor did not react in writing to the preliminary opinion of the Board but they argued at the oral proceedings before the Board that there would be a need to expand on the argumentation of inventive step specifically for the second to fourth auxiliary requests. That would have however have been the first time in appeal that a proper argumentation on inventive step for these requests different from the one for the main request would have been heard by the opponents and the Board.

3.4 The admittance of the auxiliary requests filed by the patent proprietor with the reply to the statements of grounds of appeal of the opponents is subject by virtue of Article 25(2) RPBA 2020 to Article 12(4) RPBA 2007, that states that "everything presented by the parties ... shall be taken into account by the Board if and to the extent it ... meets the requirements in [Article 12](2)". Article 12(2) RPBA 2007 is therefore also implicitly applicable under Article 25(2) RPBA 2020. Thus the auxiliary requests are only to be taken into account if the reply of the proprietor to the statements of grounds of appeal of the opponents sets out clearly and concisely why the patent should be maintained in amended form according to any of these requests, in other words why they would overcome the objections raised in the contested decision and in the submissions of the opponents that were not overcome by a higher ranking request, should the Board come to the conclusion that the higher ranking requests were not allowable. This requirement was not complied with by the patent proprietor in respect of the second to fourth auxiliary requests filed with their reply to the statements of grounds of appeal of the opponent in view of the analysis made above (points 3.1 to 3.3) and they are therefore not to be taken into account under Article 12(4) RPBA 2007.

3.5 For the above reasons the second to fourth auxiliary requests are not to be admitted into the proceedings.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

B. ter Heijden D. Semino

Decision electronically authenticated