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**Datasheet for the decision
of 29 June 2017**

Case Number: T 0100/14 - 3.3.03

Application Number: 06725255.1

Publication Number: 1874838

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Title of invention:
PROPYLENE POLYMER COMPOSITION FOR THERMOFORMING

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

Relevant legal provisions:
EPC Art. 56

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



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Case Number: T 0100/14 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 29 June 2017

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 11 November
2013 revoking European patent No. 1874838
pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
C. Brandt

Summary of Facts and Submissions

I. European Patent No. 1 874 838 was granted on the basis of 8 claims, claim 1 reading as follows:

"1. A propylene polymer composition comprising (weight percentages being referred to the sum of A+B):

(A) 60-90% by weight of a copolymer of propylene with ethylene containing less than 2.5%wt of ethylene units; and

(B) 10-40% by weight of a copolymer of propylene comprising from 15 to 35%wt of ethylene units,

said polymer composition having a melt flow rate value according to ISO 1133 (230°C, 2.16 Kg) of less than 10 g/10min."

II. A notice of opposition was filed in which revocation of the patent in its entirety was requested.

III. During opposition proceedings, reference was made to *inter alia* D1 (US 5,298,561).

IV. The decision of the opposition division to revoke the patent was announced at the oral proceedings on 23 October 2013. The decision was based on a main request filed on 25 July 2011, claim 1 of that request reading as follows:

"1. A propylene polymer composition comprising (weight percentages being referred to the sum of A+B):

(A) 60-90% by weight of a copolymer of propylene with ethylene containing less than 2.5%wt of ethylene units; and

(B) 10-40% by weight of a copolymer of propylene comprising from 15 to 35%wt of ethylene units,

said polymer composition having a melt flow rate value according to ISO 1133 (230°C, 2.16 Kg) of less than 10 g/10min and fulfils the following equation (1)

$$XS(tot) \times [C2(tot) - C2(A)] \geq 65$$

Wherein C2(A) is the mole percent of the comonomers in the copolymer (A), C2(tot) is the total mole percent of comonomers in the propylene polymer composition and XS(tot) is the total xylene soluble fraction of the propylene polymer composition (percent by weight)."

V. The decision of the opposition division, as far as relevant to the present decision, can be summarised as follows:

D1 was the closest prior art. Starting from the composition of example 1 of D1, which differed from claim 1 only in that equation (1) was not fulfilled, the problem solved by the claimed subject matter was to provide an alternative propylene polymer composition. As the skilled person only had to perform ordinary variations of the composition within the frame of D1 in order to obtain compositions according to the claimed subject matter, claim 1 did not involve an inventive step.

VI. The proprietor (appellant) lodged an appeal against that decision. With the statement setting out the grounds of appeal, the appellant filed an auxiliary request. Claim 1 of that request differed from claim 1 of the main request in that the range defining the amount in copolymer (A) was reduced from 60-90% by

weight to 75-88% by weight and the range defining its ethylene content was reduced from less than 2.5% wt to less than 2%wt of ethylene units. Also, the range defining the amount in copolymer (B) was consequently reduced from 10-40% by weight to 12-25% by weight and the range defining its ethylene content was reduced from 15 to 35%wt to 18 to 30%wt of ethylene units.

VII. In its reply to the statement of grounds of appeal, the opponent (respondent) maintained inter alia the objection of lack of inventive step over document D1.

VIII. In a communication sent in preparation of oral proceedings, the Board summarised the points to be dealt with and provided a preliminary view on the disputed issues.

IX. Further arguments and a table containing estimated values of equation (1) relying on example 1 of D1 were provided by the respondent in a letter dated 29 May 2017.

X. Oral proceedings were held on 29 June 2017.

XI. The arguments provided by the appellant, as far as relevant to the present decision, can be summarised as follows:

Main request and auxiliary request

Inventive step

Example 5 of D1 represented the closest prior art in view of the properties of the composition, which were more in line with the purpose of the patent in suit. The claimed subject matter was however also inventive

in view of example 1 of D1 as closest prior art. The problem solved in view of D1 was to provide alternative propylene polymer compositions. Starting from example 1 of D1, the skilled person would not have considered raising the amount in (B) when looking for alternative compositions, so as to satisfy equation (1) of claim 1 of the main request. This followed from the examples of D1, in particular from example 5, which showed that improved properties were in fact achieved when the amount in (B) was below 10%wt in the compositions and its content in ethylene units was high. Claim 1 of the main request was therefore inventive over D1. The same arguments applied to the auxiliary request.

XII. The arguments of the respondent, as far as relevant to the present decision, can be summarised as follows:

Main request and auxiliary request

Inventive step

Example 1 of D1 represented the closest prior art. D1 disclosed propylene polymer compositions having good optical properties as well as good rigidity. It had not been shown that the claimed compositions had improved properties with respect to the ones of D1. The patent in suit therefore provided no contribution over the prior art and the problem solved was the provision of an alternative propylene polymer composition. Starting from example 1 of D1, the skilled person only had to increase the amount in (B) to obtain a composition fulfilling equation (1) of the patent in suit. That was obvious to the skilled person as was shown in the table provided on 29 May 2017. Working with 20 wt% of (B), which was within the preferred range of D1, lead to a composition according to claim 1 of the patent in suit.

Claim 1 therefore lacked an inventive step. The same arguments applied to the auxiliary request.

XIII. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the amended main request filed with letter dated 25 July 2011 underlying the impugned decision or, alternatively, on the basis of the auxiliary request, filed with the statement setting out the grounds of appeal.

XIV. The respondent requests that the appeal be dismissed.

Reasons for the Decision

Main request

1. Inventive step

1.1 Closest prior art

1.1.1 The document identified as the closest prior art in the decision of the opposition division was D1. D1 was also seen by both parties as the closest prior art in appeal. Since D1 (column 2, lines 20-21 and lines 59-63) and the patent in suit (paragraph 9) relate to the same problem (favourable balance of rigidity, impact resistance and transparency), the Board does not see any reason to depart from D1 as the closest prior art.

1.1.2 D1 discloses (claim 1) a polymer composition obtained by sequential polymerization consisting essentially of:
a) 70-98% by weight of a crystalline copolymer of propylene with ethylene and/or with a $\text{CH}_2=\text{CHR}$ alpha olefin, where R is a linear or branched alkyl radical

with 2-8 carbon atoms containing 85 to 99.5% by weight of propylene,
b) 2-30% by weight of elastomeric copolymer of ethylene with propylene and/or a $\text{CH}_2=\text{CHR}$ olefin, where R is defined as above containing from 20 to 70% by weight of ethylene, said copolymer (b) being partially soluble in xylene at room temperature and being furthermore characterized by further conditions involving the ratio between the ethylene weight content in the copolymer and the weight of the portion of copolymer soluble in xylene and a relation of intrinsic viscosities of the portion soluble in xylene and that of the crystalline propylene copolymer a).

- 1.1.3 The crystalline copolymer of propylene with ethylene (a) of claim 1 of D1 is analogous to the copolymer of propylene with ethylene (A) according to the patent in suit and the elastomeric copolymer of ethylene with propylene (b) of claim 1 of D1 is analogous to the copolymer of propylene (B) of the patent in suit.
- 1.1.4 Example 1 of D1 (see description, bottom of column 6 to column 9 and table 1) discloses a composition displaying a melt flow rate of 2.5 g/10min and comprising 90 wt% of a crystalline copolymer of propylene with ethylene (a) having an ethylene content of 2.3 wt% and 10 wt% of an elastomeric copolymer of ethylene with propylene (b) having a calculated ethylene content of 24.3 wt% (the value is derived from the data in the table and was not disputed by the parties). The value of equation (1) for that composition was calculated by the parties to be 45.76, below the threshold value of 65 according to claim 1 of the patent in suit. The compositions according to claim 1 of the main request therefore only differ from the composition of example 1 of D1 in the value of equation

(1).

1.1.5 Example 5 of D1 (see same passages and table as given for example 1) discloses a propylene polymer composition displaying a melt flow rate of 1.2 g/10 min and comprising a copolymer of propylene with ethylene (a) containing less than 2.5%wt of ethylene units (2.4%wt) and a copolymer of propylene (b). It was not disputed that equation (1) was fulfilled in the case of that composition. The composition of example 5 is however not according to claim 1 of the patent in suit since the amount in (B) (8%wt) and its content in ethylene units (49.9%wt, the value is derived from the data in the table and was not disputed by the parties) are both outside the ranges according to claim 1 of the main request. The compositions according to claim 1 of the main request therefore differ from the composition of example 5 by two structural features, namely the amount in copolymer (B) in the composition and its content in ethylene comonomer.

1.1.6 The compositions of example 1, and respectively example 5, of D1 display a flexural modulus (780 MPa resp. 880 MPa) a ductile/brittle temperature (-8°C resp. -14°C) and haze (31.0% resp. 24.7%) that are within what the patent in suit sets out to achieve in paragraph 11 (flexural modulus lower than 1200 MPa, ductile/brittle temperature not higher than 5°C and haze value measured on 1 mm plaque not higher than 40%). The compositions of example 1 and example 5 of D1 are therefore both according to the aim of the patent in suit as far as their properties are concerned. The composition of example 1 of D1 however involves the minimum differences with respect to the claimed subject matter, since it is only distinguished therefrom by the value taken by equation (1). For these reasons, the

composition of example 1 is considered to be the disclosure of D1 that is the closest to the subject matter of the main request.

1.2 Technical problem

- 1.2.1 The patent in suit contains four examples of propylene polymer compositions according to claim 1 of the main request. These propylene polymers were prepared in a two-step polymerization process under conditions of temperature, pressure and monomer content defined in paragraphs 49-51 and Table 1 of the patent in suit. Specific additives disclosed in Table 2 were admixed to the resulting polymers that were then extruded to provide the propylene polymer compositions. The patent in suit does not contain comparative examples with the compositions of D1 and since the compositions disclosed in the examples of the patent in suit contain different additives (Calcium Stearate and Millad 3988) than those added in D1 (di-benzylidenesorbitol) and were obtained under different conditions from those disclosed in D1 (extrusion is not mentioned in D1), the properties of the compositions of these two documents cannot be compared directly with one another in a meaningful way. As a consequence, no effect or improvement can be acknowledged for the compositions of claim 1 characterized by the value of equation (1) with respect to the composition of example 1 of D1.
- 1.2.2 As a result, the problem solved by the claimed subject matter can only be seen as the provision of alternative propylene polymer compositions.

1.3 Obviousness

1.3.1 It remains to be determined whether the claimed subject matter was obvious to a person skilled in the art starting from the closest prior art D1 and in particular from example 1 of that document. The question posed is whether the skilled person would have expected a propylene polymer composition similar to that of example 1 of D1 and such that it satisfies the equation (1) of the main request to be an alternative propylene polymer composition to the composition of that example.

1.3.2 Equation (1) is defined in claim 1 of the main request by a condition on the product $XS(tot) \times [C2(tot) - C2(A)]$. In that product, $C2(A)$ represents the mole percent of the comonomers in the copolymer (A), in the case of the examples of D1 and of the patent in suit, these comonomers are ethylene only. $C2(tot)$ represents the total mole percent of comonomers in the propylene polymer composition. That entails in the examples of D1 and of patent in suit the ethylene present both in copolymer (A) and in copolymer (B). Since copolymer (B) has a higher content of ethylene units than copolymer (A) both in D1 and in the patent in suit, any increase of the amount in (B) in the propylene composition also increases the value of $C2(tot)$ and consequently leads to an increase of the value of $[C2(tot) - C2(A)]$, all other conditions remaining the same. $XS(tot)$ in equation (1) represents the total xylene soluble fraction of the propylene polymer composition (percent by weight). That fraction is primarily composed of copolymers containing the highest amount in ethylene which are, in the case of D1, the elastomeric copolymer b) of Fraction II (column 2, lines 40 and 41)

corresponding to the copolymer (B) according to claim 1 of the patent in suit. Raising the amount in (B) in the propylene composition thus results in an increase of $XS(tot)$. The value of the product $XS(tot) \times [C2(tot) - C2(A)]$, on which equation (1) relies, increases therefore with the amount in copolymer (B) in the propylene composition due to the increase in both factors of the product. That was exemplified by the respondent in a table provided on page 6 of his letter dated 29 May 2017. The estimates reported therein suggest that increasing amounts in (B) in the propylene composition would rapidly result in a value for the product $XS(tot) \times [C2(tot) - C2(A)]$ of above 65, the threshold set out in claim 1 of the main request (45.6 for 10%wt in (B); 51.7 for 11%wt; 62.0 for 12.5%wt, 81.8 for 15%wt and 130.2 for 20%wt). These data were not contested by the appellant and clearly correspond to what is expected by the skilled person in view of the the clear effect of an increase in the amount of (B) on both terms of the product.

1.3.3 Starting from example 1 of D1, the propylene polymer composition contains 10%wt of a copolymer of propylene having 24.3%wt of ethylene units. That elastomeric copolymer corresponds to the copolymer (B) of claim 1 of the main request. The value that was calculated for $XS(tot) \times [C2(tot) - C2(A)]$ (equation (1)) in the case of example 1 was 45.6. Claim 1 of D1 already sets out that the amount in elastomeric copolymer b) in the polymer composition that is also partially soluble in xylene at room temperature may vary from 2 to 30%wt, the range 5 to 20%wt being the preferred one (column 2, lines 35 and 36). As explained above, raising the amount of that copolymer in the polymer composition of D1 raises the value of $XS(tot) \times [C2(tot) - C2(A)]$. The estimates provided by the opponent in May 2017 suggest that

raising the amount in (B) to 15%wt results already in a value of 81.8 for equation (1), largely above the threshold of 65 set out in claim 1 of the main request. Polymer compositions based on example 1 of D1 and for which the amount in elastomeric copolymer is chosen in the upper part of the broadest range (2-30%wt) or also of the preferred range (5-20%wt) disclosed in D1 therefore satisfy equation (1) of the main request. The person skilled in the art looking for alternative compositions would consider such a variation, which is within the teaching of D1, as a possible solution to the posed problem, thereby obtaining a composition according to claim 1 of the main request.

- 1.3.4 It remains to be analysed whether indications exist in D1 which could have discouraged the skilled person from doing so, as submitted by the appellant. As regards the variation of the amount in elastomeric copolymer of ethylene in the polymer composition, D1 discloses that the percentage by weight of that copolymer (Fraction II) is comprised between 2 and 30%, preferably between 5 and 20% by weight of the final composition and that that amount is critical in the sense that lower percentages are insufficient for the achievement of a satisfactory level of impact resistance, while higher percentages cause an excessive decrease of rigidity (column 2, line 64 to column 3, line 3). There is in D1 no teaching against using a percentage of elastomeric copolymer of up to 30%wt in the polymer composition. Among the ten examples that are according to the subject matter of D1, examples 8, 9 and 10 all point to the use of an amount in elastomeric copolymer of above 10%wt (10.3%wt in example 8; 13.0%wt in example 9 and 10.7%wt in example 10) with properties that are roughly as good as the properties of other compositions containing less elastomeric copolymer. Moreover, the

whole document contains no indication that would lead the skilled person to disregard a part of the range which is explicitly disclosed and clearly suggested. The argument of the proprietor according to which the skilled person would not have raised the amount in elastomeric copolymer above 10%wt in D1 is therefore not persuasive.

- 1.3.5 In view of the above, the Board concludes that the subject matter of claim 1 of the main request is obvious in view of D1 as the closest prior art.

Auxiliary request

2. Inventive step

2.1 Claim 1 of the auxiliary request differs from claim 1 of the main request in that the range defining the amount in copolymer (A) was reduced from 60-90% by weight to 75-88% by weight and the range defining its ethylene content was reduced from less than 2.5%wt to less than 2%wt of ethylene units. Also, the range defining the amount in copolymer (B) was consequently reduced from 10-40% by weight to 12-25% by weight and the range defining its ethylene content was reduced from 15 to 35%wt to 18 to 30%wt of ethylene units.

2.2 The parties have not presented any new argument regarding inventive step of the auxiliary request. In particular, it was not disputed that D1 remained the closest prior art for the auxiliary request and it was not submitted that by virtue of the amendments any effect or improvement was achieved.

2.3 Example 1 of D1 discloses a polymer composition comprising 90% by weight of a propylene copolymer

corresponding to (A) in the patent suit and having an ethylene content of 2.3%wt. The composition of example 1 also comprises 10% by weight of an elastomeric copolymer corresponding to (B) in the patent in suit and having an ethylene units content of 24.3%wt (see paragraph 1.1.4, above).

2.4 The composition of claim 1 of the auxiliary request therefore differs from the polymer composition according to example 1 of D1 in the ratio of its copolymers (A) and (B), in the ethylene content in copolymer (A) and in the value of equation (1). Since no data was available establishing that the claimed subject matter of the auxiliary request solved a different problem than that formulated for the main request, the problem remains the provision of alternative propylene polymer compositions.

2.5 As to the ratio of the copolymers in the polymer composition and in particular the amount in copolymer (B), it has already been shown above (points 1.3.1 to 1.3.5) that the skilled person would have considered raising the amount in that copolymer above 10%wt and up to 30%wt arriving therefore at the range of 12-25%wt now claimed in the auxiliary request. The same reasoning therefore also applies to equation (1) present in claim 1 of the auxiliary request. D1 also teaches that the ethylene content in the copolymer (A) can be chosen between 0.5 and 10%wt (column 2, line 33), therefore also within the range of less than 2%wt now claimed. Since the limitation of that range was not shown to result in an effect not already present in the composition of example 1 of D1 and since an ethylene content of less than 2%wt is already taught in D1, also this choice cannot be seen as an inventive solution to the problem of providing an alternative. The conclusion

reached with respect to inventive step remains therefore the same as for the main request.

3. As all the requests which are in the proceedings do not meet the requirements of Article 56 EPC, the appeal is to be dismissed and there is no need for the Board to decide on any other issue.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



K. Boelicke

D. Semino

Decision electronically authenticated