

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 17 December 2021**

**Case Number:** T 1748/18 - 3.3.03

**Application Number:** 13166121.7

**Publication Number:** 2799487

**IPC:** C08L23/08

**Language of the proceedings:** EN

**Title of invention:**

Composition

**Patent Proprietor:**

Borealis AG

**Opponent:**

Basell Polyolefine GmbH

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

Inventive step (yes)

**Decisions cited:**

T 0706/17



**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 1748/18 - 3.3.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.03**  
**of 17 December 2021**

**Appellant:** Basell Polyolefine GmbH  
(Opponent) Brühler Strasse 60  
50389 Wesseling (DE)

**Representative:** LyondellBasell  
c/o Basell Poliolefine Italia  
Intellectual Property  
P.le Donegani 12  
44122 Ferrara (IT)

**Respondent:** Borealis AG  
(Patent Proprietor) IZD Tower  
Wagramerstraße 17-19  
1220 Vienna (AT)

**Representative:** Dehns  
St. Bride's House  
10 Salisbury Square  
London EC4Y 8JD (GB)

**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 9 May 2018  
rejecting the opposition filed against European  
patent No. 2799487 pursuant to Article 101(2)  
EPC.**

**Composition of the Board:**

**Chairman** O. Dury  
**Members:** F. Rousseau  
R. Cramer

## Summary of Facts and Submissions

I. The appeal lies against the decision by the opposition division, posted on 9 Mai 2018, rejecting the opposition against European patent No. 2 799 487 whose claims 1, 2, 16 and 17 read as follows:

"1. A high density polyethylene blend, comprising

- (A) 70 to 98 wt% of a high density multimodal polyethylene component having a density of at least  $940 \text{ kg/m}^3$ , and an  $\text{MFR}_5$  of less than  $1.0 \text{ g/10min}$ ;
- (B) 2 to 20 wt% of an ultra-high molecular weight polyethylene copolymer, e.g. with a C3-8 alpha olefin, having an intrinsic viscosity of at least  $7 \text{ dl/g}$  and an  $\text{MFR}_{21}$  of less than  $0.5 \text{ g/10min}$  (UHMW polyethylene copolymer);

and wherein said blend has an  $\text{MFR}_{21}$  of 0.5 to  $10.0 \text{ g/10min}$  and a density of at least  $940 \text{ kg/m}^3$ .

2. A high density polyethylene blend, comprising

- (A) 70 to 98 wt% of a high density multimodal polyethylene component having a density of at least  $940 \text{ kg/m}^3$ , and an  $\text{MFR}_5$  of less than  $1.0 \text{ g/10min}$ ;  
and
- (B) 2 to 20 wt% of an ultra-high molecular weight polyethylene copolymer, e.g. with a C3-8 alpha olefin, having a nominal viscosity molecular weight  $M_v$  of at least  $800,000 \text{ g/mol}$  and an  $\text{MFR}_{21}$  of  $0.5 \text{ g/10min}$  or less (UHMW polyethylene);

and wherein said blend has an MFR<sub>21</sub> of 0.5 to 10.0 g/10min and a density of at least 940 kg/m<sup>3</sup>.

16. A process for the preparation of a polymer blend having an MFR<sub>21</sub> of 0.5 to 10.0 g/10min and a density of at least 940 kg/m<sup>3</sup> said process comprising:

(I) polymerising ethylene in a loop reactor in the presence of a catalyst, e.g. a Ziegler Natta catalyst, so as to form a lower molecular weight component;

(II) transferring the reaction mixture from step (I) to a gas phase reactor and polymerising ethylene and at least one C3-8 alpha olefin in the presence of the lower molecular weight component and the catalyst and in the absence of hydrogen so as to form 2 to 20 wt% of a UHMW copolymer component; and

(III) after a period of time of, e.g. at least 1 minute, adding hydrogen to said gas phase reactor so as to form a HMW copolymer component so that the LMW and HMW components combined form 70 to 98 wt% of a high density multimodal polyethylene component.

17. A process for the preparation of a blend as hereinbefore defined comprising mixing

(A) 70 to 97 wt% of a high density multimodal polyethylene component having a density of at least 940 kg/m<sup>3</sup>, and

(B) 2 to 20 wt% of an ultra-high molecular weight polyethylene copolymer having an intrinsic viscosity of at least 7 dl/g and an MFR<sub>21</sub> of less than 0.5 g/10min (UHMW polyethylene copolymer); and optionally

(C) 1 to 20 wt% of an ultra-high molecular weight polyethylene homopolymer having an intrinsic viscosity of at least 6 dl/g and an MFR<sub>21</sub> of less than 0.5 g/10min (UHMW polyethylene homopolymer);

and extruding at least twice, such as three times, the same so as to form a blend having an MFR<sub>21</sub> of 0.5 to 10 g/10min and a density of at least 940 kg/m<sup>3</sup>."

II. The opposition proceedings were based among others on the following items of evidence:

D1: US 6,218,472 B1

D2: US 4,835,219

D3: WO 2010/008964 A1

D4: US 4,336,352

III. According to the reasons for the contested decision which are pertinent for the appeal proceedings:

(a) Sufficiency of disclosure and novelty were acknowledged.

(b) Regarding inventive step, D1 could be considered as closest prior art for the subject-matter of claims 1 and 2, example 3 of D1 coming closest to the composition of claim 1 of the contested patent. The blends of claim 1 were distinguished from that of example 3 of D1 by a lower amount of ultra-high molecular weight polyethylene (UHMW PE) copolymer being 2-20 wt% and the MFR<sub>5</sub> of the high density multimodal polyethylene component being less than 1.0 g/10 min.

(c) Although the UHMW PE copolymer was present at a lower level, the blends of the contested patent

exhibited as shown by the examples of the patent in suit "*excellent mechanical and rheological properties*" expressed by a "*good shear thinning behaviour*". As a result a blend "*with a well-balanced property profile*" was obtained and the problem solved was considered to be "*the provision of an improved high density polyethylene blend*".

- (d) In view of examples 1-3 of D1, the skilled person would be taught to use contents of the UHMW PE copolymer significantly higher than 20 wt%. Using a content of 15 wt% for said component, as taught in D1, would most probably lead to a  $MFR_{21}$  of the total composition outside the range defined in granted claim 1. Since D1 was mainly concerned with catalyst aspects, the skilled person would rather modify the catalysts for producing polyethylene blends with improved properties than selecting a content of UHMW PE copolymer, a high density multimodal polyethylene component with an  $MFR_5$  and a  $MFR_{21}$  for the overall composition within the limits defined in granted claim 1. D3 also could not suggest the claimed solution as it merely taught to use higher amounts for the UHMW component. Accordingly, the subject-matter of claim 1 was inventive. The same held true for the subject-matter of claim 2, wherein component (B) was not characterized by a minimum intrinsic viscosity, but by a minimum nominal viscosity molecular weight  $M_v$ .
- (e) Concerning the process claim 16, D4 was not suitable as closest prior art, because it did not concern the production of a polymer blend comprising an ethylene copolymer. Even if starting from D4, which described the production of ethylene

homopolymers, a process according to claim 16 would not be rendered obvious, as the opponent had not provided a reasoning as to why selecting a loop reactor in the first step of the process, the weight proportions for UHMW and HMW copolymers and a MFR<sub>21</sub> for the blend as defined in claim 16 would be obvious.

(f) Claim 17 implicitly concerned a process for preparing the compositions defined in claims 1 to 14. Its subject-matter was therefore also inventive.

- IV. An appeal against that decision was lodged by the opponent (appellant).
- V. In response to the statement of grounds of appeal submitted with letter of 7 September 2018, the patent proprietor (respondent) submitted with letter of 28 January 2019 a rejoinder to which were attached Auxiliary Requests I to XI whose wording is not relevant for the decision.
- VI. Referring to the Board's preliminary opinion provided in a communication of 27 September 2021, the appellant and the respondent provided additional submissions with letters of 14 October 2021 and 19 October 2021, respectively. An additional Auxiliary Request XII was attached to the respondent's letter of 19 October 2021.
- VII. Oral proceedings before the Board were held by videoconference on 17 December 2021 during which the respondent confirmed that Auxiliary Requests I and V were withdrawn.

VIII. The appellant's submissions, in so far as they are pertinent, may be derived from the reasons for the decision below. They are essentially as follows:

- (a) Product claims 1 and 2 as granted lacked an inventive step over the resin prepared in example 3 of D1, taken as the closest prior art. Faced with the problem of providing an alternative composition having good mechanical properties and processability making it suitable for the preparation of pipes, a decrease of the amount of the ultra-high molecular weight polyethylene copolymer in accordance with feature (B) would be suggested by D1, while the selection of the MFR<sub>5</sub> of the component defined with feature (A) and the MFR<sub>21</sub> of the overall composition would represent arbitrary and therefore obvious measures for the skilled person.
- (b) Process claim 16 as granted did not involve an inventive step over example 4 of D2.
- (c) If claim 1 as granted were to involve an inventive step, the same conclusion would apply to process claim 17 as granted.

IX. The submissions of the respondent, in so far as they are pertinent, may be derived from the reasons for the decision below. They are essentially as follows:

- (a) Product claims 1 and 2 as granted involved an inventive step over example 3 of D1 taken as the closest prior art. Having regard to the problem of preparing an alternative polymer blend with excellent mechanical properties and processability, the adjustment of product claims 1 and 2 should be



considered to be non obvious, since contrary to the appellant's allegations, the amount of the ultra-high molecular weight polyethylene copolymer in accordance with feature (B), the  $MFR_5$  of the component defined with feature (A) and the  $MFR_{21}$  of the overall composition mutually influenced each other. In the absence of any indication how those could be varied simultaneously, it could not be concluded that the skilled person would have arrived in an obvious way at the products of claims 1 and 2.

(b) The appellant's submissions were much too vague in respect of both the claimed features and the disclosure of the prior art to conclude that claim 16 as granted lacked an inventive step.

(c) Process claim 17 as granted was inventive at least for the reasons provided in respect of claim 1 to which it implicitly referred.

X. The appellant requested that the decision under appeal be set aside and the patent be revoked.

XI. The respondent requested that the appeal be dismissed, or alternatively that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of any of Auxiliary Requests II to IV or VI to XI filed with the reply to the statement of grounds of appeal, or on the basis of the claim of Auxiliary Request XII filed with letter of 19 October 2021.

## **Reasons for the Decision**

### *Main request (patent as granted)*

The sole issue in dispute is whether the subject-matter of claims 1, 2, 16 and 17 involves an inventive step.

### *Inventive step - claim 1*

#### *Closest prior art*

1. The claimed invention concerns a multimodal polyethylene composition and articles, preferably pipes, made from that multimodal polyethylene composition and a process for its preparation (paragraph [0001], claims 1, 3 and 15 of the patent in suit). According to paragraph [0007], it was sought by the inventors to prepare a polymer blend with excellent processability and which offers advantages in terms of mechanical properties, in particular impact strength.
- 1.1 D1 also concerns a process for the preparation of polyethylene resins having a multimodal molecular weight distribution and exhibiting outstanding mechanical properties among others for pipe applications (column 1, lines 6-11). The multimodal molecular weight distribution of the composition obtained in D1 allows to achieve a combination of improved mechanical properties of the pipe resin, without compromising its processability (column 4, lines 41-45 and 56-58).
- 1.2 In agreement with the opposition division, the parties take the composition described in example 3 of D1 as

starting point for analysing inventive step. In the absence of any indication that another disclosure within D1 would come structurally and functionally closer to the blend of granted claim 1, the Board is satisfied that the composition described with example 3 of D1 represents the closest prior art and therefore the starting point for assessing inventive step.

*Distinguishing features*

2. The polyethylene resin obtained with example 3 of D1 (passage from column 13, line 52 to column 14, line 31) is a blend of a low density PE copolymer, a medium density PE homopolymer and a high density PE homopolymer. Those resins are referred to in D1 as the first, second and third PEs, respectively. The blend of these three resins has a density of  $944 \text{ kg/m}^3$  and a  $\text{MFR}_{21}$  value of  $3.9 \text{ g/10 min}$  (D1: column 14, lines 27-28). The parties agree that this blend meets therefore the overall density and  $\text{MFR}_{21}$  requirements of operative claim 1. In this respect, it is undisputed that a HLMI (high-load melt index) of  $3.9 \text{ g/10 min}$  as described in example 3 of D1 corresponds to a  $\text{MFR}_{21}$  having the same value, as both parameters are measured using a load of  $21.6 \text{ kg}$  at  $190 \text{ }^\circ\text{C}$  (paragraph [0104] of the patent in suit and column 3, lines 7-9 of D1). As addressed below, the appellant's reasoning was based firstly on an analysis of the first PE of the blend described with example 3 of D1 and secondly on the remaining part of that resin blend, i.e. the mixture of the second and third PE resins.

2.1 As regards the low density PE copolymer (first PE) according to example 3 of D1, it has a density of  $905 \text{ kg/m}^3$  and an  $\text{MFR}_{21}$  of  $0.03 \text{ g/10 min}$  (D1: column 13, lines 58-60). Having regard in particular to the

correspondence between the intrinsic viscosity and the  $MFR_{21}$  values indicated in table 1 of the patent in suit at the top of page 16 for a specific ultra-high molecular weight polyethylene (UHMW PE) "UHMW-PE5" the appellant submits that the first PE of Example 3 of D1 also exhibits an intrinsic viscosity of at least 7 dl/g as required by operative claim 1. This finding, which was adhered to by the opposition division, is not disputed by the respondent. On that basis the Board has no reason to take a different view. Accordingly, as submitted by the appellant the low density PE copolymer described in Example 3 of D1 (first PE) is therefore an UHMW PE as defined for feature (B) of operative claim 1.

However, the first PE makes up in example 3 of D1 27 wt% of the obtained blend (column 14, line 25), whereas operative claim 1 requires that the UHMW PE copolymer is comprised in an amount of 2 to 20 wt% of the blend.

In agreement with the contested decision, the Board is therefore satisfied that the blend in accordance with operative claim 1 differs from that of the closest prior art in that the UHMW PE copolymer of feature (B) is used in a lower amount, i.e. in the range of 2 to 20 wt%.

- 2.2 Concerning the second and third (homopolymer) PEs of example 3 of D1 which constitute the remaining part of the resin blend described in example 3 of D1, the question arises whether it corresponds to a resin as defined with feature (A) of claim 1. Said second and third resins are produced using two reactors in series with the same Ziegler-Natta catalyst leading to a bimodal resin accounting for 73 wt% of the blend (see

column 14, lines 25-27: 25 wt% and 48 wt% for the second and third PE resins, respectively).

The medium density PE homopolymer (second PE) has a density of 948 kg/m<sup>3</sup> and an MFR<sub>21</sub> of 0.12 g/10 min.

The high density PE homopolymer (third PE) has a density of 968,5 kg/m<sup>3</sup> and a MI<sub>2</sub> (equivalent to a MFR<sub>2</sub> as also measured using a load of 2.16 kg at 190°C; paragraph [0104] of the specification and column 12, lines 44-46 of D1) of 65 g/10 min.

The density of the blend of the second and third PEs is not provided in D1, but it is indisputably above 940 kg/m<sup>3</sup>, as these two resins have a density above that limit.

It is also undisputed that the MFR<sub>5</sub> of the blend of the second and third PEs is not described in D1. In this respect the respondent argues that no evidence has been submitted that the blend of these second and third PEs fulfils the MFR<sub>5</sub> requirement defined for feature (A) of the present claim 1. It is put forward by the respondent that the MFR<sub>5</sub> of said blend is in fact considerably above 1.0 g/10 min, as could be generally predicted using the Hagström's equation:

$$MFR = \left[ w \left( \frac{1}{MFR_1} \right)^{\frac{w-b}{a}} + (1-w) \left( \frac{1}{MFR_2} \right)^{\frac{w-b}{a}} \right]^{-aw^b}$$

Although according to the respondent, certain assumptions have obviously to be made regarding the values of constants a and b and the relationship

between  $MFR_2$ ,  $MFR_5$  and  $MFR_{21}$  in order to estimate the  $MFR_5$  of the blend of second and third PEs in example 3 of D1, it is argued that their modelling would suggest that such  $MFR_5$  value can be 1.0 g/10min or more.

The respondent, however, did not provide a more specific indication on the  $MFR_5$  values which could be computed for the blend of second and third PEs based on that model, let alone any indication on the assumptions to be made not only for constants a and b of the above equation, but also for the relation between  $MFR_5$  and  $MFR_{21}$  of the second PE to calculate its  $MFR_5$ , and the relation between  $MFR_5$  and  $MFR_2$  for the third PE to calculate its  $MFR_5$ , on the basis of which the  $MFR_5$  of the blend of second and third PE could be computed with said equation. In the absence of further explanations the Board is therefore not in the position to reach any conclusion as to whether carrying out the teaching of example 3 of D1 necessarily results in a blend of the second and third PEs which exhibits a  $MFR_5$  of less than 1.0 g/10min, as required by feature (A) of operative claim 1.

Consequently, in addition to the amount of component (B) from 2 to 20 wt% which constitutes a distinguishing feature over example 3 of D1 (see above point 2.1), a  $MFR_5$  of less than 1.0 g/10 min as defined for feature (A) of claim 1 represents a further feature distinguishing the polyethylene blend of operative claim 1 from that disclosed with the closest prior art.

*Problem successfully solved*

3. The appellant and the respondent took at the oral proceedings similar positions as to which problem can be considered to be successfully solved by the blend of

operative claim 1 vis-à-vis the closest prior art. The appellant argued that the problem solved would be the provision of a composition which was not improved with respect to the prior art, but at most an alternative composition having good mechanical properties and processability making it suitable for the preparation of pipes. As to the respondent, it was not further argued in view of the preliminary opinion of the Board provided in the communication of 27 September 2021 that the problem solved by the claimed blend resided in the provision of an improved high density polyethylene blend. The problem solved was instead formulated as the provision of an alternative polymer blend with excellent mechanical properties and processability. This implies for the respondent that said blend, like the blend of the closest prior art, is also suitable for the production of pipes.

Whether the claimed formulations must be considered as having excellent mechanical properties and processability, or as having only good mechanical properties and processability, is, however, not decisive, as shown below. Under these circumstances, the Board considers to the benefit of the appellant a problem successfully solved over the closest prior art which is seemingly less ambitious than the problem defined by the respondent, namely the provision of further polyethylene blends having good mechanical properties and processability making them suitable for the preparation of pipes.

*Obviousness of the solution*

4. It remains to be decided whether the skilled person desiring to solve the problem identified above would, in view of the disclosure of D1, possibly in

combination with other prior art documents or with common general knowledge, have modified the blend of example 3 of D1 in such a way as to arrive at the blends of operative claim 1. The prior art documents referred to by the appellant concerning obviousness of the claimed solution are D1, D2 and D3.

4.1 Concerning D2, it is correct as submitted by the appellant that D2 teaches in claim 1 the use of 3 to 20 wt% of a component having an UHMW. However that component which has a density of at least  $940 \text{ kg/m}^3$  as defined in its claim 1 is not a low density UHMW polyethylene (density of no more than  $0.925 \text{ kg/m}^3$ ) as required by the first polyethylene according to claim 1 of D1 and exemplified with the first PE of the composition of its example 3. The skilled person would therefore have no reason to apply the teaching of D2 relating to its UHMW component to such a dissimilar component used in D1. Already for this reason, D2 cannot render feature (B) and the subject-matter of operative claim 1 obvious. Having regard to the conclusion drawn in point 4.3 below there is no need to give additional explanations in this respect.

4.2 Having regard to claim 1 and paragraph [0039] of D3, the appellant argues that this prior art also concerns bimodal, and even at least trimodal, compositions which have a density of at least  $0.940 \text{ kg/m}^3$  and provide adequate mechanical properties for producing pipes. Referring to paragraph [0044] of D3 disclosing various limits for the average molecular weight of the high molecular weight polyethylene component of the multimodal polyethylene composition, the appellant concludes that the subject-matter of operative claim 2, corresponding to that of operative claim 1 (see point 6 below), is further made obvious by the combined



teachings of D1 with D3. This reasoning, however, does not address the features distinguishing the subject-matter of operative claim 1 from the closest prior art identified above (last paragraphs of sections 2.1 and 2.2). Accordingly, D3 has not been shown to suggest the claimed solution.

4.3 As noted by the appellant, D1 itself teaches in column 4, lines 24-29 that the amount of the low density UHMW PE component (i.e. the first PE of the blend) can be lower than the 27 wt% used in example 3 of D1. It is undisputed that according to this teaching it can be as low as 15 wt%. Therefore, faced with the problem identified in above point 3, it can be agreed with the appellant that the skilled person would have found it obvious in the light of D1 to prepare blends characterized by feature (B) of operative claim 1.

4.4 However, to conclude to the obviousness for the skilled person to arrive at the blends of operative claim 1, it must have been shown that it was obvious to prepare a blend also meeting the additional requirements of operative claim 1.

In this respect, the appellant argues that the selection of an upper limit of less than 1.0 g/10min for MFR<sub>5</sub> for the high density multimodal polyethylene component in accordance with feature (A) is arbitrary and for this reasons also obvious to the skilled person, the same applying to the MFR<sub>21</sub> value of the overall composition, should one take the position that the obvious measure of decreasing the amount of the first PE down to the level defined in operative claim 1 would result in an overall composition whose MFR<sub>21</sub> value exceeds the upper limit set out in operative claim 1.

4.5 The appellant's reasoning, however, cannot convince since the  $MFR_5$  of the mixture of the second and third PEs and the  $MFR_{21}$  of the overall composition, which allegedly can each be varied in an obvious way to arrive at the blends of operative claim 1, have not been shown by the appellant to be variables which can be adjusted independently from each other. To the contrary, taking into account the general knowledge in the art according to which the ratio of two MFR values measured for the same polyolefin at two different loadings, e.g.  $MFR_5$  and  $MFR_{21}$  of component (A), depends not only on the ratio of the loadings applied, but also on the molecular weight distribution of the sample concerned, it must be concluded based on the interdependence of the  $MFR_{21}$  of component (A) and the  $MFR_{21}$  of the overall composition, illustrated by the Hagström's equation addressed in above point 2.2 whose validity was not put into question by the appellant, that the  $MFR_5$  of component (A) and the  $MFR_{21}$  of the overall composition are also interdependent.

4.6 The appellant's argument submitted at the oral proceedings that the obvious measure of reducing the amount of the first PE component (UHMW polyethylene) would not result in an effective increase of the  $MFR_{21}$  of the overall blend, since it would be understood in view of paragraph [0005] of the specification that said first PE would not melt, but act as a filler, cannot convince.

Paragraph [0005] of the specification refers to a specific state of the art concerning the inclusion of UHMW polyethylene into HDPE via extrusion resulting "*in large separate domains with no evidence of "melting" into the HDPE matrix*". The subject-matter of operative

claim 1 and the closest prior (D1: column 14, line 23), however, concern both blends, i.e. by definition homogeneous mixtures of separate polymers. Moreover, having regard to the indication in D1 that the resins have a multimodal molecular weight distribution and the mentioned usefulness of that distribution for the processability and extrusion of the high molecular weight portion of the blend (claim 1, column 1, lines 14-33 and column 4, lines 53-59), i.e. the first PE, there is for the skilled person no doubt that the first PE resin of the multimodal resin obtained in example 3 of D1 is uniformly mixed with the other resins, which is *a fortiori* the case when the proportion of said high molecular weight resin is reduced in accordance with the teaching of D1.

4.7 Furthermore, the appellant did not explain how the skilled person starting from example 3 of D1 and based on the available teaching would be able to adjust at the same time the  $MFR_5$  of the mixture of the second and third PEs and the  $MFR_{21}$  of the overall composition comprising also the first PE. This cannot be held to be trivial. Even having regard to the sole predictive model available on file, i.e. the Hagström's equation which shows the influence of the melt flow rates of two fractions of a blend (i.e. both measured with the same loading) on the overall melt flow rate measured with the same loading, any prediction concerning the  $MFR_5$  of the second and third PEs used in D1 and the  $MFR_{21}$  of the overall composition to be targeted would require assumptions concerning not only constants a and b of that equation, but also the relationship between  $MFR_5$  and  $MFR_{21}$  of the mixture of the second and third PEs, as can be taken from above points 2.2 and 4.5.

4.8 Measures which would be needed to adjust at the same time the  $MFR_5$  of the mixture of the second and third PEs and the  $MFR_{21}$  of the overall composition, such as a change of the catalytic system or of the operation conditions for the polymerisation reactions, let alone available prior art which would guide the skilled person to adopt those measures, were not specified by the appellant. The appellant's submission that the skilled person would be able to adjust the  $MFR_5$  of the mixture of the second and third PEs and the  $MFR_{21}$  of the overall composition having regard to the general knowledge in the art is, in the absence of any indication of the relevant knowledge, a mere unsubstantiated allegation which accordingly is not sufficient to conclude to the obviousness of the subject-matter of claim 1.

5. On that basis the appellant's objection that operative claim 1 lacks an inventive step over D1 must be rejected.

*Inventive step - claim 2*

6. The only difference in wording between independent claims 1 and 2 is that in the definition of feature (B) the lower limit of the intrinsic viscosity of at least 7 dl/g defining the UHMW PE copolymer has been replaced by a lower limit for the nominal viscosity molecular weight  $M_v$  of at least 800,000 g/mol. As pointed out by the appellant by reference to paragraph [0111] of the specification the nominal viscosity molecular weight  $M_v$  is computed based on the intrinsic viscosity, and the lower limit of the intrinsic viscosity of at least 7 dl/g corresponds to a lower limit for the nominal viscosity molecular weight  $M_v$  which is approximatively 800,000 g/mol. Accordingly, the parties agree that a

same assessment of inventive step has to be made for both claims 1 and 2, i.e. that any conclusion for one of these claims would be valid for the other. The board has no reason to deviate from that view.

Consequently, the subject-matter of claim 2 also involves an inventive step.

*Inventive step - claim 16*

7. The appellant objects that the process of claim 16 as granted lacked an inventive step over example 2 of D4 taken as the closest prior art. While acknowledging the existence of many differences between the process of granted claim 16 and that of example 2 of D4, the appellant did not provide an analysis of the features of the process taken as the closest prior art or specifically address the features distinguishing the claimed process from that of example 2 of D4.

7.1 Instead the appellant brought forward that the process of claim 16

(i) was defined independently from the product claims 1 and 2,

(ii) would result in blends which are more broadly defined than those defined in claim 1,

(iii) was not indicated to solve a particular problem or achieve a technical effect,

(iv) concerned a three step process which was not a new technology and

(v) should provide a contribution to the art in order to be patentable.

7.2 The Board agrees that a claimed subject-matter can only be patentable if it provides a contribution to the art.

The appellant's argumentation, however, does not follow the problem-solution approach consistently advocated by the Boards of Appeal, which approach facilitates an objective assessment of said contribution. More importantly, the submissions on inventive step provided by the appellant do not address all features of claim 16, let alone contain any indication as to which prior art would suggest the unspecified, but nevertheless acknowledged, distinguishing features over the closest prior art. On that basis, the appellant's submissions cannot lead to an objective assessment of the contribution to the art of the claimed process. Already, for this reason the reasoning provided by the appellant to demonstrate that the process of claim 16 lacks an inventive step cannot convince (see also T 0706/17, points 3.3 and 3.4 of the Reasons).

*Inventive step - claim 17*

8. Having regard to the fact that the process steps defined in claim 17 (mixing and extruding) are incompatible with those defined in claim 16, the Board has no doubt that claim 17 is meant to define a method for preparing the blends defined in claims 1 to 14. As a process claim for the preparation of the blends defined in the independent product claims, its inventive character depends on the assessment made in respect of claims 1 and 2. It was accepted by the appellant at the oral proceedings that the subject-matter of claim 17 would also be inventive if it were the case for that of claim 1. Consequently, it is also concluded that the subject-matter of claim 17 involves an inventive step.

*Conclusion*

9. Since none of the objections raised against the main request is convincing, the appeal must be dismissed and it is not necessary to consider any of the auxiliary requests.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

O. Dury

Decision electronically authenticated