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**Datasheet for the decision
of 4 October 2021**

Case Number: T 2594/18 - 3.3.03

Application Number: 12777916.3

Publication Number: 2771399

IPC: C08L23/06, F16L9/12, C08L23/08

Language of the proceedings: EN

Title of invention:
PROCESS FOR THE PREPARATION OF A HIGH DENSITY POLYETHYLENE
BLEND

Patent Proprietor:
Borealis AG

Opponent:
Basell Polyolefine GmbH

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (main request: yes)

Decisions cited:
T 0868/15



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 2594/18 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 4 October 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: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
27 August 2018 concerning maintenance of the
European Patent No. 2771399 in amended form.**

Composition of the Board:

Chairman D. Semino
Members: O. Dury
W. Ungler

Summary of Facts and Submissions

I. The appeal of the opponent is against the interlocutory decision of the opposition division posted on 27 August 2018 concerning maintenance of European patent No. 2 771 399 in amended form according to the claims of auxiliary request V filed during the oral proceedings before the opposition division and an adapted description.

II. Claims 1 and 2 of said auxiliary request V read as follows:

"1. A pipe made from a high density polyethylene blend, comprising

(A) 55 to 95 wt% of a high density multimodal polyethylene copolymer component having a density of at least 940 kg/m^3 measured according to ISO1183, said high density multimodal polyethylene copolymer comprising an ethylene homopolymer component and a hexene ethylene copolymer component; and

(B) 5 to 45 wt% of an ultra-high molecular weight polyethylene homopolymer having an intrinsic viscosity of at least 6 dl/g measured according to DIN EN ISO 1628 (1998) in Decalin at $135 \text{ }^\circ\text{C}$ and an MFR_{21} of less than 0.5 g/10min (UHMW polyethylene) measured by ISO 1133 under 21.6 kg load at $190 \text{ }^\circ\text{C}$;

and wherein said blend has an MFR_{21} of 10.0 g/10min or less and a density of at least 940 kg/m^3 ."

"2. A pipe made from a high density polyethylene blend comprising

(A) 55 to 95 wt% of a high density multimodal polyethylene copolymer component having a density of at least 940 kg/m^3 measured according to ISO1183, said high density multimodal polyethylene copolymer comprising an ethylene homopolymer component and a hexene ethylene copolymer component; and

(B) 5 to 45 wt% of an ultra-high molecular weight polyethylene homopolymer having a nominal viscosity molecular weight M_v of at least 800,000 and an MFR_{21} of less than 0.5 g/10min (UHMW polyethylene);

and wherein said blend has an MFR_{21} of 10.0 g/10min or less and a density of at least 940 kg/m^3 ."

The remaining claims of that request are not relevant to the present decision.

III. A notice of opposition had been filed against the patent, requesting the revocation of the patent in its entirety.

IV. The following documents were cited in the decision under appeal:

D1: US 4 835 219

D2: US 5 422 400

D3: WO 2010/008964

D4: US 4 336 352

V. In the decision under appeal, the opposition division held that the then pending main request and auxiliary requests I to IV were not allowable either because

their subject-matter was not inventive starting from D1 as the closest prior art or because they did not meet the requirements of Article 123(2) EPC. However, auxiliary request V filed during the oral proceedings was held to be inventive starting from D1 as the closest prior art. In that respect, the subject-matter of claims 1 and 2 of said auxiliary request V differed from the disclosure of D1 in terms of features 1, 2, 3, 4 and 7, identified as follows:

- **feature 1:** the MFR_{21} requirement of component (B);
- **feature 2:** the MFR_{21} requirement of the whole blend;
- **feature 3:** the nominal viscosity molecular weight, M_v of component (B) (only relevant for claim 2);
- **feature 4:** the subject-matter claimed being a pipe;
- **feature 7:** component (A) had to contain an ethylene homopolymer component and a hexene ethylene copolymer component.

According to the opposition division, although features 1, 2, 3 and 4 were obvious, this was not the case for feature 7. In particular, it was argued that D1 only disclosed ethylene- α -olefin copolymers in which the α -olefin could only have up to four carbon atoms, i.e. hexene as comonomer was not disclosed in D1.

For these reasons, the patent could be maintained in amended form on the basis of said auxiliary request V.

VI. The opponent (appellant) appealed against the above decision. With the statement setting out the grounds of

appeal the appellant requested that the decision of the opposition division be set aside and that the patent be revoked. Also, decision T 868/15 of 15 January 2018 was referred to and the following document was filed:

D5: Brochure "Finathene® polyethylene XS^{ene} The 4th generation PE pipe resins", Fina Chemicals, November 1998 (cited as "D12" in T 868/15)

VII. With its rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) requested that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained in amended form according to any of auxiliary requests I to III filed therewith (which are not relevant to the present decision). Also, the following document was filed:

D6: Borsafe™ HE3490-LS-H, Datasheet, Borealis

VIII. In a communication accompanying the summons to oral proceedings, the Board indicated specific issues to be discussed at the oral proceedings. It was in particular indicated therein that the appellant should indicate more precisely which passage of D1 they considered as the starting point for their objection of lack of inventive step (section 6.2: second paragraph) and if, in view of D6, they maintained their objection that the commercial bimodal high density polyethylene used in the examples of the patent in suit (HE3490-LS-H) had not been shown to effectively contain an hexene comonomer according to the definition of component (A) of claim 1 of the main request (section 6.4.2: third sub-section).

IX. With letter of 4 December 2020 the respondent filed modified versions of auxiliary requests II and III in

replacement of auxiliary request II and III filed with the rejoinder to the statement of grounds of appeal.

- X. With letter of 14 July 2021, the respondent filed an additional auxiliary request IV.
- XI. With letter of 3 August 2021, the appellant indicated that they did no longer object that the comonomer present in polymer HE3490-LS-H was unknown but argued that the respondent still had not sufficiently demonstrated that said polymer contained an ethylene homopolymer fraction and an ethylene copolymer fraction.
- XII. With letter of 30 September 2021, the respondent filed the following document:
- D7: Declaration of Joy Cheng regarding product HE3490-LS-H, dated 29 September 2021
- XIII. With the explicit agreement of both parties, oral proceedings were held on 4 October 2021 in the form of a videoconference.
- XIV. The appellant's arguments, in so far as relevant to the present decision, may be summarised as follows:

Main request - Inventive step

- (a) D1 was the closest prior art. During the oral proceedings before the Board, example 11 of D1 was further identified as a suitable starting point.

The subject-matter according to operative claim 1 differed from the disclosure of D1 at least in

features 4 and 7 as identified in the decision under appeal.

It was agreed with the formulation of the technical problem effectively solved over the closest prior art proposed by the respondent at the oral proceedings before the Board, namely that it resided in the provision of an article comprising a multimodal high density polyethylene (HDPE) blend having good mechanical properties, in particular in terms of sagging behaviour and impact strength without losses of tensile properties. During the oral proceedings before the Board it was explicitly stated in reply to a question of the Chairman that it was not contested any more that polymer HE3490-LS-H, which was used in the examples of the patent in suit, was a component (A) comprising an ethylene homopolymer component and a hexene ethylene copolymer component according to operative claims 1 and 2. It was further not contested that the examples of the patent in suit showed that the technical problem defined above was effectively solved.

However, it was obvious to solve that problem by making a pipe with a composition according to D1 comprising as component (A) a mixture of a polyethylene homopolymer and an ethylene copolymer comprising hexene as α -olefin comonomer. In particular, although D1 did not disclose specifically pipes, it explicitly mentioned extrusion moulding and was further directed to many properties which were highly relevant for pipes. Although D1 did not specifically mention hexene as comonomer for component (A) defined therein, it did not provide any reason or evidence not to do so. In

addition, the skilled person starting from D1 would have been motivated to use a component (A) as defined in operative claim 1 and to prepare a pipe with such a composition in view of the teaching of D2, D3, D4 and/or D5, which could all be combined with D1. In that respect, it was derivable from the findings of decision T 868/15 that, in view of D5, the replacement of butene-1 with hexene-1 in bimodal polyethylene compositions according to D1 was obvious.

Therefore, features 4 and 7 were obvious. It was further agreed with the opposition division's findings that features 1 and 2 as defined in the decision under appeal did not contribute to an inventive step. For these reasons, the subject-matter of claim 1 of the main request was not inventive.

- (b) The subject-matter of claim 2 of the main request further differed from the closest prior art identified above for claim 1 in feature 3. However, that feature was obvious, as already explained in the decision under appeal. Therefore, the subject-matter of claim 2 of the main request was not inventive for the same reasons as claim 1.

XV. The respondent's arguments, in so far as relevant to the present decision, may be summarised as follows:

Main request - Inventive step

- (a) It was agreed during the oral proceedings before the Board that example 11 of D1 constituted a suitable closest prior art.

The pipe according to claim 1 of the main request differed from said disclosure of D1 in features 4 and 7 as identified in the decision under appeal, whereby said feature 7 effectively amounted to two distinguishing features, namely feature 7i (hexene as comonomer) and feature 7ii (homopolymer and copolymer must be present in component (A)).

The problem effectively solved over the closest prior art resided in the provision of an article comprising a multimodal HDPE blend having good mechanical properties, in particular in terms of sagging behaviour and impact strength without losses in tensile properties. The examples of the patent in suit showed that said problem was effectively solved.

Confronted with that problem, the skilled person would have no reason to deviate from the clear teaching of document D1 regarding the sole use of propylene or butene-1 as α -comonomer for component (A). In addition, D1 did not disclose that the compositions prepared therein could be suitably used for making pipes but rather hinted at making extrusion molded articles having good surface properties/reduced shark skin. Since the properties mentioned in D1 were not solely relevant for pipes, D1 did not unambiguously contemplated pipes.

Contrary to D1, D3 was explicitly directed to pipes. In addition, since the disclosure of D3 was directed to compositions comprising two polymeric components, it could not lead in an obvious manner to the subject-matter being claimed, in which the composition was defined as comprising three

different polymeric components. The teaching of D3 was further incompatible with the one of D1 in view of the different preparation processes taught in both documents. In view of this, the fact that D3 disclosed similar properties than D1 was not sufficient to show that the compositions of D1 would have been held to be suitable for making pipes and/or to deviate from the clear but limited teaching of D1 regarding the nature of the comonomer to be used in the copolymer fraction of component (A) defined therein. For these reasons, the combination of D1 with D3 in order to arrive at the subject-matter of operative claim 1 contemplated by the appellant was based on hindsight, which was not allowable.

For similar reasons, D1 was also not compatible with D5. In particular, D5 was also specifically directed to pipes. In addition, D5 provided no information regarding the preparation process of the polymers prepared therein. Furthermore, it was not directed to blends of high density polyethylene components and ultra-high molecular weight polyethylene as D1 and nothing could be said regarding the compatibility of the polymers according to D5 with ultra-high molecular weight polyethylene, which was one of the main concerns of D1. Also, the present case differed in significant aspects from the one dealt with in decision T 868/15, in particular in respect of the disclosure of the document combined with D5 (the closest prior art document D1 of T 868/15 was different from D1 of the present case and contemplated the use of hexene). Therefore, the findings of said decision were not relevant for the case at hand.

The appellant's arguments related to D2 and D4 were not related to the above identified distinguishing features and were not relevant.

For these reasons, it was not obvious to solve the above problem by modifying the disclosure of the closest prior art according to at least features 4 and 7i. Therefore, the subject-matter according to operative claim 1 was not obvious in view of the teaching of D1, alone or in combination with D3 or D5.

(b) The subject-matter of operative claim 2 was inventive in view of D1 as the closest prior art for the same reasons as the subject-matter of claim 1.

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

The respondent requested that the appeal be dismissed (main request) or, alternatively, that the patent be maintained in amended form according to any of auxiliary request I filed with the rejoinder to the statement of grounds of appeal, auxiliary requests II and III filed with letter of 4 December 2020, or auxiliary request IV filed with letter of 14 July 2021.

Reasons for the Decision

Main request

1. The operative main request defended by the respondent is identical to auxiliary request V dealt with in the contested decision, whereby the sole objection raised in appeal against said main request is related to an alleged lack of inventive step starting from D1 as the closest prior art document. Further considering that said main request contains two independent claims 1 and 2, which differ from each other in the definition of component (B) (claim 1: intrinsic viscosity and MFR_{21} ; claim 2: M_v and MFR_{21}), in the following the assessment of inventive step is made separately for each claim.

2. Claim 1

2.1 Closest prior art

Both parties agreed with the opposition division and considered D1 as closest prior art. At the oral proceedings before the Board, it was further undisputed that example 11 of D1 (table 2) constituted a suitable starting point for the assessment of inventive step. The Board has no reason to deviate from that view.

2.2 Distinguishing features

2.2.1 Example 11 of D1 is directed to the preparation of a high density polyethylene blend comprising 90 wt.% of a high density multimodal polyethylene polymer (AE3: prepared according to column 10, lines 9-21 and having the properties reported in table 1 of D1) and 10 wt.% of an ultra-high molecular weight polyethylene (UHMWPE)

polymer (BE3: prepared according to column 11, lines 3-8 and having the properties reported in table 1 of D1) corresponding to components (A) and (B) according to operative claim 1, respectively. Various properties of these compositions after extrusion were then determined (D1: column 11, lines 62-68; column 8, lines 1-9; tables 1-2).

- 2.2.2 It was undisputed that the subject-matter of operative claim 1 differs from the disclosure according to example 11 of D1 at least in **features 4** (pipe) and **7** (hexene as comonomer in component (A)) as defined in the decision under appeal.
- 2.2.3 In its rejoinder to the statement of grounds of appeal (sections 27-31) and at the oral proceedings before the Board, the respondent argued that **feature 7** effectively amounted to two distinguishing features, namely **feature 7i** (hexene as comonomer) and **feature 7ii** (homopolymer and copolymer must be present in component (A)).

In that respect, D1 teaches that component (A) thereof (which corresponds to component (A) according to operative claim 1) is obtained by polymerising ethylene optionally with an α -olefin of up to 4 carbon atoms by a two-step polymerisation process (D1: claim 1), whereby said α -olefin can be added in either the first or the second step of said process, an addition in the first step being however preferred (D1: column 4, lines 41-43). In view of this, it is agreed with the respondent that only the addition of the comonomer in the second step of such a process may effectively lead to a component (A) comprising both a homopolymer and a copolymer (rejoinder to the statement of grounds of appeal: section 29), which was not contested by the

appellant. Instead, in example 11 the comonomer is added in the first step (D1: column 10, lines 9-21). Although the polymer material produced in the second step of the process according to example 11 of D1 may, from a technical point of view, not be meaningfully different from a homopolymer, as argued by the appellant (letter of 3 August 2021: page 2, starting from the second paragraph, which was pursued at the oral proceedings before the Board), it remained undisputed that the polymer material thus prepared is formally not a homopolymer (it was referred to as a "comonomer-poor copolymer" by the appellant). The fact that D1 teaches that the preparation process can be carried out in a reverse sequence (column 4, lines 41-43) has no impact on that conclusion concerning the effective differences between the subject-matter according to operative claim 1 and the disclosure of example 11 of D1 but can only be relevant for inventive step (when assessing whether said differences are obvious).

Under these circumstances, it is concurred with the respondent that the subject-matter of operative claim 1 differs from the disclosure of example 11 of D1 in both **features 7i and 7ii**.

- 2.2.4 In view of the above, the subject-matter of operative claim 1 differs from the disclosure of example 11 of D1 at least in **features 4, 7i and 7ii** as identified above.
- 2.3 Technical problem effectively solved over the closest prior art

During the oral proceedings before the Board, both parties agreed that the examples of the patent in suit showed that the technical problem effectively solved

over example 11 of D1 resided in the provision of an article comprising a multimodal HDPE blend with good mechanical properties, in particular in terms of sagging behaviour and impact strength without losses in tensile properties. There is no reason for the Board to deviate from that view.

2.4 Obviousness

2.4.1 The question remains to be answered if the skilled person, desiring to solve the problem(s) identified as indicated above, would, in view of the closest prior art, possibly in combination with other prior art or with common general knowledge, have modified the disclosure of the closest prior art in such a way as to arrive at the claimed subject matter.

2.4.2 In view of the above, it has to be assessed whether it was obvious to solve the problem identified in section 2.3 above by making a pipe (**feature 4**) with a composition according to D1 in which component (A) as defined therein comprises an ethylene homopolymer component and a hexene ethylene copolymer component (**features 7i and 7ii**), which was in dispute between the parties.

2.4.3 Regarding **feature 4** (pipe)

a) Although it is not in dispute between the parties that D1 does not explicitly disclose pipes, the parties disagreed whether or not D1 unambiguously contemplates pipes.

b) The appellant argued that the skilled person would recognise, in view of the properties reported in D1, that the materials prepared therein were suitable for

making pipes.

However, in the Board's view, although it is correct that D1 discloses some properties such as rigidity, impact resistance, stress crack resistance (ESCR) and melt tension (column 1, lines 15-17; column 7, lines 47-50; table 2) which are relevant for pipes, it is concurred with the respondent that said properties are not only relevant for pipes but also for many other articles. Also, the mere reference to extrusion molding at column 1, lines 16-18 of D1 is not sufficient to conclude that D1 is unambiguously directed to pipes (since also said processes are not only relevant for pipes). To the contrary, it is agreed with the respondent that the various references in D1 to improved surface properties/reduced shark skin and large hollow recipients (column 1: lines 6-8, 14-18; column 2, lines 50-51; column 7, lines 42-53) show that D1 is rather directed to large hollow articles made by blow molding than to pipes. In that respect, it makes no doubt that the properties reported in table 2 of D1 are also relevant for such articles.

c) During the oral proceedings before the Board, the appellant argued that similarly to D1, also the patent in suit did not make many explicit references to pipes but that the respondent considered that the skilled person would nevertheless recognise that pipes were hinted at in view of the properties reported in the examples of the patent in suit. Therefore, the same logic applied to D1, so the appellant.

However, it makes no doubt that, contrary to D1, the patent in suit explicitly makes several references to pipes as a preferred article that may prepared with the compositions being claimed (claim 15 as granted;

paragraphs 1, 9, 11, 12, 14, 77). Also, no evidence was provided by the appellant to refute the respondent's view that parameter "Eta 747" (sections 91-95 and table 2 of the patent in suit) was related to the processability of pipes (rejoinder to the statement of grounds of appeal: sections 47-48).

Moreover, while the information given about pipes in the patent (or the lack thereof) could potentially relate to a possible objection of lack of sufficiency which was not raised, this information cannot be of any relevance as to the teaching of D1 for the skilled person.

Therefore, the appellant's arguments did not convince.

d) The appellant further argued that the skilled person would obviously contemplate making pipes with the compositions of D1 in view of the teaching of D3 (statement of grounds of appeal: bottom of page 5), as already indicated in the decision under appeal (section 6.5.1 of the reasons).

However, although it is correct that D3 is directed to bimodal polyethylene compositions comprising a high molecular weight polyethylene component and a low molecular weight polyethylene component (claim 1), whereby the term "bimodal" is to be read in a broad sense and encompasses multimodal compositions (D3: lines 11-14 of paragraph 39) and the high molecular weight polyethylene component may include very high molecular weight (paragraph 44 of D3), D3 does not specifically disclose any blend comprising components (A) and (B) according to the teaching of D1, e.g. as defined in the most general disclosure according to claim 1 of D1.

In the decision under appeal (section 6.5.1 of the reasons), the opposition division held that pipes were standard in the art and were disclosed in D3, which disclosed using similar materials to those of the patent in suit for making pipes.

However, whereas the polyethylene compositions taught in D1 are, in the Board's view, undoubtedly ternary compositions comprising low and high molecular weight polyethylene components prepared according to a two-step polymerisation process using a Ziegler Natta catalyst together with a ultra-high molecular weight polyethylene component prepared using a specific chromium catalyst (D1: claim 1), the teaching of D3 does not specifically disclose such a ternary composition (although it does not exclude it, in particular in view of its most general disclosure according to e.g. claim 1 or paragraph 44). In addition, the preparation and catalyst systems taught in D1 and in D3 are significantly different (D1: two step polymerisation with Ziegler catalyst for (A) blended with component (B) prepared with a specific chromium catalyst; D3: two different - called "bimodal" - metallocene catalysts: see paragraph 40 of D3). Under these circumstances and further considering that the above differences would be expected by the skilled person to possibly have a major impact on the properties of the polymers being prepared and on their suitability for making pipes, it cannot be concluded that the teaching of D1 and D3 are so similar that the skilled person would unambiguously consider that the compositions prepared in D1 would be expected to be suitable for making pipes in view of their similarity to the ones prepared in D3.

In that respect, the mere fact that the composition of example 11 of D1 and the ones according to D3 are reported to exhibit satisfying slow crack growth properties (D1: ESCR according to column 8, lines 39-43 and reported in table 2; D3: pages 29-30, paragraphs 109-110: notched pipe test at 80°C and 9.2 bars pressure or Pennsylvania notch test/Charpy impact test), which is known in the art to be a property relevant for pipes, is in the Board's view not sufficient to conclude that D1 unambiguously contemplated pipes, in particular because said property is not solely relevant for pipes and in view of the focus of D1 on surface properties and hollow articles (see section 2.4.3.b) above). In addition, that conclusion is reinforced by the fact that, as argued by the respondent during the oral proceedings before the Board, the ESCR test according to D1 was not shown to be the same as the slow crack growth performance tests performed on pipes disclosed in D3. Therefore, it cannot be ascertained that the same property was determined in both documents.

For these reasons, the appellant's arguments in respect of the combination of D1 with D3 fail to convince.

e) The appellant further argued that the skilled person would have recognised that the compositions of D1 were suitable for making pipes in view of the similarity of properties taught in D1 and D5, the latter being specifically directed to pipes.

However, as already outlined in section 2.4.3.d) (first to fourth paragraphs) above, whereas the polyethylene compositions taught in D1 are ternary compositions comprising low and high molecular weight polyethylene components prepared according to a two-step

polymerisation process using a Ziegler Natta catalyst together with a ultra-high molecular weight polyethylene component prepared using a specific chromium catalyst, the teaching of D5 neither specifically discloses such a ternary composition, nor does it provide any indication regarding the catalysts used to prepare the polymers disclosed therein. Therefore, as for D3, it can also not be concluded that the teaching of D1 and D5 are so similar that the skilled person would unambiguously consider that the compositions prepared in D1 would be expected to be suitable for making pipes in view of their similarity to the ones disclosed in D5.

In addition, for the same reasons as outlined in section 2.4.3.d) (fifth paragraph) above in respect of D3, the mere similarity between some properties disclosed in D1 and the ones reported in D5, is not sufficient to conclude that D1 unambiguously contemplated pipes, in particular in view of the focus of D1 on surface properties and hollow articles. In that respect, D1 does not explicitly disclose some of the five properties which are represented in the graph on page 14 of D5 (in particular fracture toughness - RCP: rapid crack growth -, SCG: slow crack growth resistance, long term hydrostatic strength), which are indicated to be particularly relevant for making pipes. Regarding slow crack growth in particular, it is considered that, as was put forward by the respondent during the oral proceedings before the Board and which remained uncontested, the environmental stress crack resistance test (ESCR) according to D1 (column 8, lines 39-43: time elapsed until half of the specimens were cracked upon exposition to a solution containing Liponox NCI) was not shown to be mandatorily related to the ones mentioned in D5 (SCG/slow crack growth:

reference is made to Notched Pipe Test in the figures on pages 6 and 7 and to FNCT in the figure on page 8; RCP/rapid crack growth: reference is made to ductile/brittle transition temperature in the figures on pages 5 to 9 and to fracture toughness in the figure on page 14).

For these reasons, the appellant's arguments in respect of the combination of D1 with D5 are rejected.

f) In view of the above, the whole disclosure of D1, even in combination with D3 and/or D5, does not unambiguously contemplate pipes and, therefore, was not shown to render **feature 4** obvious.

2.4.4 Regarding **feature 7i** (hexene as comonomer)

a) It is concurred with the respondent that since D1 does not disclose explicitly the use of hexene as possible comonomer for component (A), D1 itself cannot render feature 7i obvious, in particular for solving the technical problem as defined above (even if said problem is not related to an improvement of a technical effect). In that respect, it is further agreed with the respondent (as argued e.g. at the oral proceedings before the Board), that whereas such a comonomer was contemplated when defining the monomers of component (B) according to D1 (column 7, lines 17-18), it was explicitly excluded for the definition of component (A) (D1: claim 1; column 4, lines 38-40). Under these circumstances, D1 by deliberately limiting the definition of comonomers of component (A) to propylene and butene-1, effectively excluded the use of hexene and even taught away therefrom.

b) The appellant argued that the skilled person would

have obviously considered using an hexene comonomer for preparing component (A) of D1 in view of the teaching of D3.

In that respect, it is questionable for the reasons already identified in section 2.4.3.b) and d) above that the combination of D1 with D3 may be held to be obvious.

In addition, although the teaching of D3 could be relevant for the preparation of component (A) of D1, it cannot be concluded that said teaching would also be considered to be valid for a blend thereof with a ultra-high molecular weight component (B) as defined in D1. In that respect, in view of the teaching of D1 that such blends may suffer from compatibility problems, it is highly questionable that the skilled person would be motivated to use a different monomer than the ones explicitly taught in D1, in particular because it is known that the nature of the monomer may significantly influence the properties of the composition (see e.g. D5: page 4). Similar concerns arise in view of the fact that the catalyst systems taught in D1 and D3 are significantly different, as already indicated in section 2.4.3.d) above.

c) The appellant further considered that the use of hexene comonomers in the examples of D1 would be hinted at by the combination of D1 with D5. In particular reference was made to the findings of decision T 868/15, in which the combination of D5 with another document D1 (different from D1 of the present case) was held to render obvious the replacement of butene-1 with hexene-1 in bimodal polyethylene compositions.

In that respect, similarly to D3, D5 is not

specifically related to ternary compositions as defined in D1. Therefore, for the same reason as outlined above for D3, the combination of D1 with D5 is not obvious already for that reason.

In addition, there is no specific reference in D1 to the products described in D5. Further considering that D1 does not unambiguously disclose pipes, it is further questionable why the skilled person would have been motivated to consider D5, which is specifically directed to polymer materials for making pipes, in order to modify the teaching of D1 regarding the nature of the monomers to be used to prepare component (A).

Also, although it may be derived from the indications at the top of page 13 of D5 that the skilled person may have wanted to replace butene-1 by hexene in particular in order to prepare pipes having improved properties, it is known from common general knowledge and from D5 itself (pages 4-5) that modifying the comonomer has a significant impact on the copolymer properties. Therefore, in view of the concerns expressed in D1 regarding the compatibility of the components making up the composition being claimed (claim 1: N parameter according to column 3, lines 47-56; column 2, lines 42-53; column 7, lines 42-53), the replacement of the sole comonomers specifically taught in D1 (propylene, butene-1) by a different comonomer, in particular hexene as disclosed in D5, cannot be held to be obvious.

Regarding the case underlying decision T 868/15, it was not disputed by the appellant, in particular at the oral proceedings before the Board, that it differs from the present one at least because document D1 of that decision which was combined with D5 (referred to as

"D12" in said decision) explicitly taught the use of hexene as comonomer (which is not the case for D1 in the present case). Also, the articles prepared in D1 of that decision and D5/D12 of T 868/15 were held to be similar (section 1.8 of the reasons of the decision), which is not the case for the disclosure of pipes in D1 and D5 in the present case (see section 2.4.3.e) above). Under these circumstances, it cannot be concluded that the findings of decision T 868/15 are equally valid for the present case and support the conclusion that in view of D5 the skilled person would have considered using hexene as comonomer instead of the sole comonomers (butene-1 or propylene) taught in D1, in particular instead of butene-1 which was used in example 11 of D1 as an obvious solution to the posed problem.

Therefore, the appellant's arguments are rejected.

d) The appellant argued that the mere absence of the disclosure in D1 of hexene as comonomer for component (A) defined therein did not constitute a technical prejudice which would have prevented the skilled person from using hexene instead of butene as comonomer in the compositions taught in D1, in particular when considering the teaching of D3 and D5 in that respect (letter of 3 August 2021: bottom of page 2-page 3).

However, the conclusions of above sub-sections a) to c) are not related to the existence of a technical prejudice in the sense of accepted case law, i.e. a widely or universally held but incorrect opinion or preconceived idea of a technical fact - here, the use of hexene as comonomer in component (A) according to D1 - (Case Law of the Boards of Appeal of the EPO, 9th edition, 2019, I.D.10.2). The above conclusions are

rather reached considering that D1 teaches away from using hexene as comonomer for component (A) as defined therein and that documents D3 and D5 were not shown to make that modification obvious. Therefore, the appellant's argument is not persuasive.

e) In view of the above, the Board concurs with the respondent that the modification of the closest prior art according to **feature 7i** in order to solve the technical problem identified above is not obvious.

- 2.4.5 The arguments put forward by the appellant in the statement of grounds of appeal in respect of documents D2 and D4 are not related to the distinguishing features identified above. That view, which was communicated to the parties in the Board's communication (section 6.5.7), was not contested any further, in particular at the oral proceedings before the Board. Therefore, there is no reason to deviate from that view and the appellant's arguments based on D2 and/or D4 can only be held to be irrelevant for the present decision.
- 2.4.6 In view of the above, the modification of D1 according to the combination of **feature 4 and feature 7i** as defined above, which is necessary in order to arrive at the subject-matter of operative claim 1, may only be arrived at based on hindsight, which is not allowable. Therefore, the subject-matter of claim 1 is inventive starting from D1 as closest prior art, even in combination with D3 and/or D5. Under these circumstances, there is no need for the Board to assess whether **feature 7ii** also contributes to the inventive step, which was in dispute between the parties.

3. Claim 2

The subject-matter of claim 2 differs from the disclosure of example 11 of D1, which was also considered as the closest prior art by both parties at the oral proceedings before the Board, at least in the same distinguishing **features 4 and 7i** addressed in section 2 in respect of claim 1 of the main request and which were found to confer an inventive step. Further considering that the parties agreed that the same technical problem was solved as identified above in respect of operative claim 1, the subject-matter of operative claim 2 is inventive in view of D1 as the closest prior art, optionally in combination with D3 and/or D5, for the same reasons as outlined above in respect of operative claim 1. That view, which was communicated to the parties in the Board's communication (section 7), was not contested any further, in particular at the oral proceedings before the Board (see minutes: page 2).

4. For these reasons, the appellant's arguments provide no reason for the Board to overturn the findings of the opposition division in respect of inventive step of the main request.

5. Since the sole objection put forward by the appellant against the main request is not successful, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated