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Datasheet for the decision of 4 June 2025

Case Number: T 1715/23 - 3.3.09

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Language of the proceedings: EN

Title of invention:
PROCESS FOR PREPARING A POLYOLEFIN COMPOSITION

Patent Proprietor:
Basell Polyolefine GmbH

Opponents:
Chevron Phillips Chemical Company LP
The Dow Chemical Company

Headword:
Process for preparing a polyolefin composition/BASELL

Relevant legal provisions:
EPC Art. 100(a), 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:

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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

Case Number: T 1715/23 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 4 June 2025

Appellant: (Opponent 2)	The Dow Chemical Company 2211 H.H. Dow Way Midland MI 48674 (US)
Representative:	Boult Wade Tennant LLP Salisbury Square House 8 Salisbury Square London EC4Y 8AP (GB)
Respondent: (Patent Proprietor)	Basell Polyolefine GmbH Brühler Strasse 60 50389 Wesseling (DE)
Representative:	LyondellBasell c/o Basell Polyolefine GmbH Industriepark Hoechst, Bldg. E413 65926 Frankfurt am Main (DE)
Party as of right: (Opponent 1)	Chevron Phillips Chemical Company LP 10001 Six Pines Drive The Woodlands, Texas 77380 (US)
Representative:	Potter Clarkson Chapel Quarter Mount Street Nottingham NG1 6HQ (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 19 July 2023 concerning maintenance of the European Patent No. 3648939 in amended form.**

Composition of the Board:

Chairman	A. Haderlein
Members:	M. Ansorge
	A. Jimenez

Summary of Facts and Submissions

I. Opponent 2 (the appellant) lodged an appeal against the opposition division's interlocutory decision holding the main request allowable.

II. With their notices of opposition, opponents 1 and 2 had requested that the patent be revoked on grounds for opposition including, *inter alia*, a lack of inventive step under Article 100(a) EPC.

III. The opposition division decided that the subject-matter claimed in the main request met the requirements of the EPC and involved an inventive step in view of D1 or D8 as the closest prior art.

IV. Claim 1 of the main request reads as follows:

"A process for preparing a polyolefin composition comprising bimodal or multimodal polyolefin in an extruder device comprising the steps of

a) supplying a bimodal or multimodal polyolefin in the form of a polyolefin powder having a mass-median-diameter D50 of the polyolefin particles in the range from 300 µm to 2500 µm to a mixing device, wherein D50 is determined by dry sieving analysis according to DIN 53477 (November 1992) using the method described in the description;

b) supplying one or more additives to the mixing device;

c) mixing the polyolefin powder and the additives at a temperature in the range from 10°C to 120°C without melting the polyolefin powder to form a mixture;

d) transferring the mixture of polyolefin powder and additives from the mixing device into the extruder device;

e) melting and homogenizing the mixture of polyolefin powder and additives within the extruder device to form a molten polyolefin composition; and

f) pelletizing the molten polyolefin composition,

wherein one of the additives is an organic peroxide, wherein the polyolefin is a polyethylene and wherein the polyolefin powder has been prepared in one or more gas-phase polymerization reactors."

Claim 1 of auxiliary request I differs from claim 1 of the main request in that it includes the following additional feature: "the amount of added organic peroxide corresponds to a content of initiator in the final polyethylene composition of from 1 to 200 ppm by weight".

Claim 1 of auxiliary request II differs from claim 1 of the main request in that the feature "d) transferring the mixture of polyolefin powder and additives from the mixing device into the extruder device" has been amended to "d) transferring the mixture of polyolefin powder and additives from the mixing device to a hopper of the extruder device and then introducing said mixture from the hopper into the extruder device" (emphasis added).

Claim 1 of auxiliary request III differs from claim 1 of the main request in that the preamble of claim 1 has been amended to "A process for preparing a polyolefin composition for blown film applications, the polyolefin composition comprising ..." (emphasis added).

Claim 1 of auxiliary request IV differs from claim 1 of the main request in that it includes the following additional feature at the end of the claim: "and wherein the polyethylene is a high density polyethylene having a density determined according to ISO 1183 at 23°C from 0.945 to 0.965 g/cm^3".

Claim 1 of auxiliary request V differs from claim 1 of the main request in that it includes the following additional feature at the end of the claim: "wherein at least one of the gas-phase polymerization reactors is a multizone circulating reactor in which one polymerization zone is a riser, in which growing polymer particles flow upwards under fast fluidization or transport conditions, and the other polymerization zones are sub-zones of a downcomer, in which the growing polymer particles flow downward in a densified form, wherein the riser and the downcomer are interconnected and polymer particles leaving the riser enter the downcomer and polymer particles leaving the downcomer enter the riser, thus establishing a circulation of polymer particles through the riser and the downcomer, wherein the polyolefin powder is obtained by polymerizing one or more 1-olefins in a cascade of at least two polymerization reactors; and wherein the polyethylene is a high density polyethylene having a density determined according to ISO 1183 at 23°C from 0.945 to 0.965 g/cm^3".

Claim 1 of auxiliary request VI differs from claim 1 of the main request in that it includes the following additional feature: "wherein the mixing device is a paddle mixer comprising one or two horizontally orientated rotating shafts" .

Claim 1 of auxiliary request VII differs from claim 1 of the main request in that it includes the following additional feature: "the amount of added organic peroxide corresponds to a content of initiator in the final polyethylene composition of from 1 to 200 ppm by weight, wherein the polyethylene is a high density polyethylene having a density determined according to ISO 1183 at 23°C from 0.945 to 0.965 g/cm^3".

Claim 1 of auxiliary request VIII differs from claim 1 of the main request in that the feature "d) transferring the mixture of polyolefin powder and additives from the mixing device into the extruder device" has been amended to "d) transferring the mixture of polyolefin powder and additives from the mixing device to a hopper of the extruder device and then introducing said mixture from the hopper into the extruder device" (emphasis added) and in that it includes the following additional feature: "wherein the polyethylene is a high density polyethylene having a density determined according to ISO 1183 at 23°C from 0.945 to 0.965 g/cm^3".

Claim 1 of auxiliary request IX differs from claim 1 of the main request in that the preamble of claim 1 has been amended to "A process for preparing a polyolefin composition for blown film applications, the polyolefin composition comprising ..." (emphasis added) and in that it includes the following additional feature: "wherein the polyethylene is a high density

polyethylene having a density determined according to ISO 1183 at 23°C from 0.945 to 0.965 g/cm^3".

Claim 1 of auxiliary request X differs from claim 1 of the main request in that it includes the following additional feature: "wherein the mixing device is a paddle mixer comprising one or two horizontally orientated rotating shafts, wherein the polyethylene is a high density polyethylene having a density determined according to ISO 1183 at 23°C from 0.945 to 0.965 g/cm^3".

V. The following documents have been cited in this case:

D1: WO 2016/087566 A1
D5: US 2009/0035545 A1
D7: US 2007/0007681 A1

VI. The parties' relevant arguments submitted in writing and during the oral proceedings are reflected in the reasons for the decision below.

VII. Requests

Opponent 2 (the appellant) has requested that the decision be set aside and that the patent be revoked.

The proprietor (the respondent) has requested that the appeal be dismissed (main request) or, as an auxiliary measure, that the patent be maintained on the basis of one of auxiliary requests I to X as filed with the reply to the appeal.

Opponent 1 (a party as of right in the appeal proceedings) has not submitted any requests.

Reasons for the Decision

Main request

1. Inventive step

1.1 While the appellant argued that the subject-matter of claim 1 of the main request did not involve an inventive step in view of D1 as the closest prior art in combination with D5, the respondent was of the opinion that the claimed subject-matter did involve an inventive step over D1 as the closest prior art.

1.2 For the following reasons, the board has come to the conclusion that the subject-matter of claim 1 of the main request does not involve an inventive step in view of D1 as the closest prior art in combination with D5.

1.3 D1 discloses a process for continuously preparing a polyolefin composition comprising bimodal or multimodal polyolefin and one or more additives in an extruder device equipped with at least one hopper, wherein polyolefin pellets are prepared from the polyolefin composition in the extruder device, the process comprising

(i) supplying a bimodal or multimodal polyolefin in the form of a polyolefin powder to the hopper;

(ii) measuring the flow rate of the polyolefin powder supplied to the hopper or measuring a flow rate of the polyolefin pellets prepared in the extruder device;

(iii) supplying one or more additives to the same hopper;

(iv) when measuring the flow rate of the polyolefin powder supplied to the hopper, adjusting the flow rates of the one or more additives supplied to the hopper in response to the measured flow rate of the polyolefin powder or, when measuring the flow rate of the polyolefin pellets prepared in the extruder device, adjusting the flow rate of the polyolefin powder to the hopper in response to the measured flow rate of the polyolefin pellets and either keeping the flow rates of the one or more additives supplied to the hopper constant or also adjusting the flow rates of the one or more additives supplied to the hopper in response to the measured flow rate of the polyolefin pellets;

(v) transferring the polyolefin powder and the additives from the hopper into the extruder device;

(vi) melting and homogenising the polyolefin powder and additives within the extruder device to form a molten polyolefin composition; and

(vii) pelletising the molten polyolefin composition(see claim 1 of D1).

The polyolefin powder and the one or more additives may be first supplied to a mixing device, which mixes the polyolefin powder and the additives, and the mixture of polyolefin powder and additives is then transferred from the mixing device to the hopper (see claim 6 and the corresponding disclosure in the specification in paragraph [0050] of D1).

As disclosed in paragraph [0029] of D1, all industrially known polymerisation methods may be used for preparing the polyolefins, with gas-phase

polymerisation, in particular in gas-phase fluidised-bed reactors or multi-zone circulating gas-phase reactors, and suspension polymerisation, in particular in loop reactors or stirred tank reactors, being preferred.

In paragraph [0032] of D1, the following disclosure is made with respect to the mean particle diameter of the polyolefin powder:

"In the case of chromium catalysts, the mean particle diameter is usually from about 300 to about 1600 µm, and in the case of Ziegler type catalysts the mean particle diameter is usually from about 100 to about 3000 µm. Preferred polyolefin powders have a mean particle diameter of from 150 to 250 µm. The particle size distribution can, for example, advantageously be determined by sieving. Suitable technics are e.g. vibrating sieve analysis or sieve analysis under an air jet."

1.4 The respondent was of the opinion that the subject-matter of claim 1 differed from D1 in that:

- the polyolefin powder had a mass-median-diameter D50 of the polyolefin particles in a range of from 300 µm to 2 500 µm. In its view, D1 only disclosed that in the case of chromium catalysts, the mean particle diameter was from about 300 µm to about 1 600 µm (i.e. inside the claimed range), and in the case of Ziegler type catalysts, the mean particle diameter was from about 100 µm to about 3 000 µm (i.e. broader than the claimed range). The preferred polyolefin powders of D1 had a mean particle diameter of from 150 µm to 250 µm, outside the claimed range.

- the polyolefin powder was obtained via gas-phase polymerisation. Paragraph [0029] of D1 listed various polymerisation methods, such as solution processes, suspension processes and gas-phase processes. Thus, in the respondent's view, a selection was necessary in order to arrive at a polyethylene produced by gas-phase polymerisation.

- an organic peroxide was added as an additive. No organic peroxide was disclosed in D1.

- mixing the organic peroxide with the polyolefin powder in a mixing device was carried out at a temperature of 10°C to 120°C without melting the polyolefin powder. No temperature range in the mixing step was disclosed in D1.

1.5 With respect to the differences over D1, the board comments as follows.

1.5.1 D1 unambiguously discloses that the polyolefin powder and the additives are first mixed and then transferred from the mixing device to the hopper of the extruder device (see claim 6 of D1). As can be derived from paragraph [0050] of D1, this represents a preferred embodiment of D1 which is also shown in Figure 2 thereof (cf. paragraph [0056]). Thus, no selection is necessary in order to arrive at this feature.

The temperature range in step c) of claim 1 is implicitly fulfilled in D1 since in the absence of any indication of a temperature it has to be concluded that the process step in question is to be carried out at around room temperature. Thus, step c) of claim 1 is not a distinguishing feature over D1. In this context,

the board does not share the respondent's view that in the absence of a literal disclosure of a temperature in the pre-mixing step of D1, the temperature range represents a further distinguishing feature. When considering the entirety of the disclosure in D1 through the eyes of a skilled person, it is not reasonable to assume that the temperature in this pre-mixing step as disclosed in claim 6, for example, might be below 10°C or above 120°C. Thus, this feature is implicitly disclosed in D1.

In paragraph [0029], D1 discloses gas-phase polymerisation as being a preferred polymerisation method. Since this feature is disclosed as being preferred, it is considered disclosed in combination with the other features of the process disclosed in D1, and therefore no selection is necessary.

D1 also discloses a mean particle diameter of the polyolefin powder which is within the claimed range (for the chromium catalyst) or which at least overlaps with the claimed range (for the Ziegler type catalyst). Assuming that this disclosure of D1 in paragraph [0032] would require a selection of a lower limit or an upper limit of the ranges disclosed in D1, or a selection of the mean particle diameter obtained by using the chromium catalyst, only a single selection is required, which cannot constitute a further distinguishing feature over D1. In this context, it is irrelevant that the preferred mean particle diameter is outside the claimed range. Under the present circumstances, no multiple selection that could justify the presence of a further difference over the disclosure of D1 is necessary.

In view of the above, the claimed process differs from the process of D1 in the addition of an organic peroxide and in that the peroxide is pre-mixed with the polyolefin powder before this mixture is transferred into the extruder device.

1.5.2 The board shares the respondent's view that the effect resulting from the differences over the process of D1 is that a polyolefin composition is produced which - when preparing blown films - has improved bubble stability while not excessively increasing the amount of gels or while maintaining an acceptable level of gel formation. Thus, the objective technical problem is to provide a process for producing a polyolefin composition leading to an improved bubble stability while not excessively increasing the amount of gels or while maintaining an acceptable level of gel formation.

1.6 As to obviousness, the board comments as follows.

1.6.1 D1 alone does not suggest that adding an organic peroxide and pre-mixing it together with the polyethylene powder before transferring it to the extruder device might be suitable for solving the problem to be solved. However, the board is of the opinion that a person skilled in the art having knowledge of D1 as the closest prior art and seeking a solution to the aforementioned problem would consider the teaching of D5 as a secondary document.

1.6.2 The respondent argued that a skilled person seeking a solution to the problem posed and starting from the process of D1 would not consider D5 since D5 was directed to a polyolefin having a relatively narrow molecular weight distribution (MWD), whereas D1 was

directed to producing a bimodal or multimodal polyolefin.

The board is not convinced by this line of argument. While it is true that a high-density polyethylene (HDPE) having a broad MWD is known to have better properties in terms of extrusion and bubble stability (see paragraph [0006] of D5), this does not mean that the teaching of D5, which is directed to producing a polyethylene having a MWD in the range of about 2.0 to about 6.5 (see the abstract and claim 1), which might be considered relatively narrow, would not be considered when looking for a solution to the problem to be solved in view of the closest prior art D1, which concerns the production of a bimodal or multimodal polyolefin. D1 and D5 both relate to high-density polyethylenes which can be used for a wide range of applications. A document dealing with a polyethylene having a relatively narrow MWD can provide teaching which is applicable in a more general context such as in polyethylenes having a possibly broader MWD. No further reasons are apparent to the board that would dissuade the skilled person from considering D5. In fact, D7, paragraph [0005], which deals with the background information of the invention, confirms this conclusion since it teaches that peroxides are used to improve bubble stability in bimodal polyethylene film materials. Thus, a skilled person seeking a solution to the problem to be solved would consider D5 as a secondary document.

1.6.3 D5 provides the teaching that the addition of an organic peroxide to a polyethylene leads to improved bubble stability in the preparation of blown films (see, for example, the abstract, paragraphs [0001] and [0032], and the claims of D5). It was uncontested by

the parties that this represents the common general knowledge of a skilled person in this technical field. This teaching is applicable to polyethylenes in general.

1.6.4 D5 provides a further relevant teaching in paragraph [0025], which reads as follows:

"In one embodiment the peroxide is added to HDPE fluff or powder, or it can be added to the HDPE when it is molten. The peroxide can be added as a liquid or as a solid in master batch form. Thorough mixing should be achieved since, among other things, poor mixing can lead to gels" (emphasis added).

Accordingly, D5 not only teaches that the addition of an organic peroxide leads to improved bubble stability in film blowing (which is commonly known in this technical field), but also that when thoroughly mixing an organic peroxide with the polyolefin powder or fluff excessive gel formation can be avoided. In other words, D5 teaches the measures that need to be taken in order to solve the problem to be solved.

1.6.5 In this context, the respondent argued that D5 did not teach that pre-mixing an organic peroxide with a polyolefin powder prior to feeding this mixture to the extruder device avoids excessive gel formation.

The board has arrived at a different conclusion. D5 mentions that poor mixing can lead to gels and it also teaches that thorough mixing of the organic peroxide with the polyethylene avoids excessive gel formation. In the board's view, this relates to the addition of the organic peroxide to HDPE fluff or powder or HDPE in the molten state. There is no indication in D5 that the

thorough mixing proposed therein might only relate to mixing in the molten state. The board interprets the teaching of paragraph [0025] of D5 in such a way that the thorough mixing includes pre-mixing the organic peroxide and the polyethylene powder or fluff in a non-molten state, i.e. before melting it, since it is explicitly mentioned in this paragraph that the peroxide may be added to the HDPE fluff or powder. Paragraph [0026] of D5, which suggests that the extruder temperature should be held at about 5% or more above the decomposition temperature of the peroxide, deals with measures to ensure the decomposition of the peroxide, and not to the mixing conditions. In this context, pre-mixing an additive and polyethylene powder is also suggested in D1 as being preferred (see paragraph [0050]). The board sees no reason why a skilled person would not adopt this preferred kind of pre-mixing when adding an organic peroxide, as taught in D5. The respondent submitted that the additives mentioned in D1 are non-reactive additives and therefore an organic peroxide, which is a reactive additive, cannot be considered a typical additive. However, the board takes the view that there is no bar to a skilled person adopting the preferred kind of mixing proposed for the additives in D1 also for an organic peroxide.

1.6.6 In the respondent's view, D5 did not disclose or give any indication that when using polyolefin powder obtained in a gas-phase process with a mass-median-diameter D50 of the polyolefin particles in the range from 300 µm to 2 500 µm, it would be possible to provide polyolefin compositions having improved properties for preparing blown films by mixing the polyolefin powder with organic peroxides in a mixing

device without melting the polyolefin powder before transferring these materials into an extruder device.

As outlined above, the board is of the opinion that the effect of adding an organic peroxide as taught in D5 with respect to a polyethylene having a relatively narrow MWD is transferable to other polyethylenes, including a bimodal or multimodal polyolefin of D1, and that the teaching of D5 is not limited to those polyolefins specifically mentioned therein. In addition, a polyolefin powder obtained by a gas-phase process having the claimed particle diameter is considered disclosed in D1 as well.

1.6.7 The respondent also argued that it can be derived from the embodiment according to Figure 2 of D1 that polymer pellets are provided via line (21), i.e. without pre-mixing it with the additives. Thus, in its view, D1 did not disclose that the polymer pellets are pre-mixed as required in claim 1.

The board is not convinced, since claim 6 and paragraph [0050] of D1 unambiguously disclose that the polyolefin powder and the one or more additives are not directly supplied to the hopper of the extruder device but are first supplied to a mixing device, which mixes the polyolefin powder and the additives, and the mixture of polyolefin powder and additives is then transferred from the mixing device to the hopper. This embodiment is shown in Figure 2 of D1, in which the polyolefin powder and the additives are pre-mixed in mixing device (25), which is a paddle mixer. The possibility of also feeding polymer pellets (in addition to the polymer powder which has been premixed with the additives) to the hopper, as shown in Figure 2 of D1, is not excluded by claim 1. In addition, it does

not change the fact that the pre-mixing as required in claim 1 is unambiguously disclosed in D1.

In view of the above, the subject-matter of claim 1 of the main request does not involve an inventive step in view of D1 as the closest prior art in combination with D5.

AUXILIARY REQUESTS I - X

2. For substantially the same reasons as those outlined above with respect to the main request, the subject-matter claimed in auxiliary requests I to X does not involve an inventive step over D1 as the closest prior art. The limitations introduced into claim 1 of auxiliary requests I to X cannot change the assessment of a lack of inventive step in view of D1, since they are either known from D1, D5 or the common general knowledge of a skilled person. Neither in its reply to the appeal nor during the oral proceedings did the respondent explain why these claim requests could be judged differently from the main request. Thus, the auxiliary requests on file are not allowable either.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

K. Götz-Wein A. Haderlein

Decision electronically authenticated