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Datasheet for the decision of 9 March 2021

Case Number: T 0024/17 - 3.3.03

Application Number: 11724839.3

Publication Number: 2571905

IPC: C08F10/00, C08F2/00

Language of the proceedings: EN

Title of invention:
CONTINUOUS TAKE OFF TECHNIQUE AND PRESSURE CONTROL OF POLYMERIZATION REACTORS

Patent Proprietor:
Chevron Phillips Chemical Company LP

Opponent:
Borealis AG

Relevant legal provisions:
EPC Art. 54, 56
RPBA Art. 13(1)

Keyword:
Novelty - (yes)
Inventive step - (yes)
Late-filed objections - admitted (no)

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Case Number: T 0024/17 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 9 March 2021

Appellant: (Patent Proprietor)	Chevron Phillips Chemical Company LP 10001 Six Pines Drive The Woodlands, Texas 77380 (US)
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Representative:	Kador & Partner PartG mbB Corneliusstraße 15 80469 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 25 October 2016 revoking European patent No. 2571905 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	O. Dury
	R. Cramer

Summary of Facts and Submissions

I. The appeal by the patent proprietor lies against the decision of the opposition division posted on 25 October 2016 revoking European patent No. 2 571 905.

II. Claims 1 and 13 of the patent as granted, which are the sole claims relevant to the present decision, read as follows:

"1. A method of producing a polyolefin, comprising:

providing a diluent and a first monomer to a first polymerization reactor;

polymerizing the first monomer in the first polymerization reactor to form a first polyolefin in a first slurry;

discharging a transfer slurry comprising the first polyolefin and the diluent continuously from the first polymerization reactor to a second polymerization reactor at a flow rate;

modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor; and

polymerizing a second monomer in the second polymerization reactor to form a second polyolefin."

"13. A system for producing a polyolefin, comprising:

a first polymerization reactor;

a second polymerization reactor disposed downstream of the first polymerization reactor;

a conduit fluidly connecting the first polymerization reactor and the second polymerization reactor in series; and

a continuous take-off device configured to control a flow of a transfer slurry through the conduit."

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

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

D2: EP 2 186 833
D3: EP 0 891 990
D6: WO 96/18662
D8: WO 2009/027197
D10: EP 1 415 999
D11: EP 1 591 460

V. In that decision the opposition division held, among others, that:

- The subject-matter of the main request (patent in suit) was novel over D2 and D6 but was anticipated by D8;

- The 1st auxiliary request (filed during the oral proceedings on 7 October 2016) was not admitted

into the proceedings;

- The subject-matter of the 2nd auxiliary request (filed during the oral proceedings on 7 October 2016) was not inventive starting from D8 as the closest prior art, in combination with D2;

- Documents D10 and D11 were not admitted into the proceedings.

Therefore, the patent was revoked.

VI. The patent proprietor (appellant) appealed the above decision. With the statement setting out the grounds of appeal the appellant requested that the contested decision regarding novelty of the patent in suit over D8 be set aside and that the case be remitted to the department of first instance to deal with inventive step (main request) or, alternatively, that the opposition be rejected, or that the patent be maintained in amended form according to any of the 1st to 5th auxiliary requests (which are not relevant to the present decision) filed therewith. In addition, the decision of the opposition division regarding the non-admittance of D10 and D11 was agreed upon.

VII. In its reply to the statement of grounds of appeal the opponent (respondent) requested that the appeal be dismissed. The respondent further requested that the 1st to 5th auxiliary requests not be admitted into the proceedings and that the Board decide on the inventive step of the main request (patent in suit) if novelty were acknowledged. In addition, it was requested that documents D10 and D11, which were resubmitted, be admitted into the proceedings.

VIII. With letter dated 22 February 2018, the appellant submitted two additional auxiliary requests (numbered "1st auxiliary request - corrected -" and "auxiliary request 4a"; these auxiliary requests are also not relevant to the present decision) and requested their admittance into the proceedings.

IX. With letters of 10 December 2018 and 10 July 2019, the parties were summoned to oral proceedings. Issues to be discussed at the oral proceedings were then specified by the Board in a communication dated 5 March 2020.

X. With letter of 26 May 2020, the respondent requested that all the auxiliary requests not be admitted and put forward additional arguments, in particular in respect of an objection of lack of inventive step starting from D6 as the closest prior art.

XI. With the explicit agreement of both parties, oral proceedings were held on 9 March 2021 in the form of a videoconference (the Board was in a room at the premises in Haar and both parties were connected via video link).

During these oral proceedings, the following submissions were made among others:

- The sole objection in respect of novelty over D8 maintained by the respondent was the one based on a continuous take-off (hereinafter "CTO") device located at the discharge point of the second reactor (line 28 on figure 1 of D8). The objection based on a CTO device located at location A on figure 1 of D8, which had been raised in writing and was retained in the decision under appeal, was

not further pursued;

- The appellant withdrew the argumentation put forward in writing that the word "continually" as used in D6 had a different meaning than the term "continuously";

- The appellant withdrew their request for remittal of the case;

- The respondent presented an inventive step objection based on the combination of document D8 with D3 and further wished to present an inventive step objection starting from document D6 as the closest prior art. The appellant requested that these objections not be admitted into the proceedings.

XII. The appellant's arguments, insofar as relevant to the decision, may be summarised as follows:

Main request - Reading of the claims - Novelty

(a) Regarding claim 1 as granted, its technical features were to be read as follows:

- In line with paragraph 39 of the patent in suit, a CTO device meant a device which was not only suitable to continuously withdraw but also to control or modulate a fluid/slurry. Therefore, a CTO device had to comprise a control valve while an open nozzle or a mere conduit was not a CTO device in the sense of the patent in suit;

- According to the wording of claim 1 itself, the "transfer slurry" was the slurry which was

discharged from the first polymerization reactor and transferred to the second polymerization reactor. Also, the same slurry was referred to in the passages of claim 1 as granted related to the discharge from the first polymerization reactor to the second reactor and in the modulation step;

- The expression "modulating the flow rate" implied a regulation or adjustment, i.e. an active operation in order to maintain a flow rate in a desired range, which implied some mandatory steps of measurement or check of said flow rate. The wording of claim 1 as granted further imposed that the flow rate of the transfer slurry was influenced as desired by a CTO device located on the second reactor.

(b) Regarding claim 13 as granted, its technical features were to be read as follows:

- The expression "a conduit fluidly connecting the first polymerization reactor and the second polymerization reactor in series" meant a single conduit (i.e. without junction) directly connecting both polymerization reactors;

- A "continuous take-off device" was to be read as defined above for claim 1 as granted;

- The expression "configured to control a flow of a transfer slurry through the conduit" imposed the presence of specific apparatuses and control devices in order to actively maintain a flow rate in the conduit within a desired range, which implied some mandatory steps of measurement or

check of said flow rate.

(c) In view of the above, neither D8, nor D2, nor D6 disclosed the step of "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor" according to claim 1 as granted or a "continuous device configured to control a flow of a transfer slurry through the conduit" as defined in claim 13 as granted. In that respect, when assessing novelty over D8, the flow rate to be modulated according to claim 1 as granted was the one of the slurry in line 18 of figure 1 of D8, not the one in line 30-30a.

(d) At least for these reasons, the subject-matter of claims 1 and 13 as granted was novel over each of D2, D6 and D8.

Main request - Inventive step starting from D8

(e) D8 was a suitable document to be taken as the closest prior art. The subject-matter of claims 1 and 13 as granted differed therefrom at least in the feature "modulating the flow rate of the transfer slurry..." (claim 1) or a "continuous device configured to control a flow of a transfer slurry through the conduit" (claim 13), respectively.

(f) It was derivable from paragraph 7 of the patent in suit that the problem addressed therein was to avoid clogging in the transfer line located between both polymerisation reactors. In addition, the patent in suit allowed to provide a simpler

transfer line between both reactors than the complicated belt line combining a long recycling line and a discharge line according to D8. The problem to be solved was therefore to provide a simplified method/system to the ones of D8 which avoided clogging. Although the patent in suit contained no examples illustrative of the subject-matter being claimed (and therefore no comparison with the closest prior art D8), it was credible, when considering the patent specification as a whole and the prior art documents, that said problems were effectively solved according to the claims as granted.

(g) Since at least the distinguishing features identified above were not disclosed in any of the documents relied upon by the respondent, the subject-matter being claimed could not be obvious over D8, either alone or in combination with any other document, in particular D2.

(h) Therefore, the subject-matter of claims 1 and 13 as granted was inventive.

Admittance of late-filed objections

(i) The objection of lack of inventive step in view of D8 in combination with D3 was submitted for the first during the oral proceedings before the Board.

In addition, the objection of lack of inventive step starting from D6 as the closest prior art was not contained in the rejoinder to the statement of grounds of appeal but was raised for the first time in a written submission filed in reaction to the Board's communication.

Considering that there was no reason justifying such a late filing, these objections should not be admitted into the proceedings.

XIII. The respondent's arguments, insofar as relevant to the decision, may be summarised as follows:

Main request - Reading of the claims - Novelty

(a) Regarding claim 1 as granted, its technical features were to be read as follows:

- The term "continuous take-off device" had no accepted definition in the art and should be interpreted in its broadest sense, i.e. as meaning anything suitable to provide a continuous discharge. In view of paragraphs 38 and 39 of the patent in suit, a mere conduit, an open nozzle or a single valve was a CTO device;

- The "transfer slurry" was not limited in any manner and the use of both the indefinite article "a" when referring to the discharge from the first reactor and the definite article "the" when referring to the modulation in claim 1 as granted meant that different slurries could be considered in these passages of claim 1;

- The expression "modulating the flow rate" was to be read in its broadest sense, which meant that it encompassed any kind of change of the flow rate. In particular, that term included any change that the manipulation of a CTO device located on the second reactor caused to the transfer slurry flow rate, even if the change

existed only for a short period and/or were undesired. The more limited interpretation of that expression contemplated by the appellant relied on features mentioned in the description but which were not reflected in claim 1 as granted. Therefore, that interpretation was not correct. In addition, the word "modulate" had a broader meaning than the word "control", as was derivable from paragraph 54 of the patent in suit according to which a partial control was seen as a modulation.

(b) Regarding claim 13 as granted, its technical features were to be read as follows:

- The expression "a conduit fluidly connecting the first polymerization reactor and the second polymerization reactor in series" did not mandatorily limit said conduit to a single conduit (i.e. without junction) directly connecting both reactors;

- A "continuous take-off device" was to be read as defined above for claim 1 as granted. However, in contrast to claim 1 as granted, claim 13 as granted did not impose that the CTO device be located on the second reactor;

- The expression "configured to control a flow of a transfer slurry through the conduit" was to be read in its broadest sense and encompassed any kind of noticeable increase or decrease of the flow rate of said transfer slurry.

(c) In view of the definition of a CTO device given above, any conduit or reactor on which a continuous

discharge took place had to implicitly comprise a CTO device. This was in particular the case for line 28 in figure 1 of D8 or for the reactors mentioned in paragraph 28 of D2, when discharged continuously. Also, valve 27 in the figure of D6, when used for a continuous discharge, was a CTO device.

(d) In view of figure 1 of D8 and of the polymerisation conditions employed, operating the - implicitly present - CTO device at the outlet of the second reactor in line 28 necessarily affected the pressure of said reactor, which in turn affected the pressure gradient between both reactors and, as a further consequence, the flow rate in transfer line 30/30a. Even if the transfer line according to claim 1 as granted were held to be line 18, which was contested, the flow rate of the slurry in line 18 would also be mandatorily affected, i.e. modulated and controlled, when operating the CTO device in line 28. That conclusion was in line with paragraph 54 (with reference to figure 3) of the patent in suit, which indicated that the "pressure within the first reactor 102 may be at least partially controlled by fluidly connecting the first reactor 102 and the second reactor 112 in a continuous state".

(e) Considering that a reactor from which a slurry was continuously discharged implicitly comprised a CTO device, the subject-matter of claims 1 and 13 as granted was anticipated by the disclosure according to paragraph 28 of D2 after performing a single selection, namely a continuous discharge.

(f) For the same reasons as outlined above in respect of D8, in view of the process run in the apparatus of the figure of D6 and of the polymerisation conditions employed, operating the CTO device 27 at the outlet of the second reactor necessarily affected the pressure of said reactor, which in turn affected the pressure gradient between both reactors and as a further consequence, the flow rate in transfer line 21, i.e. the CTO device 27 was used to modulate and was configured to control the flow rate of the slurry in transfer line 21.

(g) For these reasons, the features "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor" according to claim 1 as granted and "a continuous take-off device configured to control a flow of a transfer slurry through the conduit" according to claim 13 as granted were both disclosed in D2, D6 and D8 and could not confer novelty to the subject-matter being claimed.

Main request - Inventive step starting from D8

(h) D8 was a suitable document to be taken as the closest prior art and it was derivable from the discussion on novelty that the subject-matter of claims 1 and 13 as granted at most differed therefrom in the feature "modulating the flow rate of the transfer slurry..." (claim 1) or a "continuous device configured to control a flow of a transfer slurry through the conduit" (claim 13), respectively.

(i) Since the patent in suit contained no examples illustrative of the subject-matter being claimed and no comparison with the closest prior art D8, the problem effectively solved could only reside in the provision of an alternative method/system to the ones according to D8. The provision of a simplification over D8 was not acceptable since a transfer line according to D8 was not excluded from the scope of the operative claims.

(j) Considering that, as already indicated above in respect of novelty, it was known in the art that operating a CTO device in the discharge line of the second reactor affected not only the pressure in the second reactor but also the pressure drop in the transfer line between both reactors, including line 18 according to figure 1 of D8, it was obvious to use the CTO device at location 28 to "modulat(e) the flow rate of the transfer slurry" (claim 1) or "to control a flow of a transfer slurry through the conduit" (claim 13).

In addition, since D2 made an explicit reference to D3 in its paragraph 28, the disclosure of D3 was part of the one of D2. Considering that D3 taught that the pressure in a reactor could be controlled by using a CTO device located thereon, it was obvious to manipulate or control the flow in the transfer line between both reactors of D8 by using a CTO located on either the first or second reactor.

(k) For these reasons, the above indicated distinguishing features of claims 1 and 13 as granted were obvious in view of D8 in combination with D2 and the subject-matter claimed lacked an

inventive step.

Admittance of late-filed objections

(l) Although the objection of lack of inventive step in view of D8 in combination with D3 was explicitly raised for the first time at the oral proceedings before the Board, an objection of lack of inventive step in view of D8 in combination with D2 was raised in the rejoinder to the statement of grounds of appeal. In that respect, it had been argued in writing that D2 made reference to D3 and that the disclosure of D3 was therefore included in the one of D2. Therefore, the objection based on the combination of D8 with D2 made in writing included the combination of D8 with D3. In addition, even if the Board were to hold that the latter combination was a new objection, it still had discretion to admit it, which should be done in the present case since the objection was highly relevant.

(m) Since D6 was highly relevant for novelty and had been discussed in details by both parties, it could not be surprising that the respondent argued - even if at a later stage - that, should novelty over D6 be acknowledged by the Board, then D6 should be considered as a suitable document to be taken as the closest prior art. In addition, the selection of D6 as the closest prior art was implicitly considered by the Board in section 6.3.2 of its communication.

(n) For these reasons, the objection of lack of inventive step in view of D8 in combination with D3 and the one starting from D6 as closest prior art should be admitted into the proceedings.

XIV. The appellant requested that the decision under appeal be set aside and that the opposition be rejected (main request) or, alternatively, that the patent be maintained in amended form according to any of the following requests, in that order:

- 1st auxiliary request - corrected, filed with letter of 22 February 2018, if admitted, or otherwise 1st auxiliary request filed with the statement of grounds of appeal;

- 2nd to 4th auxiliary requests filed with the statement of grounds of appeal;

- auxiliary request 4a filed with letter of 22 February 2018;

- 5th auxiliary request filed with the statement of grounds of appeal.

The respondent requested that the appeal be dismissed. The respondent further requested that the auxiliary requests not be admitted into the proceedings.

Reasons for the Decision

Main request - Patent as granted

1. Reading of the claims' disputed features

1.1 The issue in dispute between the parties which is decisive for the present decision concerns the reading of the expressions "modulating the flow rate of the

transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor" according to claim 1 as granted and "a continuous take-off device configured to control a flow of a transfer slurry through the conduit" as defined in claim 13 as granted.

1.2 Claim 1 as granted is directed to a method of producing a polyolefin, whereby two reactors are connected in series, such that the product slurry from the first reactor is transferred to the second reactor wherein both reactors operate continuously (a continuous discharge is present from both reactors). This means that both reactors operate ideally at steady state conditions whereby as for any chemical process the skilled person is aware that independently of its definition some sort of control system takes care that in the presence of input changes or disturbances the steady state conditions are maintained as far as possible.

1.3 With this in mind, the Board is of the opinion that the skilled person would not read the features "modulating the flow rate ... " according to claim 1 as granted as encompassing any kind of change of the flow rate, even if the change existed only for a short period and/or were undesired, as put forward by the respondent, since such a reading would not be considered as a "modulation". In the context of the claim such a reading, which would be in practice not limiting, could only be the result of an interpretation of the claims without "a mind willing to understand" which is not the reading of the skilled person according to the consistent case law (Case Law of the Boards of Appeal of the EPO, 9th edition, 2019, II.A.6.1).

The Board therefore considers that it would not make sense to read that feature as the definition of a device installed on such a polymerisation unit which can provoke an uncontrolled variation of the flow rate in a specific part of said unit. Rather, the Board shares the view of the appellant that this expression would be read by the skilled person considering the context of the granted claims in a more specific manner, namely as meaning a regulation or adjustment of the flow rate in the transfer line, i.e. an active operation implying an influence in a desired manner when the system is run under certain steady state conditions in order to maintain the flow rate in said transfer line or conduit in a desired range, which implies some mandatory steps of measurement or check of said flow rate.

Therefore, it is this interpretation which is applied in the following analysis.

1.4 In that respect, although the above conclusion was reached on the basis of the wording of claim 1 as granted read in its technical context, such a reading is plainly in line with the whole disclosure of the patent specification, whereby it is in particular indicated that the aim of the patent in suit was to control the flow rate of the slurry between the reactors in order to avoid deviations from a set of desired reaction conditions and problems related to clogging (paragraph 7). Also, it is derivable from figure 2 and from paragraphs 52-55 of the patent in suit that these aims were achieved by monitoring the transfer line between both reactors, whereby the maintenance of the steady state conditions desired was achieved by activating a CTO device located either on the first reactor (CTO device 104 or 142) or on the

second reactor (CTO device 116). However, it is not for that reason that the conclusion indicated in section 1.3 was reached, contrary to the respondent's view. In other words, said conclusion was not drawn by giving to the features of the claims a limited sense on the basis of the content of the patent specification but only in view of the mere wording of these claims while giving to the word "modulating" a meaning which, in the Board's view, would be adopted by the skilled person working in the present technical field.

1.5 Regarding the meaning of the expression "continuous take-off device" contained in claims 1 and 13 as granted, it was not shown that it has an accepted definition in the art. Therefore, it has to be read in its broadest, technically sensible meaning. In that respect, it was not in dispute that that expression, per se, means a device suitable to discharge/withdraw a slurry or fluid from e.g. a reactor or a conduit, whereby the word "continuous" further requires that said withdrawal takes place in a continuous manner (as opposite to intermittent withdrawal, which is an alternative discharge mode well known in the art).

While the presence of a continuous discharge from a reactor then automatically implies the presence of a CTO device read in its broadest meaning, the whole of the process feature in which the CTO device appears in claim 1 as granted implies that this device should be suitable to "modulate" the flow rate of the transfer slurry. Therefore, that expression is read in the present decision as encompassing any device suitable to vary as desired the discharge of a slurry/fluid from e.g. a reactor or a conduit in a continuous manner. Accordingly, such a CTO device could be a control valve but not an open nozzle or a mere open

conduit - as argued by the respondent -, since the latter embodiments would not allow said device to be used to modulate the flow rate of the transfer slurry.

1.6 As far as the disputed apparatus feature of claim 13 is concerned ("a continuous take-off device configured to control a flow of a transfer slurry through the conduit") while the considerations with respect of the meaning of "continuous take-off device" as in previous paragraph 1.5 equally apply, the specification that it is "configured to control a flow of a transfer slurry through the conduit" clearly implies the presence of a control system in which the continuous take-off device is the manipulated variable and the flow of the transfer slurry through the conduit is the controlled variable. This is the case as without such a control system there would be no way to configure the CTO device so as to control the transfer slurry flow rate.

2. Novelty

2.1 Document D8

2.1.1 D8 discloses a process for the slurry polymerization of one or more α-olefins in a sequence of at least two loop reactors interconnected by means of a transfer line, the transfer of polymer from a first loop reactor to a second loop reactor comprising the steps:

i) establishing a recycle of polymer slurry to the second loop reactor by means of said transfer line, whereby a fraction of polymer slurry S1 withdrawn from said second loop reactor is continuously recycled back to it;

ii) discharging a fraction of polymer slurry produced

in the first loop reactor into a discharge line connected to said transfer line;

wherein the weight ratio R between the total polymer slurry S2 recycled back to said second loop reactor and the productivity of the polymerization plant ranges from 2 to 8 (claim 1).

Such a process is in particular carried out in the examples of D8 using a sequence of two loop reactors (first reactor 10, second reactor 20) as shown in figure 1, which is reproduced here:

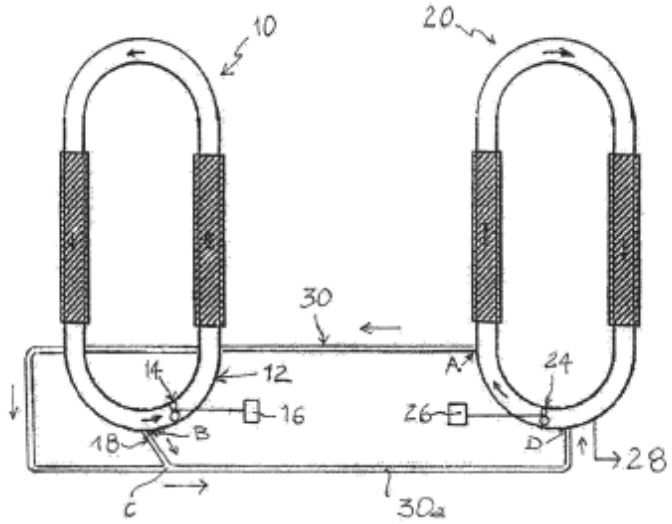


FIG. 1

2.1.2 It was in dispute between the parties which part of figure 1 of D8 corresponds to the "transfer line" according to claim 1 as granted (appellant: line 18; respondent: line 30a).

In that respect, the "transfer slurry" is explicitly defined in claim 1 as granted as the slurry which is discharged from the first polymerisation reactor. Said slurry, which is present as such in line 18 of

figure 1 of D8 (between points B and C) is then mixed at point C with the slurry flow S1 - as defined in claim 1 of D8 -, whereby its flow rate is modified by mixing with S1 so as to obtain flow rate S2 - as defined in claim 1 of D8 - in line 30a. Therefore, the "transfer slurry" according to claim 1 as granted is only present as such in line 18 of figure 1 of D8 and the "transfer line" in which the flow of the transfer slurry should be modulated according to claim 1 as granted can only be line 18 of figure 1 of D8.

In the Board's view, the fact that the transfer slurry mentioned in the modulation step of claim 1 as granted is preceded by the definite article "the" can only mean that it refers to the previously mentioned transfer slurry of the discharging step. Therefore, the respondent's argument that the "transfer slurry" mentioned twice in claim 1 as granted could refer to different slurries is rejected.

2.1.3 It was also disputed whether a "conduit fluidly connecting the first polymerization reactor and the second polymerization reactor" according to claim 13 as granted could be constituted by the combination of lines 18 and 30a according to figure 1 of D8.

In that respect, reading that expression of claim 13 in its broadest sense, there is no reason to exclude that the conduit defined in claim 13 may be constituted by different lines, such as lines 18 and 30a of figure 1 of D8, as long as these lines effectively connect both reactors. The fact that lines 18 and 30a were given different names in D8 (line 18: discharge line; line 30a: transfer line) and that they may have different diameters (D8: page 8, fourth paragraph) does not play

a role.

2.1.4 The respondent argued that the discharge line 28 (from the second reactor) of figure 1 of D8 mandatorily comprised a CTO device in the sense of the patent in suit and/or that a CTO device was also mandatorily present either on the first reactor or on line 18 in order to control the flow rate of the slurry in said line 18.

a) In that respect, in view of the reading of the term CTO device indicated in section 1.5 above and further considering that D8 teaches that the slurry is "continuously discharged" from line 28 (page 10, four lines from the bottom), it is agreed with the respondent that line 28 of figure 1 of D8 must comprise a CTO device in the sense of the operative claims, which is mandatory in order to be able to close the whole installation and/or to control the amount of polymer produced in the last reactor. Therefore, it is agreed with the respondent that a CTO device has to be - implicitly, but directly and unambiguously - present at location 28 on the second reactor 20 of figure 1 of D8.

b) However, although it is correct that the whole polymerisation unit of D8 is disclosed as being run under steady-state conditions (continuous circulation in both loop reactors: see examples; continuous discharge from the second reactor: see examples; continuous discharge from the first loop reactor via discharge line 18: see page 6, last full paragraph; steady circulation of polymer slurry in the transfer line: see examples), whereby the steady circulation of the polymer slurry in the transfer line is ensured by the pressure gradient within the polymerisation unit

(D8: claim 5; page 9, lines 19-21; page 7, second full paragraph), there is no explicit disclosure of a CTO device located on the first polymerisation reactor or in line 18, in particular not to possibly modify in a desired manner the discharge of the slurry in line 18. No arguments were further put forward by the respondent (in particular at the oral proceedings before the Board) to show that such a device would be mandatory to run the polymerisation unit according to figure 1 of D8 or to refute the appellant's argument that line 18 could well be a short or large gravity-driven-conduit, which appears plausible in view of figure 1 of D8 itself and further considering that no pressure gradient between both ends of line 18 was shown to be derivable from the disclosure of D8. Under these circumstances, it cannot be concluded that D8 directly and unambiguously discloses that a CTO device is present on the first reactor or on line 18 to control the flow of the slurry in that line.

2.1.5 In view of the above, it remains to be assessed whether or not D8 discloses using the CTO device (implicitly) present at location 28 according to figure 1 of D8 to modulate the flow rate of the transfer slurry in transfer line 18 (claim 1 as granted, taking into account the conclusion reached in sections 1.2 to 1.4 above) or within a control system to control the flow of the transfer slurry through conduit 18/30a (claim 13 as granted, taking into account the conclusion reached in section 1.6 above).

a) In that respect, there is no direct and unambiguous disclosure in D8 of any need or intention to regulate or adjust the flow of the slurry in either line 18 or conduit 18/30a. There is in particular no indication that said flow is monitored in any manner at any stage

of the process. To the contrary, it is derivable from the information provided in D8 that the flow of the slurry is determined therein by setting specific pressure conditions in the reactors and a specific pressure gradient along the transfer line (page 7, third paragraph; pressure indication in the reactors and "along the transfer line" in the examples).

b) The considerations of the respondent of what would happen in the polymerisation unit of D8 if the skilled person were to vary the discharge rate at location 28, in particular with respect to what extent this would cause a variation in the flow rate in line 18, is also not relevant, not only because D8 does not discuss this situation and does not contain such a disclosure, but also because this would amount to the possibility of an uncontrolled variation according to the understanding of the "modulating" feature of claim 1 as granted by the respondent which is not in agreement with the reading of the Board (sections 1.2 to 1.4 above). Also, this objection is not based on any argument that show that D8 directly and unambiguously discloses a control system such that the CTO device at location 28 is configured to control the transfer slurry flow rate according to claim 13 as granted (section 1.6 above).

c) At the oral proceedings before the Board, the respondent argued that the comparison of examples 1 and 2 of D8 showed that varying the discharge rate of the second reactor at location 28 led to a variation of the discharge rate in line 18, which amounted to a modulation or a control in the sense of claims 1 and 13 as granted.

However, examples 1 and 2 of D8 describe two different steady-state conditions and it is not at all surprising

that with different operating conditions different steady-states are obtained characterised by different values of the discharge rate of the second reactor and of the flow rate in line 18. In any case, the existence of different steady-states has nothing to do with either a method step of modulation of the transfer slurry in line 18 using a continuous take-off device in line 28 (claim 1 as granted) or the presence of a control system such that said take-off device is configured to control the flow rate of a transfer slurry through a conduit fluidly connecting the reactors (claim 13 as granted), when the features "modulating the flow rate" and "configured to control" according to claims 1 and 13 as granted are understood by the skilled person according to the reading in paragraphs 1.2 to 1. 4 and 1.6 above.

d) The respondent further argued that it was derivable from example 3 of D8 that if the pressure at location C of line 30/30a according to figure 1 of D8 changed, then the flow rate of slurry discharged from the loop reactor via line 18 would not be constant but be subjected to fluctuation (D8: page 11, lines 22-24). Further considering that the pressure at location C was dependent on the pressure of the second reactor, which in turn depended on the rate of withdrawal of the CTO device at location 28, the flow rate of the slurry in line 18 was effectively modulated by the CTO device at location 28.

However, in view of the reading of the expressions "modulating" and "configured to control" adopted by the Board (sections 1.2 to 1.4 and 1.6 above), an objection based on such irregular fluctuations in flow rate (as indicated in D8: page 11, penultimate sentence), i.e. uncontrolled variations, cannot succeed. In addition,

as explained above, the passages of D8 relied upon by the respondent still do not amount to a direct and unambiguous disclosure of either the operation of the CTO device at location 28 in order to manipulate the flow rate in line 18 (claim 1 as granted; sections 1.2 to 1.4 above) or to the presence of a control system such that said CTO device is configured to control the transfer slurry flow rate (claim 13 as granted; section 1.6 above).

c) Although it cannot be denied that figure 3 of the patent in suit is very similar to figure 1 of D8, it is agreed with the appellant that, as argued at the oral proceedings before the Board, said figure 3 is a simplified representation, as illustrated for instance by the fact that the complete reactors are not shown but only a part thereof. Considering both figures 2 and 3 of the patent in suit, it further makes no doubt that both embodiments illustrate the teaching of the patent in suit according to which the variable to be influenced in a desired manner is the flow rate in the transfer line between both reactors, which is achieved by manipulating the CTO device located on either the first (claim 13 as granted) or the second reactor (claims 1 and 13 as granted). The fact that the circulation of the slurry in the polymerisation unit may be determined by similar factors (pressure in the reactors and along the transfer line) both in embodiments according to the patent in suit (see in particular paragraph 54 in relation to figures 2 and 3) and in D8 (figure 1 and examples; page 7, third paragraph) does, however, not amount to a direct and unambiguous disclosure of either the operation of the CTO device at location 28 in order to manipulate the flow rate in line 18 (claim 1 as granted; sections 1.2 to 1.4 above) or to the presence of a control system

such that said CTO device is configured to control the transfer slurry flow rate (claim 13 as granted; section 1.6 above).

d) In view of this, D8 does not directly and unambiguously disclose a CTO device located on the first or the second reactor which is used to manipulate the flow rate in the transfer line or is configured to control the flow rate in a conduit fluidly connecting the first polymerization reactor and the second polymerization reactor in series, as defined in claims 1 and 13 as granted, respectively (taking into account the conclusions regarding the reading of these claims reached in sections 1.2 to 1.4 and 1.6, above).

2.1.6 In view of the conclusion reached in section 2.1.5 above, the subject-matter of claims 1 and 13 as granted is novel over D8 at least for that reason.

2.2 Document D2

2.2.1 D2 discloses a process for producing polyethylene compositions comprising polymerising polyethylene resins in a cascaded multi-stage reaction in which the reaction steps are performed in at least two slurry phase reactors (A) and (B) and at least one gas phase reactor (C) which are arranged in series in any order wherein ethylene (co)polymers having specific characteristics are prepared in each of reactors (A), (B) and (C) (D2: claim 1).

2.2.2 The respondent's novelty objection was based on the further disclosure of paragraph 28 of D2, which reads as follows:

"[0028] The slurry may be withdrawn from at least one

of the slurry phase reactors, preferably all slurry phase reactors either continuously or intermittently. A preferred way of intermittent withdrawal is the use of settling legs where the slurry is allowed to concentrate before withdrawing a batch of the concentrated slurry from the reactor. The use of settling legs is disclosed, amongst others, in US-A-3,37 4,211, US-A-3,242, 150 and EP-A-1 310 295. Continuous withdrawal is disclosed, amongst others, in EP-A-891 990, EP-A-1 415 999, EP-A-1 591 460 and WO-A-2007/025640. The continuous withdrawal is advantageously combined with a suitable concentration method as disclosed in EP-A-1415999 and EPA-1 591 460."

2.2.3 Independently of the question whether multiple selections should be made within the disclosure of D2 in order to arrive at two slurry loop reactors directly connected to each other and both operating in a continuous manner, D2 fails to disclose the feature "modulating the flow rate of the transfer slurry … using a first continuous take-off device located on the second polymerisation reactor" according to claim 1 as granted or "a continuous take-off device configurate to control a flow of a transfer slurry through the conduit" (fluidly connecting the first and second polymerisation reactors) according to claim 13 as granted in view of their reading according to paragraphs 1.2 to 1.4 and 1.6 above. Nothing relating to the required modulation of the flow rate or the required configuration of the CTO device is in particular to be found in the passage cited by the respondent, in particular not in paragraph 28 of D2. Under these circumstances, the subject-matter of claims 1 and 13 as granted is novel over D2 already for that reason.

2.3 Document D6

2.3.1 D6 discloses a "process for producing polyethylene compositions in the presence of catalytic system of ethylene polymerizing catalyst and cocatalyst in a multistage reaction sequence consisting of successive liquid phase and gas phase polymerizations, characterized in that the process comprises at least one continuous reaction sequence, in which

in the first step ethylene and optionally hydrogen and comonomer are polymerized in a loop reactor in a low boiling hydrocarbon medium in the presence of ethylene polymerizing catalyst and cocatalyst, the residence time and reaction temperature being such that the proportion of the ethylene polymer produced in the reactor from the end product of the process is between 1-20 w-%,

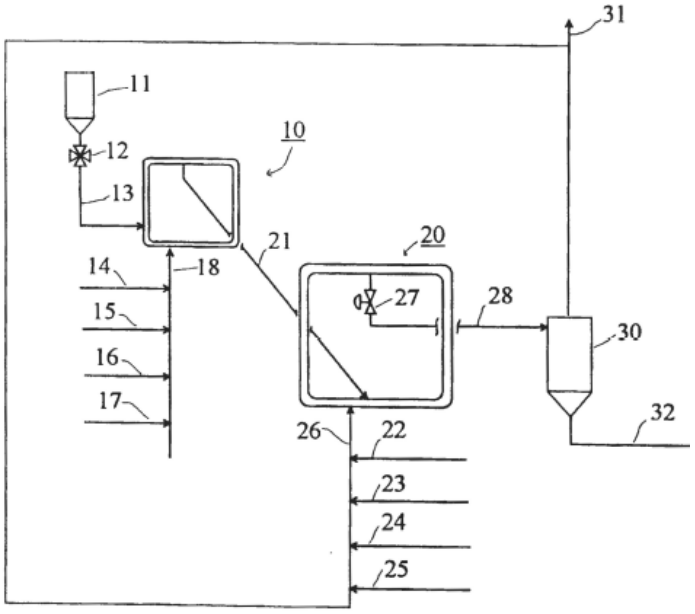
the reaction mixture removed from the step is transferred to second step where polymerization is continued in a loop reactor by adding ethylene, hydrogen and optionally inert hydrocarbon, comonomers and cocatalysts, the residence time being at least 10 minutes,

the reaction mixture is removed from the loop reactor, at least an essential part of the reaction medium is removed and

the polymer transferred to a third step where polymerizing is carried out in a gas phase reactor in the presence of added ethylene and optionally hydrogen, comonomers and cocatalysts" (claim 1).

Such a process is in particular illustrated in the

figure of D6 reproduced below:



wherein first and second slurry reactors 10 and 20 are connected via transfer line 21, whereby an exhaust valve 27 is located on said second reactor (D6: page 12, line 31 to page 13, line 11). In addition, according to page 8, lines 5-6 and page 11, lines 9-10 of D6, both reactors may either be operated with a continuous or intermittent discharge.

2.3.2 In view of the above, the polymerisation system according to D6 comprises:

- two slurry reactors 10 and 20;

- a transfer line 21 in which the slurry from the first reactor is transferred to the second reactor, whereby said line 21 is at the same time a conduit fluidly connecting both reactors;

- a valve 27 located on the second reactor 20, which may be a CTO device in the sense of the patent in

suit when the discharge of the second reactor takes place in a continuous manner. In that respect, similarly to the conclusion reached in respect of the polymerisation unit according to figure 1 of D8, it was not shown that D6 directly and unambiguously discloses a CTO device located on the first reactor and, from the information of D6, it cannot be excluded that no such CTO device is present on the first reactor, as argued by the appellant.

2.3.3 However, D6 fails to disclose the feature "modulating the flow rate of the transfer slurry … using a first continuous take-off device located on the second polymerisation reactor" according to claim 1 as granted or "a continuous take-off device configurate to control a flow of a transfer slurry through the conduit" (fluidly connecting the first and second polymerisation reactors) according to claim 13 as granted in view of their reading according to paragraphs 1.2 to 1.4 and 1.6 above. In view of this, the subject-matter of claims 1 and 13 as granted is novel over the disclosure of D6 at least for that reason.

3. Inventive step starting from D8

3.1 Closest prior art

As agreed by both parties in particular at the oral proceedings before the Board, D8 is a suitable document to be taken as the closest prior art and the process run according to examples 1 and 2 in the polymerisation system according to figure 1 of D8 is a particularly relevant starting point for the assessment of the

inventive step of claims 1 and 13 as granted.

3.2 Distinguishing feature(s)

In view of the conclusions reached above in respect of novelty, the subject-matter of claims 1 and 13 as granted differs from said closest prior art at least in the following features:

- modulating the flow rate of the transfer slurry in the transfer line 18 using the CTO device (implicitly) present at location 28 of figure 1 of D8 (claim 1 as granted);

- a CTO device configured to control the flow of the transfer slurry through conduit 18/30a (claim 13 as granted).

3.3 Problem effectively solved

3.3.1 The appellant argued that the problem to be solved over D8 resided in the provision of a simpler process (claim 1 as granted) or simpler system (claim 13 as granted) for producing a polyolefin while avoiding clogging in the line connecting both reactors.

3.3.2 In that respect, the aim of avoiding or at least reducing the risk of clogging in the transfer line between both reactors is derivable from paragraph 7 of the patent in suit (respectively from the corresponding passage of the application as filed).

In addition, although the patent in suit contains no examples specifically illustrating the subject-matter being claimed in terms of a process run under specific operating conditions and an analysis of clogging

phenomena, it is technically reasonable and also credible in view of the content of the whole patent specification that the problem of clogging in the transfer line can be reduced by monitoring the flow of the slurry in the transfer line/conduit between both reactors and that this may be done by activating a CTO device as defined in claims 1 or 13 as granted (see in particular the information regarding the CTO device in paragraphs 39-40, the DCS monitoring system for manipulating a CTO device on the first reactor in paragraph 45, the design of the transfer line with modulation by a CTO device on the first reactor in paragraphs 46-51, the use of a CTO device on the second reactor to control the flow velocity in the transfer line in paragraphs 54-55 and 70; see also figures 2 and 3).

Finally, considering that D8 also aims at reducing clogging in the transfer line between the reactors (paragraph bridging pages 1 and 2; third paragraph on page 3; paragraph bridging pages 4 and 5), the formulation of the problem solved in the form of an alternative method/system for producing a polyolefin while avoiding clogging in the line connecting both reactors is appropriate.

3.3.3 However, the arguments put forward by the appellant regarding the provision of a simpler transfer line and/or simpler control scheme as compared to figure 1 of D8 are not reflected in any manner by the technical features of granted claims 1 and 13. In particular, an installation according to figure 1 of D8 is not excluded by the definition of the system employed in the method according to claim 1 as granted or by the system according to claim 13 as granted. Therefore, such considerations cannot be taken up in the

formulation of the problem indeed solved over D8.

3.3.4 In view of the above, the technical problem effectively solved over D8 resides in the provision of a further method (claim 1 as granted) or of a further system (claim 13 as granted) for producing a polyolefin using two slurry reactors while avoiding/reducing the risk of clogging in the line connecting both reactors.

3.4 Obviousness

3.4.1 The question has to be answered whether the skilled person, desiring to solve the problem identified 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.

3.4.2 In that respect, D8 itself gives no motivation to provide a further process for producing polyolefins by monitoring and modulating the flow of the slurry in the transfer line connecting both reactors using a CTO device located on the second reactor (claim 1 as granted and sections 1.2 to 1.4 above). Also, D8 contains no hint to provide a further system for producing polyolefins by implementing a control system such that a CTO device comprised in the polymerisation unit is configured to control the transfer slurry flow rate (claim 13 as granted and section 1.6 above).

3.4.3 Although paragraph 28 of D2 teaches that the discharge line of a reactor may be made in a continuous manner, and therefore may provide a hint to use a CTO device at the discharge point of a reactor, it is silent with respect to the use of such a CTO device in order to

modulate the flow rate of the slurry in the transfer line in the sense of claim 1 as granted (see sections 1.2 to 1.4 above), in particular to do so in order to solve the above problem. D2 contains also no disclosure of a control system such that the CTO device is configured to control the transfer slurry flow rate according to claim 13 as granted (see section 1.6 above).

3.4.4 At the oral proceedings before the Board, the respondent argued that the subject-matter being claimed was obvious in the light of the combination of D8 with D2 when taking into account a further passage of D3, which was held to be encompassed in the disclosure of D2 in view of the reference to D3 in paragraph 28 of D2.

However, the Board does not agree with the respondent that the sentence of paragraph 28 of D2 "Continuous withdrawal is disclosed, amongst others, in EP-A-891 990, EP-A-1 415 999, EP-A-1 591 460 and WO-A-2007/025640" implies that the disclosure of each of these four prior art documents is fully encompassed by paragraph 28 of D2 and, as a consequence, makes part of the disclosure of D2. Rather, in the Board's view, the only information that may be derived from that sentence is that CTO devices for discharging reactors in a continuous manner are known in the art, which was not an issue in dispute in the present case. Further considering that said paragraph 28 was not shown to address the problems to be solved identified above, the skilled person starting from D8 and aiming at solving said problem would, in the Board's view, even when considering the teaching of D2, have no reason to consult these documents any further. This was done by the respondent only on the basis of hindsight, knowing

the solution proposed by the claims as granted, which is not allowable.

In addition, combining D8 with a very specific passage of any of the documents cited in said sentence of paragraph 28 of D2, as was put forward by the respondent during the oral proceedings before the Board with reference to a specific passage of D3 (EP 0 891 990: page 4, lines 32-33), constitutes, in the Board's view, a new objection, which is effectively based on the combination of D8 with D3 and is, therefore different from the one based on the combination of D8 with D2. For that reason, that objection has to be treated separately from the objection based on the combination of D8 with D2, which is done hereinafter (section 4.1).

3.4.5 The same conclusion as for the combination of D8 with D2 and D3 would be reached for the combination of D8 with D2 and either D10 or D11 (EP 1 415 999 and EP 1 591 460, which are also mentioned in the sentence of paragraph 28 of D2 indicated above). Therefore, since these objections cannot succeed, there is no need for the Board to decide on the admittance of documents D10 and D11, which was in dispute between the parties.

3.4.6 In view of the above, it cannot be concluded that, starting from D8 as closest prior art, it was obvious to solve the above indicated problem by modulating, in the method of D8, the flow rate of the transfer slurry in the transfer line 18 using the CTO device (implicitly) present at location 28 of figure 1 of D8 (claim 1 as granted) or by configuring, in the system according to figure 1 of D8, a CTO device so that it controls the flow of the transfer slurry through conduit 18/30a (claim 13 as granted). Therefore, the

distinguishing features identified above are not obvious in view of the teaching of the prior art documents cited. For that reason, the objection of the respondent concerning lack of inventive step of the the subject-matter of claims 1 and 13 as granted in view of D8 alone or in combination with D2 is rejected.

4. Admittance of late-filed objections

4.1 At the oral proceedings before the Board, the respondent raised for the first time an objection of lack of inventive step in view of D8 as closest prior art in combination with D3 and the appellant requested that said objection not be admitted into the proceedings.

4.1.1 As indicated in section 3.4.4 (third paragraph) above, the Board considers that the objection of lack of inventive step based on the combination of D8 with D3 is effectively a new objection, different from the one based on the combination of D8 with D2. Considering that it was not contested that said objection had not been previously made in writing and that the summons to oral proceedings was notified to the parties with letter of 10 December 2018, the admittance of that objection is subject to the stipulations of Article 13(1) and (3) RPBA 2007 (see the transitional provisions according to Article 25(3) RPBA 2020).

4.1.2 According to Article 13(1) RPBA 2007, an amendment to a party's case may be admitted and considered at the Board's discretion, whereby said discretion shall be exercised in view of *inter alia* the complexity of the new subject-matter, the state of the proceedings and the need for procedural economy.

4.1.3 In that respect, it is concurred with the appellant that there is no compelling reason why said objection could not have been raised earlier, in particular since the operative request is the patent as granted and documents D8 and D3 were in the proceedings from the outset of the opposition proceedings (notice of opposition: section 2). Therefore, admitting said objection submitted at the latest possible stage of the proceedings would run counter to both the economy of the proceedings and the requirements of Article 12(2) RPBA 2007 according to which the parties should submit their complete case at the outset of the appeal proceedings. Under these circumstances, the fact that an objection might be highly relevant, as argued by the respondent, is not sufficient to justify its admittance at such a late stage of the proceedings.

4.1.4 In view of the above, the Board finds it appropriate to make use of its discretion pursuant to Article 13(1) RPBA 2007 by not admitting into the proceedings the objection of lack of inventive step in view of D8 in combination with D3.

4.2 D6 as closest prior art

4.2.1 The appellant requested that the objection of lack of inventive step in view of D6 as closest prior art, which was undisputedly raised for the first time by the respondent in the written submission dated 26 May 2020, i.e. after having received the Board's communication, and put forward at the oral proceedings before the Board, not be admitted into the proceedings.

4.2.2 Under these circumstances, the admittance of that objection is subject to the stipulations of Article 13(1) and (3) RPBA 2007 (see the transitional

provisions according to Article 25(3) RPBA 2020)).

4.2.3 In that respect and for reasons similar to the ones indicated in section 4.1.3 above, there is no compelling reason why said objection could not have been raised earlier, in particular since also document D6 was in the proceedings from the outset of the opposition proceedings.

4.2.4 The respondent argued that D6 was implicitly considered as closest prior art by the Board in section 6.3.2 of its communication. However, said passage of the Board's communication was related to novelty over D6 and cannot provide a justification for considering D6 as an additional suitable document to be taken as the closest prior art and building a completely new attack of lack of inventive step thereon at a late stage of the proceedings.

4.2.5 In view of the above, the Board finds it appropriate to make use of its discretion pursuant to Article 13(1) RPBA 2007 by not admitting into the proceedings the objection of lack of inventive step starting from D6 as closest prior art.

5. Questioned by the Board, the respondent confirmed at the oral proceedings before the Board that they had no further objections against the main request. In view of the conclusions reached above in respect of claims 1 and 13 of the main request, the Board has no reason to deal with any further point.

6. Since none of the objections raised by the respondent against the main request is successful, the decision under appeal is to be set aside and the patent is to be

maintained as granted.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

B. ter Heijden D. Semino

Decision electronically authenticated