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Datasheet for the decision of 22 October 2020

Case Number: T 1020/17 - 3.3.03

Application Number: 10795345.7

Publication Number: 2513156

IPC: C08F2/42, C08F10/02

Language of the proceedings: EN

Title of invention:
METHOD FOR REPLACING INCOMPATIBLE ETHYLENE POLYMERIZATION CATALYSTS

Patent Proprietor:
TOTAL RESEARCH & TECHNOLOGY FELUY

Opponent:
INEOS Europe AG

Relevant legal provisions:
EPC Art. 56
RPBA Art. 12(2), 12(4)
RPBA 2020 Art. 25

Keyword:
Inventive step - (no)
Auxiliary requests - not substantiated - not admitted

Decisions cited:
T 0939/92

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Beschwerdekammern

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Case Number: T 1020/17 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 22 October 2020

Appellant: (Opponent)	INEOS Europe AG Avenue des Uttins 3 Rolle CH-1180 Vaud (CH)
Representative:	King, Alex Mathisen & Macara LLP Communications House South Street Staines-upon-Thames, Middx TW18 4PR (GB)
Respondent: (Patent Proprietor)	TOTAL RESEARCH & TECHNOLOGY FELUY Zone Industrielle C 7181 Seneffe (BE)
Representative:	Bounaga, Sakina De Clercq & Partners Edgard Gevaertdreef 10a 9830 Sint-Martens-Latem (BE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 23 February 2017 rejecting the opposition filed against European patent No. 2513156 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	F. Rousseau
	C. Brandt

Summary of Facts and Submissions

I. The appeal lies against the decision by the opposition division, posted on 23 February 2017, rejecting the opposition against European patent No. 2 513 156, whose claim 1 read as follows:

"1. Method for optimizing the sequential use of at least two ethylene polymerization catalysts to an ethylene polymerization loop reactor, comprising:

- transferring to a mixing vessel a first ethylene polymerization catalyst and a first diluent, thereby providing a first catalyst slurry,
- transferring said first catalyst slurry from said mixing vessel to an ethylene polymerization loop reactor at a concentration suitable for polymerizing ethylene,
- increasing the ratio of said diluent to said first ethylene polymerization catalyst in said first catalyst slurry,
- stopping the supply of said first catalyst slurry to said mixing vessel,
- stopping the supply of said first catalyst slurry to said ethylene polymerization loop reactor,
- stopping the supply of ethylene to said ethylene polymerization loop reactor,
- removing said first catalyst slurry from said ethylene polymerization loop reactor,
- emptying said mixing vessel,
- optionally rinsing said mixing vessel with fresh diluent,
- transferring to said mixing vessel a second ethylene polymerization catalyst and a second diluent, thereby providing a second catalyst slurry,

- decreasing the ratio of said second diluent to said second ethylene polymerization catalyst in said mixing vessel to obtain a concentration of said second ethylene polymerization catalyst in said second diluent suitable for polymerizing ethylene,
- transferring said second ethylene polymerization catalyst slurry from said mixing vessel to said ethylene polymerization reactor,
- restoring the supply of ethylene to said ethylene polymerization loop reactor,
- restarting ethylene polymerization in said ethylene polymerization loop reactor."

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

D1: WO 03/016362 A1
D2: WO 97/32905 A1
D3: GB patent specification 838,395
D4: EP 1 563 902 A1

III. In the impugned decision the opposition division held inter alia that the ground for opposition of lack of inventive step did not prejudice maintenance of the patent as granted. The opposition division considered that the closest prior art was not represented by the process described in D1, as argued by the opponent, but by that described in D2 as submitted by the patent proprietor. In the absence of suitable comparative examples, the problem solved over the closest prior was to provide an alternative catalyst transitioning process to that of D2. Since none of the cited documents D1 to D4 described or suggested to adopt the measure of "*decreasing the ratio of said second diluent to said second ethylene polymerization catalyst in said mixing vessel to obtain a concentration of said second*

ethylene polymerization catalyst in said second diluent suitable for polymerizing ethylene" in order to solve said problem the subject-matter of claims 1 to 17 of the patent in suit involved an inventive step. The opposition division also held that even if D1 had been chosen as the closest prior art, the subject-matter of claims 1 to 17 would still have been considered to involve an inventive step.

IV. The opponent (appellant) lodged an appeal against the above decision. With the statement setting out the grounds of appeal the appellant referred *inter alia* to the following document:

D1': WO 2003/016362 A1 (corrected version of D1).

V. The patent proprietor (respondent) submitted with its rejoinder of 6 November 2017 Auxiliary Requests 1 to 3, which were indicated to correspond to auxiliary requests AR1 to AR3 submitted before the opposition division with letter of 7 August 2015.

VI. In preparation of oral proceedings foreseen for 28 October 2020, the Board issued a communication dated 31 July 2020 including a preliminary opinion *inter alia* on whether the subject-matter of the main request involved an inventive step over the method described in D1/D1' considered to represent the closest prior art and admittance of the auxiliary requests.

VII. With letter of 5 October 2020 the respondent informed the Board that it would not be represented at the oral proceedings.

VIII. The oral proceedings were thereafter cancelled by the Board as not deemed necessary.

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

(a) D1 constituted the closest prior art. It related not only to the same technical field and to the same technical problem as the patent in suit, but further had the most features in common with granted claim 1. In contrast D2 taken in the contested decision as starting point for assessing inventive step related to an entirely different process, including essentially none of the steps recited in granted claim 1.

(b) The only features of granted claim 1 not disclosed in D1 were that the reactor is a loop reactor and the step of "decreasing the ratio of said second diluent to said second ethylene polymerization catalyst in said mixing vessel to obtain a concentration of said second ethylene polymerization catalyst in said second diluent suitable for polymerizing ethylene."

(c) However, neither of these features could provide an inventive step.

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

(a) D1 could not constitute the closest prior art, as this prior art did not concern optimizing the sequential use of at least two catalysts to an ethylene polymerization loop reactor. The closest prior art was rather represented by D2 directed to

the same purpose or effect as the method of granted claim 1.

(b) There were several technical differences between the method of granted claim 1 and the method of D2, i.e. D2 did not disclose each step of granted claim 1 relating to the catalyst slurry and/or mixing tank. An inventive step over D2 had to be acknowledged since none of documents D1 to D4 suggested the use of said technical differences in order to provide a method that allowed reducing catalyst waste and solid content in the reactor, allowing thereby a fast transitioning between catalysts, as well as a reduction of the reactor down-time.

(c) The arguments in respect of inventive step of the claims of the patent as granted applied *mutatis mutandis* to the claims of Auxiliary Requests 1 to 3.

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

XII. The respondent requested that the appeal be dismissed, or alternatively that the decision under appeal be set aside and that the patent be maintained in amended form according to any of Auxiliary Requests 1 to 3, all submitted with the rejoinder to the statement of grounds.

Reasons for the Decision

1. The respondent has informed the Board by letter of 5 October 2020 that it would not be represented at the oral proceedings, which in accordance with the case law (Case Law of the boards of Appeal, 9th edition 2019, III.C.4.3.2) is equivalent to a withdrawal of the request for oral proceedings. By means of this the respondent has decided to base its case on its written submissions. In this respect the respondent had the possibility to take position on all the issues on which this decision is based, namely inventive step starting from D1/D1' as the closest prior art and admittance of Auxiliary Requests 1 to 3, as they were dealt with the submissions of the parties and/or the communication of the Board. As the Board was in the position to decide according to the request of the appellant, the decision could be taken in writing and the oral proceedings were cancelled, as not deemed necessary.

Main request

Preliminary remarks concerning the meaning of claim 1

2. The respondent's arguments concerning inventive step rely on an alleged optimization of the sequential use of the two catalysts (e.g. points 4.3, 4.6 to 4.9 of the rejoinder dealing with the choice of the closest prior art and point 4.25 dealing with obviousness of the solution). Whereas the term optimizing has as such a recognized meaning, i.e. making as efficient, effective, or functional as possible, neither operative claim 1 defining a "method for optimizing ..." nor the specification indicate how an optimized method is to be

understood within the context of the patent in suit, in particular which aspects of the polymerization process or which properties of the polymer obtained are meant to be optimized. Accordingly, as already indicated in point 11 of the Board's communication of 31 July 2020 this vague term as used in operative claim 1 is not considered to provide any restriction to the subject-matter defined by the other features of the claim, which was not disputed by the respondent.

Moreover, as also indicated in point 12 of the Board's communication of 31 July 2020 the wording "stopping the supply of said first catalyst slurry to said mixing vessel" is obviously in error as it is rather the catalyst itself which is supplied to the mixing vessel, but not its slurry which is produced in the vessel. The only reasonable reading of that wording is therefore "stopping the supply of said first catalyst to said mixing vessel", which also was not disputed by the respondent.

Inventive step

Closest prior art

3. Whereas the appellant is of the opinion that D1' (the corrected version of D1) (in the following the reference to D1 will be used in place of D1') constitutes the closest prior art, the respondent in line with the reasons for the appealed decision is of the opinion that the closest prior art is in fact represented by D2. According to the case law the closest prior art for the purpose of objectively assessing inventive step is generally that which corresponds to a purpose or effect similar to that of the invention and requiring the minimum of structural

and functional modifications (Case Law, *supra*, I.D.3.1).

Similarities of the purpose or effect of the present invention with D2 or D1

3.1 According to the background of the invention indicated in the specification the patent in suit aims at "optimizing" the sequential feeding of at least two incompatible ethylene polymerization catalysts to an ethylene polymerization reactor (paragraphs [0011]). As already indicated in above point 2 no particular meaning is to be attributed to the term "optimization". On that basis it is understood that the patent in suit aims at improving some aspects of the sequential feeding of at least two incompatible ethylene polymerization catalysts. The term "incompatible catalysts" is having regard to paragraph [0024] of the specification broadly defined as to encompass at least two catalysts having different performances towards molecular weight regulators, those regulators encompassing hydrogen and comonomers.

3.2 It is undisputed that D2 relates to the sequential use of two different ethylene polymerization catalysts (e.g. Example 8 on pages 15 and 16). The opposition division's argument that D2 was cited in the patent in suit (page 12 of the decision, second paragraph) is however not relevant in determining whether D2 represents a realistic starting point for the present invention since D2 was not indicated in the application as file to constitute the starting point for the present inventors, reference to that prior art being only inserted in course of examination proceedings.

3.3 Concerning D1, the passage on page 11, lines 5 to 16, whose information content is illustrated by Experiment 3 on pages 18 and 19 of that document unmistakably describes that D1 is also concerned with the sequential use of different and/or incompatible catalysts in the production of olefin homopolymers or copolymers, especially ethylene homopolymers and copolymers. In that context, the term "incompatible catalysts" is defined in that passage to mean catalysts exhibiting an incompatibility resulting from different reactivity ratios for molecular weight regulators and comonomers, i.e. a definition which in essence is the same as provided in the patent in suit (see point 3.1 supra). Moreover, claim 1 of D1 concerns a polymerisation process of ethylene which can comprise a step of providing "critically clean catalyst feed vessels" which step as indicated on page 11, lines 5 to 12 is meant to be used when transitioning between different and/or incompatible catalysts takes place. Therefore, D1 like the patent in suit concerns the sequential use of incompatible catalysts.

Moreover, the polymerization method described in Experiment 3 of D1, in which the catalyst feed vessel is cleaned in order to sufficiently eliminate the catalyst previously contained in the feed vessel, reduces, in line with the wording of claim 1 of that document, the level of gel (page 19, lines 26-27), i.e. the same effect which is sought to be obtained in the patent in suit as the generation of gels is indicated in paragraph [0024] of the patent in suit to result from the simultaneous use of two incompatible catalysts.

The respondent's argument that the Ziegler-Natta catalyst is merely stored in the catalyst vessel but

not used in a polymerization process is correct as far as Experiment 3 of D1 as such is concerned. However, this experiment serves as indicated on page 18, lines 4-5 to investigate the effect of conducting polymerization with critically clean catalyst vessels and fed lines, i.e. in the situation when a constrained geometry catalyst is to be used following the use of a Ziegler-Natta catalyst for polymerization which catalyst was therefore previously present in the catalyst vessel. The purpose of storing the Ziegler-Natta catalyst in this experiment therefore is merely to illustrate the situation addressed on page 11, lines 11-12 concerning the sequential use between two incompatible catalysts, i.e. a polymerization stage using a Ziegler-Natta catalyst, followed by a polymerization stage using a constrained geometry catalyst.

Moreover, as mentioned in paragraph [0009] of the specification, the need to provide an adequate transition between production campaigns of ethylene polymers using different / incompatible polymerization catalysts was well known to the skilled person in the art so that the indication on page 11, lines 11-12 alone that the cleaning method used in D1 is useful for transitioning between different and/or incompatible catalysts would provide an immediate and unmistakable indication that the teaching of D1 is relevant for the skilled person faced with the problem addressed in the patent in suit.

Accordingly, D1, which concerns the sequential use between different and/or incompatible catalysts in the production of ethylene homopolymers or copolymers as illustrated by its Experiment 3, which includes the cleaning of the catalyst feed vessel so as to lower the

level of gels, corresponds to a purpose or effect similar to that of the present invention.

Identification of the features distinguishing present claim 1 from the methods described in D1 and D2

3.4 A comparison of the successive features of claim 1 as granted with the disclosure of D1 results in the following observations:

As indicated above D1 concerns the sequential use of at least two ethylene polymerization catalysts. It is undisputed that D1 does not disclose the use of a loop reactor.

The polymerization facility used in Experiment 3 (page 18, lines 5-7 and paragraph bridging pages 18 and 19) is shown in Figure 1. The catalysts are used in the slurry form, i.e. the catalyst is mixed with hexane as diluent (page 18, lines 6-7 and 20-21). Accordingly, the steps of transferring to a mixing vessel a first ethylene polymerization catalyst and a first diluent, thereby providing a first catalyst slurry and of transferring said first catalyst slurry to the reactor at a concentration suitable for polymerizing ethylene are disclosed in D1.

As pointed out by the appellant referring to the description of Experiment 2 of D1 (page 14, line 22 to page 15, line 7) the polymerization system depicted in Figure 1 (which is that also used in Experiment 3) necessitates a dilution of the catalyst which is pulsed into the main diluent stream before entering the polymerization reactor. Therefore the step of "increasing the ratio of said diluent to said first ethylene polymerization catalyst in said first catalyst

slurry" required by operative claim 1 is also disclosed in D1. The respondent's argument that in Experiment 2 of D1 Vessel 1 would contain the catalyst in the powder form is not relevant, as the closest prior art identified above is not the method according to Experiment 2 of D1, but that illustrated by Experiment 3, i.e. a method in which the catalyst is present in said vessel in the slurry form. Moreover, having regard to the agitation means which equip the catalyst feed vessel V1 (page 5, line 8 and Figure 1) it cannot be concluded that the catalysts in the powder form whose preparation is described in Experiment 2 is present in this form in the catalyst feed vessel.

Experiment 3 of D1 illustrates the benefit of sufficiently cleaning the catalyst feed vessel when a transitioning of incompatible catalysts takes place in order to obtain a low level of gel as required by claim 1 of D1. Comparative Run 3 of Experiment 3 (page 19, lines 6-27) shows that the mere rinsing of the catalyst vessel with hexane until it is free of solids is not sufficient for this purpose, a higher cleaning efficiency being required as shown by Inventive Example 4 of Experiment 3. On that basis, the teaching of D1 excludes that two incompatible catalysts might be present simultaneously in the polymerisation reactor, which implies that in D1 the polymerisation reaction has been stopped and the first catalyst removed before the second catalyst is used. The implicit necessity in the method of D1 to stop the reaction when changing the catalyst is confirmed on page 19, lines 3-5 where it is stated that "After run, all transfer lines and vessels of the polymerization system were cleaned to avoid contamination of subsequent runs".

Having regard to the explicit disclosure in D1 of the cleaning of the catalyst vessel, the implicit disclosure in that document of the necessary cleaning of the polymerization vessel and the explicit description that a solid constrained geometry catalyst system and hexane are loaded into the cleaned catalyst vessel before ethylene polymerization is restarted, it is concluded that all remaining steps defined in operative claim 1 are also disclosed in D1, to the exception of the step of "decreasing the ratio of said second diluent to said second ethylene polymerization catalyst in said mixing vessel to obtain a concentration of said second ethylene polymerization catalyst in said second diluent suitable for polymerizing ethylene".

3.5 In line with the respondent's analysis of the technical features distinguishing the method of operative claim 1 from that disclosed in D2, i.e. all steps relating to the catalyst slurry and/or mixing tank (points 4.12 and 4.16 on pages 5 and 6, respectively, of the reply to the statement setting out the grounds of appeal), the Board observes that the method described in D2 is structurally more remote from the method of operative claim 1 than that described in D1.

3.6 Accordingly, based on the above assessment of the purpose of the methods described in D1 and D2 and their structural similarities with the method defined in present claim 1, the Board concludes that D1 represents the closest prior art and therefore the starting point for assessing inventive step of the subject-matter of the granted patent. The features distinguishing the method of operative claim 1 from that of D1 are the ones underlined in above point 3.4, in line with the

appellant's submissions (statement of grounds of appeal, page 10, first full paragraph).

Problem successfully solved

4. The appellant did not formulate the technical problem considered to be solved over the closest prior by the subject-matter of claim 1, but only addressed the partial problem solved by the step of decreasing the ratio of the second diluent to the second ethylene polymerization catalyst in the mixing vessel to obtain a concentration of the second ethylene polymerization catalyst in the second diluent suitable for polymerizing ethylene, namely providing a slurry of the catalyst at a concentration suitable for polymerising ethylene (statement of grounds of appeal, page 10, 6th full paragraph). Such formulation is however not appropriate as the problem solved over the closest prior art should not be formulated as to contain pointers to the solution (Case Law, supra, I.D.4.3.1).

4.1 According to paragraph [0056] of the specification the step of decreasing the ratio of the second diluent to the second ethylene polymerization catalyst is advantageous as it allows that a second ethylene polymerization catalyst supplied in any given concentration or form can be used in the method. According to claim 1 this step results in a concentration of the second ethylene polymerization catalyst in the second diluent which is suitable for polymerizing ethylene. However, the concentration of the second catalyst in D1 is also suitable for polymerizing ethylene. In respect of the use of a loop reactor no particular partial problem was defined by the appellant or the respondent.

4.2 On that basis and in the absence of any other formulation of the problem submitted by the respondent the problem successfully solved over the closest prior by the subject-matter of claim 1 is to be formulated as the mere provision of a further method for the sequential use of at least two ethylene polymerization catalysts.

Obviousness of the solution

5. It remains to be decided whether the skilled person aiming at solving the problem identified above would, in view of the disclosure of D1, possibly in combination with other prior art, including common general knowledge, have modified the method of the closest prior art in such a way as to arrive at the method of operative claim 1. In the present case, the question arises whether the skilled person would have chosen to perform the polymerization in a loop reactor and to decrease the ratio of the second diluent to the second ethylene polymerization catalyst in the mixing vessel. These features being not functionally interdependent, their obviousness in the light of the prior art has to be established separately.

5.1 Regarding, the use of a loop reactor, it is undisputed that the use of such reactors for the slurry polymerisation of polyethylene homopolymers and copolymers was conventional in the art at the priority date of the patent in suit. Accordingly, their use in order to merely provide of a further method for the sequential use of at least two ethylene polymerization catalysts was obvious to the skilled person.

5.2 Concerning the step of decreasing the ratio of the second diluent to the second ethylene polymerization

catalyst in the mixing vessel to obtain a concentration of the second ethylene polymerization catalyst in the second diluent suitable for polymerizing ethylene, it has to be kept in mind that this step follows the step of transferring to the mixing vessel said second ethylene polymerization catalyst and second diluent, thereby providing a second catalyst slurry. Accordingly, such decrease of the ratio of the second diluent to the second catalyst can already be achieved by a reduction of the flow of diluent arriving to the mixing vessel, while the flow of catalyst arriving to the mixing vessel is for example kept constant or reduced to a lesser extent. However, the mere act of varying flows of compounds entering vessels in order to adjust their amounts in said vessel belongs to the common general knowledge and does not require any inventive skills. It is also noted that according to the case law of the boards of appeal, the answer to the question what a skilled person would have done in the light of the state of the art depends in large measure on the technical result he has set out to achieve (see T 0939/92, OJ EPO, 1996, 309, reasons 2.4.2 and 2.5.3). Here, faced with the problem identified in above point 4.2, the skilled person would consider any measure which he or she would consider appropriate to adjust the catalyst concentration to the level required for the polymerization reaction.

5.3 Accordingly, starting from the sequential use between different and/or incompatible catalysts in the production of ethylene homopolymers or copolymers illustrated by Experiment 3 of D1 and whishing to solve the problem identified in above point 4.2 the skilled person would have been prompted in the light of the prior art not only to use a loop reactor, but also to decrease the ratio of the second diluent to the second

ethylene polymerization catalyst in the mixing vessel, arriving thereby in an obvious manner at the method of operative claim 1.

6. For this reason the subject-matter of claim 1 of the main request does not involve an inventive step within the meaning of Article 56 EPC.

Auxiliary Requests 1 to 3

7. The question of whether Auxiliary Requests 1 to 3 submitted before the opposition division with letter of 7 August 2015, and filed anew with the rejoinder of the respondent of 6 November 2017, should be taken into account by the Board is to be answered having regard to the provision of Article 12(4) RPBA 2007 (which applies in view of the transitional provisions in Article 25(2) RPBA 2020) in combination with Article 12(2) RPBA 2007 to which Article 12(4) RPBA 2007 refers, Article 12(2) RPBA 2007 stipulating that the statement of grounds of appeal and the reply must contain a party's complete case. The respondent merely identified in sections 1.3 and 5.1 of its rejoinder the features introduced into claim 1 of Auxiliary Requests 1 to 3 and their location in the granted patent. The respondent did not indicate how said modifications could overcome the objection raised in respect of the main request, in particular whether they introduce further distinguishing features over the closest prior art, could lead to a different formulation of the problem and to a different assessment of the obviousness of the solution. Only a general statement in section 5.2 of the rejoinder, namely "*It is submitted that the arguments in respect to sufficiency and inventive step of the claims of the Main Request presented herein, apply mutatis mutandis to claims of the Auxiliary Requests 1-3*" devoid of

clear analysis was submitted with the consequence that Auxiliary Requests 1 to 3 lack substantiation. Although the lack of substantiation of the auxiliary requests was communicated to the respondent in the communication of the Board dated 31 July 2020, no additional submissions were made in this respect. Under these circumstances Auxiliary Requests 1 to 3 are held inadmissible under Article 12(4) RPBA 2007 as they do not meet the requirement of Article 12(2) RPBA 2007 (Case Law, supra, V.A.4.12.5).

Conclusion

8. As the requests on file are either not inventive or not in the proceedings, there is no need for the Board to decide on any other issue and the patent is to be revoked.

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:

B. ter Heijden D. Semino

Decision electronically authenticated