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D E C I S I O N
of 12 February 2003

Case Number: T 0360/00 - 3.3.3

Application Number: 96107996.9

Publication Number: 0744415

IPC: C08F 10/00

Language of the proceedings: EN

Title of invention:

Solid titanium catalyst component, ethylene polymerization catalyst containing the same, and ethylene polymerization process

Patentee:

Mitsui Chemicals, Inc.

Opponent:

BP Chemicals Ltd

Headword:

-

Relevant legal provisions:

EPC Art. 114(2), 100(b), 84, 83, 54, 56

Keyword:

"Late submitted material - document admitted (no)"
"New opposition ground - insufficiency of disclosure -
admissibility (no)"
"Claims - clarity (yes)"
"Novelty (yes)"
"Inventive step - non-obvious combination of known features"

Decisions cited:

G 0010/91, T 0150/82, T 0205/83, T 0256/87, T 1002/92

Catchword:

-



Case Number: T 0360/00 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 12 February 2003

Appellant: BP Chemicals Ltd.
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 9 March 2000
rejecting the opposition filed against European
patent No. 0 744 415 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: R. Young
Members: W. Sieber
J. Van Moer

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 744 415, with 4 claims, in respect of European patent application No. 96 107 996.9, filed on 20 May 1996 and claiming JP priorities of 22 May 1995 (JP 122865/95) and 8 April 1996 (JP 85527/96), respectively, was published on 28 January 1998 (Bulletin 1998/05).

Claims 1 and 2 read as follows:

"1. A solid titanium catalyst component obtainable by a process comprising:

a step of bringing (a) a liquid magnesium compound into contact with (b) a liquid titanium compound in the presence of (c) an organosilicon compound having no active hydrogen in an amount of 0.25 to 0.35 mol based on 1 mol of the magnesium compound (a); and
a step of elevating the temperature of the resulting contact product (i) to a temperature of 105 to 115°C and maintaining the contact product (i) at this temperature,
said solid titanium catalyst component comprising magnesium, titanium, halogen and the organosilicon compound having no active hydrogen (c).

2. A solid titanium catalyst component obtainable by a process comprising:

a step of bringing (a) a liquid magnesium compound into contact with (b) a liquid titanium compound in the presence of (c) an organosilicon compound having no active hydrogen in an amount of 0.25 to 0.35 mol based

on 1 mol of the magnesium compound (a); and

a step of elevating the temperature of the resulting contact product (i) to maintain the contact product (i) at a given temperature of 105 to 115°C, wherein an additional amount of the organosilicon compound having no active hydrogen (c) is added in an amount of not more than 0.5 mol based on 1 mol of the magnesium compound (a) while the temperature of the contact product (i) is elevated from a temperature lower by 10°C than the temperature maintained to a temperature at which the elevation of the temperature is completed, or after the elevation of the temperature is completed, so as to bring the additional amount of the compound (c) into contact with the contact product (i), said solid titanium catalyst component comprising magnesium, titanium, halogen and the organosilicon compound having no active hydrogen (c)."

Claim 3 was directed to an ethylene polymerization catalyst comprising: [I] the solid titanium catalyst component as claimed in any one of claims 1 and 2, and [II] an organometallic compound.

Claim 4 was directed to an ethylene polymerization process comprising polymerizing ethylene or copolymerizing ethylene and a comonomer in the presence of the catalyst as claimed in claim 3.

II. A notice of opposition was filed on 26 October 1998, on the grounds of Article 100(a) EPC (lack of novelty and lack of inventive step) where the following documents had been cited:

D1: JP-A-60-106806 (translation into English); and

D2: WO-A-94/12542.

During the oral proceedings before the opposition division the opponent referred to documents D3 and D4:

D3: EP-A-0 268 274; and

D4: FR-A-2 206 339.

However, the opposition division had considered these documents as late filed and had not introduced them into the proceedings (Article 114(2) EPC).

III. By a decision announced orally on 23 February 2000 and issued in writing on 9 March 2000, the opposition division rejected the opposition.

The decision under appeal held that the subject-matter claimed in the patent in suit was novel over D1 and D2. D1 in particular did not disclose the combination of process features required in the claims of the patent in suit. Furthermore, the opponent did not demonstrate that one the examples in D1 led to products falling within the scope of the claimed subject-matter.

Starting from D1 as the closest prior art, the objective technical problem to be solved was seen in the provision of solid titanium components having high activity in combination with excellent product properties, in particular good particle size distribution (PSD) and good melt flow rate (MFR). Neither D1 itself nor D2 contained any suggestion to the solution found in the patent in suit.

IV. On 4 April 2000, a notice of appeal against the above

decision was filed, the prescribed fee being paid on 12 April 2000.

In the statement of grounds of appeal, filed on 12 July 2000, the opponent (hereinafter referred to as the appellant) argued in substance as follows:

- (i) The catalyst components of both Claims 1 and 2 were drafted in the form of "product-by-process" claims. This type of product claim was against the Guidelines for Examination in the EPO and the case law established by the technical boards of appeal, because the claimed products could have been characterized by reference to their composition, structure or other testable parameters. Furthermore, this wording brought a "major uncertainty" regarding the scope of the claims.

- (ii) The claimed invention lacked novelty over D1 because that document disclosed a solid titanium catalyst component having all product characteristics required in Claims 1 and 2. As regards the process features in Claims 1 and 2, the method of preparing the claimed catalysts followed the same principles as in D1. Furthermore, the amount of organosilicon compound used in the method did not represent an essential feature and, consequently, had to be ignored when considering novelty of the claimed product. Also the selection of the temperature range in the preparation procedure did not confer novelty to the claimed catalysts. That range fell just in the middle of the temperature range disclosed in D1. Lack of novelty was further supported by the fact that the opposed patent did not show a clear

distinctiveness in product properties over the prior art which would be commensurate with and the basis for an absolute protection for the claimed titanium catalyst component.

- V. With a submission filed 7 November 2000, the proprietor (hereinafter referred to as the respondent) contested the appellant's arguments, since they were based on a misconception of the claimed invention, an incorrect interpretation of the case law of the technical boards of appeal or simply represented allegations which were not supported by the facts of the case. Moreover, the claimed invention was novel as emphasized by the examples and comparative examples in the patent in suit.
- VI. In a reply filed 12 February 2001, the appellant maintained the objection that it was not clear what the distinct properties of the claimed products were. Thus, the burden of proof lay with the proprietor to demonstrate distinctiveness of the claimed products.
- VII. In a communication accompanying a summons to oral proceedings (18 September 2002), the board informed the parties that the emphasis of the oral proceedings would lie on the issue of novelty, in particular with regard to the distinctiveness of the products according to Claim 1 over the prior art.
- VIII. Oral proceedings were held on 12 February 2003 where the appellant argued that the passage on page 6, lines 15 to 19 of the specification threw doubts on the significance on the feature "in the presence of (c) an organosilicon compound having no active hydrogen in an amount of 0.25 to 0.35 mol based on 1 mol of the

magnesium compound (a)" in Claims 1 and 2. This inconsistency rendered the scope of the claims unclear leading to an objection under Article 100(b) EPC. Having regard to the new ground of opposition under Article 100(b) EPC, the respondent did not agree to its introduction into the proceedings. The appellant requested also to introduce document D3 and a pamphlet of documents headed "Activity vs PSD" on the first page and presented at the oral proceedings to be introduced into the proceedings.

Having regard to novelty, the appellant basically relied on the argument that the catalyst components according to the claims showed no distinct differences over those of D1, in particular Example 1, resulting in lack of novelty. The respondent pointed to the data in the patent in suit which clearly demonstrated the distinctiveness of the claimed products. Apart from that, there was no evidence on file that an example of D1 anticipated the subject-matter of D1. In their assessment of inventive step, both parties started from D1 as the closest prior art.

IX. The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Late filed documents*

2.1 The opposition division had considered documents D3 and document D4 as late filed and, in accordance with Article 114(2) EPC, had not introduced them into the proceedings. Thus, these documents do not belong to the factual framework of the case which is the subject of the present appeal.

During the oral proceedings held on 12 February 2003, the appellant requested the board to introduce D3 into the opposition appeal proceedings because this document was relevant in the assessment of novelty of the claimed subject-matter. However, the appellant did not advance any specific circumstances which could excuse the delay in producing D3. Furthermore, it is established case law that late filed evidence should only very exceptionally be admitted into the proceedings at the appeal stage if its content is *prima facie* so highly relevant to prejudice the maintenance of the patent in suit (see eg T 1002/92, OJ EPO 1995, 605, point 3.4 of the reasons). The appellant could not, however, demonstrate at the oral proceedings that D3 was more relevant than the documents in the proceedings up to then, in particular more relevant than D1. Consequently, D3 was not admitted into the proceedings (Article 114(2) EPC).

2.2 As regards the pamphlet of documents headed "Activity vs PSD" on the first page and presented at the oral proceedings, it represented according to the appellant a graphical comparison of data extracted from D3 and the patent in suit. D3 not being admitted, the pamphlet was also not admitted into the proceedings.

3. *Sufficiency of disclosure*

3.1 The appellant argued for the first time at the oral proceedings before the board that the opposed patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC). The objection centred on the passage on page 6, lines 15 to 19 of the specification where it is stated that "it is enough that the organosilicon compound having no active hydrogen (c) is contained in the finally obtained solid titanium catalyst component. In the preparation of the solid titanium catalyst component, therefore, the organosilicon compound having no active hydrogen (c) itself may not be used, and there can be used compounds capable of producing the organosilicon compound having no active hydrogen in the course of the process for preparing the solid titanium catalyst component." This statement was inconsistent with Claim 1 which required the contacting of compounds (a) and (b) to be carried out in the presence of an organosilicon compound (c) having no active hydrogen in a specific amount (hereinafter referred to as feature (c)). This inconsistency threw doubts on the significance of feature (c) leading to the question whether Claim 1, and in particular the definition of feature (c) was clear as required by Article 84 EPC, and arising from this, whether the teaching of the patent in suit was sufficient to enable the skilled person to carry out the invention (Article 83 EPC) in the sense of his being unable to establish whether or not a solid titanium catalyst component falls within the scope of Claim 1. In this context, reference was made to T 256/87 (26 July 1988, not published in the OJ EPO).

3.2 However, following the ruling in the opinion of the Enlarged Board of Appeal G 10/91 (OJ EPO 1993, 420), and in the light of the refusal by the respondent (proprietor) to have the new ground of opposition admitted into the proceedings, the board cannot consider such ground without exceeding its jurisdiction. Therefore, this ground is completely excluded from the proceedings.

4. *Clarity*

4.1 Similarly under the EPC, the board has no jurisdiction to deal with the appellant's allegation that **granted** Claim 1 is not clear under Article 84 EPC since Article 84 EPC has no counterpart in Article 100 EPC.

4.2 Nevertheless, it is true that there is an inconsistency between the claims and that statement on page 6 of the patent specification which makes it necessary for the board to construe the meaning of Claim 1.

4.2.1 The criticality of contacting compounds (a) and (b) in the presence of an organosilicon compound (c) having no active hydrogen in a specific amount as required in Claim 1 is apparent from the patent specification page 2, lines 39 to 42 and lines 45 to 48, page 3, lines 18 to 21 and the preparation processes described on page 7, lines 1 to 50 and in the examples.

4.2.2 Thus, apart from the contradiction on page 6, there is an overwhelming support for the subject-matter as defined in Claim 1 when reading the description as a whole. The board comes therefore to the conclusion that Claim 1 on its true interpretation, is to be understood as requiring "a step of bringing (a) a liquid magnesium

compound into contact with (b) a liquid titanium compound in the presence of (c) an organosilicon compound having no active hydrogen in an amount of 0.25 to 0.35 mol based on 1 mol of the magnesium compound (a)". In other words, Claim 1, and by the same token Claim 2, are susceptible of a clear interpretation and no objection against them arises under Article 84 EPC.

5. *The patent in suit; the technical problem*

5.1 The patent in suit is concerned in general terms with a solid titanium catalyst component comprising magnesium, titanium, halogen and the above mentioned organosilicon compound having no active hydrogen (c), and in particular with a catalyst component capable of polymerizing ethylene with high activities and preparing an ethylene polymer of excellent particle properties (page 2, lines 31 to 33 of the patent specification). A method of improving the quality of a titanium catalyst component is admittedly known from D1 which is considered by the board, in line with the decision under appeal and both parties, to represent the closest state of the art.

5.2 According to D1, it was found that the quality of a titanium catalyst component could be improved by subjecting

(A) a high-activity titanium catalyst component whereof the essential components are magnesium, titanium and a halogen to heat treatment at temperatures of approximately 80 to 300°C in the presence of

(B) an organic polyvalent metal compound selected from

a group which comprises alkoxy halide and aryloxy halide compounds of polyvalent metals, and

(C) an organic hydroxyl or silicon compound.

5.2.1 It is immediately apparent that this procedure of D1 requires the addition of an organosilicon compound to an already formed "raw" solid titanium catalyst component (A), ie a process which takes place **after** the formation of the "raw" titanium catalyst component (A). This quality improving step does not involve bringing into contact (a) a liquid magnesium compound with (b) a liquid titanium compound in the presence of (c) an organosilicon compound having no active hydrogen.

5.2.2 Therefore, the correct starting point in D1 is a particular aspect of the "inventive" procedure described in the claim and on page 8, to wit the process of preparing the "raw" titanium catalyst component (A) which is similar to the process required in Claim 1 of the patent in suit.

The "raw" titanium catalyst component (A) of D1, ie not yet heat treated in the presence of (B) and (C), may be obtained by reacting magnesium compounds with titanium compounds, sometimes with the addition of a reaction adjuvant (page 4, second paragraph). As set out on page 5, first full paragraph, "the raw titanium catalyst component is produced by reacting a magnesium compound with a titanium compound. If the magnesium compound is solid, it can be reacted by creating a suspension within a liquid titanium compound, which may be diluted with an inert hydrocarbon. It is also possible to react the magnesium and titanium compounds by crushing them together mechanically. If the

magnesium compound is dissolved in an inert hydrocarbon and assumes the form of a liquid, the reaction can be implemented by mixing the liquid titanium compound with it". The recommended reaction temperature is in the approximate range of 10 to 180°C, and preferably 20 to 140°C (page 5, second full paragraph). Examples of such reaction adjuvants include silicon halides such as silicon tetrahalides, silicon alkylhalides and silicon alkoxyhalides. The amount of the possible reaction adjuvant is not indicated.

5.3 Thus, D1 describes various possibilities to prepare the "raw" solid titanium catalyst component to be used in the further preparation of the polymerization catalyst from a series of individually disclosed process conditions. The technical problem objectively arising may be seen in the search for an improved solid titanium catalyst component, in particular with respect to high activity and excellent particle properties of the resulting ethylene polymers.

5.4 The solution proposed according to Claim 1 of the patent in suit is to bring compounds (a) and (b) into contact in the presence of a certain amount of organosilicon compound (c) and under specified reaction conditions, ie elevating the temperature of the resulting contact product to a temperature of 105 to 115°C and maintaining the contact product at this temperature.

5.4.1 Tables 2 and 3 of the patent in suit give the results of the relevant comparisons between an embodiment according to Claim 1 (Example 1) and similar catalyst components prepared not according to the requirements of Claim 1: in Comparatives Examples 4 and 5, the

temperatures are either too low or too high, ie 90°C and 120°C, respectively; in Comparative Examples 6 and 7, the amount of organosilicon (c) is too low and too high; and in Comparative Example 8, both the temperature and the amount of organosilicon (a) are too low. It can be seen from these results, that the conditions specified in Claim 1 lead to an improved balance of catalyst activity and particle size properties.

5.4.2 Furthermore, the solid titanium components compared in Example 1 and Comparative Examples 4 to 7 differ only in one feature. Consequently, the comparison shows convincingly that the improvement is due specifically to the presence of the features required in Claim 1.

5.4.3 By way of contrast, appellant's allegation that the solid titanium catalyst components disclosed in D1 provide the same technical effects as those according to the patent in suit and that the objective technical problem over D1 can only be seen in the provision of alternative solid titanium catalyst components is not supported by any experimental evidence. In the light of the evidence presented in the patent in suit, appellant's approach in formulating the objective technical problem is not convincing.

5.5 In summary, the board finds it credible that the technical problem stated in the patent in suit is indeed the objective technical problem and that the claimed measures provide an effective solution to this problem.

6. *Novelty*

6.1 The claimed catalyst components of Claim 1 are drafted in the form of a "product-by-process" claim which is characterized by technical features stemming from

- (i) the chemical components making up the catalyst component, namely magnesium, titanium, halogen and an organosilicon compound having no active hydrogen, and
- (ii) their method of preparation, ie temperature, amounts and conditions of bringing into contact these components.

Both aspects lead to specific product characteristics, so that the claimed catalyst components are not only defined by a specific chemical composition. The fact that there are particular product characteristics which cannot simply be assigned to the presence or absence of atoms or compounds and cannot be defined in different terms is clearly demonstrated in the examples of the patent in suit (see points 5.4.1 and 5.4.2, above). These examples specifically show that the method of preparing the catalyst component imparts distinct differences in product properties, and that departing from the particulars of the method of preparation will not yield the desired catalyst properties. Thus, contrary to the appellant's allegation, Claim 1 has been correctly drafted in the form of a "product-by-process" claim meeting the criteria which have been held to be necessary for this type of claim in the case law, eg T 150/82 (OJ EPO, 1984, 309) and T 205/83 (OJ EPO, 1985, 363). Hence, the process features have to be taken into account when assessing novelty of the

claimed subject-matter.

6.2 The only relevant document, and in fact the only document relied upon by the appellant is D1. The analysis of D1 (see point 5.2, above) shows that the subject-matter of Claim 1 lies within the broader disclosure of D1 for preparing the "raw" titanium catalyst component (A). Although the method described in D1 and identified in the present claims may be based on the same principle of mixing together compounds and precipitating a catalyst component, the relevant question to be asked is whether the **specific combination** of steps by which the claimed catalyst components are obtainable is clearly and unambiguously derivable from D1.

6.2.1 In order to arrive at something falling within the scope of Claim 1 one would have to make a "multiple selection" from this broader disclosure of D1. In particular one would have to:

- react the magnesium and titanium compounds in the liquid form,
- select a temperature range of 105 to 115°C,
- a silicon compound as the reaction adjuvant, and
- an appropriate amount of the silicon compound.

In such a situation, where the selection from various possibilities disclosed in the prior art is to be considered, a careful comparison has to be carried out in order to assess whether or not such a "multiple selection" or "combined selection" was available to the

skilled person from a particular piece of prior art.

6.2.2 In the present case, the combination of relevant features was not explicitly set out in D1 and did not form part of an unambiguous, implicit disclosure. Therefore, in the Board's judgement, the combination of process features required in Claim 1 of the patent in suit was not made available to a skilled person from the general disclosure of D1.

6.2.3 Furthermore, none of the Examples of D1 discloses the combination of process features as required in Claim 1. The only examples of relevance in this respect are Examples 1 to 8 of D1 where, in the preparation of the "raw" titanium catalyst component (A), a liquid magnesium compound is reacted with titanium tetrachloride in the presence of an organosilicon compound. However, the amount of silicon compound is too low, ie 0.23 mol versus 0.25 mol as required in Claim 1, and the reaction temperature of 90°C is outside the range of 105 to 115°C required in Claim 1 of the patent in suit.

In Examples 9 to 15 of D1, including Example 10 cited by the appellant, no organosilicon compound is present during the formation of the "raw" catalyst component (A). The silicon compound is added after the catalyst component (A) has been prepared which does not include the requirement that a liquid magnesium compound and a liquid titanium compound are brought into contact in the presence of a certain amount of organosilicon compound (c). Thus, Examples 9 to 15 are not relevant for the assessment of novelty.

6.3 In summary, the disclosure of D1 is not such as to make

available, explicitly or implicitly, something falling within the scope of Claim 1 of the patent in suit. In other words, the subject-matter of Claim 1 is novel. In a similar manner, the subject-matter of Claim 2, which comprises all the features of Claim 1, and the subject-matter of Claims 3 and 4, both of them employing the catalyst components of Claims 1 and 2, is novel.

7. *Inventive step*

- 7.1 To assess the question of inventive step, it is necessary to consider whether the skilled person, starting from D1 and wishing to improve the properties of a catalyst component, in particular the catalyst activity and the particle properties of the resulting ethylene polymers, would have expected that this could be achieved by choosing reaction conditions so as to obtain a catalyst component as set out in Claim 1.
- 7.2 There is no suggestion in D1, the only document relied upon by the appellant, as to how the properties of the catalyst component might be further improved, let alone a hint to the combination of a certain amount of the organosilicon compound (c) in the contact step in combination with a certain temperature as a more promising preparation method of the disclosed general process.
- 7.3 Appellant's argument that a modification of the temperature and the concentration of component (c) is within usual experimentation of a skilled person was brought forward in connection with a technical problem based on the provision of alternative catalyst components, ie not improved catalyst components (see point 5.3, above). Since, however, it has been

demonstrated that the objective technical problem relates to the provision of improved catalyst components, this argument is irrelevant.

Also appellant's argument that the temperature range of 105 to 115°C required in Claim 1 falls just in the middle of the temperature range disclosed in D1, ie 10 to 180°C, is not convincing. First of all, the middle of that temperature range is 95°C which is below the range required in Claim 1. And even the preferred embodiments of D1 do not anticipate a range of 105 to 115°C: the preferred temperature range is 20 to 140°C (page 5, second full paragraph) and the temperature employed in Examples 1 to 8 is 90°C.

- 7.4 In summary, the solution to the stated problem does not arise in an obvious way from the state of the art. Consequently, the subject-matter of Claim 1 involves an inventive step (Article 56 EPC). The same conclusion applies also to the subject-matter of Claims 2 to 4 (see point 6.3, above).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young