BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen
(D) [ ] No distribution

Datasheet for the decision of 8 November 2006

Case Number: T 0700/04 - 3.3.03

Application Number: 93308456.8

Publication Number: 0595565

IPC: C08F 4/654

Language of the proceedings: EN

Title of invention:
Catalyst component for olefin polymerization

Patentee:
Mitsubishi Chemical Corporation

Opponent:
Basell Polyolefine GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 114(1), 54, 56
RPBA Art. 10(b)

Keyword:
"Late-filed submission (admitted)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0700/04 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 8 November 2006

Appellant: (Opponent)
Basell Polyolefine GmbH
Intellectual Property - F206
D-67056 Ludwigshafen (DE)

Representative:
Giberti, Stefano
Basell Poliolefine Italia S.r.l.
Intellectual Property
P.le G. Donegani 12
I-44100 Ferrara (IT)

Respondent: (Patent Proprietor)
Mitsubishi Chemical Corporation
14-1, Shiba 4-chome,
Minato-ku
Tokyo
108-0014 (JP)

Representative:
Gillard, Richard Edward
Elkington and Fife LLP
Prospect House
8 Pembroke Road
Sevenoaks
Kent TN13 1XR (GB)

Decision under appeal:
Decision of the Opposition Division of the European Patent Office dated 17 March 2004 and posted 31 March 2004 rejecting the opposition filed against European patent No. 0595565 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: R. Young
Members: W. Sieber
E. Dufrasne

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 595 565, in respect of European patent application no. 93 308 456.8, in the name of Mitsubishi Chemical Corporation, filed on 22 October 1993 and claiming a JP priority of 28 October 1992 (JP 29044192), was published on 21 March 2001 (Bulletin 2001/12). The granted patent contained 13 claims, whereby Claim 1 read as follows:

"A catalyst component for olefin polymerization which comprises an intimate mixture of the following components which have been prepared separately:

Component (A1) which is a solid component for Ziegler catalysts comprising titanium, magnesium and a halogen as essential components in a particulate form; and
Component (A2) which is a compound selected from inorganic oxides, inorganic carbonates, inorganic sulfates and physical or chemical mixtures thereof in a particulate form;

wherein Component (A2) is employed in a weight ratio to Component (A1) from 0.001 to 0.1 and has an average particle diameter smaller than that of Component (A1); and wherein the ratio of the average particle diameter of Component (A2) to that of Component (A1) is in the range of from 0.0001 to 0.5 and wherein the particles of Component (A2) adhere to or cover the particles of Component (A1)."

Claims 2-11 were dependent claims directed to elaborations of the catalyst component according to Claim 1. Claim 12 was directed to a catalyst for olefin polymerization comprising a combination of the catalyst component as claimed in any of Claims 1-11, and an organoaluminum compound. Claim 13 was directed to a process for production of olefin polymers, which comprised contacting an olefin with the catalyst for olefin polymerization as claimed in Claim 12 thereby to polymerize the olefin.

II. A notice of opposition was filed by Basell Polyolefine GmbH on 21 December 2001 requesting revocation of the patent in its entirety on the grounds of Article 100(a) EPC (lack of novelty and lack of inventive step).

The opposition was supported by the following documents:

D1: WO-A-88 02379; and

D2: Degussa Schriftenreihe Pigmente Nummer 31, May 1992.

III. By a decision which was announced orally on 17 March 2004 and issued in writing on 31 March 2004, the opposition division rejected the opposition.

(a) With regard to novelty, the only relevant document was D1. According to the opposition division, the catalytic system disclosed in D1 did not anticipate the claimed subject-matter because, firstly, several selections had to be made within the disclosure of D1 in order to arrive at the claimed combination of features. Secondly, D1 did

not disclose a catalyst system where the particles of the pulverulent inorganic material used in the polymerization process (corresponding to component (A2) of the patent in suit) adhered to or covered the catalyst particles (corresponding to component (A1) of the patent in suit).

(b) D1 was considered to represent the closest prior art which, however, did not teach that the inorganic particles adhered to or covered the catalyst particles. The technical effect brought by this difference was improved granulometric properties. Consequently the objective technical problem had to be seen in the provision of a Ziegler-Natta catalyst component for the polymerization of olefins with improved granulometric properties. D2 did not suggest a solution to this problem. Although D2 disclosed the use of synthetic silica as flow agent and carrier, it was silent about the use of synthetic silica in combination with Ziegler-Natta catalysts. To use the teaching of D2 in the field of Ziegler-Natta catalysts would have required hindsight. Hence the claimed subject-matter was not obvious over D1 and D2.

IV. On 27 May 2004, the appellant (opponent) filed a notice of appeal against the above decision with simultaneous payment of the prescribed fee.

The appellant's arguments filed with the statement of grounds of appeal on 30 July 2004 may be summarized as follows:

(a) The subject-matter of granted Claim 1 was not novel in view of D1.

It was generally known that small particles of a powder adhered to larger particles thereby improving the flow properties of the larger particles (eg D2). This was also described in D1. Furthermore, it was disclosed in D1 that the pulverulent inorganic substance such as silica could be mixed with the catalyst or the prepolymerised catalyst. In a preferred embodiment, the pulverulent inorganic substance was mixed with the prepolymer in a liquid hydrocarbon which was then eliminated by distillation. When using such a method, the particles of the pulverulent inorganic substance would automatically cover the catalyst particles.

The catalyst prepared in Example 10 of D1 met all the requirements of granted Claim 1, in particular composition, particle diameters and ratios. Furthermore, it was an inevitable consequence of the preparation method used in Example 10 (mixing the components in the presence of a hydrocarbon) that the silica particles adhered to the prepolymerised catalyst particles. In order to demonstrate this adherence, Example 10 of D1 had been repeated (Annex 1). The catalyst without silica and the catalyst prepolymerised in the presence of silica were analysed via Scanning Electron Microscopy (SEM) in combination with Energy Dispersive X-Ray (EDX). According to the appellant, SEM and EDX showed that the silica particles covered the surface of the

prepolymerised catalyst (Annex 2). Also pictures taken by a microscope showed that silica adhered to the surface of the prepolymerised catalyst (Annex 3).

(b) The problem to be solved by the patent in suit was to improve the granulometric properties of a solid Ziegler catalyst such as fluidity, angle of repose and adhesion of particles. The solution to this problem was the addition of an inorganic oxide. The same problem and solution was already described in D1. Furthermore, the teaching of D1 had to be seen in the light of D2 and D3 whereby the latter was filed together with the statement of grounds of appeal.

D3: JP-A-03217-404 (abstract).

V. In a letter dated 11 July 2006, the appellant requested, as an auxiliary motion, oral proceedings pursuant to Article 116 EPC.

VI. Following the summons to oral proceedings, the appellant withdrew in a letter dated 30 August 2006 its auxiliary request for oral proceedings and informed the board that it would not be represented at the hearing scheduled for 8 November 2006.

VII. In a letter dated 6 October 2006, the respondent (proprietor) maintained its position already set out during opposition proceedings that there was no direct and unambiguous teaching in D1 of an intimate mixture of components (A1) and (A2) as claimed in the patent in suit. D1 was not relevant for inventive step because it

related to a different problem, namely seeking to increase the temperature of the polymerisation reaction, and also provided no discussion of the benefits of an intimate mixture of components (A1) and (A2).

VIII. In a communication dated 12 October 2006, the board pointed out that the respondent's submission (point VII, above) was late-filed, namely after the expiring of the period for reply to the statement of grounds of appeal, and, consequently, would have to be considered in the light of the relevant provisions of the Rules of Procedure of the Boards of Appeal (RPBA) and the EPC, namely Articles 10(a)(1) and (2), 10(b)(1) and (3) RPBA and Article 114 EPC.

IX. On 8 November 2006, oral proceedings were held before the board where the appellant was not represented. Because it had been duly summoned, however, the oral proceedings were continued in its absence in accordance with Rule 71(2) EPC.

At the oral proceedings, the respondent basically relied upon its written submission. With respect to inventive step, it considered D1 as representing the closest prior art. Furthermore, the possibility of D3 as representing the closest prior art was discussed.

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

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal complies with Articles 106 and 108 EPC and Rule 64 EPC and is therefore admissible.

2. *Late-filed submission of the respondent*

The respondent's written submission (point VIII, above) was late-filed, namely after the expiry of the period for reply to the statement of grounds of appeal. However, the line of argument presented in this submission was essentially based on the respondent's arguments already presented before the opposition division, and did not raise issues which the board or the other party could not reasonably be expected to deal with. Consequently, the board exercised its discretion to admit this submission into the proceedings for consideration, especially in the absence of a request of the appellant not to admit it (Articles 10(b)(1) and (3) RPBA and Article 114(1) EPC).

3. *Novelty*

The only relevant document with respect to novelty is D1. No other document has been invoked in this connection in the opposition and the appeal proceedings.

3.1 D1 is directed to a process for the (co)polymerisation of α-olefins in the gas phase in a fluidised bed or mechanically stirred bed reactor using a Ziegler-Natta type catalyst or a heat activated chromium oxide catalyst wherein the (co)polymerisation is carried out in the presence of 0.005 to 0.2% by weight, based on the weight of the (co)polymer forming the bed, of an

inert pulverulent inorganic substance, eg silica. The particles of the pulverulent inorganic substance have a mean diameter by mass between 0.5 and 20 μm and this mean diameter by mass is 50-500 times smaller than the mean diameter of mass of the particles of the (co)polymer forming the bed (Claim 1). D1 is concerned with improving the homogeneity of the fluidised bed and avoiding the appearance of hot spots (page 2, lines 26 to 31). The process allows the polymerization to be operated at a temperature closer to the softening point of the produced olefin than in the absence of the pulverulent inorganic substance (page 3, line 27 to page 4, line 1).

3.2 Referring to page 8, lines 9-19 of D1, it is specified that "The pulverulent inorganic substance is used in the polymerisation or copolymerisation medium in the gaseous phase by continuous or semi-continuous introduction. More particularly, it can be introduced into the fluidised and/or mechanically agitated bed separately from and independently of the catalytic system or catalyst, more particularly using a feed device separate from that of the catalytic system or catalyst." Another possibility is that the pulverulent inorganic substance "can be introduced into the bed simultaneously with the solid catalyst. In that case the pulverulent inorganic substance can advantageously be used in the form of a mixture with the solid catalyst, whose particles remain separate from those of the pulverulent inorganic substance." Furthermore, it is stated on page 12, lines 16-29 of D1 that, when the catalyst or the solid component of the catalyst system is employed as a prepolymer, the pulverulent inorganic substance can be mixed with the prepolymer powder,

preferably in the presence of a liquid hydrocarbon diluent. The resulting prepolymer-based mixture is particularly homogeneous and efficient for the required improvement in the production of polyolefins.

Thus, the general disclosure of D1 envisages three possible systems for introduction of the pulverulent inorganic substance. In the first system the inorganic substance is introduced separately and independently of the catalytic system. By definition, therefore, this system cannot involve a catalyst comprising an intimate mixture of the catalyst component and the inorganic substance as required in Claim 1 of the patent in suit. In the second system the inorganic substance is introduced simultaneously with the solid catalyst. However, there is no mention in D1 that the application of this system would form an intimate mixture where the particles of the inorganic substance adhere to or cover the particles of the solid catalyst. On the contrary, D1 explicitly states that, in case the pulverulent inorganic substance is used in the form of a mixture with the solid catalyst, the particles of the solid catalyst "*remain separate from those of the pulverulent inorganic substance*" (page 8, lines 16-19). Finally, the mixture of prepolymerised catalyst and the pulverulent inorganic substance of page 12 of D1 is referred to as particularly homogeneous. Again, there is no mention that the particles of the inorganic substance adhere to or cover the particles of the prepolymerised catalyst.

In summary, the general disclosure of D1 does not disclose the claimed subject-matter.

3.3 The appellant also argued that the catalyst prepared in Example 10 of D1 met all the requirements of granted Claim 1 and has submitted a re-working of Example 10 to support its objection (Annex 1).

In Example 10, particles of a "solid catalyst (N)" are prepared in a first step comprising titanium, magnesium and iodine. At this stage, no silica (corresponding to component (A2) in the patent in suit) is added, so that this solid catalyst (N) would correspond to component (A1) in the patent in suit. In a second step, a reactor is charged with n-hexane, the solid catalyst (N), tri-n-octylaluminium and a large quantity of silica followed by the introduction of hydrogen and then ethylene. After drying under nitrogen, a composition (P) was obtained.

As mentioned above, the solid catalyst (N) would correspond to component (A1) in the patent in suit. However, as pointed out by the respondent, Example 10 indicates neither the particle size for the obtained solid catalyst (N) nor the exact quantity of solid catalyst (N) used in the second step. Nor did the appellant indicate these values in its re-working of Example 10. Since these parameters remain unknown, any novelty objection based on Example 10 of D1 is flawed from the beginning.

It appears that the appellant in its analysis of Example 10 equated the prepolymer powder contained in the composition (P) with component (A1) of the patent in suit. This approach is, however, not correct because the prepolymer powder is prepared in the presence of the silica whereas granted Claim 1 requires that the

components (A1) and (A2) have been prepared separately. The appellant has neither shown that this process feature of granted Claim 1 is irrelevant for a novelty assessment nor provided any argument relating to this aspect. Consequently, even if the prepolymer in the composition (P) of Example 10 is incorrectly equated with component (A1), the appellant's objection that the mixture of prepolymerised catalyst and silica obtained in Example 10 of D1 meets all the requirements of granted Claim 1 is not true.

Also the SEM and EDX photographs (Annex 2 and Annex 3) showing the particles obtained in the re-working of Example 10 fail to prove the appellant's position. In fact, it is not at all clear whether or not Annex 3 shows silica adhered to prepolymerised catalyst particles as alleged by the appellant. Annex 3 is a highly magnified image which shows only part of a catalyst particle and silica. A much broader visual field would be necessary to see whether or not the silica covers or adheres to the particle surface. Thus, the appellant's categorical statement that it does is highly doubtful. Furthermore, if the appellant's statement were true, the peripheral portion of the black part in Annex 2 would be covered by a large number of white silica particles. However, Annex 2 does not show this at all. The photographs in Annex 2 merely show that the silica particles exist between the black portions. This means that the silica particles exist separately from the catalyst particles as a mere mixture. Hence, these photographs seem to show that there is no silica on the surface of the catalyst particle.

3.4 The fact that the silica particles apparently do not adhere to or cover the prepolymerised catalyst particles in Example 10 of D1 also throws doubt on the appellant's statement that the mixing of small and large particles, in particular in the presence of a liquid hydrocarbon as mentioned on page 13 of D1, will automatically lead to a situation where the small particles cover the larger particles. Although a liquid hydrocarbon is used in Example 10, the catalyst particles are obviously not covered with silica particles. Furthermore, such a categorical statement simply ignores, as pointed out by the respondent, electrostatic phenomena that might occur. Consequently, the appellant's objection based on inherent disclosure in view of the teaching of D1 is not convincing.

3.5 In summary, there is no explicit or implicit disclosure of the claimed subject-matter in D1. Furthermore, the appellant has not shown that the catalyst prepared in Example 10 of D1 meets the requirements of granted Claim 1. Hence, the subject-matter of granted Claim 1, and by the same token, the subject-matter of granted Claims 2-13 is novel over D1.

4. *Problem and solution*

4.1 Claim 1 as granted is directed in general terms to a catalyst component for olefin polymerization which comprises an intimate mixture of a solid catalyst component (A1) and inorganic particles of a component (A2) wherein the particles of component (A2) adhere to or cover the particles of component (A1). As set out in paragraphs [0010] and [0143] in the patent in suit, the claimed catalyst component has improved

powder properties such as fluidity, angle of repose or adhesion of particles. When using the catalyst component (combined with an organoaluminium compound) for several polymerisation cycles, no adhesion of the residual catalyst in the catalyst inlet tube or polymer adhesion in the reaction vessel was observed.

4.2 As apparent from paragraph [0003] of the patent in suit, a method of improving the properties of a particulate catalyst component, in particular low angle of repose and fluidity without clogging, is known from D3. The method described in D3 comprises adding spherical polyethylene particles of an average particle diameter of from 30 to 2000 μm to a prepolymerised catalyst component comprising titanium, magnesium and a halogen (abstract). Thus, apart from using a catalyst component corresponding to component (A1) in the patent in suit, D3 discloses the same technical effects as the claimed subject-matter. Therefore, the board regards D3 as representing the closest prior art.

The opposition division and the appellant considered D1 as representing the closest prior art. Although this document discloses a catalyst component which is closer to the claimed subject-matter with respect to its composition (solid catalyst component and silica), D1 does not, in the board's view, qualify as the closest prior art because it does not disclose the same technical effects as the claimed subject-matter. As pointed out in paragraph 3.1, above, the process of D1 is concerned with improving the homogeneity of the fluidised bed and avoiding the appearance of hot spots, thereby allowing the polymerization to be operated at a temperature closer to the softening point of the

produced olefin, ie technical effects unrelated to those disclosed in the patent in suit.

4.3 As can be seen from Application Example 1 in the patent in suit, no adhesion of the residual catalyst in the catalyst inlet tube or polymer adhesion in the reaction vessel is observed when the catalyst component (combined with an organoaluminium compound) is used for several polymerisation cycles. This advantageous behaviour was not achieved when solely the catalyst component (A1) was used, ie no silica particles adhered to or covered the particles of the catalyst component (A1).

Therefore, the objective problem to be solved by the claimed subject-matter over the closest prior art can be seen in the provision of an alternative catalyst component having improved flow properties.

In view of the examples and the comparative examples in the patent in suit, the board is satisfied that this objective technical problem is solved by the features required in granted Claim 1.

5. *Inventive step*

5.1 It remains to be decided whether the proposed solution, namely the use of selected inorganic particles which cover or adhere to the catalyst particles, is obvious from the prior art.

5.2 D3 itself contains no hint to an alternative solution for improving the flow properties of the solid catalyst

component other than the use of specified polyethylene particles.

5.3 D1 discloses the use of an inert pulverulent inorganic substance in the (co)polymerisation of α-olefins in the gas phase in a fluidised bed or mechanically stirred bed reactor (paragraph 3.1, above). As set out in paragraph 4.2, above, D1 is not directed to improving the flow properties of the solid catalyst. Thus, firstly, it cannot provide any incentive with respect to improving the flow properties of the solid catalyst. Secondly, there is no explicit or implicit teaching in D1 that the particles of the inert pulverulent inorganic substance should adhere to or cover the solid catalyst. In other words, D1 does not even in principle disclose the claimed solution. And finally, D1 does also not disclose the ratios for solid catalyst and pulverulent inorganic substance (particle diameter, amount) as required in granted Claim 1. Consequently, D1 cannot provide a suggestion as to the solution offered by the patent in suit, either on its own or in combination with D3.

5.4 D2 brings the skilled person no closer to the claimed subject-matter. D2 adds nothing other than the fact that small diameter silica particles were known per se and that they can be used to aid flow properties. However, D2 does not suggest the advantages associated with adhering such particles to the surface of Ziegler-Natta catalysts, and in particular that this measure would not negatively affect the quality of the (co)polymer produced. Thus, as pointed out by the decision under appeal and by the respondent, the

application of the teaching of D2 in the catalyst field would require hindsight.

5.5 No other conclusion with respect to inventive step of granted Claim 1 can be reached when D1 is chosen as the closest prior art as proposed by the opposition division and the appellant.

The appellant argued that D1 disclosed the same technical problem (ie improvement of flow properties) and the same solution (use of inorganic fine powder) as the patent in suit. This approach is, however, not convincing because, firstly, D1 relates to a different problem as set out in paragraph 4.2, above, and, secondly, D1 does not disclose the claimed solution. As set out above, in relation to novelty, the solution offered in the patent in suit is not a mere mixture of solid catalyst and inorganic oxide. On the contrary, the solution requires that the particles of the inorganic oxide adhere to or cover the catalyst particles. The appellant has not shown that this is either explicitly or implicitly disclosed in D1. Consequently, the solution of the patent in suit cannot be obvious from D1. Furthermore, it appears that a combination of D1 with D2 requires hindsight when going from non-catalyst systems to catalyst systems. In particular, it is not apparent from D2 that the additional presence of silica would not negatively effect the quality of the (co)polymer produced. Although the argument of hindsight against the combination of D1 and D2 has been invoked in the decision under appeal and eventually led to the acknowledgment of inventive step, the appellant has never challenged this argument. The board sees no

reason to depart from the decision under appeal in this respect.

5.6 In summary, the solution to the objective technical problem does not arise in an obvious way from the cited state of the art. Consequently, the subject-matter of Claim 1 as granted, and, by the same token, the subject-matter of Claims 2 to 13 as granted involves an inventive step (Article 56 EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier R. Young