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DECISION
of 31 July 2003

Case Number: T 0943/00 - 3.3.3

Application Number: 92300907.0

Publication Number: 0498603

IPC: C08F 297/08

Language of the proceedings: EN

Title of invention:

Olefin polymerization and copolymerization process

Patentee:

BP Corporation North America Inc.

Opponent:

- (01) BOREALIS A/S
(02) Montell Technology Company bv
(03) Union Carbide Corporation

Headword:

-

Relevant legal provisions:

EPC Art. 83, 123(2)

Keyword:

"Admissibility of the main request (claims as granted) (yes)"

"Disclosure - sufficiency (no conditions for method of measurement) (yes)"

"Disclosure - sufficiency (inaccessability of a parameter in principle) (no)"

Decisions cited:

T 0123/85, T 0256/87, T 0225/93, T 0299/97, T 0378/97,
T 0564/98, T 0960/98, T 0755/00

Catchword:

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Case Number: T 0943/00 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 31 July 2003

Appellant: BP Corporation North America Inc.
(Proprietor of the patent) 200 East Randolph Drive
Chicago, IL 60601 (US)

Representative: Schlich, George William
Mathys & Squire
European Patent Attorneys
100 Gray's Inn Road
London WC1X 8AL (GB)

Respondent: BOREALIS A/S
(Opponent 01) Lyngby Hovedgade 96
DK-2800 Lyngby (DK)

Representative: Kador & Partner
Corneliusstrasse 15
D-80469 München (DE)

(Opponent 02) Montell Technology Company bv
Koeksteen 66
NL-2132 MS Hoofddorp (NL)

Representative: Gaverini, Gaetano
Basell Poliolefine Italia S.p.A.
Intellectual Property
Via Pergolesi 25
I-20124 Milano (IT)

(Opponent 03) Union Carbide Corporation
39 Old Ridgebury Road
US-Danbury
Connecticut 06817-0001 (US)

Representative: Allard, Susan Joyce
BOULT WADE TENNANT
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

Decision under appeal: Decision of the Opposition Division of the European Patent Office posted 8 August 2000 revoking European patent No. 0498603 pursuant to Article 102(1) 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. 0 498 603, with 14 claims, in respect of European patent application No. 92 300 907.0 in the name of Amoco Corporation (later BP Amoco Corporation, now BP Corporation North America Inc.), filed on 3 February 1992 and claiming US priorities of 4 February 1991 (US 650443) and 18 November 1991 (US 793821) was published on 27 December 1996 (Bulletin 1996/52). Claim 1 read as follows:

"A method for making a homopolymer of propylene or a copolymer of propylene with up to 20 mole percent of ethylene, having increased stiffness and a broadened, molecular weight distribution, comprising:

polymerizing propylene or copolymerizing a mixture of propylene with up to 20 mole percent of ethylene in the presence of a high activity catalyst system and a silane, the last two stages of the method comprising:

- (a) in one stage, producing a homopolymer or copolymer of propylene having a relatively high weight average molecular weight in the range of from 350,000 to 4,000,000 and comprising at least 5 weight percent of the total amount of final homopolymer or copolymer of propylene produced; and
- (b) in another stage, either after or prior to stage (a), producing a homopolymer or copolymer of propylene having a relatively low weight average molecular weight in the range of from 50,000 to 340,000 and comprising at least 10 weight percent

of the total amount of final homopolymer or copolymer of propylene produced;

wherein the weight average molecular weight of the final homopolymer or copolymer of propylene produced is in the range of from 150,000 to 1,500,000, and the weight average molecular weight distribution of the final homopolymer or copolymer of propylene produced is such that the M_w/M_n ratio is at least 6.0;

wherein the products formed in steps (a) and (b) comprise at least 50 weight percent of the total amount of final homopolymer or copolymer of propylene produced;

wherein the aforesaid silane is

$R_1(R_2)_xSi(OR_4)_y(OR_5)_z$, wherein R_1 and R_2 are the same or different and are each isopropyl, isobutyl, t-butyl, isopentyl, t-pentyl, neopentyl, phenyl, tolyl, naphthyl, or cycloC(R₃)_{2n-1}, wherein cycloC is a cyclobutyl, cyclopentyl, or cyclohexyl cycloaliphatic ring attached to the silicon atom and R_3 is a hydrogen or an alkyl group having from 1 to 5 carbon atoms and is a substituent to the cycloaliphatic ring and wherein n is 4, 5 or 6 when the cycloaliphatic ring is cyclobutyl, cyclopentyl or cyclohexyl.[sic] respectively, wherein R_4 and R_5 are the same or different and are each methyl.[sic] isopropyl, sec- or t-butyl, and wherein y is 1, 2 or 3, z is 0 or 1, y+z is 2 or 3.[sic] and x is 3-(y+z);

wherein a molecular weight control agent is employed in at least one of the stage (a) and the stage (b) in a sufficient amount that a homopolymer or copolymer of propylene having a

weight average molecular weight in the respective molecular weight for such stage is produced; and wherein the aforesaid catalyst system comprises a supported catalyst comprising a solid hydrocarbon-insoluble composite of a titanium-containing component supported on a magnesium-containing compound and a cocatalyst comprising a Group II or III metal alkyl."

Claims 2 to 14 were dependent claims directed to elaborations of the method according to Claim 1.

II. Notices of opposition were filed by:

- (a) Borealis A/S (opponent 01) on 23 September 1997,
- (b) Montell Technology Company bv (opponent 02) on 24 September 1997, and
- (c) by Union Carbide Corporation (opponent 03) on 26 September 1997.

The grounds of opposition raised were the grounds of Article 100(a) EPC, ie lack of novelty and lack of inventive step, the grounds of Article 100(b) EPC, ie insufficiency of disclosure, and the grounds of Article 100(c) EPC, ie added subject-matter. The oppositions were supported - *inter alia* - by the following documents:

D13: *T. Simonazzi*, "Molecular Characterization of Ethylene-Propylene Block Copolymers", *Pure & Appl. Chem.*, Vol. 56, No. 5 (1984), pages 625 to 634;

D15: *M.D. Baijal and C.L. Sturm*, "Melt Flow Rate - Intrinsic Viscosity Correlation of Polypropylene", *Journal of Applied Polymer Science*, Vol. 14 (1970), pages 1651 to 1653; and

D23: *Rubber Chemistry and Technology*, 45 (1972), pages 752 to 753.

III. By a decision issued in writing on 8 August 2000, the opposition division revoked the patent on the grounds of Article 100(b) EPC.

The decision was based on an amended set of claims (Claims 1 to 13) filed on 9 November 1998 which differed from the claims as granted in that

(a) the silane in Claim 1 was defined as comprising "at least one of diisopropyldimethoxysilane, diisobutyldimethoxysilane, or di-t-butyldimethoxysilane";

(b) granted Claims 11 and 12 were deleted and a new Claim 11 was introduced which read as follows:

"The method of any preceding claim wherein the silane comprises diisopropyldimethoxysilane."; and

(c) granted Claims 13 and 14 were renumbered as Claims 12 and 13.

The decision held that the granted patent complied with the requirements of Article 123(2) EPC but that the subject-matter of Claim 1 was not disclosed in a manner sufficiently clear and complete for it to be carried

out by the skilled person since it was clear from D13, D15 and D23 that a value of molecular weight or weight average molecular weight distribution in the absence of a specific method being mentioned for the determination thereof was meaningless. The patent in suit did not, however, teach

- (a) how the weight average molecular weight (M_w) of the polymers obtained in stage (a) and stage (b), or of the final polymer product was to be measured;
- (b) moreover, it was not possible at all to measure directly the physical properties of the polymer produced in stage (b);
- (c) as regards the measurement of the weight average molecular weight distribution by gel permeation chromatography (GPC), the conditions for this method, eg temperature and solvent, were not indicated in the patent in suit; and
- (d) it was not taught in the patent in suit how the molecular weight in the steps (a) and (b) could be controlled.

However, the opposition division did not express its opinion with regard to novelty and inventive step.

IV. On 19 September 2000, the proprietor (hereinafter referred to as the appellant) filed a notice of appeal against the above decision, the prescribed fee being paid on the same day, and requested maintenance of the patent as granted (main request), or, in the

alternative, maintenance of the patent as amended during the opposition proceedings (auxiliary request).

In the statement of grounds of appeal, filed on 15 December 2000, the appellant argued that the method for measuring the polymer weight was described in the specification as gel permeation chromatography (GPC), which was a well-known standard method. Thus, it would be a routine procedure to determine the size of the polymers in steps (a) and (b) using GPC, should such a step be deemed necessary. However, determination of the average molecular weight of the polymers in reaction steps (a) and (b) was preferably made by calculation based on modelling systems involving the reaction conditions. Furthermore, the use of hydrogen as a molecular weight controlling agent was a commonly known technique and was utilised extensively before the priority date of the patent in suit. Documents D25 to D28 were submitted to support the argumentation.

D25: Annual Book of ASTM Standards, Vol. 08.03 (1992), pages 126 to 140;

D26: *J.V. Dawkins*, "Calibration of Separation Systems", Steric Exclusion Liquid Chromatography of Polymers, ed. J. Janca, Chromatographic Series Vol. 25, 1984, pages 53 to 116;

D27: "Benefits of Polymer Process Modelling", extract from literature accompanying POLYMERS PLUSTM modelling system from Aspen Technology, Inc.; and

- D28: "Report 1: Technology and Economic Evaluation"
Polyolefins Planning Service (POPS) Subscription
Report, January 1998, published by Chem Systems,
Inc., pages III-138 to III-139.
- V. In a further letter filed on 5 February 2001, the appellant indicated its wish to withdraw document D28 and requested that D28 was not supplied to the opponents, a request which was denied by the board in a communication dated 22 February 2001.
- VI. Opponent 01 (hereinafter referred to as respondent 01) argued in its letter filed on 30 May 2001 that, even if the appellant's explanations as to the measurement of the molecular weight of the polymers by GPC and/or calculation were correct, this information was not in the patent in suit. The insufficiency regarding the measurement of the weight average molecular weight was even further compounded since the patent in suit did not disclose detailed conditions for the GPC, such as temperature and solvent. Document D27 should be disregarded as it was not available at the priority date of the patent in suit (the same objection was made by opponent 03).
- VII. Opponent 03 (hereinafter referred to as respondent 03) submitted in its letter filed on 22 October 2001 that the reversion to the granted claims should be declared inadmissible or rejected. Since Claim 1 as granted had been unconditionally amended before the opposition division to form a main request, the appellant had already withdrawn the request for maintenance of the patent in unamended form, and should not be permitted to reinstate such a request at this stage. As regards

the measurement of the weight average molecular weight of the polymers, the patent in suit did not disclose a single, reproducible teaching in this respect, nor did it refer to an earlier published document and therefore remained insufficient. D25 might present one method of determining molecular weight parameters using GPC, but there were other methods using GPC as well which led to different results. In the absence of a pointer as to exactly which method was to be used, the skilled person would arrive at different results dependent on what method he would use. Furthermore, a skilled person would not even use the proposed method in D25. The further documents D29 and D30 were submitted to support the arguments:

D29: *R. Lew, D. Suwanda, and S.T. Balke, "Quantitative Size Exclusion Chromatography of Polypropylene I: Method Development", Journal of Applied Polymer Science, Vol. 35 (1988), pages 1049 to 1065; and*

D30: "Flow Injection Polymer Analysis (FIPA) of EPDM Elastomers, Triple Detector Application Note 12", Viscotek bulletin.

VIII. In a communication, issued on 21 May 2003, accompanying a summons to oral proceedings, the salient issues as to the merits of the appeal were identified by the board as being firstly, the admissibility of the main request, secondly, whether D27 was available at the priority date of the patent in suit and thirdly, aspects concerning the measurement of the molecular weight parameters required in the various steps of the claimed process.

IX. In a letter filed on 30 June 2003, respondent 01 submitted that the appellant's request for maintenance of the patent as granted was not allowable since the claims as granted were never considered by the opposition division, had been unconditionally replaced by a new set of claims, and were therefore no longer part of the proceedings.

Having regard to sufficiency, respondent 01 argued that, although the patent in suit provided a single statement regarding the measurement of the weight average molecular weight distribution by GPC, it was well known that there were many different ways to measure the average molecular weight, GPC being just one of them. In addition, the result obtained in a GPC measurement varied with the chromatographic conditions used. Thus, a third party would not know if they were infringing Claim 1 or not, a deficiency which also the teachings of D25 and D26 could not overcome. In this context, reference was made to T 256/87 (26 July 1988) and T 225/93 (13 May 1997), neither of them published in the OJ EPO.

X. In a letter filed on 30 June 2003, the appellant confirmed its previous request for maintenance of the patent as granted, although the enclosed claim set headed "Main Request" contained minor amendments of an editorial nature when compared with the claims as granted. Furthermore, seven auxiliary claim sets were filed.

It was the appellant's view that it was entitled to revert to the granted claims, in particular because the filing of amendment claims during the opposition

procedure (9 November 1998) was accompanied by a request that the patent be maintained on the basis of the amended claims. Thus, this was an offer to amend the claims if the patent were maintained with those amended claims. In other words, that offer was, at the time, tied to maintenance of the patent. As the patent was not maintained in amended form the offer had lapsed, and there was nothing to prevent the appellant reverting to the claims as granted.

The appellant disagreed that the patent in suit was insufficient as regards the measurement of the molecular weight. GPC was said in the patent specification to be useful for measuring M_w and M_n , and this applied to the measurement of the properties of the polymers obtained in stages (a) and (b), and of the final polymer. Furthermore, calibration of GPC was well established at the priority date and GPC thus provided highly accurate results for M_w and M_n . As regards the use of hydrogen to control the molecular weight, hydrogen was utilised extensively before the priority date of the patent in suit to control the molecular weight of the product of polymerization reactions, and it was within the skill of a person skilled in the art to use hydrogen to control the molecular weight in the claimed method. The following further documents were filed in support of these arguments:

D31: *J. Boor Jr.*, "Ziegler-Natta Catalysts and Polymerizations", Academic Press 1979, Chapter 10;

D32: *R.B. Seymour and T. Cheng*, "History of Polyolefins", D. Reidel Publishing Company 1985, pages 87 to 101;

D33: US-A-3 051 690;

D34: *R.P. Quirk*, "Transition Metal Catalyzed Polymerizations", Cambridge University Press 1988, pages 84 and 85;

D35: *F.W. Billmeyer Jr.*, "Textbook of Polymer Science", John Wiley & Sons 1984, pages 16 to 21 and 214 to 228;

D36: *N.C. Billingham*, "Molar Mass Measurement in Polymer Science", John Wiley & Sons 1977, pages 199 to 221 and 230 to 233; and

D37: Encyclopaedia of Polymer Science and Engineering, Vol. 7 (1987), pages 311 to 315.

XI. Opponent 02 (hereinafter referred to as respondent 02) informed the board on 2 July 2003 that it would not attend the scheduled oral proceedings.

XII. Since the representation for respondent 01 had changed, the new representative submitted on 23 July 2003 a copy of a general authorization from Borealis Technology Oy. However, as pointed out by the board in a communication issued on 28 July 2003, opponent 01 and respondent 01, respectively, was, according to the state of the file, Borealis A/S and not Borealis Technology Oy. Thus, a general authorization from Borealis A/S was filed on 30 July 2003.

- XIII. With submissions of 29 July 2003, respondent 01 reiterated its objections to the admissibility of the main request and to the sufficiency of disclosure of the patent in suit. Furthermore, it was requested that the board disregard late filed documents D31 to D37.
- XIV. On 31 July 2003, oral proceedings were held before the board at which the appellant and respondents 01 and 03, but not respondent 02, were represented. Because the latter party had been duly summoned, however, the oral proceedings were continued in its absence in accordance with Rule 71(2) EPC.

The appellant confirmed that its main request was maintenance of the patent as granted so that the main request filed on 30 June 2003 had to be ignored. Both respondent 01 and 03 maintained their objections against the admissibility of the main request. After hearing the parties on this issue the board decided to admit the main request into the proceedings. During the discussion of sufficiency of disclosure of the main request, the parties basically relied on their written submissions. When the appellant was informed that the main request was refused due to lack of sufficiency, it withdrew its previously filed auxiliary requests except auxiliary request 5 which was made the only auxiliary request. The following discussion focused on the question whether the auxiliary request met the requirements of Article 123 EPC.

Claims 1 to 13 of the auxiliary request corresponded to Claims 1 to 13 of the claims underlying the decision under appeal (section III, above) with the further limitation in Claim 1 that the weight average molecular

weight of the polymers produced in step (a) and (b) was in the range of from 600,000 to 2,000,000 and 100,000 to 250,000, respectively, and of the final polymer was in the range of from 200,000 to 700,000.

- XV. The appellant requested that the decision under appeal be set aside and that the patent be maintained
- as granted (main request); or, in the alternative,
 - on the basis of the auxiliary request (filed as auxiliary request 5 on 30 June 2003).

Respondents 01 and 03 requested that the appeal be dismissed.

Reasons for the Decision

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

Admissibility of the main request

2. Respondent 01 and 03 objected against the admissibility of the main request, ie the claims as granted, since the proprietor had unconditionally amended these claims during the opposition procedure (submissions dated 9 November 1998, point 2) with the result that the granted claims had not been the subject of the decision of the opposition division. Thus, such a procedure, if allowed, would circumvent the main purpose of an appeal, which was to give a judicial decision upon the correctness of a decision taken by a first instance

- department, in this case the opposition division. Furthermore, the "unconditional amendment" was a fundamental act so that, once the proprietor has taken that action, the parties were entitled to draw reliable conclusions from that action.
3. According to established case law of the boards of appeal, where the patent proprietor is appealing against revocation of its patent, it is entitled to revert to a more broadly worded version of the patent, and in particular the one as granted (see T 564/98 of 6 June 2000 and T 755/00 of 18 October 2002; neither published in the OJ EPO), provided this does not constitute an abuse of procedural law (T 123/85, OJ EPO, 1989, 336; point 3.1.2 of the Reasons).
 4. Thus, the decisive question to be considered in the present case is whether the request to maintain the patent as granted, which was submitted at the very beginning of the appeal proceedings, constitutes an abuse of procedure in view of the "unconditional amendment" during the opposition proceedings.
 - 4.1 The precise wording of the proprietor's submissions made on 9 November 1998 during the opposition procedure was: "The proprietor offers unconditionally to amend Claim 1 as shown in Appendix II hereto". Apart from the fact that an "unconditional offer" is almost a contradiction in terms, the filing of amended claims during the opposition procedure was accompanied by a request that the patent be maintained on the basis of the amended claims. Thus, this was an offer to amend the claims if the patent were maintained with those amended claims. In the board's opinion, that offer was,

at the time, tied to maintenance of the patent. As the patent was not maintained in amended form the offer had lapsed, and there is nothing to prevent the appellant reverting to the claims as granted.

4.2 At least opponent 03 (respondent 03) evidently understood at that time that the proprietor's amendment of Claim 1 was not unconditional in the sense that it could not revert to a more broadly version of the claims, including the claims as granted, since it made the following statement in its letter filed on 11 April 2000: "We reserve the right to reinstate our request for Oral Proceedings should any of the amendments presently suggested by the Proprietor be withdrawn". Thus, at least one opponent did not come to the conclusion that the proprietor's "unconditional offer" was meant to be, or could reasonably be interpreted as, a definitive abandonment of any subject-matter covered by the claims as granted.

4.3 Furthermore, the sufficiency arguments brought forward in the statement of grounds of appeal apply equally both to the claims underlying the decision under appeal and to the claims as granted. In fact, Claim 1 of each claim set requires the measurement of certain molecular weight parameters which is the core issue in the present case, so that the parties had the opportunity to discuss the arguments relating to this issue before two instances.

5. In summary, the reversion to the granted claims cannot be considered as constituting an abuse of procedure. Therefore, the main request is admitted into the appeal proceedings.

Article 123 EPC (main request)

6. According to the decision under appeal, the granted patent complied with the requirements of Article 123(2) EPC. The board sees no reason to depart from that view. Nor was any objection under Article 123(2) EPC raised by the respondents.

Sufficiency of disclosure (main request)

7. The patent in suit claims a process for making a homopolymer or a copolymer of polypropylene comprising at least two different polymerization stages (a) and (b), whereby the stage (b) is carried out either after or prior to stage (a), and whereby the process is characterized by features concerning the product obtained in these stages. Thus, the polymer produced in stage (a) must have a relatively high weight average molecular weight and the polymer produced in stage (b) must have a relatively low weight average molecular weight. Furthermore, the final homopolymer or copolymer must have a specified weight average molecular weight and a weight average molecular weight distribution (M_w/M_n) of at least 6.0. Although Claim 1 and the patent specification (page 6, line 15) explicitly refer to "weight average molecular weight distribution" it is clear from the definition M_w/M_n at page 6 that "molecular weight distribution" is meant. Therefore, this term will be used hereinafter.
8. The respondents' objections under Article 100(b) EPC and the revocation of the patent in suit were based on the arguments that

- the method of measurement for the weight average molecular weight of polymers (a) and (b) or of the final polymer was not indicated;
 - the conditions of gel permeation chromatography (GPC), ie the method which is used for the measurement of the molecular weight distribution, were not indicated;
 - the properties of the polymer obtained in the second stage, and in particular the weight average molecular weight, could not be determined at all; and
 - the control of the weight average molecular weight in stages (a) and (b) was not clear.
9. Hence, it has to be decided whether or not the measurement of the parameters relating to molecular weight were disclosed in a manner sufficiently clear and complete in the patent in suit to enable a person skilled in the art to carry out the claimed invention.
10. Although Claim 1 requires that the polymers produced in the various stages have a certain weight average molecular weight, it fails to describe the method by which this parameter should be measured. It was undisputed that a person skilled in the art would, in principle, be able to measure the weight average molecular weight of a polymer. However, according to the respondents, a lack of sufficiency arose since the various methods of measuring the weight average molecular weight (eg light scattering, small-angle X-ray scattering or GPC) which were available at the

priority date of the patent in suit provided different results as could be seen from D13. In particular, a third party would not be put in the position of knowing when it was working within the forbidden area of the claims.

10.1 According to the patent in suit (page 6, lines 14 to 17), the molecular weight distribution of the final polymer is measured by GPC. Since the data points obtained from a GPC chromatogram not only yield the molecular weight distribution of a polymer but can also be used to calculate the weight average molecular weight of the polymer (see D25), the board agrees with the appellant that the single reference to GPC in the patent in suit, although given in the context of molecular weight distribution only, is a clear hint for the person skilled in the art to use GPC also for the determination of the weight average molecular weight of the polymers.

10.2 However, the respondents argued that, even if GPC were applied, the mere reference to GPC was not enough since the exact measurement conditions of GPC were of utmost importance for reliable values.

10.3 In response, the appellant argued that GPC was not an absolute method for molar mass measurement and therefore always required calibration to make GPC accurate. In the first place, it relied upon D25 and D26 as providing a detailed and comprehensive description of GPC and the methods and means for calibrating a GPC apparatus. Although D25 describes a standard test method for molecular weight averages and molecular weight distribution using universal

calibration, ie polystyrene standards, the respondents questioned the applicability of this method for polypropylene, and in particular for polypropylene with a weight average molecular weight higher than 3,000,000. Then, the appellant argued that not the universal calibration had to be used but a calibration with the type of polymer under test, ie homopolymers and/or copolymers of polypropylene. Although such a calibration, which was described in D36, might be experimentally tedious due to the lack of commercially available polypropylene standards and the need to prepare narrow distribution fractions of the polymer, this did not amount to an undue burden for a person skilled in the art. The accuracy of the GPC technique, once properly calibrated, has been acknowledged in D35: "The results of careful gel permeation chromatography experiments for molecular-weight distribution agree so well with results from other techniques that there is serious doubt as to which is correct when residual discrepancies occur" (page 216).

- 10.4 It is clear from the above that the lack of indication of the exact measurement conditions for GPC in the patent in suit leads to some doubt which calibration standard has to be used for GPC. Nevertheless, it appears that the gist of the respondents' arguments aims rather at a problem concerning the reliability of measured values. In fact, the objections regarding the missing details for GPC in the patent in suit concern more the determination of the limits of protection rather than the impossibility for the skilled person to carry out the claimed process. Varying results which could be obtained when using different calibration standards for GPC do not necessarily disable a person

skilled in the art to carry out the invention but are rather related to the question of whether the invention is correctly defined in accordance with Article 84 EPC. The latter not being a ground of opposition, the board has no power to decide on this issue in view of the fact that the claims as granted remain unamended.

10.5 In its argumentation that the lack of indication of the method of measurement for the weight average molecular weight and the exact measurement conditions for GPC, respectively, led to an insufficiency of disclosure, respondent 01 relied on T 256/87 and T 225/93.

10.5.1 According to T 256/87 (point 17 of the Reasons), a person skilled in the art has to know "when he is working within the forbidden area of the claims" It appears, however, that the concept of "forbidden area" is rather associated with the scope of the claims, ie Article 84 EPC, than with sufficiency of disclosure.

10.5.2 In T 225/93, the lack of indication of which measuring method to choose for determining the particle size did amount to an undue burden (point 2.3 of the Reasons). However, in the present case there was no suggestion that the choice of the measuring method involved an undue burden.

10.6 In summary and following the principles laid down in T 299/97 of 6 June 2001), T 378/97 of 6 June 2000 and T 960/98 of 9 April 2003 (none of the decisions being published in the OJ EPO), the board is satisfied that the lack of indication of certain calibration conditions for GPC is not detrimental to the sufficiency of the disclosure but could raise a clarity

problem with the consequence that a particular value must be interpreted in a broad manner. In other words, any value for the weight average molecular weight obtained by a GPC measurement which falls within the claimed range of values would, regardless of whether a GPC uses a universal calibration or a calibration with a polypropylene polymer, anticipate this range of values.

11. Since the molecular weight distribution (M_w/M_n) is also measured by GPC (see point 10.1, above), the conclusion reached for the measurement of the weight average molecular weight applies *mutis mutandis* to the measurement of the ratio M_w/M_n . In other words, the lack of indication of the exact measurement conditions leads at most to a degree of uncertainty which does not amount to a lack of sufficiency of disclosure.

12. Apart from the question of how the weight average molecular weight and the molecular weight distribution could be measured in general, the respondents contested that the weight average molecular weight of the polymer produced in the second step could be measured at all. Carrying out the two stages (a) and (b) in series as required in Claim 1, ie one stage followed by the other in either order, always yields a polymer mixture. Since, however, Claim 1 requires that the polymer produced in the second step has a certain weight average molecular weight, the question arises how this parameter can be measured in spite of the fact that the polymer produced in the second step is never present in isolated form but only in the polymer mixture.

- 12.1 The patent specification is silent as regards the possibility of measuring the properties of one component in the polymer mixture. Furthermore, in none of the 38 examples is the weight average molecular weight of the polymer obtained in the first and second stage indicated, but only the weight average molecular weight of the final polymer mixture.
- 12.2 In the first place, the appellant argued in the statement of grounds of appeal that the determination of the weight average molecular weight in stages (a) and (b) was preferably made by calculation based upon the reaction conditions. As would be appreciated by the skilled person, the manufacture of polymers was typically a continuous process. The reaction conditions were set according to parameters that were commonly known in the art and which were readily obtainable from process engineering consultants as standard protocols. In such protocols the ratio of molecular weight control agent to feedstock was tightly controlled in order to limit the size of the average molecular weight distribution of the polymers in the reaction. Correlation tables to gauge the optimal conditions to obtain a particular molecular weight distribution of polymer in the reaction were commonly available in the field and it would be within the remit of a person skilled in the art to apply such tables given the conditions described in the patent specification. Even if this argument were correct, however, there is no information relating to calculating the weight average molecular weight of the polymers produced in stages (a) and (b), in the patent specification, nor could the appellant establish that such calculation methods were common general knowledge at the priority date of the

patent in suit. As regards the two documents initially relied upon to support this line of argumentation, D28 has been withdrawn by the appellant and D27 refers on page 8 to a copyright as of 1994, ie after the priority date of the patent in suit. Consequently, the board cannot accept that a person skilled in the art would have known at the priority date of the patent in suit how the weight average molecular weight of the polymers obtained in the individual process stages, and in particular in the second stage, had to be calculated. This line of argumentation was not further pursued during the oral proceedings.

- 12.3 In its second attempt to explain the measuring of the weight average molecular weight of the polymer obtained in the second step, the appellant argued that it would be a routine procedure to determine this parameter of the polymers in stages (a) and (b) using GPC. As stated in the patent in suit at page 5, lines 24 to 28, the stages of the process could be carried out in series, so that the homopolymer or copolymer formed in one stage was introduced with additional monomer(s) into the next stage in the sequence, or in parallel so that the homopolymer or copolymer formed in one stage is not introduced into a particular second stage but, instead, is combined with the homopolymer or copolymer formed in the particular second stage". Taking this information into account there were three different ways to determine the weight average molecular weight of the polymer produced in the second step by GPC:

- One could carry out each stage (a) and (b) in isolation and determine the weight average molecular weight of the polymer of stage (a) and stage (b) separately.

- As stages (a) and (b) could be carried out in either order, the polymerization could be carried out with stage (a) followed by stage (b) and the reaction could be repeated with stage (b) followed by stage (a). In each case, the weight average molecular weight of the readily accessible first step polymer could be determined.

- Since the molecular weight distribution of the final product was the sum of the molecular weight distributions of the polymers obtained in the first and second stage, it would be possible to measure the molecular weight distribution of the polymer of the first stage and of the final polymer, and to calculate from these two measurements the molecular weight distribution of the polymer of the second stage. The resulting molecular weight distribution for the second stage polymer would also provide the data for the weight average molecular weight.

12.3.1 First of all, the board takes note that, although the possibility of carrying out stages (a) and (b) in parallel is mentioned in the patent in suit, this possibility is in fact excluded from the wording of Claim 1 which requires that stage (b) is carried out either after or prior to stage (a). Therefore, it is the board's view that the possibility of carrying out each stage (a) and (b) in isolation in order to

determine the weight average molecular weight of the polymer of stages (a) and (b) does not contribute to meeting the sufficiency disclosure requirement in relation to the method defined in Claim 1.

12.3.2 Secondly, this line of argumentation is based on the assumption that the polymer produced in the first stage is not affected by the polymerization in the second stage. Not only was this assumption strongly contested by respondent 01 and 03, it is also contradicted by the patent in suit. At page 7, lines 2 to 4 it is stated that "For copolymerization and terpolymerization, typically the homopolymer formed from the first monomer in the first reactor is **reacted** (emphasis by the board) with the second monomer, a mixture of first monomer and second monomer or a higher mixture of multiple monomers in the second reactor". Thus, the patent in suit itself refers to a reaction of the polymer formed in the first stage with the monomer(s) of the second stage, at least for copolymerization and terpolymerization which fall within the scope of Claim 1. As a defence, the appellant merely stated that the word "reacted" was wrong.

12.3.3 Furthermore, it appears from the examples in the patent in suit that the polymer produced in the first stage indeed does not remain inert in the second step. The general description of the examples at page 15, lines 45 to 49 reads as follows: "After a desired period of time measured from the time when the reaction temperature reached 71°C the level of hydrogen was either (a) decreased (in Examples 1-11, 18-33, 37 and 38 and Comparative Examples A-D) by venting the reactor to a pressure of about 653-722 kPa (80-90 pounds per

square inch gauge) and then repressurizing the reactor to 1204 kPa (160 pounds per square inch gauge) and continuing the reaction for another desired period of time, or (b) increased (in Examples 12-17 and 34-36) by adding additional hydrogen to the reactor and continuing the reaction for another desired period of time". Thus, only about half of the gaseous phase (comprising monomer(s) and hydrogen) of the first stage is removed by venting. There is no indication whatsoever that the partial removal of the gaseous phase actually terminates the polymerization in the first stage. On the contrary, as argued by respondent 01, the growth of the polymer produced in the first step would continue. If the polymer produced in the first stage is not inert and reacts further in the second step, then what is measured by the three different ways outlined by the appellant is not the actual weight average molecular weight of the polymer produced in the second step.

- 12.4 In summary, the appellant has not shown that the weight average molecular weight of the polymer produced in the second stage is accessible even in principle. Therefore, the board is not convinced that the actual parameter required in Claim 1 can be measured by one of the three different ways set out by the appellant, in particular when taking into account the statement in the patent in suit that the polymer produced in the first step reacts further. Though high the burden of proof is for the opponents in the opposition or opposition appeal procedure, it is not an appropriate defence of the proprietor to merely state that the wording of the description is wrong in this respect.

13. Consequently, the claimed invention is not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, because the inaccessibility of an essential parameter in the claim leads to a requirement that cannot in principle be fulfilled. Therefore, the main request is refused.
14. In view of the above, it was unnecessary for the board to rule on the issue of whether the control of the weight average molecular weight in stages (a) and (b) was sufficiently disclosed.
15. Nor was it necessary to consider the remaining documents cited in the course of the appeal proceedings, which were either not further referred to by the parties, or not of sufficient relevance to justify their introduction into the proceedings at this late stage.

Amendments (auxiliary request)

16. In Claim 1 of the auxiliary request the silane is "at least one of diisopropyldimethoxysilane, diisobutyl-dimethoxysilane, or di-t-butyl-dimethoxysilane". Furthermore, the weight average molecular weight of the polymers produced in stages (a) and (b) and of the final polymer is more narrowly defined (see section XIV, above).
- 16.1 Although the three silanes are listed amongst other compounds in granted Claim 12 and at page 8, lines 7 to 10, and the restrictions of the weight average molecular weight correspond to the preferred ranges disclosed on the pages 5 and 6 of the patent in suit,

there is no direct and unambiguous disclosure as to the combination of these two limitations, let alone a basis for the term "at least" in the context of the three silanes.

16.2 Also the examples cannot support the now claimed combination of features since they do not disclose the weight average molecular weight of the polymers produced in stages (a) and (b) at all. In addition, the examples do not use more than one silane at the time.

16.3 Consequently, the subject-matter of Claim 1 cannot be derived in a direct and unambiguous way from the patent in suit and the disclosure of the application as originally filed, respectively, so that the auxiliary request fails to meet the requirements of Article 123(2) EPC. Hence, the auxiliary request is refused.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young