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D E C I S I O N
of 30 July 2002

Case Number: T 0600/98 - 3.3.3

Application Number: 93307152.4

Publication Number: 0588567

IPC: C08F 210/16

Language of the proceedings: EN

Title of invention:

An ethylene-alpha-olefin copolymer and a molded article therefrom

Applicant:

SUMITOMO CHEMICAL COMPANY LIMITED

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 83, 84, 123(2)

Keyword:

"Sufficiency (yes)"

Decisions cited:

-

Catchword:

-



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Boards of Appeal

Chambres de recours

Case Number: T 0600/98 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 30 July 2002

Appellant: SUMITOMO CHEMICAL COMPANY LIMITED
5-33, Kitahama 4-chome
Chuo-ku
Osaka-shi
Osaka 541-0041 (JP)

Representative: Ablewhite, Alan James
MARKS & CLERK
57/60 Lincoln's Inn Fields
London WC2A 3LS (GB)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 5 December 1997
refusing European patent application
No. 93 307 152.4 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: R. Young
Members: C. Idez
U. Tronser

Summary of Facts and Submissions

- I. European patent application No. 93 307 152.4, filed on 10 September 1993, claiming the priority of the earlier Japanese patent application No. 241749/92 of 10 September 1992, and published under No. 0 588 567 on 23 March 1994, was refused by a decision of the Examining Division announced orally on 25 November 1997 and issued in writing on 5 December 1997.
- II. The decision was based on a set of 4 claims consisting of Claim 1 as submitted with letter of 7 October 1996 and of Claims 2 to 4 as submitted with letter of 12 March 1996.

Claim 1 read as follows:

"An ethylene- α -olefin copolymer consisting essentially of ethylene and α -olefin monomers having:

(A) a density (ρ) of from 0.870 to 0.945 g/cm³;
(B) a ratio (TVR) of trans-vinylene type carbon-carbon double bonds to total carbon-carbon double bonds as determined by infrared absorption spectrum being 35% or more;

(C) a weight average molecular weight (Mw) of from 3.0×10^4 to 6.0×10^5 ;

(D) a ratio (Mw/Mn) of a weight average molecular weight (Mw) to a number average molecular weight (Mn) being from 3 to 20;

(E) a coefficient (Px) of moldability represented by the following formula (1) of from 0.10 to 0.50:

$$Px = Mb/Mw \quad (1)$$

wherein Mb is an average molecular weight of fragments between branchings, and Mw is a weight average molecular weight as defined above;

(F) a coefficient (Cx) of variation of chemical composition distribution represented by the following formula (2) of from 0.40 to 0.80:

$$Cx = \sigma / SCB_{ave} \quad (2)$$

wherein σ is a standard deviation of chemical composition distribution (1/1000C) and SCB_{ave} is an average of the number of short chain branching per 1000C (1/1000C); and

(G) a swelling ratio (SR) of 1.35 or more."

Claim 2 was dependent on Claim 1. Independent Claim 3 was directed to a molded article comprising the copolymer according to Claims 1 or 2. Claim 4 was dependent on Claim 3 and directed to a film as a molded article.

III. The Examining Division refused the application on the grounds that it did not meet the requirements of Article 83 EPC.

More precisely, the decision stated that parameters (E) and (F) used in Claim 1 for defining the claimed copolymers could not be determined by the skilled person using only the disclosure of the invention and his general knowledge. Concerning the parameter (E), the decision held that the application did not indicate what were the values of the Rayleigh ratio and of the instrument constant K. Concerning the parameter (F), the decision stressed, in particular, that the units for S_i and T_i were not indicated, that formula (15) did not give a value for H_i , that the method for determining the SCB in document "Bull. Inst. Chem. Res. Kyoto Univ. Vol.69. No.2. 1991, pages 177 to 183" was different from the method for determining the SCB_i and SCB mentioned in the description of the application, and that it was not indicated in the description what kind of standard deviation of what plotting of the SCB_i 's was meant in the formula of parameter (F). The decision

stated that knowing how to determine all parameters of Claim 1 was essential to carry out the invention, in particular, because, as evidenced by the comparison between comparative Examples 1 to 3 and inventive Examples 1 and 2, polymers outside the scope of the invention could be prepared in the same manner as polymers inside the scope of the invention.

- IV. A Notice of Appeal against the decision was lodged on 4 February 1998 by the Appellant (Applicant). The prescribed fee was paid on the same day. The Statement of Grounds of Appeal was filed on 6 April 1998.

In the Statement of Grounds of Appeal, the Appellant argued that the skilled person would know how to determine all the parameters required by Claim 1, and could indeed carry out the invention and determine which copolymers were inside the scope of the claim and which were outside. It further pointed out that the polymers according to the Examples 1 and 2 of the application in suit had been obtained by the new method disclosed in the specification and that the polymers of the Comparative Examples 1 to 3 were commercially available ones made by unknown methods.

- V. Following a communication by the Board dated 3 April 2001 and a letter of the Appellant dated 3 October 2001, the Appellant was informed in an annex to oral proceedings issued on 23 April 2002 about a number of essential questions to be discussed at the oral proceedings scheduled for 30 July 2002, concerning the parameters (B) (i.e. TVR), (E), (F) and (G) present in Claim 1. In particular, concerning the parameter TVR, it was stressed that the feature "total carbon-carbon double bonds" as such referred to the total content of olefinic unsaturation present in the olefin copolymer and was not as such limited to the sum of the three specific types of carbon-carbon double mentioned in the

application in suit (i.e. the trans-vinylene type, the vinyl type and the vinylidene type). Furthermore, the values determined for each specific double bond type for a reference sample were respectively corrected by a factor "f". The knowledge of each value "f" would appear to be essential for the determination of the parameter TVR.

VI. With its letter dated 1 July 2002, the Appellant submitted a new main request and three auxiliary requests, as well as eight new documents. The arguments presented concerning in particular the parameter TVR might be summarized as follows:

- (i) It was clear that the expression "total carbon-carbon double bonds" referred only to three types mentioned in the application.
- (ii) It also belonged to the general knowledge that the skilled person, when using unsaturation type to characterise olefin polymers, would consider only the three types of unsaturation mentioned in the application. This was supported by the document "L.H. Cross et al. "The Infra-Red Spectrum of Ethylene Polymers", Discussions of the Faraday Society, Vol 9, pages 235 to 245, (1950)", (referred to below as D5), submitted with letter of 7 October 1996 during the examining procedure, and confirmed by document "Shinban Kobunshi Bunseki Handbook edited by The Japan Society for Analytical Chemistry, Research Committee of Polymer Analysis, published by Kinokuniya Shoten, January 12, 1996, pages 591, lines 9 to 16" (English translation thereof, referred below as document D6), mentioned in its letter dated 1 July 2002 and submitted with its letter of 3 July 2002.

- (iii) The correction factor "f" was calculated by calibration using a sample with known carbon-carbon double bond content.

VII. During the oral proceedings held on 30 July 2002, the Appellant submitted a new set of Claims 1 to 7 as sole request.

Claim 1 of this request reads as follows:

"An ethylene- α -olefin copolymer having:

- (A) a density (ρ) of from 0.870 to 0.945 g/cm³;
- (B) a ratio (TVR) of trans-vinylene type carbon-carbon double bonds to total carbon-carbon double bonds as determined with an infrared absorption spectrum being 35% or more;
- (C) a weight average molecular weight (Mw) of from 3.0×10^4 to 6.0×10^5 ; and
- (D) a ratio (Mw/Mn) of a weight average molecular weight (Mw) to a number average molecular weight (Mn) being from 3 to 20;

wherein said copolymer is obtainable by copolymerising ethylene and α -olefin in the presence of an olefin-polymerising catalyst comprising:

- (a) a reaction product of (a1) a titanium compound having at least one titanium-nitrogen bond with (a2) an organomagnesium compound, and
- (b) an organoaluminum compound."

Claims 2 to 5 were dependent Claims directed to specific embodiments of the catalyst used for the copolymerisation of the copolymers in the ambit of Claim 1.

Independent Claim 6 was directed to a molded article comprising the copolymer according to any of Claims 1 to 5. Claim 7 was dependent on Claim 6 and directed to a film as a molded article.

Concerning the parameter TVR, the Appellant essentially relied on the arguments submitted in its letter of 1 July 2002.

VIII. The Appellant requested that the decision of the Examining Division be set aside, and a patent be granted on the basis of Claims 1 to 7 submitted at the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*
 - 2.1 Claim 1 differs from Claim 1 as originally filed by the incorporation of the feature (i) that "the copolymer is obtainable by copolymerising ethylene and α -olefin in the presence of an olefin-polymerising catalyst comprising:
 - (a) a reaction product of (a1) a titanium compound having at least one titanium-nitrogen bond with (a2) an organomagnesium compound, and
 - (b) an organoaluminum compound."
 - 2.2 Feature (i) is supported by the passage from line 24 on page 8 to line 8 on page 9 of the application as originally filed.
 - 2.3 Support for Claim 2 is provided by Claim 2 and page 7, lines 19 to 22, of the application as originally filed.
 - 2.4 The passages on page 9, lines 9 to 18, on page 15, lines 12 to 17, and from page 22, line 14 to page 23, line 3 of the application as originally filed provide support for Claims 3, 4 and 5, respectively.

2.5 Claims 6 and 7 are supported by Claims 6 and 7 as originally filed.

2.6 Thus, it follows from the above considerations that Claims 1 to 7 meet the requirements of Article 123(2) EPC.

3. *Sufficiency*

3.1 The decision under appeal states that the parameters (E) and (F) present in Claim 1 then on file, cannot be determined by a person skilled in the art using only the disclosure of the invention of the application and his general knowledge. Thus, it concludes that a person skilled in the art cannot not carry out the invention without knowing how to determine all the parameters of Claim 1 as he does not know which copolymers are inside the scope of this claim and which are outside the scope of this claim.

3.2 Since the parameters (E) and (F) are no longer present in Claim 1, the question boils down to whether the application in suit discloses the invention in a manner sufficiently clear and complete to allow the skilled person to obtain ethylene- α -olefin copolymers having the properties defined by parameters (A), (B), (C) and (D) set out in Claim 1 by the copolymerisation of ethylene and alpha-olefin in presence of the catalyst composition defined in Claim 1.

3.3 This presupposes, on the one hand, that the skilled person knows how to determine the parameters (A), (B), (C) and (D), and, on the other hand, that he is given sufficient information as how to carry out the copolymerisation of ethylene and α -olefin in the presence of this specific catalyst.

- 3.4 There is no doubt that the skilled person would know how to determine the parameters (A) (i.e. density), (C) (i.e. weight average molecular weight) and (D) (i.e. polydispersity), since the application in suit explicitly discloses the methods according to which these parameters should be determined (cf. page 30, lines 19 to 20; page 32, line 17 to page 33, line 10).
- 3.5 The parameter (B) (i.e. determination of the TVR ratio), is defined as the ratio of trans-vinylene type carbon-carbon double bonds to total carbon-carbon double bonds as determined with an infrared absorption spectrum. The description of the application in suit, however, only gives information as how to determine the number of trans-vinylene type, of vinyl type and of vinylidene type carbon-carbon double bonds (cf. page 30, line 25 to page 32, line 16). Thus, the information given in the application concerning the determination of parameter (B) could only be regarded as sufficiently complete, provided it were clear that the skilled person, using the unsaturation content to characterise ethylene polymers, would consider only the three types of unsaturation disclosed in the application.
- 3.6 In that respect the Appellant has referred to document D5 which relates to the infra-red spectrum of ethylene polymers. While it is true that this document discloses that the three types of unsaturation found in ethylene polymers are the vinyl type, the trans-vinylene type and the vinylidene type, it further indicates that the band corresponding to cis-vinylene "has not yet" (i.e. in 1950) been detected and that the presence of tetraalkyl ethylene groups is "still" an open question (cf. D5, page 240, lines 14 to 15, lines 20 to 21, and lines 43 to 45).

3.7 However, in the absence of a document establishing, before the priority date of the application in suit, the presence in detectable amounts of other unsaturation types (e.g. trialkyl substituted ethylene, tetraalkyl substituted ethylene or cis-vinylene) than the trans-vinylene, the vinyl and the vinylene types in ethylene copolymers, the Board accepts the submission of the Appellant, that the total content of carbon-carbon double bonds in the claimed ethylene copolymers in practice corresponds to the total amount of trans-vinylene, vinyl and vinylene carbon-carbon double bonds. In that respect, there is therefore no need for the Board to consider the late filed and post-published document D6 submitted by the Appellant. It is also credible to the Board, in view of the submissions made by the Appellant, that the correction factor "f" used in formulae (3), (4) and (5) set out on pages 31 and 32 for calculating the number of the respective types of double bonds can be obtained by measurement of standard samples having known numbers of the respective carbon-carbon double bonds. It thus follows that the the skilled person, using the disclosure of the application in suit, will know how to determine the parameter (B).

3.8 As a consequence of the above, the Board comes to the conclusion that the skilled person only using the disclosure of the application in suit can determine all the parameters (A), (B), (C) and (D) required by Claim 1.

3.9 In addition to this, the application in suit provides sufficient information regarding the processing conditions concerning the copolymerisation process (cf. page 28, lines 4 to 25, Examples 1 and 2), so that there can be no doubt that the skilled person would know how to obtain a copolymer within the terms of Claim 1.

3.10 Thus, it follows from the above that the requirements of Article 83 EPC must be regarded as met.

4. *Clarity and support*

As indicated above, the application in suit discloses the methods as how to determine the parameters (A), (B), (C) and (D) used for defining the claimed copolymers. These parameters are therefore appropriately defined. Thus, the Board takes the view that the requirements of Article 84 EPC are met.

5. In view of the above findings, all the objections specifically mentioned in the decision under appeal have been met. It is therefore necessary for the decision under appeal to be set aside.

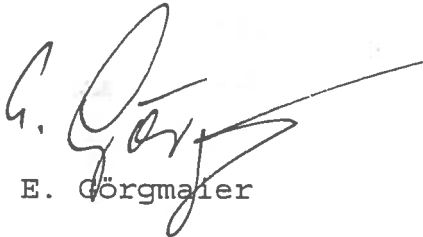
6. Furthermore, it is clear from the wording of the decision under appeal itself (Reasons for the decision, point 5) that the examination of the application with respect to the requirements of Article 54 and 56 EPC has not yet taken place. Thus, in order to avoid the loss of instance (cf. also letter of the Appellant dated 1 July 2002; page 7, paragraph 3), the Board makes use of its powers under Article 111(1) EPC to refer the case back to the first instance.

Order

For these reasons it is decided that:

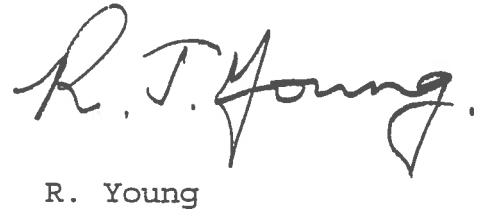
1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution on the basis of Claims 1 to 7 submitted at the oral proceedings.

The Registrar:



E. Görgmaier

The Chairman:



R. Young