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D E C I S I O N
of 24 August 1995

Case Number: T 0293/92 - 3.3.3

Application Number: 84300453.2

Publication Number: 0115940

IPC: C08F 210/06

Language of the proceedings: EN

Title of invention:
Film-forming propylene copolymer, film thereof and process for production of the film

Applicant/Patentee:
MITSUI PETROCHEMICAL INDUSTRIES, LTD.

Opponent:
HOECHST AKTIENGESELLSCHAFT Werk Kalle-Albert

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty - yes (after amendment) - characterization of a product by physical and chemical parameters in combination with process features"
"Inventive step - yes (after amendment)"

Decisions cited:
G.0003/93

Catchword:
-

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Case Number: T 0293/92 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 24 August 1995

Appellant: (Opponent)
HOECHST AKTIENGESELLSCHAFT
Werk Kalle-Albert
Zentrale Patentabteilung KA
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Representative:
-

Respondent: (Proprietor of the patent)
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Representative:
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office announced orally on 14 January 1992, issued in writing on 30 January 1992, rejecting the opposition filed against European patent No. 0 115 940 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: B. ter Laan
W. M. Schar

Summary of Facts and Submissions

I. Mention of the grant of European patent No. 0 115 940 in respect of European patent application No. 84 300 453.2, filed on 25 January 1984, claiming priority from two earlier applications in Japan (9329/83 of 25 January 1983 and 44477/83 of 18 March 1983), was announced on 30 December 1986, on the basis of a set of four claims for the contracting states DE, GB, IT and a set of three claims for the contracting state AT.

The set of claims for DE, GB, IT read as follows:

Claim 1:

"A film-forming propylene copolymer composed of a major amount of propylene and a minor amount of ethylene, characterized by having
(A) an ethylene content (Ec) from 0.1 mole% to 2.0 mole% based on the total amount of propylene and ethylene, and

(B) an isotactic value (Iso) in the range represented by formula (1) or (2),

(i) when $0.1 \leq Ec \leq 0.3$, $Iso \geq -5Ec + 96.8$ (%) (1),

and

(ii) when $0.3 < Ec \leq 2.0$, $Iso \geq -0.67Ec + 96.5$ (%) (2)

wherein *Ec* represents the numerical value of Ec (mole%)."

Claim 2 was a dependent claim which referred to a preferred embodiment of Claim 1.

Claim 3:

"A biaxially stretched film of a copolymer as claimed in claim 1 or 2 with a stretch ratio of at least 3.5 in the longitudinal direction and at least 7 in the transverse direction."

Claim 4 referred to a process for producing the film of Claim 3.

Claim 1 of the set of claims for AT was directed to a biaxially stretched film incorporating the features of Claim 1 for DE, GB, IT and corresponded thus in substance to a combination of Claims 1 and 3 of the first set of claims. Claim 2 was dependent and referred to a preferred embodiment of Claim 1. Claim 3 was the same as Claim 4 of the first set of claims and referred to a process for the production of the film of Claim 1.

II. On 29 September 1987 a Notice of Opposition against the granted patent was filed, in which the revocation of the patent in its entirety was requested on the grounds set out in Article 100(a) EPC. These objections were based mainly on

D1: US-A-4 355 144.

In the course of the procedure reference was made to JP-A-181 019/1981 cited in the patent in suit (page 4, line 18) and considered in the form of its counterpart:

D5: BE-A-895 019.

III. By a decision announced orally on 14 January 1992, issued in writing on 30 January 1992, the Opposition Division rejected the opposition. It held the view that

the documents cited during the opposition procedure did not prejudice the maintenance of the patent in unamended form.

(i) Regarding novelty, the claimed copolymers differed from those disclosed in D1 by their isotacticity values. Although values falling within the range of the patent in suit were disclosed in D1, these had been measured by a different method - the HIP method, whereas the C^{13}-NMR method was used in the patent in suit - and were thus not directly comparable. Determination of the isotacticity values of the copolymers of D1 by the method used in the patent in suit led to lower values than disclosed in D1, falling outside the claimed range. Moreover, the patent in suit used a different catalyst system for the production of the copolymers, which had therefore different structural properties.

(ii) As regards inventive step, the definition of the catalyst system disclosed in D5 was broader than in the patent in suit. Also it was not suggested in D5 to use the claimed range of ethylene comonomer. Therefore, D1 could not be combined with D5 and an inventive step was acknowledged.

IV. The Appellant (Opponent) lodged an appeal against the above decision on 3 April 1992 and paid the prescribed fee at the same time. In annex to the Statement of Grounds of Appeal filed on 9 June 1992, the Appellant submitted an experimental test report showing that the isotacticity values were hardly affected by the method of determination of that parameter. This finding led the Appellant to maintain its previous objections of lack of novelty with respect to D1 and lack of inventive step

with respect to the combined teaching of D1 and D5, the latter being now considered in the form of its corresponding DE-A-3 241 999 (D5a).

V. Together with the counterstatement on 11 January 1993 the Respondent (Proprietor) filed four sets of amended claims: a main request and a supplementary request for the contracting states DE, GB, IT and for AT, respectively.

The main request for DE, GB, IT contains four claims, of which Claim 1 reads as follows:

"A film-forming propylene copolymer composed of a major amount of propylene and a minor amount of ethylene, characterized by having
(A) an ethylene content (Ec) of from 0.1 mole% to 2.0 mole% based on the total amount of propylene and ethylene, and
(B) an isotactic value (Iso) in the range represented by formula (1) or (2),

(i) when $0.1 \leq Ec \leq 0.3$, $Iso \geq -5Ec + 96.8$ (%) (1)

and

(ii) when $0.3 < Ec \leq 2.0$, $Iso \geq -0.67Ec + 95.5$ (%) (2)

wherein *Ec* represents the numerical value of Ec (mole%) and obtainable by copolymerizing propylene and ethylene in the presence of a catalyst formed of (1) a spherical highly active solid titanium catalyst component containing magnesium, titanium, chlorine and an ester of phthalic acid with an alcohol having at least 2 carbon atoms as essential ingredients and having an average particle diameter of 1 to 200 µm with the geometric standard deviation of its particle size distribution being not more than 2.1, (2) an organo-aluminium catalyst component and (3) an organic silicon compound

having an Si-C bond under such conditions that if propylene alone was polymerized the resulting homopolymer of propylene has an isotactic value of at least 97.0%."

Claims 2, 3 and 4 correspond to those as granted.

The main request for AT contains three claims of which Claim 1 corresponds to Claim 3 of the main request for DE, GB, IT. Claims 2 and 3 correspond to those as granted.

VI. In a subsequent statement and during oral proceedings held on 24 August 1995 the Appellant argued essentially as follows:

(i) The decision of maintenance of the patent in suit in unamended form was inconsistent with the objections of lack of novelty raised by the Opposition Division in several communications following various amendments of the claims.

(ii) As to the isotacticity index, the difference in the values obtained by the different measuring methods was only marginal and within the normal experimental error. The different methods used did not result in substantially different isotacticity values, so that D1 took away the novelty of the claimed copolymers.

(iii) The product-by-process formulation did not overcome the objection of lack of novelty over the disclosure of D1. In particular, there was no evidence that the different process features resulted in polymers being themselves different. The comparative experimental reports submitted by the Respondent during opposition proceedings

could at most demonstrate that the film properties were different, which could easily be explained by differences in film processing, e.g. stretching.

(iv) From a formal viewpoint, according to Decision T 150/82 a product-by-process claim was only then allowable if the product could not be defined by reference to its composition, structure or some other testable parameter, which was not the case here, since it was possible to define the copolymer by way of its isotacticity and ethylene content.

(v) Great emphasis was laid in writing by the Appellant on the relevance of D5 for both the issues of novelty and inventive step. However, after the Board had drawn attention to the fact that this document did probably not belong to the state of the art within the meaning of Article 54(2) CBE, only D1 was relied upon by the Appellant.

VII. The Respondent argued essentially as follows:

(i) The isotacticity values obtained with the different methods of D1 and of the patent in suit, respectively, could not be properly compared. The copolymers of D1, when analyzed by the method of the patent in suit, showed a lower isotacticity value than the one disclosed, so that its copolymers had an isotacticity value outside the range claimed by the patent in suit. The copolymers of the patent in suit thus differed in respect of the isotacticity value.

(ii) The copolymer was further defined by the process by which it was prepared. The process features differed significantly from the ones used in D1 and were responsible for the improved balance of properties, as demonstrated by the additional experiments filed during the opposition proceedings on 30 May 1988 and 9 August 1990, where films made out of both copolymers were compared. Since these films were made in the same way, any differences in film properties could only be attributed to inherent differences in the copolymers from which the films were made, which proved the novelty of the present copolymers.

(iii) As regards inventive step, there was no incentive to depart from the teachings of D1, which was very specific as far as the choice of the catalyst was concerned.

VIII. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained on the basis of the main requests, or, alternatively, on the basis of the supplementary requests (see point V above).

Reasons for the Decision

1. The appeal is admissible.

Procedural matter

2. The Appellant criticised the reason of the contested decision because it deviated from a preliminary communication of the Opposition Division (see point VI-(i) above).

2.1 Indeed, the Opposition Division, instead of limiting itself to the evaluation of the requests of the parties, took a more active role in that it suggested the wording of a claim thought to be allowable (communication of 7 November 1991). Apart from being undesirable in view of impartiality in an inter partes procedure, such suggestions may also lead to confusion as regards the provisional and non-binding nature of communications written in procedures before the EPO. In the present case, the Opposition Division, by suggesting an allowable independent claim, led the parties to assume that the claims on file were not allowable; the change of mind of the Opposition Division during the oral proceedings therefore might be seen as rather unexpected and surprising for the parties. Such undesirable course of procedure shows that Opposition Divisions in inter partes procedures should refrain from making suggestions to the parties.

2.2 However, the Board also feels that preliminary opinions reflected in communications during procedures before the EPO should not be interpreted by the parties as binding. It is within the nature of the proceedings before the EPO that a case may appear in a new light once the parties have been fully heard or on the basis of the

Opposition Division's own investigation. It can therefore not be avoided that a change of opinion may be brought about even at a late stage, in particular during oral proceedings, which are meant to give the parties the opportunity to clarify their position and to elaborate on their arguments. Furthermore, the contested decision was based on facts, evidence and arguments on file and the Appellant did not show otherwise. Due to this and the above the Board does not find that the Opposition Division's way of conducting the proceedings amounts to a lack of sufficiency or substantiation of the reasons of the contested decision.

Amendments

3. The wording of the claims complies with the requirements of Article 123 EPC.

3.1 In formula (2) of Claim 1 for DE, GB, IT as granted, in the correlation between "Iso" and "*Ec*" the number "96.5" was amended into "95.5". The value of "96.5" was a printing error that occurred during the printing of the patent specification and which was not present in the text upon which the grant of the patent was based (cf. communications under Rule 51(4) EPC issued on 14 March 1986 and 26 June 1986). Therefore, this amendment does not contravene Article 123(2)(3) EPC.

3.2 The subject-matter of the patent as granted was a copolymer (for DE, GB, IT) or a film made out of a copolymer (for AT) defined by its ethylene content as well as by its isotacticity value. The additional process features are based on page 3, line 59 to page 4, line 2 of the patent specification corresponding to page 7, lines 4 to 18 of the description as originally filed. Therefore, the main request fulfils the requirements of Article 123(2) EPC.

3.3 Since the addition of a further characteristic limits the scope of a claim, there can be no question of an extension of the protection so that Article 123(3) EPC is also complied with.

Prior art

4. As it appears from points III, IV and VI above, the Opposition Division and the Appellant relied on D5 when dealing with substantive issues. This document is referred to at page 4, lines 17 to 18 of the patent specification in the form of the original japanese document as describing a titanium catalyst component corresponding to the one used in the patent in suit. However, as noted by the Respondent in its reply received on 9 August 1990 (page 4, paragraph 4), D5a was not laid open to public inspection until 26 May 1983, thus well after both priority dates of the patent in suit. The situation is different in the case of D5 published on 16 March 1983, which is between the two dates of priority, which implicitly raises the question of the validity of the first priority.

The first priority document discloses a film-forming propylene copolymer having an ethylene content as now claimed (claim), an isotacticity value according to the present formulae (English translation, page 4, first full paragraph) and produced by a catalyst system (English translation page 5, first full paragraph) that is more specific in its second component, the aluminium compound, than the one used in the patent in suit. According to this first priority document a tri-alkyl aluminium compound is used as the second catalyst component, whereas the present claim refers to a more general organoaluminium compound. The priority of the

now claimed subject-matter is thus valid insofar as the second catalyst component is a tri-alkyl aluminium compound (see also G 3/93; OJ EPO 1995, 18).

Although expressly invited by the Board in the communication accompanying the summons and at the beginning of the oral proceedings to comment on that issue and explain whether and how D5 could nevertheless be regarded as state of the art within the meaning of Article 54(2) EPC, the Appellant did not provide any argument, but merely repeated that D5 was published between the two dates of priority of the patent in suit. Since the Appellant thereafter no longer relied on the teaching of D5 in support of its substantive objections, there will be no further consideration of that document hereinafter.

Novelty

5. D1 describes a process for preparing a propylene-ethylene copolymer of improved stretchability, in particular suitable for producing biaxially stretched films, which comprises copolymerizing propylene and a small amount of ethylene in the presence of a catalyst system composed of:

(A) titanium trichloride obtained by reducing titanium tetrachloride with an organoaluminium compound and reacting the reduced solid with a complexing agent and a halogen compound simultaneously or successively; and

(B) an organoaluminium compound, and in this process, ethylene is supplied to the polymerization system together with propylene so that the ethylene content in the resulting polymer is in the range of from 0.1 to 1.0 wt% (column 2, lines 7 to 24; column 6, lines 30 to 34; Claim 1). The isotactic values of the resulting

copolymers determined by the heptane insoluble polymer (HIP) method which are reported in the examples are higher than 98%.

5.1 For the comparison of the claimed subject-matter with that teaching the three features which define the copolymers in Claim 1, namely the ethylene content (Ec), the isotactic value (Iso) and the process features, will be considered successively.

5.1.1 There is no dispute between the parties that the ethylene content in the copolymers produced by the process according to D1 falls within the range defined under condition (A) in Claim 1 of the patent in suit.

5.1.2 The question of the comparison of the isotactic values has been thoroughly discussed since that parameter is determined by the HIP method in D1, whereas the C^{13}-NMR is used in the patent in suit. In opposition as well as during the appeal proceedings both parties have made opposite assertions regarding the reliability of these two methods and the conclusiveness of any comparison. As will appear from the next paragraph, however, that point is not essential for the issue of novelty, so that no further considerations will be made regarding the isotactic values hereinafter.

5.1.3 The comparison between the definition of the catalyst system used in D1 and that of the catalyst system required according to the patent in suit reveals differences in (i) the composition of the active solid titanium catalyst component, the prior art using generally an ether as the complexing agent (cf. Claim 1 in conjunction with column 3, lines 1 to 29), whereas a magnesium compound and an ester of phthalic acid are used for the preparation of the catalyst compound in the patent in suit, (ii) the granularity of the active

catalyst component which has to meet specific criteria of size and distribution in the patent in suit, and (iii) the presence of additional Si-C bonds in the catalyst system used in the patent in suit as the result of the use of an organo silicon compound as the third catalyst ingredient.

The experimental reports submitted during opposition proceedings (Annex to the statements filed on 30 May 1988 and 9 August 1990), wherein the properties of films prepared from polymers obtained by following up Examples 1 and 2 of D1 and from polymers obtained in accordance with Example 3 of the patent in suit were compared, show that in respect of six physical properties, namely haze, impact strength, Young's modulus, heat shrinkage, surface inherent resistivity and stretchability, films prepared in accordance with the teachings of the patent in suit are significantly better. The Appellant's argument that, in the absence of any indication in these test reports regarding the processing conditions, this improved balance of properties of the films did not necessarily reflect differences in the polymers themselves cannot be accepted, since during the oral proceedings before the Board the Respondent specified that the films had been made by following the same procedure. This can only mean that the differences in the properties of the films result from different properties of the polymers, i.e. that the use of different catalyst systems results in different polymers.

This relationship has a considerable bearing on the definition of the polymers in Claim 1. In contrast to the Appellant's argument during oral proceedings that only ethylene content (Ec) and isotactic values (Iso) could be taken into account when assessing novelty, additionally there is a third feature to be considered

which is the combination of process features (i) to (iii), with which a complex balance of no less than six physical properties is improved, which could not be expressed by means of conventional parameters. The process features in the claim must therefore be regarded as equivalent to a structural definition of the polymers and thus represent a true limitation with respect to polymers characterized otherwise by their (Ec) and (Iso) parameters only; this demonstrates the novelty of the claimed subject-matter.

5.2 The question of the wording of Claim 1 has to be examined in the light of this conclusion, since a prerequisite for a "product-by-process" claim to be allowable is that the products themselves be both novel and inventive. As far as the characterization of the polymers by process features is concerned, in view of the complex correlation between catalyst features and structural features of the resulting polymers, it is the only way to express the improvement of the balance of properties, which six physical properties are shown to be involved.

This is in line with decision T 150/82, OJ EPO 1984, 109, in which in a similar situation, the Board took the view "that in order to minimise uncertainty, the form for a claim to a patentable product as such defined in terms of a process of manufacture (i.e. "product-by-process claims"), should be reserved for cases where the product cannot be satisfactorily defined by reference to its composition, structure or some other testable parameters" (Reasons, point 10).

5.3 In view of the foregoing it is concluded that the requirement of novelty is met and that the formulation of the claim is adequate to express the contribution of the catalyst system to the definition of the products.

5.4 This conclusion also applies to Claim 1 for AT, since products made out of these novel copolymers are also novel.

Inventive step.

6. The patent in suit concerns film-forming copolymers, films thereof and a process for the production of the films. As stated above, such copolymers are disclosed in D1, which the Board, like the Opposition Division, regards as the closest state of the art. Although the copolymers obtained in D1 are said to have good stretchability, the level achieved could not be regarded as entirely satisfactory. Moreover, other properties, like the haze, impact strength, Young's modulus, surface inherent resistivity and heat shrinkage and in particular the balance between these properties, were capable of improvement.

In view of the above the technical problem underlying the patent in suit may thus be seen in providing a copolymer having not only good mechanical and optical properties, but also a good balance between these properties.

According to the patent in suit this problem is to be solved by a copolymer having a low ethylene content, high isotacticity and obtainable by using a specific catalyst system.

The examples of the patent in suit and also the additional experiments mentioned above demonstrate that the various aspects of the above-defined problem are effectively solved.

7. It remains to be decided whether the claimed subject-matter is obvious having regard to the documents on file.

7.1 D1 considers the influence of the catalyst system on the properties of the copolymer and the products made thereof (see column 1, lines 18 to 65). However, D1 concerns in particular catalysts containing a specific type of titanium trichloride (see column 4, lines 49 to 68) and is silent about catalyst systems based on a spherical solid titanium component containing magnesium, titanium, chlorine and an ester of phthalic acid with an alcohol having at least 2 carbon atoms. Therefore, D1 contains no teaching as to the use of such catalysts and its effects on the product properties and hence does not provide a solution to the above-defined problem.

In fact, D1 would discourage the skilled person to use any catalyst other than those specified therein. D1 teaches that the use of a specific catalyst, in combination with the use of a limited amount of ethylene, results in a number of advantages that could not be achieved previously with other catalysts. The shortcomings reported for previous prior art propylene copolymers, particularly in terms of mechanical properties, clearly show that the improvement of one property is often achieved at the expense of other properties. These shortcomings are overcome by applying the teaching of D1, which results in particular in the enhancement of stretchability without sacrificing the Young's modulus. Therefore, any attempt to use other catalysts systems than those disclosed in D1 would in the first place mean foregoing the advantages conferred by these catalysts. The prior art survey in the introduction of the patent in suit also shows that it had not been possible to combine various advantageous properties, which confirms the specificity of the

catalyst system and the difficulty to reach a good balance of properties. As the latter aspect involving no less than six components is not considered in D1, it is evident that this citation cannot suggest any feature within the terms of the patent in suit.

7.2 In view of the above, the Board concludes that the copolymer as defined in Claim 1 of the main request for DE, GB, IT involves an inventive step. It follows that the films as defined in Claim 1 of the main request for AT, which are made out of these inventive copolymers, are also inventive.

8. As both Claims 1 for DE, GB, IT and for AT are allowable, the same goes for dependent Claims 2 to 4 for DE, GB, IT and 2 to 3 for AT, which all refer to the product according to Claims 1, and the patentability of which is supported by that of Claims 1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of two sets of claims (Claims 1 to 4 of the main request for DE, GB, IT and Claims 1 to 3 of the main request for AT) filed as main request on 11 January 1993, and a description to be adapted.

The Registrar: The Chairman:

E. Görgmaier C. Gérardin