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Datasheet for the decision of 3 July 2014

Case Number: T 0225/09 - 3.3.03

Application Number: 98931141.0

Publication Number: 0994906

IPC: C08F210/18, C08F2/38, C08F4/68

Language of the proceedings: EN

Title of invention:
ELASTOMERIC COPOLYMER AND PROCESS FOR THE PREPARATION THEREOF

Patent Proprietor:
Lanxess Elastomers B.V.

Opponents:
Sumitomo Chemical Co., Ltd.

Headword:

Relevant legal provisions:
EPC Art. 106, 108, 83, 54, 56
EPC R. 76(2)(c), 99(2)
RPBA Art. 12(2)

Keyword:
Admissibility of appeal - (yes)
Admissibility of a fresh ground of opposition (no)
Sufficiency of disclosure - main request (yes)
Novelty - main request (yes)
Inventive step - main request (yes)

Decisions cited:
G 0009/91, G 0010/91, T 0432/88, T 0534/89

Catchword:

Europäisches Patentamt
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Case Number: T 0225/09 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 3 July 2014

Appellant: (Opponent 2)	Sumitomo Chemical Co., Ltd. 5-33, Kitahama 4-chome Chuo-ku Os Osaka 541 (JP)
Representative:	Hammer, Jens Grünecker, Kinkeldey, Stockmair & Schwanhäusser Leopoldstrasse 4 80802 München (DE)
Respondent: (Patent Proprietor)	Lanxess Elastomers B.V. Mijnweg 1 6167 AC Geleen (NL)
Representative:	Herbold, Matthias LANXESS Deutschland GmbH LIP-IPR LANXESS Tower Kennedyplatz 1 50569 Köln (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 14 November 2008 rejecting the opposition filed against European patent No. 0994906 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	M. C. Gordon
Members:	D. Marquis
	C. Brandt

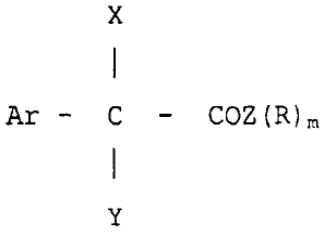
Summary of Facts and Submissions

I. The appeal by the opponent lies from the decision of the opposition division dated 15 October 2008 and posted on 14 November 2008 to reject the oppositions against European patent N° 0994906 (based on application number 98 931 141.0).

II. The patent was granted with a set of 19 claims of which independent claims 1, 9 and 10 read as follows:

"1. A process for the preparation of elastomeric copolymers comprising copolymerising a) ethylene, b) an a-olefin, c) a non-conjugated polyene (C) which in the molecule contains one C=C bond that is polymerizable using a Ziegler-Natta catalyst, and d) optionally a non-conjugated polyene (D) which in the molecule contains two or more C=C bonds, that are polymerizable using a Ziegler-Natta catalyst, wherein the copolymer has the following properties:

i the weight ratio between the ethylene content and the a-olefin content is between 80/20 and 40/60
ii the polyene (C) content is 4 to 30 wt%
iii the polyene (D) content is 0 to 5 wt%,
by means of a catalyst composition comprising a Group 3, 4, 5 or 6 transition metal and a Group 1, 2, 12 or 13 organometallic compound, characterised in that the catalyst composition also comprises a compound represented by the formula:



where:

X = a halogen atom,
Y = H, an alkyl group with 1-30 C atoms, an aromatic group with 6-30 C-atoms, or a halogen atom,
Z = 0 (oxygen) or N (nitrogen),
R independently represents H, an alkyl group with 1-30 C atoms or an aromatic group with 6-30 C atoms,
Ar = an aromatic group with 6-30 C atoms
m= 1 or 2,

and wherein the polymerisation is carried out in gasphase, in slurry or in solution, wherein the polymer is present in a polymer concentration larger than 70 g/l of solvent."

"9. An elastomeric copolymer derived from components comprising
a) ethylene,
b) an a-olefin,
c) a non-conjugated polyene (C) having one C=C bond that is copolymerizable using a Ziegler-Natta catalyst, and
d) a non-conjugated polyene (D) which in the molecule contains two or more C=C bonds that are copolymerizable using a Ziegler-Natta catalyst,
wherein the copolymer has the following properties:

i the weight ratio between the ethylene content and the α-olefin content is between 80/20 and 40/60
ii the polyene (C) content is 4 to 30 wt.% relative to the polymer
iii the polyene (D) content is 0.1 to 2 wt.% relative

to the polymer
iv a branching coefficient BC, for which the following holds :

$0.57 - 0.022 * [C] \leq BC \leq 0.7$

where

$$BC = \frac{g'(III)}{MWD} + 0.25*RBE*[D]^{0.5} + 0.0855 * [DCPD]$$

[C] = polyene (C) content of the polymer (wt.%, relative to the total weight of the polymer),
[D] = polyene (D) content of the polymer (wt.%, relative to the total weight of the polymer),
RBE = relative branching efficiency of the polyene (D) relative to vinyl norbornene (VNB),
[DCPD] = dicyclopentadiene content of the polymer (wt.% relative to the polymer)."

"10. An elastomeric copolymer derived from components comprising
a) ethylene,
b) an a-olefin,
c) a non-conjugated polyene (C) having one C=C bond that is copolymerizable using a Ziegler-Natta catalyst, and
d) a non-conjugated polyene (D) which in the molecule contains two or more C=C bonds that are copolymerizable using a Ziegler-Natta catalyst,

wherein the copolymer has the following properties:

i the weight ratio between the ethylene content and the α-olefin content is between 80/20 and 40/60
ii the polyene (C) content is 4 to 30 wt.%
iii the polyene (D) content is 0.1 to 2 wt.%

iv a branching coefficient BC*, for which the following holds :

$0.57 - 0.022 * [C] \leq BC^* \leq 0.7$

where

$$BC^* = \frac{g'(III)}{MWD} + \Sigma_D (0.25*[D]^{0.5})$$

[C] = polyene (C) content of the polymer (wt.%, relative to the total weight of the polymer),
[D] = polyene (D) content of the polymer (wt.%, relative to the total weight of the polymer),
$\sum_D$ = sommation of all contributions to BC* of the polyenes D present in the elastomeric copolymer."

Claims 2 to 8 were directed to preferred embodiments of claim 1. Claims 11 to 19 were directed to preferred embodiments of claims 9 and 10.

III. Two oppositions against the patent were filed by opponent 1 (Bayer Polymers, later LANXESS Deutschland GmbH) and opponent 2 (Sumitomo Chemical Company Limited) in which the revocation of the patent was requested on the grounds according to Article 100(a) EPC (lack of novelty of claims 9 to 19 and lack of inventive step of all claims, opponent 1 and 2) and Article 100(b) EPC against claims 9 and 10 (opponent 1).

IV. With letter of 8 January 2008, the opponent 1 withdrew its opposition.

V. The decision of the opposition division relied *inter alia* on the following documents:
D1: EP-A-0044119

D3: EP-A-0094051
D7: JP-A-63008408
D8: JP-A-63008408 (English translation of D7)
D17: The British Polymer Journal, June 1977, p. 133-139
Annex 2: "Calculations Regarding the Parameters used in EP-0-994 906" submitted by opponent 2 with its notice of opposition.

In the decision the opposition division held that the main request (claims as granted) fulfilled the requirements of Article 83 EPC and that it was novel over D1, D3 and D7/D8. Starting from the closest prior art D1, the problem was to provide a Ziegler-Natta polymerization process for the preparation of ethylene/ a-olefin/diene terpolymer rubbers which were gel free and in which the branching was distributed homogeneously over all polymer chains while the molecular weight distribution remained narrow. The solution to that problem could not be derived from the prior art. Consequently the claims fulfilled the requirements of Article 56 EPC.

VI. On 23 January 2009, the opponent 2 lodged an appeal against the decision of the opposition division. The statement setting out the grounds of the appeal was filed on 24 March 2009. Opponent 2 requested that the patent be revoked on the grounds of Article 100(b) EPC (claims 1 and 9) and Article 100(a) EPC (lack of novelty of claim 9 in view of D3 and D7/D8 and lack of inventive step of all the claims in view of D1).

VII. The reply to the statement of grounds of appeal was filed with letter of 13 July 2009. The patent proprietor requested the dismissal of the appeal or the maintenance of the patent on the basis of auxiliary

requests I or II as filed therewith.

VIII. On 13 March 2013 the Board issued a summons to attend oral proceedings on 24 October 2013. The oral proceedings was cancelled by communication of the Board sent by Telefax on 21 October 2013 and by communication of 30 October 2013 rescheduled for 3 July 2014. The preliminary opinion of the board was sent on 5 September 2013.

IX. By letter of 24 September 2013, the patent proprietor requested the dismissal of the appeal as being inadmissible and did not give his consent to the introduction of the grounds of opposition under Article 83 EPC against claim 1. Two new auxiliary requests III and IV were also filed.

X. Oral proceedings were held on 3 July 2014.

XI. The appellant's arguments may be summarised as follows:

- Admissibility of the appeal

The appeal was admissible because the statement of grounds of appeal addressed the reasons provided by the opposition division in its decision. Furthermore, the same arguments in support of the grounds of opposition still applied for the appeal procedure because the patent had been maintained unamended.

- Article 83 EPC

Claim 1 was not sufficiently disclosed because it referred to polymerisations in the gas phase and in slurry which could not be carried out at the polymer concentration specified in the claim, i.e. more than

70g/l solvent. Examples were provided only for a small number of monomer components, with only one branching inhibitor and only in solution.

The objection against claim 1 under Article 83 EPC was admissible as it was raised in reply to the reasoning concerning the polymer concentration in claim 1 given by the opposition division in its decision.

Claim 9 was not sufficiently disclosed because the examples did not enable the skilled person to produce elastomeric copolymer materials as claimed in the opposed patent other than those specifically exemplified. The patent as granted did not provide a general teaching of how to obtain elastomeric copolymer materials in particular with the required branching coefficient. Also, the examples and the arguments submitted by the patentee in first instance proceedings clearly showed that the adjustment of the branching coefficient was by no means a routine measure for the average skilled person.

- Article 54 EPC

Annex 2 established a mathematical relation between the degree of branching g'(III) of elastomeric copolymers, the measured weight average intrinsic viscosity ([η]), the propylene weight fraction (w3) and the branching ratio (g_η^*). It had been shown by the opponent 2 in the notice of opposition and the further letter of 18 December 2003 (attached to the statement of grounds of appeal as enclosures A and B respectively) that comparative example 4 of D3 and comparative examples 4, 5 and 6 of D7/D8 disclosed elastomeric copolymer materials with branching coefficients in accordance with claim 9. This evidence was not rendered invalid by

the fact that the examples of the patent in suit employed methods for the determination of certain parameters, which were different from those reported in the cited prior art because the operative claims contained no restriction in this respect.

- Article 56 EPC

D1 was the closest prior art. The experimental data of the patent did not show that any technical effect was associated with the polymer concentration but only showed that the selection of the branching inhibitor was decisive for the preparation of polymers with a desired branching coefficient, enabling furthermore the polymerization reaction to be run at high polymer concentrations. This was an obvious desideratum for the average skilled person and was not inventive in view of D1 since it was always the desire of the average skilled person to run a polymerization reaction at high polymer concentrations in order to improve the overall yield of the polymerization reaction. Furthermore, D1 already identified that the concentration of the solution in the polymerization reaction was a measure for the activity of the catalyst system, so that it was readily apparent that when using high activity catalyst systems the solution concentration automatically increased. Thus D1 clearly showed, contrary to the argument of the patent proprietor, that the solution concentration could not be considered as a measure influencing the polymer structure. Claims 1 to 8 thus lacked inventive step.

The product claims 9 and onward lacked inventive step on the basis of the detailed arguments provided in enclosures A and B as well in the notice of opposition filed by the opponent 1 (designated "Enclosure C").

XII. The respondent's arguments may be summarised as follows:

- Admissibility of the appeal

The appeal should be rejected as inadmissible because the statement setting out the grounds of appeal failed clearly and concisely to present the legal and factual reasons why the decision taken by the opposition division was erroneous and had to be set aside or even reversed.

- Article 83 EPC

The objection under Article 83 EPC had been raised against claim 1 for the first time in the statement of grounds of appeal. This was a fresh ground because no opposition had been formed against claim 1 under Article 83 EPC and hence not admissible. For claims 9 and 10, no evidence had been advanced to show what would prevent the skilled person from carrying out the invention over the whole scope of the claims.

- Article 54 EPC

The equation set out in Annex 2 was based on the invalid assumption that the elastomeric copolymers of the prior art were monodisperse. This was not the case because the copolymers of D3 and D7/D8 had molecular weight distributions of at least 2.8. The branching coefficient had to be (not could be) obtained according to the methodology set out in paragraphs [0004] to [0007] of the patent in suit. The subject matter of claim 9 was novel over D3 and D7/D8.

- Article 56 EPC

D1 was the closest prior art. Claim 1 differed from D1 in that the reaction was carried out at a polymer concentration larger than 70 g/l. D1 showed that at a content of ENB above 4 wt% the concentration of the polymer in the solution significantly dropped below 20 g/l. It was not disputed that running a polymerisation at high polymer concentration was an obvious desideratum. However D1 did not disclose how this could be achieved. For this reason the skilled person, faced with the problem of combining high ENB concentrations with a high polymer concentration, would not contemplate D1. The claims of the patent in suit were therefore inventive over D1.

As no reasoned arguments had been advanced either in the notice of opposition or in the statement of grounds of appeal in support of the allegation of lack of inventive step in respect of claims 9 and 10 said objection was not admissible.

XIII. The appellant (opponent 2) requested that the decision under appeal be set aside and that the patent be revoked.

XIV. The respondent (patent proprietor) requested that the appeal be found not to be admissible. In the alternative it was requested that the appeal be dismissed or that the patent be maintained on the basis of auxiliary requests I or II as filed with the reply to the statement setting out the grounds of appeal or on the basis of auxiliary requests III or IV as filed with letter of 24 September 2013.

Reasons for the Decision

1. Admissibility of the appeal

1.1 The statement of grounds of appeal filed by opponent 2 contains several general references to submissions provided by both opponents during first instance proceedings before the opposition division. These references were constituted by:

- the notice of opposition of the opponent 2 as well as Annex 2 relating to the feature analysis and the calculations regarding the parameters used in the patent in dispute (Enclosure A)
- the additional arguments as submitted with letter of 18 December 2003 (Enclosure B) and
- the notice of opposition of the opponent 1 (Enclosure C)

The earlier submissions provided in Enclosures A to C were referred to in the statement of grounds of appeal. Enclosures A and B were cited in connection with the Articles 83, 54 and 56 EPC and a reference to Enclosure C was added for Article 56 EPC. The statement of grounds of appeal did not contain any further analysis of the reasons why these earlier submissions should give cause to overturn the decision under appeal.

According to Rule 99(2) EPC, the statement of grounds of appeal should set out the legal and factual reasons why the decision under appeal should be set aside. As was pointed out in decision T 432/88 of 15 June 1989 (unpublished), such a vague reference leaves it to the Board and respondent to conjecture in what respect the

appellant considers the decision under appeal to be defective. This is just what the requirement of grounds for appeal is designed to prevent. Decision T 534/89 (OJ EPO 1994, 464) further held in this respect that otherwise the respondent would be at a loss to know how to prepare his case and the Board cannot direct the appeal proceedings in an efficient way (see the Publication "Case Law of the Boards of Appeal of the European Patent Office", 7th Edition (2013) section IV.E.2.6.4). Under these circumstances, it is not possible, as required under the jurisprudence of the Boards of Appeal, for the present Board, or indeed the Respondent to fully understand by reading these parts of the statement of grounds for the appeal and the decision under appeal, the case that is being made by the appellant nor to ascertain precisely, without further investigation into the technical details as presented before the opposition division and on record in the file, in what respect(s) the decision under appeal was attacked. As a consequence, the mere references to the Enclosures A to C provided before the opposition division do not contribute to set out the legal and factual reasons why the decision under appeal should be set aside.

1.2 However, the objections raised by the appellant in the statement of grounds of appeal did not rely exclusively on references to earlier submissions, but also included some specific and self-contained arguments relating to several aspects of the contested decision, namely:

- the objection pursuant to Article 83 EPC against claim 9 of the patent in suit and relating to the adjustment of the branching coefficient of the elastomeric copolymers dealt with under point 2 of the appealed decision

- the objection of lack of novelty against claim 9 over D3 and D7/D8 based on the calculation of the branching coefficients as indicated in point 2 on page 5 of the statement of grounds of appeal dealt with under point 3 of the appealed decision
- explicit arguments in respect of the ENB/VNB ratio in reply to arguments provided by the respondent in a letter of 14 August 2008 and
- detailed arguments in support of an objection of lack of inventive step of claim 1 based on D1 on pages 7 and 8 of the statement of grounds of appeal and dealt with under point 6 of the appealed decision

1.3 Taking into consideration the statement of grounds of appeal as a whole, the appellant therefore provided - explicitly - a number of arguments expressing his disagreement with the finding of the decision under appeal on novelty of claim 9 over D3 and D7/D8, but also challenged the finding on inventive step of claim 1 over D1 which led to the rejection of the opposition. Hence, the appellant challenges the decision under appeal with respect to the rejection of the opposition and gives reasons for its criticism. The board therefore comes to the conclusion that the appeal complies with Articles 106 and 108 EPC and Rule 99 EPC and is therefore admissible.

Main request (claims as granted)

2. Article 83 EPC

2.1 Claim 1

2.1.1 In the two notices of opposition as well as during the following written opposition proceedings before the opposition division, only the subject matter of claims 9 and 10 was objected to under Article 83 EPC. The opponents held that the determination of the branching coefficients BC and BC* was not sufficiently disclosed and that the elastomeric copolymers of claims 9 and 10 could not be prepared on the basis of the information provided in the patent. At the oral proceedings before the opposition division, the appellant also contended that claim 9 contravened Article 83 EPC on the grounds that the branching inhibitor was not sufficiently disclosed. In the decision under appeal the opposition division held that the invention of the contested patent was disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (point 2 of the decision) because it had been shown how to calculate the branching coefficients BC and BC* and that the branching inhibitor was sufficiently disclosed in the examples 1, 2 and 4 to 12 of the patent.

2.1.2 It is only in the statement of grounds of appeal that the appellant raised an objection against claim 1 under Article 83 EPC. It was held therein that claim 1 contravened Article 83 EPC on the grounds that the patent would require a polymer concentration of more than 70 g/l solvent even when the polymerisation process was carried out in the gas phase or in slurry.

2.1.3 The part of the decision under appeal dealing with the ground under Article 83 EPC does not rely on the polymer concentration in the polymerisation medium. The only instance in the decision under appeal where the opposition division relies on this feature is in the reasoning regarding the inventive step of claim 1.

There the objection concerning the polymer concentration in the polymerisation medium was provided in a different context than the objection now raised against claim 1 under Article 83 EPC. In this regard, the appellant did not, for example, show how the reasoning of the opposition division with respect to Article 56 EPC could have resulted in the objection of lack of sufficiency of disclosure raised in the statement of ground of appeal.
The appellant's argument that this new objection under Article 83 EPC was raised as a reaction to the reasoning provided in the decision under appeal according to which the opposition division relied on the polymer concentration in the polymerisation medium is therefore not convincing.

2.1.4 The objection against claim 1 under Article 83 EPC raised by the appellant in the statement of grounds of appeal is not related to the objection raised against claims 9 or 10 before the opposition division and had never been raised against claim 1, it is therefore a new objection raised during the appeal proceedings. This was not contested by the appellant during the oral proceedings before the board.

2.1.5 Furthermore, the feature objected to in claim 1 as granted had always been part of that claim, meaning that the objection of lack of sufficiency relating to the polymer concentration in the polymerisation medium could have been raised on its own before the opposition division independently of the reasoning provided in the contested decision under Article 56 EPC against claim 1.

2.1.6 The extent and grounds for opposition mentioned in Rule 76(2)(c) EPC are connected in the sense that (a)

specific claim(s) is/are objected to under a specific ground or grounds. It is inadmissible without the approval of the patentee to extend the opposition over and above this basic framework, which defines both the extent to which the patent was originally opposed (G 9/91 OJ EPO 1993, 408) and the grounds originally submitted with respect to the subject-matter opposed under Article 99(1) and Rule 76(2)(c) EPC (see G 10/91 OJ EPO 1993, 420).

A fresh ground for opposition is correspondingly to be interpreted as referring to a new legal basis for objecting to the maintenance of the patent, which legal basis was not both raised and substantiated in the notice of opposition and which was not introduced into the proceedings by the opposition division.

By limiting the extent to which the patent is opposed under Article 100(b) EPC to the independent product claim 9 the opponent deliberately refrained from making use of his right under the EPC also to oppose the process claim 1 of the patent in suit under Article 100(b) EPC.

The objection of lack of sufficiency of disclosure relied upon by the appellant against claim 1 in the statement of grounds of appeal is correspondingly a fresh ground for opposition.

2.1.7 According to G 10/91, OJ EPO 1993, 420, a fresh ground for opposition may be considered in appeal proceedings only with the approval of the patentee. Since the respondent did not give consent to consideration of the issue of lack of sufficiency of disclosure of claim 1, it cannot be considered in the appeal proceedings.

2.2 Claim 9

The appellant has not provided any facts or evidence in support of his objection relying on a lack of general teaching in the patent allowing the skilled person to prepare the elastomeric copolymers having a branching coefficient in the range specified in claim 9. The contested patent discloses in Tables 1 and 2 for examples 1, 2 and 4 to 12 eleven elastomeric copolymers comprising ethylene, propylene, ethylidene-norbornene (ENB) and optionally vinylidene-norbornene (VNB) (examples 5 to 12) with a branching coefficient falling within the claimed range. The preparation process of these elastomeric copolymers is disclosed in paragraphs [0060] to [0063]. They were obtained by polymerisation in the presence of sesquiethyl aluminium chloride and oxyvanadium trichloride as the Ziegler-Natta catalyst system with ethyl ester of monochlorodiphenyl acetic acid as the branching inhibitor, a polymerisation process which is known in the art, as demonstrated by the disclosure of D1. The parameters used for the analysis of the elastomeric copolymers are disclosed in paragraphs [0056] to [0059] and the methods of calculation of the branching coefficient BC referred to in claim 9 is defined in paragraphs [0004] to [0009].

With respect to the branching of the elastomeric copolymers, the patent provides information regarding the parameters that may be of relevance for the skilled person. Paragraph [0024] indicates that the branching coefficient is a measure of the branching caused by cationic reactions. The branching itself is affected by the presence of polyene (D) (paragraphs [0023] and [0025]), the nature of the catalyst (paragraph [0034]) and the branching inhibitor (paragraph [0036]). The patent also provides a teaching concerning the

adjustment of branching in paragraph [0037] "*The use of small amounts of polyene (D) can give the desired amount of branching.*" wherein the small amount of polyene (D) is exemplified in paragraph [0020] of the patent. The patent in suit therefore provides a guidance on how to obtain the elastomeric copolymers having a branching coefficient in the range specified in claim 9.

According to the established jurisprudence of the Boards of Appeal, each of the parties to the proceedings carries the burden of proof for the facts it alleges. If a party whose arguments rest on these alleged facts does not discharge its burden of proof, this goes to the detriment of that party (see Case Law of the Boards of Appeal of the European Patent Office, 7th edition, 2013, III.G.5). The appellant's argument that the means of adjusting the branching coefficient within the range of claim 9 was insufficiently disclosed in the patent in suit so that a skilled person was not in the position to prepare the elastomeric copolymers of claim 9 was not supported by any evidence and is therefore not convincing. In view of the above, the board comes to the conclusion that claim 9 is sufficiently disclosed in the contested patent.

3. Article 54 EPC - Claims 9 and 10

3.1 Both claim 9 and claim 10 pertain to an elastomeric copolymer derived from components comprising a) ethylene, b) an a-olefin, c) a non-conjugated polyene (C) having one C=C bond that is copolymerizable using a Ziegler-Natta catalyst, and d) a non-conjugated polyene (D) which in the molecule contains two or more C=C bonds that are copolymerizable using a Ziegler-Natta

catalyst.
The elastomeric copolymer claim 9 is further characterized by the branching coefficient as defined by

$$BC = \frac{g'(III)}{MWD} + 0.25*RBE*[D]^{0.5} + 0.0855 * [DCPD]$$

and the elastomeric copolymer claim 10 is characterized by its branching coefficient as defined by

$$BC^* = \frac{g'(III)}{MWD} + \Sigma_D\,(0.25*[D]^{0.5})$$

wherein g'(III) represents the degree of branching as defined by $([\eta]/[\eta]^*)^{1.725}$ wherein $[\eta]$ is the measured weight-average intrinsic viscosity (in dl/g) and $[\eta]^*$ is the apparent weight-average intrinsic viscosity of a linear copolymer with an ethylene/α-olefin composition corresponding to that of the elastomeric copolymer (dl/g), MWD is the molecular weight distribution of the elastomeric copolymer, [C] is the polyene (C) content of the polymer (wt.%, relative to the total weight of the polymer), [D] is the polyene (D) content of the polymer (wt.%, relative to the total weight of the polymer), RBE is the relative branching efficiency of the polyene (D) relative to vinyl norbornene (VNB), [DCPD] is the dicyclopentadiene content of the polymer (wt.% relative to the polymer) and $\sum_D$ is the sommation of all contributions to BC* of the polyenes D present in the elastomeric copolymer.

3.2 D3 and D7/D8 both disclose elastomeric copolymers from ethylene, propylene, ethylidene-norbornene and vinylidene-norbornene.

Table 1 of D3 or Table 2 of D7/D8 disclose for the

copolymer of comparative example 4 of D3 and comparative examples 4 to 6 of D7/D8, the ethylene content (C_2) of the polymer, the intrinsic viscosity [η], the iodine value, the ratio of ethylidene norbornene (ENB) to vinyl norbornene (VNB), the molecular weight distribution (Q) and the parameter g_η^* which is defined as the ratio $[\eta]/[\eta]_1$ wherein [η] is the intrinsic viscosity of the copolymer rubber and $[\eta]_1$ is the intrinsic viscosity of a linear ethylene-propylene random copolymer having an ethylene content of 70 mole% having the same weight average molecular weight as the copolymer rubber of the invention of the cited documents and a MWD of 2.5.

It was not disputed that neither D3 nor D7/D8 explicitly discloses the degree of branching g'(III) as defined in claims 9 and 10 of the main request.

3.3 In order to demonstrate that the polymers of D3 and D7/D8 fell within the scope of the operative claims 9 and 10, the appellant derived an equation to convert those measurement values reported in Table 1 of D3 and Table 2 of D7/D8, in particular the parameter g_η^*, the intrinsic viscosity [η] and the propylene weight fraction to the degree of branching g'(III) as defined in claims 9 and 10. The derivation of this equation was set out in Annex 2. The derivation involved making a number of assumptions which are not explained or identified, even implicitly, in Annex 2 or the accompanying submission in the opposition proceedings. The assumptions become apparent by reference to the documents relied upon by the appellant as a basis for the equations employed in the derivation, and cited in Annex 2. Study of said documents however raises questions about the validity of certain of the assumptions that were made in deriving the conversion

equation. In particular equation (7) of Annex 2, $g'=([\eta]/[\eta]_{lin})$ relating to the branching parameter is stated in D17 to be valid for monodisperse systems (D17 page 134 in respect of equation (7) thereof). The polymers of D3 and D7/D8 however have MWDs of 2.8 and consequently are not monodisperse but polydisperse. It is not explained in Annex 2 or in other submissions of the appellant why equation (7) would, nevertheless be applicable to polydisperse systems. That such assumption may not automatically be made follows from the text accompanying equations (8) and (19) for polydisperse systems in D17 where it is stated that ratios of intrinsic viscosities defining the degree of branching vary with molecular weight distribution of the polymer.

The steps of the derivation of the conversion equation presented in Annex 2, thus rely, at least from the step invoking equation (7) onward, on an assumption which in view of the information given in D17 (which reference is cited by the appellant in Annex 2) does not appear to be valid. The Board drew attention in the written and oral proceedings to the question of the validity of the conversion equation, however the appellant did not avail itself of the opportunity to address this matter either in writing or orally. There thus exist serious doubts as to the validity of the equation relied upon by the appellant to demonstrate lack of novelty with respect to D3 and D7/D8 which doubts have not been dispelled by any submissions of the appellant. Under these circumstances, the Board is unable to conclude that the appellant has demonstrated unambiguously that the polymers of D3 and D7/D8 fall within the scope of operative claims 9 and 10 and has consequently failed to prove that the subject-matter of said claims lacks novelty. Consequently, the requirements of Article 54

EPC are satisfied.

4. Article 56 EPC

4.1 Claim 1

4.1.1 The patent in suit relates to a process for the production of elastomeric copolymers derived from components comprising a) ethylene, b) an a-olefin, c) a non-conjugated polyene (C) obtained in the presence of a Ziegler-Natta catalyst (paragraph [0001]).

4.1.2 D1 discloses in experiments 5, 7 and 8 of Table 4 a polymerisation process for the production of elastomeric terpolymers containing ethylene, propylene and ethylidene-norbornene (ENB) with sesquiethyl aluminium chloride and oxyvanadium trichloride as Ziegler-Natta catalyst system. The polymerisation takes place in the presence of an activator of formula 4 (D1, page 17) which falls under the formula provided in claim 1 of the patent in suit. The ethylidene-norbornene (ENB) content (4.8 wt%, 4.7 wt% and 5.2 wt%) of the elastomeric terpolymers of experiments 5, 7 and 8 is within the range of feature (C) of claim 1 of the patent in suit (4 to 30 wt%). In D1, the weight ratio of ethylene and propylene in the resulting terpolymers can be deduced from the contents of propylene and ENB reported in Table 4. The ratios obtained for the terpolymers of experiments 5, 7 and 8 (55.1/40.1; 57.9/37.4 and 60.1/34.7) all fall within the range of claim 1 of the patent in suit (80/20 to 40/60). However, in experiments 5, 7 and 8 of D1 the solution concentrations during polymerisation (15.4; 11.2 and 6.4 g/l) are below the value of larger than 70 g/l required according to claim 1 of the main request.

D1 discloses elastomeric copolymers with ethylene and polyene contents comparable to those of the patent and obtained with the same catalyst system. The opposition division, the appellant and the respondent considered D1 to be the closest prior art. D1 has the same purpose as the patent in suit and can be seen as the closest prior art.

4.1.3 The technical problem addressed by the subject-matter of claim 1 of the main request was the provision of a process for the preparation of elastomeric copolymers allowing the production of virtually gel-free elastomeric copolymers wherein the weight ratio between the ethylene content and the a-olefin content is between 80/20 and 40/60 and the polyene (C) content is 4 to 30 wt% (paragraphs [0032], [0047] and [0048]).

4.1.4 The examples of the patent in suit report the continuous polymerization of ethylene, propylene, ethylidene-norbornene (ENB) (as the polyene C) and/or vinyl-norbornene (VNB) (as the polyene D). The Tables of the patent report the amounts of solvent, ethylene, propylene, ENB and VNB, branching inhibitor and polymerization conditions. In the examples I to XII, sesquiethyl aluminium chloride and oxyvanadium trichloride were used as the catalyst system and ethyl ester of monochlorodiphenyl acetic acid was present as the branching inhibitor according to claim 1. The molecular weight (Mn), molecular weight distribution (MWD), branching parameter (g'(III)), branching coefficient (BC) and crystallinity of the prepared polymer are reported in Table 2. It can be deduced from Table 2 that the elastomeric copolymers obtained have i) a weight ratio between the ethylene content and propylene content of between 80/20 and 40/60 and ii) a polyene (C) content of 4 to 30 wt%. The elastomeric

copolymers of comparative examples A to E in Table 3 were obtained from the same monomers and under the same conditions as in examples 1, 2 and 4 to 12 with the difference that in the comparative examples either no branching inhibitor (comparative example A) or a branching inhibitor not according to claim 1 (comparative examples B-E) was present during polymerisation.

The patent in suit does not contain comparative examples with respect to the process described for experiments 5, 7 and 8 of D1 in which the polymer concentration is below 70 g/l. The technical problem can therefore only be seen as the provision of a further process for the preparation of elastomeric copolymers based on the polymerisation of ethylene, an a-olefin and a non-conjugated polyene wherein the weight ratio between the ethylene content and the a-olefin content is between 80/20 and 40/60 and the polyene (C) content is 4 to 30 wt%.

4.1.5 The solution to the above problem resides in the polymerisation process defined in claim 1 of the patent in suit in which the polymer concentration is larger than 70 g/l.

4.1.6 It remains to be decided whether the proposed solution to the technical problem as defined above is obvious in view of the prior art. The question to answer is whether the skilled person, starting from the closest prior art D1 would envisage a process for the preparation of elastomeric copolymers conducted at a polymer concentration of 70 g/l solvent to yield copolymers wherein the weight ratio between the ethylene content and the a-olefin content is between 80/20 and 40/60 and the polyene (C) content is 4 to 30

wt%.

4.1.7 In D1, the process for the preparation of elastomeric copolymers of experiments 5, 7 and 8 is run at a low polymer concentration of 15.4; 11.2 and 6.4 g/l respectively. In Tables 3, 4 and 5, further examples of elastomeric copolymers containing a polyene (C) were conducted at higher polymer concentrations (up to 37.4 g/l in experiment 2 in Table 4) but when the polymer concentration of these examples is above 16.0 g/l (as employed in example 7 of Table 3, giving a Polyene (C) content of 4.5 wt%) the content of ethylidene-norbornene (polyene (C)) in the resulting elastomeric copolymers never exceeds 4 wt%. As a result, the examples of D1 do not teach the skilled person that elastomeric copolymers with a polyene (C) content of 4 to 30 wt% can be obtained if the process is conducted at a polymer concentration of more than 16.0 g/l.

Also D1 teaches on page 11, lines 13 and 14 that the polymer concentration of the solution is a measure of the activity of the catalyst system. Since the polymerisation rate of the monomers is known to vary widely (D1, page 6, lines 22 and 23), ultimately impacting the monomer molar ratio in the resulting elastomeric copolymers, a skilled person would not expect the same proportion of monomer incorporation for widely different polymer concentrations. Therefore it could not be expected that raising the polymer concentration from 16.0 as in experiment 7 of Table 3 or 15.4 as in experiment 5 of Table 4 to such an extent that it reaches 70 g/l as required by claim 1 of the main request would lead to a comparable proportion of monomer incorporation in the resulting elastomeric copolymers. On the basis of the experiments provided in D1, a skilled person would have had no grounds to

expect that elastomeric copolymers with a polyene content (C) within the claimed range would inevitably be obtained or indeed could be obtained when the polymer concentration is raised from ca 16 g/l in D1 to 70 g/l in claim 1 of the main request.

4.1.8 The subject matter of claim 1 of the main request is therefore not obvious in view of the closest prior art D1.

4.2 Claims 9 to 19

4.2.1 The arguments provided in reply to the decision of the opposition division on pages 7 and 8 of the statement of grounds of appeal refer solely to claim 1 of the patent as granted and its characterizing feature, namely the polymer concentration of more than 70 g/l solvent. There is no reference to claims 9 and 10 in this passage and it is not apparent either how the reasoning provided in relation to the polymer content in the polymerization medium could relate to claims 9 and 10 which do not contain this feature.

4.2.2 The statement of grounds of appeal also briefly refers to arguments relating to the inventive step of claims 9 and onwards contained in Enclosures A to C to the extent of stating that the arguments set out therein still applied. However this is the sum total of the submissions made with respect to inventive step of claims 9-19. As pointed out above under 1.1, such a vague reference leaves it to the Board and respondent to conjecture in what respect the appellant considers the decision under appeal to be defective. That part of the statement of the grounds of appeal submitted by the appellant does not allow the respondent and the Board to understand the case made by the appellant against

the inventive step of claims 9 to 19. When given the opportunity to present his case against inventive step of claims 9 to 19 at the oral proceedings, the appellant relied solely on the submissions provided in writing.

4.2.3 Rule 99(2) EPC as well as Article 12(2) RPBA set out that the statement of grounds of appeal shall contain a party's complete case and shall set out clearly and concisely the reasons why it is requested that the decision under appeal be reversed, amended or upheld, and should specify expressly all the facts, arguments and evidence relied on. The statement of grounds of appeal submitted by the appellant does not set out factual reasons why in the appellant's view the conclusion reached by the opposition division in respect of inventive step for claims 9 to 19 in its decision is not correct and why the decision should be set aside. The objection of lack of inventive step of claims 9 to 19 mentioned in the statement of grounds of appeal can therefore not be regarded as substantiated and is, thus, not a subject of the appeal proceedings.

Order

For these reasons it is decided that:

1. The appeal is dismissed.

The Registrar: The Chairman:

E. Goergmaier M. C. Gordon

Decision electronically authenticated