BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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

Datasheet for the decision of 9 March 2007

Case Number: T 1145/04 - 3.3.03

Application Number: 96919412.5

Publication Number: 0843878

IPC: H01B 3/44

Language of the proceedings: EN

Title of invention:
Electrical devices including ethylene, alpha-olefin, vinyl norbornene elastomeric polymers

Patentee:
ExxonMobil Chemical Patents, Inc.

Opponent:
Koninklijke DSM N.V.
Mitsui Chemicals, Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84, 83, 54, 56

Keyword:
"Claims - clarity (no) (main request)"
"Amendments - added subject-matter (no) (3rd auxiliary request)"
"Disclosure - sufficiency (yes) (3rd auxiliary request)"
"Novelty (yes) (3rd auxiliary request)"
"Inventive step (yes) (3rd auxiliary request)"

Decisions cited:
G 0009/91, T 0925/98

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1145/04 **-** 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 9 March 2007

Appellant 01: (Opponent 01)
Koninklijke DSM N.V.
P.O. Box 9
NL-6160 MA Geleen (NL)

Representative:
-

Appellant 02: (Opponent 02)
Mitsui Chemicals, Inc.
2-5 kasumigaseki 3-Chome
Chiyoda-ku
Tokyo 100-6070 (JP)

Representative:
Cresswell, Thomas Anthony
J.A. KEMP & CO.
14 South Square
Gray's Inn
London WC1R 5JJ (GB)

Respondent: (Patent Proprietor)
ExxonMobil Chemical Patents, Inc.
5200 Bayway Drive
Baytown, TX 77520-5200 (US)

Representative:
Dew, Melvyn John
ExxonMobil Chemical Europe Inc.
Law Technology
P.O. Box 105
B-1830 Machelen (BE)

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office dated 15 July 2004 and posted 10 August 2004 concerning maintenance of European patent No. 0843878 in amended form.

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. 0 843 878, in respect of European patent application no. 96 919 412.5, based on International application PCT/US96/10300, in the name of ExxonMobil Chemical Patents Inc., filed on 13 June 1996 and claiming a US priority of 14 June 1995 (US 490503), was published on 24 October 2001 (Bulletin 2001/43). The granted patent contained six claims, whereby Claim 1 read as follows:

"1. An electrically conductive device comprising:

a) an electrically conductive member including at least one electrically conductive substrate; and
b) at least one electrically insulating member substantially surrounding the electrically conductive member; said insulating member including an elastomeric polymer including

i) ethylene in the range of >50 mole percent, preferably >70 mole percent, more preferably from 75 to 85 mole percent;
ii) alpha-olefin in the range of from 10 to 50 mole percent, preferably from 10 to 30 mole percent, more preferably in the range of from 15 to 25 mole percent, preferably wherein said α-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1, and combinations thereof, and
iii) vinyl norbomene (*sic*) in the range of from 0.16 to 5 mole percent, preferably of from 0.16 to 1.5 mole percent, more preferably vinyl norbornene

in the range of from 0.16 to 1 mole percent, said mole percents based on the total moles of said elastomeric polymer; and

wherein said elastomeric polymer has a branching index less than 0.5, preferably less than 0.4, more preferably less than 0.3; wherein said elastomeric polymer has a M_w/M_n above 6, preferably above 8, more preferably above 10, most preferably above 15; (***sic***)"

Claims 2-5 were dependent claims directed to preferred embodiments of the electrically conductive device of Claim 1. Independent Claim 6 was directed to an electrical cable.

II. Notices of opposition were filed on 26 April 2002 by DSM N.V., now Koninklijke DSM N.V. (opponent 01), and on 24 July 2002 by Mitsui Chemicals Inc. (opponent 02). Opponents 01 and 02 opposed the patent on the grounds that its subject-matter was not patentable within the terms of Articles 54 and 56 EPC (Article 100(a) EPC). In addition, opponent 02 opposed the patent on the grounds that the invention was not sufficiently disclosed (Article 100(b) EPC) and that its subject-matter extended beyond the application as filed (Article 100(c) EPC).

Among the documents cited by the opponents were:

D2: ***F.B. Baldwin et al,*** Rubber Chemistry and Technology, 1970, 43, 522- 548;

D7: JP-151758 (considered in the form of an English translation of the full text);

D15: EP-A-0 094 051;

D18: US-A-4 599 391;

D19: Experimental Report 1 filed by opponent 02 with letter dated 11 June 2004; and

D20: Experimental Report 2 filed by opponent 02 with letter dated 11 June 2004.

III. In a decision announced orally on 15 July 2004 and issued in writing on 10 August 2004, the opposition division held that the patent could be maintained in amended form on the basis of the main request as submitted with the letter dated 17 June 2004. Claim 1 of this request read as follows:

"An electrically conductive device comprising:
a) an electrically conductive member including at least one electrically conductive substrate; and
b) at least one electrically insulating member substantially surrounding the electrically conductive member; said insulating member including an elastomeric polymer consisting of ethylene polymerised with alpha-olefin and vinylbornene, having

i) ethylene in the range of >50 to 85 mole percent,
ii) alpha-olefin in the range of from 10 to 30 mole percent, preferably wherein said α-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1, and combinations thereof, and

iii) vinyl norbornene in the range of from 0.16 to 5 mole percent, said mole percents based on the total moles of said elastomeric polymer; and

wherein said elastomeric polymer has a branching index less than 0.5, preferably less than 0.4, more preferably less than 0.3; wherein said elastomeric polymer has a M_w/M_n above 6, preferably above 8, more preferably above 10, most preferably above 15."

Dependent Claims 2-5 corresponded to Claims 2-5 as granted.

IV. Notices of appeal were filed on 23 September 2004 by appellant 01 (opponent 01) and on 5 October 2004 by appellant 02 (opponent 02), the requisite fee being paid on the respective same day.

V. The statement of grounds of appeal of appellant 01 was filed on 13 December 2004. Objections pursuant to Articles 83 and 56 EPC were raised.

(a) It was argued that the branching index (BI) was not sufficiently defined in the patent in suit. The BI was defined by formula (1) on page 7 of the patent in suit. One of the parameters in this formula was $M_{v,br}$ which should be calculated from the measured intrinsic viscosity (IV) via formula (2)

$$M_{v,br} = k(IV)^{1/a}.$$

Since the value for the constant "k" was not given in the patent in suit, the BI in formula (1) could

not be calculated and a person skilled in the art did not know how to choose the required elastomeric polymer with a BI less than 0.5

(b) The subject-matter of Claim 1 of the main request as allowed by the opposition division was obvious in view of D7 or D15.

VI. The statement of grounds of appeal of appellant 02 was filed on 13 December 2004. Objections pursuant to Articles 123(2), 83, 54 and 56 EPC were raised.

(a) It was argued that the ranges for the monomeric contents in Claim 1 of the main request as allowed by the opposition division was the result of a selection which was not directly and unambiguously derivable from the application as originally filed. Moreover, the lower limit for the ethylene content had been amended to >50% although 50% was originally disclosed.

(b) The elastomeric polymer required in amended Claim 1 could have an ethylene content of from >50 mole % up to a maximum of 85 mole %. Since, however, the maximum content of the other two components was 35 mole % (30 mole % of α-olefin and 5 mole % of vinyl norbornene (VNB)), it was not possible to produce an elastomeric polymer with an ethylene content of >50 to <65 mole %. Consequently, a skilled person could not repeat the invention over the whole scope of the claim.

(c) The subject-matter of Claim 1 of the main request was not novel over Control Example 1 of D7. It was

quite clear from the disclosure of D7 that Control Example 1 related to an ethylene, α-olefin, VNB polymer. The submission of 11 June 2004 described a reliable repetition of Control Example 1 of D7, and demonstrated that such repetition inevitably resulted in a copolymer which had all the properties specified in Claim 1 of the main request. Further, page 3, lines 21-24 of D7 disclosed appropriate uses for the copolymer rubbers described, ***inter alia*** wire covering.

(d) D15 was considered to represent the closest prior art. However, given the similarity of the disclosures of D7 and D15, it was clear that similar comments applied if D7 was taken as the closest prior art.

The only difference between the disclosure of D15 and the claimed subject-matter was in the nature of the diene component of the elastomeric polymer. Since no advantage had been demonstrated which was connected with the use of a VNB diene component, rather than a combination of VNB and ENB as the diene component, the objective technical problem to be solved over D15 had to be considered to be the provision of an alternative polymer for use as an electrically insulating material, the polymer having an alternative diene component.

The solution to this problem would have been obvious to the skilled person when combining the disclosure of D15 with any of D2, D18 or D21, the latter being newly cited.

D21: F.B. Baldwin and G. Ver Strate, Rubber Chemistry and Technology, 1972, 45, 709-881.

VII. The respondent (proprietor) requested in its reply received on 19 April 2005 that the patent be maintained in amended form as allowed by the opposition division, ie that the appeal be dismissed, or that the patent be maintained on the basis of the first or second auxiliary request, both filed on 17 June 2004 before the opposition division. Furthermore, the respondent submitted a claim set E (Claims 1-5) as third auxiliary request. The arguments of the respondent may be summarized as follows:

(a) Claim 1 of the main request did not contain subject-matter which extended beyond the content of the application as filed. The numerical values for the limits of the ranges set out in Claim 1 could be found in Claim 1 as originally filed which expressed the amounts of each constituent in a cascade if narrowing ranges. Furthermore, the replacement of "50%" by ">50%" was an amendment which clarified an inconsistency in the claim as originally filed and was in line with the case law of the boards of appeal.

(b) As regards the objection to the branching index under Article 100(b) EPC, this objection was late filed and without merit. The skilled reader would understand the Mark-Houwinck equation and would be able to derive $M_{v,br}$ from known values of the Mark-Houwinck constants. In this context, reference was made to the Ver Strate reference in the footnote

to page 7 of the granted patent. Pages 535 and 536 of that reference where submitted.

D22: G. Ver Strate, "Ethylene-Propylene Elastomers" in Encyclopedia of Polymer Science and Engineering, 2nd ed., vol. 6, 1986, 535-536.

VIII. Following a communication from the board (12 January 2007), the appellant submitted with a letter dated 8 February 2007 a fourth (claim set F) and a fifth (claim set G) auxiliary request, and with a letter dated 14 February 2007 a sixth auxiliary request (claim set H).

IX. In a letter dated 8 February 2007, appellant 02 advanced arguments with respect to the issues of Article 123(2) and Article 84 EPC. With respect to the latter, it was pointed out that it was not clear whether electrically conductive devices in which the elastomeric polymer (a) consisted of ethylene polymerised with α-olefin and VNB and (b) had an ethylene content of greater than 50 mole % but less than 65 mole % fell within the scope of Claim 1 of, for example, the main request. Furthermore, appellant 02 reiterated that the claimed subject-matter lacked an inventive in view of D15 in combination with D2 and/or D21.

X. Oral proceedings were held before the board on 9 March 2007.

(a) As regards the main request, the discussion focussed on the question as to whether or not

Claim 1 of this request met the requirements of Article 100(c), 84 and 123(2) EPC.

(b) Following the discussion of the main request, the appellant withdrew the 1st and 2nd auxiliary request.

(c) The 3rd auxiliary request contained five claims (Set E) which corresponded to the claims of the main request (point III, above), except that the range for ethylene was amended to **70** to 85 mole percent and the range for the alpha-olefin was amended to 10 to **25** mole percent (amendments in bold).

(i) Appellant 02 argued that Claim 1 of this request contravened Article 123(2) EPC because the combination of monomeric ranges was not directly and unambiguously derivable from the application as filed. Appellant 01 had no comment as regards Article 123(2) EPC.

(ii) No objections under Article 84 EPC were raised against the claims of the 3rd auxiliary request.

(iii) Appellant 01 maintained its objection that the claimed subject-matter lacked sufficiency of disclosure because the constant k was not disclosed. D22, relied upon by the respondent in this context, was not suitable to cure this deficiency. Appellant 02 had no comment as regards Article 83 EPC.

(iv) Appellant 02 did not maintain its novelty objection against the subject-matter of the 3rd auxiliary request. Appellant 01 had also no objection in this respect.

(v) As regards inventive step the parties basically relied upon their written submissions. The appellants argued that the skilled person knew (eg from D2 or D21) that VNB works very well for peroxide curing and therefore would substitute the ENB/VNB mixture used in D15 for VNB.

XI. Appellant 01 and appellant 02 requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

XII. The respondent requested that the appeal be dismissed and the patent be maintained in amended form as allowed by the opposition division (claim set A - main request), or, in the alternative,

that the decision under appeal be set aside and the patent be maintained on the basis of

- claim set E (Claims 1-5) filed on 19 April 2005 (3rd auxiliary request); or

- claim set F (Claims 1-5) filed on 8 February 2007 (4th auxiliary request); or

- claim set G (Claims 1-5) filed on 8 February 2007 (5th auxiliary request); or

- claim set H (one claim) filed on 14 February 2007 (6th auxiliary request).

Reasons for the Decision

1. The appeals comply with Articles 106 and 108 EPC and Rule 64 EPC and are therefore admissible.

Main request

2. *Amendments (Main Request)*

2.1 Claim 1 of the main request (point III, above) differs from Claim 1 as granted (point I, above) in that

- the phrase "consisting of ethylene polymerised with alpha-olefin and vinylnorbornene" has been introduced in the context of the elastomeric polymer, and

- the contents for ethylene, alpha-olefin and vinyl norbornene have been amended as follows:

"i) ethylene in the range of >50 to 85 mole percent",
ii) alpha-olefin in the range of from 10 to 30 mole percent, preferably wherein said α-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1, and combinations thereof, and
iii) vinyl norbornene in the range of from 0.16 to 5 mole percent".

2.2 Although the opposition division did not object against these amendments, the board has the power to examine whether or not amendments of the claims or other parts of a patent made in the course of the opposition or appeal proceedings meet the requirements of the EPC, eg with regard to the provisions of Article 84 and 123(2) EPC. In fact, the board not only has the power to carry out such an examination but is obliged to do so (see paragraph 19 of the reasons of G 9/91 (OJ EPO 1993, 408).

2.2.1 Indeed, the "consisting of" language requires that the elastomeric copolymer specified in Claim 1 of the main request can contain only ethylene, α-olefin and vinyl norbornene (VNB), and no other component. On the other hand, the elastomeric polymer is also defined as having an ethylene content in the range of from >50 to 85 mole percent, an α-olefin content in the range of from 10 to 30 mole percent percent and a VNB content in the range of from 0.16 to 5 mole percent. Thus, if the ethylene content is taken to be any value in the range of greater than 50 mole percent to less than 65 mole percent, which is within the scope of the ethylene range defined in Claim 1 of the main request, then either the α-olefin content must be greater than the defined upper limit of 30 mole percent or the VNB content must be greater than the defined upper limit of 5 mole percent. If, however, the α-olefin and the VNB content must not exceed the defined upper limits of 30 and 5 mole percent, respectively, then the lower limit of the ethylene content would be 65 mole percent thereby excluding the range of >50 to <65 mole percent although complying with the requirement of greater than 50 mole percent.

It is therefore not clear whether electrically conductive devices in which the elastomeric polymer (a) consists of ethylene polymerized with α-olefin and VNB and (b) has an ethylene content of greater than 50 but less than 65 mole percent fall within the scope of Claim 1. Indeed, an ambiguity exists as to whether such devices are (i) ***within*** the scope of Claim 1, by virtue of the ethylene content being within the claimed range, or (ii) ***excluded*** from the scope of Claim 1 because either the α-olefin or the VNB content must be greater than the relevant claimed upper limit.

2.2.2 Hence, the amendments introduced into Claim 1 of the main request render the scope of the claim unclear contrary to the requirements of Article 84 EPC. For this reason alone, Claim 1 of the main request is not allowable, and a discussion as to whether or not the amendments meet the requirements of Article 123(2) EPC or as to as to whether or not the limit >50 mole percent meets the requirements of Article 100(c) EPC is superfluous.

2.3 Claim 1 being not allowable, the main request as a whole has to be refused.

3. It may be convenient to recall at this juncture that the 1st and the 2nd auxiliary requests were withdrawn during the oral proceedings (see point X(b), above).

3rd auxiliary request

4. *Amendments (3rd auxiliary request)*

4.1 Claim 1 of the 3rd auxiliary request (point X(c), above) differs from Claim 1 as granted (point I, above) in that

- the phrase "consisting of ethylene polymerised with alpha-olefin and vinylnorbornene" has been introduced in the context of the elastomeric polymer,

- the contents for ethylene, alpha-olefin and VNB have been amended as follows:

  "i) ethylene in the range of 70 to 85 mole percent",
  ii) alpha-olefin in the range of from 10 to 25 mole percent, preferably wherein said α-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1, and combinations thereof, and
  iii) vinyl norbornene in the range of from 0.16 to 5 mole percent".

4.2 The "consisting of" language is supported by eg the terminology "The Ethylene, Alpha-Olefin, Vinyl Norbornene Elastomeric Polymer" used in the heading on page 10, line 12 of the application as originally filed. This is common language in the polymer field to describe elastomeric polymers consisting of these three monomer units.

4.3 As regards the ranges for ethylene, α-olefin and VNB it is conspicuous to the board that each of the numerical values for the limits of the ranges set out in Claim 1 of the 3rd auxiliary request is found in Claim 1 of the application as originally filed which expressed the amount of each constituent as a cascade of narrowing ranges.

Component	Claim 1 3rd aux. request (mole percent)	original Claim 1 (mole percent)
ethylene	70-85	50-90 pref. **70**-90 more pref. 75-**85**
α-olefin	10-25	**10**-50 pref. 10-30 more pref. 15-**25**
vinyl norbornene	0.16-5	**0.16-5** pref. 0.16-1.5 more pref. 0.16-1

4.3.1 In relation to VNB, the broadest range has been kept unchanged from original Claim 1.

The ranges for the ethylene and the α-olefin content are the result of a combination of a broader range with a preferred disclosed narrower range. According to established case law (eg T 925/98 of 13 March 2001, not published in the OJ EPO), such a combination does not contravene Article 123(2) EPC.

4.3.2 Appellant 02 alleged that the combination of ranges for the constituents set out in Claim 1 of the 3rd auxiliary request required a multiple selection not disclosed in the application as originally filed. However, this argument is not convincing.

As set out above, an ethylene content of 70-85 mole percent is unequivocally derivable from Claim 1 as originally filed. In the present case, this specific disclosure of the ethylene content implies further restrictions to other features of the claim, namely the content of the α-olefin and VNB, because (i) the elastomeric polymer consists only of ethylene polymerised with α-olefin and VNB and (ii) the proportions given for these three components must, by definition, add up to 100 mole percent. In other words, an amendment of the range of one component necessitates an amendment of the other two ranges. Thus, starting from the disclosed ethylene content of 70-85 mole percent and taking into account the cascade of values presented in Claim 1 as originally filed, the skilled reader would inevitably arrive at the ranges for the α-olefin and VNB set out in Claim 1 of the 3rd auxiliary request. In fact, it is the only possible combination of originally disclosed values that properly adds up to 100%. Hence, the combination of limits of the ranges in Claim 1 of the 3rd auxiliary request requires neither a multiple nor an arbitrary selection from the application as originally filed as alleged by appellant 02.

4.4 Dependent Claims 2-5 correspond to granted Claims 2-5 (and Claims 2-5 as originally filed, respectively).

4.5 No objection under Article 84 EPC was raised by the appellants. Nor does the board see a reason to raise an objection on its own.

5. *Sufficiency of disclosure (3rd auxiliary request)*

5.1 Claim 1 requires that the elastomeric polymer has a branching index (BI) less than 0.5. According to paragraph [0046] the BI is defined by formula (1):

$$BI = \frac{M_{v,br} \times M_{w,DRI}}{M_{w,LALLS} \times M_{v,DRI}} \quad (1)$$

where $M_{v,br} = k(IV)^{1/a}$, and a is the Mark-Houwink constant (= 0.759 for ethylene, α-olefin, diene monomer in decalin at 135°C).

5.2 Appellant 01 raised for the first time in appeal proceedings the objection that the patent was insufficient for failing to provide a value for constant k in the expression given in paragraph [0046] of the patent in suit.

The respondent, on the other hand, submitted that the skilled reader well understood the Mark-Houwink equation and would be able to derive $M_{v,DRI}$ from known values of the Mark-Houwink constants. The Mark-Houwink equation was normally expressed as:

$$IV = k^* [M_v]^a$$

where a and k^* were the well known and documented Mark-Houwink constants. This equation could be rearranged as:

$M_v = [(1/k^*)IV]^{1/a}$ or $M_v = (1/k^*)^{1/a}[IV]^{1/a}$.

Since k^* and a were both constants, $(1/k^*)^{1/a}$ was also a constant, and this has been expressed in paragraph [0046] of the patent in suit in the following way for $M_{v,br}$:

$M_{v,br} = k(IV)^{1/a}$

where k is $(1/k^*)^{1/a}$ and a and k^* are the known Mark-Houwink constants.

Appropriate values for the Mark-Houwinck constants a and k^* were known for EPDM compositions. Constant a was indicated in the patent in suit in paragraph [0046], and as an example of a literature reference to constant k^*, the respondent mentioned the Ver Strate reference in the footnote to page 7 of the granted patent that gave values for k^* in Figure 7 (filed as D22). The value for k, as used in the patent in suit, could then readily be calculated.

5.3 The use of the same letter in the patent in suit for a constant which in the end is not the Mark-Houwinck constant k^* is certainly unfortunate. Nevertheless, the board is of the opinion that the skilled reader would be in a position to rearrange the equation in the patent in suit, ie $M_{v,br} = k(IV)^{1/a}$, into the "normal" presentation as outlined by the respondent.
Appellant 01 has not shown that the failure to provide a value for constant k in the patent in suit amounts to an undue burden or even an insuperable difficulty for the determination of k, eg via documented values for

the Mark-Houwink constant k^* as pointed out by the respondent. Finally, it is conspicuous to the board that appellant 02 was and obviously is in a position to determine the branching index as demonstrated in the numerous experimental examples submitted during the opposition proceedings (submissions dated 11 June 2004, D19 and D20). In the board's view this amounts to independent evidence that a person skilled in the art using the information in patent in suit and common general knowledge was in a position to determine the constant k.

5.4 Thus, in view of the above, and in particular in view of the independent evidence provided by appellant 02, the board comes to the conclusion that the patent in suit does not lack sufficiency with respect to the determination of the branching index.

5.5 No further objection under Article 100(b) EPC was raised against the claims of the 3rd auxiliary request by the appellants. Nor does the board see any reason to raise an objection in this respect.

Consequently, the patent in suit discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

6. *Novelty (3rd auxiliary request)*

6.1 Appellant 02, the party which had raised a novelty objection in the statement of grounds of appeal in view of Control Example 1 of D7 and its reproduction thereof, respectively (data submitted 11 June 2004), did not maintain this objection against Claim 1 of the

3rd auxiliary request. Nevertheless, it might be convenient at this juncture to explain why the claimed subject-matter is novel over D7.

6.1.1 D7 relates to ethylene copolymer rubber consisting of ethylene, a C_{3-10} α-olefin and a polyene wherein the polyene consists of 5-ethylidene-2-norbornene (ENB) and VNB in a molar ratio of ENB/VNB of 1/1 to 45/1 (Claim 1). D7 makes a passing reference to the use of the rubber as wire covering in a list of possible applications (page 3). All of the examples and control examples, other than Control Examples 1 and 2, disclose a value for the ENB/VNB molar ratio measured in the final polymer. According to appellant 02, the lack of indicating an ENB/VNB ratio must mean that the copolymers of Control Examples 1 and 2 contained either ENB or VNB. Given the very low value for the parameter g_η^* (ratio $[\eta]/[\eta]_1$) for Control Example 1 in Table 1, the skilled person would assume, according to appellant 02, that the polymer described is an ethylene/propylene/VNB polymer.

6.1.2 However, there is no need to enter into a discussion as to whether or not the repeat of Control Example 1 of D7 is adequate to show an inevitable result (which was challenged by the respondent) because the data provided by appellant 02 show that the reproduced copolymer has a propylene content of 28.5 mole percent which is outside the range required in Claim 1 of the 3rd auxiliary request (10-25 mole percent). Consequently, for this reason alone, the subject-matter as claimed in the 3rd auxiliary request is novel over Control Example 1 of D7.

6.2 Since no novelty objection was raised against the subject-matter of the 3rd auxiliary request and the board sees no reason to raise an objection on its own, the subject-matter of Claims 1-5 of the 3rd auxiliary request is considered to be novel over the cited prior art (Article 54 EPC).

7. *Problem and solution (3rd auxiliary request)*

7.1 Claim 1 of the 3rd auxiliary request is directed to electrically conductive devices wherein the insulation member includes an elastomeric polymer consisting of ethylene polymerized with α-olefin and VNB (Claim 1). The aim of the patent in suit is (a) to reduce the overall cost of cable insulation and (b) to improve its quality. Cost is reduced by speeding up manufacture (by fast extrusion, fast cure rate and high cure state) and by reducing cure additives consumption. Quality is improved by having low surface roughness, low electrical loss and/or improved long term heat aging. These aspects are all mentioned in paragraph [0007] of the patent specification.

7.2 The opposition division and the appellants were of the opinion that both D7 and D15 could be considered as the closest prior art since both documents related to the same type of subject-matter and the same problems as the patent in suit.

7.2.1 As mentioned in point 6.1.1, above, D7 is directed to ethylene/α-olefin/polyene copolymer rubbers wherein the polyene is a mixture of ENB and VNB. Furthermore, there is a passing reference on page 3 to the use of the rubber as wire covering in a list of possible

applications. The problems which D7 aims to solve relate to good extrudability and rapid vulcanization, ie problems which are also mentioned in the patent in suit. On the other hand, there is no indication of the insulation properties of the wire covering and polymer-coated wires may be used for purposes where electrical insulation is not required (eg fencing). Thus, the problem of electrical loss, which is mentioned in the patent in suit, is not an issue in D7.

7.2.2 Similarly, D15 discloses a random copolymer rubber comprising ethylene, a C_{3-10} α-olefin and a polyene wherein the molar ratio of ethylene/α-olefin is 55/45 to 95/5 and the polyene is a mixture of ENB and VNB in a molar ratio of 1/1 to 20/1 (Claim 1). Excellent extrudability, fast cure rate and excellent tensile strength are the aims of D15 (page 2, lines 17-21). The rubber may as one of a range of applications be used as electric insulation material in cables and electric wires (page 10, lines 14-25) which, at least implicitly, covers electrical loss. On that basis the board considers D15 to represent the closest prior art.

7.3 In discussing molecular weight distribution (referred to in D15 as "Q" and measured in a different way), D15 states that Q "is desirably 6 or less, more desirably 2 to 6" (page 5, lines 33-36) and that a "Q value of 2.5 to 5 has an especially excellent good balance of the strength and the processing characteristics (page 6, lines 1-3). Hence, the clear teaching of D15 is to narrow molecular weight distribution. Nevertheless, there appears to be at least a certain overlap between Q and M_w/M_n as required in Claim 1 of the 3rd auxiliary request. As can be seen from D20, an experimental

report relating to the reproductions of Comparative Example 3 and Example 5 of D15 filed by appellant 02 during the opposition procedure and admitted by the opposition division into the proceedings, a Q value of 4.8 in Example 5 of D15 corresponds to a M_w/M_n value of 8.2 when measured in accordance with the method disclosed in the patent in suit.

The branching index is not taught in D15. However, D15 requires a parameter g_η^* of 0.2 to 0.9. This parameter is defined as the ratio $[\eta]/[\eta]_l$ and is the same parameter mentioned in D7 (see point 6.1.1, above). Page 5 of D15 states: "A value g_η^* considerably less than 1 seems to mean the presence of partial cross-linking structures in the copolymer chain, in addition to short chain branches derived from alpha-olefin which is a copolymerization component with ethylene." According to appellant 02 it is well known in the art that cross-linking occurs as the degree of long-chain branching increases. Thus, g_η^* is often used in scientific literature to express the degree of long-chain branching whereby a lower g_η^* value suggests increased long-chain branching. Therefore, the polymers disclosed in D15 having low g_η^* values inherently have a highly branched structure and thus, according to appellant 02, a branching index which fulfils the requirements as set out in Claim 1 of the 3rd auxiliary request. In this context, appellant 02 had submitted during the opposition procedure D19 and D20 which related to reproductions of Comparative Example 3 and Example 5 of D15 and provided direct measurement of the branching index. According to these submissions, Comparative Example 3 with $g_\eta^* = 0.18$ had a branching

index of 0.28 and Example 5 with g_η^* = 0.57 had a branching index of 0.39.

7.3.1 The respondent argued that D19 and D20 could be given no weight as evidence as full preparative details were not given. However, this argument is not convincing because there is no evidence that appellant 02 strayed from the process disclosed in D15. Indeed, there is nothing on file which would substantiate that the right procedure was not followed.

7.3.2 Although the copolymer rubber disclosed in D15 has some features in common with the elastomeric polymer as defined in Claim 1 of the 3rd auxiliary request, it contains a mixture of ENB and VNB as pointed out in point 7.2.2, above. However, the difference of the claimed subject-matter over D15 is not only the use of VNB as the sole diene, as alleged by appellant 02. In fact, there is not a single embodiment in D15 which explicitly or implicitly discloses an elastomeric polymer having all the features required in Claim 1 apart from VNB being only diene. Even Example 5 for which M_w/M_n and the branching index have been provided by D20 differs in more than one aspect from the subject-matter of Claim 1, namely the use of ENB/VNB **and** the ethylene content (with only 63.4 mole percent outside the range required in Claim 1). Thus, the difference between the subject-matter of Claim 1 and the closest prior art D15 lies more in a combination of features than in only using VNB instead of an ENB/VNB mixture, namely an elastomeric polymer having a certain monomer composition, the diene being only VNB, the polymer having a branching index less than 5 and the polymer having a M_w/M_n above 6.

7.4 When formulating the objective technical problem, the technical effect(s) that the claimed subject-matter provides over the closest prior art have to be taken into account. In the present case, there are no comparative data available that would demonstrate any improvement which results from the use of the polymers required in Claim 1 of the 3rd auxiliary request, rather than polymers as disclosed in D15. In the patent in suit, elastomers according to the invention (Polymers 2 and 6) are compared with EPDM-ENB elastomers (Polymers 1 and 4) which do not represent the closest prior art. On the other hand, the data provided in D20 (Table 2) show that a rubber compound produced by vulcanising the polymer of Example 5 of D15 with peroxide has a Mooney Viscosity of 40, demonstrating a good processability, an M_H value of 195 (maximum torque; a parameter also mentioned in the examples of the patent in suit), indicating a high cure state. Thus, the available data do not demonstrate that the claimed subject-matter provides any advantages in terms of improved quality or lower cost compared with the polymers disclosed in D15.

Since no advantage has been demonstrated which is connected with the use of the elastomeric polymer required in Claim 1, the objective technical problem can only be seen in the provision of an electrically conducting device comprising an alternative elastomeric polymer as the electrically insulating material having a good balance of properties.

From the examples in the patent in suit, eg Tables 4-9, it is evident that this objective technical problem is solved.

8. *Inventive step (3rd auxiliary request)*

8.1 It remains to be decided whether or not the proposed solution, ie the elastomeric polymer described in Claim 1, is obvious from the prior art when starting from D15 as the closest prior art. In particular appellant 02 argued that the claimed subject-matter would be obvious in view of a combination of D15 with any of D2, D18 or D21.

8.2 D2 discusses the influence of residual olefin structure on EPDM vulcanization. With respect to peroxide-cured rubbers of ethylene/propylene/diene copolymers it is stated on page 528: "All the terminal olefinic residues show relatively high crosslinking efficiencies suggesting significant levels of addition reactions, the residues from VNB and MNB [5-methylene-2-norbornene, added by he board] being most effective in this respect." In fact, MNB has the highest apparent efficiency (Table VII). The passage continues: "Thus, it would appear that a vinylidene grouping in which the doubly substituted carbon atom is part of a strained ring system (MNB) is more potent …". In other words, VNB is not singled out as the preferred diene. A similar statement can be found in the "Conclusions" paragraph 2 on page 544 which again highlight the benefit of the doubly substituted carbon being part of a strained ring system which points to MNB and not to VNB (which does not have a doubly substituted carbon being part of a strained ring system!). In addition,

page 526 of D2 contains the warning that VNB may incorporate with difficulty.

Furthermore, it is conspicuous to the board that the peroxide curing data quoted in Table VII of D2 have been measured for EPDM elastomers which contain ethylene well below the 70-85 mole percent specified in Claim 1 of the 3rd auxiliary request. The EP-VNB copolymer has the highest amount of ethylene at 52 mole percent.

Finally, D2 contains no indication of the effect of changing the diene on extrusion rate, surface roughness or electrical insulating properties.

8.2.1 It is apparent from the above analysis that D2 and the passages relied upon by appellant 02, respectively, basically deal with the curing efficiency of various dienes in EPDM elastomers. The influence of the change of the diene on the other properties that are likewise relevant to an electrically insulating material is not discussed. Thus, the skilled person seeking to provide an alternative electrically insulating member in an electrically conductive device of D15 while maintaining the good balance of properties thereof would not necessarily consult D2. And if the skilled reader did consult D2 he would not conclude that VNB should replace the mixture of VNB/ENB used in D15 because D2 does not identify VNB as the most efficient diene. Thus, for this reason alone, the subject-matter of Claim 1 of the 3rd auxiliary request is not obvious from a combination of D15 with D2.

8.2.2 But even if one would assume, in favour of appellant 02, that the skilled reader would identify VNB as a preferred monomer for peroxide curing in EPDM elastomers, the claimed subject-matter is still not obvious from a combination of D15 with D2. In addition to substituting the ENB/VNB mixture in D15 for VNB as the only diene, the skilled person would have to choose from various passages in D15 the other features, such as ethylene content, molecular weight distribution and branching index, in order to arrive at something falling within the scope of Claim 1 of the 3rd auxiliary request. It has not been made credible why the skilled person would focus on such a combination which as such is neither disclosed nor suggested in D15. For example, D15 favours a narrow molecular weight distribution (point 7.3, above) whereas the patent in suit goes towards a broad molecular weight distribution.

It appears that, without the patent in mind, the skilled person had no reason to focus on individual parts of the disclosure of D15 and to combine it with the teaching of D2, a document that focusses on cure properties and does not mention the other properties relevant to the claimed subject-matter. Therefore, a combination of D15 and D2 is based on hindsight and cannot succeed.

8.3 D21, a textbook relating to polyolefin elastomers based on ethylene and propylene, is not more relevant than D2. Page 782 onwards discusses EPDM polymer rubbers, in providing a detailed discussion on the different cure properties on rubbers containing different dienes. Table XI on page 784 of D21 to which appellant 02 referred is tabulating results for EPDM elastomers with

different dienes. This table and the discussion of it on page 785 again point to MNB as the diene providing the highest cross-linking efficiency. This point is reinforced by the first line of the text on page 786 which states: "The case for MNB is clear". As in D2, VNB is not singled out as the preferred diene.

In addition, as in D2, the peroxide curing data quoted in Table XI of D21 have been measured for EPDM elastomers which contain ethylene in an amount well below the 70-85 mole percent specified in Claim 1 of the 3rd auxiliary request, for example the EP-VNB copolymer has an ethylene content of 52 mole percent. Nor does D21 contain an indication of the effect of changing the diene on extrusion rate, surface roughness or electrical insulating properties.

Therefore, the same arguments brought forward against the combination of D15 with D2 apply equally to a combination of D15 with D21.

8.4 The basic argument of the appellants that the skilled person knew (eg from D2 or D21) that VNB works very well for peroxide curing and therefore would substitute the ENB/VNB mixture used in D15 with VNB is not convincing. In the board's view, this argument is based on an oversimplification of the features and properties that are of interest. As pointed out above, the difference over the cited prior art is not simply the use of VNB instead of an ENB/VNB mixture. Further, the aim of the claimed subject-matter is a balance of properties (point 7.4, above) and not simply good cross-linking. Finally, there is a clear teaching in D15 that ENB is necessary, and more ENB is better. In

particular, reference is made to page 4, lines 12-14 where it is stated that "a VNB content higher than the above-mentioned range undesirably results in poor vulcanized rubber properties". Although this teaching may not build up a prejudice, as alleged by the respondent, it is not credible that faced with this clear instruction the skilled reader would increase the VNB content to the extent of removing ENB altogether without expecting negative effects on the overall properties of the elastomeric polymer.

8.5 D18 is even less relevant. D18 does not even describe elastomers, but plastics as can be seen from the density of the polymers (eg the polymers of all examples have a density of about 0.92 g/cm^3). The description on column 3, lines 19-21 states that the α-olefin content should be 0-3 mol % which is clearly outside the composition range required in Claim 1 of the 3rd auxiliary request. The polymers in D18 are produced by free radical polymerization, not Ziegler-Natta polymerization (column 3, lines 44-46).

Thus, it would not have been obvious to combine this document with D15 when looking for alternative elastomeric polymers. Also the appellants did not rely on this document any more at the oral proceedings.

8.6 In summary, the subject-matter of Claim 1 of the 3rd auxiliary request, and, by the same token, the subject-matter of dependent Claims 2-5 is not obvious from the cited prior art.

9. Because the appellant succeeded on the 3rd auxiliary request, there was no need to consider its further auxiliary requests.

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 with the order to maintain the patent on the basis of the claim set E (Claims 1 to 5) filed on 19 April 2005 as 3rd auxiliary request and after any necessary consequential amendment of the description and drawings.

The Registrar: The Chairman:

E. Görgmaier R. Young