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D E C I S I O N
of 27 June 2006

Case Number: T 0789/03 - 3.3.03

Application Number: 96921029.3

Publication Number: 0843702

IPC: C08L 23/16

Language of the proceedings: EN

Title of invention:
Improved elastomeric vehicle hoses

Patentee:
ExxonMobil Chemical Patents, Inc.

Opponents:
Koninklijke DSM N.V.
LANXESS Deutschland GmbH
Mitsui Chemicals, Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 84

Keyword:
"Claims - clarity (no)"

Decisions cited:
-

Catchword:
-



Case Number: T 0789/03 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 27 June 2006

Appellant 01:
(Opponent 03)

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Respondent:
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office dated
9 April 2003 and posted 2 June 2003 concerning
maintenance of European patent No. 0843702 in
amended form.

Composition of the Board:

Chairman: R. Young
Members: W. Sieber
H. Preglau

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 843 702, in respect of European patent application no. 96 921 029.3, based on International application PCT/IB96/00686, in the name of ExxonMobil Chemical Patents Inc. (formerly Exxon Chemical Patents Inc.), filed on 24 May 1996 and claiming a US priority of 14 June 1995 (US 490385), was published on 16 June 1999 (Bulletin 1999/24). The granted patent contained six claims, whereby Claims 1, 5 and 6 read as follows:

1. A vehicle hose comprising:

an ethylene, α -olefin, vinyl norbornene elastomeric polymer;
wherein said elastomer has an M_w/M_n greater than 6;
wherein a compound made from said elastomeric polymer has a $ML(1+4)$ @ 100°C of less than 90;
wherein said elastomeric polymer has an ethylene content in the range of from 50 mole percent to 90 mole percent, a vinyl norbornene content in the range of from 0.2 to 5 mole percent, the balance of the ethylene, alpha olefin, vinyl norbornene elastomeric polymer will be made up of an alpha-olefin, based on the total moles of said elastomeric polymer; and
wherein said elastomeric polymer has a branching index in the range of from 0.1 to 0.6.

5. The vehicle hose of claim 4 wherein said elastomeric polymer includes:

i) an ethylene content in the range of from 50 to 70 mole percent preferably in the range of from 50 to 65 mole percent;
ii) a vinyl norbornene content in the range of from 0.3 to 3.0 mole percent, preferably in the range of from 0.4 to 2.5 mole percent;
iii) an alpha-olefin making up the balance of said elastomeric polymer, said mole percents based on the total moles of said elastomeric polymer;

wherein said elastomeric polymer has

a) a $ML(1+8)$ 125°C in the range of from 30 to 100, preferably in the range of from 50 to 100; and
b) a M_w/M_n above 10 preferably above 15.

6. A vehicle hose comprising:

an ethylene, alpha-olefin, vinyl norbornene elastomeric polymer, wherein said alpha-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1 and combinations thereof, wherein said elastomeric polymer includes ethylene in the range of from 50 to 65 mole percent, and said vinyl norbornene is present in the range of from 0.4 to 1.0 mole percent, said alpha-olefin making up the remainder of said elastomeric polymer, said mole percents based on the total moles of said elastomeric polymer;

wherein said elastomeric polymer has:

- i) a M_w/M_n above 15;
- ii) a ML (1+8) 125°C in the range of from 50 to 100; and
- iii) a branching index in the range of from 0.1 to 0.3;

wherein a vehicle hose compound including said elastomeric polymer has:

- 1) a ML (1+4) 100°C below 70;
- 2) a modulus (100 percent) above 4 MPa;
- 3) a VW compression set below 50 percent; and
- 4) a weight gain in oil below 65 percent.

Claims 2-4 were dependent claims directed to elaborations of the vehicle hose according to Claim 1.

II. Notices of opposition were filed by:

- DSM N.V., now Koninklijke DSM N.V. (opponent 01), on 16 February 2000,
- Bayer AG, now Lanxess Deutschland GmbH (opponent 02), on 14 March 2000, and
- Mitsui Chemicals Inc. (opponent 03) on 16 March 2000.

The opponents requested revocation of the patent in its entirety based on the grounds of Article 100(a) EPC, ie lack of novelty and lack of inventive step, and on the grounds of Article 100(b) and (c) EPC.

The oppositions were supported - *inter alia* - by the following document:

D14: EP-A-0 765 908.

III. By an interlocutory decision which was announced orally on 9 April 2003 and issued in writing on 2 June 2003, the opposition division decided to maintain the patent in amended form according to the proprietor's main request.

(a) The claims of the main request corresponded to the claims as granted except that

in Claim 1

- the term "an ethylene, alpha-olefin, vinyl norbornene elastomeric polymer" was amended to "an elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene", and
- the upper limit of the vinyl norbornene content was amended to 2.5 mole percent (formerly 5 mole percent);

in Claim 5

- the vinyl norbornene content was restricted to 0.4 to 2.5 mole percent;

in Claim 6

- the term "an ethylene, alpha-olefin, vinyl norbornene elastomeric polymer" was amended to "an elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene", and
 - the phrase "wherein a vehicle hose compound including said elastomeric polymer has ..." was amended to "wherein the vehicle hose compound including said elastomeric polymer has ...".
- (b) The opposition division rejected the objection raised under Article 100(c) EPC against the feature "the balance of the elastomeric polymer being the alpha-olefin" in granted Claims 1, 5 and 6 (see point I, above). The deletion of the numerical limits to the alpha-olefin content of the elastomeric polymer in Claims 1, 5 and 6 as originally filed and their replacement by the above mentioned feature did not result in added subject-matter because it was disclosed on page 9, lines 6-8 of the application as originally filed that the balance of ethylene, alpha-olefin and diene monomer would generally be made up of an alpha-olefin.
- (c) As regards the amendments made during the opposition procedure, these amendments did not give rise to objections under Article 123(2) and (3) or Article 84 EPC.
- (d) The patent was sufficient as regards the branching index since the measurement methods for the branching index and the Mooney viscosity were

disclosed on page 6, lines 28-52 and on page 4, line 38, respectively, of the patent in suit. Furthermore, opponent 03 was in a position to measure the branching index of ethylene-alpha-olefin-vinyl norbornene polymers.

- (e) The subject-matter of the main request was novel over the cited prior art, in particular D14, and involved an inventive step.

IV. Notices of appeal against the above decision were filed by appellant 01 (opponent 03) on 24 July 2003 and by appellant 02 (opponent 02) on 30 July 2003, the required fee being paid on the respective same day. The statements of grounds of appeal were filed on 10 October 2003 and 10 September 2003, respectively.

- (a) Appellant 01 was of the opinion that the objection under Article 100(c) EPC with respect to the feature "the balance of the elastomeric polymer being alpha-olefin" still applied to Claims 1, 5 and 6 of the main request as allowed by the opposition division.

Claim 6 was insufficient because a skilled person could not produce a vehicle hose compound which had all of properties 1) to 4) of Claim 6. There was some inclarity as to whether the words "vehicle hose compound" in Claim 6 referred to a vulcanised product or an unvulcanised. However, whichever was the correct interpretation, it must be acknowledged that the term referred either to a vulcanised product or to an unvulcanised product, and could not simultaneously denote both products.

Assuming, firstly, that a vehicle hose compound referred to a vulcanised product, a Mooney viscosity measurement, ie property 1) of Claim 6, could not be taken on a vulcanised product. Alternatively, if a vehicle hose compound related to an unvulcanised product, then products 2) to 4) set out in Claim 6 could not be measured.

Appellant 01 maintained its objection that the claimed subject-matter was not novel over D14.

Finally, the claims encompassed subject-matter which did not solve all the alleged problems, namely when sulphur was used as the curative, and as a result the claims lacked inventive step.

In support of its arguments, appellant 01 filed documents D30-D32 (together with the statement of grounds of appeal) and D33 (with letter dated 17 November 2003):

D30: Annex 1; Experimental Report by H. Murakami and T. Hakuta dated 19 September 2003;

D31: Annex 2; Experimental Report by T. Hakuta dated September 2003;

D32: Annex 3; Experimental Report by T. Hakuta dated 31 March 2003;

D33: Signed version of the Experimental Report by Hakuta referred to as Annex 2 dated 30 October 2003.

(b) Appellant 02 argued that the disclosure of the opposed patent would not enable the skilled person to repeat the invention, in particular, the measurement and calculation of the branching index would not be disclosed. In this context, the following further document was filed:

D34: J.V. Dawkins et al, "Gel Permeation Chromatography: Calibration Procedures for Linear Polyethylene", European Polymer Journal, 1971, vol. 7, pages 1537-1547.

Furthermore, the claimed subject-matter was not based on an inventive step.

V. Together with its reply to the appeals, the respondent (proprietor) filed on 1 July 2004 a new main request and further auxiliary claim sets, namely a first to ninth auxiliary request. The independent claims of all the requests referred to "a peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene".

VI. In a communication dated 21 April 2006, the board set out the points to be discussed at the oral proceedings scheduled for 27 June 2006.

VII. In its letter dated 26 May 2006, appellant 01 maintained its objections under Articles 54, 56, 100(b) and (c) EPC and filed the following further documents:

D35: EP-A-0 552 946;

D36: Concise Encyclopaedic Dictionary of Rubber Technology, by A.S. Craig, Elsevier Publishing Company, Amsterdam, 1969, pages 102-103; and

D37: ASTM D1646-81.

Furthermore, appellant 01 submitted that the insertion of the term "peroxide-cured" into the independent claims of all requests rendered those claims unclear. This was because the peroxide-cured elastomeric polymer also was defined as consisting of ethylene, alpha-olefin and vinyl norbornene. Taking into account that peroxide curing processes were complicated and involved side reactions between the peroxide and monomer leading to chemical modifications of some of the monomers, the elastomeric polymer referred to in the claims could not "consist of" ethylene, alpha-olefin and vinyl norbornene.

VIII. With letter dated 26 May 2006, the respondent filed amended sets of claims for a main request and a first to seventh auxiliary request which replaced the previously filed requests.

(a) The main request comprised six claims, whereby Claims 1 and 6 read as follows:

"1. A vehicle hose comprising:
a peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene;
wherein said elastomer has an Mw/Mn greater than 6;
wherein a compound made from said elastomeric polymer has a ML(1+4)@100°C of less than 90;
wherein said elastomeric polymer has an ethylene

content in the range of from 50 mole percent to 89.8 mole percent, an alpha-olefin content in the range of 10 to 49.8 mole percent, and a vinyl norbornene content in the range of from 0.2 to 2.5 mole percent, based on the total moles of said elastomeric polymer; and wherein said elastomeric polymer has a branching index in the range of from 0.1 to 0.6.

6. A vehicle hose comprising a peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene, wherein said alpha-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1 and combinations thereof, wherein said elastomeric polymer includes ethylene in the range of from 50 to 64.6 mole percent, said vinyl norbornene is present in the range of from 0.4 to 1.0 mole percent, and said alpha-olefin is present in the range of from 35 to 49.6 mole percent, said mole percents based on the total moles of said elastomeric polymer;

wherein said elastomeric polymer has:

- i) a M_w/M_n above 15;
- ii) a $ML(1+8)_{125^\circ C}$ in the range of from 50 to 100; and
- iii) a branching index in the range of from 0.1 to 0.3;

wherein the vehicle hose compound including said elastomeric polymer has:

- 1) a $ML(1+4)_{100^\circ C}$ below 70;
- 2) a modulus (100 percent) above 4 MPa;

- 3) a VW compression set below 50 percent; and
- 4) a weight gain in oil below 65 percent."

The remaining claims are not important for this decision and will not be discussed in further detail.

- (b) The first auxiliary request also comprised six claims whereby Claims 1 and 6 corresponded to Claims 1 and 6 of the main request, except that in Claim 1 the upper limit of the ethylene content was amended to 89.7 and the lower limit of the vinyl norbornene content was amended to 0.3.
- (c) The second auxiliary request comprised five claims whereby Claim 1 corresponded to Claim 1 of the main request, except that the peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene was further defined by "wherein said alpha-olefin is selected from the group consisting of propylene, butene-1, hexane-1 and octene-1". Claim 5 corresponded to Claim 6 of the main request.
- (d) The only claim of the third auxiliary request corresponded to Claim 6 of the main request.
- (e) The six claims of the fourth auxiliary request were based on the claims of the main request and drafted as use claims whereby Claims 1 and 6 read as follows:

"1. Use of a peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene;

wherein said elastomeric polymer has an Mw/Mn greater than 6;

wherein a compound made from said elastomer polymer has a ML(1+4)@100 C of less than 90;

wherein said elastomer polymer has an ethylene content in the range of from 50 mole percent to 89.8 mole percent, an alpha olefin content in the range of 10 to 49.8 mole percent, and a vinyl norbornene content in the range of from 0.2 to 2.5 mole percent, based on the total moles of said elastomeric polymer; and

wherein said elastomeric polymer has a branching index in the range of from 0.1 to 0.6, for vehicle hose applications.

6. Use of a peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene, wherein said alpha-olefin is selected from the group consisting of propylene, butene-1, hexene-1, octene-1 and combinations thereof, wherein said elastomeric polymer includes ethylene in the range of from 50 to 64.6 mole percent, said vinyl norbornene is present in the range of from 0.4 to 1.0 mole percent, and said alpha-olefin is present in the range of from 35 to 49.6 mole percent, said mole percents based on the total moles of said elastomeric polymer;

wherein said elastomeric polymer has:

- i) a M_w/M_n above 15;
- ii) a $ML(1+8)_{125^\circ C}$ in the range of from 50 to 100; and
- iii) a branching index in the range of from 0.1 to 0.3;

for vehicle hose applications

wherein the vehicle hose compound including said elastomeric polymer has:

- 1) a $ML(1+4)_{100^\circ C}$ below 70;
- 2) a modulus (100 percent) above 4 MPa;
- 3) a VW compression set below 50 percent; and
- 4) a weight gain in oil below 65 percent."

(f) The fifth auxiliary request comprised six claims whereby Claims 1 and 6 corresponded to Claims 1 and 6 of the fourth auxiliary request, except that in Claim 1 the upper limit of the ethylene content was amended to 89.7 and the lower limit of the vinyl norbornene content was amended to 0.3.

(g) The sixth auxiliary request comprised five claims whereby Claim 1 corresponded to Claim 1 of the fourth auxiliary request, except that the peroxide-cured elastomeric polymer consisting of ethylene, alpha-olefin and vinyl norbornene was further defined by "wherein said alpha-olefin is selected from the group consisting of propylene, butene-1, hexene-1 and octene-1". Claim 5 corresponded to Claim 6 of the fourth auxiliary request.

(h) The only claim of the seventh auxiliary request corresponded to Claim 6 of the fourth auxiliary request.

IX. On 27 June 2006, oral proceedings were held before the board at which the party as of right (opponent 01) was not represented. Since it had been duly summoned, however, the oral proceedings were continued in its absence in accordance with Rule 71(2) EPC.

The discussion at the oral proceedings focussed on the amendments made to Claims 1 and 6 of the main request, namely the introduction of new ranges for the alpha-olefin content, the amendment to a peroxide-cured elastomer consisting of ethylene, alpha-olefin and vinyl norbornene, and the amendment of the phrase "wherein a vehicle hose compound including said elastomeric polymer has ..." to "wherein the vehicle hose compound including said elastomeric polymer has ...".

Appellant 02 pointed out that the amendment to a peroxide-cured elastomeric polymer in Claim 1 rendered another requirement of Claim 1 unclear, namely "wherein a compound made from said elastomer has a ML(1+4)@100°C. It was not possible to measure the Mooney viscosity of a peroxide-cured elastomeric polymer.

The chairman pointed out that the amendments discussed with respect to the main request were also present in at least one claim of each auxiliary request. Thus, these objections against the main request equally applied to all auxiliary requests.

- X. Appellant 01 and appellant 02 requested that the decision under appeal be set aside and the patent be revoked in its entirety.
- XI. The respondent requested that the decision under appeal be set aside and that the patent be maintained:
- on the basis of the main request filed on 26 May 2006 and comprising 6 claims, or, in the alternative,
 - on the basis of one of the auxiliary claim sets all filed on 26 May 2006 with:
 - first auxiliary request (Claims 1-6),
 - second auxiliary request (Claims 1-5),
 - third auxiliary request (Claim 1),
 - fourth auxiliary request (Claims 1-6),
 - fifth auxiliary request (Claims 1-6),
 - sixth auxiliary request (Claims 1-5), and
 - seventh auxiliary request (Claim 1).
- XII. The party as of right did not file any request.

Reasons for the Decision

1. The appeals comply with Articles 106 and 108 EPC and Rule 64 EPC and are therefore admissible.
2. *Main request*
 - 2.1 Amendments
 - 2.1.1 Claims 1 and 6 of the main request (point VIII(a), above) refer to a **peroxide-cured** elastomeric polymer **consisting** of ethylene, alpha-olefin and vinyl norbornene (emphasis added). The words "peroxide-cured" and "consisting of" were introduced by way of amendment.
 - 2.1.2 The board agrees with appellant 01 that the insertion of the term "peroxide-cured" into Claims 1 and 6 of the main request renders those claims unclear. This is because the peroxide-cured elastomeric polymer is further defined as **consisting of** ethylene, alpha-olefin and vinyl norbornene. The phrase "consisting of" requires that the polymer contains nothing other than the ethylene, alpha-olefin and vinyl norbornene. However, given that the polymer is peroxide cured, the polymer would be expected to contain residual peroxide molecules, or other oxygen-containing species derived from peroxide, within or bound to its structure. In addition, the peroxide-cured copolymer would be expected to contain a small number of monomer units other than ethylene, alpha-olefin and vinyl norbornene, due to side reactions during the peroxide curing process resulting in chemical modification of the monomers. It is common general knowledge that peroxide curing processes are complicated, and that side

reactions between peroxide and monomers occur. Chemical modification of some of the monomers would therefore be expected.

The respondent's argument that the side products and remaining traces of peroxide are negligible is not convincing. In the present case, the uncured elastomeric polymer consists of ethylene, alpha-olefin and vinyl norbornene. The introduction of the further requirement that the elastomeric polymer is peroxide-cured ignores that the peroxide-cured product cannot be the same as it was before due the substantial changes occurring during the curing process. It is the character of these changes that create the unclarity as to what the actual product is. With this in mind it is clear that the **peroxide-cured** elastomeric polymer cannot **consist of** ethylene, alpha-olefin and vinyl norbornene. Accordingly, Claims 1 and 6 of the main request are inherently unclear, contrary to Article 84 EPC.

- 2.1.3 Claim 1 requires that "a compound made from said elastomeric polymer has a ML(1+4)@100 of less than 90". However, **said** elastomeric polymer is now peroxide-cured. As pointed out by appellant 02, it is not clear what has to be understood by a Mooney viscosity of a compound made from a peroxide-cured elastomeric polymer. Any person skilled in the art would be aware that a Mooney viscosity cannot be taken on a vulcanized elastomeric polymer (eg D36 and D37).

2.1.4 Independent Claim 6 of the main request has also been amended to refer to "a peroxide-cured elastomeric polymer consisting of ..." which introduces the same unclarity as in Claim 1.

Furthermore, the introduction of "peroxide-cured" into Claim 6 adds to an inconsistency in that claim which was already present in the corresponding granted Claim 6.

Claim 6 as granted requires the vehicle hose compound including the elastomeric polymer to have properties 1) to 4) as set out in that claim (point I, above). The unclarity arises because it is not clear whether the words "vehicle hose compound including said elastomer" refer to a vulcanised product or an unvulcanised product, and because the listed properties 1) to 4) include the Mooney viscosity, ie property 1), which cannot be measured on a vulcanized product, and the other properties 2) to 4), which are not relevant to uncured products. With the amendment to a peroxide-cured elastomeric polymer, Claim 6 of the main request now explicitly requires a vulcanised product to have a Mooney viscosity ML(1+4)100°C of below 70. This is inherently unclear, because, as pointed out in point 2.1.3, above, any person skilled in the art would be aware that a Mooney viscosity measurement cannot be taken on a vulcanized elastomeric polymer.

2.2 Hence, Claims 1 and 6 of the main request do not meet the requirements of Article 84 EPC.

2.3 Claims 1 and 6 of the main request being not allowable, the main request has to be refused.

2.4 As Claims 1 and 6 of the main request do not meet the requirements of Article 84 EPC, any further consideration concerning the requirements of for example, Articles 123 or 83 EPC, is superfluous.

3. *First to seventh auxiliary requests*

Each independent claim of each auxiliary request refers to "a peroxide-cured elastomeric polymer consisting of ...". In the present case, the combination of "peroxide-cured" and "consisting of" does not meet the requirements of Article 84 EPC, as pointed out in point 2.1.2, above. Thus, for this reason alone, the first to seventh auxiliary requests have to be refused.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

E. Görgmaier

R. Young