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Datasheet for the decision of 6 March 2007

Case Number: T 0563/04 - 3.3.03

Application Number: 96916901.0

Publication Number: 0850273

IPC: C08L 23/16

Language of the proceedings: EN

Title of invention:
Calendered elastomeric articles

Patentee:
ExxonMobil Chemical Patents, Inc.

Opponent:
Mitsui Chemicals, Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 123(2), 123(3)
EPC R. 57a, 88

Keyword:
"Main request, first and second auxiliary requests - amendments - added subject-matter - yes"
"Third, fourth and fifth auxiliary request - claims - clarity - no"
"Sixth auxiliary request - maintenance in amended form - yes"

Decisions cited:
T 0002/80, T 13/83, T 1002/92

Catchword:
-

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Case Number: T 0563/04 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 6 March 2007

Appellant: (Opponent)
Mitsui Chemicals, Inc.
2-5 Kasumigaseki 3-chome
Chiyoda-ku
Tokyo 100 (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:
Weber, Thomas
Patentanwälte
von Kreisler-Selting-Werner
Bahnhofsvorplatz 1 (Deichmannhaus)
D-50667 Köln (DE)

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office dated 2 February 2004 and posted 23 February 2004 concerning maintenance of European patent No. 0850273 in amended form.

Composition of the Board:

Chairman: R. Young
Members: M. Gordon
E. Dufrasne

Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 0 850 273 in the name of Exxon Chemical Patents Inc., later ExxonMobil Chemical Patents Inc. in respect of European patent application No. 96916901.0, filed on 31 May 1996 as international application No. PCT/US96/08246, published as WO 97/00287 on 3 January 1997, and claiming priority of US patent application no. 08/490 794 dated 15 June 1995, was announced on 5 January 2000 (Bulletin 2000/01) on the basis of 16 claims, claim 1 of which read as follows:

"1. A calendered article comprising an elastomeric polymer blend, said blend including:

a) a first ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, wherein in said first elastomeric polymer;

i) said ethylene is present in the range of at least 10 weight percent; said non-conjugated bicyclic diene is present in the range of from 0.1 to 10 weight percent, the balance being the said alpha-olefin, said weight percents based on the total weight percent of said first elastomeric polymer, wherein said first elastomeric polymer is present in said calendered article at a ratio of 1.5:1 to 9:1 with a second ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, said first elastomeric polymer has a crystallinity less than 2.5 percent; as measured by Differential Scanning Calorimetry (DSC), and

b) said second ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, includes;

i) said ethylene in the range of from 65 to 85 weight percent, said bicyclic nonconjugated [*sic*] diene in the range of from 0.1 to 10 weight percent, the balance being the said alpha-olefin, said weight percents based on the total weight of said second elastomeric polymer; and the said second elastomeric polymer has a crystallinity greater than 3 percent;

wherein said first elastomeric polymer has a ML (1+4) 125°C in the range of from 20 to 150; and wherein said second elastomeric polymer has a ML (1+4) 125°C in the range of from 100 to 1000, the ML value being determined according to ASTM D1646."

Claims 2-8 were dependent claims defining preferred embodiments of the calendered article of claim 1. Dependent claim 6 thereof read as follows:

"6. The calendered article of any of claims 1 to 5, wherein said alpha-olefin is selected from the group consisting of propylene, hexene-1, and octene-1, wherein said non-conjugated bicyclic diene is 5-ethylidene-2-norbornene; wherein said first elastomeric polymer has less than 1 percent crystallinity and said second elastomeric polymer has a crystallinity greater than 7 percent".

Dependent claim 9 read as follows:

"9. The calendered article of any preceding claim wherein said first and said second elastomeric polymers have 93 percent or greater of the molecules of a blend within 2 percent of the ethylene content of the respective elastomeric polymer, and 93 percent or greater of the molecules of said first and said second elastomeric polymer have a nonconjugated [*sic*] bicyclic diene content within 0.25 percent of the non-conjugated bicyclic diene content of the respective elastomeric polymer; and

wherein said blend has a M_w/M_n greater than 2.0 to less than 3.5, as measured by Gel Permeation Chromatography (GPC)".

Claims 10 and 11 which were dependent on any preceding claim defined calendered articles characterised *inter alia* by the distribution of monomer content analogously to claim 9.

Independent claim 12 related to a roofing article and read as follows:

"12. A roofing article, comprising a blend of a first elastomeric polymer and a second elastomeric polymer;

a) wherein said first elastomeric polymer is present in said blend in the range of from 70 to 80 weight percent, based on the total weight of the blend;

b) wherein said first elastomeric polymer is an ethylene, propylene, 5-ethylidene-2-norbornene elastomeric polymer, having:

i) ethylene present at less than 62 weight percent;

ii) 5-ethylidene-2-norbornene present in the range of from 2 to 4 weight percent; and

iii) the balance being propylene;

c) wherein said first elastomeric polymer has an ML (1+4) at 125°C in the range of from 25 to 70;

d) wherein said second elastomeric polymer is an ethylene, propylene, 5-ethylidene-2-norbornene elastomeric polymer having:

i) ethylene present in the range of from 73 to 77 weight percent;

ii) 5-ethylidene-2-norbornene present in the range of from 2 to 4 weight percent; and

iii) the balance being propylene;

wherein said second elastomeric polymer has an ML (1+4) at 125°C in the range of from 200 to 700; wherein 97 percent of molecules of said first and said second elastomeric polymers have a composition within 1 percent of the bulk ethylene content of the respective elastomeric polymers;

wherein 97 percent of molecules of said first and said second elastomeric polymers have a composition within 0.1 percent of the 5-ethylidene-2-norbornene content of the respective elastomeric polymers; and

wherein said first elastomeric polymer has crystallinity less than 1 percent, said second elastomeric polymer has a crystallinity greater than 7 percent;

wherein the ML units are determined according to ASTM D1646 and the crystallinity of the first elastomeric polymer is measured by Differential Scanning Calorimetry (DSC)."

Claim 13 specified a preferred embodiment of the roofing article of claim 12.

Independent claim 14 was a method claim and read as follows:

"14. A method of preparing an elastomeric polymer compound comprising:

a) blending a first ethylene, alpha-olefin, non-conjugated bicyclic diene elastomeric polymer with a second ethylene, alpha-olefin, non-conjugated bicyclic diene elastomeric polymer to form a blended elastomeric polymer product;

b) blending into the product of step a)

i) fillers;

ii) oils;

iii) curing agents;

iv) vulcanizing accelerators;

said blending of a) and b) carried out at temperatures in the range of from 93 to 178°C, characterized in that said first elastomeric polymer has a ML (1+4) 125°C in the range of from 20 to 150 and wherein said second elastomeric polymer has a ML (1+4) 125°C in the range of from 100 to 1000, as determined according to ASTM D1646".

Claims 15 and 16 were dependent claims directed to preferred embodiments of the method of claim 14.

II. A notice of opposition was filed on 5 October 2000 by Mitsui Chemicals Inc.

It was requested that the patent be revoked in its entirety on the grounds of lack of novelty and inventive step (Article 100(a) EPC), lack of sufficiency of disclosure (Article 100(b) EPC) and extension beyond the content of the application as filed (Article 100(c) EPC).

Inter alia the following documents were relied upon:
D1: EP-A-765 908
D4: EP-A-446 380
D6: EP-A-564 961
D7: JP-A-49-8541
D8: JP-A-55-36251
D7 and D8 were cited in the form of the original Japanese language documents and English language translations thereof.

III. With a letter dated 10 December 2003, following the issue of a communication and a summons to attend oral proceedings before the opposition division, the opponent cited three further documents, all in the form of (partial) English language translations:
D11: "Raw Rubber Strength, Elongation and Molecular Structure of EPDM", Matsuda *et al.*, Nippon Gomu Kyokaishi 60(4) (1987), pp. 203-205;
D12: "Structure and Property of Ethylene/Propylene Rubber", Nagasawa *et al.*, Nippon Gomu Kyokaishi 51(9) (1978), pp. 677-684 section 3.1 and
D13: "Ethylene/Propylene Rubber", Okita (1972), section 4.5.1.

IV. By a decision announced orally on 11 February 2004 and issued in writing on 23 February 2004 the opposition division found that the patent could be maintained in amended form on the basis of the third auxiliary request, consisting of 14 claims, submitted during the oral proceedings before the opposition division.
Claim 1 of this request differed from claim 1 as granted in that:

- the content of ethylene in the first elastomeric polymer was specified to be in the range of from 10 to 63 wt%;
- the α-olefin in the first elastomeric polymer was restricted to propylene;
- the ratio of the first and second polymers was 1.5:1 to 6:1.

Consequential amendments had been made to the granted product claims 5, 6, 9, 10 and 11.
Granted claims 12 and 13 had been deleted.
Granted method claim 14 - now renumbered as claim 12 - had been amended to read as follows, the additions and deletions compared to granted claim 14 being indicated as follows:
additions in **bold**;
deletions in [square brackets]:

"12. A method of preparing an elastomeric polymer compound comprising:
A) blending
a) [blending] a first ethylene, alpha-olefin, non-conjugated bicyclic diene elastomeric polymer **wherein in said first elastomeric polymer:**
i) said ethylene is present in the range of from 10 to 63 weight percent; said non-conjugated bicyclic diene is present in the range of

from 0.1 to 10 weight percent, the balance being propylene as the said alpha-olefin, said weight percents based on the total weight percent of said first elastomeric polymer, wherein said first elastomeric polymer has a crystallinity less than 2.5 percent; as measured by Differential Scanning Calorimetry (DSC), with a second ethylene, alpha-olefin non-conjugated bicyclic diene elastomeric polymer **at a ratio of 1.5:1 to 6:1 wherein**

b) said second ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, includes;

i) said ethylene in the range of from 65 to 85 weight percent, said bicyclic nonconjugated diene in the range of from 0.1 to 10 weight percent, the balance being the said alpha-olefin, said weight percents based on the total weight of said second elastomeric polymer; and the said second elastomeric polymer has a crystallinity greater than 3 percent;

wherein said first elastomeric polymer has a ML (1+4) 125°C in the range of from 20 to 150; and wherein said second elastomeric polymer has a ML (1+4) 125°C in the range of from 100 to 1000, the ML value being determined according to ASTM D1646,

to form a blended elastomeric polymer product;

[b] **B**) blending into the product of step [a] **A**)

i) fillers;

ii) oils;

iii) curing agents;

iv) vulcanizing accelerators;

said blending of [a] **A**) and [b] **B**) carried out at temperatures in the range of from 93 to 178°C" [characterized in that said first elastomeric polymer has a ML (1+4) 125 °C in the range of from 20 to 150 and wherein said second elastomeric polymer has a ML (1+4) 125°C in the range of from 100 to 1000, as determined according to ASTM D 1646]."

According to the decision,

(a) D12 and D13 were not admitted to the procedure. According to the minutes (page 3 first paragraph) D11 was considered to be relevant and "this document was allowed to be introduced into the proceedings". D11 was considered in the decision.

(b) It was held that the claims according to the third auxiliary request met the requirements of Articles 83 and 84, and 123(2) and (3) EPC.

(c) Novelty of the subject matter of the claims of the third auxiliary request was acknowledged. The decision held, *inter alia* with respect to the cited documents that:

- D1 related in one embodiment to a blend of two ethylene/α-olefin/non-conjugated diene copolymer rubbers of different intrinsic viscosities. The Mooney viscosities ML_{1+4} (100°C) of the polymers were from 5-180. D1 did not disclose the Mooney viscosities of the individual rubbers in the blend and provided no worked example of a calendered article. The crystallinity of the rubbers was not disclosed;

- D4 disclosed a blend of a high molecular weight EPDM copolymer rubber and a low molecular weight ethylene/α-olefin/non-conjugated diene copolymer rubber. Nothing was said in D4 about the crystallinity, or the Mooney viscosities of the rubbers in the blend. There was no disclosure that the ethylene content of the individual copolymer rubbers should be different. Green strength or a calendered article were not mentioned;
- D7 disclosed blends of ethylene/alpha-olefin/non-conjugated diene copolymers with low molecular weight ethylene/alpha-olefin copolymers. Nothing was said about a blend of two ethylene/alpha-olefin/non-conjugated diene copolymer rubbers;
- D8 disclosed the preparation of ethylene/alpha-olefin/non-conjugated diene copolymer rubbers in the presence of vanadium compounds and aluminium compounds. The ethylene/alpha-olefin/non-conjugated diene copolymer rubbers were not characterised with regard to their crystallinity and Mooney viscosity.

(d) With regard to inventive step, the technical problem underlying the patent in suit was to provide calendered articles of ethylene/propylene/non-conjugated diene ("EPDM") rubbers which had simultaneously improved peel adhesion and green strength in the unvulcanized state and which could be used for roof sheeting materials.

The solution was provided in that calendered articles were made from blends of EPDM rubbers

having a specific ethylene content, Mooney viscosity and crystallinity.

D6 represented the closest prior art as it dealt with the problem of providing polymer blends for heat seamable roof sheeting materials having improved green strength and splice adhesion. The problem was solved according to D6 by blends of ethylene/propylene or ethylene/propylene/non-conjugated diene (EPDM) rubbers with polyolefin homopolymers, random copolymers and block copolymers as crystallinity enhancing polymers. There was no example or suggestion in D6 to employ an EPDM rubber having a crystallinity greater than 3% as a crystallinity enhancing polymer.

There was also, with reference to Table II of D6, no clear teaching in D6 which of the three EPDM rubbers used in the worked examples should be selected for the invention of the patent in suit. Two of these had crystallinities far above 3%, one ("Vistalon® MD-744") had crystallinity less than 2.5% which according to page 4, lines 38 to 46 of D6 was not preferred for roofing materials.

Regarding the combination of D6 with D11, it was held that D11 was an article about the relationship of the tensile strength of raw rubber (green strength), degree of crystallinity and the ethylene content of EPDM rubbers. Of the twelve EPDM rubbers disclosed in D11 one had a Mooney viscosity ML (1+4) 100°C of greater than 100 and an (estimated) crystallinity greater than 3. An incentive to combine this EPDM with Vistalon® MD-744 to solve the problem underlying the patent in suit could not be seen. Rather this combination would have been possible only with hindsight.

(e) Accordingly it was held that the patent could be maintained in amended form on the basis of the third auxiliary request.

V. An appeal was filed in the name of the opponent, Mitsui Chemicals Inc. on 30 April 2004, the prescribed fee being paid on the same day.

VI. The statement of grounds of appeal was filed on 22 June 2004.

(a) Together with the statement of grounds of appeal the appellant filed for the first time the following documents:
D14: US-A-4 722 971
D15: "Compendium of Synthetic Rubber Processing Technology", Vol. 7; "Ethylene/Propylene Rubbers", 10 July 1972, pp 9, 92, 93, 96-97 (Japanese language document, English language translation of indicated passages was submitted).

(b) With regard to Article 123(2) EPC the replacement of the numerical limits for the content of the α-olefin in the first (80 to 27 weight%) and second (27 to 37 weight%) elastomeric polymers of claim 1 of the application as filed by the term "the balance" was objected to. While there was clearly an error in the ranges specified in claim 1 as filed, in particular with regard to the second polymer, it was not clear, and not derivable from the application as filed how this should be corrected. There was no basis for the new

(calculable) limits of from 27 to 89.9 wt% (first elastomeric polymer) and from 5 to 34.9 wt% (second elastomeric polymer).

(c) With regard to Article 83 EPC it was argued that the compositional distributions defined in claims 9, 10 and 11 were not exemplified in the patent. The only method mentioned in the patent for measuring the compositional distribution did not make it possible to determine which percentage of the molecules in the bulk sample had ethylene and diene contents within specified margins of the required ranges.

(d) An objection pursuant to Article 84 EPC was raised against claim 6.

(e) Objections of lack of novelty were maintained with respect to the disclosures of D1, D4, D7, and D8, reference being made to the notice of opposition for the reasoning.

(f) With regard to inventive step, both D6, and the newly cited D14 were proposed as candidates for the closest prior art.

(i) D14 disclosed blends of a high molecular weight EPDM and a low molecular weight EPDM, which had faster extrusion rates, which according to D14 was "believed to be due to the higher unvulcanised strength of the improved copolymers". Thus D14 was directed to blends of two

EPDMs with the aim of improving the green strength.

With regard to "Sample D" of D14 it was submitted that both the EPDMs had Mooney viscosities within the broad ranges specified in the operative claim of the patent in suit.

D14 did not explicitly indicate the crystallinity. This could however be estimated from D15 which set out the relationship between the propylene content and the crystallinity of an EPDM. Thus it could be estimated that the polymers forming "Sample D" of D14 had the required crystallinities. Thus sample D of D14 fell within the definition of the copolymer blend of the operative claim 1.

D14 did not disclose a calendered article. Thus the technical problem with respect to D14 was the provision of an alternative moulding technique for the blend.

It was common knowledge, as evidenced by D15 that calendering and extrusion were dominated by the same factors. Thus a resin which was suitable for extrusion moulding was also suitable for calendering.

Other cited documents disclosed calendered articles produced from blends similar to those of D14, reference being made *inter alia* to D6.

(ii) With regard to the combination of D6 and D11 it was submitted that D6 related to the provision of roof sheeting materials and taught to use a blend of a high crystallinity polymer and a low crystallinity polymer in the ratios as required by the patent in suit. This blend was mixed with various additives and sheeted e.g. by calendering, yielding a product with high green strength and splice adhesion in the uncured state. A polymer emphasised in D6 and favoured for use in roof sheeting, Vistalon® MD-744, had an ethylene content of 60 weight%, a percentage unsaturation of 2.7%, which was submitted to correspond to a diene content in the range of from 0.1 to 10 weight%, a crystallinity of less than 1%, and a Mooney viscosity ML (1+4) at 125°C of 53. Thus Vistalon® MD-744 corresponded to the polymer (a) as defined in claim 1.

Example 16 of D6 showed Vistalon® MD-744 had particularly advantageous physical properties including seam peel adhesion at elevated temperatures.

The second, high crystallinity polymer of D6 could be any crystallinity enhancing polymer. Thus the problem with respect to D6 was to provide an alternative calendered article wherein the high crystallinity component (b) was made of EPDM. As there was no evidence that the articles of the patent had improved green

strength and splice adhesion compared with the polymers of D6, the problem to be solved was no more than the provision of alternatives.

D6 mentioned a wide variety of polymers for use as the crystallinity enhancing material and it was made quite clear that any polymer which enhanced the crystallinity would provide increased adhesion as shown by high peel and shear adhesion values. The crystallinity enhancing polymer used according to D6 should not be limited to those used in the examples or to those commercially available polymers listed on pages 6 and 7 of D6. D6 therefore invited the skilled person to employ alternative crystallinity enhancing polymers instead of those specific compounds taught in the examples.

In seeking such alternatives, documents which taught high crystallinity elastomeric polymers having good green strength and peel adhesion properties, such as D11 and D14 would be considered. D11 disclosed polymers having high green strength and elongation. Since, as taught in D11, elongation was connected to adhesion, D11 related to polymers having high green strength and adhesion properties.

(iii) With regard to the combination of D6 with D14 it was submitted D14 taught that high

molecular weight EPDMs could advantageously be combined with low molecular weight EPDMs, for example Vistalon® MD-744 of D6 to improve green strength. Thus starting from D6, example 16 and incorporating the teaching of D14 the skilled person would be motivated to produce a blend of Vistalon® MD-744 with the high molecular weight EPDMs of D14 in expectation of achieving a high green strength.

VII. In its response, dated 18 March 2005 the patentee - now the respondent - maintained as the main request the set of claims according to the former third auxiliary request. Two further sets of claims, as a first and second auxiliary request, stated to correspond to the 4th and 5th auxiliary request as presented to the opposition division were submitted.

(g) With regard to the newly filed documents it was submitted that D14 was not more relevant than originally submitted references D1 to D10. D15 related to an ethylene/propylene copolymer (EPM rubber) and thus was not concerned with blends of EPDM rubbers. Hence D15 had no relationship to the subject matter of the patent in suit.
It was consequently requested not to admit D11, D12, D14 and D15 to the proceedings.

Remittal was requested in the case that the board would admit the arguments based on D14 (see section VI.(f).(i) and (iii) above).

(h) With regard to Article 123(2) EPC it was argued that the basis for the amendment in respect of the first elastomeric polymer was in the patent as granted page 6, lines 38, 39 and the corresponding part of the application as originally filed. The further amendments were also submitted to be based on - identified - parts of the patent as granted.

(i) It was submitted that claim 6 met the requirements of Article 84 EPC.

(j) Concerning novelty it was argued *inter alia* that D1 did not contain any direct and unambiguous disclosure concerning the crystallinity of the individual EPDMs, the Mooney viscosity and the different amounts of ethylene of the individual polymers.

D4 neither disclosed blends comprising elastomeric polymers that were distinct in crystallinity nor did it disclose that the ethylene content of the individual elastomeric polymers was distinct. Further D4 did not disclose individual elastomeric polymers that were defined by their respective Mooney viscosity.

D6 disclosed blends of an EPDM and "EPR" (defined in D6 as an ethylene-propylene copolymer) both having crystallinity of at least 2 wt%. D6 taught to add a crystallinity enhancing polymer if the blend had a crystallinity of less than 2 wt%. D6 did not contain any direct and unambiguous disclosure of a blend of elastomeric polymers wherein the first polymer had a crystallinity of

less than 2.5 percent and the second had a crystallinity of greater than 3%.

(k) With regard to inventive step it was submitted:

(i) D14, although this disclosed blends of two EPDMs distinct in their molecular weight had neither any relationship to calendered articles nor to the technical problem underlying the patent in suit.

(ii) With respect to the combination of D6 and D11 it was submitted that D6 did not contemplate blends of two EPDM polymers. The crystallinity enhancing polymers were specifically defined in D6 to be selected from defined classes. Terpolymers of ethylene, propylene and non-conjugated dienes were neither disclosed nor suggested to be blended with EPDM or EPR. The argument that D6 taught that **any** (emphasis of the respondent) crystallinity enhancing polymer could be employed was disputed - on the contrary these were limited to those specified in general in D6.
It was disputed that Vistalon® MD 744 corresponded to the first polymer specified in the claims.
The argument based on the choice of Vistalon® MD-744, emphasised by the appellant relied on an *ex post facto* approach. Vistalon® MD-744 was not preferred according to D6, which required

the EPDM to have a crystallinity of at least 2 wt%. Vistalon® MD-744 however had a crystallinity of less than 1 wt%.

(iii) D11 related to a research program relating to raw rubber strength, elongation and molecular structure of EPDM and contained no teaching relating to achieving a superior balance of peel adhesion and green strength.

(iv) Regarding the combination of D6 and D14 it was submitted that D14 contained no reference to peel adhesion and green strength.
In any case the focus of the appellant on Vistalon® MD-744 in D6 was based on a hind-sight approach.

VIII. On 14 December 2006 the board issued a communication together with a summons to attend oral proceedings.

(l) With regard to Article 123(2) EPC the board noted that according to page 6, lines 17-19 (application as filed) the amount of the bicyclic diene was not fixed *a priori* but varied as a function of the α-olefin employed. This appeared to be incompatible with the feature in the then pending claim 1 of all requests that it was the α-olefin which made up the "balance" of the monomers in the two polymers.

(m) With regard to Article 84 EPC an objection against claim 6 of all three requests was raised.

IX. In a letter dated 5 February 2007, received on equal date the appellant maintained the objections in respect of Article 123(2) EPC concerning the feature "the balance" in claims 1 and 12 of all three requests. An objection was also raised - for the first time in the appeal proceedings - with respect to claim 5 of all three requests regarding the specification of the α-olefin in the two copolymers.

Objections were also raised pursuant to Rule 57a EPC in respect of amendments made during the opposition proceedings to claim 12, derived from granted claim 14 (see section IV above in which the differences between amended claim 12 and granted claim 14 are indicated).

It was objected that:

- moving the final phrase which had begun with "characterised in that" from after step B) to before step B);
- replacement in said final phrase of the words "characterised in that" with "wherein";
- replacing "as determined according to ASTM D1646" with "the ML value being determined according to ASTM D1646"

merely served to "tidy up" granted claim 14 (operative claim 12) but did not address any of the grounds of opposition pursuant to Article 100 EPC.

It was requested that if D14 and D15 were to be admitted that the case be remitted to the opposition division. However all other issues in respect of documents other than D14 should be resolved at the oral proceedings before the board.

X. Together with a letter dated 2 February 2007 and received by the EPO on 6 February 2007 the respondent submitted an amended main request and 1st-8th auxiliary requests.

(n) *Main request, first and second auxiliary requests (each comprising 13 claims).*

(i) Compared with the previous main request (corresponding to the third auxiliary request found able to be maintained according to the decision under appeal (see section IV above)), in the main, first and second auxiliary requests former claim 6 had been deleted and the subsequent claims renumbered such that *inter alia* the method claim 12 (cited above) became claim 11.
The first auxiliary request contained the further amendment, compared to the main request, that claims 1 and 11 specified that the amount of ethylene in the second elastomeric polymer was in the range of from 70 to 80 weight%.
Claims 1 and 11 of the second auxiliary request contained the still further amendment, compared to the first auxiliary request, that the ratio of the two polymers of 1.5 to 6:1 had been replaced by the feature that the first elastomeric polymer was present in the blend in the range of from 60 to 80 percent by weight based on the weights of the first and second elastomeric polymer.

(ii) The respondent submitted with respect to the feature "the balance" in the second polymer (main, first and second auxiliary requests) that in the description as filed it was disclosed that both the first and second elastomeric polymers were "ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymers" and that - independently from the wording of the claims - both the elastomeric polymers had been disclosed only by reference to the content of ethylene and "non-conjugated bicyclic diene elastomeric copolymer" [*sic*].

It was thus evident that the balance to 100 weight percent was constituted by the α-olefin.

It was further submitted that one reason for the introduction of the definition of the content of α-olefin as "the balance" could have been the finding, during the examination procedure, that the ranges specified in the claims as originally filed did not add up to 100 weight percent. The wording "the balance" could be seen as a correction of this error, which correction would have been immediately apparent to the skilled person and was independently disclosed in the description in the form of definitions of the elastomeric polymers in which only the content of

the ethylene and the diene had been specified.
It was further submitted that this amendment did not extend the scope of protection.

(o) *Third, fourth and fifth auxiliary requests (each comprising 13 claims)*

(i) Compared with the previous main request (corresponding to the third auxiliary request found able to be maintained according to the decision under appeal (see section IV above)), in the third, fourth and fifth auxiliary requests former claim 6 had been deleted and the subsequent claims renumbered such that *inter alia* the process claim 12 became claim 11.
Claim 1 of the third, fourth and fifth auxiliary requests contained the further amendments, compared with the previous main request, that the amounts of α-olefin (restricted to propylene in the case of the first elastomeric polymer) in the first and second elastomeric polymers were specified as being in a range from 27 to 80 percent by weight and 27 to 37 weight percent respectively.
The fourth and fifth auxiliary requests further contained the amendments noted for the first and second auxiliary requests respectively (see section X.(a).(i) above).

(ii) The respondent submitted that the contents of monomers were as in claim 1 as originally filed. The phrase "the balance" had thus been deleted. The α-olefin in the first polymer had been restricted to propylene.
It was submitted that since the ranges had been disclosed in the application as filed no new subject matter had been introduced.
With regard to Article 84 EPC it was submitted that this claim was clear. The skilled reader would not disregard the 100 weight percent constraint and combine the maximum of any two of the components with the minimum of the remaining component. If one component were present at the maximum amount allowed, the other two components would be present at or between their stated maxima and minima. The whole amount added up to 100 weight percent.

(p) *Sixth auxiliary request (comprising 12 claims)*

(i) Compared with the previous main request, corresponding to the third auxiliary request found able to be maintained according to the decision under appeal, former claims 6 and 11 had been deleted and the subsequent claims renumbered such that, *inter alia* independent method claim 12 became claim 10. The ranges of

monomers for the first elastomeric copolymer were identical to those of that third auxiliary request. In the definition of the second elastomeric copolymer only the lower limits of the monomer content were specified. Accordingly claim 1 of the sixth auxiliary request read as follows:

"1. A calendered article comprising an elastomeric polymer blend, said blend including:

a) a first ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, wherein in said first elastomeric polymer;

i) said ethylene is present in the range of from 10 to 63 weight percent; said non-conjugated bicyclic diene is present in the range of from 0.1 to 10 weight percent, propylene as the said alpha-olefin being present in the range of from 27 to 80 weight percent, said weight percents based on the total weight percent of said first elastomeric polymer, wherein said first elastomeric polymer is present in said calendered article at a ratio of 1.5:1 to 6:1 with a second ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, said first elastomeric polymer has a crystallinity less than 2.5 percent; as measured by Differential Scanning Calorimetry (DSC), and

b) said second ethylene, α-olefin, non-conjugated bicyclic diene elastomeric polymer, includes;
i) said ethylene in the range of at least 65 weight percent, said bicyclic nonconjugated [*sic*] diene in the range of at least 0.1 weight percent, the said alpha-olefin being present in at least 27 weight percent, said weight percents based on the total weight of said second elastomeric polymer; and the said second elastomeric polymer has a crystallinity greater than 3 percent;
wherein said first elastomeric polymer has a ML (1+4) 125°C in the range of from 20 to 150; and wherein said second elastomeric polymer has a ML (1+4) 125°C in the range of from 100 to 1000, the ML value being determined according to ASTM D1646."

(ii) The respondent submitted that the ranges of the first elastomeric polymer were based on claim 1 as originally filed; the scope of this feature did not extend beyond that of the patent as granted. The amended definition of the second elastomeric polymer was submitted to be based on the disclosure of claim 1 as originally filed and at the same time addressed the problem of the ranges adding up to more than 100 weight percent.

(q) *Seventh and eighth auxiliary requests*

The seventh and eighth auxiliary requests are not of importance for the present decision and will not be considered further.

XI. Oral proceedings were held on 6 March 2007

(r) The appellant raised no objections to the submission of new requests one month prior to the oral proceedings.

(s) Following an observation of the board relating to the admissibility of claims 9 and 10 of the main request pursuant to Article 123(2) EPC the respondent submitted revised main and 1st-6th auxiliary requests which were identical with the respective previous corresponding requests **except that** claims 9 and 10 of the main request and the corresponding claims of the 1st-5th auxiliary requests had been deleted and the subsequent claims renumbered and the dependencies adapted. Thus method claim 11 of the previous main request became claim 9 of the same request as filed at the oral proceedings, the 1st-5th auxiliary requests being amended in the same manner.
With regard to the sixth auxiliary request, due to the previous deletion of former claim 11 (see section X.(c).(i) above), only claim 9 was deleted. The subsequent claims were renumbered and the dependencies adapted. Thus method claim 10 of the former sixth auxiliary request became claim 9 of the same request as filed at the oral proceedings.

(t) *Admissibility of the amendments*

(i) *Main request*

With respect to Article 123(2) EPC the appellant objected that there was neither an explicit nor an implicit basis for the feature "the balance" in claims 1 and 9 (formerly claim 11).

The calculated range of "the balance" (27 to 89.9 weight%) was broader than the range defined in originally filed claim 1 for the α-olefin content (27-80 weight%) of the first polymer.

According to page 6 lines 17-19 of the application the limitations on the amount of crystallinity and content of the non-conjugated bicyclic diene differed when the α-olefin was not propylene. Page 6 lines 7-10 disclosed that different amounts of ethylene were required with different α-olefins. This implied that the content of ethylene and diene depended on the α-olefin employed. The feature that the α-olefin made up the balance resulted from an arbitrary interpretation of the disclosure of the original application, which had no implicit basis. Reference was made to T 13/83 (OJ EPO 1984, 428) in which, according the appellant, it was stated that an amendment extending a range had no basis in the application as filed.

An objection was also raised with respect to claim 5 according to which the α-

olefin in the first polymer was propylene whereas in the second polymer the α-olefin was selected from a defined group. Claim 5 thus represented a new combination of features for which there was no basis in the application as originally filed.

The respondent emphasised that from the amounts of diene and ethylene disclosed at pages 5 and 6 of the original specification it was implicit that the amount of α-olefin could reach 89.9 weight%. Thus there was no extension. A correction of claim 1 was required in respect of both polymers. According to page 6 of the application if the α-olefin was propylene the crystallinity requirement was satisfied when ethylene was present in the range of from 10 to 63 weight%. Thus the problem that had existed had been overcome by restriction of the α-olefin to propylene. There was a similar statement at page 6 of the application with regard to the second polymer.

There was possibly an inconsistency between the description and this claim. This was however not an issue of Article 123(2) EPC but possibly of Article 84 EPC.

Following deliberation, the board announced that the **main request** was **refused.**

(ii) *First and second auxiliary requests*
The appellant indicated that the same objections were raised as in the case of the main request.
The respondent offered no comments on these requests.

(iii) *Third to fifth auxiliary requests*
With respect to the third, fourth and fifth auxiliary request the appellant submitted that the respective claims 1 lacked clarity since the specified amounts of monomers in the second elastomeric polymer added up to more than 100%.

The respondent argued that the skilled person would understand that combinations of amounts of monomer which resulted in a total above 100 wt% were excluded, and that said amounts were in effect disclaimed.

(iv) *Sixth auxiliary request*
With regard to the sixth auxiliary request the appellant objected that there was no basis in the application as originally filed for the - implicit - upper limits. This "correction" was not "immediately evident" as demonstrated by the fact that this was the third "correction" (i.e. attempt to "correct" for the term "balance") proposed by the

respondent, reference being made to Rule 88 EPC.

An objection pursuant to Rule 57a EPC was raised in respect of the deletion of claim 6. An objection pursuant to Rule 57a was also raised against the replacement in the method claim 9 (corresponding to claim 12 of the former main request- cf. section IV above) of the wording "characterised in that" with "wherein" as compared to claim 14 as granted.

The respondent submitted that the - implicit - upper limits of the three monomers were directly derivable from the application as filed; the originally disclosed upper limits could not be exceeded by the new claim. The scope of protection was also reduced compared to the granted patent.

With regard to Rule 88 EPC it was submitted that the number of auxiliary requests was not indicative that the amendment was not "immediately evident".

With regard to the objections pursuant to Rule 57a EPC it was submitted that claim 9 had been brought into line with claim 1.

(v) *Conclusions of the board as to the admissibility of the first to sixth auxiliary requests:*

Following deliberation the board announced that:

- the first to fifth auxiliary requests were refused;
- the sixth auxiliary request met the requirements of Articles 84, 123(2) and (3) and Rule 57a EPC.

(u) *Sixth auxiliary request - Article 83 EPC*

With respect to the compliance of claim 8 of the sixth auxiliary request (corresponding to granted claim 9) with Article 83 EPC, the appellant submitted that there was insufficient information relating to the determination of the parameters specified or how to determine on the final blend whether the parameters were complied with. There was no information in the patent which would enable the skilled person reliably to arrive at the required product. Only example 8 was within the scope of the claims of the sixth auxiliary request, and it was not disclosed how this product was obtained. There were no data to show that the polymer of this example met the requirements of claim 8.

The respondent submitted that it was common knowledge how to prepare the polymers and determine the monomer content thereof.

(v) *Sixth auxiliary request - Article 54 EPC*

With regard to Article 54 EPC, the appellant maintained the objections of lack of novelty of the subject matter of the claims of the sixth auxiliary request in respect of the disclosures of

D1 and D4, reference being made to the written submissions.

With respect to D1 it was further submitted that page 11, lines 28 and 59 disclosed calendered products and building materials respectively. The proportion of ethylene and diene disclosed in D1 overlapped with the claimed ranges. The polymers of D1 would have Mooney viscosity and crystallinity values within the claimed ranges. It was conceded that no single part of D1 provided the entire disclosure and that it was necessary to combine various parts of D1.

With respect to D4 it was submitted that this disclosed calendered blends of two rubbers. Since the composition of the blends was known at least some of those would have the required properties. D4 allowed the two polymers to have different contents of ethylene even if no examples showed this.

The respondent submitted that neither D1 nor D4 provided a direct, unambiguous disclosure of the subject matter claimed.

(w) *Admissibility of D14 and D15*

Preliminary to addressing the issue of inventive step (Article 56 EPC), the admissibility of D14 and D15 was discussed.

The appellant submitted that D14 disclosed all features of the claims including the physical properties such as green strength, but did not disclose "calendered articles".

D15 provided evidence that the blends of D14 had the crystallinity required by the operative claims.

From D15 and common general knowledge it was known that the same factors affected extrusion processability as affect calendaring processability. Thus D14 was relevant for calendered articles with good peel adhesion and green strength, and so represented the closest prior art.

D14 disclosed that addition of the second component led to better processability and green strength in extrusion.

The respondent submitted that D14 addressed a technical problem unrelated to that of the patent or of D6. The relationship indicated by the appellant between extrusion processing and calendering was disputed.

Concerning the relationship between D14 and D15 it was submitted that D14 contained no link or pointer to D15.

Following deliberation the board announced that D14 and D15 were not admitted to the procedure.

(x) *Sixth auxiliary request - inventive step*

The appellant submitted that the closest prior art was represented by D6 which disclosed blends of a high crystallinity polymer and a low crystallinity polymer. The blends were calendered and exhibited good green strength and splice adhesion. The polymer "Vistalon® MD-744" corresponded to the first polymer specified according to the claims of the sixth auxiliary request. Example 4 of Table IIIA of D6 disclosed a blend of this polymer with LDPE (crystallinity >3 weight%) in the proportions of 65:35. The subject matter claimed

according to the sixth auxiliary request was distinguished from the disclosure of D6 by the crystallinity enhancing polymer. The examples of the patent showed no improvement compared to D6.
D11 disclosed EPDM having high green strength, elongation and crystallinity with the required ratio of ethylene. Thus it would be obvious to use the polymers of D11 as crystallinity enhancing polymers in the compositions of D6.
The respondent submitted that the technical problem was to provide calendered articles with an improved balance of green strength and peel adhesion. According to D6 (page 4 line 38) it was preferred that the EPDM had at least 2 weight% crystallinity. "Vistalon® MD-744" however had less than 1%. D6 taught that the crystallinity enhancing polymers were to be selected from a restricted group which did not include EPDM. The peel adhesion results in D6 were measured after heat setting, i.e. on cured polymers whereas the patent in suit was concerned with peel adhesion of uncured polymers. Thus the results could not be compared.
The problem of providing better peel adhesion properties in the uncured state was not discussed in D6.
D11 related only to EPDM and was not relevant to the problem of the invention.

XII. The appellant (opponent) requested that the decision under appeal be set aside and that the European Patent No. 850 273 be revoked.

The respondent (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request, filed at the oral proceedings or, in the alternative of one of the first to sixth auxiliary requests, filed at the oral proceedings, or the seventh or eighth auxiliary request, both filed on 6 February 2007.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request- Article 123(2) EPC.*

According to claim 1 of the main request the content of α-olefin in the two elastomeric polymers is defined as being "the balance" (to 100 weight percent).

2.1 There is no explicit basis for the feature "the balance" - this is not disputed.

2.2 Claim 1 as originally filed specified the first and second polymers as being polymers of ethylene, α-olefin and non-conjugated diene. The same terminology is employed in the description. Accordingly, the board is satisfied that this terminology refers to polymers having only the three components named, i.e. terpolymers.
In the light of this finding, the existence of an implicit basis for the amendment of claim 1 according to which the content of α-olefin in the first and second elastomeric polymers is defined as being "the balance" will be examined.

2.2.1 With regard to the first polymer, claim 1 of the application as originally filed specified:
10 to 63 weight% ethylene;
0.1 to 10 weight% non-conjugated bicyclic diene;
80 to 27 weight% α-olefin.
In the discussion of this polymer starting at page 5 line 30 of the application as filed it is taught that typically the crystallinity of this component is less than 2.5 percent. It is disclosed that when the α-olefin is propylene this condition is fulfilled when the ethylene content is in the range of from 10 to 63 weight%. It is further disclosed that when other α-olefins are employed "slightly different amounts of ethylene can be introduced without violating the above limitation of crystallinity" (page 6 lines 7-8 of the application as filed). As an example it is stated that in the case of octene-1 as the α-olefin the ethylene content could be as high as 65 weight%.
Therefore according to the description the precise limits of the amount of ethylene depend upon the choice of the α-olefin comonomer(s) employed.
Since the α-olefin in the first polymer is restricted to propylene, the permissible content of ethylene will - according to the disclosure of above cited passage of the description - be in the range of 10-63 wt%. This is the range specified in claim 1 of the main request.
Accordingly the specification of the amount of α-olefin, i.e. propylene in the case of the first elastomeric polymer as "the balance", is implicitly disclosed in the application as filed and thus the definition of this in claim 1 of the main request does not result in subject matter extending beyond the scope of the application as filed.

2.2.2 In contrast to the first polymer, the α-olefin in the second polymer is not restricted to any specific monomer.
According to page 6 of the application as originally filed the crystallinity condition defined in the claim is achieved with the specified content of ethylene and non-conjugated bicyclic diene when the α-olefin is propylene. There is no disclosure that these limits apply with **any** α-olefin. On the contrary, it is taught that when the α-olefin is not propylene, "slightly different limitations of the amount of crystallinity and non-conjugated diene content will apply".
Therefore defining the content of α-olefin, in the absence of a limitation thereof to propylene, merely by the term "the balance" results in subject matter which is neither explicitly nor implicitly disclosed in the application as filed and hence extends beyond the content of the application as filed.

2.3 Accordingly claim 1 of the main request does not meet the requirements of Article 123(2) EPC.
The main request must be refused.

3. *First and second auxiliary requests - Article 123(2) EPC.*

Since claim 1 of these requests retains the definition of the amount of α-olefin in the second elastomeric polymer as "the balance", the defect identified in the above discussion of the main request applies also to these requests.

Accordingly the first and second auxiliary requests must be refused.

4. *Third auxiliary request*

The third auxiliary request defines the contents, in terms of weight% of the three monomers in each of the polymers by closed ranges, namely:

Monomer	First polymer	Second polymer
Ethylene	10 to 63	65 to 85
α-olefin	27 to 80 (propylene)	27 to 37
diene	0.1 to 10	0.1 to 10

4.1 *Article 123(2) EPC.*

The numerical ranges defined are identical to those disclosed in claim 1 of the application as originally filed.
Accordingly the requirements of Article 123(2) EPC are satisfied.

4.2 *Article 84 EPC*

With regard to the limitations in respect of the second polymer it is noted that the sum of the upper limit of the ethylene (85 wt%) and the lower limit of the α-olefin content (27 wt%) results in a total greater than 100 wt%, namely 112 wt%. Similarly the sum of the lower limit of the ethylene content and the upper limit of the α-olefin content results in a total of 102 wt%.
This claim furthermore does not correspond to any claim that was present in the patent as granted.
Accordingly this claim must be examined for conformity

with all requirements of the EPC including Article 84 EPC.
Since the sums of respective upper and lower limits exceed 100 wt% the claim is not clear and does not meet the requirements of Article 84 EPC (cf. T 2/80, OJ EPO 1981 431, points 2 and 3 of the Reasons).

The respondent submitted (see above X.(b).(ii) and XI.(c).(iii)) that the skilled reader would automatically interpret the claim to exclude contents of the monomers which would result in a total content of 100 weight%.

However since three ranges are involved, multiple alternative interpretations of the claim are possible. While it is immediately apparent that - in their totality - the three upper limits are incorrect, it is not apparent and not unambiguously derivable that only a subset of these is incorrect, or, were this to be assumed, to ascertain which of the limits were to be regarded as incorrect.

4.3 Thus claim 1 of the third auxiliary request does not meet the requirements of Article 84 EPC and the request must therefore be refused.

5. *Fourth and fifth auxiliary requests*

5.1 Claim 1 of both these requests have the same definition of the monomer content of the two polymers as the third auxiliary request, and for the reasons explained above do not meet the requirements of Article 84 EPC.

5.2 Consequently the fourth and fifth auxiliary requests must be refused.

6. *Sixth auxiliary request - admissibility of amendments*

6.1 *Article 123(2) and (3) EPC*

Compared to the third auxiliary request claim 1 of the sixth auxiliary request is amended by specifying for the second polymer only the lower limits of the monomer contents, i.e. at least 65 weight percent ethylene, at least 0.1 weight percent bicyclic nonconjugated [*sic*] diene and at least 27 weight percent α-olefin.
The upper limit of the content of each monomer in the second polymer is no longer specified explicitly.
However the scope of the claim in respect of these comonomers may be calculated from the respective lower limits of the other two monomers as follows:
For ethylene: 100-(0.1+27)=72.9 wt% (wherein 0.1 is the minimum amount of the bicyclic non-conjugated diene and 27 is the minimum amount of α-olefin).
Analogously the maximum amounts of the other monomers are:
Non-conjugated bicyclic diene: 8 weight%
α-olefin: 34.9 weight%.
Accordingly the ranges for the content of the three monomers (explicit in the case of the lower limits and calculated for the upper limits are):
Et: 65-72.9 wt%
Diene: 0.1-8 wt%
α-olefin: 27-34.9 wt%.

The respective lower limits were disclosed explicitly in claim 1 as originally filed.

Regarding the upper limits, since the claim specified weight percentages, it was implicit that the total of all monomers was limited to 100 weight%. Further as the wording of the claim restricted the monomers to the three (classes) explicitly named (see section 2.2 above), the theoretical maximum content of each monomer would have also been directly - implicitly - derivable. This is despite the originally disclosed defective upper limits, which as indicated above would have been recognised by the skilled person as being incorrect in their totality (see the discussion of the third auxiliary request, section 4.2 above).

6.1.1 The argument of the appellant that the deletion of the upper limits of the amounts of comonomers in the second polymer generated, by implication, new limits as above which had not been in substance disclosed in the application as originally filed is not convincing for the following reasons:

(a) The claim does not explicitly specify any new upper limits. Consequently there is no new **disclosure** of a particular combination of monomer amounts which was not present in the application as filed. On the contrary, the only difference, consequent upon the upper limit deletions is in the **scope** of the resulting claims. This approach is analogous to that adopted in the decision T 2/80 referred to above.

(b) Clearly, a change of scope does not necessarily imply the addition of subject matter.

(c) It is conspicuous to the board that the outer extent of the scope of the claim represented by the deletion still lies, in respect of each of the comonomers, within the corresponding limits previously set out in claim 1 of the application as filed.

6.1.2 Accordingly the amendment deleting the upper limits of the monomer contents of the second polymer meets the requirements of Article 123(2) EPC.

6.1.3 The appellant has raised no other objections pursuant to Article 123(2) EPC in respect of this claim nor has the board any objections of its own.

6.1.4 With respect to Article 123(3) EPC no objections have been raised by the appellant in respect of the sixth auxiliary request. The board notes that, compared to claim 1 as granted the upper limits of the monomers in the first polymer are specified and in particular the content of α-olefin, which is now restricted to propylene, is specified by a defined range. Regarding the second polymer, the ranges permitted for the three monomers (explicit and implicit) are all within the ranges permitted by claim 1 as granted. Further the proportions of the polymers is restricted to the range 1.5:1 to 6:1 compared to 1.5:1 to 9:1 in the patent as granted. Analogous amendments were made to the independent method claim 9, corresponding to granted claim 14.

Therefore the board is satisfied that the amendments made do not extend the scope of protection beyond that of the claims as granted.

6.1.5 Accordingly the claims of the sixth auxiliary request meet the requirements of Article 123(2) and (3) EPC.

6.2 *Rule 88 EPC*

The appellant has objected that the amendment offered as the sixth auxiliary request does not meet the requirements of Rule 88 EPC. However the respondent has at no point invoked this Rule as a basis for the amendment.
As explained above, the sixth auxiliary request arises as a result of an amendment that is directly and unambiguously derivable from the implicit disclosure of the application as originally filed, and not a correction within the meaning of Rule 88 EPC.
Accordingly the objections of the appellant with respect to Rule 88 EPC are not supported.

6.3 *Rule 57a EPC*

Two amendments were objected to as not addressing a ground of opposition (see XI.(c).(iv) above). Claim 6 as granted related to the calendered article of any of claims 1 to 5 and specified *inter alia* the compounds from which "**said** alpha-olefin" (emphasis by the board) was to be selected.

6.3.1 Claim 1 has been amended, compared to the patent as granted, by restricting the alpha-olefin of the first polymer to propylene. This amendment has not been challenged as not addressing a ground of opposition.
The definition in claim 6 as granted of the "said" alpha-olefin (in respect of both polymers of claim 1) being selected from a defined group was inconsistent

with the (amended) claim 1 since this specified that the alpha-olefin in the first polymer was mandatorily propylene. Thus the consequent deletion of claim 6 must be regarded as an inseparable part of the larger amendment of claim 1. Hence it cannot be regarded as not being occasioned by a ground of opposition or therefore as contravening Rule 57a EPC.

6.3.2 With regard to claim 9, which corresponds to granted claim 14, it is noted that, as granted, claim 14 did not specify the proportions of monomers in the two elastomeric polymers, the crystallinity of the two polymers or the blending ratio. During opposition proceedings, claim 1 was extensively amended (see section IV above).

The effect of the amendments made to original claim 14 was to align it with the amended version of claim 1, in particular in respect of the constitution of the two polymers, and thus avoid an objection pursuant to Article 84 EPC arising from a lack of clarity due to inconsistencies between these claims arising from the amendments made to claim 1. Further, claim 1 as granted and according to the sixth auxiliary request employs the term "wherein" and this term has now been introduced into claim 9 in the corresponding location. It has not been alleged that the amendments made to claim 1, which are now reflected in claim 9, did not arise as a consequence of grounds of opposition raised (Rule 57a EPC).

Accordingly it is concluded that the amendments made to claim 9 of the sixth auxiliary request meet the requirements of Rule 57a EPC.

7. *Article 83 EPC*

The objection of the appellant that the disclosure of the patent was not sufficient to enable the skilled person to prepare the polymer blends (see section VI.(c), above) was supported by no evidence, and therefore amounts merely to an unsupported assertion. Regarding the objection that the tests disclosed in the patent would not enable the skilled person to ascertain whether the parameters, in particular the compositional distribution defined in claim 8 had been attained, likewise no evidence has been advanced, nor has it been explained in which manner the method disclosed might be defective (see XI.(d) above).
Accordingly the appellant has failed to submit any evidence to support the assertion of insufficiency which accordingly is dismissed as unfounded.

8. *The patent in suit*

According to claim 1 of the sixth auxiliary request, which is reproduced in section X.(c) above, the patent in suit relates to a calendered article comprising an elastomeric polymer blend of a first and a second ethylene, α-olefin, non-conjugated diene polymer in defined proportions (range of ratios). Each of the polymers has different - defined - contents of the monomers, and different crystallinities whereby the crystallinity of the first polymer is less than 2.5% and that of the second polymer is greater than 3%. Independent claim 9 specifies a method of preparing an elastomeric polymer by blending the two components specified in claim 1 with various additives and at a defined temperature.

8.1 According to paragraph [0002] of the patent in suit representative uses of calendered articles are roof sheeting, roof membranes and roof flashing.

8.2 Calendering is stated to be a process which involves relatively little shear, and the shear being increased if the calendar rolls move at different speeds. The other common method for forming articles from elastomeric polymers, extrusion, imposes higher shear on the articles and exposes the articles to higher temperature.
Calendering results in articles having large directional orientation, ideally being isotropic (paragraph [0003] of the patent in suit). This results in relatively uniform physical properties in both the machine and transverse directions. This is beneficial in roofing applications such as those mentioned above. Smoothness of the sheet is a valued property. This arises in a calendered sheet through the ability of the polymer compound to flow under the relatively low shear forces (paragraph [0005] of the patent in suit).

8.3 In paragraph [0006] of the patent it is explained that the size of the calendered sheet is dictated by the width of the calendar rolls. Where a greater width is required the fabricator has various alternatives including gluing or adhesively laminating the strips. In roofing sheets such gluing or lamination is generally less effective, less strong and hence less acceptable than a process where the sheets are spliced together in their green state. Such splicing results in sheets having a wider interval between sections which have to be adhesively laminated after vulcanization. The wider sheets are made by adhering, in an overlapped

splice, the uncured sheets. For success the adhesion of the calendered sheets in the uncured (green) state is important. The splice is most often made by bringing two sheets together and applying pressure for a short time at ambient temperature (paragraph [0007] of the patent in suit).

8.4 Tensile strength is an important consideration for the handling of uncured (green) compounds. In fabrication it is not practical for the sheet to be supported at all times, i.e. there are distances between conveying devices where the sheet is unsupported and it can deform or stretch under its own weight, the deformation being greater the lower the green strength. Further in moving around various points in the fabricating process the sheet is subjected to elongation and stretching, which could have a negative impact on its final properties and, in particular, could alter the thickness leading to widening of manufacturing tolerances (paragraph [0008]).

8.5 Thus there are competing needs. On the one hand the peel adhesion depends on the ability of the elastomeric polymers to flow and establish adhesion between the two sheets, which requires that flow can be maintained under gentle shear conditions. On the other hand the desired high green strength or tensile strength arises from the ability of the polymer to resist shear forces, which implies a high viscosity (paragraph [0010] of the patent in suit).

8.6 Thus there exists a need for an elastomeric polymer or combination of elastomeric polymers with a combination

of excellent green strength and excellent peel adhesion during the calendering operation (paragraph [0014]). Therefore the technical problem which the patent in suit sets out to solve is to provide such an elastomeric polymer composition.

8.7 The only example of the patent which demonstrates the subject matter of the independent claims 1 and 9 of the sixth auxiliary request is example 8. The evidence of this example is that the technical problem underlying the patent in suit has in fact been solved. This has not been challenged by the appellant/opponent.

9. *Late filed documents*

Together with the statement of grounds of appeal, the appellant submitted D14 which was proposed as an alternative closest state of the art.

9.1 Since this document was submitted after the end of the nine month opposition period it is late filed (Article 114(2) EPC).
According to the established case law, in particular T 1002/92 (OJ EPO 1995, 605, reasons 3.3) in proceedings before the boards of appeal new evidence going beyond that presented in the notice of opposition should only very exceptionally be introduced into the proceedings if such new material is *prima facie* highly relevant such that it can be expected to change the result and is highly likely to prejudice maintenance of the patent.

9.2 D14 relates according to claim 1 to blends of two EPDMs of differing molecular weight, differing diene content and overlapping ethylene content. The aim of D14 is to improve the fabrication properties of the polymer blends as explained at column 1, lines 9-23 and column 3 lines 1-16. According to column 3 lines 55-63 by introducing an intermolecular compositional distribution superimposed on a skewed molecular weight distribution it was possible to produce polymers which were easier to fabricate and/or yielded better vulcanisate properties than hitherto known polymers. The fabrication processes considered in D14 are extrusion and injection moulding (column 3 line 24). There is no discussion in D14 of calendered articles in general. Nor is there any discussion in D14 relating to the problem of adhering unvulcanised sheets of other articles prepared from the polymer blends.

9.3 The crystallinity of the polymer blends is not disclosed in D14.
The appellant has submitted with respect to Samples "D" and "E" of D14 that the crystallinity could be derived by reference to D15 (cf. section VI.(f).(i) above). The board observes that the data in the partial translation of D15 provided relates not to the EPDM terpolymers of D14 but to a different polymer, namely ethylene/propylene co-polymers. Therefore D15 provides no evidence about the crystallinity of the polymers employed in Samples "D" and "E" of D14.

9.4 The appellant has further submitted that D15 teaches extrusion and calendering processability are influenced by the same factors, and therefore that the skilled person would understand that the compositions of D14

would be useful in calendering processing. While this is indeed stated in D15 in section 4.5.1, the board notes firstly that this appears to be inconsistent with the discussion of extrusion and calendering in the patent in suit (reported in section 8.2 above) which emphasises that the conditions imposed by these two fabrication processes are significantly different, in particular in terms of the stresses to which the polymers are exposed. Secondly, the problem underlying the patent in suit is related not to calendering processability *per se* but to the peel adhesion and green strength properties of the thus formed sheets. While it may be true - as shown by D15 - that compositions which can be processed by extrusion may also be processable by calendering, this is not of importance in consideration of the relevance of D14 to the present opposition appeal proceedings since this aspect does not correspond to the technical problem underlying the patent in suit (see section 8.6 above).

9.5 Since D14 does not relate to the same problem as the patent in suit, namely heat seamability or splice adhesion of calendered articles, and - since it does not disclose the crystallinity - has not been shown even to relate to the same polymers as defined according to the independent claims of the sixth auxiliary request, it is not *"highly relevant"*. Since D15 was cited only in order to elucidate the disclosure of D14 the relevance of this document depends on that of D14.

9.6 Accordingly the disclosure of D14, and as a consequence D15 have not been shown to be *prima facie* highly relevant (cf. section 9.1 above).
Accordingly neither D14 nor D15 is admitted to the procedure.

10. *Article 54 EPC*

In the written proceedings the appellant referred in respect of D1, D4, D7 and D8 to its arguments set out in the notice of opposition (see section VI.(e) above).
At the oral proceedings, novelty objections were maintained only in respect of D1 and D4 (see section XI.(e) above).
Since the arguments presented were, however, only those already considered by the opposition division, they do not give the board any cause to consider that the conclusions reached by the opposition division in respect of these documents (section IV.(c) above) were incorrect. Furthermore, since the claims of the sixth auxiliary request are narrower in scope than those of the third auxiliary request considered and found allowable in the decision under appeal, there is no reason for the board to consider that these arguments would lead to a different conclusion in relation to the claims of the sixth auxiliary request.
Accordingly the subject matter claimed is novel.

11. *Article 56 EPC*

11.1 *The closest prior art*

By common consent, of the documents that are in the procedure, the closest prior art is represented by the teachings of D6.
This relates according to claim 1 thereof to a self-adhering heat seamable sheet material for roofing.
The material is prepared from an uncured polymeric composition which is a blend 10-95 parts by weight of a polymer selected from the group consisting of:

- semicrystalline polyolefins having more than about 2 percent by weight crystallinity and
- polyolefins having up to 2 percent by weight crystallinity, and mixtures thereof;

with 5 to 90 parts by weight of a crystallinity enhancing polymer which is selected from the group consisting of polyethylene and polypropylene homopolymers; poly(ethylene-co-propylene) random copolymers and poly(ethylene-b-octene) and poly(ethylene-b-octene) and poly(ethylene-b-butene) block copolymers.
According to the "Summary of the Invention" the object of D6 is to provide polymer blends for heat seamable roof sheeting materials that need not be cured and which do not require solvent-based splicing adhesives. A further object is to provide blends of EPDM, EPR or other similar olefinic type polymers and a crystallinity enhancing polymer which improves the green strength and splice adhesion of heat seamable roof sheeting materials. A still further object is to provide a method for covering roofs which employs polymer blend heat seamable roof sheeting materials

which do not require curing and which can be joined and seamed together at their edges without the use of adhesives. It is taught that the compositions can be sheeted *inter alia* by calendering (page 8 line 43).
The base polymers according to D6 are selected from two groups differing in their crystallinity as explained above. However according to page 4, lines 38 and 39 to be useful as a roofing material it is preferred that the EPDM have at least about 2 weight% crystallinity.
The examples of D6 employ three EPDM polymers. Only one of these - "Vistalon® MD-744", having an ethylene content of 60 wt%, crystallinity <1 wt%, (page 9, Table II) and a Mooney viscosity ML(1+4) 125°C of about 52 (page 4 line 27, referred to in D6 as "ML/4") corresponds to the first polymer according to the claims of the sixth auxiliary request, which has not been contested. The other EPDMs exemplified in D6 (Table II), namely "Royalene® 375" and "EPsyn® 5508" have ethylene contents (76 and 73 wt% respectively) and crystallinities (14.6 and 9.2 wt% respectively) above the corresponding limits specified in claims 1 and 9 of the sixth auxiliary request.
In the examples of D6 the properties of peel adhesion are determined on vulcanised products, heating being carried out at 260°C, 425°C or 550°C prior to testing (Tables VIA, VIB, VIIA, VIIB, VIIIA, VIIIB, IXA, IXB, and X).
Vistalon® MD-744 is employed in examples comparing the subject matter of D6 with documents which are prior art to D6 (examples 16-18, pages 26 and 27, Tables XI and XII).
Although, as noted above, it is stated in D6 that the blends of D6 can be sheeted by milling, calendering or extrusion (page 8 line 43), it is not disclosed by

which method the sheets employed in the examples were prepared.
Since D6 relates to the same technical problem as the patent in suit, the board is satisfied that this document can be considered to represent the closest prior art.

11.2 *The objective technical problem*

The peel adhesion measurements in the patent in suit are carried out on non-cured (unvulcanised) materials, whereas the data of D6 relates to vulcanised compositions.
Accordingly there is no direct comparison possible between the results reported in D6 and the patent in suit.
Accordingly there is no reason to diverge from the statement of problem set out in the patent in suit (cf. section 8.6 above.

11.3 *The claimed solution*

According to claims 1 and 9 of the sixth auxiliary request this problem is solved by employing as the second component an EPDM of defined monomer content and crystallinity.

11.4 *Obviousness of the claimed solution*

11.4.1 D6 discloses that the second component, the crystallinity enhancing polymer, be selected from a precisely defined group of (co)polymers. There is no suggestion or indication in D6 that the named (co)polymers are merely illustrative members of some

larger - unspecified - grouping. Nor does D6 include any teaching that alternative materials may be used as the second component, or provide any guidance for the skilled person how to identify any such alternatives. Accordingly D6 provides no incentive to replace the crystallinity enhancing polymers by alternatives and correspondingly no teaching as to which alternatives could be employed. Accordingly it would not be obvious based on the teaching of D6 even to formulate a technical problem such as that defined in section 11.2 above, let alone to provide the solution to the above formulated technical problem forming the subject matter of the claims of the sixth auxiliary request. Accordingly the subject matter claimed is not obvious with respect to the disclosure of D6 on its own.

11.4.2 Regarding the proposed combination of D6 with D11, the board observes that D11 relates to an investigation of the tensile strength of EPDM, the roller kneading workability and relationship with the molecular structure of the EPDM. It is not related to the problem underlying either the patent in suit or D6.
While there is a discussion of the extent of crystallinity and the relationship between this and various physical properties there is no discussion relating to the use of crystalline EPDM as an additive to low crystallinity EPDM for any reason.
The conclusion of D11, namely that in order to obtain an EPDM excellent in roller kneading workability it is significant to measure tensile strength and elongation at a wide range of temperatures and examine the relationships with their molecular structure, indicates that D11 if anything provides an outline of a further research programme. There is nothing in this conclusion

or indeed in the rest of D11 that is of relevance to the problem of modifying EPDM compositions in view of improving heat seamability in the non-vulcanised state or to the problem of providing crystallinity enhancing polymers for EPDM.

11.4.3 It is therefore concluded that the combination of D6 with D11 does not render the claimed solution to the technical problem obvious.

11.5 The subject matter of the patent in suit is not obvious in the light of the cited prior art and hence is founded on an inventive step.

12. For the foregoing reasons, the sixth auxiliary request is allowable.

13. There is thus no need to consider the seventh and eighth auxiliary requests filed by the respondent.

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 sixth auxiliary request (claims 1 to 11) filed at the oral proceedings and after any necessary consequential amendment of the description.

The Registrar: The Chairman:

E. Görgmaier R. Young