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**Datasheet for the decision  
of 29 August 2006**

**Case Number:** T 0099/05 - 3.3.03

**Application Number:** 98117597.9

**Publication Number:** 0905182

**IPC:** C08K 5/16

**Language of the proceedings:** EN

**Title of invention:**  
Acrylic elastomer composition

**Patentee:**  
Nippon Mektron, Limited

**Opponent:**  
Zeon Corporation

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56, 104(1)  
RPBA Art. 11a(1)

**Keyword:**

"Inventive step (yes)"  
"Apportionment of costs (yes)"

**Decisions cited:**

G 0010/91, G 0001/95, T 0219/83, T 0197/86, T 0585/92

**Catchword:**

See Reasons 3.37, 3.38



Case Number: T 0099/05 - 3.3.03

**DECISION**  
of the Technical Board of Appeal 3.3.03  
of 29 August 2006

**Appellant:**  
(Opponent)

Zeon Corporation  
Intellectual Property  
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**Respondent:**  
(Patent Proprietor)

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**Representative:**

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**Decision under appeal:** Decision of the Opposition Division of the European Patent Office dated 28 October 2004 and posted 25 November 2004 rejecting the opposition filed against European patent No. 0905182 pursuant to Article 102(2) EPC.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** C. Idez  
H. Preglau

## Summary of Facts and Submissions

- I. The grant of the European patent No. 0 905 182 in the name of Nippon Mektron, Limited in respect of European patent application No. 98 117 597.9 filed on 16 September 1998 and claiming priority of the Japanese patent application JP 27349697 filed on 19 September 1997 was announced on 29 January 2003 (Bulletin 2003/05) on the basis of 4 claims.

Independent Claims 1 to 4 read as follows:

"1. An acrylic elastomer composition, which comprises an acrylic elastomer obtained by copolymerization of at least two kinds of acrylic esters selected from the group consisting of ethyl acrylate, n-butyl acrylate and methoxyethyl acrylate with 0.1 to 10% by weight of a fumaric acid mono-lower alkyl ester having a lower alkyl group having 1 to 5 carbon atoms, 0.1 to 5 parts by weight of an aromatic diamine compound vulcanization agent per 100 parts by weight of the acrylic elastomer and 0.1 to 10 parts by weight of a guanidine compound vulcanization accelerator per 100 parts by weight of the acrylic elastomer.

2. An acrylic elastomer composition, which comprises a copolymer of a fumaric acid mono-lower alkyl ester-containing acrylic elastomer obtained by copolymerization of: (a) 30 to 90% by weight of an alkyl acrylate having an alkyl group having 1 to 8 carbon atoms, (b) 9.9 to 70% by weight of an alkoxyalkyl acrylate having an alkoxyalkyl group having 2 to 8 carbon atoms, (c) 0.1 to 10% by weight of the fumaric acid mono-lower alkyl ester having a lower

alkyl group having 1 to 5 carbon atoms and (d) 0 to 30% by weight of a vinyl or olefinic monomer copolymerizable therewith, sum total being 100% by weight, and

0.1 to 5 parts by weight of an aromatic diamine compound vulcanizing agent per 100 parts by weight of the acrylic elastomer and 0.1 to 10 parts by weight of a guanidine compound vulcanization accelerator per 100 parts by weight of the acrylic elastomer.

3. Use of the acrylic elastomer composition according to claim 1 or 2 as a vulcanization molding material for seal members or hose members to be used at contact sites with a metal member.

4. Use of the acrylic elastomer composition according to claims 1 or 2 as a vulcanization molding material for seal members or hose members to be used at contact sites with oil."

II. On 22 October 2003, a Notice of Opposition against the patent was filed by Zeon Corporation.

The Opponent requested revocation of the patent in its entirety on the ground of lack of inventive step (Article 100(a) EPC).

The opposition was supported by the following documents:

D1: US-A-3 883 472;

D2: JP-A-H6-99515 (in form of English translation thereof);

D3: US-A-5 250 644;

D4: US-A-3 904 588;

D5: A. L. Spelta et al; "Designing the Structure of Acrylic Elastomers"; Kautschuk & Gummi, Kunststoffe, Vol. 42. Nr. 7; 1989, pages 569-576; as well as the later filed, but admitted Experimental Report dated 13 September 2004 submitted by the Opponent with its letter dated 17 September 2004.

III. By a decision announced orally on 28 October 2004, and issued in writing on 25 November 2004, the Opposition Division rejected the opposition.

According to the decision document D2 represented the closest state of the art, since it had the most features in common and since it related to the same technical problem (oil resistance) as the patent in suit.

As can be understood from the decision, the only distinguishing feature resided in the use of a fumaric ester instead of the use of a maleic ester in D2.

The Opposition Division stated that the composition of Example 4 of the patent in suit showed a better compression set than Comparative Example 1 thereof. According to the decision, even the comparison between Example 2 and Example 4 of the experimental report submitted by the Opponent on 17 September 2004 also showed that a better compression set was obtained by the compositions according to the patent in suit than for the compositions according to D2.

As can be deduced from the decision, the objective technical problem starting from D2 was hence seen in the improvement of the compression set of the cured acrylic elastomer composition.

The decision stated that none of the other cited documents cited D1, D3, D4 or D5 gave an incentive to replace the maleic monoester of D2 by a fumaric monoester in order to improve the compression set of the cured acrylic elastomer composition.

Thus, the Opposition Division came to the conclusion that the requirements of Article 56 EPC were fulfilled, and it decided to reject the opposition.

- IV. A Notice of Appeal was filed on 24 January 2005 by the Appellant (Opponent) with simultaneous payment of the requested fee.
- V. With the Statement of Grounds of Appeal filed on 5 April 2005, the Appellant submitted an experimental report.

It also argued essentially as follows:

(i) As acknowledged in the decision under appeal, the only distinguishing feature between the subject-matter of Claims 1 and 2 and D2 was the fact that the claimed elastomer compositions comprised a fumaric mono-lower alkyl ester instead of a maleic mono-lower alkyl ester.

(ii) According to the decision this led to an improvement of the compression set.

(iii) The annexed experimental report showed that there was no difference in compression set between a fumaric monoester containing acrylic elastomer (according to the opposed patent) and a maleic monoester containing acrylic elastomer (according to D2).

(iv) This report contained a total of six experimental runs:

Run 1 was the same as Example 1 of D2.

Run 2 was the same as Run 1 except that mono-n-butyl fumarate was used in Run 2 instead of mono-n-butyl maleate.

Run 3 was the same as Example 2 of patent in suit.

Run 4 was the same as Run 3 except that mono-n-butyl maleate was used in Run 4 instead of mono-n-butyl fumarate.

Run 5 was the same as Example 4 of the patent in suit.

Run 6 was the same as Run 5 except that monoethyl maleate was used in Run 6 instead of mono-ethyl fumarate.

(v) All experimental conditions except the stereochemical configuration of the unsaturated monoester had been kept constant between Runs 1 and 2, 3 and 4 as well as 5 and 6, respectively.

(vi) The actual differences in compression set observed in two corresponding runs were minimal and inconsistent with respect to the direction in which the compression set changed upon replacement of a maleate monoester with the corresponding fumarate monoester.

(vii) Thus, the experimental data submitted clearly showed that the alleged technical effect on the basis

of which the Opposition Division had acknowledged the involvement of an inventive step (improvement of compression set) did not exist.

(viii) Consequently, the objective technical problem had to be seen in the provision of alternatives to the acrylic elastomer compositions known from D2.

(ix) The compositions of the patent in suit were an obvious solution to this problem.

(x) The skilled person would have been motivated to replace the maleic monoester of D2 by a fumaric monoester as a carboxyl group cure site, because a maleic monoester and a fumaric monoester, when incorporated by copolymerization into an acrylic elastomer composition of the kind claimed in the opposed patent, caused the same crosslinking reaction.

(xi) Furthermore, the equivalency of a maleic monoester and a fumaric monoester for the provision of a carboxyl group curing site in an acrylic elastomer for crosslinking with an aromatic diamine compound vulcanizing agent was taught in D1 (Column 2, lines 9 to 15; Examples 19A and 20A) and D4 (column 1, lines 20 to 25).

(xii) Therefore, the subject-matter of Claims 1 and 2 of the opposed patent did not involve an inventive step within the meaning of Article 56 EPC.

(xiii) The uses according to Claims 3 and 4 of the patent in suit were also obvious in view of D2 (cf. D2, translation, page 1, abstract; page 7, paragraph



[0018]), and D4 (Column 2, lines 61 to 65; column 3, lines 5 to 9).

VI. With its letter dated 22 August 2005, the Respondent (Patentee) submitted an experimental report.

It also argued essentially as follows:

(i) Concerning the experimental report submitted by the Appellant:

(i.1) The experiments conducted by the Appellant did not represent appropriate reproductions of the examples described in the prior art or in the contested patent.

(i.2) In its experiments the Appellant used 2 pbw of stearic acid and 1 pbw of processing aid (wax, Greg G-8205) while Example 1 of D2 and Examples 2 and 4 of the patent used only 1 pbw of stearic acid and no Greg G-8205.

(i.3) Furthermore the curing conditions were not the same as used in D2 or in the patent, respectively.

(i.4) Thus, the experimental report of the Appellant did not support its allegation that an unexpected technical effect was not achieved by the experiments disclosed in the patent.

(ii) Concerning its own experimental report:

(ii.1) Examples V3<sub>F</sub>/V4<sub>M</sub> (the suffixes F and M indicating the use of a fumaric monoalkyl ester and the use of a maleic monoalkyl ester, respectively) represented an

exact repetition of Appellant's experiments R-3 and R-4.

(ii.2) V4<sub>M</sub> yielded a substantially higher i.e. worse compression set than V3<sub>F</sub>.

(ii.3) Experiments C3<sub>F</sub> and C4<sub>M</sub> had been conducted under the curing conditions used in the patent in suit.

(ii.4) C1<sub>F</sub> and C2<sub>F</sub> were identical except for the fact that the amount of di-o-tolylguanidine was different. The resulting compression set was basically the same for both experiments.

(ii.5) In C3<sub>F</sub> and C4<sub>M</sub> the same difference as regards the amount of di-o-tolylguanidine applied. The replacement of fumarate by maleate in C4<sub>M</sub> resulted in a substantially inferior compression set.

(ii.6) Thus, the new experimental data provided further clear evidence that replacing a maleate-type cure site monomer by the corresponding fumarate yielded an unexpected technical effect.

VII. With its letter dated 16 February 2006, the Respondent submitted a set of 3 claims representing a first auxiliary request.

VIII. With its letter dated 17 March 2006, the Appellant submitted a new experimental report.

It also argued essentially as follows:

(i) Concerning the new experimental report:

(i.1) In Run R-1-1<sub>M</sub> to Run R-6-1<sub>M</sub> in Table III of the experimental report curing was carried out under the same conditions as adopted in Examples 2 and 4 of the opposed patent.

(i.2) In Run R-1-2<sub>M</sub> to Run R-6-2<sub>M</sub> in Table IV of the experimental report curing was carried out under the same conditions as adopted in Example 1 of D2.

(i.3) The additional experiments showed that there was no substantial difference in compression set between compositions based on a maleic acid mono-lower alkyl ester and compositions based on a fumaric acid mono-lower alkyl ester.

(ii) Concerning the experimental report submitted by the Respondent:

(ii.1) The Respondent had recognized that in these experiments C3<sub>F</sub> and C4<sub>M</sub>, a difference existed with respect to the amount of di-o-tolylguanidine.

(ii.2) There was a further substantial difference between experiments C3<sub>F</sub> and C4<sub>M</sub> in that mono-n-butyl maleate was used in C4<sub>M</sub>, but monoethyl fumarate was used C3<sub>F</sub>. This made a comparison between experiments C3<sub>F</sub> and C4<sub>M</sub> irrelevant.

(ii.3) Thus, the difference in compression set observed in these two experiments did not support the contention

- that the substitution of a maleate compound by a fumarate compound alone resulted in a relevant technical effect on the basis of which an inventive step could be acknowledged.
- IX. In its letter dated 24 March 2006, the Respondent requested that the new experimental submitted by the Appellant should be rejected as late filed, or, should this request not be granted, that the oral proceedings be postponed in order to give the Respondent the opportunity to analyze this experimental report and to conduct its own experiments.
- X. In its letter dated 27 March 2006, the Appellant strongly objected to the postponement of the oral proceedings and argued that the additional experimental results only represented a minor modification of the experiments submitted with the Statement of Grounds of Appeal dated 5 April 2005.
- XI. Oral proceedings were held before the Board on 30 March 2006. At the oral proceedings it was decided to introduce the experimental report filed by the Appellant with its letter dated 17 March 2006 into the proceedings and to continue the proceedings in writing.
- XII. In a communication dated 10 April 2006 annexed to the summons to oral proceedings scheduled to take place on 29 August 2006, the Board asked the Parties for clarification concerning:
- (i) the property "permanent set" indicated for the composition of Example 1 of D2, and

(ii) the curing mechanism, the structure and the configuration of maleate monoester- and fumarate monoester-containing acrylic elastomers.

XIII. With its letter dated 28 July 2006, the Respondent submitted three sets of Claims representing its first, second and third auxiliary requests as well as the following documents:

D6: JP-A-11-343378;

D6a: English translation of D6;

D7: Front page of the PCT publication WO-A-99/50349;

Annex A: Declaration of Mr. K. Zeniya and Mr. K. Saito (the inventors of D2) dated 21 July 2006; and an Experimental report comprising Tables 1 to 5.

It argued essentially as follows:

(i) Request of cost apportionment under Article 104(1) EPC:

(i.1) The sole reason why no final decision could be reached at the end of the oral proceedings on March 30, 2006 was that Appellant's late filed submission dated March 17, 2006 had been admitted into the proceedings. This submission had been made less than two weeks prior to the oral proceedings.

(i.2) It was clear from the grounds of opposition outlined in the Notice of Opposition that the Opponent relied from the very beginning of the present proceedings, among other things, on the relevance of Example 1 of D2.

(i.3) However, instead of filing supporting experimental data with the Notice of Opposition brief or at any other suitable occasion, the long time missing and repeatedly requested experimental data had been submitted only a few days before the (under normal circumstances) final oral proceedings before the Board of Appeal.

(i.4) If these data had been submitted in a sort of timely manner, the postponement of a final decision by returning to proceedings in writing and setting a new date for second oral proceedings in the appeal stage could have been avoided.

(ii) Concerning the terms "permanent set" and "compression set":

(ii.1) In view of the relevant measurement conditions referred to in D2 and in the patent in suit, and the reference in both documents to the standard JIS K-6301 in that respect, the term "permanent set" in the translation of D2 as provided by the Opponent would appear to be a mistranslation and should properly read "compression set".

(ii.2) It was assumed that the relevant measurement conditions in D1 and D2 as well as in the opposed patent, all including 25% compression at 150°C for 70 hours, defined a compression set measurement and were comparable with each other.

(iii) Concerning structural differences between acrylic elastomer prepared with a fumarate or a maleate:

(iii.1) The Appellant had not provided any convincing evidence in support of his allegation that a fumaric ester and a maleic ester indeed yielded identical acrylic elastomers and/or identical crosslinked vulcanizates.

(iii.2) The Appellant had not provided any convincing argument why the trans-configuration of the fumaric monoesters and the cis-configuration of maleic monoesters should transform into the same absolute configuration at the resulting two carbon atoms of the formed polymer backbone.

(iii.3) The experimental data submitted clearly showed that the resulting vulcanizates were different since they had different compression sets.

(iii.4) Hence, there was a clear evidence for a difference achieved by replacing the maleic monoesters by fumaric monoesters, which gave rise to an improvement in compression set.

(iii.5) This was also a clear proof for an inventive step connected to the teaching claimed in the patent in suit.

(iii.6) It should also be noted that the Appellant himself had apparently considered the replacement of maleate monoesters by fumarate monoesters as cure site monomers in acrylic rubbers to represent an invention. Reference was made to the document D6 which was a patent application of the Appellant aiming at exactly this technical teaching.

(iv) Concerning the Experimental Report:

(iv.1) As shown by the new comparative examples based on Example 1 of D2 (Tables 1 to 3 of the annexed Experimental report), the compression set at 150°C as well as at 175°C was significantly better in the case of using butyl fumarate (BF) as compared with the results obtained by using butyl maleate (BM) as the cure site monomer.

(iv.2) The discrepancy between the results indicated in Example 1 of D2 and its repetition in terms of compression set found its origin in the fact that Example 1 of D2 had in fact not been conducted with 4 wt.-% of BM, but rather with 7 wt.-% thereof (and with only 43 wt.-% of ethyl acrylate rather than 46 wt.-% (cf. Annex A). This was also confirmed by the comparative experiments set out in Table 2.

(iv.3) Table 3 further showed an improvement of the compression set when BM was replaced by BF.

(iv.4) The experimental data submitted by the Appellant during the pending proceedings were summarized in Table 4 attached.

(iv.5) The only experiments in Table 4 according to which an unexpected improvement by replacing a maleate by the corresponding fumarate allegedly was not achieved were those allegedly repeating Example 1 of D2. These experiments were however pointless as shown above in the annexed Tables 1-3.



(iv.6) All the other comparative experiments submitted by the Appellant also supported the superiority of the compression set of embodiments using a fumarate instead of the corresponding maleate.

(iv.7) The majority of the experiments conducted by the Appellant had been repeated by the Patentee under exactly the conditions used by the Appellant (cf. Table 5). All repetitions revealed a clear superiority of the embodiments using fumarate monoesters over those using the corresponding maleate monoester.

(iv.8) Thus, the experimental evidence on file clearly supported the existence of an unexpected technical effect (i.e. improvement of compression set) and thus of an inventive step of the claimed subject-matter.

(iv.9) As regards any potentially remaining doubts concerning the effect on compression set of the replacement of the maleate monoester by a fumarate monoester change, it should be noted that the burden of proof was on the Appellant. Hence, following the principles outlined in decision T 219/83 (OJ EPO 1986, 211), the Patent Proprietor must be given the benefit of the doubt.

XIV. With its letter dated 28 July 2006, the Appellant submitted the following documents:

D8: Declaration of Mr. H. Masuda, dated 25 July 2006;  
and

D9: EP-B-0 477 984.

It also argued essentially as follows:

(i) It confirmed that the term "permanent set" used in Example 1 of D2 was identical to "compression set" used in the patent in suit. Reference was also made in that respect to the standard JIS K 6301 in D2 (page 8, lines 13 and 14) and to document D9 (page 4, line 16) which referred to compression set determined according to JIS K 6301.

(ii) According to D8, during the polymerization, the double bond of the maleate monoalkyl ester and of the fumarate monoalkyl ester was converted into a single bond. Consequently, there was no difference between an acrylic elastomer obtained from a fumarate monoalkyl ester and an acrylic elastomer obtained from a maleate monoalkyl ester.

(iii) In D8 it was stated that a maleate monoester a fumarate monoester exhibited different reactivity in the copolymerization. Nevertheless, once the same amounts of monoalkyl esters had been incorporated into the acrylic elastomer, the two acrylic elastomers exhibited substantially the same properties.

(iv) Consequently, the subject-matter of Claims 1 and 2 lacked novelty and in any event inventive step over D2.

(v) The subject-matter of the patent in suit also lacked inventive step since it would have been obvious to use ethyl acrylate and butyl acrylate in combination in view of the teaching of D1 and D2.

XV. Oral proceedings were held on 29 August 2006 before the Board.

(a) After having heard the Parties on the relevance of the documents submitted with their respective letters dated 28 July 2006, the Board, after deliberation, informed the Parties that the documents D6, D6a, D7, Annex A and Tables 1 to 5 of the Experimental report submitted by the Respondent with its letter dated 28 July 2006 and that the documents D8 and D9 submitted by the Appellant with its letter dated 28 July 2006 were introduced into the proceedings.

(b) The discussion moved then on the assessment of inventive step. While essentially relying on the arguments presented in that respect during the written phase of the appeal proceedings, the Parties made additional submissions, which may be summarized as follows:

(i) By the Appellant:

(i.1) Document D8 showed that there was no difference between an acrylic elastomer obtained using a monoalkyl fumarate and an acrylic elastomer obtained using a monoalkyl maleate. In that respect, the fact that the heat ageing properties expressed in changes of the elongation or the tensile strength of the fumarate and maleate elastomers did not exactly correspond was not relevant, since these differences were within the reproducibility of the tests.

(i.2) The incorporation of the maleate monoester and of the fumarate monoester in the polymer chain of the

elastomer resulted in the presence of a succinate monoester structure in the polymer chain.

(i.3) While asymmetric carbon atoms were hence present in the polymer chain, it had not been shown by the Patentee either that this resulted in a polymer having optical activity, or that different stereochemical configurations would be obtained when starting from the maleate monoalkyl ester and when starting from the fumarate monoalkyl ester.

(i.4) Furthermore, due to the possibility of free rotation of the ester and acid groups in the succinate monoester, the crosslinking reaction with a diamine would statistically result in identical products.

(i.5) In any case, it had not been shown that there was an improvement in the compression set of the cured elastomer when using a fumarate instead of a maleate alkyl monoester.

(i.6) Both Parties had repeated Example 1 of D2, and had come to irreconcilable statements concerning the effect of the change of maleate to fumarate.

(i.7) Contrary to the arguments of the Respondent in view of the decision T 219/83, it could not be considered, that, in such a case, the benefit of the doubt must as a rule always be given to the Patent Proprietor (Respondent).

(i.8) Reference was made to point 12 of the Reasons for the decision in T 219/83, in which the following statements were to be found: "it is true that under

Article 114(1) EPC the European Patent Office, in proceedings before it, examines the facts of its own motion and is not restricted in this examination to the facts, evidence and arguments provided by the parties and the relief sought. But if the European Patent Office is unable to establish the facts of its own motion, it is the party whose argument rests on these alleged facts who loses thereby. This is the situation here. The two parties have made contrary assertions concerning the desired elimination of alkali. In such cases the ruling goes against the opponent as appellant if he is unable to substantiate an assertion which could disprove the existence of an inventive step."

(i.9) In the present case, it was the Patent Proprietor who had argued for the first time at the oral proceedings before the Opposition Division, that the claimed elastomer compositions exhibited a better compression set than the composition according to D2.

(i.10) Consequently, the Patent Proprietor had the burden of the proof of the fact (i.e. a better compression set) he alleged. Thus, the benefit of the doubt could not be given to the Patent Proprietor in the present case.

(i.11) The tests submitted by the Appellant in the course of the opposition and appeal proceedings had been carried out in good faith, as was underlined by the fact that they were accompanied by declarations of the technical expert who carried out the tests.

(i.12) In view of the declaration of the inventors of D2 in Annex A, it would in contrast be questionable as

to whether the technical experts of the Patent Proprietor were reliable.

(i.13) The Opposition Division had been wrong when considering that the comparison between Example 4 and Comparative 1 of the patent in suit demonstrated the effect alleged by the Patent Proprietor.

(i.14) The only distinguishing feature between the composition of the patent in suit and the composition of Example 1 of D2 was the use of a fumarate ester instead of a maleate ester.

(i.15) It should hence have been shown that the alleged effect had its origin in this distinguishing feature. Reference was made in that respect to the decision T 197/86 (OJ EPO 1989, 371). This was not the case, since **butyl** maleate used in Comparative Example 1 of the patent in suit had been replaced by **ethyl** fumarate in Example 4 of the patent in suit (emphases by the Board).

(i.16) In the absence of a technical effect, the technical problem starting from document D2 had to be seen in the preparation of alternative compositions.

(i.17) It would have been obvious to solve this technical problem by replacing the maleate alkyl monoester in the compositions of D2 by a fumarate monoester since these components were presented as in equivalent in acrylic elastomers as shown by documents D1 and D3.

(i.18) Furthermore, D1 could be considered as the closest state of the art. Starting from D1, this would have represented an obvious alternative to use a combination of ethyl acrylate and butyl acrylate instead of ethyl acrylate or butyl acrylate alone in the polymerization mixture for the manufacture of the acrylic elastomer.

(ii) By the Respondent:

(ii.1) In document D8 it was not clear how the tests had been conducted, since there was no information concerning the conditions of polymerization of the elastomers, in particular of the composition of polymerization mixture.

(ii.2) The Patent Proprietor did not agree to the introduction of the ground of lack of novelty into the proceedings. In any case, the tests in D8 showed that the elastomer obtained from maleate and the elastomer obtained from fumarate were not the same, since their properties for example heat-ageing properties strongly differed.

(ii.3) In the decision of the Opposition Division, it had been considered that the change of maleate to fumarate led to an improvement of the compression set.

(ii.4) Thus, in the appeal proceedings, the burden of proof was on the Appellant to demonstrate that the findings of the Opposition Division were wrong.

(ii.5) Document D1 did not disclose the specific combination according to Claim 1 of the patent in suit.

Multiple selections (i.e. acrylic esters, the monoalkyl ester of the unsaturated dicarboxylic acid, the curing agent and the accelerator) had to be made in order to come to a composition according to the patent in suit.

(ii.6) Furthermore, the oil resistance and the compression set of the compositions exemplified in D1 were very bad.

(c) The Board, after deliberation, having informed the Parties of its opinion according to which the subject-matter of the main request met the requirements of Article 56 EPC, the discussion then moved to the question of apportionment of costs.

The arguments presented by the Parties in that respect may be summarized as follows:

(i) By the Respondent:

(i.1) Due to the late filing of experimental data by the Appellant short before the oral proceedings of 30 March 2006, no final decision had been taken at the end of this oral proceedings.

(i.2) Due to the late filing, it had been necessary to return to the written phase of the appeal proceedings and to set up a second oral proceedings.

(i.3) Reference was made to the Article 11a(1)(c) of the Rules of Procedure of the Boards of Appeal in that respect.



(i.4) Consequently, even if it would be considered that there was no abuse of procedure from the side of the Appellant, the request for apportionment of costs was justified.

(ii) By the Appellant:

(ii.1) The experimental data submitted by the Appellant with its Statements of Appeal had been criticized by the Respondent in its letter dated 22 August 2005.

(ii.2) The further experimental data submitted with the letter dated 17 March 2006 should be considered as a reply to the criticism of the Respondent.

(ii.3) The filing of these experimental data hence did not amount to an abuse of procedure.

(ii.4) Only minor amendments had been made in the tests submitted with the letter of 17 March 2006 in comparison to the tests submitted with the Statements of Grounds of Appeal. Thus, they could have been dealt with in the oral proceedings of 30 March 2006, and there was hence no reason for postponing the oral proceedings.

XVI. The Appellant requested that the decision under appeal be set aside and that the European patent No. 905 182 be revoked, and that the request for apportionment of costs be rejected.

The Respondent requested that the appeal be dismissed, or in the alternative that the decision under appeal is set aside and the patent be maintained on the basis of

auxiliary requests 1 to 3 submitted with the letter dated 28 July 2006. He further requested the additional costs incurred due to the second oral proceedings to be imposed on the Appellant.

## **Reasons for the Decision**

1. The appeal is admissible.
2. *Procedural matters*
  - 2.1 As indicated above in Section XIII, the Respondent submitted with its letter dated 28 July 2006 the documents D6, D6a, D7, Annex A and an Experimental Report containing Tables 1 to 5. As mentioned above in Section XIV, the Appellant filed, with its letter dated 28 July 2006, the documents D8 and D9.
  - 2.2 In this connection, the Board notes firstly that all these documents have been submitted before the date indicated in the communication of the Board of 10 April 2006 for further submissions, i.e. one month before the oral proceedings scheduled to take place on 29 August 2006.
  - 2.3 The Board further notes, on the one hand, that documents D6, D6a, D7 and D8 have been submitted by the Parties in relation to the point raised by the Board in its communication concerning the structure of maleate- and fumarate-monoalkyl ester containing acrylic elastomers, and, on the other hand, that document D9 has been submitted in order to deal with the point raised in the communication of the Board concerning the

"true" meaning of the wording "permanent set" in Example 1 of D2.

2.4 Concerning Annex A and the Experimental Report containing Tables 1 to 5 filed by the Respondent, it is clear, in the Board's view, that these documents represent counterstatements of the Respondent to the Experimental Report submitted by the Appellant with its letter dated 17 March 2006 which was admitted into the proceedings by the Board at the oral proceedings of 30 March 2006.

2.5 Thus, under these circumstances, the Board see no reason not to admit all these documents into the proceedings.

*Main Request*

3. *The patent in suit, the technical problem*

3.1 The patent in suit is concerned with acrylic elastomer compositions which can be used as a vulcanization molding material such as seal members or hoses for use in the automotive industry.

3.2 Such compositions are known from documents D1 and D2.

3.3 D1 relates to fast curing, scorch and heat resistant elastomeric compositions containing a dipolymer of an acrylic ester and a butenedioic acid monoester or a terpolymer of these monomers with ethylene (column 1, lines 10-14). These compositions are useful in the manufacture of automotive accessories such as hoses or seals (Abstract).

- 3.4 The acrylic ester component of the polymeric compositions of the present invention is methyl acrylate, ethyl acrylate, propyl acrylate, isopropyl acrylate, a butyl acrylate, methacrylate, ethyl methacrylate, propyl methacrylate, isopropyl methacrylate, or a butyl methacrylate. The butenedioic acid monoester component of the instant polymeric compositions may be, for example, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, phenyl, tolyl, xylyl, naphthyl, and dimethylnaphthyl monomaleate or monofumarate, including various isomers of the alkyl or aryl moiety. (Column 2, lines 3 to 15).
- 3.5 The polymeric compositions are vulcanized for about 0.5-45 minutes at about 160°C-235°C, preferably 10-30 minutes at about 175°C-180°C. Suitable curing agents include hexamethylenediamine (HMDA), hexamethylenediamine carbamate (HMDAC), tetramethylenepentamine (TEPA), HMDA-cinnamaldehyde adduct, and HMDA-dibenzoate salt, 4,4'-methylenedianiline, 4,4'-oxydiphenylamine, m-phenylenediamine, p-phenylenediamine, and 4,4'-methylenebis(o-chloroaniline), hexamethylene diamine carbamate and 4,4'-methylene dianiline being preferred. The amount of the amine used in this vulcanization process is about 0.06-0.30 mole of amino function per kilogram of polymer, preferably 0.12-0.22 mole per kilogram. Suitable vulcanization accelerators are alkali metal salts of weak inorganic acids and alkali metal hydroxides, alkali metal salts of weak organic acids, alkali metal alcoholates and phenolates, quaternary ammonium and quaternary phosphonium

hydroxides, alcoholates, phenolates, halides, and salts with weak acids, tertiary amines, guanidine, aryl- and alkylguanidines and heterocyclic tertiary amines (Column 2, line 31 to column 3, line 1).

- 3.6 In its Examples 1A to 15B, 20A, 20AA and 20B, D1 discloses rubber compositions obtained by vulcanizing ethylene/methyl acrylate/monoethyl maleate terpolymers. The compression set (after 70 hours at 150°C) determined according to the standard ASTM D-395 of the cured elastomers varies between 13% (Ex.15B) and 100% or more (Ex.20B). The oil swell (3 days at 150°C in ASTM oil No.3) determined according to ASTM D-471 of the cured compositions of Examples 1A to 15B varies between 82% (Example 13A) and 184% (Example 1B).

In its Examples 17A to 19B D1 discloses rubber compositions obtained by vulcanizing ethyl acrylate/monoethyl fumarate copolymers, but gives no information concerning the oil swell or the compression set of the cured rubber.

- 3.7 D2 relates to an oil-resistant hose made of a steam-vulcanized product of carboxyl group-containing acrylic elastomer, or a blend comprising the carboxyl group-containing acrylic elastomer and a carboxyl group-containing acrylic elastomer having ethylene further copolymerized therein. The carboxyl group-containing acrylic elastomer is a copolymer having copolymerized therein a maleic acid monoalkyl ester as a carboxyl group-containing monomer (paragraph [0004]).

- 3.8 Examples of alkyl acrylate (component (a)) used for the preparation of the carboxyl group-containing acrylic

elastomer are alkyl acrylates, the alkyl group of which has 1 to 8 carbon atoms and may have a substituent such as a cyano group, such as methyl acrylate, ethyl acrylate, n-propyl or isopropyl acrylate, n-butyl or isobutyl acrylate, n-amyl acrylate, n-hexyl acrylate, 2-ethylhexyl acrylate, n-octyl acrylate and 2-cyanoethyl acrylate; ethyl acrylate and butyl acrylate being preferred (paragraph [0006]).

Examples of an alkoxyalkyl acrylate (component (b)) used for the preparation of the carboxyl group-containing acrylic elastomer are alkoxyalkyl acrylates, the alkoxyalkyl group of which has 2 to 8 carbon atoms, such as methoxymethyl acrylate, ethoxymethyl acrylate, 2-methoxyethyl acrylate, 2-ethoxyethyl acrylate and 2-butoxyethyl acrylate. Of these, 2-methoxyethyl acrylate and 2-ethoxyethyl acrylate are preferably used. In the case when the above-mentioned components (a) and component (b) are used in combination, the proportion thereof is generally such that the former is about 10 to 90% by mol and the latter is about 90 to 10% mol. Furthermore up to about 20% by weight, of the component (a) and/or the component (b) may be substituted by, i.e., copolymerized with, other copolymerizable monomers, and, more specifically, up to about 10% by weight of the component (a) and/or the component (b) may be substituted by, i. e., copolymerized with diene monomers (paragraph [0006] to paragraph [0010]).

3.9 According to D2, the above-mentioned monomeric components are used in an amount of about 80 to 99.9% by weight in total, and the remainder (i.e., about 20 to 0.1% by weight), of monomer is a monoalkyl ester of maleic acid. such as monomethyl, monoethyl,

monoisopropyl, monobutyl and mono-octyl esters (paragraph [0011]).

3.10 The acrylic elastomers can be vulcanized by any vulcanizing agent, but, a polyamine compound is preferably used. As specific examples of the polyamine compound, hexamethylene diamine, hexamethylene diamine carbamate, tetramethylene pentamine, 4,4'-methylene dianiline, m-phenylene diamine and 4,4'-diaminodiphenyl ether. These polyamine compounds are used in an amount of about 0.1 to 10 parts by weight, preferably about 0.2 to 5 parts by weight, based on 100 parts by weight of rubber. The polyamine compounds are preferably used in combination with a vulcanization accelerator. The vulcanization accelerator includes alkali metal salts of organic acid or inorganic acid, and alkali metal hydroxides, quaternary ammonium salts and quaternary phosphonium salts, tertiary amines, and guanidines such as diphenylguanidine and tetramethylguanidine. The accelerator is used in an amount of about 0.1 to 10 parts by weight, preferably about 0.5 to 5 part by weight, based on 100 parts by weight of rubber (paragraphs [0015] and [0016]).

3.11 D2 discloses in its Example 1 the use of an elastomeric acrylic elastomer obtained by copolymerizing 46 wt% ethyl acrylate, 20 wt% n-Butyl acrylate 30 wt% methoxyethyl acrylate, and 4 wt% mono-n-butyl maleate (paragraph [0020]).

This elastomer is vulcanized using 1 part by weight per of methylene dianiline and 2 parts by weight of di-o-tolylguanidine per 100 parts by weight of the elastomer. The composition is subjected to press

vulcanization (primary vulcanization carried out in a mold at 160°C for 30 minutes, and secondary vulcanization carried out in an electric oven at 175°C for 2 hours). The vulcanizate obtained by press vulcanization is further tested for its **permanent set** [sic] (JIS K-6301; 150°C, 70 hours, 25% compression), and for its oil resistance (JIS K-6301, JIS No.3 oil, volume change after immersion at 150°C for 70 hours) (paragraph [0021]). According to Table 1 of D2, the press vulcanized composition of Example 1 exhibits an oil swell of 20% and a **permanent set** [sic] of 13% (emphases by the Board).

- 3.12 According to the patent in suit its aim is to provide acrylic elastomer compositions having distinguished metal corrosion resistance, oil resistance and compression set characteristics (patent in suit, paragraph [0010]).
- 3.13 While D1 and D2 clearly deal with the oil resistance of the hoses made from the elastomeric compositions disclosed therein, they do not expressly refer to the metal corrosion resistance of the cured elastomer compositions described therein. Nevertheless, the Board notes that the Respondent (Patent Proprietor) has stated in its letter dated 14 April 2004 (page 10, first and second paragraphs), that the elastomeric hoses of the patent in suit as well as those of D1 and D2 have to fulfil specific requirements as regards to the resistance against specific environmental influences, so that it can be considered, in the Board's view, that D1 and D2 are also implicitly concerned with the metal corrosion resistance of the



hoses made from the elastomeric composition disclosed therein.

3.14 The Board further observes that, although document D2 seems in paragraph [0021] and in its Example 1 to refer the permanent set and that D1 apparently makes a distinction between "permanent set" and "compression set" (cf. Table IV), all the Parties in their respective letters dated 28 July 2006 have agreed that the reference to a "permanent set" in D2 must indeed be read as "compression set" as referred to in the patent in suit and in document D1. Since this interpretation is further supported by the reference in D2 to the standard JIS K-6301 and the reference in document D9 (page 4, line 16) to the determination of the compression set in accordance with JIS-K-6301 (ASTM D 395), the Board hence considers that D2 is also concerned with the compression set of the elastomers disclosed therein.

3.15 As stated in the decision T 989/93 of 16 April 1997, (not published in OJ EPO; Reasons, point 12), the closest state of the art should normally be represented by a document which deals with the same problem.

3.16 While D2 has been considered as the closest state of the art in the decision under appeal, the Appellant, at the oral proceedings before the Board, has also used D1 as starting point for the assessment of inventive step.

3.17 Although, in view of the considerations in paragraphs 3.12 and 3.13 above, D1 and D2 could be both regarded as meeting the requirements set out in decision T 989/93 to be used as starting point for the

assessment of inventive step, since they both refer, explicitly, to the oil resistance and the compression set and, implicitly, to the metal corrosion resistance of the elastomer compositions disclosed therein, the compositions disclosed in D2 (cf. in particular Example 1 thereof) come closer to those according to the patent in suit than those disclosed in D1, in terms of the combination of the acrylic ester component to be used for the manufacture of the acrylic elastomer and in terms of the curing system (aromatic amine + guanidine) to be used for vulcanizing the acrylic elastomer, so that document D2 represents, in the Board's view, a more appropriate starting point than document D1.

3.18 Thus, starting from D2, the technical problem may be seen in the provision of acrylic elastomer compositions which enables the manufacture of molded parts such as hoses having a good metal corrosion resistance, a good oil resistance and improved compression set (cf. also paragraph [0006] of the patent in suit).

3.19 While, according to the problem-solution approach, it should, at this stage, normally be established by which distinguishing technical features the patent in suit proposes to solve this technical problem, the Board notes that the Appellant has submitted that the acrylic elastomers defined in Claims 1 and 2 of the patent in suit were indistinguishable from the composition disclosed in Example 1 of D2, and that therefore the subject-matter of these claims lacked novelty over D2.

3.19.1 In this connection, the Board firstly observes that the only ground of opposition raised and substantiated by

the Appellant (Opponent) in its Notice of Opposition was lack of inventive step.

- 3.19.2 The Board further states that the ground of lack novelty has neither been introduced nor dealt with by the Opposition Division in the decision under appeal.
- 3.19.3 It thus follows that the ground of opposition of lack of novelty constitutes a fresh ground of opposition within the meaning of the decision G 10/91 (OJ EPO, 1993, 420; Opinion point 3), which may not be introduced into the appeal proceedings without the agreement of the Patent Proprietor (Respondent), that is not the case here (cf. Section XV (b)(ii.2) above).
- 3.19.4 Nevertheless, as stated in point 7.2 of the Reasons of the decision G 1/95 (OJ EPO, 1996, 615), if the closest prior art destroys the novelty of the claimed subject-matter, such subject-matter obviously cannot involve an inventive step.
- 3.19.5 In that respect, the main argument of the Appellant concerning the lack of distinction between the compositions according to Claims 1 and 2 of the patent in suit and that of Example 1 of D2 was based on the fact that the difference in the way of preparing the compositions (i.e. using a fumarate monoester according to the patent in suit instead of a maleate monoester according to Example 1 of D2) resulted in no difference in the final crosslinked product.
- 3.19.6 According to the Appellant, once the maleate monoester or the fumarate monoester is incorporated in the acrylic elastomer, the difference between the cis-

(maleate) and the trans- (fumarate) configurations disappears since the double bond is converted into a single bond during polymerization and since there is hence a possibility of free rotation of the esters and carboxylic acid groups. Thus, according to the Appellant, no difference could be seen between an acrylic elastomer obtained using a fumarate monoester and an acrylic elastomer obtained from a maleate monoester.

3.19.7 While the Appellant has referred in that respect to document D8, this document cannot, in the Board's view, support this allegation for the following reasons:

- (a) Document D8 (page 1, fourth paragraph) indeed acknowledges that a maleate monoalkyl ester and a fumarate monoalkyl ester have different reactivities in the copolymerization with the other monomers used in the polymerization mixture for preparing the acrylic elastomer.
- (b) Due to these different copolymerization rates, this must inevitably imply, in the Board's view, that the degree and kind of incorporation of maleate and fumarate in the acrylic elastomer are different.
- (c) This implies that replacing 4% by weight of maleate monoester in the composition of Example 1 of D2 by 4% by weight of the corresponding fumarate ester would not lead to an acrylic copolymer having the same amount and the distribution of succinate ester units in its polymeric chain.

- (d) This fact is, in the Board's view, also implicitly corroborated in D8 (first page fourth paragraph), which states that "**when** (emphasis by the Board) the same amounts of the monoalkyl esters are incorporated in the acrylic elastomers, the two elastomers exhibit substantially the same properties..."
- (e) In other words, there are considerable doubts as to whether replacing the maleate ester by its corresponding fumarate ester in Example 1 of D2 would lead to the same elastomer.
- (f) These doubts are also justified in view of Table IV of the document D8. Independently of the fact that it is not indicated in D8 how the same amounts of cure site monomer have been incorporated in the acrylic elastomer (i.e. as to whether the conditions of Example 1 of D2 would have to have been modified in order to achieve the same level of incorporation of the corresponding fumarate as the level of incorporation achieved for the maleate in Example 1 of D2), the Board notes that the properties of the elastomers obtained by copolymerizing either a monomaleate or a monofumarate such as the changes in modulus and elongation after heat aging differs so significantly (e.g. decrease of 1% of the modulus and of 6% of the elongation for the maleate after 70 hours at 175°C in comparison to a decrease of 24% of the modulus and an increase of 11% of the elongation of the fumarate; decrease of elongation 41% for the maleate after 500 hours at 175°C in

comparison to a decrease of 22% for the elongation of the fumarate), that the final elastomer compositions cannot be considered to be the same.

- (g) These doubts are further corroborated by the document D6a (D6, D7). Although D6a is the translation of the post published Japanese patent application JP 11-343378 (D6) (corresponding to the WO-A-099/50349 (D7)) which has been filed by the present Appellant, it provides, in the Board's view, further indicia of differences between acrylic elastomers obtained by copolymerization of monomaleate and acrylic elastomers obtained from fumaric monoester, since D6a discloses that problems encountered (e.g. pressure resistance) with the use of elastomers prepared by copolymerization of maleic monoester such as those of D2 can be overcome by replacing the maleic acid monoester by a fumaric acid monoester in the copolymerization of the acrylic elastomer (cf. D6a, paragraph [0003] to paragraph [0006]).

3.20 Consequently, the Board can only come to the conclusion that it has not been shown that the composition according to Example 1 of D2 is indistinguishable from the compositions according Claims 1 and 2 of the patent in suit.

3.21 It should hence be considered that the solution to the technical problem defined above proposed by the patent in suit consists in the use of a fumarate alkyl monoester as comonomer in the preparation of the acrylic elastomer component of the acrylic elastomer

composition according to Claims 1 and 2 of the patent in suit.

- 3.22 Consequently, it must be now be checked whether the technical problem is effectively solved by the claimed measures.
- 3.23 In that respect, it has been considered in the decision under appeal that the comparison between Example 4 and Comparative Example 1 of the patent in suit showed that the replacement of a maleate monoester by a fumarate monoester led to an improvement of the compression set.
- 3.24 The Board however notes that the Appellant has contested at the Oral Proceedings before the Board the validity of the comparison made by the Patent Proprietor in the patent in suit, since the composition of Comparative Example 1 uses a n-butyl maleate while the composition of Example 4 uses the ethyl fumarate. This was in its view supported by the considerations made in decision T 197/86.
- 3.25 In this connection, the Board observes that the compression set of the composition of Example 4 is given as 12% (cf. Table 3) while the compression set of the composition of Comparative Example 1 is given as 22%, and that the properties of the compositions of Example 4 in terms of oil resistance and metal corrosion resistance are very similar to those of the composition of Comparative Example 1.
- 3.26 The Board further observes that the composition of Comparative Example 1 is a composition falling under the definition of the elastomer compositions according

to D2, in that the elastomer has been prepared from a monomer composition comprising 46% by weight of ethylene acrylate, 30% of n-butyl acrylate, 20% of methoxyethyl acrylate and 4% of n-butyl maleate, and that the elastomer has been cured using an aromatic diamine and a guanidine. In other words, Comparative Example 1 is representative of an elastomer composition according to D2 and the composition of Example 4 differs from that of Comparative 1 by the use of a fumarate monoester instead of a maleate monoester.

- 3.27 As indicated in the decision T 197/86 relied on by the Appellant, where comparative tests are chosen to demonstrate an inventive step with an improved effect over a claimed area, the nature of the comparison with the closest state of the art must be such that the effect is convincingly shown to have its origin in the distinguishing feature of the invention (T 197/86, Reasons point 6.1.3).
- 3.28 In the present case, it firstly cannot be denied, in the Board's view, that the composition of Example 4 differs from the composition of Comparative Example 1 by the use of monofumarate instead of a monomaleate, and that the composition according to Comparative Example 1 is representative of elastomeric compositions according to D2.
- 3.29 While it is true, as submitted by the Appellant, that the alkyl group of the monoester is not the same in Example 4 as in Comparative Example 1, it should, however, be noted that D2 makes no distinction between the use of monomethyl maleate, monoethyl maleate, monoisopropyl maleate, monobutyl maleate and monoethyl



maleate in the acrylic elastomer (cf. paragraph [0011]), let alone gives any indication concerning the influence of the choice of the maleate alkyl ester on the compression set, so that there was *prima facie* no reason for the Opposition Division to suppose that the choice of the alkyl group of the maleate monoester might significantly influence the compression set of the cured elastomer. Nor is it apparent, in view of the minutes of the Oral Proceedings before the Opposition Division, that such an argument was raised by the Opponent against the validity of comparison between Example 4 and Comparative Example 1 of the patent in suit.

3.30 Furthermore, the Experimental Report submitted by the Opponent (Appellant) with its letter dated 17 September 2004 before the oral proceedings in front of the Opposition Division and considered by the Opposition Division in its decision shows that an acrylic elastomer composition obtained using butyl fumarate (Example 2) as comonomer exhibits a better compression set than a corresponding composition obtained using butyl maleate (Example 4) as comonomer.

3.31 Under these circumstances, it is conceivable, in the Board's view, that the Opposition Division could indeed have been convinced that the improvement of compression set had been shown to have its origin in the distinguishing feature of the claimed invention.

3.32 Since the Opposition Division has considered in its decision that the replacement of a maleate monoester by a fumarate monoester led to a better compression set of the cured elastomer, this has for its consequence that

the burden of proof is on the Appellant to demonstrate that the decision of the Opposition Division was wrong in that respect (cf. by analogy T 585/92 (OJ EPO 1996, 129; Reasons point 3.2), i.e. to substantiate its allegation that the replacement of a maleate monoester by the corresponding fumarate monoester in the preparation of the acrylic elastomer does not lead to an improvement of the compression set of the cured elastomer composition.

3.33 In that context, the Appellant has firstly submitted with its letter dated 5 April 2005 comparative tests based, in its view, on repetitions of Example 1 of D2 and of Examples 2 and 4 of the patent in suit. While these tests have been criticized by the Respondent as not being fair repetitions of these examples due to change in the elastomer composition (e.g. amount of stearic acid, use of processing aid Greg-8205) and in the curing conditions (temperature and duration of the vulcanization steps), the Board notes that the "repetition" of Example 1 of D2 by the Appellant shows a better compression set in the case of the use of monobutyl maleate (11.8%) than for monobutyl fumarate (12.3%), but that the "repetitions" of Example 2 and 4 of the patent in suit show that a better compression set is obtained when monobutyl fumarate is used (18.0%) instead of monobutyl maleate (19.5%) and when monoethyl fumarate is used (12.2%) instead of monoethyl maleate (13.5%).

3.34 The additional comparative experiments submitted by the Appellant with its letter dated 17 March 2006 comprise two sets of tests. The first one (cf. Table III) is based on a repetition of Example 1 of D2 and of

Examples 2 and 4 of the patent in suit but using the curing conditions defined in the patent in suit (cf. page 5, lines 51-53) and a second set (Table IV) is based on a repetition of Example 1 of D2 and of Examples 2 and 4 of the patent in suit but using substantially the curing conditions defined in D2 (cf. paragraph [0021] thereof).

3.35 While Table III shows that the maleate monoester leads to a better compression set than the corresponding fumarate monoester in the repetition of Example 1 of D2 and of Example 2 of the patent in suit (10.9% instead of 11.5% and 15.5% instead of 16.5%, respectively), it is noted by the Board that the fumarate monoester leads to a better compression set in the repetition of Example 4 of the patent in suit (9.8 instead of 10.2%). The Board further observes that Table IV also contains diverging results concerning the effect of the maleate and the fumarate monoester, i.e. while the maleate monoester leads to a better compression set in the repetition of Example 1 of D2 (11.4% instead of 11.9%), the repetition of Example 2 and 4 of the patent in suit shows an improvement of the compression set when the fumarate monoester is used (17.3% instead of 18.1% and 11.4% instead of 11.9%).

3.36 While as shown in the preceding paragraphs above, the experiments submitted by the Appellant give divergent results concerning the effect of the replacement of a maleate monoester by the corresponding fumarate monoester on the compression set, the Board observes that the tests carried out by the Respondent, as summarized in Tables 1, 2, 3 and 5 of the Experimental Report submitted with the letter dated 28 July 2006,

**consistently** illustrate that the use of a fumarate monoester in place of the corresponding maleate monoester confers a clearly better compression set to the cured elastomer composition obtained therefrom. This is shown by the repetition of Example 1 of D2 as presented in D2 (i.e. based on 4% by weight of the maleate or fumarate monobutyl ester; cf. Table 1; compression set 13% when using a fumarate monoester instead of 21% when using the corresponding maleate monoester), by the repetition of the "true" Example 1 of D2 (cf. Annex A which contains a declaration of the inventors of D2 according to which the amount of maleate monoester was indeed 7% instead of 4% as erroneously indicated in D2; cf. also Table 2, 11% compression set for the fumarate instead of 15% for the maleate monoester), by the further comparisons based on Example 1 of D2 in Table 3 (compression set of the fumarate monoester based elastomer compositions of respectively 10, 10, 10 and 12% in comparison to respectively 22, 18, 24 and 15% for the corresponding maleate monoester based elastomer compositions) and by the additional comparative tests based on Example 2 and 4 of the patent in suit (cf. Table 5; compression sets of the fumarate monoester based elastomer compositions 20, 11, 13 10 and 12% respectively to be compared with the compression sets of the respective corresponding maleate monoester elastomer compositions of 60, 48, 52, 33 and 30%).

3.37 The Board also notes that in view of the contrary conclusions drawn by the Parties concerning the existence (Respondent) or of the non existence (Appellant) of the improvement of the compression set from their respective experimental data, each Party has

respectively relied on considerations made in the decision T 219/83 (cf. Sections XIII (iv.9) and XV (b)(i.8) above), and has hence respectively concluded that the benefit of the doubt should be given to him in respect of the question of the existence (Respondent) or non existence (Appellant) of the alleged effect.

3.38 In the Board's view, the present case however differs substantially from the case under consideration in the decision T 219/83 where contrary **assertions** had been made by the Parties, in that it is here **conflicting experimental data** which have been submitted by the Parties. This has for its consequence that the question of the existence or not of the improvement of the compression set is not, in the Board's view, to be decided by establishing to whom the benefit of the doubt is to be given, but in accordance with the established jurisprudence of the Boards of Appeal, it is to be decided on the basis of the overall balance of probability, i.e. that one set of facts is more likely to be true than another.

3.39 In that respect, the Board, having regard to all the evidence adduced by the Parties and hence to the overwhelming evidence of the Respondent in comparison with the much more marginal and in any case somewhat divergent and even self contradictory results provided by the Appellant, has no hesitation in deciding, on the balance of probability, that it is more likely that the replacement of a maleate monoester by the corresponding fumarate monoester in the preparation of the acrylic elastomer leads to an improvement of the compression set of the cured elastomer.

3.40 Since as indicated above in paragraph 3.32, the burden of proof in the present case was upon the Appellant to establish that the improvement of the compression set did not exist, this inevitably implies that the Appellant has not discharged the burden of proof for its contention.

3.41 Consequently, the Board comes to the conclusion that the proposed solution provides an effective solution to the technical problem.

#### 4. *Inventive step*

4.1 It remains to be decided whether the claimed subject-matter was obvious to a person skilled in the art having regard to the relevant prior art.

4.2 Document D2, as shown above in paragraphs 3.7 to 3.11, mentions only the use of maleate monoester as comonomer in the preparation of acrylic elastomer. Hence, it cannot hence provide a hint to the solution proposed in the patent in suit.

4.3 While it is true that document D1 envisages the use of fumarate monoester in the manufacture of acrylic elastomer (column 2, lines 9 to 15), there is no indication in D1 as to whether using a C<sub>1</sub>-C<sub>5</sub> fumarate monoester in combination with at least two acrylic esters selected from ethyl acrylate, butyl acrylate and methoxyethyl acrylate (cf. Claim 1 of the patent in suit) or in combination with a C<sub>1</sub> to C<sub>8</sub>-alkyl acrylate and a C<sub>2</sub> to C<sub>8</sub>-alkoxyalkyl acrylate (cf. Claim 2 of the patent in suit) in the preparation of an acrylic elastomer would lead to elastomeric compositions having

improved compression set when cured with a system comprising an aromatic polyamine and a guanidine. This is primarily because, although D1 discloses the compression set of cured elastomer compositions obtained using a maleate monoester (ethyl maleate) as comonomer, it does not even mention, as indicated above in paragraph 3.6 above, the compression set of the compositions obtained using a fumarate monoester (ethyl fumarate), so that not even the slightest indication can be derived from D1 as to a possible effect of a fumarate monoester on the compression set in comparison to a maleate monoester. This is also because it does not even mention the use of a further acrylic ester, since it merely refers to acrylic dipolymer consisting of an acrylic ester and a monoester of butenedioic acid and to terpolymers consisting of ethylene/acrylic ester/monoester of butenedioic acid (column 1, lines 33 to 36). Consequently, D1 cannot suggest the solution proposed by the patent in suit.

- 4.4 Document D3 generally relates to an elastomeric acrylic copolymer consisting essentially of an acrylic acid ester and 0.2 to 15% by weight, based on said acrylic acid ester, of a partial ester of an unsaturated polycarboxylic acid having  $n$  carboxyl groups wherein  $n$  is an integer of not less than 2 and  $n-1$  carboxyl groups are esterified with an alkyl alcohol having 1 to 4 carbon atoms (column 2, lines 25 to 27). The acrylic elastomer is crosslinkable and can provide a crosslinked product having both excellent alkali resistance and oil resistance (column 2, lines 42 to 45).

4.5 According to D3 representative examples of the partially esterified unsaturated polycarboxylic acid are an unsaturated dicarboxylic acid monoester, e.g. an itaconic acid monoester such as monomethyl itaconate, monoethyl itaconate, monopropyl itaconate or monobutyl itaconate, or a fumaric acid monoester such as monomethyl fumarate, monoethyl fumarate, monopropyl fumarate or monobutyl fumarate; an unsaturated tricarboxylic acid ester, e.g. an aconitic acid diester such as dimethyl aconitate, diethyl aconitate or methylethyl aconitate, itaconic acid monoesters such as monomethyl itaconate and monoethyl itaconate being particularly preferred. The partially esterified polycarboxylic acids may be used alone or in admixture thereof (column 3, lines 9 to 30).

4.6 According to D3 any of acrylic acid esters which have been usually used in the preparation of acrylic rubbers can be used in the acrylic elastomer. Representative examples of the acrylic acid esters are an alkyl acrylate such as methyl acrylate, ethyl acrylate, butyl acrylate or 2-ethylhexyl acrylate, an alkoxyalkyl acrylate such as methoxyethyl acrylate, and the like. Alkyl acrylates having a C<sub>1</sub> to C<sub>8</sub> alkyl group and alkoxyalkyl acrylates having a C<sub>2</sub> to C<sub>8</sub> alkoxyalkyl group wherein the alkoxy group has 1 to 4 carbon atoms are generally used (column 3, lines 31 to 42). According to D3 it is preferable to use a mixture of 10 to 50% by weight of methyl acrylate, 30 to 85% by weight of ethyl acrylate and 5 to 30% by weight of methoxyethyl acrylate, because an acrylic rubber with well-balanced oil resistance and low temperature resistance is obtained (column 3, lines 46 to 51).



According to D3, the acrylic rubber can be cured by a curing agent or crosslinking agent, e.g. an amine compound such as hexamethylene diamine carbamate, N,N'-dicynnamylidene-1,6-hexanediamine or 4,4'-methylene-bis(cyclohexylamine) carbamate (column 4, lines 21 to 26). The crosslinked product of the acrylic rubber has excellent alkali resistance and oil resistance, in addition to other properties, such as heat resistance, water resistance, weatherability and ozone resistance and can be suitably employed in molding into seal, gasket, O-ring or roll (column 4, lines 32 to 39).

More specifically, D3 discloses in its Examples 1, 3 and 4 rubber compositions obtained by vulcanizing with hexamethylene diamine carbamate as curing agent an elastomer being a copolymer of ethyl acrylate and a monoester of itaconic acid (monomethyl in Examples 1 and 3, and monoethyl in Example 4) or a copolymer of ethyl acrylate, methoxyethyl acrylate and monomethyl itaconate (Example 3) and in its Example 2 a rubber obtained by vulcanizing an acrylic elastomer being a copolymer of ethyl acrylate and monoethyl fumarate. The compression set after 70 hours at 150°C determined according to JIS K 6301 varies between 29.7% (Example 1) and 40.7% (Example 4) for the rubber based on an itaconate monoester and is given as 38.8% for the rubber based on the fumarate monoester.

- 4.7 It is hence not only evident that D3 does not disclose the specific curing system according to the patent in suit, but moreover that the compression set indicated for the acrylic elastomer composition based on the fumarate monoester in D3 (Example 2) is much worse than the compression set obtained in the composition of

Example 1 of D2. Consequently, D3 cannot suggest to replace the maleate monoester in the compositions of D2 by a fumarate monoester in order to improve the compression set of the elastomeric compositions cured with an aromatic amine and a guanidine. D3 is therefore of no help for solving the technical problem.

4.8 Document D4 refers to random elastomeric copolymers having very good resistance to oil and low temperatures that render them suitable for a wide variety of industrial applications, such as hoses or seals (column 1, lines 16 to 19; column 3, lines 5 to 9). More specifically, it relates to a random copolymer comprising ethylene, an alkyl acrylate selected from methyl and ethyl acrylate, and about from 0.5 to 10 weight percent of a monoester of 1,4-butenedioic acid in which the alkyl group of the ester has 1 to 6 carbon atoms (column 1, lines 20 to 25). The copolymer when vulcanized is elastomeric and has a brittle point of less than about  $-40^{\circ}\text{C}$  and an oil swell of less than about 120% after immersion in ASTM No.3 oil for 70 hours at  $150^{\circ}\text{C}$  (column 1, lines 29 to 32). Generally, methyl acrylate is preferred, and comprises about from 40 to 62 weight percent of the terpolymer, preferably 52-58 weight percent. According to D4 monoalkyl esters of either maleic acid and fumaric acid are satisfactory, monomethyl maleate, monoethyl maleate, and monopropyl maleate being particularly preferred (column 1, lines 35 to 48).

4.9 While D4 discloses that the elastomeric compositions can be vulcanized amine curing agents, such as hexamethylene diamine, hexamethylene diamine carbamate, tetramethylene pentamine, hexamethylene diamine

cinnamaldehyde adduct, hexamethylene diamine dibenzoate salt, and aromatic amines (column 3, lines 13 to 16, 43 to 49), it does not mention the use of accelerators let alone of guanidine. Furthermore, D4 gives absolutely no information of the compression set of the rubbers prepared from the elastomeric copolymers and it only exemplifies terpolymers containing a maleate monoester (cf. Tables I and II). Consequently, D4 cannot suggest the solution proposed by the patent in suit.

4.10 Document D5 is even less relevant than documents D1 to D4, since, although dealing with the structure of acrylic elastomers and properties thereof such as oil resistance, heat resistance and low temperature flexibility (cf. Paragraph 2 "Target properties and monomers"), it neither mentions the use of maleate nor fumarate monoalkyl esters as comonomers, nor is it concerned with the problem of compression set of the vulcanized acrylic elastomers.

4.11 Consequently, the subject-matter of Claims 1 and 2, and by the same token that of dependent Claims 3 to 4 involves an inventive step (Article 56 EPC).

4.12 It thus follows that the main request of the Respondent is allowable. Since the main request is allowable there is no need for the Board to deal with the auxiliary requests of the Respondent.

## 5. *Apportionment of costs*

5.1 According to Article 11a(1) of the Rules of Procedure of the Boards of Appeal, "subject to Article 104(1) EPC, the Board may on request order a party to pay some or

all of another party's costs which shall, without limiting the Board's discretion, include those incurred by any:

- (a) amendment pursuant to Article 10b to a party's case as filed pursuant to Article 10a(1)
- (b) extension of a time limit;
- (c) acts or omissions prejudicing the timely and efficient conduct of oral proceedings;
- (d) failure to comply with a direction of the Board;
- (e) abuse of procedure."

- 5.2 In the present case, the Appellant has submitted thirteen days before the oral proceedings scheduled to take place before the Board on 30 March 2006 a new experimental report presented as a response to the Respondent's submissions dated 22 August 2005.
- 5.3 In that respect, the Board observes firstly that, even if the filing of this new experimental report would be considered as an answer to the deficiencies alleged by the Respondent in its letter dated 22 August 2005 in respect of the previous experimental report submitted by the Appellant with its letter dated 5 April 2005, no reasons for the delay (i.e. about 8 months) have been given by the Appellant.
- 5.4 The Board further notes that the summons to attend the oral proceedings scheduled to take place on 30 March 2006 has been issued on 17 November 2005. It is hence evident, in the Board's view, that the Appellant should have been well aware at that time of the criticism expressed by the Respondent in its letter dated 22 August 2005 concerning the relevance of its first experimental report data, so that it could have asked

for a postponement of the oral proceedings before the Board in order to enable further comparative experiments to be carried out, if deemed appropriate. The Board can only state, however, that such a request was never presented.

5.5 The Board further observes that, while the Respondent, in view of the late submission of this experimental has asked with its letter dated 24 March 2006 for postponement of the oral proceedings of 30 March 2006, the Appellant with its letter dated 27 March 2006 strongly objected to such a postponement. Since, in the Board's view, the question of postponing the oral proceedings was linked to the question of whether the late filed experimental report should be introduced into the proceedings, the Board has deemed it appropriate to maintain the oral proceedings of 30 March 2006 in order to hear the arguments of the Parties concerning the relevance of the late-filed experimental report of the Appellant, and hence to decide on the introduction or not of this report into the proceedings.

5.6 As a result of the admission of this experimental data into the proceedings and of the, in the Board's view, equitably justifiable consequential request of the Respondent to be allowed sufficient time to file counter-experiments, the oral proceedings of 30 March 2006 before the Board did not result in a final decision with regard to the patentability of the claimed subject-matter.

5.7 Thus, even if the Board were inclined to consider that the Appellant, through inadvertence, has envisaged only

at a very late stage that it could be appropriate to reply to the criticism made by the Respondent in its letter dated 22 August 2005 in respect of its first experimental report, and that hence the filing of the experimental report by the Appellant with its letter dated 17 March 2006 did not represent an abuse of proceedings, it is nevertheless evident that the very late filing of this experimental report has delayed the final outcome of the proceedings, and has necessitated holding a second oral proceedings before the Board on 29 August 2006.

5.8 Consequently, in accordance with Article 11a(1)(c), the Board finds it appropriate for reasons of equity to order a different apportionment of costs under Article 104(1) EPC. It is consequently justified that the Appellant shall pay the Respondent the costs reasonably incurred by the Respondent for attending the second oral proceedings on 29 August 2006, i.e. the travel expenses and the remuneration for one day of its representative.

**Order**

**For these reasons it is decided that:**

1. The appeal is dismissed.
  
2. The Appellant is ordered to pay to the Respondent the costs reasonably incurred by the Respondent in attending the second oral proceedings before the Board.

The Registrar:

The Chairman:

E. Görgmaier

R. Young