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# D E C I S I O N
# of 27 May 2004

**Case Number:** T 0658/02 - 3.3.3

**Application Number:** 94921115.5

**Publication Number:** 0668298

**IPC:** C08F 22/06

**Language of the proceedings:** EN

**Title of invention:**
Maleic acid copolymer, process for producing the same and use thereof

**Patentee:**
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**Opponent:**
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European Patent Department City Point
The Procter & Gamble Company
BASF Aktiengesellschaft, Ludwigshafen

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 100(c), 123(2)

**Keyword:**
"Opposition grounds - extension of subject-matter"

**Decisions cited:**
-

**Catchword:**
-

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**Case Number:** T 0658/02 - 3.3.3

# D E C I S I O N
## of the Technical Board of Appeal 3.3.3
## of 27 May 2004

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**Representative:** -

**Decision under appeal:** **Decision of the Opposition Division of the European Patent Office dated 16 April 2002 and issued in writing on 26 April 2002 revoking European patent No. 0668298 pursuant to Article 102(1) EPC.**

**Composition of the Board:**

**Chairman:** R. Young
**Members:** A. Däweritz
A. Pignatelli

## Summary of Facts and Submissions

I. The grant of European patent No. 0 668 298 in respect of European patent application No. 94 921 115.5, based on International patent application PCT/JP94/01180, filed on 18 July 1994 and published under No. WO-A-95/03342 on 2 February 1995, claiming the priorities of 20 July 1993, 18 March 1994 and 2 June 1994, respectively, of three earlier patent applications in Japan (178946/93, 49375/94 and 121578/94), was announced on 31 March 1999 (Bulletin 1999/13) on the basis of a set of 17 claims, Claims 1, 3, 5, 10 and 14 of which read as follows:

"1. A maleic acid-based copolymer which has a level of adsorption to clay within the range of 20 to 90 % and has a calcium ion-stabilization degree constant of 4.0 or larger, wherein said copolymer is a copolymer of maleic acid, maleic acid salt or mixtures thereof and a water-soluble ethylenically unsaturated monomer in a ratio of 95/5, to 5/95 by molar amount, said copolymer having a weight-average molecular weight of 1,000 to 100,000.

3. A maleic acid-based copolymer as in claim 1 or 2, wherein said level of adsorption to clay is within the range of 30 to 70 % and wherein said calcium ion-stabilization degree constant is within the range of 4.2 to 6.0.

5. A detergent composition which comprises:

a maleic acid-based copolymer having a level of adsorption to clay within the range of 20 to 90 %

and having a calcium ion-stabilization degree constant of 4.0 or larger, wherein said copolymer is a copolymer of maleic acid, maleic acid salt or mixtures thereof and a water-soluble ethylenically unsaturated monomer in a ratio of 95/5 to 5/95 by molar amount, said copolymer having a weight-average molecular weight of 1,000 to 100,000; and a surfactant.

10. A process for producing a maleic acid-based copolymer according to claim 1, which comprises the steps of:
charging a material (A) into a reaction vessel, in such a manner that the concentration of said material (A) will be 35 % by weight or higher, wherein said material (A) is maleic acid and/or its salt;
adding hydrogen peroxide into said reaction vessel after said charging step, in such a manner that the amount of hydrogen peroxide is within the range of 3 to 20 % by weight of said material (A); and
adding a water-soluble ethylenically unsaturated monomer (B) into said reaction vessel after said charging step and within 30 to 500 minutes after initiation of a reaction, in such a manner that the ratio (A)/(B) is within the range of 95/5 to 5/95 in mol ratio, wherein the adding of said monomer (B) is completed 10 to 300 minutes later than completion of said step of adding hydrogen peroxide.

14. A detergent composition which comprises:

a maleic acid-based copolymer according to claim 1; and a surfactant;

wherein said maleic acid based copolymer is obtainable by a process including the steps of:

charging a material (A) into a reaction vessel, in such a manner that the concentration of said material (A) will be 35 % by weight or higher, wherein said material (A) is maleic acid and/or its salt;

adding hydrogen peroxide into said reaction vessel after said charging step, in such a manner that the amount of hydrogen peroxide is within the range of 3 to 20 % by weight of said material (A); and

adding a water-soluble ethylenically unsaturated monomer (B) into said reaction vessel after said charging step and within 30 to 500 minutes after initiation of a reaction, in such a manner that the ratio (A)/(B) is within the range of 95/5 to 5/95 in mol ratio, wherein the adding of said monomer (B) is completed 10 to 300 minutes later than completion of said step of adding hydrogen peroxide."

The further independent product-by-process Claims 15, 16 and 17 related to an inorganic pigment-dispersing agent, a water-treating agent and a fibre-treating agent, respectively, each of them comprising a maleic

acid-based copolymer according to Claim 1 which was defined in the same way as in Claim 14.

Dependent Claims 2, 4, 6 to 9 and 11 to 13 related to elaborations of the subject-matter of the respective preceding independent claims.

II. Notices of Opposition were filed by three Opponents on 17, 23 and 24 December 1999, respectively, in which revocation of the patent in its entirety was requested on the grounds of Articles 100(a), (b) and (c) EPC, because the subject-matter of the claims lacked novelty and inventive step, was excluded from patentability under Article 52(2)(a) EPC and extended beyond the content of the application as filed, and the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The grounds of opposition under Article 100(a) EPC were initially based on five patent documents, six pieces of literature relating to commercial products and two experimental reports, the patent documents including:

D7: US-A-4 555 557,

D8: EP-A-0 075 820,

D9: EP-A-0 451 508 and

D12: JP-A-52-004 510 (1977; German translation provided with the Notice of Opposition)

In the Notice of Opposition of Opponent 02, it was pointed out that the essential feature of the copolymer requiring the molar ratio of the maleic acid or salt to water-soluble ethylenically unsaturated monomer to be from 95/5 to 5/95 had been introduced only during the grant procedure, which, however, had had no basis in the application as originally filed. Moreover, the molar ratio of the monomers had only been disclosed in relation to the specific process claimed (cf. Claim 10, above), and "when these ratio's are used in the process, this does not mean the resulting copolymer has these ratio's as well" (item 3.4).

III. In a decision announced orally on 16 April 2002 and issued in writing on 26 April 2002, the patent was revoked for lack of novelty in view of each of D9 and D12 and in view of the non-patent literature, respectively, including public prior use with regard to the product literature mentioned above.

The objections based on the grounds of opposition under Articles 100(b) and 100(c) EPC were, however, rejected.

IV. On 25 June 2002, a Notice of Appeal against the above decision was filed by the Patent Proprietor (Appellant) with simultaneous payment of the prescribed fee.

In the Statement of Grounds of Appeal, received on 22 August 2002, the Appellant disputed the reasons given in the decision and further requested that the patent in suit be maintained on the basis of a set of Claims 1 to 15 forming a new Main Request, Claim 1 of which read as follows:

"1. A maleic acid-based copolymer which has a level of adsorption to clay within the range of 30 to 70 % and has a calcium ion-stabilization degree constant within a range of 4.2 to 6.0, wherein said copolymer is a copolymer of maleic acid, maleic acid salt or mixtures thereof and a water-soluble ethylenically unsaturated monomer in a ratio of 95/5, to 5/95 by molar amount, said copolymer having a weight-average molecular weight of 1,000 to 100,000."

Compared with Claim 1 as granted, this amendment resulted from the incorporation of the subject-matter of Claim 3 as granted (section I, above).

V. The arguments relating to the grounds of opposition as submitted during the written appeal proceedings in letters dated 12 March 2003 (Respondents 01, 02 and 03, ie R-1, R-2 and R-3, respectively), 9 May 2003 (R-1), 14 May 2003 (R-3), 23 May 2003 (Ap), 16 June 2003 (R-1), 11 July 2003 (R-1), 29 October 2003 (Ap), 8 April 2004 (R-1) 27 April 2004 (R-2) and 28 April 2004 (R-1) as far as they are relevant to the further prosecution of the case, in particular at the oral proceedings held on 27 May 2004, can be summarised as follows:

(a) Respondent 1, who also referred to the pending opposition relative to a divisional application of the patent in suit, disputed the admissibility of the appeal by the Patent Proprietor. This objection was, however, withdrawn by the letter dated 28 April 2004. A further request for apportionment of costs under Article 104 EPC made by this party, if further requests were filed by

the Appellant, was withdrawn at the oral proceedings on 27 May 2004.

(b) All Respondents disputed the arguments brought forward by the Appellant and supported the above decision by providing further arguments to the grounds of appeal.

In particular, R-1 and R-2 reiterated the objections relative to the ground of opposition under Article 100(c) EPC (cf. the Notice of Opposition of Opponent 02, cf. section II, above). In addition, it was pointed out that, whilst the ratio had been described in the context of one possible process to produce the copolymers in question, the product claims were not limited to polymers produced by this process. Hence, this insertion of the monomer ratio from the general description of a specific process into product claims which were not limited to any process constituted violation of Article 123(2) EPC. Moreover, reference was made to D7, D8 and D9 to demonstrate that the polymerisation of maleic acid or its copolymerisation with monomers such as methacrylic acid resulted in products containing residual monomers, ie the conversion was always below 100%. Thus, according to D7, a given monomer ratio of eg 1.1 to 3.0 yielded copolymers containing the monomers in a molar ratio of 1.15 to 2.7. This demonstrated, however, that, in the patent in suit, information had been added to the product claim on the basis of the principle that the above monomers would react in proportions equal to their starting molar ratios. However, D7

taught categorically that this assumption was wrong and demonstrated this using the relevant monomers (letter of R-1 dated 12 March 2003, section 2 on pages 5 and 6).

(c) In a communication dated 1 July 2003, a number of preliminary, provisional remarks to the questions of Articles 100(b) and 100(c) EPC were given. The parties were also informed that the Board intended to deal with the requirements concerning the wording of the claims, in particular those under Articles 123(2) EPC, before turning to the issues according to Article 100(a) EPC.

Thus, as regards Articles 100(c) and 123(2) EPC, the question arose of whether there was a proper basis for the percentage range of the copolymer composition in the application as originally filed. It was noted that, even according to the examples in the patent in suit, the incorporation of the monomers in the copolymer was not 100%.

(d) In reply to this communication, further arguments dealing with the issue of Article 100(b) EPC were filed by the Appellant. The letter also included Tables 3 and 4 showing the amounts of residual maleic acid (A) and of residual water-soluble ethylenically unsaturated monomer (B) in Examples 1-1 to 1-22 and 2-1 to 2-22 of the patent in suit, as well as the ratio (A)/(B) of the monomers charged and the calculated compositional ratio thereof in the polymers (letter dated 29 October 2003).

Moreover, five auxiliary requests were filed with this letter, in each of which Claim 1 contained a definition of the maleic acid-based copolymer having the above limitation, present in Claim 1 of the Main Request (section III, above), of the molar ratio of the monomers in the copolymer being from 95/5 to 5/95.

With respect to the composition of the copolymer and the question of Article 123(2) EPC, it was argued that the residual amount of each monomer in the copolymer was small and that, the skilled person, would, therefore, have been quite capable of determining the actual residual content of any water-soluble ethylenically unsaturated monomer remaining at the end of the polymerisation reactions detailed in the examples using standard techniques. According to the Appellant, the requirements of Article 123(2) and 123(3) EPC were, therefore, met in full.

VI. The oral proceedings held on 27 May 2004, in the presence of all parties, focused on the issue concerning Article 100(c) EPC.

(a) At the beginning of the proceedings, it was pointed out to the parties that the questions raised with respect to this issue concerned equally all the requests on file, ie the Main Request filed with the Statement of Grounds of Appeal and each of the five Auxiliary Requests submitted with the letter dated 29 October 2003, since Claim 1 of each request required the maleic acid-based copolymer to contain the two types of

monomers in a molar ratio of from 95/5 to 5/95. This was *expressis verbis* acknowledged by the Appellant in the course of the discussion, who also conceded that the onus of proof for the compliance of the claims with the requirements of Article 123(2) EPC had been on the Appellant.

In the patent as granted, each independent claim either contained *expressis verbis* the requirement that this molar ratio was fulfilled by the copolymer (see Claims 1 and 5, section I, above) or contained a reference to the copolymer according to Claim 1 (Claims 10 and 14 to 17). This meant that this ratio was a mandatory feature of all embodiments claimed according to all requests on file.

Therefore, it was necessary that a clear and unambiguous basis for this ratio in the original version of the application be provided, in order to show that the requirements of Article 123(2) EPC were fulfilled. However, as already pointed out, a 100% conversion was apparently never achieved during the preparation of the copolymer.

(b) Further to its previous position (section V(d), above) that the amount of residual monomers was small (application text in EP-A-0 668 298: page 63, lines 8/9), the Appellant referred to the data of Examples 1-13, 1-14, 1-18 and 1-19 in Table 3 (as submitted with the letter dated 29 October 2003) to demonstrate that the monomers had been incorporated in the copolymers in the same proportions as charged to the reaction mixture.

Moreover, in all the copolymers produced, the monomer ratio incorporated was within the range defined in Claim 1. At the limits of the molar ratio range, where one monomer was in excess, the other component would be consumed completely, which meant that, in view of the small residual monomer contents shown in the tables submitted, there had at least been an implicit disclosure of the molar range of the monomers incorporated in the product as defined in Claim 1.

(c) Since all the Respondents argued along the same lines, their arguments can be dealt with together.

The Respondents pointed out that the first series of examples contained in Table 3 (section V(d), above) did not comply with Claim 1, because neither the level of adsorption to clay (AC), nor the calcium ion-stabilisation degree constant (CSC) were given. Moreover, they referred to the fact that no showing had been provided by the Appellant to demonstrate that a monomer was ever used up completely. On the contrary, according to the data provided for all the examples, residual monomer contents of both constituents of the respective copolymers were present. Whilst a specific molar ratio of the monomers charged could give a copolymer containing its components in the same molar ratio (as eg shown in Example 2-18 of Table 4 as filed with the letter of 29 October 2003), this represented only an accidental correspondence of the ratios and was not valid for all possible combinations covered by the claims as demonstrated eg by Example 2-1 of that table.

Rather, each deviation of the compositional ratio from the ratio of monomers charged demonstrated that the two ratios related to different features.

VII. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the Main Request filed with the Statement of Grounds of Appeal, or, in the alternative, on the basis of the first, second, third, fourth or fifth Auxiliary Request, all filed with the letter dated 29 October 2003.

The Respondents requested that the appeal be dismissed.

## Reasons for the Decision

1. In view of the fact that the initial objection to the admissibility of the appeal raised by respondent 1 has been withdrawn, it is not necessary for the Board to go into this matter in more detail, in particular, since no reason is seen by the Board for this objection to prevail.

Consequently, the appeal is admissible.

2. *Articles 100(c) and 123(2) EPC*

The arguments concerning the ground of opposition according to Article 100(c) EPC focused on the question of whether the formulation "wherein said copolymer is a copolymer of maleic acid, maleic acid salt or mixtures thereof and a water-soluble ethylenically unsaturated monomer in a ratio of 95/5[,] to 5/95 by molar amount",

which is contained in each Claim 1, ie the patent as granted and according to each of the requests on file (cf. sections I, IV and V(b), above) has a basis in the documents of the application as filed, as required by Article 123(2) EPC. Hence, the following observations and considerations are equally valid for each request, as acknowledged by the Appellant (section VI(a), above).

2.1 The Appellant was not able to point to an explicit basis, in the documents of the application as originally filed, for the relevant ratio of maleic acid, maleic acid salt or mixtures thereof and a water-soluble ethylenically unsaturated monomer in a ratio 95/5 to 5/95 by molar amount. Nor is such a basis discernible by the Board. In fact, neither the claims nor the description of the initial version of patent application referred to the molar composition of the resulting copolymer.

2.2 As to the further question of whether an implicit basis might be found in the disclosure of the application as filed, a molar ratio of from 95/5 to 5/95 was disclosed in that version of the application documents only in connection with the specific polymerisation process, wherein it was required that, in relation to the amount of material (A) (ie maleic acid and/or its salt), the water-soluble ethylenically unsaturated monomer (B) was fed into a reaction vessel in such a manner that the molar ratio (A)/(B) was within the above range.

2.2.1 The same wording defining the specific process (as in original Claims 18 and 22 to 25) could be found on page 30, line 18, to page 31, line 11 of the initial English translation of the application (EP-A-0 668 298; page 10, lines 22 to 35).

2.2.2 Since, however neither the claims nor the description of the application as filed referred to the molar composition of the resulting copolymer *per se* (section 2.1, above), the wording relating to the specific polymerisation process could only provide an adequate basis for the definition of the copolymer itself, if it were directly and unambiguously derivable from the application as filed, that the molar composition of the resulting copolymer was always identical with the molar ratio of monomers fed into the reaction vessel.

2.3 That this is not the case, is evidenced at least by the examples and tables corresponding to the examples in the patent in suit.

2.3.1 Thus, Tables 3, 6, 9 and 12 refer to the properties of the final polymer product, in particular, besides the molecular weight, either calcium ion capturability and clay dispersibility, or CSC and AC. Tables 3 and 6 clearly show, however, that the conversion of the monomers never reached 100%, but that an "amount of residual maleic acid" of between 0.1 and 2.5% (Examples 1-23 and 1-21, respectively) remained. Although no residual monomer contents of monomer (B), nor the molar ratios (A)/(B) in the copolymers are given in the description of the respective examples of the patent in suit; nor in the above Tables 3 and 6,

the presence of residues is nevertheless indicative that a one-to-one incorporation of monomers does not take place.

2.3.2 Data giving the molar compositions of the copolymers prepared in the examples of the patent in suit (ie residual monomer contents of monomer (B), molar ratios (A)/(B) in the copolymers) were given for the first time in Tables 3 and 4 in the letter dated 29 October 2003 (section V(d), above). These new data demonstrate that, with only a few exceptions, the molar ratios of the monomer mixtures fed to the polymerisation reaction are different from the molar ratios of the components incorporated in the copolymers. These few exceptions do not allow to infer that the two features are identical. They must be considered as accidental.

2.3.3 Consequently, far from fulfilling the necessary condition of congruency between the molar ratio of monomers fed to the reaction vessel and the molar composition of the resulting copolymer, the examples of the patent in suit indicate that the polymerisation generally does not go to completion and that the molar composition of the resulting copolymer in general diverges from the molar ratio of the monomer reactants used in its preparation.

2.4 This finding is further supported eg by D7, as referred to by the Respondents (section V(b), above). Thus, in this document, a clear distinction has also been made between the ratio of the monomers fed to the polymerisation and the constitution of the copolymer (column 2, line 57 to column 3, line 24). A copolymer "having *almost the same* constitution as the feed

composition is obtained if the molar ratio maleic acid (MA)/(METH) acrylic acid (AA) in the feed composition is 1.80 or lower" (column 2, line 66 to column 3, line 2, emphasis added). Nevertheless, even at a molar ratio of the monomers of below 1.80, the values of the above molar ratio and of the ratio in the copolymer are still not identical (cf. the reference to a monomer ratio of 1.50 and the copolymer composition of from 1.40 to 1.45 resulting therefrom; column 3, lines 2 to 4; and the end of section V(b), above).

2.4.1 The feed composition as disclosed in the present case, however, concerns molar ratios of from 95/5 to 5/95 or, as expressed in D7, ratios ranging from 19.0 to 0.05. Hence, it extends far beyond the limits considered in D7. In other words it is evident that there is *a fortiori* no basis for assuming a general congruency between the molar ratio in the monomer feed and the molar composition of the resulting copolymer in the context of the particular process exemplified in the patent in suit.

2.4.2 A still further point must, however, also be taken into account: no Claim 1 according to any request on file is limited to the above specific comonomer compositions "maleic acid (MA)/(meth)acrylic acid (AA)" of D7 or to those in the examples in the patent in suit. Rather, each such claim includes any "water-soluble ethylenically unsaturated monomers" as component (B) (for which a long list of examples of various types is given in paragraphs [0039] to [0043]), each of which, as generally known in the art, has its own reactivity and its own copolymerisation parameter with respect to the other monomer, eg the maleic component.

2.4.3 It follows that the molar ratio in the monomer charge and/or feed to the polymerisation mixture cannot directly and unambiguously be translated into the composition of the copolymer as defined in claim 1.

2.4.4 This conclusion is not invalidated by the argument of the Appellant, according to which, in certain of the examples of the patent in suit, the molar composition of the copolymer did not diverge from the molar ratio of the monomer feed, reference being made in particular to Examples 1-13, 1-14, 1-18 and 1-19 (section VI(b), above), in which the respective molar compositions of the copolymers corresponded directly to the amounts of maleic anhydride charged and acrylic acid fed to the vessel. The fact that in certain cases there is no divergence is not evidence that a disclosure of molar ratio of starting monomers amounts to a disclosure of a copolymer of molar composition corresponding to this monomer molar ratio. On the contrary, it shows that the assumption of correspondence is not valid for the general case (cf. section VI(c), above).

2.4.5 Neither is the argument of the Appellant, that the divergences registered are small, considered to be relevant. Firstly, the divergences are not negligible, since they amount to up to 2.5% (section 2.3.1, above) and secondly, even if they had been, the fact remains that the subject-matter now claimed, ie the molar composition of the copolymer is an "*aliud*", which is something other than what was originally disclosed, namely the molar ratios of particular monomers fed into a particular reaction. The onus of proof was on the Appellant to show that these items of subject-matter

were identical and this onus has not, for the reasons given, been discharged.

2.5 It follows that neither the patent in suit nor the application from which it is derived contains the basis for the definition of the molar composition of the copolymer in Claim 1 necessary for compliance of the patent in suit as granted or according to the Main Request with the requirements of Article 123(2) EPC.

3. By the same token and as indicated in section 2, above, this finding is also valid for Claim 1 of the First to Fifth Auxiliary Requests, each of which contains *expressis verbis* the same feature as discussed above with respect to the versions of Claim 1 as granted and as contained in the Main Request, respectively.

4. Since a decision can only be made on a request as a whole, there is no need to consider the further claims separately. Nor must the further grounds of opposition be taken into account, because the assessment of those issues could not change the outcome of these appeal proceedings.

5. Consequently, none of the requests on file can be successful.

## Order

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

The appeal is dismissed.

The Registrar: The Chairman:

G. Rauh R. Young