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Datasheet for the decision of 16 April 2015

Case Number:	T 1964/12 - 3.3.03
Application Number:	99117421.0
Publication Number:	0985690
IPC:	C08F220/06, C08F222/02, C11D3/37
Language of the proceedings:	EN

Title of invention:
Acrylic acid-maleic acid copolymer (or its salt), its production process and use, and production process for aqueous maleic salt solution with low impurity content

Patent Proprietor:
NIPPON SHOKUBAI CO., LTD.

Opponents:
Rohm and Haas Company
BASF SE

Headword:

Relevant legal provisions:
RPBA Art. 12(4)
EPC Art. 54, 123(2)

Keyword:

Main request not admitted -
 claim intentionally restricted before the opposition division so no right to revert to claim as granted
Auxiliary requests -
 admitted into the proceedings but lack of novelty established presumption that unusual parameters do not define a new subject-matter not displaced
 unallowable amendment
- late filed objection admitted -

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

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Case Number: T 1964/12 - 3.3.03

DECISION
of Technical Board of Appeal 3.3.03
of 16 April 2015

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted on 9 July 2012 concerning maintenance of the European Patent No. 0985690 in amended form.**

Composition of the Board:

Chairman	O. Dury
Members:	F. Rousseau
	R. Cramer

Summary of Facts and Submissions

I. European patent No. 0 985 690 in respect of European patent application No. 99 117 421.0 was granted on the basis of eight claims, of which claims 1, 4 and 5 read as follows (underlining and strikethrough were added by the Board to indicate, respectively, features added to and deleted from the claims of the application as filed):

"1. An acrylic acid-maleic acid copolymer (or its salt), characterized by having a magnesium ion scavengeability of ~~210~~ 230 mg (in terms of $Mg(OH)_2$)/g or more and a magnesium hydroxide scale inhibitability of 30 % or more.

4. An acrylic acid-maleic acid copolymer (or its salt), having a magnesium ion scavengeability of ~~210~~ 230 mg (in terms of $Mg(OH)_2$)/g or more, a molecular weight distribution of 3.5 or less, and low-molecular fractions with a molecular weight of 1,000 or less in the ratio of 9 wt % or less to the total of the copolymer (or its salt).

5. A production process for an acrylic acid-maleic acid copolymer (or its salt), comprising the step of copolymerizing ethylenically unsaturated monomers including acrylic acid and maleic acid in the presence of a polymerization initiator, with the production process being characterized in that: 50 wt % or more of the maleic acid is initially charged; the maleic acid has a neutralization degree of 70~95 mol % before the polymerization initiator is charged; and the resultant acrylic acid-maleic acid copolymer (or its salt) has a neutralization degree of

50~70 mol % and a solid component concentration of 45 wt % or more at the end of the polymerization."

II. Opponents 1 and 2 filed notices of opposition against the patent and requested its revocation on the grounds that its subject-matter lacked novelty and inventive step (Article 100(a) EPC) and was insufficiently disclosed (Article 100(b) EPC). The copolymer of claim 1 was objected to *inter alia* as lacking novelty over EP-A-0 668 298 (D1), also taking into account the patent proprietor's written submissions of 24 March 2004 made during the examination proceedings. The notices of opposition also contained additional novelty objections, in particular against the production process according to granted claim 5.

III. By a decision of 7 December 2011 announced during oral proceedings, with written reasons posted on 9 July 2012, the opposition division held that the patent as amended according to the documents of auxiliary request 6 submitted with letter of 28 November 2011 met the requirements of the EPC. The decision was based also on the claims according to the then pending main request and auxiliary requests 1 to 5 submitted with letter of 28 November 2011.

IV. The main request and auxiliary requests 1 to 6 all contained the same claims 1 and 3 reading as follows:

"1. An acrylic acid-maleic acid copolymer (or its salt), characterized by having a weight-average molecular weight in the range of 5,000 to 100,000, a magnesium ion scavengeability of 230 mg (in terms of $Mg(OH)_2$)/g or more and a magnesium hydroxide scale inhibitability of 30 % or more.

3. An acrylic acid-maleic acid copolymer (or its salt), having a weight-average molecular weight in the range of 5,000 to 100,000, a magnesium ion scavengeability of 230 mg (in terms of $Mg(OH)_2$)/g or more, a molecular weight distribution of 3.5 or less, and low-molecular fractions with a molecular weight of 1,000 or less in the ratio of 9 wt % or less to the total of the copolymer (or its salt)."

V. The main request and auxiliary requests 1 to 5 also comprised various versions of a claim 6 directed to a process for preparing an acrylic acid-maleic acid copolymer (or its salt), the wordings of which differed from that of claim 5 as granted by the insertion of various limiting features. Auxiliary request 6 did not contain any claim directed to a process for preparing an acrylic acid-maleic acid copolymer (or its salt) but only claims directed to said acrylic acid-maleic acid copolymers (claims 1 to 3), to a detergent composition (claim 4) and a builder (claim 5) comprising the same.

VI. In the reasons for the interlocutory decision the opposition division held *inter alia* that the process claims 6 of the main request and of auxiliary requests 1 to 5 were not allowable under Article 123(2) EPC since they resulted from "various new selections and/or combinations of certain properties or measures taken from the application as originally filed". As to auxiliary request 6, its claims 1 to 5 were considered to meet the requirements of Article 123(2) and (3) EPC. Claims 1 and 3 were in particular held to correspond to claims 1 and 4 as granted, respectively, the claims as granted being found to correspond to claims 1 to 8 as originally filed. The opposition division also considered that the acrylic acid-maleic acid copolymers of claim 1 as defined in auxiliary request 6 were novel.

It held that none of the documents cited by the opponents disclosed a copolymer having a weight-average molecular weight, a magnesium ion scavengeability and a magnesium hydroxide scale inhibitability in accordance with claim 1. D1 was stated to disclose a maleic acid copolymer but to be silent about its performance with respect to magnesium ion scavengeability. In addition the process used for preparing the copolymers of the patent was carried out with a neutralisation degree of the maleic acid lower than 100 % in contrast to the process of D1, influencing "the nature of the product achieved" as indicated by the patent proprietor.

VII. The patent proprietor and opponents 1 and 2 appealed said interlocutory decision with letters of 7, 10 and 17 September 2012 respectively.

VIII. Together with its statement of grounds of appeal dated 19 November 2012 the patent proprietor submitted a main request and auxiliary requests 1 to 6. Claims 1 and 3 of those requests are the same as claims 1 and 3 of auxiliary request 6 on which the decision under appeal was based. Their wording is provided in point IV above. The main request submitted with the patent proprietor's statement of grounds for appeal contains a claim 6 directed to a process for the preparation of an acrylic acid-maleic acid copolymer (or its salt) and having the same wording as claim 5 as granted. Auxiliary requests 1 to 6 each comprise an amended version of that process claim 6 in which, compared to process claim 5 as granted, various features have been inserted.

IX. With their statement of grounds of appeal, both submitted on 19 November 2012, opponents 1 and 2 submitted document D15 (Appendices A to D) and Annexes 1 and 2, respectively.

X. The patent proprietor replied to the statements of grounds of appeal of opponents 1 and 2 with a letter of 22 March 2013 and submitted attached therewith auxiliary request 7. The claims of that request correspond to the claims of auxiliary requests 6 submitted with the statement of grounds of appeal, except that claims 1 to 3 had been amended by adding at the end the feature "wherein the molecular weight is determined by gel permeation chromatography under conditions as defined in the description".

XI. Additional submissions were made by the patent proprietor with letters of 15 November 2013, 21 February 2014, 13 March 2014 and 16 March 2015.

XII. Opponents 1 and 2 replied to the statement of grounds of appeal of the patent proprietor with letters of 3 April 2013 and 22 May 2013 respectively. Additional submissions were made by the opponents with letters of 9 July 2014 and 14 November 2014 (opponent 1) and with letters of 22 January 2015, 16 February 2015 and 9 April 2015 (opponent 2), the latter being communicated to the other parties by fax of 10 April 2015.

XIII. A communication from the Board in preparation for the oral proceedings had been sent by fax on 24 March 2015.

XIV. Oral proceedings took place before the Board on 16 April 2015, at the end of which the Board's decision was pronounced.

XV. The patent proprietor's submissions, as far as relevant for the present decision, may be summarised as follows:

Admissibility of the claim requests

a) The present claim requests had not been filed to delay the proceedings. The main request comprised the production process claim as granted. Accordingly, that claim should not be objected to under Article 123(2) EPC. The same held true for claim 6 of auxiliary request 6, as it was identical to the production process claim as granted except that it had been limited to processes producing the copolymers defined in the preceding claims. Concerning auxiliary requests 1 to 5 the limitations incorporated into the process claims as granted were not arbitrary, but characterised embodiments of the original disclosure that were described as being most preferred. Taking also into account the fact that the opposition division had not explained why the criticised combination of features of the process claims did not comply with Article 123(2) EPC, the present claim requests therefore constituted a *bona fide* response to the contested decision. Those requests should therefore be admitted into the proceedings.

Amendments

b) The objection that claims 1 and 3 did not meet the requirements of Article 123(2) EPC, given the modified value of the magnesium ion scavengeability, had been raised shortly before the oral proceedings. It was belated and therefore should not be admitted into the proceedings. The combination of the minimum value of 5 000 of the molecular weight with the maximum value of 100 000 for that parameter was allowable in accordance with the practice of the boards of appeal. Moreover, considering that a complex of the copolymer with the magnesium ions was formed, it was implicit that the molecular weight of the copolymer had an influence on the properties magnesium ion scavengeability and magnesium hydroxide scale inhibitability. Therefore, a link between molecular weight and magnesium ion scavengeability was not arbitrary, and even supported by the examples of the application as filed. Therefore, claims 1 and 3 as amended complied with Article 123(2) EPC.

Clarity

c) The weight-average molecular weight of the copolymer or its salt was measured in buffered solution, so the result of that measurement did not depend on whether the copolymer was in its acid or salt form. Nevertheless, auxiliary request 7 which incorporated the definition of the method used for measuring that parameter had been submitted in order to overcome that objection. Accordingly, it should be admitted into the proceedings.

Novelty

d) A relationship between both magnesium ion scavengeability and magnesium hydroxide scale inhibitability existed and some degree of dependence could be assumed based on the similarity of the mechanisms underlying these two properties, namely formation of a complex between the magnesium ions and the copolymer. However, there was no proportionality relationship between these two parameters, as the tests had been carried out at two different temperatures. This was demonstrated by examples 1-1 to 1-6 of the patent in suit, for which the highest value of magnesium ion scavengeability (250 mg $Mg(OH)_2$/g) was obtained with the lowest value of magnesium hydroxide scale inhibitability (34%).

e) Similarly, the ability to scavenge magnesium ions and that to scavenge calcium ions were correlated as they were based on similar mechanisms, but no linear relationship existed between magnesium ion scavengeability as measured in the patent in suit and calcium ion capturability as determined in D1.

f) Moreover, the production process in the patent in suit differed from the production process of D1 with respect to the degree of neutralisation of maleic acid before the polymerisation initiator was charged, so that the copolymers of D1 were to be expected to have different properties, meaning that no conclusion could be drawn with respect to the magnesium ion scavengeability and magnesium hydroxide scale inhibitability of the copolymers produced in D1. Moreover, D15 did not present experimental results for copolymers obtained after a dialysis step. Therefore, D15 did not allow any conclusion as to whether those parameters were fulfilled for the copolymers of examples 1-23 and 1-24 of D1, as said copolymers had been prepared with such an additional dialysis step.

g) In the absence of a clear relationship between calcium ion capturability on the one hand and magnesium ion scavengeability and magnesium hydroxide scale inhibitability on the other, the opponents had not discharged their burden of proof that the copolymers of D1 anticipated those claimed in the patent in suit. The subject-matter of claim 1 of auxiliary request 1 was therefore novel over D1.

h) The same arguments applied to auxiliary requests 2 to 7.

XVI. The opponents' submissions, as far as relevant for the present decision, may be summarised as follows:

Admissibility of the claim requests

a) In the proceedings before the opposition division, process claim 5 as granted had been voluntarily abandoned in view of objections of lack of novelty already raised in the notices of opposition. That claim 5 as granted had been reintroduced into the main request as claim 6. Similarly, each of auxiliary requests 1, 2, 3, 4, 6 and 7 contained at least one process claim which was broader than those considered by the opposition division. Moreover, the process claims of those requests were not linked back to the copolymers claimed *per se*, or did not comprise all the features of said copolymers. In addition, no argumentation had been provided as to why the subject-matter of those claims was novel and inventive. Accordingly, the main request and auxiliary requests 1, 2, 3, 4, 6 and 7 should not be admitted into the proceedings.

Amendments

b) As regards the amendments contained in claims 1 and 3 of all requests, namely the selection of a minimum molecular weight range of 5 000 and the selection of a minimum magnesium ion scavengeability of at least 230 mg/g, the application as filed disclosed that the magnesium ion scavengeability of the copolymer depended on its molecular weight. Although those numerical values were disclosed in isolation in the application as filed, their combination resulting from that double selection was arbitrary and not supported by the disclosure of the original documents, and in particular not by its examples. Accordingly, claims 1 and 3 of the present requests infringed Article 123(2) EPC.

Clarity

c) The subject-matter of claims 1 and 3 on which the contested decision was based lacked clarity, as it was not clear whether the weight-average molecular weight was based on the acrylic acid-maleic acid copolymer or its salt.

Novelty

d) In Appendix D of D15 the calcium ion capturability of copolymer series 1 from Dl was compared with the corresponding magnesium ion scavengeability provided by the proprietor in Table 1 submitted on 24 March 2004. Although the parameters "magnesium ion scavengeability" and "magnesium hydroxide scale inhibitability" were not familiar to polymer scientists in the present field, it was clear from that comparison that calcium ion capturability determined as per D1 and magnesium ion scavengeability determined as per the proprietor were proportionally linked. Calcium ion capturability and magnesium ion scavengeability values tracked each other well, magnesium ion scavengeability representing, for all the data points, between 50 and 64% of the calcium ion capturability. Even though the actual tests proposed by the patent proprietor and D1 were slightly different, both tests put a value on the same functional characteristic of the polymer, namely its ability to capture/scavenge alkaline earth metal ions.

e) The copolymers of D1 showing the highest calcium ions capturability were those produced in examples 1-23 and 1-24 after dialysis of the copolymers of examples 1-20 and 1-21 to remove the lower weight fraction of those copolymers. They also fulfilled the weight-average molecular weight requirement of claim 1 of the present requests. In view of the calcium ions capturability of those copolymers disclosed in D1 and the relationship between calcium ion capturability and magnesium ion scavengeability demonstrated in Appendix D, it could be concluded that the copolymers in examples 1-23 and 1-24 fulfilled the condition of a magnesium ion scavengeability of at least 230 mg/g. Considering that both magnesium hydroxide scale inhibitability and magnesium ion scavengeability depended on the ability of the copolymer to bind magnesium ions, a copolymer having a magnesium ion scavengeability of at least 230 mg/g was considered to inherently fulfil the requirement of a magnesium hydroxide scale inhibitability of 30% or more. In particular, reference was made to the ratio of magnesium hydroxide scale inhibitability to magnesium ion scavengeability that could be deduced for copolymer series 1 of D1 from the measurements made by the patent proprietor and submitted on 24 March 2004. Accordingly, the opponents had discharged their burden of proof that the claimed copolymers lacked novelty. The patent proprietor, however, had never submitted evidence that the copolymers of examples 1-23 and 1-24 did not fulfil the unusual parametric definition of operative claim 1. Therefore, the subject-matter of claim 1 of the present requests should be considered to lack novelty over D1.

XVII. The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of the main request or one of auxiliary requests 1 to 6, all submitted with the statement of grounds of appeal, or on the basis of the claims of auxiliary request 7 submitted with letter of 22 March 2013.

XVIII. The opponents requested that the decision under appeal be set aside and that the patent be revoked.

Reasons for the Decision

1. The appeals are admissible.

Admissibility of the main request and auxiliary requests 1 to 7

2. Article 12(4) RPBA requires the Board to take into account everything presented by the parties under Article 12(1) RPBA if and to the extent that it relates

to the case under appeal and meets the requirements in Article 12(2) RPBA. Those requirements are undisputedly met by the present claim requests. The claim requests relate to the case under appeal and were submitted either with the statement of grounds of appeal of the patent proprietor or in reply to the opponents' statements of grounds of appeal within four months of their notifications. In addition, detailed reasons as to why the amended process claims contained in all requests are allowable under Article 123(2) EPC, i.e. as to why the decision of the opposition division should be amended, are given in the statement of grounds of appeal of the patent proprietor.

3. However, according to Article 12(4) RPBA, the Board has the discretion to hold inadmissible requests which could have been presented or were not admitted in the first-instance proceedings. In this context the question is not merely whether the present claim requests could have been presented before the first instance, but whether, taking into account all relevant circumstances of the case, the situation was such that these requests should have been filed already at that stage of the proceedings.

4. In view of the objections of lack of novelty and/or lack of an inventive step raised by the opponents in their notices of opposition, the patent proprietor decided in the present case not to argue novelty and inventiveness of the process claims as granted, but intentionally limited their subject-matter. By doing so the patent proprietor deliberately chose not to obtain a decision from the opposition division on the process claims as granted. In the present case, allowing the patent proprietor to revert on appeal to the process claims as granted, as now proposed in the main request, would go

against the need for procedural economy. Accordingly, the Board, having regard to the facts and arguments presented to it, decided to make use of its discretionary power under Article 12(4) RPBA not to admit the main request into the proceedings.

5. As to auxiliary requests 1 to 6, the mere fact that they might be broader in scope that the claims submitted during the opposition proceedings does not necessarily mean that they should not be admitted into the proceedings. In the present case the sole reason for their non-compliance with the requirements of the EPC, as established by the opposition division, was not lack of novelty or lack of an inventive step as invoked by the opponents, but the fact that the combination of various features taken from the description and inserted into the process claims had no basis in the application as filed. Under those circumstances, restricting the amendments made to the original process claims to features that are meant to characterise embodiments of the original disclosure that are described as most preferred, as was done in the present case, constitutes a legitimate reaction by the appellant (patent proprietor) to the reasoning underlying the appealed decision. Although these requests could already have been submitted at the first instance, the Board does not identify in the patent proprietor’s attitude any lack of diligence or fairness towards the other parties. Requiring the patent proprietor in the present situation to further restrict its claims in comparison with the claims submitted before the first instance while still meeting the requirements of Article 123(2) EPC would be unfair to the patent proprietor.

6. The same holds true for auxiliary request 7, submitted with the patent proprietor's rejoinder, which contains

the same process claims as auxiliary request 6 but also modified claims 1 and 3 in order to overcome the clarity objection raised by opponent 2 in its statement of grounds of appeal.

7. Under the present circumstances, the Board has no reason to make use of its discretionary power under Article 12(4) RPBA to hold inadmissible auxiliary requests 1 to 7, which therefore are to be taken into consideration in these appeal proceedings.

Novelty over D1 - auxiliary request 1

8. D1 concerns maleic acid-based copolymers used in detergent compositions (claims 1 and 6). The maleic acid-based copolymers are described in claim 1 as having a weight-average molecular weight of 1 000 to 100 000, a calcium-ion capturability of 300 mg $CaCO_3$/g or higher calculated as calcium carbonate, and a clay-dispersibility of 1.2 or higher.

8.1 The calcium-ion capturability within the meaning of D1 is an index which shows how many calcium ions are captured in water by the maleic acid-based copolymer, most preferred values of that index being at least 450 mg $CaCO_3$/g (page 6, lines 25-32). The clay-dispersibility is a numerical value for evaluating the degree of dispersion of clay in the presence of the copolymer, which parameter depends on the ability of the copolymer to remove calcium ions existing in clay particles (page 6, lines 49-50 and page 8, lines 39-45). D1 also specifies that the copolymers' weight-average molecular weight is more preferably within the range of 2 000 to 50 000 and most preferably 5 000 to 15 000 in order to improve the calcium-ion stabilization degree constant and the ability to be adsorbed to clay. The calcium-ion stabilisation degree constant of the maleic acid-based copolymer is defined on page 8, lines 39-40 of D1 as being an index corresponding to the degree to which the copolymer chelates calcium ions in water.

8.2 Summing up, D1 unambiguously discloses that the maleic acid-based copolymers of D1 chelate or in other words capture calcium ions, this ability being reflected in D1 by the parameters "calcium-ion capturability" and "clay-dispersibility".

9. Preferred copolymers of D1 are maleic acid-acrylic acid copolymers as shown in examples 1-1 to 1-25, with examples 1-23 and 1-24 exhibiting calcium-ion capturability values of 470 and 480 g $CaCO_3$/g respectively (Table 6, page 29). Their molecular weight values are indicated in the same Table 6 to be 16 000 and 25 000, respectively.

9.1 On the basis of the description of examples 1-23 and 1-24 provided in D1 (see Table 6, page 29, page 17, lines 10-25 and page 16, lines 40-58), it was not contested that D1 describes copolymers (or their salts) comprising all the features of claim 1 of auxiliary request 1 except their magnesium ion scavengeability and magnesium hydroxide scale inhibitability.

9.2 However, the parties were in dispute as to whether the features of a magnesium ion scavengeability of 230 mg or more (in terms of $Mg(OH)_2$)/g) and a magnesium hydroxide scale inhibitability of 30% or more made it possible to distinguish the copolymers or their salts according to operative claim 1 from those described with examples 1-23 and 1-24 of D1.

9.3 Neither D1 nor any of the other prior art documents cited in the proceedings mentions magnesium ion scavengeability or magnesium hydroxide scale inhibitability. No evidence whatsoever that magnesium ion scavengeability and magnesium hydroxide scale inhibitability were parameters that had already been disclosed or used, let alone were part of common general knowledge, has been offered.

9.4 Hence, the only express distinction between the definition of the copolymers now being claimed and those obtained in examples 1-23 and 1-24 of D1 relies on the two unusual parameters magnesium ion scavengeability and magnesium hydroxide scale inhibitability.

Magnesium ion scavengeability

10. According to paragraph 16 of the patent in suit magnesium ion scavengeability is an index showing how much magnesium ion the acrylic acid-maleic acid copolymer (or its salt) scavenges in water. It defines, as shown by the wording of claim 1, the amount of magnesium ion expressed in terms of magnesium hydroxide ($Mg(OH)_2$) scavenged by 1 g of the copolymer (or its salt). It reflects the ability of that copolymer to chelate magnesium ions (paragraph 65 of the patent in suit, lines 14-17).

10.1 Having regard to structural similarities between the copolymers disclosed in D1 and those of operative claim 1, which both consist of maleic acid and acrylic acid repeating units, it is credible that the copolymers of D1, like those of the patent in suit, are able to chelate or scavenge magnesium ions. The ability of the copolymers of D1 to chelate or scavenge magnesium ions is furthermore demonstrated by Appendix C of D15. This appendix provides values of magnesium ion scavengeability and magnesium hydroxide scale inhibitability of the acrylic acid-maleic acid copolymers prepared in accordance with examples 1-1 to 1-6 and 1-17 to 1-19 of D1. The values originate from experimental data submitted by the patent proprietor on 24 March 2004 during the examination proceedings. Moreover, Appendices C and D of D15 give a comparison between the magnesium ion scavengeability of said copolymers measured by the patent proprietor and their calcium-ion capturability as disclosed in D1.

10.2 As shown in Appendix D of D15 (column 7), for the copolymers of examples 1-1 to 1-6 and 1-17 to 1-19 of D1 the ratio between magnesium ion scavengeability (expressed in mg of $Mg(OH)_2$)/g of copolymer) and calcium capturability (expressed in mg $CaCO_3$/g of copolymer) lies in the range of 50% (example 1-4) to 64%(example 1-19). This range of ratios approximately matches the molecular weight ratio of calcium carbonate (100 g) to magnesium hydroxide (58 g), namely 58%. In other words, the experimental data provided by the patent proprietor for copolymers 1-1 to 1-6 and 1-17 to 1-19 of D1 show that the molar quantities of calcium ions or magnesium ions that can be scavenged by a specific copolymer of D1 are almost identical. This is not only credible when taking into account the similarities between calcium and magnesium ions outlined by the opponents, but also considering the mechanism involved for scavenging both calcium and magnesium ions, namely chelation by the repeating units of the copolymer.

10.3 Returning to the copolymers disclosed in examples 1-23 and 1-24 of D1, these exhibit a calcium-ion capturability of 470 and 480 mg $CaCO_3$/g copolymer respectively, corresponding to the most preferred values of that index being above 450 mg $CaCO_3$/g (page 6, lines 25-32). Although the magnesium ion scavengeability of those copolymers has not been experimentally determined, it is credible in view of the relationship between calcium-ion capturability and magnesium ion scavengeability addressed in point 10.2 above that the copolymers of examples 1-23 and 1-24 of D1 exhibit not only the highest calcium-ion capturability as disclosed in D1, but also the highest magnesium ion scavengeability. Taking a ratio of 58% between magnesium ion scavengeability and calcium capturability (corresponding to an identical amount of magnesium and calcium ions), or even the lowest ratio experimentally observed by the patent proprietor of 50% (see point 10.2 above), a strong presumption has been established that the copolymers of examples 1-23 and 1-24 of D1 which exhibit a calcium-ion capturability of 470 and 480 mg $CaCO_3$/g have a magnesium-ion scavengeability within the meaning of the patent in suit which is at least 50% of those values, i.e. at least 235 mg $Mg(OH)_2)$/g, which is in the range of 230 mg $Mg(OH)_2)$/g or more of operative claim 1.

Magnesium hydroxide scale inhibitability

11. According to paragraph 21 of the patent in suit the magnesium hydroxide scale inhibitability of an acrylic acid-maleic acid copolymer (or its salt) is an index showing to what extent the acrylic acid-maleic acid copolymer (or its salt) prevents the generation and deposition of magnesium hydroxide scale. According to paragraph 139 of the patent in suit, which describes the test method for determining that parameter, and as confirmed by the patent proprietor’s submissions in its letter of 21 February 2014, the magnesium hydroxide scale inhibitability represents the ratio of magnesium,

among the magnesium which forms $Mg(OH)_2$ precipitate when no copolymer is added which turns to magnesium ions upon adding the polymer.

11.1 Therefore, this parameter also depends on the ability of the acrylic acid-maleic acid copolymer (or its salt) to scavenge magnesium ions. Accordingly, a higher ability of the copolymer to scavenge magnesium ions is expected to increase the proportion of magnesium ions that do not form $Mg(OH)_2$, corresponding to increased values of magnesium hydroxide scale inhibitability.

12. The patent proprietor conceded that the parameters magnesium ion scavengeability and magnesium hydroxide scale inhibitability are correlated, as the effects they describe are based on the same phenomenon, namely complexation of magnesium ions by the acrylic acid-maleic acid copolymer, but disputed that their values were directly proportional.

12.1 It is nevertheless noted by the Board that the data of the patent in suit and those summarised in Appendix C of D15, all based on measurements made by the patent proprietor, show that any maleic acid-acrylic acid copolymer tested having a magnesium ion scavengeability of at least 230 $Mg(OH)_2)$/g also exhibits a magnesium hydroxide scale inhibitability of more than 30% (see patent in suit, examples 1-1 to 1-6, 2-16 and 2-17 and Annex C of D15 - examples 1-1 to 1-4 and 1-17 for method B), i.e. according to operative claim 1.

12.2 Considering that both parameters- magnesium ion scavengeability and magnesium hydroxide scale inhibitability - reflect the ability of the acrylic acid-maleic acid copolymer (or its salt) to scavenge magnesium ions, that the highest magnesium ion scavengeability is also expected to provide the highest magnesium hydroxide scale inhibitability, and in addition that all copolymers tested having a magnesium ion scavengeability of at least 230 $Mg(OH)_2)$/g fulfil the requirement of a magnesium hydroxide scale inhibitability of more than 30%, a strong presumption has been established that the copolymers produced in examples 1-23 and 1-24 of D1 also meet the parametric requirement for a magnesium hydroxide scale inhibitability of more than 30%.

12.3 Consequently, the meaning of the unusual parameters selected by the patent proprietor to define the copolymers of present claim 1, and the analysis of the experimental data of the patent proprietor provided in Annexes C and D of D15, establish a strong presumption that the values of these unusual parameters defined in operative claim 1 are inherently fulfilled by the copolymers described in examples 1-23 and 1-24 of D1. In these circumstances, the burden of establishing that the claimed copolymers lack novelty over D1, which primarily lay on the opponents, has been discharged.

12.4 The patent proprietor argued that the experimental values of magnesium ion scavengeability and magnesium hydroxide scale inhibitability reported in Appendices C and D were based on copolymers which had not been prepared with an additional dialysis step so that those values could not be used to draw any conclusion with respect to the copolymers of examples 1-23 and 1-24 of D1 prepared using such a step. It results from paragraph 25 of the patent in suit that a factor favourable to obtaining a copolymer meeting the parametric requirements of claim 1 of the patent in suit is a low amount of low-molecular weight fraction with a molecular weight of 1 000 or less. This is achieved in example 1-6 of the specification by using a dialysis step, the resulting copolymer exhibiting magnesium ion scavengeability and magnesium hydroxide scale inhibitability values within the ranges defined in operative claim 1. The negative effect of the low molecular weight fraction of the copolymer on magnesium ion scavengeability is also stressed in paragraphs 40 and 48 of the specification. Hence, the fact that a dialysis step is used for the preparation of the copolymers of examples 1-23 and 1-24 cannot rebut, but rather reinforced, the presumption that the copolymers disclosed in those examples meet the parametric definition of operative claim 1.

13. The patent proprietor argued that the copolymers of D1 do not have the properties required by operative claim 1, as the production process in D1 differs from that of the patent in suit. It referred to the step of neutralising 70 to 95 mol % of maleic acid before the polymerisation initiator is charged, as described in paragraph 29 of the patent in suit, whereas in D1 the maleic acid is entirely neutralised before the initiator is charged.

13.1 The copolymers of examples 1-23 and 1-24 of D1 are obtained after dialysis of the copolymers produced in examples 1-20 and 1-21 respectively, in order to remove their lower molecular weight fraction (page 17, lines 10-25). As shown in Table 5, pages 26-27 of D1, the copolymers of examples 1-20 and 1-21 are indeed prepared by neutralising 100% of maleic acid before the polymerisation initiator is charged. This is therefore also valid for the copolymers prepared in accordance with examples 1-23 and 1-24.

13.2 The ratio between magnesium ion scavengeability and calcium-ion capturability, used in point 10.3 above to estimate the magnesium ion scavengeability of the copolymers of examples 1-23 and 1-24 of D1 on the basis of their known calcium-ion capturability, is based on the data summarised in Appendix D (see points 10.1 and 10.2 above). That ratio ranges from 50 to 64%. Based only on the copolymers of D1 prepared by neutralising 100% of maleic acid before the polymerisation initiator is charged, i.e. the copolymers of examples 1-1 to 1-6 (see tables 1 and 2, pages 18-20), the corresponding data summarised in Appendix D give a ratio between magnesium ion scavengeability (expressed in mg of $Mg(OH)_2$)/g of copolymer) and calcium capturability (expressed in mg $CaCO_3$/g of copolymer) within the range of 50 to 63%, i.e. almost the same range of 50 to 64% considered in point 10.3 above.

13.3 Consequently, even assuming that using a different neutralisation degree of maleic acid before the initiator is charged has some influence on the properties of the resulting copolymer, this would not affect the conclusion drawn in point 10.3 above with respect to copolymers 1-23 and 1-24 which are also prepared with maleic acid being entirely neutralised before the initiator is charged. The decisive point is not whether the process features used in the patent in suit have an effect on the properties of the copolymers produced, in particular magnesium ion scavengeability and magnesium hydroxide scale inhibitability, but rather whether the values of the parameters defined in present claim 1 allow a distinction over the copolymers disclosed in D1, in particular those of examples 1-23 and 1-24. In this respect no evidence has been provided that a complete neutralisation as used for example in the context of examples 1-23 to 1-24 of D1 cannot lead to copolymers exhibiting the claimed magnesium ion scavengeability and magnesium hydroxide scale inhibitability values.

14. According to paragraph 123 of the patent in suit, the excellent performance of the copolymers of the patent in suit or their salts in terms of metal ion scavengeability, clay dispersibility, calcium carbonate scale inhibitability and magnesium hydroxide scale inhibitability is due to the very low proportion of moieties where maleic acid is polymerised in the block form. However, no evidence has been referred to by the patent proprietor in order to demonstrate that the process steps used in examples 1-23 and 1-24 of D1 do not enable such homogeneous distribution of maleic acid and acrylic acid moieties to be obtained. In other words, the patent proprietor has not established to which extent the unusual parameters magnesium ion scavengeability and magnesium hydroxide scale inhibitability it chose to use to define the present acrylic acid-maleic acid copolymers (or their salts) actually reflect structural distinguishing features over the copolymers disclosed in examples 1-23 and 1-24 of D1.

15. Accordingly, the counter-arguments of the patent proprietor cannot reverse the strong presumption established by the opponents that the copolymers produced in examples 1-23 and 1-24 of D1 inherently fulfil the parametric requirements of present claim 1 and therefore are structurally indistinguishable from them. That presumption has also not been overcome by measuring the magnesium ion scavengeability or magnesium hydroxide scale inhibitability of copolymers obtained with examples 1-23 and 1-24. Nor has the patent proprietor put forward considerations which are in line

with the general state of the art and show that the unusual parametric definition of claim 1 cannot be met by the copolymers 1-23 and 1-24 of D1 or that said definition reflects a structural difference.

16. Therefore, in these circumstances, the presumption that the subject-matter of claim 1 is not novel having regard to the disclosure of D1 has not been rebutted. Accordingly, the subject-matter of claim 1 does not meet the requirements of Article 54 EPC.

Amendments - auxiliary request 1

17. Opponent 1 has in its rejoinder submitted that claims 1 and 3 of auxiliary request 1 do not meet the requirements of Article 123(2) EPC because the range of molecular weight defined in claims 1 and 3 is not disclosed in the application as filed. One week before the oral proceedings, opponent 2 submitted that those claims extend beyond the content of the application as filed in view of the additional argument that the combination of that range with the minimum value of 230 mg/g for the magnesium ion scavengeability is not disclosed in the application as filed. The patent proprietor requested the Board not to admit that new argument.

Considering that this new argument was straightforward and had been communicated to the patent proprietor six days before the oral proceedings, it could be reasonably dealt with during the oral proceedings. Therefore the Board exercised its discretion pursuant to Article 13(1) and (3) RPBA to admit this new argument into the proceedings.

17.1 Claim 1 of this request differs from claim 1 as filed in that the minimum value for the magnesium ion scavengeability of 210 mg has been amended to 230 mg and the weight-average molecular weight of the copolymer has been specified to be in the range of 5 000 to 100 000.

17.2 The minimum value of the magnesium ion scavengeability now defined in claim 1 is disclosed in the paragraph on page 6, lines 13-21 of the application as filed. It has been selected from other minimum values of the magnesium ion scavengeability listed there, namely 210 as in original claim 1, preferably 220, more preferably 230, and even more preferably 240 mg.

17.3 The limitation of the weight-average molecular weight of the copolymer represents a quantitative reduction of the range envisaged within the application as filed, merely excluding values below 5 000 which are disclosed as less preferred in the application as filed. Page 8, lines 17-22 discloses the weight-average molecular weight of the acrylic acid-maleic acid copolymer (or its salt) as being preferably in the range of 2 000~100 000, more preferably 3 000~50 000, and even more preferably 5 000~20 000, and most preferably 6 000~15 000. This amended feature taken in isolation is therefore disclosed in the application as filed.

17.4 However, it is stated in lines 20-22 of that passage that "in the case where the weight-average molecular weight is less than 2 000, the magnesium ion scavengeability tends to be so low as to deteriorate the detergency". It therefore follows that the magnesium ion scavengeability whose lower limit also has been amended cannot be held to be independent of the weight-average molecular weight, at least at the bottom of the range originally disclosed for the latter.

17.5 It results from the above that the subject-matter of claim 1 can only emerge from the disclosure of the application as filed if the skilled reader can find therein an unambiguous and direct pointer linking the choice of a lower limit for the weight-average molecular weight of 5 000 to the selection of a minimum value of the magnesium ion scavengeability of 230 mg/g. Such a pointer, however, was not indicated. Although it is clear to the Board that magnesium ion scavengeability depends not only on the molecular weight of the copolymer but also on its other characteristics, the application as filed has not been shown to provide an unambiguous and direct disclosure that a minimum magnesium ion scavengeability of 230 mg can be achieved with copolymers having molecular weights as low as 5 000. Such information is not apparent in particular from the description of the exemplified copolymers meant to be in accordance with the present invention, and which exhibit a magnesium ion scavengeability of at least 230 and have a molecular weight of at least 8 000 (see examples 1-1 to 1-5, Table 1-3, page 59, as well as examples 2-16 and 2-17, pages 69 and 70).

17.6 The Board therefore concludes that the subject-matter of claim 1 provides the skilled person with technical information not derivable from the content of the application as filed. The same holds true for claim 3, which also defines a copolymer characterised by the same ranges of weight-average molecular weight and magnesium ion scavengeability. Consequently, claims 1 and 3 extend beyond the content of the application as filed, and thus infringe Article 123(2) EPC.

18. In view of the conclusion drawn in points 16 and 17.6 above regarding the novelty and allowability of the

amendments, the first auxiliary request is not allowable. In these circumstances it is not necessary to deal with the further objections under Articles 83 and 84 EPC raised against the first auxiliary request.

Auxiliary requests 2 to 7

19. The conclusion reached in respect of auxiliary request 1 is also valid for auxiliary requests 2 to 6, as they contain the same claims 1 and 3.

20. As regards auxiliary request 7, the wording of its claims 1 and 3 differs from that of claims 1 and 3 of auxiliary request 1 only in that the method for determining the weight-average molecular weight is specified. That modification has been introduced to overcome the objection under Article 84 EPC that it was not clear whether the molecular weight related to the copolymer acid or to the copolymer salt. It was not disputed that this would not affect the issues of novelty and allowability of the amendments addressed above. Consequently, the conclusion reached in respect of auxiliary request 1 is also valid for auxiliary request 7.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

B. ter Heijden O. Dury

Decision electronically authenticated