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D E C I S I O N
of 23 June 1999

Case Number: T 0282/97 - 3.3.3

Application Number: 92309616.8

Publication Number: 0540237

IPC: H01B 3/30

Language of the proceedings: EN

Title of invention:

Superabsorbent polymeric materials which are temperature and salt tolerant and cables which include same

Applicant:

AT&T Corp.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 54

Keyword:

"Novelty (no) - prior disclosure - implicit features"

Decisions cited:

-

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0282/97 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 23 June 1999

Appellant: AT&T Corp.
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Representative: Johnston, Kenneth Graham
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 19 August 1996
refusing European patent application
No. 92 309 616.8 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: A. Däweritz
A. Lindqvist

Summary of Facts and Submissions

I. European patent application No. 92 309 616.8, filed on 21 October 1992, claiming the priority of 30 October 1991 of an earlier application in the United States of America (785601) and published under No. 0 540 237 on 5 May 1993, was refused by a decision issued in writing on 19 August 1996, for lack of novelty in the light of the disclosures of two conflicting older European patent applications and

D3: EP-A-0 316 457,

in particular Example 2 thereof.

II. The decision was based on a set of 10 claims submitted with a letter dated 5 February 1996. This letter did not contain any arguments to the objections raised by the Examining Division.

Claims 1 and 10 read as follows:

"1. A superabsorbent polymer which retains substantially its superabsorbent capability notwithstanding exposure to solutions having a relatively high salt concentration and/or relatively high temperatures, said superabsorbent polymer having an ionic constituent which is characterised in that its solubility product is substantially higher than that of carboxylate, and in that it has a slower reaction rate for forming an anhydride than does carboxylate, characterised by a counter ion in a concentration approximately equal to that of the said ionic constituent."

"10. A cable, which includes a core comprising at least one communication transmitting medium, and a sheath system in which is disposed said core, said cable including at least one waterblocking member which comprises a superabsorbent polymer as set forth in claim 1."

Claims 2 to 9 concerned preferred embodiments of the polymer according to Claim 1.

III. On 14 October 1996, a Notice of Appeal against the above decision was filed by the Applicant (Appellant). The prescribed fee was paid in due time.

In the Statement of Grounds of Appeal filed on 18 December 1996, the Appellant

(i) requested to allow the insertion the words "monovalent" before the word "counter" in line 8 of Claim 1,

(ii) argued essentially as follows:

1. The invention disclosed and taught a superabsorbent material that was salt tolerant as well as temperature tolerant. It highlighted a number of design criteria that should be used in selecting a superabsorbent polymer which, when put in a communication cable, would exhibit suitable salt and temperature tolerance.

2. As each of the cited references used alkali metal and metal salts such as Mg, Ca, Sr, Ba and Zn or Al salts for the sulfonic group, those compositions would not exhibit appropriate salt tolerance even in sea water for the reason set forth on pages 1 to 4 of the application.
3. A second point of distinction was the fact that the concentrations of the ionic group and the counter ion were substantially equal. Example 2 of D3 did not teach the use of equal concentrations. However, the wording of Claim 1 was not intended to mean that each and every ionic constituent was required to have a corresponding counter ion.
4. The polymer of Example 2 had a relatively high amount of non-ionic copolymer content, which meant that its solubility product was no longer "substantially higher than that of carboxylate" and its polymer did not exhibit a "slower reaction rate for forming an anhydride than does carboxylate." The second parameter will be referred to as "reaction rate" hereinafter.

IV. On 5 March 1999, the Appellant was summoned to oral proceedings under Article 116(1) EPC. In a communication issued pursuant to Rule 71a(1) EPC, several points were addressed concerning both formal and substantive issues:

- (i) Regarding the Appellant's proposal to insert the words "mono valent", it was pointed out that there was no basis for that concept in the application as originally filed (Article 123(2) EPC).
- (ii) The presence of the solubility product in Claim 1, which parameter was not properly defined in the application, gave rise to an objection under Article 84 EPC.
- (iii) An objection of lack of novelty was raised based on the disclosure of Example 2 of D3, which confirmed the view of the Examining Division. The Appellant's argument to regard features in the characterising portion of the claim as distinguishing features raised the question of the significance of such a characterisation (Article 84 EPC) as well as that of the possibility to achieve such a result (Article 83 EPC).
- (iv) Regarding a possible discussion of the issue of inventive step it was indicated in general terms that D3 was also highly relevant, since it concerned the same technical problem as the application in suit, namely to prevent salt-water from seeping in an optical or electrical cable (Article 56 EPC).

V. Together with the Appellant's reply of 24 May 1999, a new Claim 1 incorporating the compositional features of original Claims 2 and 3 was filed which reads as follows:

"A superabsorbent polymer which retains substantially its superabsorbent capability not withstanding exposure to solutions having a relatively high salt concentration and/or relatively high temperatures, said superabsorbent polymer characterized by the combination of:

i. an ionic constituent selected from the group consisting of sulfonate, sulfate and phosphate, and characterized in that its solubility product is substantially higher than that of carboxylate, and in that it has a slower reaction rate for forming an anhydride than does carboxylate, and

ii. a counter ion selected from the group consisting of ammonium, potassium, lithium, and cesium,

the polymer further characterized in that the ion concentration of i is approximately equal to the ion concentration of ii."

The additional arguments provided by the Appellant can be summarised as follows:

(i) Example 2 of D3 was considered as closest prior art, but its polymer had a mol fraction of amide of more than 30 %.

(ii) Although some of the Appellant's polymers also had amide constituents, these should be limited in amount so as to meet the other requirements specified by the Appellant, i.e. the relative solubility and reaction rate as compared to carboxylate. These conditions were not

prescribed nor recognised as necessary for the improved cable filling materials claimed.

(iii) In calculating the solubility product constant and reaction rate for anhydride formation, the whole weight of the polymer was used, not just the mol weight of the ionic constituent.

(iv) The requirements as to the solubility product and the reaction rate for forming an anhydride were mandatory features of the revised claim.

VI. Oral proceedings were held on 23 June 1999, which the Appellant, although duly summoned as is evident from the advice of delivery signed on 8 March 1999, did not attend.

VII. The request in the Statement of Grounds of Appeal for reconsideration of the refusal has been interpreted by the Board as a request that the decision of the Examining Division be set aside and a patent be granted on the basis of Claim 1 as filed on 27 May 1999 and Claims 4 to 10 as filed on 5 February 1996.

Reasons for the Decision

1. The appeal is admissible.

2. The Board is satisfied that the requirements of Article 123(2) EPC are met by the claims.

2.1 Claim 1 is a combination of Claims 1, 2 and 3 as originally filed and of a feature disclosed on

page 6, lines 21 and 22, and is thus not objectionable in that respect. In particular, the incorporation of the individual counter ions overcomes the objection raised in the communication pursuant to Rule 71a(1) EPC.

2.2 Claims 4 to 10 have not been modified during the examination and appeal proceedings.

3. *Novelty*

3.1 D3 concerns a waterproofing agent for cables which prevents highly concentrated salt water like sea-water from seeping in beneath the sheaths of optical and metallic cables, moving inside the sheaths and eventually deteriorating various devices to which cables are connected (page 1, paragraph 1).

3.1.1 According to Claim 1, the agent comprises a cross-linked macromolecular compound containing a sulfonic acid group or a salt thereof in certain minimum amounts.

3.1.2 Claim 3 further defines the said salts as being one or more sodium, potassium, calcium, magnesium, ammonium and/or organic amine salts.

3.1.3 Claim 4 specifies the amounts of the individual types of monomers used in the monomer mixture. The sulfonic acid group-containing monomer forms 50 to 100 mol % of the monomer mixture, further comonomers 0 to 50 mol %. Optionally, according to Claims 5 and 6, a small amount of a cross-linking agent may be added to the monomer mixture.

3.1.4 More particularly, Example 2 discloses the preparation of a copolymer from a monomer mixture of (a) 70 mol % of ammonium 2-acrylamide-2-methylpropane sulfonate and (b) 30 mol % of acrylamide. Additionally, the monomer mixture contains 0.2 mol% of N,N-methylenebisacrylamide, based on (a) + (b). The resulting waterproofing agent is used in Examples 7 and 12 to measure its sealant and absorbing capacities with respect to synthetic sea water.

3.2 As regards the qualitative aspects of the composition, which will be considered first, the polymer according to Claim 1 is defined in terms of combinations of (i) ionic constituents selected from sulfonates, sulfates and phosphates and (ii) counter ions selected from ammonium, potassium, lithium and cesium.

3.2.1 Claims 4 to 9, relating to preferred embodiments of Claim 1, define possible additional constituents of the polymer, and therefore demonstrate that the wording of Claim 1 cannot be interpreted as being limited to the constituents explicitly defined in the claim. In other words, it does not exclude further components. This is confirmed in the description. On page 5, lines 15 to 28, sulfonate, sulfate or phosphate constituents are described as "primary" ionic constituents as opposed to other components, such as non-ionic and "another or secondary ionic group" constituents, preferably carboxylate. Combinations of carboxylate groups with sulfate or sulfonate groups, which make it possible to adjust the balance between the sensitivity of the polymer to

salts and water absorbency, are also envisaged (page 7, line 4 *et seq.*; page 10, line 6 *et seq.*).

3.2.2 In its letter dated 24 May 1999, page 1, penultimate paragraph, the Appellant has explicitly confirmed that some of its polymers have amide constituents. This is in accordance with Claim 7 which explicitly refers to the presence of nitrile, hydroxyl and amide groups.

3.2.3 It follows that on the basis of the qualitative aspects of the compositional features no difference can be demonstrated between the claimed polymer and the disclosure of D3.

3.3 Hence, the issue of novelty boils down to the question whether there is also correspondence in the quantitative aspects of the composition of the polymers.

3.3.1 As regards the quantitative composition, Claim 1 does not define the composition of the polymer in terms of ratios of monomers used to prepare it or in terms of percentages of different monomer units incorporated therein. To this end, the Appellant has relied on the parameters "solubility product", K_{sp} , and "reaction rate" of the ionic constituents, which are characterised in Claim 1 in comparison to carboxylate only by the terms "substantially higher" and "slower", respectively.

3.3.2 In view of the argument that the polymers known from D3, in particular that of its Example 2 did not comply with these two parameters, it has to be

examined whether these parameters represent an unambiguous and clear distinction over this prior art.

- 3.3.2.1 From the wording of Claim 1, it is evident that both parameters depend on the presence of the ionic groups in the polymer. Page 5, lines 6 to 14, confirms this close relation: "The ionic group includes an ionic constituent which is characterized by a solubility product, K_{sp} , that is substantially higher than that of carboxylate and in that it has a lower reaction rate for forming an anhydride than does carboxylate. As a function, the ionic group absorbs water and is less sensitive to a salt solution as compared to a carboxyl group which typically has been used".

This wording may even indicate that the two parameters relate to properties of the ionic monomers rather than to properties of the final polymer. This would be in line with the reference to a number of K_{sp} values for difficultly soluble inorganic compounds such as CaCO_3 , CaSO_4 , MgCO_3 and MgSO_3 in the passage bridging pages 5 and 6.

The passage continues: "Although the solubility product of carboxylate is not given, it is similar to that of carbonate". At lines 12 and 13, a reference is made to "calcium and magnesium polyacrylates (carboxylates)".

- 3.3.2.2 According to the Statement of Grounds of Appeal, penultimate paragraph, and the letter dated 24 May 1999, paragraph 3, the calculation of the solubility product is based on the whole molecule's molecular

weight, "not just on the mol weight of the ionic constituents". Due to the "relatively high amount of non-ionic copolymer content", the resulting solubility product of the (final or resulting) polymer would not meet the requirement in Claim 1.

If a certain relationship between these two parameters and the properties of the polymer can be inferred from these statements, it is far from evident that these parameters could be relied upon to establish difference in the quantitative aspect of the respective compositions.

3.3.3 As opposed to primary ionic groups (sulfonate, sulfate and phosphate), page 5, line 15 to 25, of the description mentions "another or secondary ionic group which preferably is carboxylate and a non-ionic constituent", such as hydroxyl, amide or nitrile. It is clear from this passage that all these other components interact with water and, if present, with salt.

Moreover, steric effects due to intramolecular distribution of functional groups (random or block distribution) or branching of the polymer chain are also known to have an important influence on the properties of a polymer. This applies to both parameters.

The application is totally silent in this respect, and no further information is available on file, such as measured or calculated values for either polymers containing carboxylate groups or polymers containing the said primary ionic constituents (optionally

together with secondary ionic and/or non-ionic constituents) as encompassed by the present claims. It is not evident either in which way such measurements or calculations should be carried out.

- 3.3.4 The claim requires K_{sp} to be "substantially higher" and the "reaction rate" to be slower than those values of carboxylate. Apart from the unclear term "substantially" in the claims, the basis line for an assessment of the two parameters is not clear, because the "carboxylate" has not been defined either. As shown for magnesium and calcium carbonates, the solubility products may differ by more than a magnitude for the same anion. This has to be taken for granted for the corresponding values of polymers as well (see page 6, lines 5 to 7: "Although the solubility product of carboxylate is not given, it is similar to that of carbonate.")

Although these considerations appear to concern rather the question of clarity, a point which has not been raised in the examination procedure and only briefly in the annex to the summons (points 2 and 7), they also bring to light that these two features *per se*, as disclosed, cannot offer an unambiguous and reliable definition of the polymers.

- 3.4 A further critical point for the issue of novelty is the fact that the polymers according to Claim 1 have not only to be different from calcium or magnesium polyacrylate or the inorganic compounds as mentioned at the top of page 6, but also from known polymers containing significant amounts of ionic components within the meaning of the "primary ionic

constituent".

- 3.4.1 The statements in the application concerning solubility and reactivity are also valid for the polymers known from D3 which contain sulfonate groups and non-ionic groups, viz. amide groups, which also interact with the optionally salt-containing water.
- 3.4.2 Contrary to the relative amounts of the different monomers, the degree of neutralisation of the ionic groups is defined in Claim 1 in terms of a molar ratio. In accordance with page 6, lines 20 and 23, the ionic and counter ionic components are present at approximately equal concentrations, irrespective of any further non-ionic components. The application does not contain a definition how far the breadth of range covered by the term "approximately equal" extends.
- 3.4.3 It is beyond doubt that ammonium 2-acrylamide-2-methylpropane sulfonate (see page 7, lines 5 and 6 in combination with page 6, line 35 of the application) has a anion/cation molar ratio of 1:1.
- 3.4.4 In Example 2 of D3, this monomer is copolymerised with acrylamide and a minute amount of cross-linking comonomer. There is no indication that the ratio of ionic and cationic groups was changed during polymerisation or thereafter.
- 3.5 Hence, whether one considers the qualitative aspects or the quantitative aspects of its composition, the polymer as defined in Claim 1 cannot be distinguished from the product disclosed in D3 and therefore lacks

novelty.

- 3.6 Consequently, the patent application does not meet the requirements of Articles 52(1) and 54(1) and (2) EPC.
4. Under these circumstances, neither Claims 4 to 10 nor the other citations need be taken into further consideration. Moreover, it is not possible to consider the question of inventive step (Article 56 EPC), and lack of clarity and conciseness (Article 84 EPC) and the question of disclosure (Article 83 EPC) can be disregarded.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

C. Gérardin