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**Datasheet for the decision
of 30 June 2011**

Case Number: T 1662/07 - 3.3.07

Application Number: 98915058.6

Publication Number: 0988108

IPC: B01J 20/28

Language of the proceedings: EN

Title of invention:

Superporous hydrogel composites having fast swelling, high mechanical strength, and superabsorbent properties

Patent Proprietors:

Purdue Research Foundation

Opponents:

BASF SE

Headword:

-

Relevant legal provisions:

EPC Art. 56

Relevant legal provisions (EPC 1973):

EPC Art. 54(1)(2)

Keyword:

"Novelty (no) - Main Request"

"Inventive step (no) - obvious solution - 1st and 2nd
Auxiliary Requests"

Decisions cited:

-

Catchword:

-



Case Number: T 1662/07 - 3.3.07

D E C I S I O N
of the Technical Board of Appeal 3.3.07
of 30 June 2011

Appellants: BASF SE
(Opponents) D-67056 Ludwigshafen (DE)

Representative: -

Respondents: Purdue Research Foundation
(Patent Proprietors) Hovde Hall
Purdue University
West Lafayette
Indiana 47907-1288 (US)

Representative: Vossius & Partner
Siebertstraße 4
D-81675 München (DE)

Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
24 July 2007 concerning maintenance of European
patent No. 0988108 in amended form.

Composition of the Board:

Chairman: J. Riolo
Members: G. Santavicca
P. Schmitz

Summary of Facts and Submissions

I. The appeal by the opponents lies from the interlocutory decision of the Opposition Division concerning the maintenance of European patent No. 0 988 108 (application N° 98 915 058.6, originating from international application PCT/IB98/00686, published as WO 98/51408), according to which, account being taken of amended Claims 1 to 24 of the Second Auxiliary Request submitted with letter of 13 April 2007 and of a description adapted thereto as submitted at the oral proceedings held on 13 July 2007, the patent and the invention to which it relates met the requirements of the EPC. The decision also gave the reasons for refusing the Main and the First Auxiliary Requests (submitted, respectively, with letters of 18 December 2006 and 13 April 2007).

II. Claims 1 and 17 of the Second Auxiliary Request underlying the decision under appeal read as follows (compared with Claims 1 and 17 as granted, additions are in bold, deletions in strike-through):

"1. A superporous hydrogel composite obtainable by a process comprising:
combining at least one ethylenically-unsaturated monomer, a multi-olefinic crosslinking agent, particles of a hydrophilic disintegrant, and a blowing agent to form an admixture thereof; and
subjecting said admixture to polymerization and foaming conditions, whereby said ethylenically-unsaturated monomer, multi-olefinic crosslinking agent, and disintegrant are crosslinked to form said superporous hydrogel composite;

wherein said superporous hydrogel composite has an average pore size in the range of 10 μm to 3,000 μm ; and wherein said hydrophilic disintegrant is at least one of (i) a crosslinked natural or synthetic polyelectrolyte, **or** (ii) a crosslinked neutral hydrophilic polymer. ~~(iii) a non crosslinked natural or synthetic polyelectrolyte having a particulate shape, (iv) a non crosslinked neutral hydrophilic polymer having a particulate shape, or (v) a porous inorganic material that provides wicking by capillary forces."~~

"17. A method of forming a superporous hydrogel composite comprising:
combining at least one ethylenically-unsaturated monomer, a multi-olefinic crosslinking agent, particles of a hydrophilic disintegrant, and a blowing agent, to form an admixture thereof; and
subjecting said admixture to polymerization and foaming conditions to form said superporous hydrogel composite, wherein the disintegrant is at least one of (i) a crosslinked natural or synthetic polyelectrolyte, **or** (ii) a crosslinked neutral hydrophilic polymer. ~~(iii) a non crosslinked natural or synthetic polyelectrolyte having a particulate shape, (iv) a non crosslinked neutral hydrophilic polymer having a particulate shape, or (v) a porous inorganic material that provides wicking by capillary forces."~~

III. The patent in suit had been opposed in its entirety on the grounds of insufficiency of the disclosure (Article 100(b) EPC), of lack of novelty and of lack of an inventive step (Article 100(a) EPC), *inter alia* having regard to documents:
D2: DE-A1-195 40 951;

D3: EP-A1-0 744 435.

The opponents *inter alia* mentioned Examples 1 and 5 of D2 and, with their letter of 13 April 2007, provided data concerning the size of the hydrogels obtained from the repetition of Example 5 of D2.

IV. According to the decision under appeal, *inter alia*:

- (a) As to the alleged insufficiency of the disclosure, Scanning Electron Microscopy (SEM) was mentioned in the description as the method on the basis of which the size of the microcells were determined. Thus, even if the values for the pore size could vary depending upon the method, the skilled person would consider that the range as defined in Claim 1 was obtainable by using the SEM method. The disclosure was thus sufficient.

- (b) The Second Auxiliary Request complied with Articles 84 and 123(2) EPC. Novelty was acknowledged, as: the claimed disintegrants were all crosslinked polymers, which feature was not present in Example 5 of D2, nor in D2 itself; Example 1 of D2 was not novelty-destroying, because the superabsorber added to the reaction mixture was not necessarily crosslinked; and, Example 1 of D2 did not specify the pore size. As to inventive step, the results presented in Table 2 of the patent in suit showed that the problem addressed by the patent in suit (hydrogels swelling faster than those of the prior art) had been solved. D2 did not address the swelling properties, i.e. was not the closest prior art document, and even if combined with D3, which allegedly disclosed the use of

cross-linked carboxymethylcellulose, would not lead the skilled person at the claimed subject-matter. Thus, obviousness had not been proven.

- V. In their statement setting out the grounds of appeal, the appellants contested, in particular, that the alleged lack of novelty over Example 1 of D2 had not been accepted.
- VI. In response to the statement setting out the grounds of appeal, the patent proprietors (respondents) made the Second Auxiliary Request underlying the decision under appeal their Main Request and submitted two sets of amended claims as the 1st and 2nd Auxiliary Requests (letter of 24 April 2008).

Claims 1 and 17 of the 1st and 2nd Auxiliary Requests read, respectively, as follows (compared with Claim 1 as granted, additions are in bold, deletions in strike-through):

1st Auxiliary Request

"1. A superporous hydrogel composite obtainable by a process comprising:
combining at least one ethylenically-unsaturated monomer, a multi-olefinic crosslinking agent, particles of a hydrophilic disintegrant, and a blowing agent to form an admixture thereof; and
subjecting said admixture to polymerization and foaming conditions, whereby said ethylenically-unsaturated monomer, multi-olefinic crosslinking agent, and disintegrant are crosslinked to form said superporous hydrogel composite;

wherein said superporous hydrogel composite has an average pore size in the range of 10 μm to 3,000 μm ; and wherein said hydrophilic disintegrant is at least one of ~~(i) a crosslinked natural or synthetic polyelectrolyte, or (ii) a crosslinked neutral hydrophilic polymer. (iii) a non crosslinked natural or synthetic polyelectrolyte having a particulate shape, (iv) a non crosslinked neutral hydrophilic polymer having a particulate shape, or (v) a porous inorganic material that provides wicking by capillary forces~~ **crosslinked sodium carboxymethylcellulose, crosslinked sodium starch glycolate, crosslinked sodium carboxymethylstarch, crosslinked dextran sulfate, crosslinked chitosan, cross linked hyaluronic acid, crosslinked sodium alginate, crosslinked pectinic acid, crosslinked deoxyribonucleic acids, crosslinked ribonucleic acid, crosslinked gelatin, crosslinked albumin, polyacrolein potassium, sodium glycine carbonate, crosslinked poly(acrylic acid), crosslinked poly(styrene sulfonate), crosslinked poly(aspartic acid), crosslinked polylysine, crosslinked polyvinylpyrrolidone, crosslinked ultramylopectin, crosslinked poly(ethylene glycol), crosslinked neutral cellulose derivatives, microcrystalline cellulose, powdered cellulose, cellulose fiber and crosslinked starch.**"

"17. A method of forming a superporous hydrogel composite comprising:
combining at least one ethylenically-unsaturated monomer, a multi-olefinic crosslinking agent, particles of a hydrophilic disintegrant, and a blowing agent, to form an admixture thereof; and

subjecting said admixture to polymerization and foaming conditions to form said superporous hydrogel composite, wherein the disintegrant is at least one of ~~(i) a crosslinked natural or synthetic polyelectrolyte, or (ii) a crosslinked neutral hydrophilic polymer. (iii) a non crosslinked natural or synthetic polyelectrolyte having a particulate shape, (iv) a non crosslinked neutral hydrophilic polymer having a particulate shape, or (v) a porous inorganic material that provides wicking by capillary forces~~ **crosslinked sodium carboxymethylcellulose, crosslinked sodium starch glycolate, crosslinked sodium carboxymethylstarch, crosslinked dextran sulfate, crosslinked chitosan, cross linked hyaluronic acid, crosslinked sodium alginate, crosslinked pectinic acid, crosslinked deoxyribonucleic acids, crosslinked ribonucleic acid, crosslinked gelatin, crosslinked albumin, polyacrolein potassium, sodium glycine carbonate, ~~crosslinked poly(acrylic acid), crosslinked poly(styrene sulfonate), crosslinked poly(aspartic acid), crosslinked polylysine, crosslinked polyvinylpyrrolidone, crosslinked ultramylopectin, crosslinked poly(ethylene glycol), crosslinked neutral cellulose derivatives, microcrystalline cellulose, powdered cellulose, cellulose fiber~~ and crosslinked starch."**

2nd Auxiliary Request

Compared with Claims 1 and 17 of the 1st Auxiliary Request, Claims 1 and 17 of the 2nd Auxiliary Request have been both restricted to 3 specific disintegrants, i.e. " ... wherein said hydrophilic disintegrant is at least one of crosslinked sodium carboxymethylcellulose,

crosslinked sodium starch glycolate, crosslinked polyvinylpyrrolidone."

- VII. In response to a communication by the Board in preparation for oral proceedings:
- (a) the respondents withdrew their request for oral proceedings and requested a decision on the basis of the file (letter of 17 May 2011);
 - (b) the appellants maintained their requests and submitted further arguments in support of the grounds of lack of novelty and of an inventive step (letter of 27 May 2011).

VIII. Oral proceedings were held on 30 June 2011, in the announced absence of the patent proprietors, pursuant to Rule 115(2) EPC. At the end of the oral proceedings, the decision was announced.

IX. The appellants have essentially argued as follows:

Main Request (Second Auxiliary Request underlying the decision under appeal and allowed by the Opposition Division)

Novelty

- (a) The thickeners used in D2 were always in particle form or crosslinked or both, so the disintegrant defined in Claim 17 could not distinguish the claimed method from that of e.g. Example 1 of D2. Upon adding these thickeners to the foaming aqueous mixture of monomers and crosslinker, they did nothing more than what they normally did when exposed to water, i.e. swelled. This swelling action increased the viscosity of the mixture, on

the one hand, and, on the other hand, their volume, so they were suitable to act as disintegrants. Example 1 of D2 disclosed the addition of a superabsorbent, which was a hydrophilic crosslinked disintegrant.

- (b) Since D2, e.g. Example 1, disclosed all of the features of Claim 17 of the Main Request, the claimed subject-matter lacked novelty.

1st and 2nd Auxiliary Requests

Amendments

- (c) The deletion of the two classes (i) and (ii) of disintegrants defined in Claims 1 and 17 of the Main Request and the inclusion of the disintegrants defined in Claim 7 as granted, which belonged to more classes, thus which could be selected from two classes, were such that objections under Article 123(2) EPC arose for both the 1st and 2nd Auxiliary Requests, which thus were not formally allowable.

Novelty

- (d) Novelty was not contested, as crosslinked poly(acrylic acid) had been cancelled from the list of disintegrants.

Inventive step

- (e) The closest prior art document was D2.

(f) It had not been shown that the problem stated in Paragraph [0022] of the patent in suit had been solved over the whole breadth of Claims 1 and 17 having regard to Example 1 of D2. So the problem was to provide alternative methods and foamed superabsorbents.

(g) Although crosslinked poly(acrylic acid) polymers had been cancelled, it was obvious for the skilled person starting from D2, e.g. Example 1, that any further superabsorbent could be used, such as polyvinylpyrrolidone, which was known to be a superabsorbent from the documents on file, or any other superabsorbent. So the skilled person need not even consider D3 to prove obviousness.

X. The respondents had, in writing, essentially argued as follows:

Main Request (Second Auxiliary Request underlying the decision under appeal and allowed by the Opposition Division)

Novelty

(a) There was full agreement with the findings of the decision under appeal on the novelty of the claimed subject-matter over Example 1 of D2. In particular, D2 incontestably did not provide any disclosure for the average pore size of the foamed polymers. So the claimed subject-matter was novel.

1st and 2nd Auxiliary Requests

Amendments

- (b) The amended claims were based on features as granted, so they were clearly allowable.

Novelty

- (c) The subject-matter of Claims 1 and 17 of 1st and 2nd Auxiliary Requests was *a fortiori* novel over D2.

Inventive step

- (d) D1 rather than D2 was the closest prior art document.
- (e) The problem stated in Paragraph [0022] of the patent in suit (the provision of superporous hydrogels having fast swelling and high absorbency as well as high mechanical strength) had been solved by the claimed subject-matter. This fact was apparent from the comparison between "crosslinked" and "non-crosslinked thickeners", as illustrated by Example 9, in which the superporous hydrogel of Sample #2 used a "non-crosslinked thickener" of D2 ("Copolymerisate von Ethylenglycol und Propylenglycol") and the superporous hydrogels of Samples #9 to #9 used "crosslinked thickeners". The use of "crosslinked thickeners" imparted substantially shorter swelling times to the superporous hydrogels prepared therewith.

(f) Since in D2 a thickener was used for the mere purpose of increasing the viscosity of the aqueous medium, and since for this purpose the thickeners disclosed by D2 were not the crosslinked natural or synthetic polyelectrolytes, nor the crosslinked neutral hydrophilic polymers as claimed, there was no hint in D2 at using the claimed disintegrants. So the claimed subject-matter was not obvious.

XI. The appellants (opponents) requested that the decision under appeal be set aside and the patent be revoked.

XII. The respondents (patent proprietors) had requested in writing that the appeal be dismissed, alternatively that the decision under appeal be set aside and the patent be maintained on the basis of the 1st or 2nd Auxiliary Requests filed with letter of 24 April 2008.

Reasons for the Decision

1. The appeal is admissible.

Main Request (Second Auxiliary Request underlying the decision under appeal)

Novelty

2. Superporous hydrogels, their preparation and uses are known from D2.

2.1 D2 *inter alia* discloses a process for producing water-absorbing, expanded or foamed, crosslinked polymers,

characterised by foaming a polymerizable aqueous mixture of

(a) monoethylenically unsaturated monomers which contain an acidic group and which are at least 50 mol.% neutralized,

(b) optionally further monoethylenically unsaturated monomers,

(c) a crosslinker,

(d) optionally at least one polymerization initiator,

(e) 0.1-20% by weight of at least one surfactant,

(f) optionally at least one solubilizer, and

(g) optionally thickeners, foam stabilizers, polymerization regulators, fillers and/or cell nucleating agents,

in a first stage by dispersing fine bubbles of a gas inert to free radicals from an external source, and polymerizing the resulting foam in a second stage to form an expanded hydrogel, and adjusting the water content of the expanded hydrogel to 1-45% by weight (Claim 6).

2.1.1 According to D2, the crosslinkers have at least 2 ethylenic double bonds (as an example of monomers of this type, which are normally used as crosslinkers in polymerization reactions, D2 inter alia mentions N,N'-methylenebisacrylamide) (Claim 8).

2.1.2 Also, D2 discloses that superabsorbents in powder form can be used as thickeners (Claim 13).

2.1.3 This use is specifically illustrated in Example 1 of D2, in which the following components are mixed in a beaker using a magnetic stirrer:

sodium acrylate in water (monoethylenically unsaturated monomer);
acrylic acid (monoethylenically unsaturated monomer);
triacrylic ester of glycerol etherified with
20 ethylene oxide (hydrophilic crosslinker);
adduct of 80 mol of ethylene oxide and 1 mol of tallow
fatty alcohol (surfactant);
1,4-butanediol diacrylate (hydrophobic crosslinker);
pentane (foam structuring additive), and
water.

The resulting homogeneous mixture is transferred into a flask into which argon is passed from below, the stream of argon being adjusted so that it bubbles at a specified rate through the reaction mixture.

Then, an amount of finely ground superabsorbent (particle size <100 µm) is added to the reaction mixture and mixed in homogeneously.

2.1.4 According to D2 (introductory portion, page 2, lines 6-9; page 6, lines 50, 58 and 68), a superabsorbent is a water absorbing, **crosslinked** polymer (emphasis added by the Board). Hence, the conclusion by the Opposition Division in Point 4 of the decision under appeal, i.e. that the superabsorbent added in Example 1 of D2 is not necessarily crosslinked, cannot be correct.

2.1.5 Also, the superabsorbent added in Example 1 of D2 is by definition water-absorbing, thus hydrophilic. Having regard to the small size (<100 µm), it is a fast water-absorbing material. So the superabsorbent added in Example 1 of D2 is a "hydrophilic disintegrant" as

- defined in the patent in suit (paragraph [0023], page 4, line 20).
- 2.1.6 Since the superabsorbent added in Example 1 of D2 is in particulate form, the hydrogel obtained from Example 1 of D2 is a composite hydrogel.
- 2.2 It follows from the foregoing that D2, in particular its Example 1, discloses all of the features of the method of Claim 17 of the Main request.
- 2.3 Consequently, the method of Claim 17 lacks novelty and the Main Request is not allowable.
- 2.4 In view of that decision, the Board need not decide whether or not also the product of Claim 1 of the Main Request is novel, i.e. whether or not the pore size defined in Claim 1 of the Main Request, which might represent the only difference from D2, is intrinsically disclosed by D2.

1st and 2nd Auxiliary Requests

3. Since Claims 1 and 17 of the 1st and 2nd Auxiliary Requests aim at restricting the nature of the disintegrants used and define 3 disintegrants in common (crosslinked sodium carboxymethylcellulose, crosslinked sodium starch glycolate, crosslinked polyvinylpyrrolidone), that play a role in the assessment of inventive step (*infra*), the 1st and 2nd Auxiliary Requests will be considered together.

Amendments

4. Compared with Claims 1 and 17 as granted, Claim 1 and 17 of 1st and 2nd Auxiliary Requests have been amended to include almost all or only 3 of the disintegrants defined in Claim 7 as granted.

4.1 Hence, the amendments consist in the combination of Claims 1 and 17 as granted with some of the additional features defined in Claim 7 as granted, i.e. intermediate generalizations.

4.2 The Board, in its communication, and the appellants, during the oral proceedings, have raised questions on whether or not these intermediate generalizations are allowable e.g. under Article 123(2) EPC, in particular whether or not a combination of the now defined disintegrants was disclosed in the application as filed. The respondents did not answer the questions raised by the Board.

4.3 Since the 1st and 2nd Auxiliary Requests fail for lack of an inventive step (*infra*), the raised questions as mentioned may be left unanswered in the present case.

Novelty

5. Novelty of the subject-matter of Claims 1 and 17 of the 1st and the 2nd Auxiliary Requests was not contested by the appellants during the oral proceedings. The Board has no reason to take a different position.

Closest state of the art

6. The patent in suit concerns superporous hydrogel composites having fast swelling, high mechanical strength, and superabsorbent properties.
7. D2 pertains to the technical field of the patent in suit (foamed hydrogel composites), aims at similar objectives (fast swelling, high absorbency, stability, as resulting from the examples of D2) and discloses composite products including crosslinked disintegrants (Example 1 of D2, Point 2.1.4, *supra*), which are very similar to those of the patent in suit. Instead, D1, invoked by the respondents, at least did not disclose crosslinked disintegrants. So D2 describes the closest prior art.

Problem and Solution

8. The patent in suit (paragraphs [0022] and [0023]) addresses the problem of making superporous hydrogels having fast swelling and high absorbency as well as high mechanical strength.
 - 8.1 D2 is not acknowledged in the patent in suit. Having regard to the disclosure of Example 1 of D2, in which a crosslinked disintegrant is used, as well as to the mention in D2 (page 6, lines 58-59) of crosslinked poly(acrylic acid), which is defined in Claim 7 as granted of the patent in suit, which option is now cancelled, it may however be considered that D2 and the application as filed, and on which the patent in suit has been granted, encompassed composite hydrogels using the same crosslinked superabsorbents.

8.2 Having regard to D2 as the closest prior art, in particular its Example 1, no improvement whatsoever has ever been demonstrated by evidence. The comparison allegedly shown in Example 9 of the patent in suit, as invoked by the respondents, does not concern a composite hydrogel with a crosslinked disintegrant as in Example 1 of D2.

8.3 Hence, the problem effectively solved by the subject-matter of Claim 17 of 1st and 2nd Auxiliary Requests can only be the provision of further methods for forming foamed hydrogel composites.

Obviousness

9. The method of Claim 17 of 1st and of 2nd Auxiliary Requests differs from the closest embodiment of D2 (Example 1) in a specific superabsorbent used as disintegrant.

9.1 In other words, the closest prior art (embodiment illustrated by Example 1 of D2) merely mentions the presence of a superabsorbent without revealing its nature, whereas Claim 17 mentions specific superabsorbents as disintegrants.

9.2 However, according to D2 (page 3, lines 30-68), a number of monomers can be used in the preparation of superabsorbents polymers or copolymers, among which N-vinyl lactams as vinylpyrrolidone are mentioned (page 3, lines 63-64). So the use of vinylpyrrolidone in the preparation of water-absorbing, cross-linked polymers referred to as superabsorbents was known.

- 9.3 Furthermore, D3 (background of the invention, page 2, lines 19-30 and 31-34), discloses that *inter alia* crosslinked carboxymethyl cellulose (*idem*, line 26) and crosslinked polyethyleneoxide (i.e. crosslinked poly(ethylene glycol)) (*idem*, line 29), are known water absorbing resins, i.e. superabsorbents, all being in form of particle or powder having a particle diameter of 0.01 to 5 mm, wherein it is known that the absorption rate of each particle increases as the particle diameter becomes smaller.
- 9.4 As established in the Case Law of the Boards of Appeal of the EPO (6th edition, 2010, I.D.8.19.6), when the technical problem is simply that of providing further methods or compositions of matter, as in the present case, the choice of one of several variations available in the prior art (e.g. D2 and D3) for that sort of methods or compositions of matter (such as crosslinked carboxymethyl cellulose and crosslinked poly(ethylene glycol) in D3, polyvinylpyrrolidone (PVP) in D2), which thus are known or conventional, represents an equally suggested or obvious solution to the posed problem. The simple act of arbitrarily selecting one among equally obvious variations is devoid of any inventive character.
- 9.5 It follows from the foregoing that the skilled person starting from D2 to provide further methods of making foamed superabsorbents finds, if not in D2 itself (e.g. PVP), at least in D3 (e.g. crosslinked carboxymethyl cellulose), a suggestion on how to modify the closest embodiment of D2 with a specific, known superabsorbent, thus in a way that inevitably leads to the method of Claim 17 of 1st and 2nd Auxiliary Requests.

9.6 Therefore, the method of Claim 17 of the 1st and of the 2nd Auxiliary Request was obvious.

Conclusion

10. None of the claim requests on file fulfil the requirements of the EPC.

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:

S. Fabiani

J. Riolo