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D E C I S I O N
of 6 July 1999

Case Number: T 0680/96 - 3.3.3

Application Number: 91302895.7

Publication Number: 0450923

IPC: A61L 15/00

Language of the proceedings: EN

Title of invention:

Method of treating the surface of an absorbent resin

Applicant:

Nippon Shokubai Co., Ltd.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Novelty - implicit disclosure (no) - interpretation of a prior art document in the light of the technological context of its date of publication"

"Inventive step (yes) - method developed from the availability of a new device"

Decisions cited:

-

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0680/96 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 6 July 1999

Appellant: Nippon Shokubai Co., Ltd.
1-1, Koraihashi, 4-chome
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Osaka-fu 541 (JP)

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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 5 March 1996
refusing European patent application
No. 91 302 895.7 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: B. ter Laan
F. De Preter

Summary of Facts and Submissions

- I. European patent application No. 91 302 895.7, filed on 2 April 1991, claiming priority from an earlier application in the USA (US 502738 of 2 April 1990) and published on 9 October 1991 under No. 0 450 923, was refused by a decision of the Examining Division of the European Patent Office dated 5 March 1996. That decision was based upon three sets of claims, one as the main and two as auxiliary requests, all filed on 9 January 1996.

Claim 1 of the main request read:

"A method for treating the surface of an absorbent resin, which comprises mixing: (A) 100 parts by weight of an absorbent resin powder possessing a carboxyl group; (B) 0.01 to 30 parts by weight of a cross-linking agent; (C) 0 to 50 parts by weight of water; and (D) 0 to 60 parts by weight of a hydrophilic organic solvent; the mixing being carried out in a high-speed stirring type mixer provided with an inner surface formed substantially of a substrate (I) possessing a contact angle of not less than about 60° with respect to water and a heat distortion point of not lower than about 70°; and completing the reaction of the absorbent resin powder (A) with said cross-linking agent (B)."

Dependent Claims 2 to 13 referred to preferred embodiments of the method according to Claim 1.

The first auxiliary request differed from the main request in that in the method of Claim 1 the inner surface should be a shaped material of said substrate

(I) detachably inserted into the mixer. Like in the main request, dependent Claims 2 to 13 referred to preferred embodiments of the method according to Claim 1.

According to Claim 1 of the second auxiliary request the inner surface of the mixer should have a thickness of not less than 5 mm and should be cylindrical. Dependent Claims 2 to 12 were directed to preferred embodiments of Claim 1.

- II. The Examining Division held that the claimed subject-matter was novel, but did not involve an inventive step. In particular, it was found that D1 (GB-A-2 162 525) addressed the same problem as the application, that is, water retentivity under pressure. The problem to be solved was seen as an improvement of the method of D1. According to the examples of the application, which demonstrated an improved absorption under pressure, that problem was solved. The solution proposed by the application implied the use of a non-adhesive surface coating of sufficient durability of the inner surface of the mixer used for treating the absorbent resin, which was considered to be obviously desirable for the skilled person. The further definitions were practical embodiments which did not result in any surprising effect. Any improved crosslinking was enhanced by the use of a mixer with a non-stick surface. Therefore, the subject-matter of all requests was not inventive.

- III. On 1 May 1996 a Notice of Appeal was lodged against that decision; the prescribed fee was paid on 3 May 1996. With the Statement of Grounds of Appeal filed on

8 July 1996, the Appellant (Applicant) submitted three sets of claims corresponding to the requests upon which the decision of the Examining Division was based. The Appellant also commented upon the issue of inventive step and supplied additional arguments by a letter dated 30 July 1996.

- IV. After a communication from the Board, in which several objections under Articles 123(2), 84, 54 and 56 EPC were raised, on 9 June 1999 three new sets of claims replacing the claims then on file as well as additional experiments were filed. Those claims were again replaced by three sets filed on 25 June 1999.

At the oral proceedings before the Board held on 6 July 1999, after further objections by the Board, those claims were again replaced by one set of fourteen claims as the sole request. Claim 1 of the main request reads as follows:

"A method for treating the surface of an absorbent resin, which comprises mixing: (A) 100 parts by weight of an absorbent resin powder possessing a carboxyl group; (B) 0.01 to 30 parts by weight of a cross-linking agent; (C) 0 to 50 parts by weight of water; and (D) 0 to 60 parts by weight of a hydrophilic organic solvent; the mixing being carried out in a high-speed stirring type mixer provided with an inner surface formed substantially of a substrate (I) possessing a contact angle of not less than about 60° with respect to water and a heat distortion point of not lower than about 70°C at not less than about 600 m/minute of the lead-end peripheral speed of the stirring blade; and completing the reaction of the

absorbent resin powder (A) with said cross-linking agent (B) for cross-linking the surface region."

Dependent Claims 2 to 14 refer to preferred embodiments of the method according to Claim 1.

V. The Appellant's arguments submitted in writing and during oral proceedings can be summarised as follows:

(i) Regarding novelty, a coating for mixers intended for mixing abrasive gel-like material was not known; the mixers disclosed in D1 and in other documents on file were not coated on their inner surfaces.

(ii) As to inventive step, the advantages of the present method could not be attained with a mixer according to D1, since the latter did not have surface parameters as required in the application in suit. This was illustrated by the results of the additional experiments filed on 9 June 1999. At the priority date of the present application, the skilled person would have expected an abrasive effect of the powder to be mixed and for that reason would not have used a mixer with a non-stick coating on its inner surface. Also, he would have expected insufficient shearing forces with such a coating. Therefore, common sense would have suggested not to use such a coating. Furthermore, D1 did not refer to absorption under pressure, so that it contained no information regarding that property.

VI. The Appellant requested that the decision of the first

instance be set aside and that a patent be granted on the basis of Claims 1 to 14 submitted at the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

The wording of the claims

2. The amendments to the claims are in conformity with the requirements of Article 123(2) EPC.

Claim 1 of the main request differs from the one as originally filed in the addition of:

- (a) "the mixing being carried out", which constitutes only an editorial amendment,
- (b) the mixing being carried out in a mixer "at not less than about 600 m/minute of the lead-end peripheral speed of the stirring blade", which is originally disclosed on description page 10, second full paragraph (page 5, lines 17 to 18 of the application as published), and
- (c) "for cross-linking the surface region" at the end of the claim, which is based on original description page 15, last paragraph (page 6, line 58 of the application as published).

Claim 2 finds its support in original Claims 2 to 4 and the sentence in the description joining pages 12 and

13.

Claims 3 to 9, 10, 12 and 13 correspond to original Claims 5 to 11, 15, 21 and 24.

Claims 11 and 14 are a combination of original Claims 16 and 19, and 25 and 26, respectively.

3. The present wording of the claims also satisfies the requirements of Article 84 EPC as all the features essential for the definition of the invention are now incorporated in Claim 1.

Novelty

4. D1 describes a process for preparing a water-absorbing agent composed of a water-absorbing resin powder, the molecular chains near the surface of which are crosslinked, which process comprises mixing 100 parts by weight of a powder of a carboxyl-containing water-absorbing resin selected from a hydrolyzate of a starch-acrylonitrile graft polymer, a partially neutralized product of a starch-acrylic acid graft polymer, a saponification product of a vinyl acetate-acrylic ester copolymer, a hydrolyzate of an acrylonitrile copolymer, a crosslinked product of a hydrolyzate of an acrylonitrile copolymer, a hydrolyzate of an acrylamide copolymer, a crosslinked product of a hydrolyzate of an acrylamide copolymer, a partially neutralized product of polyacrylic acid and a crosslinked product of a partially neutralized product of polyacrylic acid, with 0.001 to 10 parts by weight of a polyhydric alcohol, 0.01 to 8 parts by weight of a hydrophilic organic solvent and 0 to 8 parts by weight

of water, and heating the mixture at a temperature of at least 90°C to react the water-absorbing resin powder with the polyhydric alcohol (Claim 1). The mixing may be carried out using ordinary mixing methods and devices (page 5, lines 38 to 39). For uniform mixing, mixers having a high mixing power are desirable and ordinary mixers or kneaders may be used. Various types of mixers are exemplified (page 3, lines 27 to 32). One preferred means for stirring and mixing is to use a high-speed rotating paddle-type mixer, which is available under the trade names "Turburizer" and "Sand Turbo", both produced by Hosokawa Micron (page 4, lines 38 to 43). In the worked examples of D1 the mixing of the water-absorbing resin powder with the other components is carried out in a paddle-type mixer (Example 1), a twin-arm kneader (Examples 2 and 3) and a V-type mixer (Example 4).

- 4.1 According to the claimed subject-matter of the application in suit, the mixing device is required to have an inner surface formed substantially of a substrate possessing a contact angle of not less than about 60° with respect to water and a heat distortion point of not lower than about 70°C at not less than about 600 m/minute of the lead-end peripheral speed of the stirring blade. According to the description the high-speed stirring type mixers to be used include mixers of the type capable of mixing two or more kinds of powder by the high-speed rotation of a rotar provided with a multiplicity of paddles and disposed inside a cylinder container, such as "Turbulizer" and "Sand Turbo", both produced by Hosokawa Micron (paragraph bridging pages 10 and 11 of the original application; page 5, lines 16 to 24 of the application

as published). Regarding the "Turbulizer", it is specified that it has a lining of a substrate fulfilling the requirements laid down in Claim 1 (page 11, first full paragraph of the original application; page 5, lines 27 to 31 of the application as published).

4.2 In view of the fact that both the application in suit and D1 mention the "Turbulizer" - the spelling "Turburizer" resulting from the conversion into Japanese of the original word "Turbulizer" - as one of the suitable mixing devices, the question arose whether the Turbulizer mentioned in D1 did not also possess the inner lining described in the present application, or, in other words, whether the method now claimed had not been implicitly disclosed in D1. Invited by the Board to demonstrate that the "Turburizer" of D1 did not already possess the required inner lining, the Appellant first explained that their attempts to obtain such information had been so far unsuccessful, then relied on time considerations speaking in favour of technical differences between the known device and that defined in the application. According to the Appellant, the "Turburizer" described in D1 did not have an inner lining, as D1 had been published more than four years prior to the present priority date, and it had a priority date itself of almost six years earlier, whereas the "Turbulizer" used in the application in suit had been developed only after that time.

4.3 Therefore, the Board is faced with the situation that, although D1 would appear to disclose the same type of mixers as the one required in the application in suit, the Appellant stated that the prior art mixers were

nevertheless different from the one now used. In the absence of evidence as to the contrary the Appellant should normally be given the benefit of the doubt. In fact, the time lapse between D1 and the present application gives a certain plausibility to the Appellant's argument, which allows the Board to accept it. Therefore, D1, interpreted in the light of the technological context of its date of publication, is deemed to differ from the present application in that the mixers used there do not have a lining according to the requirements of present Claim 1.

- 4.4 In the light of the above-mentioned considerations, the claimed subject matter is novel.

Inventive step

5. The application in suit concerns a method of treating the surface of an absorbent resin.
- 5.1 As stated above, such method was known from D1, Example 1, in which a resin made out of sodium acrylate, acrylic acid and trimethylolpropane triacrylate is mixed with glycerol and ethanol in a paddle type mixer, of which the "Turbulizer" is an example (see point 4 above). Therefore, the Board, like the Examining Division and the Appellant, considers D1 as the closest state of the art.
- 5.2 Although the process of D1 is said to provide a water-absorbing agent which possesses, amongst other favourable properties, a high speed of water absorption and high water retentivity even under pressure (page 1, lines 50 to 57), the absorption rate under pressure as

well as the liquid permeability still left room for improvement.

5.3 According to the description of the present application (page 3, third and fourth paragraphs of the original application; page 2, lines 49 to 54 of the application as published), the object of the invention is to provide a method of treating the surface of an absorbent resin which is effective for obtaining an absorbent possessing a high absorption rate under pressure and a high water retaining property under pressure as well as an excellent liquid permeability. However, regarding the water retaining property under pressure, the examples of the present application show that the property under that name in fact refers to the absorption rate under pressure (page 8, lines 45 to 54 of the application as published) and that no other information regarding the water retentivity is available. Therefore, no conclusions can be drawn regarding that property.

5.4 In view of this, the technical problem underlying the application in suit has to be reformulated as to provide a method of treating the surface of an absorbent resin which is effective for obtaining an absorbent possessing a high absorption capacity under pressure as well as an excellent liquid permeability.

5.5 According to the application in suit that problem is to be solved by the method comprising mixing an absorbent resin powder with a cross-linking agent and possibly water and a hydrophilic organic solvent in a high-speed stirring type mixer provided with a specific inner surface, as defined in Claim 1.

5.6 The examples in the application show that the above-defined problem is effectively solved. In particular, it has been shown that the method according to Claim 1 results in resins having a high absorption capacity and a high absorption rate under pressure as well as an excellent liquid permeability (Table 1). More specifically, a comparison between Examples 1 and 2 with Controls 1 and 2 (Table 1) demonstrates that the resins treated according to the application in suit have an improved absorption rate under pressure and liquid permeability as compared with those of D1.

6. It remains to be decided whether the claimed subject-matter is obvious having regard to the documents on file.

6.1 According to the general teaching of D1, the speed of water absorption and water holding property, even under pressure, could be improved by preparing a water-absorbing agent from the components as indicated above (point 4). Mixing may be carried out using ordinary methods and devices (page 5, lines 38 to 39) and various types of mixers are exemplified (page 3, lines 27 to 32). However, although the use of a high-speed rotating paddle-type mixer available under the trade names "Turbulizer" and "Sand Turbo" is preferred (page 4, lines 38 to 43), no special emphasis is laid on the inner lining of those mixers. In fact, D1 does not even mention the inner lining of the mixing devices to be used.

Therefore, D1 by itself cannot render obvious the subject-matter of present Claim 1.

- 6.2 The other documents on file are less relevant than D1 and none of those mentions the inner lining of any mixers used for treating absorbent resins, so that no combination of any of the other documents with D1 could lead to the present solution.
- 6.3 For the above reasons, the Board comes to the conclusion that the subject-matter of Claim 1 involves an inventive step.
7. As Claim 1 of the main request is allowable, the same goes for dependent Claims 2 to 14, the patentability of which is supported by that of Claim 1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order to grant a patent on the basis of Claims 1 to 14 submitted at the oral proceedings after adaptation of the description.

The Registrar:

The Chairman:

E. Görgmaier

C. Gérardin