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**Datasheet for the decision
of 6 March 2014**

Case Number: T 1445/11 - 3.3.09

Application Number: 01104153.0

Publication Number: 1130045

IPC: C08J3/12, C08L101/14

Language of the proceedings: EN

Title of invention:

Process for producing a water-absorbent resin powder

Patent Proprietor:

NIPPON SHOKUBAI CO., LTD.

Opponent:

BASF SE

Headword:

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - (yes)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 1445/11 - 3.3.09

**D E C I S I O N
of Technical Board of Appeal 3.3.09
of 6 March 2014**

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
18 April 2011 concerning maintenance of the
European Patent No. 1130045 in amended form.**

Composition of the Board:

Chairman: W. Sieber
Members: N. Perakis
F. Blumer

Summary of Facts and Submissions

- I. Mention of the grant of European patent No. 1 130 045 to Nippon Shokubai Co Ltd, was published on 17 August 2005 (Bulletin 2005/33). The granted claims contained six independent process claims 1, 10, 11, 16, 17 and 18. Claim 17, the only claim relevant for this decision, reads as follows:

"17. A production process for a water-absorbent resin powder, which comprises the steps of: polymerizing an aqueous monomer solution containing a monomer and a crosslinking agent; heat-drying the resultant crosslinked hydrogel polymer; and pulverizing the resultant dry polymer; wherein:

the step of pulverizing the dry polymer is carried out so as to form a water-absorbent resin powder having a bulk-density, as measured by an apparatus according to JIS K-3362, of not less than 0.65 g/ml;

characterized in that the dry polymer is forcibly cooled after the heat-drying step; and the cooled water-absorbent resin powder is further surface-crosslinked."

- II. A notice of opposition was filed against the patent by BASF SE, requesting the revocation of the patent on the grounds of lack of novelty and inventive step (Article 100(a) EPC).

The documents cited in the opposition proceedings included:

- D1: Modern Superabsorbent Polymer Technology, Wiley-VCH, ISBN 0-471-19411-5, 1997, pages 70-74, 87-90, 93-95, 97-101 and 141-143;
- D2: Genehmigungsantrag der Cassella AG (open to the public between 2 March 1992 to 14 April 1992 according to Staatsanzeiger für das Land Hessen);
- D4: Research Disclosure RD 38363 (published 1996); and
- D7: WO 00/24810 A1.

III. By a decision announced orally on 16 March 2011 and issued in writing on 18 April 2011, the opposition division maintained the patent in amended form on the basis of claims 1-23 of the second auxiliary request submitted on 12 December 2006. Claim 16 of this request corresponded to granted claim 17.

The opposition division considered that the process of claim 16 was novel and involved an inventive step. D2 was considered to represent the closest state of the art. The invention of claim 16 improved the mixability of the water-absorbent resin powder with the aqueous surface cross-linking agent solution, thereby improving the continuous operability and the properties of the powder (see point B.4.5.5).

IV. The patent proprietor filed an appeal against the decision of the opposition division on 27 June 2011 and paid the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 18 August 2011, including auxiliary requests 1 to 8. The patent proprietor requested that the decision of the opposition division be set aside and the patent be

maintained as granted, alternatively on the basis of one of the auxiliary requests.

- V. The opponent filed an appeal against the decision of the opposition division on 14 June 2011 and paid the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 20 August 2012. The opponent requested that the decision of the opposition division be set aside and the patent be revoked in its entirety.
- VI. As the proprietor and the opponent are respectively both appellant and respondent in these proceedings, for the sake of simplicity the board will continue to refer to them as the proprietor and the opponent.
- VII. By letter of 5 January 2012, the patent proprietor filed observations on the appeal of the opponent. It also filed page 91 of the textbook D1 and a translation of the first priority document of the patent in suit into English. These documents are not relevant for the present decision.
- VIII. By letter of 6 January 2012, the opponent filed observations on the appeal of the patent proprietor.
- IX. By a further letter of 24 January 2014, the patent proprietor replaced the previously filed auxiliary requests 1-8 with auxiliary requests 1-15.
- X. Oral proceedings were held before the board on 6 March 2014. During these oral proceedings the patent proprietor filed auxiliary request 16 and withdrew all previous requests.

Auxiliary request 16, sole request of the patent proprietor, comprised claims 1-5. Claim 1 corresponded to granted claim 17 and dependent claims 2-5 to granted dependent claims 19, 20, 22 and 23, respectively.

XI. The relevant arguments put forward by the patent proprietor in its written submissions and at the oral proceedings may be summarised as follows:

- Claim 1 of auxiliary request 16 involved an inventive step.
- D2 was the closest state of the art since it concerned the production process for a water-absorbent resin powder, which comprised the steps of polymerizing an aqueous monomer solution containing a monomer and a crosslinking agent, heat-drying the resultant crosslinking hydrogel polymer and pulverizing the resultant dry polymer to produce said water-absorbent resin powder. However, D2 did not disclose that the dry polymer was forcibly cooled after the heat-drying step. The contact of the dried particles with the pulverizing rollers, despite the fact that they were cooled with water, did not clearly and unambiguously lead to a reduction of the particles' temperature.
- D7 should not have been considered to represent the closest state of the art because it concerned a complete drying method for hydrogels. Regarding example 1, it did not disclose that the cooling was forcible.
- D4 should not be considered to represent the closest state of the art because it concerned

drying of pasty materials using a continuous through-circulation belt dryer. D4 did not disclose the preparation of a crosslinked hydrogel. Regarding superabsorbents (SAP), they were only disclosed as an example. Regarding the cooling zone, it was a facultative step.

- Claim 1 of auxiliary request 16 involved an inventive step even if D4 was considered to represent the closest prior art. There was clearly no hint in the art to adjust the bulk density of the powder to not less than 0.65 g/ml in order to improve the absorption capacity under load, irrespective of whether (i) the preparation of the hydrogel polymer by polymerising an aqueous monomer solution containing a monomer and a crosslinking agent, (ii) the combination of the drying step with a forcible cooling step and (iii) the surface-crosslinking of the powder could be considered obvious in view of D1. The relation between bulk density and absorption capacity under load was illustrated in table 2 of the patent in suit, in particular examples 10-13, 6, 15, 16, 19-21. Not only did these examples show the presence of such a relation, they also showed that this correlation was present within the entire useful range of the powder particle diameter, namely between 150 and 850 μm .

- The argument of the opponent, that the relation between the increase of bulk density and the improvement of absorption capacity under load was foreseeable for the skilled person, was a mere allegation which was not based on any technical evidence. Also the argument that there was no relation between bulk density and absorption

capacity under load was not credible in the absence of technical evidence. In fact, the opponent did not submit any technical evidence to show that water-absorbent resin powder with a bulk density of less than 0.65 g/ml (i.e., outside the claimed scope) showed an absorption capacity under load comparable or superior to that with a bulk density of not less than 0.65 g/ml.

XII. The relevant arguments put forward by the opponent in its written submissions and at the oral proceedings may be summarised as follows:

- Claim 1 of auxiliary request 16 lacked an inventive step.
- D4 could be considered to represent the closest prior art as it concerned a drying process of pasty or rubbery materials like SAP, which used a through-circulation belt dryer having a final cooling zone. The final cooling zone of the belt dryer was not an arbitrary alternative of the drying belt but had the purpose of rendering the product more brittle for subsequent milling.
- The missing features concerning the preparation of the SAP hydrogel and its further surface-crosslinking were obvious since they were the usual technical measures belonging to the general background knowledge of the person skilled in the art. These features were disclosed in detail in D1.
- Regarding the missing feature concerning the bulk density of the water-absorbent resin powder of not less than 0.65 g/ml, it was a feature which was

adjusted automatically by the forcible cooling. Anyway, the bulk density was not a feature which could be considered independently from the forcible cooling. This was acknowledged in the patent in suit (see paragraph [0072]).

- Furthermore, the results of table 2 of the patent in suit did not show that the claimed bulk density related to an improvement of the absorption capacity under load. Moreover, the results of table 2 did not concern the entire useful range of resin powder particle diameter. But even if table 2 was considered to show an improvement, this was foreseeable for the skilled person.

- D7 could also be considered to represent the closest state of the art since it disclosed in example 1 a process for the preparation of a water-absorbent resin powder comprising the steps of polymerizing an aqueous monomer solution containing a monomer and a crosslinking agent, heat-drying the resultant crosslinked hydrogel polymer at an air temperature of 180°C, forcibly cooling the dry polymer at 60°C, pulverizing the resultant dry polymer and screening it to a particle size between 120 - 850 µm. The bulk density was a feature which was adjusted by the forcible cooling and the surface-crosslinking was a conventional measure obvious to the skilled person.

XIII. The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained on the basis of auxiliary request 16 (claims 1-5) as filed during the oral proceedings before the board.

XIV. The opponent requested that the decision under appeal be set aside and the patent be revoked.

Reasons for the Decision

1. Both appeals are admissible.
2. Auxiliary request 16, which was filed by the patent proprietor during the oral proceedings before the board, was admitted into the proceedings. Claims 1-5 of this request corresponded to granted claims 17, 19, 20, 22 and 23, respectively, and did not surprise the opponent who had already commented on their lack of patentability in the statement setting out the grounds of its appeal (see point 3.6). Furthermore, the opponent did not raise any objection against the admissibility of this request during the oral proceedings.
3. The only objection raised by the opponent against auxiliary request 16 was that it lacked an inventive step.
 - 3.1 The closest state of the art
 - 3.1.1 Any of D2, D4 and D7 could be considered to represent the closest state of the art. However, since D4 clearly discloses the forcible cooling of the polymer after the heat-drying step (page 3, first paragraph) which is an essential feature according to the patent in suit (page 8, line 35), the board decided to consider D4 as the closest state of the art.
 - 3.1.2 As far as the general disclosure of D4 is concerned, the board considers that it at least implicitly

discloses for the skilled person, the production of a water-absorbent resin powder, despite the fact that it particularly focuses on the specific drying step of a pasty material. D4 mentions a superabsorbent as an example for a pasty material (page 1, first paragraph). It goes without saying that the skilled person reading D4 understands that a superabsorbent to be dried in this specific step has to be manufactured in a previous step (including aqueous polymerisation), which is part of his common general knowledge as apparent from D1 (point 3.2.2). Thus this step, although not explicitly disclosed, is implicit in view of the general disclosure of D4.

It is also remarked that D4 explicitly discloses that subsequent to the drying and cooling the product is milled (page 3, first paragraph, last line). Thus, the pulverization step of the dried material is also disclosed by D4.

Finally the cooling step is not optional as the patent proprietor alleged but mandatory in order to render the particles brittle for subsequent milling (page 3, first paragraph, last two lines). The patent in suit itself discloses that pasty or rubbery products at high temperatures are not easily pulverizable. Reference is made to paragraph [0160] which reports troubles during pulverization such as aggregate-derived extraordinary noises of the pulverizer and adhesion of the aggregate to the pulverizer. Therefore it is clear for the skilled person reading D4 that in order to avoid the above mentioned troubles the product has to be rendered brittle, which is achieved by cooling.

3.1.3 In view of the above considerations the production process of claim 1 differs from the disclosure of D4 in that:

- the pulverizing of the dry polymer is carried out so as to form a water-absorbent resin powder having a bulk density, as measured by an apparatus according to JIS K-3362, of not larger than 0.65 g/ml, and
- the cooled water-absorbent resin powder is further surface-crosslinked.

3.2 The technical problem

3.2.1 The technical problem underlying the claimed invention in the light of D4 is to provide a process which yields an improved water-absorbent resin powder (see patent in suit, paragraphs [0002], [0015] and [0017]). This technical problem is solved by the features of claim 1. The experimental part of the patent in suit, in particular table 2, provides the required technical evidence that the set technical problem has indeed been solved.

Table 2 shows that by adjusting the bulk density of a cooled water-absorbent resin powder so that it is not less than 0.65 g/ml (see examples 10, 12, 6, 15, 16 and 19-21 according to the invention as listed in table 2 which have a bulk density of 0.74, 0.76, 0.67 and 0.68 g/ml) the absorption capacity under load, in particular under a load of 4.90 kPa, is improved (it ranges between 24-28 g/g).

The comparative examples of table 2 which have a bulk density less than 0.65 g/ml (see examples 11 and 13 with a bulk density of 0.63 g/ml) show a worse absorption capacity under a load of 4.90 kPa (see

examples 11 and 13 with an absorption capacity of 18 and 20 g/g).

It is admitted that the comparison of table 2 concerns the particle size fractions of:

150-300 μm (example 10 according to the invention compared with example 11 not according to the invention) and

150-500 μm (example 12 according to the invention compared with example 13 not according to the invention).

Regarding the particle size of larger fractions, namely not larger than 850 μm (examples 6, 15, 16, and 19-21), the provided results indicate that the improved values observed for the fractions 150-300 μm and 150-500 μm also apply to the entire particle diameter range useful in SAP, namely 150-850 μm .

Consequently, contrary to the allegations of the opponent, the technical evidence of the patent in suit illustrates the sought improvement within the entire particle diameter range useful for SAP and not only for a part of it.

3.2.2 In this context the opponent argued that:

- the results of table 2 do not show that there is a clear relation between the bulk density and the absorption capacity under load, and
- the observed improvement is inherent when the powders are obtained by pulverizing the dry polymer so that the bulk density is not less than 0.65 g/ml.

The board remarks however, that the opponent, who bears the burden of proof, did not submit any technical evidence to show that:

- there is no relation between bulk density and absorption capacity under load, or
- the improvement is inherent when the pulverization is carried out so as to form a powder with a bulk density of not less than 0.65 g/ml.

3.3 Obviousness

3.3.1 The skilled person starting from the production process for a water-absorbent resin powder of D4 and aiming at the provision of production process of an improved product would not find any hint in the art that the dry polymer, after the forcible cooling, should be pulverized in such a manner that the powder has a bulk density of not less than 0.65 g/ml. Furthermore, the opponent has not shown that such a pulverizing step belongs to the general background knowledge of the skilled person.

3.3.2 Regarding the step of manufacturing the SAP hydrogel and the step of the further surface-crosslinking of the SAP powder, the board agrees with the opponent that they are steps which concern ordinary technical measures belonging to the general background knowledge of the skilled person (see D1: page 71, lines 16-24 and page 74, lines 5-6). Incidentally, the patent in suit does not disclose that these steps provide any technical effect and the patent proprietor did not rely on those steps for the assessment of inventive step. Consequently these steps do not contribute to the inventiveness of the claimed process, which as set out

above relies exclusively on the specific step of pulverization of the forcibly cooled dry polymer.

- 3.3.3 On the basis of the above considerations, it is concluded that the subject-matter of claim 1 is not obvious and that this claim involves an inventive step.
- 3.3.4 Regarding D2 and D7 (the latter cited under Article 54(2) EPC against claim 1), the patent proprietor contested that they clearly and unambiguously disclosed cooling of the polymer, not to mention that they did not disclose forcible cooling. The board notes that even if it was admitted that D2 and D7 disclosed a forcible cooling, these documents were not more pertinent than D4 and that considering them as the closest state of the art would not lead to a different conclusion regarding the issue of inventive step.
4. Dependent claims 2-5, which correspond to preferred embodiments of the subject-matter of claim 1, involve *mutatis mutandis* an inventive step.
5. Under the present circumstances, auxiliary request 16 fulfils the requirement of the EPC and is therefore patentable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of auxiliary request 16 (claims 1-5) as filed during the oral proceedings before the board, after any necessary consequential adaptation of the description and the figure.

The Registrar:

The Chairman:



M. Cañueto Carbajo

W. Sieber

Decision electronically authenticated