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**Datasheet for the decision
of 5 August 2019**

Case Number: T 1252/14 - 3.2.05

Application Number: 04009614.1

Publication Number: 1470905

IPC: B29B9/06, B29C47/10, B29C35/04

Language of the proceedings: EN

Title of invention:
Method for disintegrating hydrate polymer

Patent Proprietor:
Nippon Shokubai Co., Ltd.

Opponent:
Evonik Degussa GmbH

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
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Case Number: T 1252/14 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 5 August 2019

Appellant:
(Opponent)

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted on 2 April 2014
rejecting the opposition filed against European
patent No. 1470905 pursuant to Article 101(2)
EPC.**

Composition of the Board:

| | |
|-----------------|-----------|
| Chairman | M. Pooock |
| Members: | P. Lanz |
| | G. Weiss |

Summary of Facts and Submissions

- I. The appeal by the opponent is against the decision of the opposition division to reject the opposition against European patent EP-B-1 470 905.
- II. During the opposition proceedings, the opponent had raised the grounds for opposition according to Articles 100(a) (lack of novelty and lack of inventive step) and 100(b) EPC 1973 .
- III. The appellant (opponent) requests that the decision under appeal be set aside and that the European patent be revoked.
- IV. The respondent (patent proprietor) requests that the appeal be dismissed or, as an auxiliary measure, that the patent be maintained on the basis of the claims according to any of auxiliary requests 1 to 6 filed under cover of a letter dated 22 December 2014.
- V. The following documents were referred to during the appeal proceedings:

E2: EP 0 497 623 A2;

E3: EP 0 412 363 A2;

E4: Handbook "Modern Superabsorbent Polymer Technology", Chapter 3 "Commercial Processes for the Manufacture of Superabsorbent Polymers", pages 69 to 117, edited by Fredric L. Buchholz and Andrew T. Graham, published by Wiley-VCH, New York/Chicester/Weinheim/Brisbane/Singapore/Toronto 1998 (ISBN 0-471-19411-5).

VI. Claim 1 as granted (main request) is worded as follows:

"A method for disintegrating a hydrate polymer having a solid content in the range of 50 - 70 wt. % with a screw extruder, characterised in that said polymer is disintegrated while supplying 0.1 - 30 parts by weight of water per 100 parts by weight of said hydrate polymer."

VII. The appellant's arguments can be summarised as follows:

Document E2 was the closest prior art from which the subject-matter of claim 1 differed in the characterising feature of the polymer being disintegrated while supplying 0.1 - 30 parts by weight of water per 100 parts by weight of said hydrate polymer. According to the patent in suit, the objective technical problem was to reduce the residual monomer content and the content of soluble components in the disintegrated polymer. The solution according to present claim 1 was not based on an inventive step, since it was obvious to carry out the vapour treatment of document E3 in the extruder disclosed in document E2. This was in particular true in view of the particle size of the gel of 0.5 to 30 mm (see E3, page 3, lines 51 to 53), its solid content in the range of 20 to 65 wt.% (see E3, page 3, lines 46 to 47), its temperature of at least 50°C (see E3, claim 1) and the fact that that the extruder of document E2 (see page 4, line 20) was suitable for agitating the polymer particles as required in the treatment according to document E3 (see page 3, lines 54 to 58). Hence, the skilled person would have expected that performing the vapour treatment of document E3 in the extruder of document E2 resulted in a reduction of residual monomers and of soluble components in the disintegrated polymer. The

allegation in the patent in suit that the claimed method also reduced the kneading motion in the extruder was not proven. Moreover, since it was obvious to combine documents E2 and E3 in order to achieve the alleged technical effect of lowering the content of residual monomers and soluble components in the disintegrated polymer, the further alleged advantage of reducing the kneading motion had to be considered a bonus effect which could not justify the presence of an inventive step. It was also noted that the examples of the contested patent were silent on the amount of water supplied to the extruder during the disintegration of the polymer. Therefore, it was not clear whether the technical effect derived from the examples and shown in Table 1 of the patent could be achieved with the method of claim 1, which explicitly required supplying 0.1 to 30 parts by weight of water per 100 parts by weight of said hydrate polymer. In view of these doubts, the presence of an inventive step could not be justified with an unproven technical effect of reducing the residual monomer content and the content of soluble components in the disintegrated polymer.

Furthermore, the subject-matter of claim 1 was not inventive over a combination of documents E2 and E4. According to paragraph [0026] of the patent, the term "water" in claim 1 covered not only pure water but could also include an alkali. Hence, supplying a sodium hydroxide solution to the extruder while the polymer was being disintegrated was in accordance with present claim 1. The technical problem could therefore be formulated as providing a method for producing a water absorbing polymer, wherein the acrylic acid was at least partially neutralised in the extruder. The solution to this problem was rendered obvious by handbook E4, which constituted the skilled person's

common general knowledge. On pages 85 to 87, document E4 described the disintegration of the polymer gel in an extruder downstream of the polymerisation reactor (see in particular page 86, line 33 *et seqq.*) and made reference to document E2 (see reference 62 on page 86, line 3 and page 87, line 16). The advantage of providing a separate unit for disintegrating the polymer was that additives could be added during chopping and grinding, for example a sodium hydroxide solution for neutralising the polymer (see E4, page 87, lines 22 to 23). In view of this teaching, it was obvious for a skilled person to combine documents E2 and E4. This combination resulted in a method which differed from the subject-matter of claim 1 only in the specification of the amount of water supplied to the extruder. However, it was not apparent that the claimed amount of water provided any advantages. This aspect could therefore not support the presence of an inventive step of the subject-matter of claim 1.

VIII. The respondent's arguments were essentially as follows:

Document E2 represented the closest prior art for the subject-matter of claim 1, which differed from the content of document E2 in the feature of the polymer being disintegrated, while supplying 0.1 to 30 parts by weight of water per 100 parts by weight of said hydrate polymer. According to the patent, the above mentioned distinguishing and characterising feature avoided the generation of a kneading motion. At the same time, the resulting product could be prevented from mutual adhesion (see paragraph [0013] of the patent). Consequently, the resulting gel polymer comprised a reduced content of a soluble component and of a residual monomer (see Table 1 of the patent). Contrary to the appellant's allegation, the examples of the

patent were covered by the wording of claim 1. The amount of water added to the polymer in accordance with the characterising portion of the claim could be calculated from the data given in the examples as being 4.6 parts (Example 1) and 9.4 parts (Example 2), respectively, in relation to 100 parts of the hydrate polymer. For instance, in Example 1 the solid content before disintegration was shown to be 58 wt % (see page 11, line 24 of the patent). On the same page at line 28, the solid content after disintegration was stated to be 56.5 wt %. The results as shown in Table 1 of the contested patent demonstrated that the soluble components as well as the residual monomer in the disintegrated polymer had been reduced while not negatively affecting the performance parameters like the absorption capacity under load (GV). This improvement could be connected to a certain extent to the prevention of a kneading motion in the extruder while also preventing the mutual adhesion of hydrate polymer particles. On the basis of this technical effect, the objective technical problem underlying the patent in suit in the light of document E2 was to provide a method of disintegrating a hydrate polymer, wherein the residual monomer and water-soluble component content in the disintegrated hydrate polymer was reduced while the hydrate polymer's performance parameters like the absorption capacity under load were neither endangered nor negatively affected. Document E3 could not render the claimed solution obvious. First, the meaning of the term "möglichst geringe lösliche Anteile im Polymer" in document E3 (see page 2, lines 27 to 29) related to some extent to the amount of residual acrylic acid in the polymer gel (see E3, Tables 1 to 7) and was, hence, different from the meaning of the expressions "residual monomer content" and "water soluble component" according to the patent

in suit. Secondly, in document E3 (see page 3, lines 51 to 53) the treatment with water vapour was performed on particles having a diameter of 0.1 to 60 and preferably of 0.5 to 30 mm. This meant that they had already undergone a disintegrating process. In contrast, according to the patent (see examples), the hydrate polymer was fed to the extruder in the form of a belt having a thickness of 3 to 7 mm. In document E3 the addition of steam was done after the hydrated gel polymer had been finely divided and not during the disintegration step. Also for this reason, document E3 could not render obvious the subject-matter of contested claim 1. Thirdly, none of documents E2 and E3 disclosed a single specific example in which the solid content of the hydrate polymer was as high as 50 to 70% by weight. The present invention could therefore be considered a selection invention in terms of the solid content of the hydrate polymer. Finally, the person skilled in the art could learn from document E3 to reduce the residual monomer content by treating a particulate gel polymer with water vapour while being stirred in an appropriate apparatus, which avoided an agglomeration of the particles. The skilled person was aware of the fact that screw extruders, as applied in the contested patent, were specially used for kneading and homogenising a particulate matter before extruding the mass through a nozzle or an orifice. In view of that, the person skilled in the art would not seriously consider the use of an extruder in the treatment according to document E3, where the polymer gels were in the form of particles and stirred substantially without sticking together (see E3, page 3, lines 46 to 49). In summary, it was not obvious for a person skilled in the art to combine E2 and E3 so as to arrive at the technical teaching of the contested patent. The

appellant's inventive step objections were based on an *ex post facto* analysis.

Regarding the further objection based on documents E2 and E4, the appellant redefined the technical problem as providing another method for producing water absorbing polymer, wherein an at least partial neutralisation of an acrylic acid was achieved in a screw extruder. However, this reformulated problem was not based on the technical effects of the present invention in view of document E2, in particular the prevention of kneading motion, the prevention of agglomeration, the reduction of residual monomer, the reduction of soluble component and the attainment of high absorption performance parameters of a hydrate polymer after a disintegrating process. Further, the reformulated wording of the technical problem as proposed by the appellant already considered the teaching of document E4, which was clearly inadmissible and lead to an inaccurate assessment of inventive step. Hence, the appellant's inventive step objection based on documents E2 and E4 was not suitable to call into question the inventive merits of the subject-matter of claim 1.

Reasons for the Decision

1. Inventive step

1.1 Closest prior art

It is uncontested that document E2 forms the closest prior art for the subject-matter of claim 1 as granted (main request). Moreover, it is not disputed that the subject-matter of claim 1 differs from the disclosure of document E2 in the feature of the polymer being

disintegrated, while supplying 0.1 to 30 parts by weight of water per 100 parts by weight of said hydrate polymer.

1.2 Technical effect and objective technical problem

Following the problem-solution approach, the objective technical problem is formulated on the basis of the technical effect achieved by the differing features over the closest prior art. In the case at hand, the patent in suit describes the technical effect of the method of claim 1 as the reduction of the content of residual monomer and soluble components in the disintegrated polymer (see for example paragraph [0017]).

In its statement setting out the grounds of appeal, the appellant questioned whether the examples of the patent, which supported the above technical effect, were in accordance with the claimed subject-matter, in particular as regards the proportion of water added during the disintegration step. In that respect, the board first observes that the appellant did not submit any experimental evidence showing that the method as defined in claim 1 does not achieve the technical effect of reducing the residual monomer content and the content of soluble components in the disintegrated polymer. Moreover, as pointed out by the respondent, according to both examples of the patent (see end of paragraph [0063] as well as paragraphs [0064] and [0067]), the water content of the hydrate polymer is increased during its disintegration in the extruder by the claimed proportion (see the reduction of the solid content from 58 wt.% to 56.5 wt. % in Example 1 and from 58 wt.% to 55 wt.% in Example 2). Taking into account the evidence on file, the board has no reason

to deny that the technical effect as set out in the patent in suit can be achieved by the method of claim 1.

On the basis of this technical effect, the objective technical problem of the claimed invention resides in the reduction of the residual monomer content and the content of soluble components in the disintegrated polymer.

1.3 Obviousness of the proposed solution

1.3.1 Document E3 is directed to a process for obtaining crosslinked water-swellaable polymers having an improved water absorption capacity coupled with a very low content of soluble fractions in the polymer (see E3, page 2, lines 27 to 29). In particular, a water-containing, finely divided polymer gel having a solids content of from 20 to 65 wt.% is treated with steam at not less than 50°C, wherein the solids content of the water-containing polymer gel is increased by not more than 30% by weight (see E3, claim 1). For the increase of the water absorption capacity of the crosslinked polymers according to document E3, the polymer gels used as starting materials must be in the form of particles and should as far as possible be capable of being stirred substantially without sticking together (see E3, page 3, lines 47 to 49). To this effect, document E3 mentions kneaders, tumble driers, paddle driers, rotary ovens, disk driers, kettles equipped with a helical ribbon stirrer, bins with stirrers or a fluidised bed as examples for apparatuses in which the polymer can be circulated or stirred so that an agglomeration of the water-containing gel particles is prevented (see E3, page 3, lines 54 to 58).

The appellant essentially argues that the extruder of the closest prior art E2 was suitable for agitating the polymer particles as required in the treatment according to document E3 and that it was therefore obvious to carry out the vapour treatment of document E3 in the screw extruder of document E2.

As emphasised by the respondent, the purpose of stirring the polymer particles in document E3 is to prevent their agglomeration during the treatment with vapour. By contrast, according to document E2 a hydrated gel polymer is extruded through a perforated plate of a screw extruder, which requires the presence of a pressurised polymer mass and runs against the requirement of preventing agglomeration. In view of these opposing aims, the person skilled in the art would not, from an objective point of view, consider the use of a screw extruder as a stirrer in the treatment according to document E3. For this reason, a combination of documents E2 and E3 does not render obvious the subject-matter of granted claim 1.

- 1.3.2 The appellant also challenged the presence of an inventive step on the basis of a combination of documents E2 and E4. According to the appellant, the technical problem in this context was to provide a method for producing a water absorbing polymer, wherein the acrylic acid was at least partially neutralised in the extruder.

The board re-emphasises that according the problem-solution approach, the objective technical problem is formulated on the basis of the technical effect achieved by the differing features over the closest prior art. As stated above, the technical effect of the method of claim 1 resides in the reduction of the

residual monomer content and the content of soluble components in the disintegrated polymer (see for example paragraph [0017] of the patent). It is not apparent that the skilled person can derive the alternative formulation of the technical problem as proposed by the appellant in the context of the inventive step attack in view of a combination of documents E2 and E4 from a technical effect achieved by the differing features over the closest prior art E2. Rather, this formulation of the technical problem already points to the solution according to page 87, lines 22 to 26 of document E4. Following established case law (see Case Law of the Boards of Appeal of the European Patent Office, 8th edition, 2016, I.D.4.3.1), the technical problem addressed by an invention has to be formulated in such a way that it does not contain pointers to the solution or partially anticipate the solution, since including part of a solution offered by an invention in the statement of the problem necessarily results in an *ex post facto* view being taken of inventive step when assessing the state of the art. On this ground alone, the appellant's inventive step reasoning based on documents E2 and E4 must fail.

- 1.3.3 For these reasons, the appellant's inventive step objections cannot convincingly demonstrate that the claimed subject-matter was obvious for the skilled person in view of the cited prior art. The board therefore concludes that the subject-matter of claim 1 as granted is based on an inventive step, Article 56 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



N. Schneider

M. Poock

Decision electronically authenticated