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Datasheet for the decision of 17 January 2008

Case Number: T 1008/05 - 3.3.03

Application Number: 97104803.8

Publication Number: 0796868

IPC: C08B 31/00

Language of the proceedings: EN

Title of invention:
Stabilized or stabilized, crosslinked waxy potato starch

Patentee:
National Starch and Chemical Investment Holding Corporation

Opponent:
Südzucker Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 114(2)
RPBA Art. 13(3)

Keyword:
"Novelty (yes)"
"Inventive step (yes)"
"Late filed documents - not admitted"

Decisions cited:
T 0572/88, T 0375/91, T 0355/99

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1008/05 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 17 January 2008

Appellant: (Opponent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office dated 31 May 2005 and posted 13 June 2005 rejecting the opposition filed against European patent No. 0796868 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: R. Young
Members: C. Idez
E. Dufrasne

Summary of Facts and Submissions

I. The grant of the European patent No. 0 796 868 in the name of National Starch and Chemical Investment Holding Corporation in respect of European patent application No. 97 104 803.8 filed on 20 March 1997 and claiming priority of the US patent application No. 13937 filed on 22 March 1996 was announced on 4 September 2002 (Bulletin 2002/36) on the basis of 22 claims.

Independent Claims 1, 6 and 11 and dependent Claims 4 and 14 read as follows:

"1. A modified starch comprising a hydroxypropylated, crosslinked waxy potato starch.

4. The starch of claim 1, wherein the starch has a peak viscosity of at least three times that of a hydroxypropylated, crosslinked potato starch, wherein the peak viscosity is measured by heating a paste at 90°C in an RVA Series 4 Rapid Visco Analyzer, said paste is prepared from a slurry containing 5.5% starch on a dry weight basis which is heated from 50°C to 90°C at a rate of 1.5°C per minute, then held at 90°C for seventeen minutes.

6. A method of increasing the viscosity of a composition comprising adding the starch of claim 1 in an amount of from 5 to 90% of a conventionally used starch.

11. An edible composition comprising a hydroxypropylated crosslinked waxy potato starch."

14. The composition of claim 11, wherein the starch is present in a significant viscosity increasing amount."

Claims 2, 3, 5, 7 to 10, 12 to 13, and 15 to 22 were dependent claims.

II. On 3 June 2003, a Notice of Opposition against the patent was filed by Südzucker AG.
The Opponent requested revocation of the patent in its entirety on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC) and on the ground of insufficient disclosure (Article 100(b) EPC).

The opposition was supported inter alia by the following documents:

Dl: GB-A-1 218 255;
D2: GB-A-1 171 893;
D3: O.B. Wurzburg, M.S., "Modified starches: Properties and Uses", CRC Press, Inc. 1986, Page 201;
D4: WO-A-92/11376; as well as the late filed, but admitted, document
D5: US-A-2 829 987.

III. By a decision announced orally on 31 May 2005 and issued in writing on 13 June 2005, the Opposition Division rejected the opposition.
In its decision the Opposition Division considered that the objection under Article 83 EPC in respect of the expression "significant viscosity increasing amount" in Claim 14 could not succeed because there was sufficient information in the patent in suit for selecting the amount of hydroxypropylated crosslinked waxy potato starch. Furthermore this objection was, according to

the Opposition Division, in fact a clarity objection, which did not constitute a ground for opposition.

The subject-matter of Claims 1 to 22 was considered as novel over documents D1, D2, D3, D4 and D5.
Concerning inventive step, D3 was considered as the closest state of the art because it belonged to the same technical field as the opposed patent, i.e. the chemical derivatization of waxy starch, inhibition by crosslinking and stabilisation by hydroxypropylation, for use as food additive.
The subject-matter of Claim 1 was distinguished from that of D3 by the use of waxy starch from potato.
Starting from D3, the technical problem was seen in the provision of food composition with a desired viscosity while using far less derivatized waxy potato starch than would be needed when using a conventional starch thickener.
According to the decision, the dramatic increase of viscosity obtained by using a waxy potato starch was not predictable from the cited documents (D1, D2, D3 or D4). Consequently inventive step was acknowledged for the subject-matter of Claims 1 to 22.

IV. Notice of Appeal was filed on 9 August 2005 with simultaneous payment of the prescribed fee.

V. With its Statement of Grounds of Appeal filed on 13 October 2005, the Appellant submitted an experimental report.
It also argued essentially as follows:

(i) Concerning novelty:

(i.1) Document D4, read in the light of the general technical knowledge of the person skilled in the art, was novelty destroying for the subject-matter of Claim 1.

(i.2) It belonged to the state of the art to combine hydroxypropylation and crosslinking (as shown by documents D1, D2 and D3).

(i.3) Furthermore the possibility of combining such process steps was disclosed on page 12, lines 30 to 31 of D4.

(i.4) Waxy potato starches were starches with a high amount of amylopectin. Thus, D2 (read in combination with D5 to which it referred concerning the origin of the starch), was also novelty destroying for the subject-matter of Claim 1.

(ii) Concerning inventive step:

(ii.1) D3 had been considered as the closest state of the art by the Opposition Division. According to the Opposition Division, inventive step was acknowledged in view of an unexpected increase of viscosity when using waxy potato starch instead of waxy maize starch.

(ii.2) In the annexed experimental report, Example 3 of the patent in suit had been reproduced using maize starch, waxy maize starch, potato starch and waxy potato starch.

(ii.3) This report firstly showed that the values indicated in Graph 1 and in Table II of the patent in suit could not be reproduced.

(ii.4) In order to determine the rheological behaviour of potato starch, the potato starch had to be made free from multivalent cations before the measurement.

(ii.5) The change of peak viscosity between potato starch and waxy potato starch was in the ratio of 1.6, while the change from maize starch to waxy maize starch was in the ratio of 1.8.

(ii.6) Thus, there was no surprising effect in terms of viscosity increase when using a waxy potato starch.

(ii.7) Thus, the subject-matter of Claims 1 to 22 did not involve an inventive step.

VI. With its letter dated 16 June 2006, the Respondent submitted a set of Claims 1 to 22 forming an auxiliary request. It also argued essentially as follows:

(i) Concerning novelty:

(i.1) D4 could not be considered as novelty destroying since it did not disclose the combination of hydroxypropylation and diphosphatasing.

(i.2) Contrary to the submissions of the Appellant, hydroxypropylation was often used alone in starch modification or with other types of modifications.

(i.3) Concerning D2, the Appellant had stated that the term "waxy potato starch" had to be interpreted to include starch fractions.

(i.4) Fractionation of starch into an amylose-rich fraction and an amylopectin-rich fraction was associated with a disruption of the starch granules and it did not however lead to a waxy starch in the meaning of the patent in suit.

(i.5) The skilled artisan would know that waxy starch without any other precision implied that the starch was in a granular form.

(i.6) Paragraph [0001] of the patent in suit specifically stated that starch consisted of amylopectin and amylose, and the examples of the present patent clearly used granular (native) starch, not fractionated starch.

(i.7) Thus, D2 did not refer to a waxy starch but to a starch fraction rich in amylopectin (cf. page 2, lines 8 to 10) and was silent as to the origin of the starch used. D5 relied on by the Appellant did not state that potato starch was a preferred starting material.

(ii) Concerning inventive step:

(ii.1) D3 would represent the closest state of the art, since it referred to the use of waxy starch modified by crosslinking and hydroxypropylation as food additive.

(ii.2) The subject-matter of Claim 1 differed from D3 in the use of waxy starch from potato. The

distinguishing feature resulted in a dramatic increase in viscosity compared to waxy maize starch and waxy rice starch as evidenced in Table II of the present patent, which could be considered as a synergistic effect.

(ii.3) The problem underlying the present invention could therefore be seen in providing a food composition with a desired viscosity while using far less derivatised waxy potato starch than would be needed when using a conventional starch thickener.

(ii.4) This effect was not predictable even if one would have combined D3 and D4.

(ii.5) As could be seen from Table II of Example 5, the viscosity of the hydroxypropylated, crosslinked waxy potato starch was not only significantly higher than any of the other hydroxypropylated, crosslinked starches, but the difference in viscosity from the unmodified base to the modified starch was much greater for potato than for any other starch.

(ii.6) The arguments and the experimental data provided by Appellant were highly deficient because the Appellant did not use the RVA viscosity procedure of the present invention, and did not specify whether the waxy potato starch that was used was the amylopectin fraction of a "normal" potato starch or a naturally occurring waxy potato starch.

(ii.7) The Appellant had stated that the very high viscosity of the PO/$POCl_3$ waxy potato was due to polyvalent cations. However, if the potato starch

contained polyvalent cations, this might increase the viscosity of unmodified starch, but any additional crosslinking on a starch which has been reacted with 8.52% PO and 0.017% $POCl_3$ would tend to reduce the peak viscosity, not to increase it.

(ii.8) Appellant's own data showed that polyvalent cations reduced the viscosity (comparison between Fig. 3 and Fig.5 and between Fig.4 and Fig.6 of the experimental report).

(ii.9) Appellant's test using starches which were "freed from polyvalent cations" was not a fair comparison to, nor a repeat of, the examples of the present patent. Further, there was nothing in the patent in suit which stated that the viscosity was a result of purely covalent crossing and therefore no reason to free the starches from polyvalent cations.

(ii.10) Thus, the experiments of the Appellant could not prove that there was no surprising effect.

VII. With its letter dated 12 December 2007, the Appellant submitted *inter alia* the following documents:

D10: Experimental report; and

Dl1: Analyses of products Microlys 340, 52, 54 and 56 of the firm Lyckeby Stärkelsen made by Zuckerforschung Tulln (ZFT) in 1993 and 1999;

The Appellant also argued essentially as follows:

(i) Concerning novelty:

(i.1) It was maintained that D4 was a novelty destroying document for the subject-matter of Claim 1.

(i.2) It was submitted that Claim 1 was not limited to granular starches. Thus, D2 was novelty destroying document.

(ii) Concerning inventive step:

(ii.1) D4 could be considered as the closest state of the art. Starting from D4, the technical problem was seen in the preparation of waxy potato starch with high viscosity.

(ii.2) In view of the teaching of D3 (combination of hydroxypropylation and crosslinking), it would have been obvious to solve this technical problem.

(ii.3) It was further contested that the viscosity of hydroxypropylated crosslinked potato starch (non waxy) could be as low as 450 cp (cf. Tables 2 and 3 of the patent in suit). As shown by documents D10 and D11, the viscosity of such starch would be in the range from 4000 to 4500 cp. In other words there was no surprising effect in the change of viscosity when crosslinking and hydroxypropylating a waxy potato starch.

(ii.4) Even if one would start from D3 as closest state of the art, no inventive step could be acknowledged, since the comparative data submitted (D10) further showed that the increase of viscosity by changing from potato starch to waxy potato starch was well below that

obtained when changing from corn starch to waxy corn starch, and from rice starch to waxy rice starch.

(ii.5) Furthermore, the skilled person would have expected that an increase of viscosity would occur when changing from a normal starch to a waxy starch.

VIII. Oral proceedings took place before the Board on 17 January 2008.

At the oral proceedings the discussion essentially focussed on the questions (i) of novelty of the claimed subject-matter in view of documents D2 and D4, (ii) of the question of the admission of the documents D10 and D11 into the proceedings, and (iii) of inventive step of the claimed subject-matter in view of documents D3 and D4.

(i) Concerning point (i), while essentially relying on the arguments presented in the written phase of the appeal, the Parties made additional submissions which may be summarized as follows:

(i.1) By the Appellant:

(i.1.1) D4 referred to potato starch comprising more than 98% of amylopectin.

(i.1.2) These starches were to be used in the food industry (page 1, lines 15 to 16).

(i.1.3) They also were submitted to chemical derivatization (cf. page 12, lines 18 to 31).

(i.1.4) The combination of hydroxypropylation and crosslinking was usual for starch used in the food industry as shown by the additive referenced E 1442 in that field. Reference was made in that respect to the decision under appeal (page 5, paragraph 5.4).

(i.1.5) Thus, D4 was a novelty destroying document when read in the light of the general knowledge of the person skilled in the art.

(i.1.6) In any case, even if one would consider that a selection had to be made from the chemical modification listed on page 12 of D4, this selection would have no no inventive character and could not confer novelty to the claimed subject-matter.

(i.1.7) D2 should be considered as novelty destroying for the subject-matter of Claim 6. Even if it would be considered that the starch according granted Claim 1 should be in granular form, it was evident that the starch when used in the method of Claim 6 would no longer be in granular form since it had to be heated to a stage at which the granules would be disrupted in order to be incorporated in the food composition. The same consideration would apply for the subject-matter of Claim 11.

(i.2) By the Respondent:

(i.2.1) D4 disclosed not only chemical modification of the extracted amylopectin, but also physical and enzymatic modifications thereof.

(i.2.2) There was the need of making a first selection.

(i.2.3) Furthermore, even if one would select a chemical modification, the starch might be only hydroxypropylated or only crosslinked.

(i.2.4) While the reference to the additive E1442 might show that the combination of hydroxypropylation and crosslinking was used in the food industry, there were other possible treatments for starch to be used in the food industry.

(i.2.4) Concerning D2, it was submitted that the fractioned starch would still contain 5 to 10% by of amylose and could not, hence, be considered as a waxy starch.

(i.2.5) The method according to Claim 6 referred to the use of a crosslinked and hydroxypropylated starch as such, i.e. in granular form. Thus, the arguments of the Appellant in respect of Claim 6 were not pertinent. The same considerations would apply for the subject-matter of Claim 11.

The Board, having, after deliberation, informed the Parties that the claimed subject-matter was considered as novel, the discussion moved to point (ii). The arguments presented by the Parties in that respect could be summarized as follows:

(ii.1) By the Respondent:

(ii.1.1) The experimental report D10 had been submitted very late and the Respondent had no possibility to carry out counter experiments.

(ii.1.2) It would have been necessary to carry out these experiments in view of the high dispersion of the viscosity values observed for the hydroxypropylated and crosslinked potato starch in Table 3 of D10.

(ii.1.3) D11 concerned internal experiments carried out by the Appellant on some commercial products of the firm Lyckeby Stärkelsen in the year 1993 and 1999.

(ii.1.4) The Respondent had had no possibility to carry out counter experiments in that respect.

(ii.1.5) Thus, it was requested that D10 and D11 should not be introduced into the proceedings.

(ii.2) By the Appellant:

(ii.2.1) D10 had been submitted in response of the criticism expressed by the Respondent concerning the apparatus (i.e. Brabender) used for determining the viscosity in the first experimental report submitted with the Statement of Grounds of Appeal.

(ii.2.2) The results obtained in Fig. 3 of D10 were in line with those obtained in Fig. 5 of the first experimental report. The results presented in D10 would, however, constitute a better comparison basis with the results presented in the patent in suit.

(ii.2.3) The late filing of D10 was due to the fact that the Respondent did not have at its disposal the apparatus used in the patent in suit for carrying out the viscosity determination (i.e. RVA Series 4 Rapid

Visco Analyzer 4 of the Newport Scientific; cf patent in suit page 5, lines 4 to 5) and had to supply it from Australia.

(ii.2.4) Document D11 had been submitted in order to show that the viscosity value obtained in the patent in suit for hydroxypropylated and crosslinked potato starch was not correct. D11 referred to commercial products (e.g. Microlys 52) whose characteristics could be obtained from the producer. The Appellant was prepared to present a fax confirming these data.

After deliberation, the Board informed the Parties that documents D10 and D11 were not introduced into the proceedings. The discussion then moved to point (iii). In that respect, the Parties, while essentially relying on their written submissions, presented additional arguments which may be summarized as follows:

(iii.1) By the Appellant:

(iii.1.1) The Opposition Division was wrong in its decision when considering that there was a dramatic increase in viscosity.

(iii.1.2) The comparison should not have been made between waxy potato starch and waxy corn or waxy rice, but between waxy potato starch and normal potato starch.

(iii.1.3) In any case, it belonged to the general knowledge that the viscosity of potato starch was much higher than that of waxy corn, or waxy rice.

(iii.1.3) As shown by the experimental report submitted with the Statement of Grounds of Appeal, the increase of viscosity when changing from potato starch to waxy potato starch was well below the increase obtained when changing from corn starch to waxy corn starch.

(iii.1.4) There was hence no surprising effect.

(iii.1.5) Furthermore, Claim 1 of the patent in suit was directed to a starch *per se*. Only Claim 4 made reference to the increased viscosity of the starch.

(iii.1.6) Document D3 had been published in 1986, i.e. before D4. It taught to combine hydroxypropylation and crosslinking for waxy starch (i.e. corn starch) for use of the waxy starch in food application. This general teaching would apply to the waxy potato starch which had been only available at the time of D4 (1990).

(iii.1.7) If one would take D4 as closest state of the art, it would have been obvious to modify the waxy potato starch in view of its application in the food as taught in D3, taking into account that crosslinking and hydroxypropylation were expressly mentioned in D4 as possible modifications.

(iii.1.8) This was further evident in view of the reference in paragraph [0009] of the patent in suit to the problem encountered by waxy starch pastes stored under refrigerated or freezing conditions. The solution proposed in D3 was to combine hydroxypropylation and crosslinking of the waxy starch.

(iii.1.9) D3 further taught that stabilization led to rapid viscosity development. The same effect was shown in Graph 1 of the patent in suit for the claimed potato starch and could not be considered as surprising.

(iii.2) By the Respondent:

(iii.2.1) The claimed starches were to be used as thickeners in the food industry.

(iii.2.2) They surprisingly exhibited a rapid increase in viscosity which could not have been predictable from D3, and less sensibility to the presence of salts as also shown by the tests submitted by the Appellant.

(iii.2.3) They could be used in much lesser amount than conventional thickeners in food compositions as shown by the examples of the patent in suit.

(iii.2.4) There was no indication in the prior art that the change of non waxy to waxy potato starch would result in an increase of viscosity.

IX. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed, or in the alternative that the decision under appeal be set aside and the patent be maintained on the basis of the auxiliary request submitted with letter dated 16 June 2006.

Reasons for the Decision

1. The appeal is admissible.

2. *Procedural matters*

2.1 As indicated above in Section VIII, the Respondent requested that documents D10 and D11 submitted with the letter dated 12 December 2007 of the Appellant should not be admitted into the proceedings due to their very late filing.

2.2 As can be deduced from the letter of the Appellant of 12 December 2007 (cf. page 4, second and third paragraphs), document D10 has been submitted in response to the criticism expressed by the Respondent in its letter dated 16 June 2006 in view of the experimental report submitted with the Statement of Grounds of Appeal due to the fact that a Brabender viscosimeter had been used instead of a RVA viscosimeter as disclosed in the patent in suit for carrying out the viscosity determinations on the starch products. Concerning document D11, its aim, according to the letter of 12 December 2007, was further to support the view of the Appellant that the viscosity value indicated for the non waxy hydroxypropylated and crosslinked potato starch in the patent in suit (i.e. 450 cP) could not be a correct one.

2.3 The Board firstly notes, as mentioned by the Respondent at the oral proceedings before the Board, that the viscosity measurements carried out by the Appellant in D10 on the non waxy starch potato modified according to the process disclosed in Example 3 of the patent in

suit (cf. Fig. 3 thereof; end viscosity values between 400 and 4500 cP) show a high divergence (i.e. ratio of about 11) which is even higher than the one observed for the values obtained for the non waxy potato modified according to Example 3 of the patent in suit in the first experimental report (cf. Fig 5, values between 200 and 1400 cmg; i.e. a ratio of only 7).

2.4 In that context, it is conceivable for the Board, that the Respondent reasonably questions the accuracy of the tests carried out by the Appellant, since the divergence observed in the first experimental report could not apparently be attributed to the use of a different viscosimeter, and hence that it needs to carry out its own tests in order to find out the possible grounds for such divergence.

2.5 In that context, while it is clear to the Board, that some delay might have been necessary for the Appellant in order to supply the specific viscosimeter used in the patent in suit (i.e. RVA Series 4 Rapid Visco Analyser of Newport Scientific) from Australia, this would, however not as such justify, in the Board's view, a delay of 18 months for carrying out additional tests to respond to the criticism expressed by the Respondent in its letter dated 16 June 2006.

2.6 In any case, in view of the time needed for the Appellant for carrying out its tests, it would not be fair, in the Board's view, to consider that the Respondent has had enough time to carry out its counter experiments in the only 5 weeks preceding the oral proceedings.

2.7 Thus, the fact that the presentation of these tests only occurred five weeks before the oral proceedings jeopardizes the purpose of the oral proceedings, namely to make a case ready for decision at the conclusion of the oral proceedings (Art. 13(3) RPBA) and the right of the Respondent to file a detailed counterstatement. This is contrary to a fair and expedient procedure (cf. also T 375/91 of 17 November 1995; not published in OJ EPO; Reasons point 3.2).

2.8 Consequently, the Board decided not to introduce document D10 into the proceedings (Article 114(2) EPC).

2.9 Document D11 refers to Brabender viscosity measurements carried out by the Appellant on commercial waxy potato starch products of the firm Lyckeby Stärkelsen in the years 1993 and 1999.

2.10 Independently of the fact that it is questionable in the Board's view, as to whether viscosities determined with the Brabender viscosimeter could directly challenge the validity of viscosity values determined with the RVA viscosimeter, it still remains, as for D10, that the Appellant has presented the submission only five weeks before the oral proceedings.

2.11 Thus, for the same reasons as for document D10, the Board decided not to introduce document D11 into the proceedings (Article 114(2) EPC).

3. *Novelty*

3.1 Lack of novelty of the subject-matter of Claim 1 has been alleged by the Appellant in view of documents D4 and D2.

3.2 Document D4 relates to genetically engineered modification of potato, resulting in the formation of practically solely amylopectin-type starch in the potato (page 1, lines 4 to 7). According to D4, starch from such potato has a great potential in food additive (page 1, line 37 to page 2, line 1).

3.3 As indicated in D4, amylopectin is extracted from the amylopectin potato and depending on the final use of the amylopectin, its physical and chemical qualities can be modified by derivatisation, i.e. chemical, physical or enzymatic treatment and combinations thereof (page 12, lines 13 to 16).

3.4 According to D4, the chemical derivatisation of the amylopectin, can be carried out in different ways, for example by oxidation, acid hydrolysis, dextrinisation, different forms of etherification, such as cationisation, hydroxypropylation and hydroxy ethylation, different forms of esterification, for example by vinyl acetate, acetic anhydride, or by monophosphatising, diphosphatising and octenyl succination, and combinations thereof (page 12, lines 18 to 31).

3.5 In this connection, the Board notes that Claim 1 of the patent in suit requires, explicitly, that

(a) that the starch be a potato starch,

(b) that the starch be waxy,

(c) that the starch be hydroxypropylated, and

(d) that the starch be also crosslinked.

3.6 According to the decision T 355/99 of 30 July 2002 (not published in OJ EPO; Reasons, point 2.2.4), it is not sufficient for a finding of lack of novelty that the claimed features could have been derived from a prior art document, there must have been a clear and unmistakable teaching of the claimed features Furthermore, according to the decision T 572/88 of 27 February 1991 (not published in OJ EPO; Reasons, point 4), assessment of novelty should be strictly distinguished from that of inventive step.

3.7 Thus, the question boils down as to whether there is in D4 a clear and unmistakable teaching of the combination of features mentioned above in paragraph 3.5.

3.8 In that respect, and independently of the question as to whether the term "starch" used in Claim 1 would only refer to granular starch and whether the extracted amylopectin according to D4 would hence fall under this definition, it is immediately evident that D4 not only refers to several modes of derivatization of the amylopectin (physical, chemical or enzymatic treatment), but that it also mentions a list of possible chemical treatments (cf. paragraphs 3.3 and 3.4 above).

3.9 Thus, even one would consider that the feature "starch" would not represent a distinguishing feature over D4 and that the amylopectin fraction would represent a waxy starch, in order to come to a starch falling under the scope of Claim 1 as granted i.e. further exhibiting the combination of features (c) and (d) mentioned above in paragraph 3.5, it would be still necessary to select a chemical treatment among the physical, chemical and enzymatic treatments, to further select hydroxypropylation among the list of possible chemical treatments, further to select a chemical modification of the hydroxypropylated starch from the list of possible treatments (physical, chemical or enzymatic), and finally to select a crosslinking reaction (diphosphatising) among the possible chemical modifications.

3.10 Thus, in view of the several options which can be chosen for the derivatization of the extracted amylopectin, it cannot be concluded that, when a hydroxypropylation modification of the amylopectin is used, it will be inevitably combined with a further chemical treatment, let alone with a crosslinking reaction.

3.11 Consequently, the Board can only state that there is no clear and unmistakable teaching in D4 of the combination of features (c) and (d) mentioned above in paragraph 3.5.

3.12 Consequently, the subject-matter of Claim 1 must be regarded as novel over the disclosure of D4 (Art. 54 EPC).

3.13 This conclusion cannot be altered by the further arguments of the Appellant, that combination of hydroxypropylation and crosslinking for starch products to be used as food additive would be common in the technical field of food additives and that this would represent a non inventive selection (cf. also Sections VIII (i.1.4) to VIII (i.1.6) above).

3.13.1 This is firstly because the fact that this combination could be applied commonly in the field of starch based food additive does not imply that this combination would inevitably be applied to the extracted amylopectin according to document D4.

3.13.2 This is also because as indicated in paragraph 3.6 above assessment of novelty should be strictly distinguished from that of inventive step.

3.14 Document D2 refers to a process for preparing a cold-water-soluble, gum like, low viscous starch product, comprising heating a mixture of water and a starch fraction rich in amylopectin to a temperature of at least 110°C for a period of time sufficient to dissolve at least substantially all of the starch fraction, treating the solution obtained with a starch depolymerising agent until there is obtained a starch product which, as an aqueous solution containing 45% of the starch product, has a viscosity at 60°C of from 250 to 20 000 cP, measured with a Brookfield viscosimeter at 20 r.p.m., and drying the starch product thus obtained (page 1, line 75 to page 2, line 2).

3.15 According to D2, the starting material is a starch fraction rich in amylopectin obtained by fractionating

starch, and a suitable starting material is the amylopectin-rich fraction which is obtained by the starch fractionating process disclosed in US patent specifications No. 2 822 305, 2 829 987, 2 829 988, 2 829 989 and 2 829 990 (page 2, lines 8 to 22).

3.16 As indicated in D2, starch products, which in the dissolved conditions have a viscosity of increased stability, may be obtained by treating the starting material prior to, during or after the depolymerisation, with a monofunctional reagent, such as acetic acid anhydride, vinyl acetate, acrylonitrile, ethylene oxide or propylene oxide (page 2, lines 72 to 79). The starch products may also be treated prior to, during or after the depolymerisation with a bifunctional reagent, provided that the bifunctional reagent is used in a concentration sufficiently low not to impair the solubility and the speed at which the product dissolves (page 2, lines 98 to 103).

3.17 While D2 does not contain any explicit reference to potato starch as starting component, the Appellant has submitted that in the document US-A-2 829 987 (D5) mentioned at line 21 of page 2 of D2 among the US patent applications disclosing starch fractionating processes relied on in D2, reference is made to potato starch (cf. D5, column 2, lines 1 to 2) as starch which might be fractioned according to the process disclosed therein.

3.18 Independently of the questions as to whether a starch fraction would be excluded by the wording "starch" used in Claim 1 of the patent in suit and whether a distinction could be made between the expression "rich

in amylopectin" in D2 and the expression "high in amylopectin" used in the patent in suit for defining the waxy character of the claimed starch (cf. page 2, lines 12 to 13), D2 cannot, in the Board's view represent a novelty destroying document for the subject-matter of Claim 1 for the following reasons:

3.18.1 Even if one would consider that the features "waxy" and "starch" used in Claim 1 of the patent in suit do not represent distinguishing features over D2, multiple selections would have still to be made in order to come to a starch according to Claim 1, i.e. further exhibiting the combination of features (a), (c), and (d) set out in paragraph 3.5 above.

3.18.2 First of all one would have to select the process according to D5 among the other fractioning processes disclosed at page 2, lines 20 to 22 of D2, to select potato starch among the starches mentioned in D5 at column 2, lines 1 to 3, to select to produce or not to produce starch products with increased viscosity stability, to select hydroxypropylation in order to increase the viscosity stability of the starch products among the stabilization processes disclosed at page 2, lines 76 to 79, and to further select to combine or not to combine the hydroxypropylation with a treatment with a bifunctional reagent.

3.19 Thus, in view of the several options which can be chosen for the preparation of the starch products of D2, it cannot be concluded that, when a potato starch is chosen as starting component, it will be inevitably treated with a monofunctional reagent for increasing its viscosity stability, let alone with propylene oxide,

and further treated with a bifunctional reagent.

3.20 Consequently, the Board can only come to the conclusion that there is no clear and unmistakable teaching of such combination in D2.

3.21 It thus follows that the subject-matter of Claim 1 must be regarded as novel over D2 (Article 54 EPC).

3.22 Since the subject-matter of Claim 1 is novel over D2 and D4, the same conclusion applies *a fortiori* for the subject-matter of dependent Claims 2 to 5, as well as for the subject matter of independent Claim 6 which relates to a method using a starch according to Claim 1, and to that of independent Claim 11 which deals with a food composition comprising a hydroxypropylated crosslinked waxy potato starch in the ambit of Claim 1. By the same token, the subject-matter of dependent Claims 7 to 10, and 12 to 22 must also be considered as novel (Article 54 EPC).

4. *Problem and solution*

4.1 The patent in suit concerns stabilized and crosslinked waxy starch products which are suitable as food additives.

4.2 Such products are known from document D3 which the Board considers as representing the closest state of the art.

4.3 Document D3 relates to starches such as corn, potato, tapioca or rice starches (page 201, lines 7 to 10). According to D3 starches need to be modified in order

to be used in the food industry (page 201, line 11). According to D3, crosslinking is the most important modification since the swelling and subsequent rupturing of starch granules during cooking can be controlled by introduction of difunctional agents capable of reacting with hydroxyl groups of two different molecules within the starch granule. Hence, cooked pastes are more viscous and heavy bodied and less likely to breakdown with extended cooking times increased acid or severe agitation (page 201, lines 17 to 23). As further taught in D3, stabilization treatment reduces the tendency of waxy starches to lose their hydrating ability and clarity on storage at low temperature, and this stabilization treatment is usually carried out in combination with crosslinking (page 201, lines 36 to 38). Stabilization could also be useful when rapid viscosity development is needed (page 201, lines 39 to 40).

4.4 As can be deduced from the patent in suit, its aim is to provide starch products which have unexpectedly high viscosities such that they can provide the desired viscosity to a food composition while using substantially less than would be need if using a conventional starch thickener (cf. patent in suit paragraph [0015]).

4.5 Thus, starting from D3, the technical problem may be seen in the provision of a modified starch which can confer desired viscosity to a food composition while using substantially less than would have been needed if using a conventional starch thickener starch product such as waxy corn, non waxy corn, or non waxy potato starch.

4.6 This problem is solved according to Claim 1 by providing a waxy potato starch which is hydroxypropylated and crosslinked.

4.7 In that respect, the Board observes that Examples 7 to 16 of the patent in suit show that much lesser amounts of the claimed starch than that of a conventional starch (hydroxypropylated and crosslinked waxy corn starch) are needed to obtain the desired viscosity of food compositions even containing salts. Furthermore, Graph 1 of the patent in suit shows that the claimed starch leads to very much quicker increase in viscosity and to higher peak and final viscosities than stabilized and crosslinked starches such as non waxy potato starch, waxy corn starch, or dent corn starch. These latter effects are even corroborated by the tests presented as valid (i.e. after elimination of multivalent cations from the potato starch) by the Appellant in its experimental report submitted with the Statement of Grounds of Appeal (cf. Fig.1, 2, 3 and 4 thereof). In particular, the comparison between Fig.3 and Fig.4 shows that hydroxypropylated and crosslinked waxy potato starch reaches a peak viscosity of between 2200 and 2400 cmg after only 10 minutes and a final viscosity (45 min) between 2200 and 2300 cmg while the hydroxypropylated and crosslinked non waxy potato starch needs 25 minutes to reach a viscosity between only 1250 and 1500 cmg and exhibits a final viscosity between 1300 and 1600 cmg.

4.8 Thus, the Board can only come to the conclusion that the claimed measures provide an effective solution to the technical problem. This conclusion further implies

that the Board cannot accept the submission of the Appellant that the technical problem underlying the subject-matter of Claim 1 should be merely seen in the provision of further starch products *per se* without any consideration of their efficiency as thickener in food compositions.

5. *Inventive step*

5.1 It remains to be decided whether this solution was obvious to the person skilled in the art having regard the prior art relied upon by the Appellant i.e. documents D3 and D4.

5.2 While D3 presents the combination of stabilization and crosslinking as usual for starches to be used as food additives, and indicates that stabilization might be useful when rapid viscosity development is needed, it is however evident that D3 does not refer to waxy potato starch. Thus, D3 alone cannot suggest the proposed solution.

5.3 Document D4 relates to the production of waxy potato starch and mentions that the extracted amylopectin fraction may be chemically derivatized. It further teaches that the waxy potato starch has a great potential as a food additive (cf. also paragraphs 3.2 and 3.3 above).

5.4 In this context, the decisive question for the assessment of inventive step is, in the Board's view, not whether the skilled person could have applied a combination of hydroxypropylation and crosslinking as taught in D3 for also modifying waxy potato starch as

disclosed in D4 but whether he would have applied these combined modifications to a waxy potato starch with the expectation of solving the technical problem.

5.5 In this connection, the Board notes that the Appellant has submitted that non waxy potato starch was known to have a higher viscosity than waxy or non waxy corn starches and was able to confer a higher viscosity to food compositions than these starches, so that the same effect could have been expected from waxy potato starch.

5.6 Independently of the fact that this argument is not supported by any piece of prior art in particular concerning the behaviour of non waxy potato starches in food compositions, let alone those containing salts which according to the Appellant might have a considerable influence on the viscosity of potato starch compositions (cf. Experimental report page 2, third paragraph), it would in any case still remain that there is, in the Board's view, absolutely no indication in the prior art, that hydroxypropylated and crosslinked waxy potato starch would exhibit a much quicker increase in viscosity and much higher peak and final viscosities than hydroxypropylated and crosslinked non waxy potato starch (cf. also paragraph 4.7 above).

5.7 Nor can the Board accept the further argument of the Appellant that, in view of the improvement in viscosity profile obtained when changing from hydroxypropylated and crosslinked non waxy corn to hydroxypropylated and crosslinked waxy corn (cf. Fig.1 and 2 of the experimental report, cf. also Graph 1 of the patent in

suit), the same behaviour would have been expected when changing from non waxy to waxy potato starch.

5.7.1 This is primarily because this argument is not supported by any prior art but only by experimental data derived either from the patent in suit (Graph 1) or from a post published experimental report (Fig.1, 2, 3 and 4).

5.7.2 Furthermore, even if it would have been known that the change from non waxy to waxy corn starch results in an improvement of the viscosity profile, this is also because there is absolutely no evidence in the prior art relied on by the Appellant that such a trend, if observed for corn starches, would be transferable to potato starches.

5.8 Thus, D3 even in combination with D4 would not suggest the solution proposed in the patent in suit.

5.9 Consequently, the Board comes to the conclusion that the subject-matter of Claim 1 involves an inventive step over the prior art relied on by the Appellant.

5.10 This conclusion would not be altered if one would have taken D4 as the closest state of the art and combined it with D3. This is because the relevant question is still not whether the skilled person could have modified the waxy potato starch of D4 by hydroxypropylation and crosslinking as disclosed in D3 but whether it would have done these modifications with the aim to provide starch products having the improved viscosity behaviour set out in paragraph 4.5.

5.11 Consequently, the same arguments as for the combination of D3 with D4 (cf. paragraphs 5.5 to 5.7 above) would equally apply to the combination of D4 with D3.

5.12 Since the subject-matter of Claim 1 meets the requirements of Article 56 EPC, the same conclusion would apply *a fortiori* to the subject-matter of dependent Claims 2 to 5, of Claims 6 to 10 which are directed to method using a starch according to Claim 1 and of Claims 11 to 22 which relate to a food composition containing a starch in the ambit of Claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier R. Young