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**D E C I S I O N**  
of 29 October 1997

**Case Number:** T 0515/94 - 3.3.4

**Application Number:** 84116504.6

**Publication Number:** 0149258

**IPC:** A23L 1/0522

**Language of the proceedings:** EN

**Title of invention:**

Converted starches for use as a fat- or oil-replacement in foodstuffs

**Patentee:**

National Starch and Chemical Investment Holding Corporation

**Opponent:**

Amylum N.V.

Coöperatieve Verkoop- en Productievereniging voor  
Aardappelmeel en Derivaten AVEBE B.A.

**Headword:**

Converted Starches/NATIONAL STARCH

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Main request - novelty (no)"

"Auxiliary request - novelty (yes) - inventive step (yes)"

**Decisions cited:**

T 0939/92

**Catchword:**

-



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Boards of Appeal

Chambres de recours

Case Number: T 0515/94 - 3.3.4

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.4  
of 29 October 1997

**Appellant:** National Starch and Chemical Investment  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 5 April 1994  
revoking European patent No. 0 149 258 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** U. M. Kinkeldey  
**Members:** D. D. Harkness  
W. Moser

## Summary of Facts and Submissions

I. European patent application No. 84 116 504.6 relating to "Converted starches for use as a fat- or oil-replacement in foodstuffs" was granted with 9 claims as European patent No. 0 149 258 the only independent claim being claim 1 which read as follows:

"1. A converted gelling starch suitable for use as a fat- and/or oil-replacement in foodstuffs, characterised in that the starch has a dextrose equivalent (DE) of less than 5, that aqueous dispersions thereof at 10 to 50% by weight of starch solids have a hot flow viscosity of at least about 10 seconds at 55°C and are capable of forming gels having a gel strength of at least 25g within 24 hours at 4°C and that the starch is a dextrin or an acid-converted starch."

II. Two oppositions were filed requesting revocation of the patent on the grounds that the subject-matter of the claims was not novel and not inventive.  
(Articles 100(a), 54 and 56 EPC).

III. In a decision dated 5 April 1994 the opposition division accepted novelty (Article 54 EPC) in view of document

(6) Starch, Chemistry and Technology (1967)  
volume 2(II) Ch IX

but revoked the patent for lack of inventive step  
(Article 56 EPC) in view of document

(1) US-A-3 986 890

for the following reasons:

Document (1) related to hydrolysed starches, prepared alternatively by acid or enzymatic hydrolysis, which, as mixture have an overall DE value being 25 or less, preferably 5 to 10. Such mixtures could be mixed completely with fats and oils. The DE value was said to be related to the degree of polymerisation of the starches, the higher the molecular weight of the components the lower the DE value. It was possible to alter the consistency of the products by variation of the solid content.

Document (1) did not teach the required ranges of values for the two parameters hot flow viscosity and gel strength which according to document (6) mainly determine product consistency. However, the hot flow viscosity and gel strength of the products of document (1) and those of the disputed patent should be comparable since the patentee agreed that products according to document (1) were satisfactory fat replacers.

It was concluded that document (1) taught the use of starch hydrolysis products with a DE lower than 25 as fat replacers, whereby the suitable consistency could be adjusted to that of the product in which fat should be replaced by variation of the solids content and it needed no more than routine work for the skilled person to monitor the relevant parameters for starch hydrolysis products as DE, hot flows viscosity and gel strength and adjust such products to consistency appropriate to the substance to be replaced.

- IV. The appellant (patentee) filed an appeal against the decision of the opposition division and paid the appeal fee. A statement setting out the grounds of appeal was submitted as was an auxiliary request having nine claims.
- V. The respondents I and II (opponents 01 and 02) replied to the appeal.
- VI. Oral proceedings took place on 29 October 1997. Respondent I informed the Board in a letter dated 9 September 1997, that it would not attend oral proceedings.
- VII. During the oral proceedings the appellant relinquished the auxiliary request previously filed and submitted a new auxiliary request of which the main claim reads as follows:

"1. Use of an acid-converted starch or dextrin as a partial fat- and/or oil-replacement in foodstuffs, said starch or dextrin having a dextrose equivalent (DE) of less than five, the aqueous dispersion thereof at 10 to 50% by weight of starch solids has a hot flow viscosity of at least about 10s at 55°C and is capable of forming gels having a gel strength of at least 25g within 24 hours at 4°C."

Claims 2 to 5 also relate to use claims dependant upon claim 1. Claims 6 to 8 concern an improved fat- and/or oil-containing foodstuff in which some or all of the fat and/or oil has been replaced by the use of an aqueous dispersion of the acid converted gelling starch of claim 1 which is cooked, and claim 9 relates to a method for preparing a low calorie foodstuff by replacing fat and/or oil by an aqueous dispersion of the converted gelling starch of claim 1 which is cooked. The independent claims 6 and 9 read as follows:

"6. An improved fat- and/or oil-containing foodstuff, wherein the improvement comprises the partial or total replacement of the fat and/or oil by use of an aqueous dispersion of the acid-converted gelling starch of claim 1, the starch being cooked prior to or during incorporation into the foodstuff."

"9. A method for preparing a low calorie foodstuff, comprising the step of replacing the fat and/or oil in the foodstuff by an aqueous dispersion of the converted gelling starch of claim 1, the starch being cooked prior to or during incorporation into the foodstuff."

In addition to documents (1) and (6) the following citations were referred to:

(2) DD-A-105 715 (=D3)

(3) US-A-3 962 465

(9) DE-A-2 365 850

(13) DE-A-110 957

(15) Brochure "Paselli SA2" March 1982 (AVEBE)

VIII. The arguments of the appellant can be summarised as follows:

Main request (maintenance of the patent as granted)

The subject-matter of the main claim was novel because document (6) represented a general disclosure relating to acidic hydrolysis of starches and many methods were given. There was not any specific disclosure pertaining to the products prepared by the patent in suit. These products represented a selection of acid converted starches which were suitable for fat replacement in

foodstuffs and were characterised by the features specified in the claim. Document (6) described how the particular hydrolysis cleavage affects the properties of the starch product.

Table II in document (6) did not relate to specific acid hydrolysis starch products and only represented a comparison of the parameters there disclosed. The ranges of conditions for the hydrolysis were too broad and did not result in products as claimed being produced. The products prepared in document (6) would not be suitable for fat replacement purposes.

Document (13) was only relevant to the temperature dependence of the hydrolysis process in determination of the point of cleavage and did not disclose the products now claimed.

Neither document (6) nor (13) disclosed products which could be used for fat replacement in foodstuffs.

With regard to inventive step the one-pot simplified process reaction product of the patent in suit enabled a single product of the required characteristics to be obtained.

The product of document (1) was designed to overcome the deficiencies of the prior art and to be both thermoreversible and suitable for fat replacement in foodstuffs. The products, which comprised a highly degraded enzymatically hydrolysed starch of high DE value plus a lowly degraded hydrolysed starch produced by acid hydrolysis, exhibited DE values of 5 to 25 and were therefore of low stability.

Document (1) was silent in respect of the required combination of features specified by claim 1 of the patent in suit and there was no hint to investigate such parameter values which resulted in the desired fat replacement capability.

The disclosure of document (2) related only to enzymatic hydrolysis and the two parameters hot flow viscosity and gel strength were not mentioned or suggested. Thus the appellant had chosen a totally different solution to the problem of providing starch hydrolysates for fat replacement in foodstuffs.

The mixtures of starches of different degrees of degradation described in document (3) were produced to overcome the problems of thermo-reversibility and stability to freezing and defrosting. All of these products were not suitable for fat replacement purposes.

#### Auxiliary request

The subject-matter of the use claims was not anticipated by documents (1), (2), (6), (9) or (13). Documents (6) and (13) made no reference to fat replacement properties of the prepared products, also document (1) described a thermo-reversible mixture of two hydrolysed starches having an average DE value of 5 or above, and document (2) was concerned only with enzymatically hydrolysed starches which were of different chemical composition from those hydrolysed using aqueous acid. Document (9) was referred to in order to support the appellant's view that document (1) did not disclose DE values below 5. Dextrin was described as a product obtained by acid hydrolysis of starches and was not of the same chemical constitution as enzymatically hydrolysed starches.



With regard to inventive step the same arguments applied as for the main request (see above).

IX. The respondents' arguments can be summarised as follows:

Main request (maintenance of the patent as granted)

The subject-matter of claim 1 of this request was not novel because both documents (6) and (13) recited process conditions for the acid hydrolysis of starch which were the same as those of example 3 of the patent in suit and consequently these citations would yield products which on analysis would give the same values for the specified parameters. Table IV of document (6) specified copper reducing numbers of acid modified corn starch from which DE values of less than 5 were calculated.

Document (1) also disclosed acid hydrolysed starches having DE values of below 5 because this DE value was only attained if a hydrolysed starch having a DE value below 5 were mixed with another of higher DE value. The phrase "suitable for use as a fat and/or oil replacement in foodstuffs" was not limitative. It was also known from document (15) that enzymatically hydrolysed starches were useful as fat replacement products.

With regard to inventive step it was agreed that the problem to be solved was to provide an alternative hydrolysed starch composition which would be suitable for use as a fat and/or oil replacement in foodstuffs.

In the description of the patent in suit it was stated that the prior art products of document (1) were satisfactory for use as fat replacement in foodstuffs. Therefore, the appellant only needed to determine from

the prior art the parameter values which made such products suitable for their intended purpose. The appellant had merely restricted the mixed compositions of document (1) to a single component, namely the acid hydrolysed starch with DE below 5. A figure of 2 was given for the DE value of enzymatically hydrolysed starches stated to be suitable for fat replacement in document (15); therefore, this parameter was obvious to a skilled person. The consistency of the starch products could be adjusted by adding solids as was the case in document (1).

The prior art was so close to the subject-matter claimed that it was obvious to determine the combination of parameters relied upon in the claims. It was also questioned whether or not starches of each kind could be used and whether they would all give rise to satisfactory results when used as fat replacement in foodstuffs. It appeared that the use of each kind of starch would not necessarily solve the problem and that a more limited claim has to be formulated.

#### Auxiliary request

The subject-matter of the main claim of this request was not novel because the mixed hydrolysis products of document (1) were not restricted to DE values of 5-10 or 5-25 and did include values below 5. Accordingly, the citation disclosed starch hydrolysis products of DE values below 5 which were used for fat replacement in foodstuffs and the appellant had tried to distinguish from this prior art by reference to parameters not previously quoted in combination. Although document (1) referred to mixtures of hydrolysed starches of differing DE values this was not essentially different from the heterogeneous mixtures now claimed.

The claims of the auxiliary request were not inventive essentially for the same reasons as submitted for the main request.

- X. The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted, or that the decision under appeal be set aside and that the patent be maintained on the basis of the following auxiliary request:

claims 1 to 9 and the description page 2 submitted during the oral proceedings and description pages 3 to 10 as granted.

The respondents requested that the appeal be dismissed.

- XI. The Chairwoman gave the Board's final decision orally at the end of the oral proceedings, thereby terminating the appeal proceedings. Further written submissions were later filed by the parties.

## Reasons for the Decision

### *Main request*

#### Novelty, (Article 54 EPC)

1. The description of the patent in suit indicates that conventional processes are used to prepare the acid hydrolysis starch products used as fat replacement in foodstuffs, and that it is sufficient to stop the process when products having the combination of claimed parameters have been obtained. The three examples in the patent in suit indicate a wide variation in process conditions, and no general process for the acid hydrolysis is given.

2. A comparison of the process employed for acid hydrolysis of starch in example 3 of the patent in suit with processes disclosed in prior art documents (6) and (13) shows that these two prior art methods and that of the said example are essentially the same.

Example 3 of the patent in suit:

3% concentrated HCl, about 16hrs at 52°C.

Document (6) at page 219:

1-3% aqueous mineral acid, for 12 to 14hrs at 50°-55.5°  
and page 220: 0.3N HCl for 2-16hrs at 50°.

Document (13) page 1, right hand column, second paragraph:

1-3% acid, 12 to 24hrs at 50°-55.5°C

In the absence of any differing process steps one has to assume that same processes produce the same products.

The appellant has argued that it was the merit of the inventors to recognise that certain features of this product should be measured, namely the claimed ones, which then would be considered as a "selection" out of the many hydrolysis-products produced by the general methods described in document (6) or (13). An analysis of table II of document (6), however, shows that already these features could be deduced.

4. Table II of document (6) relates to the hot paste viscosity and gel properties of corn-starch and acid-modified corn-starch. According to this table products having a fluidity of 10 to 50 have gel-breaking strengths of 118 to 32.6g/sq.cm. The "at least" value

for gel-breaking strength in claim 1 is 25g while the hot flow viscosity is of "at least 10s". This means that the values of table II are included in the scope of claim 1. The values of table II had to be interpreted in the light of document (6) page 224 last paragraph, where it is stated that "increasing acid modification, indicated by decreasing hot paste viscosity, progressively lowers the rigidity and breaking strength of the cold aged gel". Further, it is common general knowledge that the DE number increases with a greater degree of acid hydrolysis. The low DE number is further supported by the copper number data of table IV on page 228 of document (6) which was convertible to DE values using the conversion formula of document (20) at page 617. DE values for acid modified corn starch calculated from the data in table IV were shown to be from 0.16 to 0.28 and well below the claimed limit of 5. This shows that the sample of the table II which had a starch fluidity of 10, a gel breaking strength of 118g, and also a low DE number falls under the main claim of the main request.

5. When asked by the Board to comment on table II the appellant submitted that the table only represented a comparison of parameters and was not directed to individual acid-hydrolysis products. In view of the above analysis of the teaching of table II and table IV, it is evident that this argument is not correct.
6. Claim 1 of the main request is thus not allowable because it does not fulfil the requirement of Article 54 EPC.

*Auxiliary Request*

*Admissibility under Article 123(2) and (3) EPC*

7. The appellant substantiated the admissibility of the new request by reference to both the specification as originally filed and the claims as granted. The respondent II agreed that there was no objection to this request under Article 123 EPC, and the Board also found no reason to disallow it in this respect.

*Novelty, (Article 54 EPC)*

8. Document (1) is concerned with the use as fat replacement in foodstuffs of thermoreversible mixtures of starch hydrolysates the hydrolysed products being of respective degrees of polymerization differing from each other in their DE values by at least one order of magnitude, ie, at least 10 times. This document is therefore, not novelty destroying.
9. Document (2) describes the use for fat replacement purposes of enzymatically hydrolysed starches. The appellant stated that acid- and enzymatic-hydrolysis of starch lead to products of differing nature because the separate methods cleave the starch molecules at sites which are not the same and therefore they give rise to products which are chemically different. This specific statement was not contested by the respondents. Since, furthermore, the hydrolysed products according to document (2) are thermoreversible whilst those of the patent in suit are not, this disclosure is not novelty destroying already for this reason.
10. Furthermore, it was stated by the technical expert appearing for respondent II that dextrin is not a product of enzymatic hydrolysis but was prepared by an acidic treatment of starch.

11. Accordingly, novelty, is acknowledged for the use claims of the auxiliary request and also for the claims to foodstuffs which are the products of this use. Method claim 9 is also novel as it employs the same acid converted starch as was used in claim 1.

*Inventive step, (Article 56 EPC)*

The closest prior art

12. In the Board's opinion, the closest prior art is document (2) which relates to the enzymatic hydrolysis of starch, the product of this process has a low DE value, is temperature stable, useful as a consistency and thickening agent for foodstuffs, and suitable also for use as a fat replacement therein.

The technical problem

13. In the light of this prior art the problem to be solved was to provide an alternative hydrolysed starch product suitable for use as a fat/oil replacement in foodstuffs.

Assessment of inventive step

14. The question to be answered is whether it would have been obvious for the skilled person to replace the enzymatically hydrolysed starch of document (2) by an acid hydrolysed starch as defined in the patent in suit for the purpose of fat replacement in foodstuffs.
15. Document (2) relates to providing a water-binding material which acts as a consistency and thickening agent and simultaneously as a fat replacement when mixed with foodstuffs. This is an enzymatically hydrolysed starch composition. There is no mention of acid hydrolysed starches in this document.

16. Document (1) provides an aqueous thermoreversible starch gel product which could be used as body- and consistency-imparting additive, ie. thickener, for foodstuffs. Document (2) predates document (1), and therefore in the light of the teaching of the earlier publication document (1) went on in preparing a product which consisted of a mixture of two starches of significantly different (10 times) DE values, the average DE value being below 25 and preferably 5-10. The gel mixture (see document (1) column 2 lines 40 to 50) could be formed from any mixture of high molecular starch and low molecular starch. The former includes native (untreated) starch, starch derivatives and partially degraded starches, and the latter hydrolysed starches prepared by any method, eg, enzymatic or acid hydrolysis. The description at column 4 lines 51 to 62 describes the use of the gel as a fat substitute.
17. Document (2) is limited to enzymatically hydrolysed starches, and document (1) requires a mixture of starches and is thus based on a different principle which primarily was to impart thermoreversibility to the products, a property which does not belong to the particular acid hydrolysed product of claim 1, (see patent description page 3 line 6). There is no teaching in either document (1) or (2) which leads the skilled person to the use of the defined acid hydrolysed starches for fat replacement.
18. Thus, neither of these two documents alone or in combination with the other would lead the skilled person to use only the acid hydrolysed starches as defined in claim 1 for the purpose of fat replacement in foodstuffs.



19. Document (15) is restricted to the use of enzymatically hydrolysed potato starch and does not add any more relevant information than is available from documents (1) and (2). In view of this the question as to the publication date to be accorded to this document may be left unanswered.
  
20. As decided above, the disclosure of document (6) destroyed the novelty of the acid hydrolysed starches of claim 1 of the main request, however fat replacement in food was not disclosed. Since there is no disclosure in documents (1) and (2) of the said hydrolysed starches, these being the citations which refer to fat replacement, there is therefore no link between fat replacement and the required acid hydrolysed starch and therefore the skilled person would not combine either of documents (1) and (2) with document (6).
  
21. Respondent II has argued that the stated problem cannot be solved by each and any starch. However, in the opinion of the Board any one of the starch sources specified in the patent description may be used for preparation of the acid hydrolysed starch, (see page 3 lines 12 to 14). There appears to be no technical reason to suspect that these starch sources would not be able to be hydrolysed with acid to provide a product having the stated parameters which by definition solve the problem to be solved. All of these starting materials contain the basic starch molecule, and it is technically plausible that acid hydrolysis would occur in the same way for each of them. Therefore, it is not justified to restrict the starting materials in the present case to those employed in the examples.

22. Board of appeal decision T 939/92 (of 12 September 1995) is distinguished in that the final products therein referred to were required to have herbicidal activity, and this feature was not plausible for a number of the compounds claimed. The facts of the present case do not thus correspond with those of the quoted decision.
23. For the above stated reasons the subject-matter of claim 1 of the auxiliary request is inventive.
24. The subject-matter of claims 2 to 5 appendant to claim 1 is also inventive for the same reason as given for claim 1. Since claims 6 to 8 relate to the products of the use claims employing the acid converted starch their subject-matter is inventive for the reasons stated in paragraph 20 above. The method of claim 9 is also inventive for the same reasons as have been given for claim 1.

*Procedural matter*

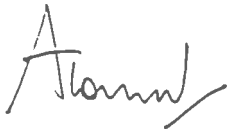
25. When a final decision is given orally at the end of oral proceedings the appeal procedure is thereby terminated. Accordingly all submissions made after the closure of said procedure may not be considered by the Board.

**Order**

**For these reasons it is decided that:**

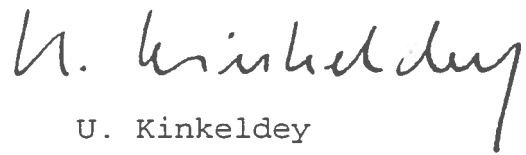
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of claims 1 to 9, the description page 2 submitted during oral proceedings and description pages 3 to 10 as granted.

The Registrar:



A. Townend

The Chairwoman:



U. Kinkeldey

