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D E C I S I O N
of 9 November 1993

Case Number: T 0089/91 - 3.3.2

Application Number: 84201301.3

Publication Number: 0140410

IPC: C12N 9/30

Language of the proceedings: EN

Title of invention:

Novel enzyme product and its use in the saccharification of starch

Patentee:

Gist-Brocades N.V.

Opponent:

Kali-Chemie Aktiengesellschaft
Novo-Nordisk A/S

Headword:

Enzyme product/GIST-BROCADES

Relevant legal norms:

EPC Art. 54, 56, 83, 87(1)

Keyword:

"Novelty of claims auxiliary requested - yes, after amendment by disclaimer"

"Inventive step (yes) - non-obvious solution"

Decisions cited:

G 0001/92, T 0534/89, T 0017/91, T 0105/87

Catchword:

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Case Number: T 0089/91 - 3.3.2

D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 9 November 1993

Appellant: Kali-Chemie Aktiengesellschaft
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Representative:

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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office dated 10 December
1990 concerning maintenance of European patent
No. 0 140 410 in amended form.

Composition of the Board:

Chairman: A.J. Nuss
Members: U.M. Kinkeldey
S.C. Perryman

Summary of Facts and Submissions

I. European patent application No. 84 201 301.3 was granted as European patent No. 0 140 410 with 14 claims. Claim 1 reads as follows:

"1. An enzyme product comprising amyloglucosidase and acid alpha-amylase, said acid alpha-amylase having substantially alpha-1,4-glucosidic bond splitting activity and showing optimum activity during saccharification reaction at a pH from 3.5 to 5.0 and a temperature from 60 to 75°C, in a ratio of at least 0.16 AAU (acid amylase units) per AGI (amyloglucosidase units)".

Claims 2 to 7 are dependent on Claim 1 and relate to particular embodiments of the enzyme product.

Claims 8 to 14 relate to a process for converting starch into dextrose in the presence of an enzyme product as defined in any one of Claims 1 to 7.

II. Notices of opposition against the European patent were filed. Revocation of the patent was requested on the grounds of Article 100(a) and (b) EPC. The opposition was supported by prior art documents, out of which in the appeal proceedings the following citations remained relevant:

- (2) GB-A-887 410
- (3) J.J. Marshall, Die Stärke, vol. 27 No. 11, pages 377-383
- (17) US patent 2 893 921
- (18) US patent 3 117 063.

III. The Opposition Division maintained the patent in amended form. Claim 1 as maintained reads as follows:

"1. An enzyme product comprising amyloglucosidase and acid alpha-amylase, said acid alpha-amylase having substantially alpha-1,4-glucosidic bond splitting activity and showing optimum activity during saccharification reaction at a pH from 3.5 to 5.0 and a temperature from 60 to 75°C, in a ratio of at least 0.16 AAU (acid amylase units) per AGI (amyloglucosidase units) **wherein said enzyme product is substantially free from transglucosidase.**"

(Amendment emphasised by the Board).

The reasons for maintaining the patent on the basis of this amended claim were essentially the following:

- (a) The skilled person was able to select a commercially available amyloglucosidase to isolate an alpha-amylase therefrom having the properties specified in Claim 1, and to prepare therefrom the claimed enzyme product without an undue burden of experimentation.
- (b) The subject-matter of claim 1 as amended by the addition of the feature that the enzyme product was substantially free of transglucosidase, was novel because none of the documents cited unequivocally disclosed an enzyme product free from transglucosidase.
- (c) For considering the question of inventive step, document (3) was taken as the closest prior art, as it attempted to address in quantitative form the question of how much alpha-amylase is required for efficient starch digestion. The reader would have concluded that an alpha-amylase:amyloglucosidase

ratio equivalent to 0.018 AAU/AGI, that is almost ten times less than the ratio of the two enzymes required by the amended Claim 1, would be sufficient. Whereas document (3) also referred to two other enzyme preparations having alpha-amylase to amyloglucosidase ratios of 1:3.5 and 1:2.4, the pH and temperature optimum values of these enzymes were not given, nor was there any indication that they were free of transglucosidase. On this basis document (3) would not have led the skilled person to make an enzyme product falling under the claims.

IV. Appellants (Opponents) (01) and (02) both filed appeals against this decision, Appellant (01) also submitting

(19) experimental data

intended to show that following the instructions of document (18) inevitably led to a product falling within the scope of Claim 1.

The Appellants argued essentially as follows:

- (a) The isolation of an appropriate alpha-amylase from commercial amyloglucosidase required an undue amount of experimentation, and the patent failed to meet the requirements of Article 83 EPC. Unless a person skilled in the art was fortunate enough to have selected already for the first test a commercial amyloglucosidase preparation containing an appropriate alpha-amylase, an extremely lengthy and expensive process of testing commercially available preparations was likely to ensue, as the patent did not contain even a single example identifying publicly available starting materials.

- (b) Claim 2 was not entitled to claim priority from the European patent application No. 83 201 303 because in this priority application the subject-matter of an enzyme product in which the AAU to AGI ratio was in the range of from 0.2 to 4.5, was not disclosed. Accordingly Claim 2 lacked novelty over the disclosure in a lecture by the co-inventor of the patent in suit, Dr J. J. M. Labout, at the 35th Starch Convention of the Arbeitsgemeinschaft Getreideforschung at Detmold, April 25 to 27, 1984. For the contents of this lecture a report appearing on pages 157 to 161, of Starch/Stärke 37 (1985) Nr. 5 was relied on.
- (c) Claim 1 was not novel as the experimental data in (19) showed that by following the teaching of document (18), an enzyme product derived from the microorganism *Aspergillus phoenicis* (Staley 298), ATCC 13156 would be produced, which product fell within the parameters specified by Claim 1. It was sufficient that its falling within these parameters could have been determined (G 1/92 OJ EPO 1993, 277).
- (d) Even if the product were novel, in any case it lacked inventive step. Both document (2) and document (18) disclosed the removal of transglucosidase and this in combination in particular with the teaching of documents (3) and/or (17) rendered the subject matter of Claim 1 obvious.

V. The Respondent argued essentially as follows:

- (a) The description described at least one way of preparing the claimed enzyme product. This was, according to established case law, sufficient for the purposes of Article 83 EPC.
- (b) The attack on novelty of Appellants (02) was based on an illegitimate combination of three references, namely document (17), document (18) and the experimental data (19). In document (18) it was mentioned that amyloglucosidase preparations according to document (17) were unable to hydrolyse starch or a starch-derived substrate completely to glucose. Moreover, neither document (17) nor (18) taught or suggested that the amyloglucosidase preparation in question contained alpha-amylase.
- (c) The most important aspect of the invention claimed was that with the glucoamylase preparation "enriched" with alpha-amylase increased yields could be obtained in a shorter period of time in an industrial process in which higher concentrations of the substrate were used. None of prior art showed this. Even until recently, the glucose yields in concentrated starch solutions were limited to approximately 95%. The yields according to the present invention, which amounted to 95.0 to 95.8% were indeed surprising as was the high conversion at an early stage of the starch degradation process, which high conversion at shorter reaction times provided significant economic advantages.

VI. By letter of 4 November 1993 Respondent submitted further comments, two auxiliary requests and evidence in the form of a declaration by one of the co-inventors,

Dr J. Labout, containing experimental data to show the benefits of the invention.

The Appellants submitted that the Board should refuse to admit the evidence as not being submitted in due time, relying inter alia on Decisions T 534/89 (OJ EPO 1994, 464) and T 17/91 (Headnote in OJ EPO 1993, Issue 9) where late filed evidence was rejected as inadmissible in view of an abuse of the procedure. Appellants (01) by letter of 5 November 1993 further suggested that matter be referred back to Opposition Division for a complete review of the questions of novelty and inventive step.

VII. Oral proceedings took place on 9 November 1993. The Appellants (01) did not attend these proceedings, although duly summoned. During oral proceedings, the Respondent submitted further versions of the two auxiliary requests which differed from those submitted by letter of 4 November 1993 only by corrected spelling.

Claim 1 of the Auxiliary Request A corresponds to Claim 1 as maintained, but contains after the words "an enzyme product" the phrase "... other than such product obtained from *Aspergillus phoenicis* ATCC 13156, ...". It was submitted that should the Board of Appeal decide that Claim 1 of the main request lacked novelty in view of the teaching of (18) to obtain a glucoamylase enzyme preparation, purified from transglucosidase activity, from *Aspergillus phoenicis* ATCC No. 13156, novelty existed for Claim 1 of this Auxiliary Request A in which a so obtained enzyme preparation was disclaimed. This disclaimer was allowable and sufficient, since the teaching of documents (17) and (18) was at most an accidental anticipation.

VIII. The Appellants requested that the decision under appeal be set aside and that the European Patent be revoked.

The Respondent requested as main request that the appeal be dismissed and that the patent be maintained (i.e. as amended before the Opposition Division), and as auxiliary requests, that the decision under appeal be set aside and the patent be maintained on the basis respectively of Claim 1 in Auxiliary Request A, or Claim 1 in Auxiliary Request B, both handed in at the oral proceedings.

Reasons for the Decision

1. The appeals are admissible.

2. *Procedural matters*

2.1 Late filed evidence

Pursuant to its discretion under Article 114(2) EPC, the Board decided to admit the declaration by Dr Labout, as it provided no more than experimental support for statements already appearing in the patent in dispute concerning advantages of the invention, so that no new issues were raised. The decisions relied on by the Appellants (see point VI above) were concerned with the quite different situation where the raising of new issues in evidence not submitted in due time amounted to a manifest abuse of the procedure.

2.2 Remittal of the case

The auxiliary requests by the Respondent had been filed as a precautionary measure in relation to an alleged

anticipation on which the Opposition Division had found in the Respondent's favour, but on which Appellant (02) had filed further evidence at the appeal stage. In these circumstances, and in the absence of any request by the Respondent for remittal, the Board considered that the only appropriate course would be for the Board itself to decide on the claims put forward in the Respondent's requests.

3. *Sufficiency of disclosure (Article 83 EPC) of all requests*

3.1 In the patent in suit, on page 4, line 17 ff. it is stated that acid alpha-amylase occurs as a component in amyloglucosidase preparations and can be obtained in substantially pure form from such preparations using an appropriate separation technique, such as high-performance liquid chromatography. Further, advice is given that amyloglucosidase derived from the microorganism *Aspergillus niger* is the preferred amyloglucosidase but that many genera of microorganism contain species known to produce amyloglucosidase can be used as a source of the said acid alpha-amylase. The Appellants have submitted nothing which would show that this information is not correct.

3.2 The tests required to identify appropriate starting materials, which were available on the market at the priority date, and the actual preparation of an enzyme product meeting the parameters defined by the claims appear to be routine, so that the absence of any example clearly identifying particular starting materials available at the priority date does not matter. Even allowing for several commercial products having to be tested before a suitable starting material is found, the total work involved to produce something falling within the claims does not appear to amount to an undue burden.

Consequently the Board considers the invention to be sufficiently disclosed for the purpose of Article 83 EPC.

4. *Main request*

4.1 Allowability - Article 123(2) EPC

The allowability of Claim 1 of the main request, which has been amended compared to the granted claim by the addition of the feature that the enzyme product is substantially free of transglucosidase, was accepted by the Opposition Division, and not challenged on appeal. The Board agrees that it is allowable.

4.2 Novelty (Article 54 EPC)

Document (18) describes the making of an amyloglucosidase preparation derived from the deposited, and publicly available, strain of *Aspergillus phoenicis* ATCC 13156 described in document (17), by refining it so that it no longer contains transglucosidase.

Document (18) specifically states that the material as described in document (17) is to be used as the starting material, see column 1, lines 8 to 47. Experimental data (19) submitted by Appellants (02) shows that such amyloglucosidase preparation in accordance with the process of document (18) contains acid alpha-amylase having the characteristics specified in Claim 1, and an alpha-amylase to amyloglucosidase ratio falling within the range specified in Claim 1, i.e. the experiments following the teaching of document (18) resulted in two transglucosidase free samples, one with an AAU'/AGI ratio of 0.75 and one with a ratio of 0.72. This is not a mosaic of documents, but a demonstration of what carrying out the teaching of the single document (18) produces. While documents (17) and (18) do not report

the fact that the product contains acid alpha-amylase, and give no information on the temperature and pH optimum, or on the AAU/AGI ratio, document (18) does teach the making of a product falling within Claim 1, starting from a publicly available starting material. The Respondent has not contested that the relevant properties were determinable by a person skilled in the art. As the relevant properties were determinable, the teaching of document (18) destroys the novelty of Claim 1 (cf. G 1/92 loc. cit.). Consequently the main request has to be rejected.

5. *Auxiliary Request A*

5.1 Allowability in view of Article 123(2) and (3) EPC

Claim 1 of auxiliary request A reading "An enzyme product, **other than such product obtained from *Aspergillus phoenicis* ATCC 13156**, comprising amyloglucosidase and acid alpha-amylase ..." differs from the Claim 1 of the main request only by the disclaimer indicated by underlining. According to established case law the use of a disclaimer to establish novelty over a specific piece of prior art does not contravene Article 123 (2) EPC (see e.g. T 105/87 of 25 February 1988, not published in OJ EPO). The disclaimer is a limitation of the scope of protection, so no question of contravention of Article 123(3) EPC arises.

5.2 Novelty (Article 54 EPC)

5.2.1 The disclaimer excludes from the scope of Claim 1 of Auxiliary Request A an enzyme product produced according to document (18) from strain ATCC 13156 (see point 4.2 above), the sole enzyme product described in the prior art for which the Board considered it established that

it fell within the scope of Claim 1 of the main request. Claim 1 of the Auxiliary Request A can thus be considered as novel.

5.2.2 Entitlement to Priority of dependent Claim 2

In the European patent application No. 83 201 303 of 11 September 1983 from which priority is claimed, the disclosed range for the AAU/AGI ratio is from a lower limit of 0.12 with no upper limit specified. The restrictions in present Claim 2 to a range with a lower limit of 0.2 to an upper limit of 4.5, fall within the disclosure by the priority application and do not alter the nature of the invention therein disclosed. Thus the invention must be regarded as the same invention as in the priority application, and so in accordance with Article 87(1) EPC this Claim 2 is entitled to the priority claimed. The attack against this Claim 2 based on the lecture by the co-inventor in April 1984, that is after the priority date, thus must fail.

5.3 Inventive step (Article 56 EPC)

5.3.1 For the purpose of considering whether Claim 1 of Auxiliary Request A contains an inventive step over the prior art, the Board does not consider document (18) as the closest state of the art because the reader is not made aware of the alpha amylase component having any importance for the properties of the enzyme product disclosed.

5.3.2 Rather the Board agrees with the view of the Opposition Division that document (3) is to be considered to be the closest state of the art because there, several *Aspergillus*, *Rhizopus* and *Endomyces* strains (including *Aspergillus phoenicis*, the so-called "Staley" strain, which is the same species as disclosed according to

documents (17) and (18)) were investigated. In Table 3 on page 381 of document (3) enzyme activities for glucoamylase and alpha-amylase are given and their abilities to digest amylopectin were compared (Figure 8). The results show that the substrate is efficiently degraded by the combination of the said enzymes in the ratio alpha-amylase/glucoamylase of 1:57, represented by the commercial glucoamylase preparation Diazyme. The author concluded that adequate levels of alpha-amylase were required (see page 382, left column, first paragraph, lines 7 to 12), without providing any specific guidance.

- 5.3.3 Based on this prior art the problem arising is to provide a class of enzyme preparations having improved saccharification properties.
- 5.3.4 The data given in the patent in suit on page 7, Table 1, show that saccharification time could be decreased while at the same time increasing the yield of glucose. Further more, these results were supported by the declaration of Dr Labout, stating that an enzyme preparation having an alpha-amylase/amyloglucosidase ratio in accordance with the claimed invention shows an unexpected rise in yield. He concludes that the alpha-amylase enriched enzyme product gives increased yields in a shorter period of time. Thus, it is plausible that the problem is solved by the product of Claim 1 of Auxiliary Request A.
- 5.3.5 No suggestion that removal of transglucosidase and providing the enzymes in the claimed ratio of at least 0.16 of the specified type of acid alpha-amylase units per amyloglucosidase units would achieve a beneficial effect can be derived from (3) or any other document of the prior art. The disclosure of documents (18) and (17)

concerning the strain *Aspergillus phoenicis* ATCC 13156 gives no hint that any beneficial properties are due to the high proportion of acid amylase it contains.

5.3.6 Document (3) also disclosed that one other, commercially available, enzyme preparation derived from *Aspergillus niger* (NRRL 337 of Smiley) had an alpha-amylase to amyloglucosidase ratio of 1:3.5 but provided no information from which it could be deduced that the alpha-amylase of this preparation meets the requirements of Claim 1 relating to the pH and temperature optimum values. Appellant (02) had supplied in a letter dated 25.10.90 experimental results from which it appeared that NRRL 337 of Smiley contained acid alpha-amylase with a pH optimum at 3.0, outside the limits of Claim 1, even though the AAU/AGI ratio fell within that required by Claim 1. Similarly other products, also apparently commercially available before the priority date, were mentioned in the experimental results submitted in this letter of 25 October 1990, but these failed in one or other respect to meet the requirements of Claim 1, even apart from the question of being free from transglucosidase. The Board is not prepared to conjecture that because something falling close to but outside Claim 1 can be derived from the prior art in an obvious manner this also renders something within Claim 1 obvious.

5.3.7 As to the teaching of document (3), the Board agrees with the Opposition Division's opinion that from this document the skilled person would conclude that the amount of alpha-amylase contained in Diazyme L-100, which is stated to have an alpha-amylase to glucoamylase ratio of 1:57 (0.018) is sufficient to digest starch efficiently. Diazyme L-100 is discussed in detail in document (3) and contrasted favourably to a product having an AAU/AGI ratio of 1:15,000, whereas products

having higher ratios though appearing in Table 3 are not further discussed. The Board can derive no suggestion from document (3) that would the skilled man to seek a product as defined in Claim 1. That document (3) discloses one strain in Table 3, *Aspergillus phoenicus* [sic] from Staley, now disclaimed, from which a product having an acid alpha-amylase and a AAU:AGI ratio required by Claim 1 can be derived, can be disregarded in the present case when considering inventive step. This is because there is nothing in document (3) that would lead the skilled man to seek other enzyme products similar to this Staley product in respect of the features specified in Claim 1, as the importance of these features was not disclosed nor does document (3) single out this enzyme product as being in any way particularly suitable.

- 5.3.7 None of the other documents in the proceedings comes closer to the invention claimed in Auxiliary Request A than those discussed above because they describe e. g. products still containing transglucosidase. Further, no combination of any documents would lead to a different view on the question of inventive step. It is not sufficient to put forward a complicated chain of argument that if the skilled man had relied on a particular isolated passage in one document, another isolated passage in a second document, and possibly yet another isolated passage in a third document, then he could have arrived at something falling within the claim, when there appears no reason to rely on those particular passages and not on other parts of the same documents which suggest something different. Rather it is necessary to show that treating the teaching of these documents as a whole, without hindsight based on knowledge of the claimed invention, the skilled man would have arrived at something within the claim as a solution to the problem.

5.4 Thus, Claim 1 of the Auxiliary Request A, and consequently all other claims of this request, being either product claims dependant directly or indirectly on Claim 1, or claims to a saccharification process using the product of Claim 1, satisfy the requirements for inventive step.

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 Claim 1 of Auxiliary Request A submitted during the oral proceedings and with the dependencies of the other claims and the description to be adapted.

Registrar:

Chairman:

P. Martorana

A. Nuss