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D E C I S I O N
of 19 August 1998

Case Number: T 0099/95 - 3.3.4

Application Number: 88120669.2

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IPC: A21D 8/04

Language of the proceedings: EN

Title of invention:
Method for improving flour dough

Patentee:
Gist-Brocades N.V.

Opponent:
Novo Nordisk A/S

Headword:
Improvement flour dough/GIST BROCADES

Relevant legal provisions:
EPC Art. 56

Keyword:
"Main request - inventive step (yes)"

Decisions cited:
T 0068/85, T 0019/81, T 0409/91, T 0694/92, T 0939/92

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0099/95 - 3.3.4

D E C I S I O N
of the Technical Board of Appeal 3.3.4
of 19 August 1998

Appellant: Gist-Brocades N.V.
(Proprietor of the patent) Wateringseweg 1
P.O. Box 1
2600 MA Delft (NL)

Representative: Irvine, Jonquil Claire
J.A. Kemp & Co.
14 South Square
Gray's Inn
London WC1R 5LX (GB)

Respondent: Novo Nordisk A/S
(Opponent) Novo Allé
2880 Bagsvaerd (DK)

Representative: Dehmel, Albrecht, Dr. Dipl.-Chem.
Patent- und Rechtsanwälte
Bardehle . Pagenberg . Dost . Altenburg .
Geissler . Isenbruck
Galileiplatz 1
81679 München (DE)

Decision under appeal: Decision of the Opposition Division of the European Patent Office posted 6 December 1994 revoking European patent No. 0 321 811 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 0 321 811 having the title "Method for improving flour dough" was granted with eight claims of which the main claim read as follows:

"1. A method for improving rheological properties of a flour dough, characterized in that flour, yeast and water are combined with an effective amount of a microbial enzyme preparation comprising sulfhydryl oxidase and glucose oxidase with a ratio, based on units of enzymes present, in the range of 0.003 to 10, and said ingredients are mixed to form a suitable baking dough."

II. The patent was opposed by the respondent (opponent) on the grounds of insufficiency, lack of novelty and inventive step, Article 100(a) and (b) EPC. The ground of insufficiency was withdrawn during the opposition proceedings.

The following documents have inter alia been cited:

- (1) US-A-2 783 150
- (2) Young and Nimmo, Proceedings of the Biochemical Society, 1972, page 33p
- (3) Motte and Wagner, Biochemistry, volume 26, 1987, pages 7363 to 7371
- (5) US-A-4 632 905

(7) Kaufman and Fennema, Cereal Chemistry, 64(3),
1987, pages 172 to 176

(11) Ullmann's Encyclopedia of Industrial Chemistry,
Fifth, Completely Revised Edition, volume A4,
Germany, 1985, pages 346 to 347.

III. In its decision dated 6 December 1994, the Opposition
Division revoked the patent for lack of inventive step,
Article 102(1) EPC.

IV. The appellant (patentee) filed an appeal, a statement
setting out the grounds of appeal and paid the appeal
fee.

V. The respondent replied to the appeal.

VI. With a letter dated 13 May 1998 the appellant filed an
additional auxiliary request.

VII. Oral proceedings were held on 19 August 1998.

VIII. At oral proceedings the appellant filed a new main
request having seven claims, claims 2 to 7 being
dependent on claim 1 which reads as follows:

"1. A method for improving rheological properties of a
flour dough characterised in that flour, yeast and
water are combined with an effective amount of a
microbial enzyme preparation comprising sulphhydryl
oxidase and glucose oxidase and said ingredients are
mixed to form a suitable baking dough, the ratio of
sulphhydryl oxidase to glucose oxidase in said
preparation, based on units of enzymes present, being

in the range of 0.003 to 10 and sulphhydryl oxidase being present in said dough in an amount of 35 to 800 units per kg of flour."

- IX. The appellant's arguments at oral proceedings as regards the new main request can be summarised as follows:
- (a) The new claim 1 did not contravene Article 123(2) EPC because it was based on the description of the European patent application as filed, in particular page 4 lines 16 to 23 and claim 3 as filed.
 - (b) Article 123(3) EPC was met because claim 1 corresponded to claim 3 of the patent in suit as granted.
 - (c) With regard to Article 84 EPC the appellant maintained that the language of claim 1 was clear and that there was no ambiguity even though some of the ratios glucose oxidase/sulphydryl oxidase (GOX/SHX) in comparative data fell within the range given in that claim. The term "an effective amount" was clear to a person skilled in the art. It was a functional feature which should be allowable as any other formulation of the claim would unfairly restrict the scope of the invention; in this respect Board of Appeal decision T 68/85 (OJ 1987, 228) was cited.
 - (d) There was no sustainable novelty objection because not one of the prior art citations referred to 35 to 800 units of SHX, and although comparative

examples A1 and A2 in Table III reflected the process of document (7), they did not employ effective amounts of enzyme preparation.

- (e) The disclosure of document (1) was considered to be the closest prior art. However, it was not clear from its description that dough was to be treated rather than flour to prepare an improved flour. The description showed that GOX lead to a strengthening in dough, however, this process required large amounts of GOX (500-1000gm/kg) which was too expensive.

- (f) The problem to be solved by the patent in suit was to find a GOX enzyme composition which was more economic, yet as efficient as the GOX compositions of the prior art used in combination with accepted oxidants in the production of dough having the required rheological properties.

- (g) Table IV of the patent in suit showed that only 110 units GOX/kg flour with 38 units of SHX were required to produce dough having the necessary rheological properties. This was a surprising result having regard to the disclosure in prior art document (7) which had investigated SHX for the purpose of strengthening dough and had not come to any positive experimental results. The conclusion was that the large SHX molecule was unable to catalyse a net increase in disulphide bonds because the thiol groups were insufficiently accessible to it. This would not indicate a change from the relatively small molecules of the conventional inorganic oxidants. Having regard to

the disclosure of document (7) it would have been obvious to use SHX with the compounds indicated as enhancers of SHX activity, eg, horseradish peroxidase.

- (h) The investigation of SHX disclosed in document (3) also would not at all encourage the skilled person to select it for the purposes contemplated by the patent in suit, because when used to reactivate reductively denatured ribonuclease, figure 2 showed that it was 50 hours before any significant activity was detected. The affidavit filed by Professor J Nicolas considered this document and he confirmed that it showed that SHX was not capable of catalysing the oxidation of protein linked thiol groups. Further the affidavit indicated that there existed in 1987 many possible oxidases, but both documents (3) and (7), each dated 1987, and thus approximately at the priority date of the patent in suit, gave no incentive to select SHX.
- (i) Document (11) confirmed that there existed a problem with the use of chemical oxidants but the author of document (7) was unable to proceed satisfactorily after having considered document (11).
- (j) Having regard to the nearest prior art disclosed in (1) it was not obvious to use GOX in combination with SHX and have any reasonable expectation of success.
- (k) The appellant denied that the Board of Appeal

decisions T 409/91 (OJ 1994 653), T 939/92 (OJ 1996 309) and T 694/92 (OJ 1997 408) were applicable to the present case.

X. The respondent's submissions as regards the new main request can be summarised as follows:

- (a) Claim 1 was not clear and did not comply with Article 84 EPC because the reference to "an effective amount", a form of disclaimer, was not defined in the patent in suit. Accordingly, the skilled person would not know what to do especially as the ratio and amounts of GOX/SHX used in the comparative examples A1 and A2 of Table III of the patent in suit fell within those given in the claim, but were said to be unsuitable for the purposes of the invention. Some calculations relating to the amounts of enzymes employed were filed during the oral proceedings. Further, the understanding of the patent in suit was not helped by the statement by the appellant that baking was an art and not a science.
- (b) The Opposition Division had not properly considered the question of novelty (Article 54 EPC) because the appellant had likened the process of examples A1 and A2 in Table III of the patent in suit to that of the prior art document (7), and therefore this document was still relevant when assessing novelty.
- (c) With regard to Article 56 EPC it was the case that in view of the calculations filed and the comparative examples of the patent in suit that

the problem to be solved was not solved over the whole range of ratios and GOX/SHX quantities specified in the process claimed. Therefore the requirements of Article 56 EPC were not met.

- (d) Starting from document (1) as nearest relevant document, it was known that GOX prepared from *Aspergillus niger* contained SHX, this view being supported by documents (2) and (3). Therefore, the disclosure of document (1) did relate to GOX/SHX compositions and, consequently, it was only the specific amounts of GOX/SHX which were responsible for solving the problem. The tables in the specification of the patent in suit were referred to and it was said that from Table 1 examples 2 to 5 fell within the scope of claim 1, but example 5 was not effective. In Table III examples A1 and A2 were said to be comparative even though the ratio GOX/SHX was the same as specified in claim 1. From Table IV examples B1 to B3 were prior art, only B4 corresponded to the invention and this example was inferior to them. Table V examples 4 to 6 were those of document (1), examples 1 to 3, and example 7 corresponded to the invention, but all examples had a dough stability of >12 min.
- (e) Document (11) would be referred to by a skilled person looking for oxidants, and he would conclude from that document that, because some oxidants are banned from use, it would be obvious (a) to look in the enzyme field, (b) to select an enzyme which oxidises -SH groups, and (c) that SHX would be the enzyme selected.

- (f) From the disclosure in document (5) at column 1 it was known that commercial enzymes showed an SHX activity and such enzymes were produced from *Aspergillus niger*.
- (g) When considering Tables III and IV of the patent in suit it was not clear how to distinguish between effective and ineffective results. It was not allowed for the appellant to rely upon trial and error experimentation. The respondent referred to Board of Appeal decisions T 409/91 (supra), T 694/92 (supra) and T 939/92 (supra) second headnote, in support of his case. He did not make any comment in respect of Board of Appeal Decision T 68/85 (supra).

XI. The requests of the parties were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of

- (a) main request: claims 1 to 7 filed during oral proceedings
- (b) first auxiliary request: claims 1 to 7 filed during oral proceedings
- (c) second auxiliary request: claims 1 to 8 filed on 18 May 1998

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

Main Request

2. *Article 123(2) and (3) EPC*

- 2.1 The Board is satisfied that the subject-matter of the claims was disclosed in the patent application as filed, in particular in the first paragraph and page 3 line 31 to page 4 line 24 of the description as well as the claims, thus the requirement of Article 123(2) EPC has been met.

The subject-matter of claim 1 corresponds with that of claim 3 of the patent in suit as granted, therefore, the requirement of Article 123(3) EPC has also been met.

3. *Clarity, Article 84 EPC*

- 3.1 In an attempt to establish that the subject-matter of the claims was not clear the respondent made observations and calculations upon the information given in the Tables I to V of the patent in suit. He tried to show that the invention was not solved for all the values specified by claim 1.

- 3.2 It was part of the appellant's submissions that Tables I to IV were of a comparative nature, indeed only some of the examples were according to the invention. It was therefore easy for the respondent to

cast doubt upon the disclosure in said tables by making unfavourable comparisons to show that the problem had not been solved over the whole range claimed.

3.3 In the Board's view the respondent drew the wrong conclusion from Table V when he stated that all the examples produced approximately the same result in terms of dough stability. The results of examples 1 to 6 were all the same, ie, dough stability > 12 min. However, examples 1 to 3 were according to and examples 4 to 6 were not according to the invention. It is abundantly clear from a comparison of examples 1 to 3 with examples 4 to 6 that only one fifth of the GOX used in examples 4 to 6 was necessary to achieve the same result as in examples 1 to 3. Thus these comparisons are clear in what they are intended to indicate, namely that an equivalent result is obtained whether one uses GOX without added SHX (examples 4 to 6) or only approximately one sixth of the amount of GOX with added SHX (examples 1 to 3).

3.4 The wording of the main claim is such that an "effective amount" of the enzyme composition is employed "for improving rheological properties of a flour dough". In determining what this term means the skilled person would have at his disposal the details of the examples of the invention which are successful, and starting from there would have no difficulty in performing other processes by running routine trials which would not involve any undue burden for him to perform. The term is accepted as a technical feature and does have the effect of limiting the claim to those combinations which give the desired rheological properties. Since the important features are that SHX

is used and that its ratio relative to GOX is given then the actual amount employed may be easily evaluated by the skilled person. Said features are in themselves a direct pointer to what is to be done and therefore it would in this case be unreasonable to restrict the appellant to the specific examples. The respondent admitted that "effective amount" is a form of disclaimer, and in the Board's opinion this term excludes those possibilities upon which he based his calculations.

- 3.5 The above decision is consistent with the established jurisprudence of the Boards of Appeal in particular T 68/85 (supra) in that functional terms are allowable in claims in cases in which the skilled person would not be unduly burdened by having to perform routine tests having already been given examples which conform with the claimed invention.

4. *Novelty, Article 54 EPC*

The only prior art cited by the respondent against the novelty of the claimed subject-matter was the disclosure of document (7). Although comparative examples A1 and A2 of Table III of the patent in suit were akin to the process as performed in said citation, the latter did not make any reference to GOX or the required GOX/SHX ratio. This document does not therefore anticipate the claimed subject-matter. The Board considered that no other prior art document was relevant under Article 54 EPC.

5. *Inventive step, Article 56 EPC*

5.1 The closest prior art

The Board, in agreement with both parties, is satisfied that document (1) is the closest prior art as it described a process in which flour and baking compositions were treated with GOX in amounts of one part by weight to 500,000 of flour or baking composition in order to cause them to mature. The GOX employed in this document was said to contain minor amounts of other enzymes, e.g., catalase. Such a product was obtained by cultivation of *Aspergillus niger*, e.g., in a sugar containing medium to produce a metallic gluconite.

5.2 The technical problem

In the light of that prior art document (1) the problem to be solved was to improve the process of this document so as to obtain the same rheological effects whilst using a cheaper enzyme mix.

5.3 The solution to the problem

The solution to this problem lies in the use of an effective amount of a GOX/SHX mixture mixed in proportions which comply with the given GOX/SHX ratio and quantity range for SHX specified in claim 1.

5.4 Assessment of inventive step

5.4.1 The difference between the subject-matter claimed and that of document (1) lies in the use of an effective

amount of a GOX/SHX composition which complies with the specified ratio of GOX/SHX and the amount of SHX per kg of flour.

- 5.4.2 Having regard to this prior art document, the question to be answered is whether or not it was obvious to carry out the process using the ingredients as specified in claim 1.
- 5.4.3 Document (1) does not give any indication of the claimed solution to the problem because this document describes in the treatment of flour the use of GOX alone or in combination with other known additives, in particular ascorbic acid, (see column 3 lines 8 to 10). However, no mention was made of SHX let alone any ratio relative to GOX. Therefore the respondents rely on the statements made in document (1) that GOX preparations originating from *Aspergillus niger* cultures contain a mixture of enzymes and thus also SHX, which assumption finds no basis in this document. Whatever may be the true composition of an *Aspergillus niger* culture as described in document (1) in the only products referred to other than the enzymes produced thereby are potassium, ammonium and calcium gluconates. Even if the said culture did produce SHX which the Board does not accept for lack of disclosure to this effect in document (1), the complete absence of any disclosure that SHX was present in the catalytic proportions required and was not to be considered as an oxidant, the Board cannot see how the skilled person would have arrived at the teaching of the patent in suit.
- 5.4.4 The skilled person would have associated document (1) with document (3) (1987) which concerned *Aspergillus*

niger Sulphydryl Oxidase and with the disclosure of document (2) (1972). The disclosure of (3) was not directly linked to a baking process, however, the Board considers that it relates to a relevant neighbouring technical field which the skilled person would be aware of.

5.4.5 Document (3) refers to the disclosure of document (2) and recognised that (page 7369) *Aspergillus niger* glucose oxidase preparations have an ability to catalyse the oxidation of GSH by virtue of SHX catalytic activity.

5.4.6 However, this activity did appear to be very low and not practical in a baking process because it took 50 hours to realise said activity, see document (3) figure 2 page 7367. This was not disputed by the respondent, and the Board concluded that also when document (1) is read in the light of the teaching of documents (2) and (3) there is no positive indication to use SHX with GOX in the ratio specified in claim 1 of the patent in suit.

5.4.7 The respondent argued that document (1) differed from the claimed subject-matter only in that it did not refer to the SHX side activity of GOX from *Aspergillus niger* as a possible substitute for chemical oxidants, also that it did not mention the particular ratio of SHX/GOX or a specific amount of SHX to be added to the flour. This activity was linked with the known oxidants of document (11) which did not refer to any oxidase product at all. There is, however, no teaching in document (11) which concerns the use of SHX as even an oxidant, let alone as a catalyst, with GOX which is an

entirely different function. Thus the respondent has confused the oxidative function of oxidants with the catalytic function of SHX specifically to improve the inefficient glucose oxidase dough conditioning process as claimed in the patent in suit. Furthermore, it cannot be concluded from document (11) that because some inorganic oxidants are banned in some countries it would be obvious to consider enzymes which oxidise the -SH group and that obviously SHX would be used, as submitted by the respondent. Enzymes and oxidases, in particular SHX, are not part of the teaching of document (11); thus, the respondent's submission depends upon knowledge of the solution to the problem to be solved by the patent in suit, and is therefore ex post facto and not acceptable to the Board.

5.4.8 Document (7) disclosed an investigation into the evaluation of SHX as a strengthening agent for wheat flour dough and concluded that active SHX had essentially no effect on the free -SH groups in flour, whereas potassium iodate had a substantial effect (see paragraph bridging pages 173 and 174, also the conclusions page 176). There was therefore no incentive in this document to use SHX as claimed. This disclosure is contrary to the respondent's argument in respect of document (11) because SHX was found to have no effect on -SH groups in flour whilst potassium iodate did, thus documents (7) and (11) lead towards potassium iodate and not SHX.

5.4.9 The disclosure of document (5) is no more relevant than that of the documents already discussed as it refers to commercially available *Aspergillus sojae* enzyme preparations having an SHX side activity.

- 5.4.10 From the above reasoning it is concluded that none of the prior art documents gave a positive indication to employ SHX at all and in particular not in combination with the GOX described in document (1).
- 5.4.11 Finally, the appellant has shown that the use of an unknown combination of GOX/SHX in the proportions specified per kg of flour has enabled dough of good rheological properties to be prepared using far less of the expensive GOX than was the case in the prior art, thus demonstrating a technical effect previously only possible by employing large amounts of GOX. Examples 1, 2 and 3 of Table V of the patent in suit when compared with examples 4, 5 and 6 of said Table demonstrate the success of the claimed method.
- 5.4.12 The Board of Appeal therefore recognises an inventive step for the subject-matter of the main request.
6. With regard to Board of Appeal Decision T 19/81 (OJ EPO 1982, 51), the facts are different in that this decision related to the support of a prejudice by use of patent specifications of which the given information was not readily compatible with the notions currently accepted in the art. Document (7), however, is not a patent specification but an article published in a well known journal which reflects common general knowledge.

Board of Appeal Decision T 409/91 (supra) is distinguished in the facts in that, whereas the crystal size produced in identical fuel oil compositions varied according to unknown factors, the present claim 1 relies upon effective amounts disclosed within the GOX/SHX ratio and quantities of SHX defined by the

specified range.

The facts of the present case also do not correspond with those of Board of Appeal Decision T 694/92 (supra), because it related to the realisation of a technical effect anticipated at a theoretical level in the prior art thus necessitating that the terms in which the invention was claimed were fair and adequate, whereas the catalytic activation of GOX by SHX as described in the patent in suit was not known in the prior art. The patent in suit does not relate to the achievement of a given technical effect by known techniques in different areas of application because there exists only one area of application, namely that of bread making, and there is no reason to deny that the claimed process may be carried out by the skilled person throughout said area of application.

The respondent cited the Board of Appeal Decision T 939/92 (supra) (points 2.4 to 2.6) which relates to Article 56 EPC and whether or not a technical effect is achieved by all the chemical compounds covered by a claim. This case also differs from the situation in the patent in suit which relates to a process in which claim 1 gives clear advice in respect of the only two compounds to be used, namely GOX and SHX in a given ratio. The only feature to be determined is not a chemical compound but rather the "effective amount" to improve rheological properties of the dough.

7. Since the main request is allowable, auxiliary requests 1 and 2 need not be considered.

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
 - (a) claims 1 to 7 filed during oral proceedings as main request, and

 - (b) description, pages 2 to 10, as granted.

The Registrar:

The Chairwoman:

U. Bultmann

U. Kinkeldey