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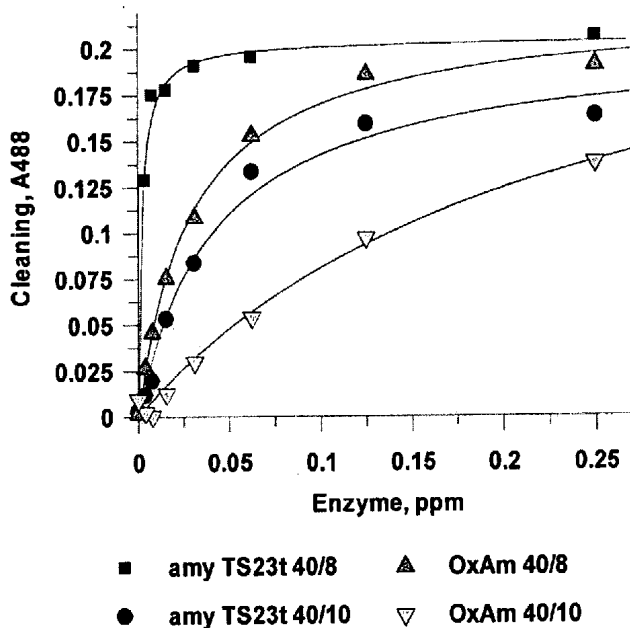
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ,

[Continued on next page]

(54) Title: TS23 ALPHA-AMYLASE VARIANTS WITH ALTERED PROPERTIES

Figure 9



(57) Abstract: Described are variants (mutants) of a parent alpha-amylase having alpha-amylase activity and exhibiting altered properties relative to the parent alpha-amylase, and methods of use, thereof.





EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. C11D3/386 C12N9/28 C12N15/75

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, WPI Data, FSTA, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 96/23873 A (NOVONORDISK AS [DK]; BISGAARD FRANTZEN HENRIK [DK]; SVENDSEN ALLAN [DK] 8 August 1996 (1996-08-08) page 14 - page 16; examples 3,4 -----	1-13, 15-23
Y	WO 2004/113551 A (NOVOZYMES AS [DK]; VIKSOE-NIELSEN ANDERS [DK]; ANDERSEN CARSTEN [DK];) 29 December 2004 (2004-12-29) sequence 18 -----	1-13, 15-23
A	WO 2006/002643 A (NOVOZYMES AS [DK]; ANDERSEN CARSTEN [DK]; OESTDAL HENRIK [DK]; SKAGERL) 12 January 2006 (2006-01-12) ----- -/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

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04/03/2010

Name and mailing address of the ISA/

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>LIN L -L ET AL: "A gene encoding for an alpha-amylase from thermophilic Bacillus sp. strain TS-23 and its expression in Escherichia coli" JOURNAL OF APPLIED MICROBIOLOGY, vol. 82, no. 3, 1997, pages 325-334, XP002514257 ISSN: 1364-5072 abstract</p> <p style="text-align: center;">-----</p>	

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-13, 15-23

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4, 10-13, 15-23 (partially)

All subject matter referring to a variant of a parent AmyTS23 alpha-amylase having at least 80% identity to the parent alpha-amylase and comprising at least:

- (a) a truncation of the C-terminus,
 - (b) a substitution of residue 201,
- wherein the amino acids refer to SEQ ID NO:1.

1.1. claims: 1-4, 8, 9, 13, 15-23 (partially)

All subject matter referring to a variant of a parent AmyTS23 alpha-amylase having at least 80% identity to the parent alpha-amylase and comprising at least:

- (a) a truncation of the C-terminus,
 - (c) a deletion of residues R180 and S181,
- wherein the amino acids refer to SEQ ID NO:1.

1.2. claims: 1-4, 13, 15-23 (partially)

All subject matter referring to a variant of a parent AmyTS23 alpha-amylase having at least 80% identity to the parent alpha-amylase and comprising at least:

- (b) a substitution of residue 201,
 - (c) a deletion of residues R180 and S181,
- wherein the amino acids refer to SEQ ID NO:1.

1.3. claims: 5-7, 13, 15-19, 22, 23 (partially)

All subject-matter referring to a variant of a parent AmyTS23 alpha-amylase having at least 85% identity to the parent alpha-amylase and comprising a truncation of the C-terminus.

2. claims: 1-4, 10-23 (partially)

As inventions 1, further comprising a substitution at one or more residues selected from 87, 225, 272 and 282.

3. claims: 1-4, 8, 9, 13-23 (partially)

As inventions 1.1, further comprising a substitution at one or more residues selected from 87, 225, 272 and 282.

4. claims: 1-4, 13-23 (partially)

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

As inventions 1.2, further comprising a substitution at one or more residues selected from 87, 225, 272 and 282.

5. claims: 5-7, 13-19, 22, 23 (partially)

As inventions 1.3, further comprising a substitution at one or more residues selected from 87, 225, 272 and 282.

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