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12 January 2012 (12.01.2012) US

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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, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: PRODUCTION OF CHEESE WITH *S. THERMOPHILUS*

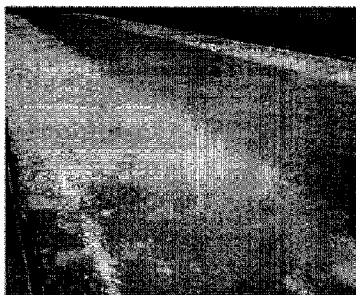


FIG. 4A

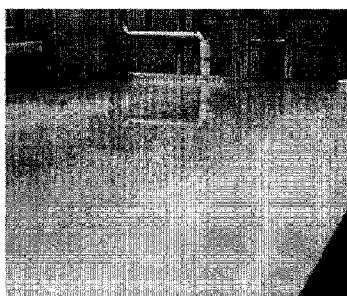


FIG. 4B

(57) Abstract: Methods and compositions for producing cheese with *S. thermophilus* and a urease inhibitor, and for producing hard or semi-hard cheese, such as cheddar, with *S. thermophilus* that is partially or completely deficient in its ability to release ammonia from urea are provided. Methods and compositions for reducing, the amount of open texture (e.g., slits, cracks, or fractures) in hard and semi-hard cheeses, as well as hard and semi-hard cheeses that comprise one or more *S. thermophilus* bacteria that are partially or completely deficient in their ability to release ammonia from urea, are also provided.



UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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27 December 2012

Published:

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER INV. A23C19/032 A23C19/05 A23C19/068 A23C19/072 C12R1/46 A23C9/13 ADD. 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) A23C C12R 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 practicable, search terms used) EPO-Internal, BIOSIS, COMPENDEX, EMBASE, FSTA, WPI Data														
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;"> WO 2011/004012 A2 (CHR HANSEN AS [DK]; CARLSON MORTEN [DK]; JANZEN THOMAS [DK]) 13 January 2011 (2011-01-13) page 6, line 20 - page 13, line 16; claims; examples ----- </td> <td style="vertical-align: top;"> 1,9-12, 16-19, 22, 24-28, 32,42,46 </td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;"> US 6 962 721 B1 (SEPULCHRE ANNE-MARIE [FR] ET AL) 8 November 2005 (2005-11-08) cited in the application </td> <td style="vertical-align: top;"> 1-3, 9-28,32, 42,46, 56,60, 61,63, 67-69 </td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;"> column 2, line 39 - column 3, line 41; claims; examples ----- -/- </td> <td style="vertical-align: top;"> 4-8, 29-31, 38,39, 43-45 </td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	WO 2011/004012 A2 (CHR HANSEN AS [DK]; CARLSON MORTEN [DK]; JANZEN THOMAS [DK]) 13 January 2011 (2011-01-13) page 6, line 20 - page 13, line 16; claims; examples -----	1,9-12, 16-19, 22, 24-28, 32,42,46	X	US 6 962 721 B1 (SEPULCHRE ANNE-MARIE [FR] ET AL) 8 November 2005 (2005-11-08) cited in the application	1-3, 9-28,32, 42,46, 56,60, 61,63, 67-69	Y	column 2, line 39 - column 3, line 41; claims; examples ----- -/-	4-8, 29-31, 38,39, 43-45
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
X	WO 2011/004012 A2 (CHR HANSEN AS [DK]; CARLSON MORTEN [DK]; JANZEN THOMAS [DK]) 13 January 2011 (2011-01-13) page 6, line 20 - page 13, line 16; claims; examples -----	1,9-12, 16-19, 22, 24-28, 32,42,46												
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Y	column 2, line 39 - column 3, line 41; claims; examples ----- -/-	4-8, 29-31, 38,39, 43-45												
☒ 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 application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "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 26 September 2012		Date of mailing of the international search report 29/10/2012												
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Smeets, Dieter												

INTERNATIONAL SEARCH REPORT

International application No

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Y	page 17, paragraph Materials and methods page 20, paragraph Discussion - page 21, left-hand column, paragraph 1	47-53, 64-66
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Y	page 11, paragraph [056]; claims 1,5,6,9, 13-15; examples page 5, paragraph [017]	4-8, 29-31, 38,39, 43-45
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X	US 2003/228680 A1 (KRINGELUM BOERGE [DK] ET AL) 11 December 2003 (2003-12-11) figure 5; example 4; table 4.1 -----	33-37, 40,41
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A	MARTLEY F G ET AL: "OPEN TEXTURE IN CHEESE: THE CONTRIBUTIONS OF GAS PRODUCTION BY MICROORGANISMS AND CHEESE MANUFACTURING PRACTICES", JOURNAL OF DAIRY RESEARCH, CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, GB, vol. 63, no. 3, 1 August 1996 (1996-08-01) , pages 489-507, XP008003404, ISSN: 0022-0299 page 499, paragraph 3 - paragraph 5 -----	56-71
X	GB 1 005 803 A (COMMW SCIENT IND RES ORG) 29 September 1965 (1965-09-29) example 3 -----	54,55, 70,71
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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/034455

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.:

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: 1-17

Method of manufacturing hard/semi-hard cheese having no open texture using ur(-) *S. thermophilus*. Hard/semi-hard cheese made by this method.

2. claims: 18-27

Fermented milk product comprising live ur(-) *S. thermophilus*

3. claims: 28-32, 42-46

A culture comprising at least one ur(-) *S. thermophilus* and at least one *Lactococcus* bacteria.

4. claims: 33-41

Method of accelerating milk acidification using *S. thermophilus* and a formate source

5. claims: 47-53

Method of producing cheese using *S. thermophilus* and a urease inhibitor.

6. claim: 54

Composition comprising milk, *S. thermophilus* and a urease inhibitor

7. claims: 55, 70, 71

Composition comprising cheese, wherein the cheese comprises a urease inhibitor.

8. claims: 56-69

Method of producing a reduced open-texture cheese using i) ur(+) *S. thermophilus*, a urease inhibitor or ii) ur(-) *S. thermophilus*.
