



(51) International Patent Classification:

C12P 7/10 (2006.01) C12P 7/46 (2006.01)
C13K 1/02 (2006.01) C12P 7/52 (2006.01)
D21C 3/04 (2006.01) C12P 7/58 (2006.01)
C12P 7/18 (2006.01)

(21) International Application Number:

PCT/US2011/025070

(22) International Filing Date:

16 February 2011 (16.02.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/305,101 16 February 2010 (16.02.2010) US

(71) Applicant (for all designated States except US): **GRAIN PROCESSING CORPORATION** [US/US]; 1600 Oregon Street, Muscatine, Iowa 52761 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JOHAL, Sarjit** [US/US]; 1600 Oregon Street, Muscatine, Iowa 52761 (US). **RAMSDEN, Steven L.** [US/US]; 1600 Oregon Street, Muscatine, Iowa 52761 (US). **HALLORAN, Zachary J.** [US/US]; 1600 Oregon Street, Muscatine, Iowa 52761 (US). **POLLMEIER, Albert J.** [US/US]; 1600 Oregon Street, Muscatine, Iowa 52761 (US).(74) Agents: **KRATZ, Rudy et al.**; 120 S. LaSalle Street, Suite 1600, Chicago, Illinois 60603 (US).

(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, RO, RS, RU, 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.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, 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).

Published:

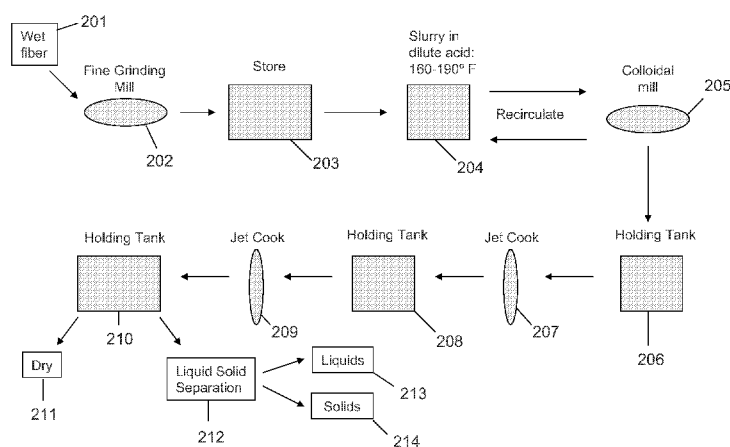
- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

3 November 2011

(54) Title: PROCESS FOR HYDROLYSIS OF WET FIBER AND METHOD FOR PRODUCING FERMENTATION PRODUCTS FROM WET FIBER

FIG. 2



(57) Abstract: Disclosed are a method of hydrolysis of wet fiber and a method for preparing ethanol. Generally, an agricultural plant material, such as corn hulls, distillers dried grains, or spent germ, is treated to at least partially hydrolyze the fiber. The process may include a maceration step followed by a shearing operation in the presence of steam to yield a treated product, in which, in many embodiments, saccharides will be released and unbound from fibrous portions of the agricultural product. In some embodiments, the process includes macerating the material to provide a slurry having a solids content of at least 10 percent and jet cooking the slurry. A mixture of saccharides prepared in this fashion may be fermented to yield ethanol and/or biochemicals.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/025070

A. CLASSIFICATION OF SUBJECT MATTER

INV. C12P7/10 C13K1/02 D21C3/04
 ADD. C12P7/18 C12P7/46 C12P7/52 C12P7/58

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)

C12P C13K D21C

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, COMPENDEX, EMBASE, FSTA, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BEALL D S ET AL: "Conversion of hydrolysates of corn cobs and hulls into ethanol by recombinant Escherichia coli B containing integrated genes for ethanol production", BIOTECHNOLOGY LETTERS, vol. 14, no. 9, 1992, pages 857-862, XP000002656343, ISSN: 0141-5492 abstract; table 1 page 858, paragraphs 4, 5 ----- -/--	1,3-5, 9-13,15, 16,18-28



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

"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

5 August 2011

Date of mailing of the international search report

19/08/2011

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

Schröder, Gunnar

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/025070

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LAWFORD H G AND ROUSSEAU J D: "Fuel ethanol from corn residue prehydrolysate by a patented ethanologenic Escherichia coli B.", BIOTECHNOLOGY LETTERS, vol. 14, no. 5, May 1992 (1992-05), pages 421-426, XP000002656344, DOI: 10.1007/BF01021258 abstract page 422, paragraph 4 -----	1,4,5, 12,13, 15,18-23
X	US 4 242 455 A (MILLER FRANKLYN D [US] ET AL) 30 December 1980 (1980-12-30) abstract; claims 1, 2, 6, 11; figure 1A column 5, line 15 - column 7, line 20 column 3, lines 33-62 -----	1,3-5, 9-13,15, 16,18-28
X	US 2003/199049 A1 (NGUYEN QUANG A [US] ET AL) 23 October 2003 (2003-10-23) abstract; figure 1 paragraphs [0045] - [0048] -----	1,3-5, 7-13, 15-28
X	WO 2005/079190 A2 (MIDWEST RESEARCH INST [US]; NGUYEN QUANG ANH [US]) 1 September 2005 (2005-09-01) abstract page 7, line 4 - page 8, line 33 -----	1,3-5, 9-15, 18-21,23
X	US 2009/143573 A1 (OLSON DAVID A [US]) 4 June 2009 (2009-06-04) abstract; claims 1-3, 9; figures 1A, 1B, 2 paragraphs [0099], [0103] - [0105] paragraph [0112] -----	1,3-6, 12-16, 18-23
X	US 4 425 433 A (NEVES ALAN M [US]) 10 January 1984 (1984-01-10) abstract column 5, lines 32-48 column 6, lines 13-41 column 6, line 51 - column 10, line 14; figures 1, 2 -----	1,2,4,5, 7,8, 15-20,23
X	US 4 708 746 A (HINGER KLAUS-JUERGEN [DE]) 24 November 1987 (1987-11-24) abstract; claim 1 column 1, line 59 - column 2, line 11 ----- -/--	1,3,7,8, 15, 17-19,23

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/025070

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 338 366 A (GRACE TODD S [US] ET AL) 16 August 1994 (1994-08-16) abstract; claims 1-5, 9, 10 column 3, line 40 - column 4, line 68 -----	1,3-5, 7-13, 15-17
A	WO 2006/017786 A2 (GRAIN PROCESSING CORP [US]; MCPHERSON ROGER E [US]; SCOTT JOHN L [US];) 16 February 2006 (2006-02-16) abstract; figure 1 -----	1-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/025070

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4242455	A	30-12-1980	NONE
US 2003199049	A1	23-10-2003	AU 5727001 A 13-03-2002
			AU 8102801 A 18-02-2002
			BR 0113262 A 13-01-2004
			BR 0113263 A 06-01-2004
			CA 2418441 A1 14-02-2002
			CA 2419658 A1 07-03-2002
			DK 1307576 T3 27-07-2009
			EP 1307575 A1 07-05-2003
			EP 1307576 A1 07-05-2003
			ES 2324855 T3 18-08-2009
			WO 0218610 A1 07-03-2002
			WO 0212529 A1 14-02-2002
			US 6423145 B1 23-07-2002
WO 2005079190	A2	01-09-2005	NONE
US 2009143573	A1	04-06-2009	WO 2009094531 A2 30-07-2009
US 4425433	A	10-01-1984	CA 1168998 A1 12-06-1984
			DK 274481 A 22-06-1981
			EP 0038359 A1 28-10-1981
			JP 56501311 T 17-09-1981
			MC 1503 A 17-11-1983
			NO 812106 A 19-06-1981
			WO 8101154 A1 30-04-1981
US 4708746	A	24-11-1987	BR 8207282 A 18-10-1983
			DE 3149587 A1 23-06-1983
			EP 0081678 A2 22-06-1983
			JP 58141799 A 23-08-1983
			SU 1449013 A3 30-12-1988
			ZA 8207528 A 31-08-1983
US 5338366	A	16-08-1994	BR 9305401 A 26-07-1994
WO 2006017786	A2	16-02-2006	CA 2575511 A1 16-02-2006
			EP 1773891 A2 18-04-2007