



(43) International Publication Date
7 September 2012 (07.09.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/118411 A3

(51) International Patent Classification:

E21B 41/00 (2006.01) *E21B 43/18* (2006.01)
E21B 43/16 (2006.01) *E21B 43/40* (2006.01)

(21) International Application Number:

PCT/RU2012/000153

(22) International Filing Date:

2 March 2012 (02.03.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

PCT/RU2011/000139 3 March 2011 (03.03.2011) RU

(71) Applicant (for all designated States except US):
GALADIGMA LLC [US/US]; 11054 Topview Road,
South Jordan, UT 84095 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **BARENBAUM, Azary Aleksandrovich** [RU/RU]; Leninsky Prospekt, 95, k. 4, kv. 111, Moscow, 119313 (RU). **ZAKIROV, Sumbat Nabievich** [RU/RU]; ul. Akademika Vargi, 18, kv. 49, Moscow, 117133 (RU). **ZAKIROV, Ernest Sumbatovich** [RU/RU]; ul. Akademika Vargi, 18, kv. 49, Moscow, 117133 (RU). **SEREBRYAKOV, Vladimir Aleksandrovich** [US/US]; 11054 Topview Road, South Jordan, UT 84095 (US).

(74) Agent: **PYLNEV, Yury Aleksandrovich**; "Baker & McKenzie - CIS, LTD", ul. Dolgorukovskaya, 7-11th floor, Sadovaya Plaza, Moscow, 127006 (RU).

(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.

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

15 August 2013

(54) Title: METHOD FOR THE ADDITIONAL DEVELOPMENT OF DEPLETED NATURAL HYDROCARBON DEPOSITS

(57) Abstract: The present invention relates to oil-gas industry, specifically - to additional development of depleted natural hydrocarbon deposits. Under the proposed method: the deposit is prepared for additional development; at least one injection well is created and/or used to pump at least one working agent into the deposit for the purpose of obtaining hydrogen, oxygen and methane homologs and further extracting the natural hydrocarbons remaining in the stratum; at least one working agent is injected until the predetermined formation pressure is achieved in the deposit; at least one production well is created and/or used; extraction of formation fluids is started after the specified formation pressure is reached in the deposit; water, hydrocarbons, hydrogen, oxygen and carbon dioxide are recovered from the extracted formation fluids; the extracted water and unreacted carbon dioxide are directed to at least one injection well for reinjection into the deposit. The proposed method is suitable for all types of depleted natural hydrocarbon deposits. It permits: firstly, not only burying carbon dioxide underground, but also utilizing it for production of hydrogen, oxygen and methane homologs in the stratum; secondly, further extracting the oil, gas and condensate remaining in the stratum; thirdly, not only incurring costs, but also generating revenue from the sale of the above-mentioned products.



WO 2012/118411 A3

INTERNATIONAL SEARCH REPORT

International application No

PCT/RU2012/000153

A. CLASSIFICATION OF SUBJECT MATTER INV. E21B41/00 E21B43/16 E21B43/18 E21B43/40 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) E21B		
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, 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	WO 2008/128331 A1 (UNIV TECHNOLOGIES INT [CA]; GATES IAN DONALD [CA]; ADAMS JENNIFER JANE) 30 October 2008 (2008-10-30) page 1, line 4 - line 6; figures 2,3 page 4, line 12 - line 23 page 8, line 19 - page 9, line 9 page 10, line 1 - page 14, line 9 page 20, line 9 - line 22 page 34, line 16 - page 35, line 27 page 36, line 16 - page 39, line 27 page 40, line 21 - page 42, line 19 page 42, line 30 - page 44, line 22 ----- -/-	1-12
☒ 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 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	Date of mailing of the international search report	
7 June 2013	19/06/2013	
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 Dantine, Patrick	

INTERNATIONAL SEARCH REPORT

International application No

PCT/RU2012/000153

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/012093 A1 (PROFERO ENERGY INC [CA]; GATES IAN DONALD [CA]; ADAMS JENNIFER JANE [C]) 4 February 2010 (2010-02-04) abstract; figures 1,2,9,13,14,15,16,19,20 -----	1-12
X	US 2003/022324 A1 (WILD WERNER [CH]) 30 January 2003 (2003-01-30) abstract; figure 1 -----	1,3-6,9
X	Hitoshi Koide ET AL: "Subsurface CO ₂ Disposal with Enhanced Gas Recovery and Biogeochemical Carbon Recycling", Environmental Geosciences, 1 September 2001 (2001-09-01), pages 218-224, XP055065811, Japan DOI: 10.1046/j.1526-0984.2001.0080 Retrieved from the Internet: URL: http://co2.eco.coocan.jp/ref/A1BiogeochemicalCarbonRecycling.pdf [retrieved on 2013-06-07] figures 1,5,7 -----	1,3-7,9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/RU2012/000153

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008128331	A1	30-10-2008	NONE

WO 2010012093	A1	04-02-2010	CA 2638451 A1 01-02-2010
		EP 2321495 A1 18-05-2011	
		US 2011250582 A1 13-10-2011	
		WO 2010012093 A1 04-02-2010	

US 2003022324	A1	30-01-2003	AT 320302 T 15-04-2006
		CA 2292073 A1 13-06-2001	
		DK 0963780 T3 10-07-2006	
		EP 0963780 A1 15-12-1999	
		ES 2257788 T3 01-08-2006	
		PT 963780 E 31-05-2006	
		US 2003022324 A1 30-01-2003	
