

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
15 January 2009 (15.01.2009)

PCT

(10) International Publication Number  
WO 2009/009382 A3

- (51) International Patent Classification:  
E21B 43/22 (2006.01)
- (21) International Application Number:  
PCT/US2008/069048
- (22) International Filing Date: 2 July 2008 (02.07.2008)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/949,402 12 July 2007 (12.07.2007) 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, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: PROCESS FOR ENHANCED OIL RECOVERY USING A MICROBIAL CONSORTIUM

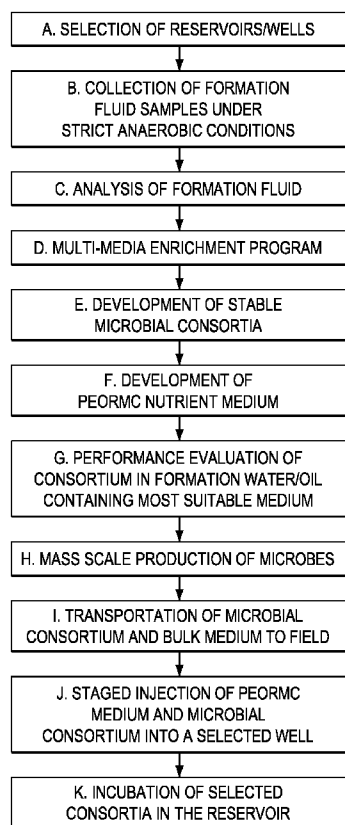


FIG. 1

(57) Abstract: A process and related apparatus for enhancing the oil recovery from an oil well are described. An embodiment of the process generally includes selection of a candidate reservoir; collecting oil formation water samples under anaerobic conditions; selecting media and enriching the microbes derived from the formation water; characterizing and identifying the selected consortium; mass scale production of the selected consortium; anaerobically preparing a defined composition nutrient medium, transportation of the nutrient medium by ISO tankers and the consortium by a specially designed field laboratory unit to the selected well treatment site; injecting the medium and consortium into the reservoir of the well; closing the well for the proliferation of microbes for one to three weeks; and allowing the microbes to dislodge oil in the reservoir and thereby enhance recovery of oil from the well.

WO 2009/009382 A3



FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,  
NO, PL, PT, RO, SE, SI, SK, 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*

**Published:**

— *with international search report*

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

7 May 2009

**A. CLASSIFICATION OF SUBJECT MATTER***E21B 43/22(2006.01)i*

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)

IPC E21B 33/138, E21B 43/16, E21B 43/22, E21B 43/27

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

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

eKIPASS (KIPO internal) &amp; keywords: microbial enhanced oil recovery, anaerobic bacteria, and similar terms

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 2005/005773 A2 (THE ENERGY RESERCH INSTITUTE et al.) 20 January 2005 cite in the application See the abstract; page 5 line 10 - page 6 line 6; page 7 line 8 - page 12 line 22; page 17 line 22 - page 18 line 16; page 22 line 5 - page 24 line 15; and examples	12-14,19 1-11,15-18,20-22
A	US 6758270 B1 (EGIL SUNDE et al.) 6 July 2004 cite in the application See the abstract; figures 1-4; and column 4 line 41 - column 5 line 35	1-22
A	US 5044435 A (GEORGE T. SPERL et al.) 3 September 1991 See the abstract; figure 1; column 3 lines 54-65; and claim 1	1-22
A	US 5297625 A (EUGENE T. PREMUZIC et al.) 29 March 1994 See the abstract; figures 1, 2; and claim 1	1-22
A	US 4558739 A (MICHAEL J. MCINERNEY et al.) 17 December 1985 See the abstract; figures 1, 2; column 3 line 57 - column 4 line 15; and examples	1-22

 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 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

06 MARCH 2009 (06.03.2009)

Date of mailing of the international search report

**10 MARCH 2009 (10.03.2009)**

Name and mailing address of the ISA/KR

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**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:

- I. Claims 1-11 directed to a process for enhancing recovery of oil from a subterranean reservoir.
- II. Claims 12-14 directed to a system for anaerobically treating an oil reservoir.
- III. Claims 15-21 directed to a system for producing an anaerobic nutrient medium and a method of producing a nutrient medium.
- IV. Claim 22 directed to an anaerobic sampling device.

The common technical feature among independent claims 1, 12, 15, 19, 20 and 22 is 'the use in a microbial enhanced oil recovery (MEOR) process under anaerobic conditions'. However, this feature is not considered the "special technical feature" because it lacks an inventive step with respect to document WO 2005/005773 A2 cited in the ISR. Hence, there is a lack of unity "a posteriori" (PCT Rules 13.1 and 13.2).

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 fee, this Authority did not invite payment of any additional fee.
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.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2008/069048**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2005-005773 A2	20.01.2005	CA 2531963 A1	20.01.2005
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US 4558739 A	17.12.1985	NONE	