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| | |
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| <i>C10G 47/22</i> (2006.01) | <i>E21B 43/30</i> (2006.01) |
| <i>C10G 49/00</i> (2006.01) | <i>E21B 43/34</i> (2006.01) |
| <i>E21B 43/24</i> (2006.01) | <i>E21B 47/00</i> (2006.01) |
| <i>E21B 43/243</i> (2006.01) | <i>E21B 47/06</i> (2012.01) |

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[Continued on next page]

(54) Title: IN SITU RECOVERY FROM A RELATIVELY PERMEABLE FORMATION CONTAINING HEAVY HYDROCARBONS

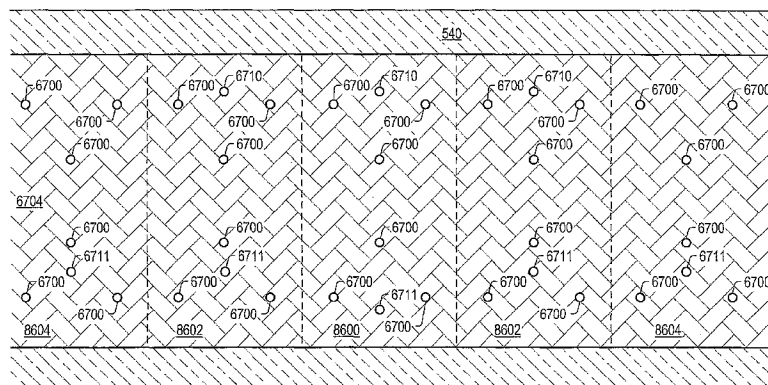


FIG. 137

(57) Abstract: A method for treating a relatively permeable formation containing heavy hydrocarbons in situ may include providing heat from a first set of heat sources (6700) to a first section (8600) of the formation. The heat provided to the first section (8600) may pyrolyze at least some hydrocarbons in the first section (8600). Heat may also be provided from a second set of heat sources (6700) to a second section (8602) of the formation. The heat provided to the second section (8602) may mobilize at least some hydrocarbons in the second section (8602). A portion of the hydrocarbons from the second section (8602) may be induced to flow into the first section (8600). A mixture of hydrocarbons may be produced from the formation. The produced mixture may include at least some pyrolyzed hydrocarbons.

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(81) **Designated States (national):** AE, AG (patent), AL, AM, AT, AU (patent), AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM (patent), DZ (patent), EC, EE, ES, FI, GB, GD (patent), GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC (patent), LK, LR, LS, LT, LU, LV (patent), MA, MD,

MG, MK, MN, MW, MX, MZ, NO, NZ, OM (patent), PH, PL, PT, RO, RU, SD, SE, SG, SI (patent), SK, SL, TJ, TM, TN, TR, TT, TZ (patent), UA, UG, UZ, VN, YU, ZA (patent), ZM, ZW.

(84) **Designated States (regional):** ARIPO (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/12941

| A. CLASSIFICATION OF SUBJECT MATTER | | | | |
|---|--|--|--|--|
| IPC(7) : C01B 3/24; C10G 47/22, 49/00; E21B 43/24, 43/243, 43/295, 43/30, 43/34, 47/00, 47/06 | | | | |
| US CL : 166/57, 59, 60, 245, 250.01, 257, 267, 302; 585/1,2 | | | | |
| 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) U.S.: 166/57, 59, 60, 245, 250.01, 256, 257, 266, 267, 272.1, 302; 585/1, 2 | | | | |
| 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) | | | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | | | |
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | | |
| X | US 2,685,930 A (ALBAUGH) 10 August 1954 (10.08.1954), col. 2, lines 7-35; col. 3, line 64 - col. 4, line 5; col. 5, lines 1-40. | 1,4,8-10,13,28,44-46 | | |
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| Y | | 5,6,37,38-42 | | |
| Y | US 1,269,747 A (ROGERS) 18 June 1918 (18.06.1918), page 1, line 84-95. | 5 | | |
| Y | US 5,404,952 A (VINEGAR ET AL) 11 April 1995 (11.04.1995), Abstract and col. 2, lines 38-50. | 6 | | |
| Y | US 2,914,309 A (SALOMONSSON) 24 November 1959 (24.11.1959), col. 3, lines 5-35. | 37, 38 | | |
| Y | US 3,380,913 A (HENDERSON) 30 April 1968 (30.04.1968), col. 2, lines 14-45. | 39-42 | | |
| X | US 3,132,692 A (MARX ET AL) 12 May 1964 (12.05.1964), col. 3, lines 35-73; col. 4, lines 14-25; col. 4, line 75 - col. 5, line 37. | 50, 51, 55, 58-71 | | |
| A | US 6,016,867 A (GREGOLI ET AL) 25 January 2000 (25.01.2000), see entire document. | 1-49 | | |
| A | US 6,016,868 A (GREGOLI ET AL) 25 January 2000 (25.01.2000), see entire document. | 1-49 | | |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex. | | | | |
| * Special categories of cited documents: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent 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 </td> <td style="width: 50%; border: none;"> "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 </td> </tr> </table> | | | "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent 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 |
| "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent 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 | | |
| 21 January 2003 (21.01.2003) | | 10 FEB 2003 | | |
| Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230 | | Authorized officer <i>George Suchfield</i> George Suchfield Telephone No. 703-3081113 | | |

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/12941

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

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

1. Claim Nos.: 76-7215
because they relate to subject matter not required to be searched by this Authority, namely:
as set forth in Form PCT/ISA/224, only claims 1-75 would be searched in the absence of a response by applicant.

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

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

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

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.
 No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

PCT/US02/12941

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | US 4,886,118 A (VAN MEURS ET AL) 12 December 1989 (12.12.1989), see entire document. | 1-75 |
| A | US 4,485,869 A (SRESTY ET AL) 04 December 1984, see entire document. | 1-49 |
| A | US 4,384,613 A (OWEN ET AL) 24 May 1983 (24.05.1983), see entire document. | 50-75 |
| A | US 3,349,845 A (HOLBERT ET AL) 31 October 1967 (31.10.1967), see entire document. | 1-75 |
| A | US 3,149,670 A (GRANT) 22 September 1964 (22.09.1964), see entire document. | 1-75 |