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- (30) **Priority Data:**
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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, BN, 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, PA, 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, 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).

[Continued on next page]

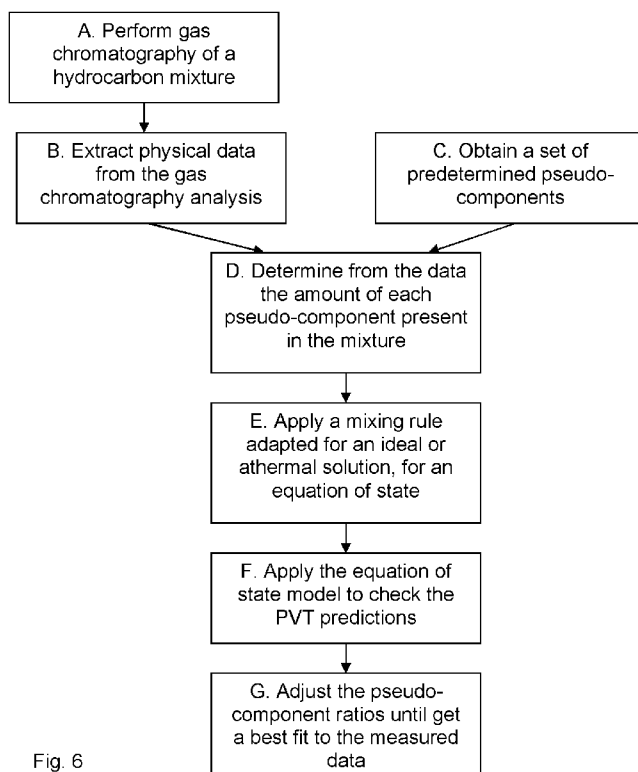
(54) **Title:** HYDROCARBON MIXTURE MODELLING

Fig. 6

(57) **Abstract:** A method of characterising a mixture comprising a plurality of hydrocarbons comprises: obtaining a set of predetermined pseudo-components, each pseudo-component representing a respective group of hydrocarbons; obtaining physical data about the hydrocarbon mixture; and determining from the data the amount of each pseudo-component considered to be present in the mixture.

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18 September 2014

- *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))*

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2013/050351

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06F19/00
ADD. G01N30/86

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)

G06F G01N

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	ECKERT E. ET AL: "New approach to the characterisation of petroleum mixtures used in the modelling of separation processes", COMPUTERS & CHEMICAL ENGINEERING, PERGAMON PRESS, OXFORD, GB, vol. 30, no. 2, 15 December 2005 (2005-12-15), pages 343-356, XP027759804, ISSN: 0098-1354 [retrieved on 2005-12-15] abstract page 343, right-hand column, line 17 - page 346, left-hand column, line 30 ----- -/--	1-12,14, 17-27, 32-36

☒ 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

7 March 2014

Date of mailing of the international search report

18/07/2014

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2013/050351

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.:

1-12, 14, 17-27, 32-36

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

International application No

PCT/GB2013/050351

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 2011/007268 A1 (SCHLUMBERGER CA LTD [CA]; SCHLUMBERGER SERVICES PETROL [FR]; SCHLUMBER) 20 January 2011 (2011-01-20) paragraphs [0001], [0002], [0007], [0012], [0017], [0019] paragraph [0062] - paragraph [0064] figures 2A-3D -----	1-12,14, 17-27, 32-36
X	ZUO J. Y. ET AL: "Plus Fraction Characterization and PVT Data Regression for Reservoir Fluids near Critical Conditions", CONFERENCE INFO: SPE ASIA PACIFIC OIL AND GAS CONFERENCE AND EXHIBITION, 16-18 OCTOBER, BRISBANE, AUSTRALIA, SOCIETY OF PETROLEUM ENGINEERS, AU, 16 October 2000 (2000-10-16), pages 1-12, XP008167885, DOI: 10.2118/64520-MS the whole document -----	1-12,14, 17-27, 32-36
X	DARIDON J. L. ET AL: "Petroleum characterization from ultrasonic measurement", JOURNAL OF PETROLEUM SCIENCE AND ENGINEERING, vol. 19, no. 3-4, 1 March 1998 (1998-03-01), pages 281-293, XP055105497, ISSN: 0920-4105, DOI: 10.1016/S0920-4105(97)00050-8 the whole document -----	1-12,14, 17-27, 32-36
X	COTTERMAN R. L. ET AL: "Flash calculations for continuous or semicontinuous mixtures by use of an equation of state", INDUSTRIAL & ENGINEERING CHEMISTRY PROCESS DESIGN AND DEVELOPMENT, vol. 24, no. 2, 1 April 1985 (1985-04-01), pages 434-443, XP055105011, ISSN: 0196-4305, DOI: 10.1021/i200029a038 the whole document -----	1-12,14, 17-27, 32-36
X	VOGEL J. L. ET AL: "Applications of equations of state to calculate reservoir fluid properties", FLUID PHASE EQUILIBRIA, vol. 14, 1 January 1983 (1983-01-01), pages 103-116, XP055105700, ISSN: 0378-3812, DOI: 10.1016/0378-3812(83)80118-6 the whole document ----- -/--	1-12,14, 17-27, 32-36

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2013/050351

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 2007/114377 A1 (QIAN KUANGNAN [US] ET AL) 24 May 2007 (2007-05-24) the whole document -----	1-12,14, 17-27, 32-36
A	US 2007/050154 A1 (ALBAHRI TAREQ A [KW]) 1 March 2007 (2007-03-01) abstract figures 1-6 paragraph [0020] - paragraph [0024] -----	1-12,14, 17-27, 32-36

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2013/050351

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011007268 A1	20-01-2011	AU 2010272254 A1 EP 2454449 A1 WO 2011007268 A1	02-02-2012 23-05-2012 20-01-2011
US 2007114377 A1	24-05-2007	AU 2006318648 A1 CA 2630146 A1 EP 1965892 A2 JP 5190371 B2 JP 2009525461 A MY 145833 A US 2007114377 A1 WO 2007061935 A2	31-05-2007 31-05-2007 10-09-2008 24-04-2013 09-07-2009 30-04-2012 24-05-2007 31-05-2007
US 2007050154 A1	01-03-2007	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12, 14, 17-27, 32-36

A method of characterising a mixture of hydrocarbons.

2. claims: 13, 14, 17, 19, 20

Simulating blending a plurality of hydrocarbon mixtures together.

3. claims: 15, 17, 19, 20

A method of modelling contamination from drilling mud in a petroleum sample.

4. claims: 15, 17, 19, 20

A method of modelling solubility.

5. claims: 15, 17, 19, 20

A method of modelling asphaltenes.

6. claims: 15, 17, 19, 20

A method of modelling naphthenic acids.

7. claims: 15, 17, 19, 20, 28-30, 32, 33, 35, 36

A method of modelling wax precipitation in a fluid/mixture.

8. claims: 15, 17, 19, 20, 31-33, 35, 36

A method of modelling polymers.

9. claims: 16, 17, 19, 20

A method of determining allocation agreements for a group of oil wells.
