



(51) International Patent Classification:

C10G 19/02 (2006.01) B01J 37/00 (2006.01)
C10G 25/00 (2006.01) B01J 23/00 (2006.01)
C10G 29/16 (2006.01) B01J 27/236 (2006.01)
B01J 23/06 (2006.01)

(21) International Application Number:

PCT/US2012/048577

(22) International Filing Date:

27 July 2012 (27.07.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/513,042 29 July 2011 (29.07.2011) US

(71) Applicant (for all designated States except US): SAUDI ARABIAN OIL COMPANY [SA/SA]; Box 5000, Dhahran, 31311 (SA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): AL-HAJJI, Adnan [SA/SA]; P.o. Box 05091, Saudi Aramco, Dhahran, 31311 (SA). KOSEOGLU, Omer, Refa [US/SA]; P.O. Box 8560, Saudi Aramco, Dhahran, 31311 (SA). MULLER, Hendrick [DE/SA]; P.O. Box 832, Saudi Aramco,

Dhahran, 31311 (SA). AL JAWAD, Hanadi [SA/SA]; P.O. Box 1513, Saudi Aramco, Dhahran, 31311 (SA).

(74) Agent: CRISPINO, Ralph, J.; Abelman, Frayne & Schwab, 666 Third Avenue, New York, NY 10017-5621 (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, 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, 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,

[Continued on next page]

(54) Title: PROCESS FOR REDUCING THE TOTAL ACID NUMBER IN REFINERY FEEDSTOCKS

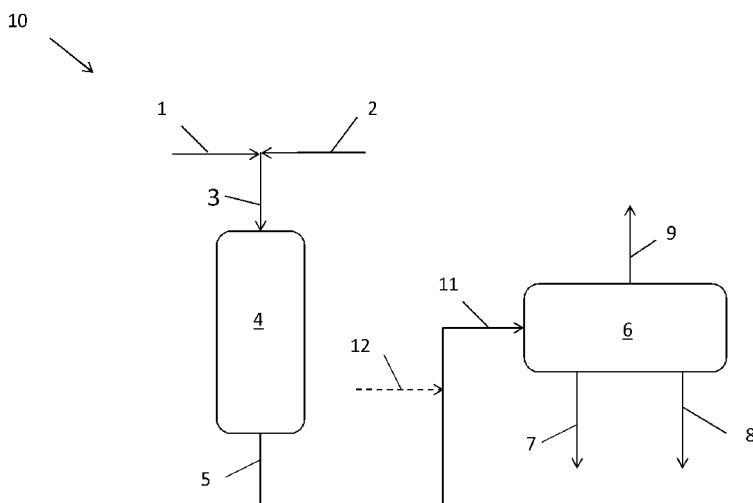


FIG. 1

(57) Abstract: A process is described for reducing the total acid number of a refinery feedstock. In one embodiment, refinery feedstock containing naphthenic acids is contacted with an effective amount of solid catalyst in the presence of an aqueous caustic base, wherein the caustic base is sodium hydroxide or potassium hydroxide, for a period of time sufficient to neutralize at least a portion of the naphthenic acids in the feedstock. Thereafter, the aqueous phase is separated from the neutralized refinery feedstock. In another embodiment catalyst is pretreated with a caustic base solution and contacted with refinery feedstock to reducing the total acid number.

WO 2013/019631 A3



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 (Rule 48.2(h))*

Published:

— *with international search report (Art. 21(3))*

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

11 April 2013

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/048577

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C10G19/02 C10G25/00 C10G29/16 B01J23/06 B01J37/00
 B01J23/00 B01J27/236
 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)
 C10G B01J

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	US 4 199 440 A (VERACHTERT THOMAS A [US]) 22 April 1980 (1980-04-22) column 4, line 56 - column 5, line 16 examples I-IV	1-17
X	EP 0 203 574 A2 (MERICHEM CO [US]) 3 December 1986 (1986-12-03) column 4, line 10 - column 7, line 23 column 9, line 1 - line 10	1-17
A	US 2006/043003 A1 (MOREIRA ELIZABETH M [BR] ET AL) 2 March 2006 (2006-03-02) paragraphs [0030], [0038] page -2 claims 1-13	1-17
	----- -/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
---	---

Date of the actual completion of the international search 17 January 2013	Date of mailing of the international search report 28/01/2013
--	--

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 Bernet, Olivier
--	---

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/048577

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.:

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/US2012/048577

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 2004/026299 A1 (CHAMBERLAIN PRAVIA OSCAR RENE [BR] ET AL) 12 February 2004 (2004-02-12) paragraphs [0029], [0032], [0042], [0047] example 2 claims 14-18	18-31
X	----- EP 0 831 096 A2 (AIR PROD & CHEM [US]) 25 March 1998 (1998-03-25) page 3, line 4 - line 56 example 2 -----	32,33

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/048577

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
US 4199440	A	22-04-1980	NONE	

EP 0203574	A2	03-12-1986	DE 203574 T1	11-06-1987
			DE 3674246 D1	25-10-1990
			EP 0203574 A2	03-12-1986
			JP 6092584 B	16-11-1994
			JP 62000586 A	06-01-1987
			MX 168629 B	02-06-1993
			US 4675100 A	23-06-1987

US 2006043003	A1	02-03-2006	NONE	

US 2004026299	A1	12-02-2004	AU 2003244845 A1	23-01-2004
			BR 0202552 A	25-05-2004
			US 2004026299 A1	12-02-2004
			US 2006283781 A1	21-12-2006
			WO 2004005434 A1	15-01-2004

EP 0831096	A2	25-03-1998	BR 9704762 A	17-11-1998
			CN 1179423 A	22-04-1998
			DE 69713697 D1	08-08-2002
			DE 69713697 T2	31-10-2002
			EP 0831096 A2	25-03-1998
			JP 3049602 B2	05-06-2000
			JP 10109964 A	28-04-1998
			US 5731449 A	24-03-1998

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-17

A process for reducing the total acid number of a refinery feedstock containing naphthenic acids, the process comprising:

contacting the refinery feedstock containing naphthenic acids with an effective amount of solid catalyst in the presence of an aqueous caustic base for a period of time sufficient to neutralize at least a portion of the naphthenic acids in the refinery feedstock to produce a treated mixture; and
phase separating the treated mixture into an aqueous phase and a neutralized refinery feedstock.

2. claims: 18-33

A process and a catalyst for reducing the total acid number of a refinery feedstock containing naphthenic acids, the process comprising contacting the refinery feedstock containing naphthenic acids with an effective amount of solid catalyst that has been pretreated with a caustic base for a period of time sufficient to neutralize at least a portion of the naphthenic acids in the refinery feedstock to produce a treated product having reduced total acid number.
