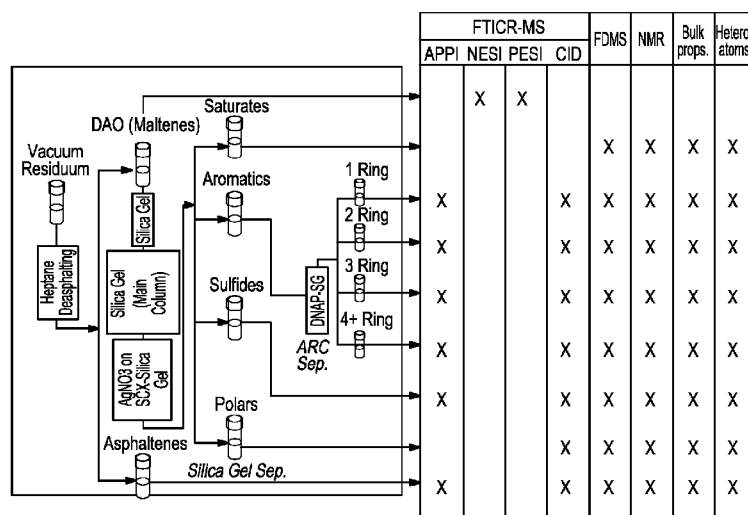




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- Published:
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[Continued on next page]

(54) Title: GENERATION OF MODEL-OF-COMPOSITION OF PETROLEUM BY HIGH RESOLUTION MASS SPECTROMETRY AND ASSOCIATED ANALYTICS

**FIG. 9**

(57) Abstract: A method to determine the model-of-composition of a vacuum resid wherein the resid is separated into eight fractions, saturates, aromatics, sulfides and polars by a combination of soft ionization methods.



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- *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:**
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International application No

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A. CLASSIFICATION OF SUBJECT MATTER
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B. FIELDS SEARCHED

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B01D

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KEIKO MIYABAYASHI ET AL.: "CONSTITUENT ANALYSIS OF DAO BEFORE AND AFTER HYDROCRACKING OVER ZEOLITE CATALYST BY ULTRA-HIGH RESOLUTION FOURIER TRANSFORM ION CYCLOTRON RESONANCE MASS SPECTROMETRY", PROCEEDINGS OF 15TH SAUDI-JAPAN JOINT SYMPOSIUM 28 November 2005 (2005-11-28), pages 1/10-10/10, XP002673940, Retrieved from the Internet: URL: http://www3.kfupm.edu.sa/catsymp/Symp15th/05%20Miyake.pdf [retrieved on 2012-04-16]	1-17
Y	page 2/10, lines 17-39; point 3. results and discussion; figures 5,6; page 1/10, Abstracts, lines 5-7; page 2/10, lines 1-4; page 3/10, point 2. Experiments, -/-	1-17



Further documents are listed in the continuation of Box C.



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"&" document member of the same patent family

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	lines 9-10. -----	
X	BHAJENDRA N BARMAN ET AL.: "PETROLEUM AND COAL", ANAL. CHEM., vol. 73, 31 December 2001 (2001-12-31), pages 2791-2804, XP002673941,	1-17
Y	page 2795, right column, lines 23-34; page 2796, right column, lines 1-53. -----	1-17
X	A.A. AL-HAJJI ET AL.: "CHARACTERIZATION OF NITROGEN AND SULFUR COMPOUNDS IN HYDROCRACKING FEEDSTOCKS BY FOURIER TRANSFORM ION CYCLOTRON MASS SPECTROMETRY", OIL AND GAS SCIENCE AND TECHNOLOGY-REV. IFP , 31 December 2008 (2008-12-31), pages 115-128, XP002673942, Retrieved from the Internet: URL: http://ogst.ifpenergiesnouvelles.fr/index.php?option=com_article&access=standard&Itemid=129&url=/articles/ogst/pdf/2008/01/ogst07064.pdf [retrieved on 2012-04-16]	1-17
Y	point 1.2 Mass Spectrometry an Ionization modes, line 8-18; points 2.5, 2.6, 2.7, 2.8, 2.9, 2.10 -----	1-17
Y	US 2010/230587 A1 (MARSHALL ALAN G [US] ET AL) 16 September 2010 (2010-09-16) the whole document -----	1-17
Y	US 7 509 837 B2 (LUBKOWITZ JOAQUIN A [US] ET AL) 31 March 2009 (2009-03-31) the whole document -----	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/065313

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010230587 A1	16-09-2010	US 2010230587 A1	16-09-2010
		US 2012132796 A1	31-05-2012

US 7509837 B2	31-03-2009	EP 1946087 A2	23-07-2008
		US 2007181798 A1	09-08-2007
		WO 2007047770 A2	26-04-2007
