

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
27 November 2003 (27.11.2003)

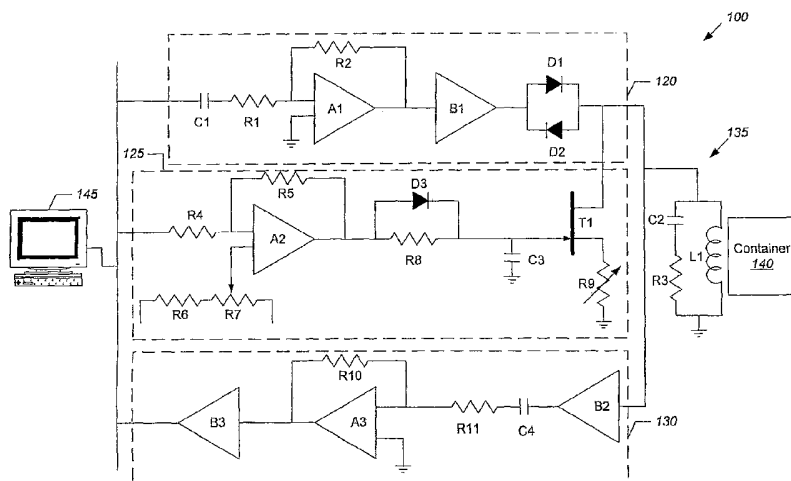
PCT

(10) International Publication Number
WO 2003/098248 A3

- (51) International Patent Classification⁷: **G01R 33/36**, 33/28
- (74) Agents: **CHISHOLM, Robert** et al.; Amersham Health, 101 Carnegie Center, Princeton, NJ 08540 (US).
- (21) International Application Number: PCT/US2003/015491
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 15 May 2003 (15.05.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 60/381,610 17 May 2002 (17.05.2002) US
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
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- Published:
— with international search report
- (88) Date of publication of the international search report:
9 June 2005

[Continued on next page]

(54) Title: METHODS, SYSTEMS, CIRCUITS, AND COMPUTER PROGRAM PRODUCTS FOR DETERMINING POLARIZATION OF A GAS



(57) Abstract: A system for determining polarization of a gas comprises a container (140) that contains the polarized gas. An oscillator circuit comprises an NMR coil (21) that is positioned adjacent to the container. A pulse generator circuit (120) is configured to generate an electrical pulse that may be transmitted to the optical cell through the NMR coil to excite the polarized gas responsive to a control processor. A Q-reduction circuit (125) that is independent of the pulse generator circuit is configured to reduce oscillations in the oscillator circuit from the transmitted electrical pulse responsive to the control processor. A receive circuit (130) is responsive to an electrical signal that is induced in the oscillator circuit due to the electromagnetic excitation of the polarized gas. The control processor is configured to determine the polarization of the gas based on the output signal of the receive circuit. A polarimetry circuit for determining polarization of a gas includes an NMR coil that may be configured to excite a polarized gas and be responsive to an electromagnetic signal generated by the excited, polarized gas.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/15491

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01R33/36 G01R33/28

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 7 G01R

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 practical, search terms used)

EPO-Internal, INSPEC, COMPENDEX, EMBASE, MEDLINE, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/025493 A1 (WHEELER BRADLEY A ET AL) 4 October 2001 (2001-10-04)	1,3-7, 49, 51-53, 55,56
Y	paragraph '0127!; figure 9	8,10-12, 16, 18-27, 29-33, 37-39, 41-48, 57,58

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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 document 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.

Z document member of the same patent family

Date of the actual completion of the international search

21 October 2003

Date of mailing of the international search report

04/11/2003

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/15491

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 291 994 B1 (KIM YONG-WAH ET AL) 18 September 2001 (2001-09-18) column 3, line 17 - line 46 column 4, line 2 - line 39 column 13, line 21 -column 17, line 53; claims 1-6,24-28 ----	8,10-12, 16, 18-27, 29-33, 37-39, 41-48, 57,58
A	EP 0 459 064 A (SCHLUMBERGER HOLDINGS ;SCHLUMBERGER PROSPECTION (FR); SCHLUMBERGER) 4 December 1991 (1991-12-04) page 15, line 15 -page 16, line 32 ----	12-27, 30-48, 57,58
A	US 6 002 256 A (SLADE ROBERT ANDREW) 14 December 1999 (1999-12-14) column 2, line 35 - line 46 column 5, line 61 -column 6, line 46 ----	12-27, 30-48, 57,58
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 273 (C-0953), 18 June 1992 (1992-06-18) & JP 04 067844 A (TOSHIBA CORP), 3 March 1992 (1992-03-03) abstract -----	12,57,58

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claim numbers 6 and 7 are duplicated, although they should have been numbered consecutively in accordance with Rule 6.1 (b) PCT. Consequently, a number one greater than the highest claim number of the application is assigned to the later claims with the same number, i.e. the "second" claim 6 is referred to as "claim 57" and the "second" claim 7 is referred to as "claim 58" in the search report.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/15491

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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:
see FURTHER INFORMATION sheet PCT/ISA/210
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 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

Information on patent family members

International Application No

PCT/US 03/15491

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