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[Continued on next page]

(54) Title: PROCESSING SYSTEM AND METHOD FOR HAND-HELD IMPEDANCE SPECTROSCOPY ANALYSIS DEVICE FOR DETERMINING BIOFUEL PROPERTIES

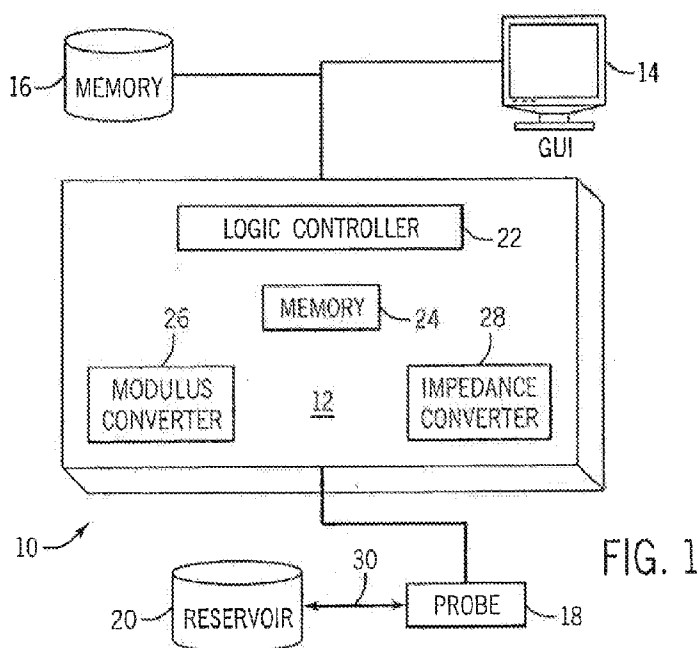


FIG. 1

(57) Abstract: Disclosed herein is a hand-held impedance spectroscopy analysis device for analyzing fluids wherein the impedance spectroscopy device is in communication with a sample cell including a reservoir containing a fluid sample, the sample cell including a sample cell circuit and two metal plates in contact with the fluid sample and in contact with a pair of electrodes. The analysis device includes a processing system including a main processor which is responsive to commands from a user input device, and a data acquisition circuit which receives power and command signals from the processing system. The data acquisition circuit is operable to transmit excitation signals to the electrodes, wherein the excitation signals are applied at each frequency in a predetermined set of frequencies, and the data acquisition circuit is further operable to receive response signals from the electrodes indicative of the fluid sample at each frequency in the

predetermined set of frequencies and to convert the response signals into a magnitude and phase angle data set. The main processor is operable to receive the magnitude and phase angle data set from the data acquisition circuit and to receive at least one of calibration information and temperature information from the sample cell circuit and perform an impedance spectroscopy algorithm using the magnitude and phase angle data set and the information from the sample cell circuit to determine a fluid property.



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30 July 2009

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/082065**A. CLASSIFICATION OF SUBJECT MATTER****G01N 27/02(2006.01)i, G01R 27/02(2006.01)i**

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 G01N 27/02, G01R 27/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models since 1975
Japanese utility models and applications for utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS(KIPO internal) & keywords: impedance, fluid

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,028,433 A (MARGARET A. CHEIKY-ZELINA; WAYNE A. BUSH) 22 FEBRUARY 2000 See abstract, Figs. 1-3, 9, 11, column 4, line 62 - column 14, line 63.	1-11
Y	US 2005/0110503 A1 (CHARLES J. KOEHLER et al.) 26 MAY 2005 See Fig. 1, [0025]-[0032].	1-11
A	US 2005/0104607 A1 (CARL S. BYINGTON et al.) 19 MAY 2005 See abstract, Figs. 3, 4, [0019]-[0043].	1-11
A	JP 2005-62537 A (SONY CORPORATION) 10 MARCH 2005 See abstract, [0022]-[0051].	1-11

☐ 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

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"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

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/082065**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.: 12, 13
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:

Claim 1 defines a hand-held impedance spectroscopy analysis device, but claims 12 and 13 dependent on claim 1 define a processing system, instead of a hand-held impedance spectroscopy analysis device. Therefore, claims 12 and 13 define unclearly the matter for which protection is sought.
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:

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 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

Information on patent family members

International application No.

PCT/US2008/082065

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