

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
19 May 2005 (19.05.2005)

PCT

(10) International Publication Number  
**WO 2005/045635 A3**

- (51) **International Patent Classification:**  
**G01F 23/00** (2006.01) **G08B 21/00** (2006.01)
- (21) **International Application Number:**  
PCT/US2004/035979
- (22) **International Filing Date:** 29 October 2004 (29.10.2004)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
60/481,581 30 October 2003 (30.10.2003) US  
10/975,658 28 October 2004 (28.10.2004) US
- (71) **Applicant** (for all designated States except US):  
**PERKINELMER LAS, INC.** [US/US]; 549 Albany Street, Boston, MA 02118 (US).

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

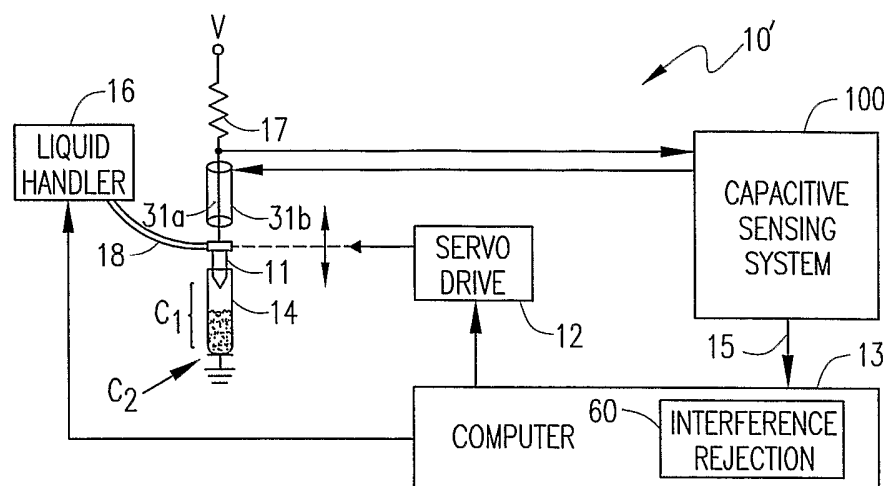
- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) **Date of publication of the international search report:**  
9 November 2006

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.

- (72) **Inventors; and**
- (75) **Inventors/Applicants** (for US only): **HARAZIN, Richard, R.** [US/US]; 500 Rosebud Drive North, Lombard, IL 60148 (US). **ZWEIFEL, Ronald, A.** [US/US]; 1222 Oakton Lane, Naperville, IL 60540 (US).
- (74) **Agent:** **SZUWALSKI, Andre, M.**; 1445 Ross Avenue, Suite 3200, Dallas, TX 75202 (US).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

(54) **Title:** METHOD AND APPARATUS TO REJECT ELECTRICAL INTERFERENCE IN A CAPACITIVE LIQUID LEVEL SENSOR SYSTEM



(57) **Abstract:** Methods, systems, and computer program products for measuring a capacitance ( $C_1$ ) between a probe (11) and a liquid, pausing movement of the probe (11) based on a rate of change of the capacitance ( $C_1$ ), further measuring the capacitance ( $C_1$ ) while the probe (11) is paused, and, based on the further measurements, performing one or more of: resuming movement of the probe (11), determining a position of the probe (11), aspirating liquid into the probe (11), and dispensing from the probe (11). Resuming movement of the probe (11) can include returning iteratively to measuring a capacitance ( $C_1$ ), and the further measuring can be performed for a time interval that can vary based on the further measured capacitance(s) ( $C_1$ ), a probe (11) movement characteristic, and/or a sampling rate.



WO 2005/045635 A3

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/35979

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: G01F 23/00( 2006.01);G08B 21/00( 2006.01)

USPC: 33/33

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)

U.S. :

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)

http://www.google.com

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US Patent 5,365,783 (Zweifel) 22 November 1994 (22.11.1994); column 4, lines 1-36, 54-57; column 5, lines 3-22, 39-55; column 6, lines 54-67; column 7, lines 14-36.	1, 2, 5, 6 and 8-10 ----- 3, 4, 7, 11-15, 17-19, 21, 23, 24-26 and 28-
Y	US Patent 4,326,851 (Bello et al.) 27 April 1982 (27.04.1982); column 4, lines 32-64; column 6, lines 39-56; column 7, lines 1-13.	1, 3, 4, 13, 15, 17, 19
Y	US Patent 5,855,851 (Matsubara et al.) 5 January 1999 (5.01.1999); column 7, lines 18-20, 30-61	1, 3, 4, 13, 15, 17, 19
Y	US Patent 4,977,786 (Davis) 18 December 1990 (18.12.1990); column 6, lines 3-68.	7, 11-13, 17, 21, 23, 24, 29
A	US Patent 6,328,934 B1 (Ljung et al.) 11 December 2001 (11.12.2001).	
A	US Patent 5,027,075 (Harding, Jr.) 25 June 1991 (25.06.1991).	



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	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

07 August 2006 (07.08.2006)

Date of mailing of the international search report

13 SEP 2006

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (571) 273-3201

Authorized officer

Hezron Williams

Telephone No. (571) 272-2800