



(43) International Publication Date
23 January 2014 (23.01.2014)

- (51) International Patent Classification:
A61N 5/00 (2006.01)
- (21) International Application Number:
PCT/US2013/051062
- (22) International Filing Date:
18 July 2013 (18.07.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/672,837 18 July 2012 (18.07.2012) US
61/772,617 5 March 2013 (05.03.2013) US
- (71) Applicant (for all designated States except US): **THE TRUSTEES OF PRINCETON UNIVERSITY** [US/US];
87 Prospect Avenue, Princeton, NJ 08544 (US).
- (72) Inventors; and
- (71) Applicants (for US only): **YANG, Haw** [US/US]; 1 Glacier Drive, Princeton Junction, NJ 08550 (US). **WELSH-ER, Kevin** [US/US]; 3611 Quail Ridge Drive, Plainsboro, NJ 08543 (US).
- (74) Agent: **GOLDBERG, Daniel**; Meagher Emanuel Laks Goldberg & Bovino, LLP, One Palmer Square, Suite 325, Princeton, NJ 08542 (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, 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, PA, 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, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- 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:
13 March 2014

(54) Title: MULTISCALE SPECTRAL NANOSCOPY

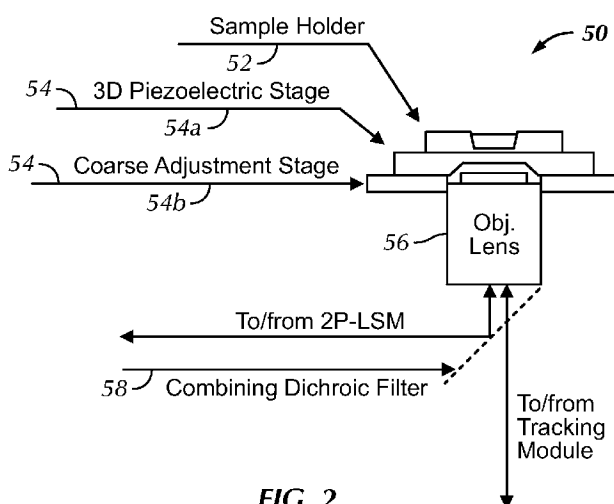


FIG. 2

(57) Abstract: A system and method for non-invasively tracking a particle in a sample is disclosed. The system includes a 2-photon or confocal laser scanning microscope (LSM) and a particle-holding device coupled to a stage with X-Y and Z position control. The system also includes a tracking module having a tracking excitation laser, X-Y and Z radiation-gathering components configured to detect deviations of the particle in an X-Y and Z directions. The system also includes a processor coupled to the X-Y and Z radiation gathering components, generate control signals configured to drive the stage X-Y and Z position controls to track the movement of the particle. The system may also include a synchronization module configured to generate LSM pixels stamped with stage position and a processing module configured to generate a 3D image showing the 3D trajectory of a particle using the LSM pixels stamped with stage position.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/051062

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61N 5/00 (2013.01)

USPC - 250/492.1

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(8) - A61N 5/00; G21G 5/00; G01K 1/08 (2013.01)

USPC - 250/491.1, 492.1, 397, 398; 356/496; 850/5, 29, 30

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - H01J 37/3174, 37/3045, 37/244 (2013.01)

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

Orbit, Google Patents, ProQuest

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0057121 A1 (YANG et al) 10 March 2011 (10.03.2011) entire document	11
-----		-----
Y		1-10, 12-20
Y	US 2011/0279893 A1 (VIZI et al) 17 November 2011 (17.11.2011) entire document	1-10, 18-20
Y	WO 2012/002893 A1 (BULA et al) 05 January 2012 (05.01.2012) entire document	2-7, 12-17
Y	US 2008/0075227 A1 (CHRISTOPH et al) 27 March 2008 (27.03.2008) entire document	4-7, 14-17
Y	US 2011/0004447 A1 (HURLEY et al) 06 January 2011 (06.01.2011) entire document	6, 16
Y	US 2009/0263002 A1 (CREMER et al) 22 October 2009 (22.10.2009) entire document	8-10, 18-20
Y	US 5,699,193 A (MONNO et al) 16 December 1997 (16.12.1997) entire document	10, 20
A	US 2012/0135874 A1 (WANG et al) 31 May 2012 (31.05.2012) entire document	1-20
A	US 2009/0262183 A1 (HAYASHI et al) 22 October 2009 (22.10.2009) entire document	1-20
A	US 2012/0038307 A1 (AHN et al) 16 February 2012 (16.02.2012) entire document	1-20

 Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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.
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

18 December 2013

Date of mailing of the international search report

10 JAN 2014

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:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774