

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
2 December 2004 (02.12.2004)

PCT

(10) International Publication Number
WO 2004/104551 A2

- (51) International Patent Classification⁷: **G01N**
- (21) International Application Number:
PCT/US2004/015327
- (22) International Filing Date: 14 May 2004 (14.05.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/471,149 16 May 2003 (16.05.2003) US
60/498,868 29 August 2003 (29.08.2003) US
- (71) Applicant (for all designated States except US): **UNIVERSITY OF CHICAGO** [US/US]; 5555 South Woodlawn Ave., Suite 300, Chicago, Illinois 60637 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **GRIER, David G.** [US/US]; 120 W. 15th Street, Apt. 2G, New York, New York 10011 (US).
- (74) Agents: **MARTIN, Matthew E.** et al.; Foley & Lardner LLP, Suite 2800, 321 North Clark Street, Chicago, Illinois 60610 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, 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.

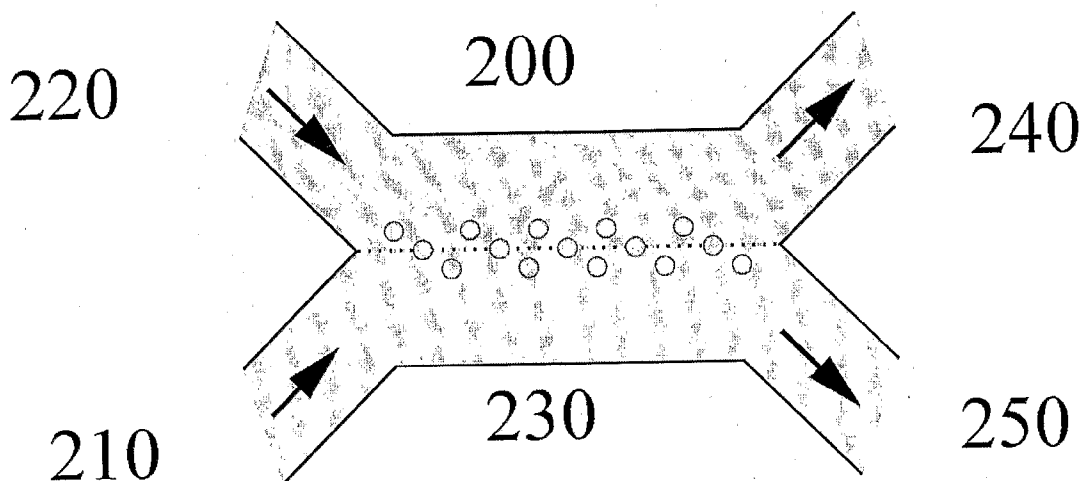
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, 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:

— without international search report and to be republished upon receipt of that report

[Continued on next page]

(54) Title: OPTICAL FRACTIONATION METHODS AND APPARATUS



(57) **Abstract:** Static arrays of optical traps can be used to sort microscopic objects with exponential sensitivity to size. Such optical fractionation relies on competition between an externally applied force and the moving objects' differing affinities for optical gradient traps. In a reverse fractionation method, objects that are more strongly influenced by the traps tend to become kinetically locked in to the array and are systematically deflected back into an input flow. In a thermal ratcheting method, patterns are spaced to allow particle diffusion, thus providing the opportunity for forward or reverse movement through the patterns. Unlike other sorting techniques, optical fractionation can operate continuously and can be continuously optimized. The exponential sensitivity arises quite generally from the particle size dependence of the potential wells' apparent widths.

WO 2004/104551 A2



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.