



(43) International Publication Date
12 April 2012 (12.04.2012)

(10) International Publication Number
WO 2012/047889 A3

- (51) **International Patent Classification:**
G01N 33/551 (2006.01) *C12Q 1/68* (2006.01)
- (21) **International Application Number:**
PCT/US2011/054769
- (22) **International Filing Date:**
4 October 2011 (04.10.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
- | | | |
|------------|-------------------------------|----|
| 61/389,484 | 4 October 2010 (04.10.2010) | US |
| 61/389,490 | 4 October 2010 (04.10.2010) | US |
| 61/443,167 | 15 February 2011 (15.02.2011) | US |
| 61/491,081 | 27 May 2011 (27.05.2011) | US |
- (71) **Applicant** (*for all designated States except US*):
GENAPSYS INC. [US/US]; 1455 Adams Drive, Suite 2104, Menlo Park, California 94025 (US).
- (72) **Inventor; and**
- (75) **Inventor/Applicant** (*for US only*): **ESFANDYARPOUR, Hesaam** [IR/US]; 465 Gabilan Street, No. 9, Los Altos, California 94022 (US).
- (74) **Agents:** **WU, Nan** et al.; 777 6th Street N.W., Suite 1100, Washington, District of Columbia 20001 (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, 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, KM, 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, 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, MD, 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, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

- *with international search report (Art. 21(3))*

- (88) **Date of publication of the international search report:**
12 July 2012

(54) **Title:** SYSTEMS AND METHODS FOR AUTOMATED REUSABLE PARALLEL BIOLOGICAL REACTIONS

(57) **Abstract:** A method comprises magnetically holding a bead carrying biological material (e.g., nucleic acid, which may be in the form of DNA fragments or amplified DNA) in a specific location of a substrate, and applying an electric field local to the bead to isolate the biological material or products or byproducts of reactions of the biological material. For example, the bead is isolated from other beads having associated biological material. The electric field in various embodiments concentrates reagents for an amplification or sequencing reaction, and/or concentrates and isolates detectable reaction by-products. For example, by isolating nucleic acids around individual beads, the electric field can allow for clonal amplification, as an alternative to emulsion PCR. In other embodiments, the electric field isolates a nanosensor proximate to the bead, to facilitate detection of at least one of local pH change, local conductivity change, local charge concentration change and local heat. The beads may be trapped in the form of an array of localized magnetic field regions.



WO 2012/047889 A3