

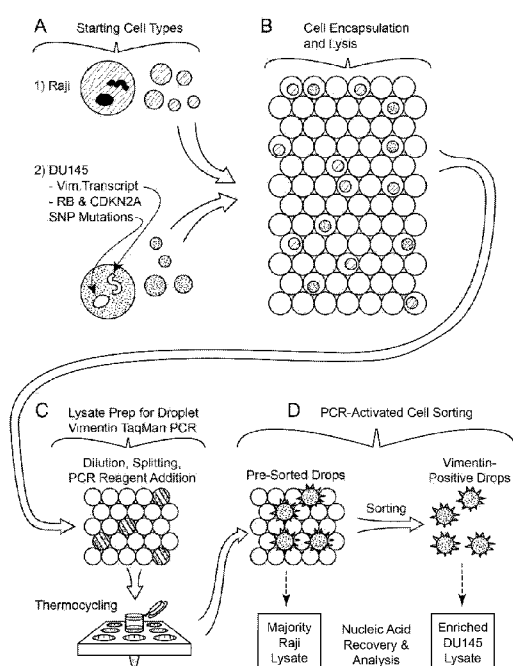


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- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, 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, SA, 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.
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[Continued on next page]

(54) **Title:** PCR-ACTIVATED SORTING (PAS)

FIG. 56



(57) **Abstract:** The methods described herein, referred to as PCR-Activated Sorting (PAS), allow nucleic acids contained in biological systems to be sorted based on their sequence as detected with nucleic acid amplification techniques, e.g., PCR. The nucleic acids can be free floating or contained within living or nonliving structures, including particles, viruses, and cells. The nucleic acids can include, e.g., DNA or RNA. Systems and devices for use in practicing methods of the invention are also provided.



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))*

— *with sequence listing part of description (Rule 5.2(a))*

(88) Date of publication of the international search report:

7 April 2016

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/037822

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B05B 1/02 (2016.01)

CPC - B05B 1/26 (2015.12)

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) - B05B 1/02, 1/08; C12Q 1/68; G01N 1/10 (2016.01)

CPC - B05B 1/26, 7/0012; B01L 7/525, 2200/025 (2015.12)

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

239/10, 61; 435/6.12; 436/180

CPC - B05B 1/26, 7/0012; B01L 7/525, 2200/025 (2015.12) (keyword delimited)

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

PatBase, Google Patents, Google, PubMed

Search terms used: PCR, microfluid, droplet, primer, FACS, sort, emulsion, triple emulsion.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/028378 A2 (THE REGENTS OF THE UNIVERSITY OF CALIFORNIA et al) 20 February 2014 (20.02.2014) entire document	1-4, 16-20
A	US 2011/0217736 A1 (HINDSON) 08 September 2011 (08.09.2011) entire document	1-4, 16-20
A	US 2014/0154695 A1 (RAINDANCE TECHNOLOGIES et al) 05 June 2014 (05.06.2014) entire document	1-4, 16-20
A	SCIAMBI et al. "Adding reagent to droplets with controlled rupture of encapsulated double emulsions," Biomicrofluidics, 05 August 2013 (05.08.2013), Vol. 7, Pgs. 1-6. entire document	1-4, 16-20
A	US 2013/0189700 A1 (SO et al) 25 July 2013 (25.07.2013) entire document	1-4, 16-20

☐ 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

"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)

"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

11 January 2016

Date of mailing of the international search report

02 FEB 2016

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/037822

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.:
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:
3. ☒ Claims Nos.: 5-15, 21-36
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 additional fees, this Authority did not invite payment of additional fees.
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.