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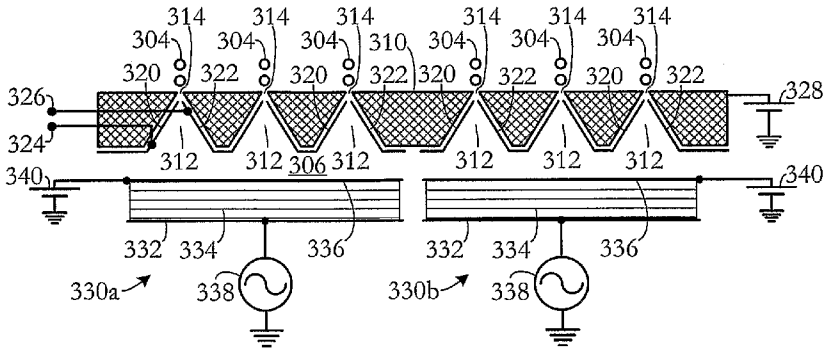
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Published:
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(88) Date of publication of the international search report:
27 March 2008

(54) Title: ELECTROSONIC CELL MANIPULATION DEVICE AND METHOD OF USE THEREOF



(57) Abstract: In a method of injecting a substance into a living cell, the substance, the cell and a liquid are placed into a tapering passage (312). Energy is applied, thereby inducing poration. To sort cells, a cellular suspension is placed in a tapering passage (312), including a narrow end that defines an opening (314) that has a dimension corresponding to a cell size. An acoustic wave is applied by a transducer (330), thereby forcing cells having a cell size smaller than the selected cell size through the opening (312). To extract material from a cell, an electric field, formed between a first electrode (320) and a second electrode (322), and an acoustic wave are applied, thereby causing the cell membrane to allow the material to pass out of the cell.

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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ***C12M 3/00*** (2006.01) ***C12N 13/00*** (2006.01) ***C12N 15/87*** (2006.01)

US CL. 435/285.2 435/173.1 435/461

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)

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)
CAPLUS, WPIDS (inject?, sort?, extract?, manipulat?, ?porat?, taper?, pyramid?, conic?, cone, coniod, angled, cell, c12m, c12n, apparatus)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2000/063408 A2 (TRAZENECA AB) 26 October 2000. See whole document, particularly Fig's 1 – 3.	1, 2, 9, 10
X	US 2005/0064578 A1 (Muller-Hartmann *et al.*) 24 March 2005. See whole document, particularly Fig's 12 and 13.	1, 2, 9, 10

[X] Further documents are listed in the continuation of Box C [X] 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	Date of mailing of the international search report
8 November 2007	04 FEB 2008
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 Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
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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.:
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:

See Supplemental Box.

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.: 1-10

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.

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No III:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

Note that Rule 13.2 states that where a group of inventions is claimed in one and the same international application, the requirement of unity of invention referred to in Rule 13.1 shall be fulfilled only where there is a technical relationship among those inventions involving one or more of the same corresponding special technical features. The expression "special technical features" shall mean those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

The claims define 4 separate inventions:

1. Claims 1 – 10 define a method for inserting a substance into a cell
2. Claims 11 – 12 define a method of sorting cells
3. Claims 13 – 16 define a method of extracting materials from a cell
4. Claims 17 – 34 define an apparatus for manipulating cells

The inventions do not share a special technical feature, as they rely on known techniques such as electroporation, sonoporation and the like. The feature of a tapering passage is also known in the art. For example, see the following documents:

US 2005/0064578 A1 (Muller-Hartmann et al.) 24 March 2005.

WO 2000/063408 A2 (TRAZENECA AB) 26 October 2000.

As such, there is no special technical feature linking the aforementioned groups of claims as a single invention.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2006/011565

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. These particulars are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	2005064578	AU	2003227006	CA	2476439	CN	1643132
		DE	10208188	EP	1476537	WO	03070875
WO	2000/063408	AU	41296/00	AU	45821/00	EP	1173599
		US	6653136	US	2004106189	WO	0063407

END OF ANNEX