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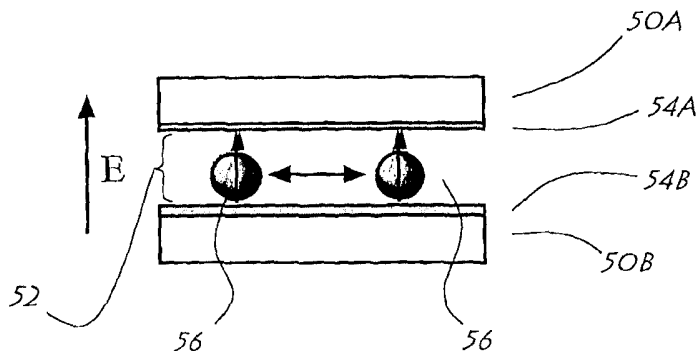
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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(54) Title: DEVICES EMPLOYING COLLOIDAL-SIZED PARTICLES



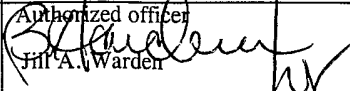
(57) Abstract: The present invention relates to the use colloidal particles to realize photonic and microfluidic devices. In particular embodiments, colloidal particles are used to realize microfluidic a two-way valve, three-way valve, check valve, three-dimensional valve, peristalsis pump, rotary pump, vane pump, and two-lobe gear pump. In certain embodiments, actuation of an active element in the microfluidic structure is accomplished by electrophoresis, the use of an optical trap or "tweezer", or the application of an electric field or magnetic field. In other embodiments, the application of an electrical field to

colloidal particles that are substantially constrained to two dimensional movement is used to realize wave guides, filters and switches for optical signals.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/14233

A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : C02F 1/40, 11/00; C25B 11/00, 13/00, 9/00; G01N 27/27, 27/403, 27/453 US CL : 204/601 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) U.S. : 204/601 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) search terms: optical, magnetic, electric or dielectrophoresis, array cytometry		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 6,261,430 B1 (YAGER et al) 17 July 2001 (17.07.2001), column 3, line 36 - column 14, line 63.	1-12, 15-16, 19, 22-38
Y	US 6,007,690 A (NELSON et al) 28 December 1999 (28.12.1999), column 26, line 58 - column 32, line 37.	1-12, 15-16, 19, 22-38
Y,P	US 6,355,491 B1 (ZHOU et al) 12 March 2002 (12.03.2002), column 3, line 43 - column 24, line 53.	1-12, 15-16, 19, 22-38
X	US 5,837,115 A (AUSTIN et al) 17 November 1998 (17.11.1998), column 1, line 32 - column 34, line 48.	1-12, 15-16, 19, 22-38
X	US 5,427,663 A (AUSTIN et al) 27 June 1995 (27.06.1995), column 4, line 35 - column 30, line 37.	1-12, 15-16, 19, 22-38
Y,P	US 6,368,871 B1 (CHRISTEL et al) 09 April 2002 (09.04.2002), column 1, line 61 - column 14, line 23.	39-48
X,P	US 6,251,691 B1 (SEUL et al) 26 June 2001 (26.06.2001), column 1, line 26 - column 34, line 44.	39-46
X,P	US 6,387,707 B1 (SEUL et al) 14 May 2002 (14.05.2002), column 5, line 61 - column 44, line 65.	39-48
☐ 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	"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
"E"	earlier application or patent published on or after the international filing date	"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
"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)	"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
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
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Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230		Authorized officer  Jill A. Warden Telephone No. (703) 308-0661

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/14233

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claim Nos.: 13,14,17,18,20 and 21
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:
Claims 13, 17, 20 states structure comprises ONLY one input port AND multiple input ports. Claims 14, 18, 21 states structure comprises ONLY one output port AND multiple output ports.
3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

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 an additional fee, this Authority did not invite payment of any additional fee.
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.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

PCT/US02/14233

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-12, 15-16, 19, 22-38, drawn to A Microfluidic Structure.

Group II, claim(s) 39-48, drawn to A Photonic Structure Using Light Manipulation.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group II lacks the special technical feature of a magnetic field.

The claims are deemed to correspond to the species listed above in the following manner:

In group II, claims 39-46 use optical manipulation only and claims 47-48 use optical and electrical fields for manipulation of colloid particle.

The following claim(s) are generic: Claims 39-46.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: In group II, claims 39-46 lack the special technical feature (electrical fields) of claims 47-48.