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[Continued on next page]

(54) Title: PRECISION PUMP WITH MULTIPLE HEADS

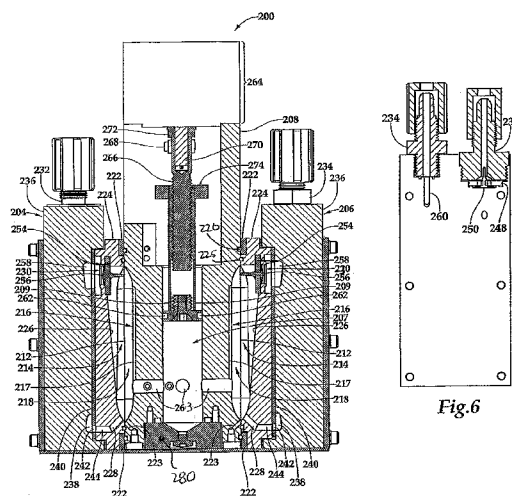


Fig.5

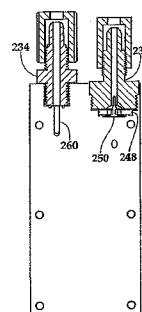


Fig.6

(57) Abstract: A pump for use in handling one or more different process fluids includes a plurality of pumping chambers having a process fluid inlet and a process fluid outlet, process fluid outlet coupled to a process fluid valve on each pumping chamber for selectively preventing and allowing the flow of process fluid through the pumping chamber, an actuation mechanism for pumping actuating fluid to a plurality of actuating fluid chambers in fluid communication with the actuating fluid chambers to permit flow into each actuating fluid chamber of actuating fluid, and at least one diaphragm separating each pumping chamber from an associated actuating fluid chamber, for separating process fluid from actuating fluid. Operation of the actuation mechanism displaces actuating fluid and causes actuating fluid to flow only into each of the actuating fluid chambers having an opened process fluid valve, resulting in pumping.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/069434

A. CLASSIFICATION OF SUBJECT MATTER

INV. F04B13/02 F04B43/06 F04B53/10 F04B49/06

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)

F04B

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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 332 372 A (REYNOLDS STEVEN M [US]) 26 July 1994 (1994-07-26)	1, 2, 4-7, 10-12, 53, 54
A	abstract; figures 10-12, 14 column 5, line 15 - column 6, line 24 column 7, lines 3-25 column 7, lines 47-64 column 8, line 65 - column 9, line 4	14, 31, 51, 53
A	US 6 391 111 B1 (FUJIMOTO AKIHIRO [JP] ET AL) 21 May 2002 (2002-05-21) abstract; figures 6, 7, 13, 15, 21	1-13, 53-55
A	GB 2 156 445 A (HEWLETT PACKARD CO) 9 October 1985 (1985-10-09) figure 1 page 2, lines 21-70	1, 3
	----- -/-	

☒ 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 document 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

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 844 424 A (OHMI TADAHIRO [JP]; FUJIKIN KK [JP] OHMI TADAHIRO; FUJIKIN KK) 27 May 1998 (1998-05-27) figures 1,2 sentences 5-12, paragraph 1 sentence 36, paragraph 3 - sentence 4, paragraph 4 sentences 31-36, paragraph 4 -----	4,5,13, 53,55
A	US 2002/043502 A1 (SNODGRASS OCIE T [US] ET AL) 18 April 2002 (2002-04-18) abstract; figure 2 paragraphs [0003], [0036], [0037], [0041], [0048] - [0053], [0062]; claim 10 -----	1-55
A	US 5 803 122 A (THEILMEIER THOMAS [US]) 8 September 1998 (1998-09-08) figures 1,5,6 -----	5,55
A	US 5 165 869 A (REYNOLDS STEVEN M [US]) 24 November 1992 (1992-11-24) abstract; figure 2 column 3, line 39 - column 4, line 3 -----	1,14,27, 51,53

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/069434

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 additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an 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 reportcovers 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13,53-55

apparatus (claim 1) and method (claim 53) are mainly concerned with a pump comprising a plurality of pumping chambers with diaphragms, a fluid outlet and inlet, a process fluid valve, and an actuation mechanism for pumping a plurality of process fluids in a controlled manner.

2. claims: 27-30

apparatus (claim 27) is directed towards a pump comprising a plurality of pumping chambers with diaphragms, a fluid outlet and inlet, a process fluid valve, an actuation mechanism and a central reservoir for storing the actuation fluid enabling a displacement member to pump the actuation fluid between the reservoir and the actuation chambers.

3. claims: 14-26,31-52

apparatus (claims 14 and 31) and method (claim 51) are directed towards a pump comprising a pumping chambers with diaphragms, a fluid outlet and inlet, a process fluid valve, an actuation mechanism and a plurality of pairs of pumping and actuating chambers enabling the first and second pump chambers to pump simultaneously to a dispense point.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2008/069434

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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