

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
24 December 2008 (24.12.2008)

PCT

(10) International Publication Number  
**WO 2008/157351 A3**

(51) International Patent Classification:

A61M 5/142 (2006.01) F04B 43/08 (2006.01)  
F04B 43/00 (2006.01) F04B 43/12 (2006.01)  
F04B 43/02 (2006.01)

(21) International Application Number:

PCT/US2008/066914

(22) International Filing Date: 13 June 2008 (13.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

11/765,121 19 June 2007 (19.06.2007) US

(71) Applicant (for all designated States except US): **SMITHS MEDICAL ASD, INC.** [US/US]; 160 Weymouth Street, Rockland, MA 02370-1136 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **AMLEY, Joseph** [US/US]; 839 Scales Road, Suwanee, GA 30024 (US).  
**LACROSS, Steven** [US/US]; 4329 Old Bridge Lane,

Norcross, GA 30092 (US). **LINCOLN, Danny** [US/US]; 489 Hooper Road, Commerce, GA 30530 (US). **MACK, Stanley, Paul** [US/US]; 5035 Westbury Lane, Suwanee, GA 30024 (US). **VICK, Stephen, L.** [US/US]; 4591 Outer Bank Drive, Norcross, GA 30092 (US). **PATZER, Charles, R.** [US/US]; 5388 Cherry Bud Ct., Columbus, OH 43228 (US).

(74) Agents: **FREI, Donald, F.** et al.; Wood, Herron & Evans, L.L.P., 441 Vine Street, 2700 Carew Tower, Cincinnati, OH 45202 (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, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

[Continued on next page]

(54) Title: PROGRESSIVE CAVITY PROPAGATION PUMP

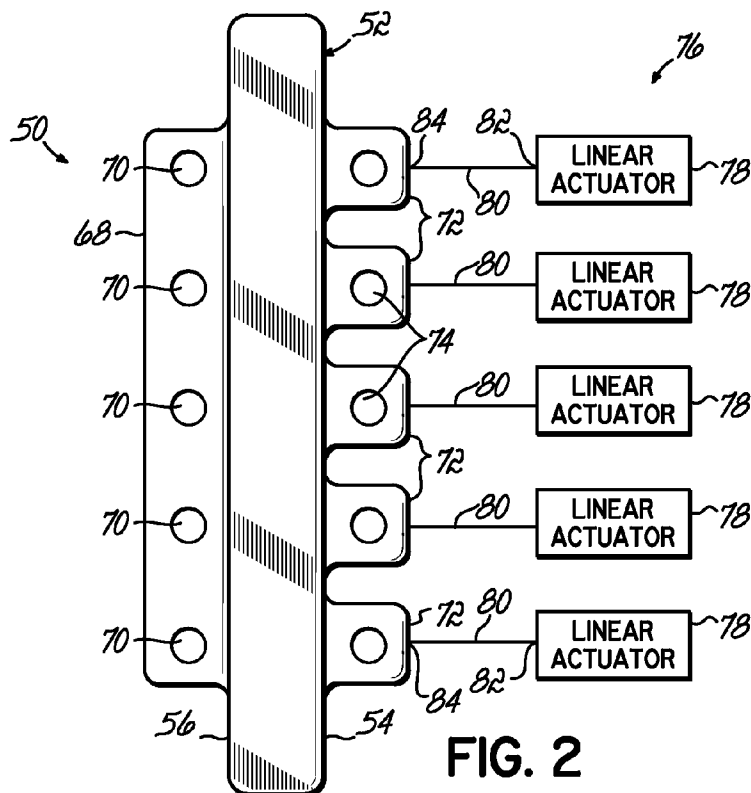


FIG. 2

(57) Abstract: A pump (50) is provided that includes a body (52) made at least partially of an elastomeric material and an inlet port (62) and an outlet port (64), with each port (62, 64) being coupled to the body (52). The pump (50) further includes a flow passage (66) formed in the body (52) and extending between the inlet port (62) and the outlet port (64), with at least a portion of the flow passage (66) being normally closed and with the inlet port (62) being fluidly uncoupled with the outlet port (64) when the pump (50) is in a free-state condition. An actuating device (76) is coupled to the body (52) and is operable for sequentially deforming the body (52) to create a cavity (88a) within the normally closed portion of the flow passage (66), the cavity (66) being in fluid communication with the inlet port (62), thereby drawing a packet of fluid (90a) from the inlet port (62) into the cavity and propagating the cavity and the packet of fluid contained therein toward the outlet port (64).



(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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

2 April 2009

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/066914

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M5/142 F04B43/00 F04B43/02 F04B43/08 F04B43/12

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)

A61M 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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/181866 A1 (ABRAHAMSON KENT [US] ET AL ABRAHAMSON KENT [US] ET AL) 25 September 2003 (2003-09-25)	1,2, 4-11,53, 54, 56-59,82
A	the whole document	12
X	WO 2006/056986 A (CORE LTD Q [IL]; GOLDOR ORI [IL]; ROTEM SHACHAR [IL]) 1 June 2006 (2006-06-01)	1,2, 4-11,53, 54, 56-59,82
A	page 4, line 9 - page 5, line 19; figures 1A-3 ----- -/--	12



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

22 January 2009

Date of mailing of the international search report

30/01/2009

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040,  
 Fax: (+31-70) 340-3016

Authorized officer

Ceccarelli, David

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/066914

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 298 05 173 U1 (KAMMERER ROLF [DE]) 16 July 1998 (1998-07-16)	1,2, 4-11,13, 41,53, 54, 56-60, 76,82
A	the whole document	12
X	DE 84 11 204 U1 (KOWALZIK, HARTMUT, 4650 GELSENKIRCHEN, DE) 23 June 1988 (1988-06-23)	1,2,4, 6-11,13, 41,53, 54, 56-60, 76,82
A	the whole document	12
X	US 6 074 179 A (JOKELA GREGORY RAYMOND [US] ET AL) 13 June 2000 (2000-06-13)	1,2,53, 54,82
A	the whole document	4-12, 56-59
X	DE 198 56 744 A1 (SCHIMMELPFENNIG WINFRIED [DE]; RIGGERS WILFRIED [DE] PLASMASELECT AG []) 15 June 2000 (2000-06-15)	1,2,4-6, 22,23, 53,54, 56-58, 65,66,82
	the whole document	
X	WO 2005/111423 A (NEUBERG COMPANY LTD [JP]; OGAWA KENJI [JP]) 24 November 2005 (2005-11-24)	1,4,6, 13,27, 31,41, 53,56, 58,60, 69,76,82
	the whole document	
X	WO 02/23043 A (BEENKER JAN W [DE]) 21 March 2002 (2002-03-21)	1,3,4,6, 13-16, 27,28, 30,31, 41,53, 55,56, 58,60, 69,70, 76,82
	page 14, paragraph 3 - page 15, paragraph 6; figure 4	
	----- -/--	

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/066914

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 593 290 A (GREISCH DANNY L [US] ET AL) 14 January 1997 (1997-01-14)  column 5, line 60 - column 8, line 42; figures 1-9	1,2,4-6, 13,14, 27,31, 41,53, 54, 56-61, 69,76,82
X	FR 2 444 177 A (BECKER ERICK [DE]) 11 July 1980 (1980-07-11)  the whole document	1,3,4,6, 13,14, 18-21, 41,53, 55,56, 58,60, 62-64, 76,82
X	FR 2 451 477 A (LEMAIRE DENISE) 10 October 1980 (1980-10-10)  the whole document	1,3,4,6, 13,14, 18-21, 41,53, 55,56, 58,60, 62-64, 76,82 32,33, 72,73
X	US 3 922 119 A (ROSENQUIST ROGER K) 25 November 1975 (1975-11-25)  the whole document	1,3,4,6, 13-16, 18-21, 27-29, 31, 34-36, 38,41, 42, 45-50, 52,53, 55,56, 58,60, 62-64, 69-71, 74-82
X A	FR 1 498 254 A (LEMAIRE D) 20 October 1967 (1967-10-20) the whole document	1,53,82  1,3,4,6, 13-21, 27-53, 56,58, 60-64, 69-82

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2008/066914

## 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.: 83-88  
because they relate to subject matter not required to be searched by this Authority, namely:  
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy. Pumping a fluid to a patient (implicit) is a clear therapeutic measure.
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 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.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1,2,4-12,53,54,56-59,82

A progressive cavity propagation pump with a body having an inlet and an outlet port and a normally closed flow passage, and an actuating device for propagating a cavity from the inlet to the outlet port, the body extending along a linear path and being provided with a plurality of longitudinally extending tabs coupled to linear actuators.

---

2. claims: 1,3,4,6,18-21,53,55,56,58,62-64,82

A progressive cavity propagation pump with a body having an inlet and an outlet port and a normally closed flow passage, and an actuating device for propagating a cavity from the inlet to the outlet port, the body extending along a circular path and being provided with an offset driving axle.

---

3. claims: 1,4,6,13-17,27-53,56,58,60,61,69-82

A progressive cavity propagation pump with a body having an inlet and an outlet port and a normally closed flow passage, and an actuating device for propagating a cavity from the inlet to the outlet port, the body comprising a thermoplastic frame and an elastomeric member.

---

4. claims: 1,4,6,22-26,53,56,58,65-68,82

A progressive cavity propagation pump with a body having an inlet and an outlet port and a normally closed flow passage, and an actuating device for propagating a cavity from the inlet to the outlet port, the body comprising a first and a second open conduits.

---

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/066914

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003181866 A1	25-09-2003	AT 400310 T AU 2003213795 A1 CA 2479127 A1 EP 1485149 A1 ES 2310238 T3 WO 03080158 A1	15-07-2008 08-10-2003 02-10-2003 15-12-2004 01-01-2009 02-10-2003
WO 2006056986 A	01-06-2006	CN 101094991 A EP 1834095 A1 JP 2008521477 T US 2007269324 A1	26-12-2007 19-09-2007 26-06-2008 22-11-2007
DE 29805173 U1	16-07-1998	NONE	
DE 8411204 U1	23-06-1988	NONE	
US 6074179 A	13-06-2000	NONE	
DE 19856744 A1	15-06-2000	AT 220932 T AU 1863400 A WO 0033898 A1 EP 1140257 A1 ES 2183635 T3	15-08-2002 26-06-2000 15-06-2000 10-10-2001 16-03-2003
WO 2005111423 A	24-11-2005	JP 2006029314 A US 2008050256 A1	02-02-2006 28-02-2008
WO 0223043 A	21-03-2002	AT 335130 T AU 1035902 A BR 0113901 A CA 2422579 A1 CN 1474912 A DE 10146190 A1 EP 1317626 A1 ES 2269470 T3 JP 2004509270 T MX PA03002184 A	15-08-2006 26-03-2002 10-02-2004 14-03-2003 11-02-2004 25-04-2002 11-06-2003 01-04-2007 25-03-2004 24-07-2003
US 5593290 A	14-01-1997	NONE	
FR 2444177 A	11-07-1980	GB 2037371 A US 4332534 A	09-07-1980 01-06-1982
FR 2451477 A	10-10-1980	NONE	
US 3922119 A	25-11-1975	NONE	
FR 1498254 A	20-10-1967	NONE	