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14/211,919 14 March 2014 (14.03.2014) US(71) Applicant: **INO THERAPEUTICS LLC** [US/US]; Perryville III Corporate Park, 53 Frontage Road, Third Floor, Hampton, New Jersey 08827-9001 (US).(72) Inventors: **ACKER, Jaron**; 431 West 37th Street, Unit 7G, New York, New York 10018 (US). **KOHLMANN, Thomas**; 5201 Valley Drive, McFarland, Wisconsin 53558 (US). **TOLMIE, Craig R.**; 1690 Red Oak Drive, Stoughton, Wisconsin 53589 (US).(74) Agent: **ALEGRIA, Rory P.**; Servilla Whitney LLC, 33 Wood Avenue South, Second Floor, Suite 210, Iselin, New Jersey 08830 (US).

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(54) Title: THERAPEUTIC GAS DELIVERY DEVICE WITH PULSED AND CONTINUOUS FLOW CONTROL

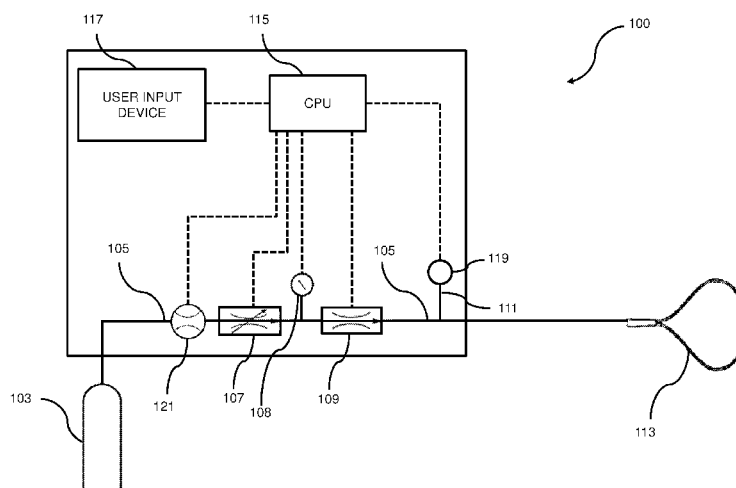


FIG. 1

(57) **Abstract:** Described are methods and devices for therapeutic or medical gas delivery that utilize at least one proportional control valve (107) and at least one binary control valve (109). The proportional control valve may be in series with the binary control valve to provide a valve combination capable of pulsing therapeutic gas at different flow rates, depending on the setting of the proportional control valve. Alternatively, the proportional control valve and binary control valve may be in parallel flow paths.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/028483

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M16/12
ADD.

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

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)

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	EP 0 659 445 A1 (OHMEDA INC [US] DATEX OHMEDA INC [US]) 28 June 1995 (1995-06-28)	1-14
Y	whole document, especially figures 1, 2 and column 5, lines 11-27	5-9
X	WO 99/59662 A1 (INSTRUMENTARIUM CORP [FI]) 25 November 1999 (1999-11-25)	1-3, 10-14
Y	the whole document	5-9
X	WO 2012/153293 A1 (OXYPOINT BVBA [BE]; HENDRICKX PHILIP [BE]; BORGONJON DIRK [BE]) 15 November 2012 (2012-11-15)	1-14
Y	whole document, especially figures 2, 3, page 15, page 17	5-9
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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

23 July 2014

Date of mailing of the international search report

16/10/2014

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/028483

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.: 15-26
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. Claims 15-26 define a method of administering a therapeutic gas to a patient.
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 all searchable 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.:

1-14

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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/028483

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 4 686 974 A (SATO TORU [JP] ET AL) 18 August 1987 (1987-08-18)	1-14
Y	column 6, line 49 - column 7, line 11; figures 1,2	5-9
Y	----- DE 10 2010 016699 A1 (MAQUET GMBH & CO KG [DE]) 3 November 2011 (2011-11-03) paragraphs [0037] - [0038]; figures 1-3	5-9
A	----- WO 99/22796 A1 (INSTRUMENTARIUM CORP [FI]) 14 May 1999 (1999-05-14) the whole document	1-14
A	----- US 4 584 996 A (BLUM ALVIN S [US]) 29 April 1986 (1986-04-29) the whole document	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/028483

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/028483

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
<div></div>			

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-14

Claims 1-14 essentially define a therapeutic gas delivery device comprising a binary control valve and a proportional control valve for delivery of variable flow of therapeutic gas.

2. claims: 27-38

Claims 27-38 essentially define a therapeutic gas delivery device comprising a binary control valve and a variable pressure controller for varying gas pressure.
