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(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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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**Published:**

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) **Title:** VALVE UNIT FOR A CHROMATOGRAPHY APPARATUS

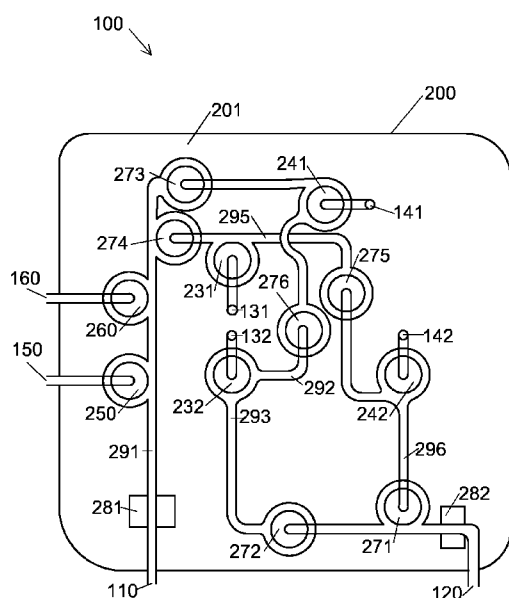


Fig. 2

(57) **Abstract:** The present invention relates to a valve unit (100) for a chromatography apparatus, the valve unit comprising a fluid inlet (110) configured to receive an input fluid, a fluid outlet (120) configured to provide an output fluid, a first pair of fluid ports (131,132) configured to be coupled to a first column, a second pair (141,142) of fluid ports configured to be coupled to a second column, a coupling valve assembly (200) configured to direct fluid between a selection of the fluid inlet (110), the fluid outlet (120), the first pair of fluid ports (131,132) and the second pair of fluid ports (141,142) in response to one or more control signals, wherein the coupling valve assembly is configured to direct fluid using a selection of membrane valves coupled by fluid channels comprised in a body of the coupling valve assembly. The invention further relates to a chromatography apparatus comprising the valve unit and a membrane valve comprised in the valve unit.



**(88) Date of publication of the international search report:**  
16 May 2019 (16.05.2019)

INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2018/075694

A. CLASSIFICATION OF SUBJECT MATTER  
INV. G01N30/42 B01D15/18  
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)  
G01N B01D  
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, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 992 175 A (KLEMENTI TOE JOKHANNESOVICH ET AL) 16 November 1976 (1976-11-16) column 1, line 22 - line 27 column 9, line 43 - column 12, line 40; figures 10-13 -----	1-12, 14-22
Y	EP 1 775 001 A1 (XENDO HOLDING B V [NL]) 18 April 2007 (2007-04-18) paragraphs [0004], [0018], [0023], [0028], [0030] - [0046]; figure 8 -----	1-12, 14-22
Y	WO 2008/048395 A1 (SEMBA BIOSCIENCES INC [US]; BAIER JOERG WERNER [US]; MIERENDORF ROBERT) 24 April 2008 (2008-04-24) page 29, line 1 - page 32, line 30 ----- -/--	1-12, 14-22

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 but 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	

Date of the actual completion of the international search <b>11 February 2019</b>	Date of mailing of the international search report <b>15/04/2019</b>
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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 <b>Müller, Thomas</b>
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2018/075694

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CHIM YONG CHIN ET AL: "Simulated Moving Bed Equipment Designs", SEPARATION AND PURIFICATION REVIEWS, vol. 33, no. 2, 12 January 2004 (2004-01-12), pages 77-155, XP055263428, US ISSN: 1542-2119, DOI: 10.1081/SPM-200042081 the whole document -----	1-12, 14-22

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2018/075694

## 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 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.:  
  
1-12, 14-22

### 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: 1-12, 14-22

valve unit for a chromatography apparatus comprising a plurality of ports

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2. claim: 13

membrane valve comprising a body, a membrane, a piston, and a spring

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2018/075694
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3992175	A	16-11-1976	NONE
EP 1775001	A1	18-04-2007	AT 511901 T 15-06-2011
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