



- (51) **International Patent Classification:**
B01D 29/56 (2006.01) *B01D 29/62* (2006.01)
- (21) **International Application Number:**
PCT/US2012/039109
- (22) **International Filing Date:**
23 May 2012 (23.05.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
13/093,859 26 April 2011 (26.04.2011) US
13/402,948 23 February 2012 (23.02.2012) US
- (72) **Inventor; and**
- (71) **Applicant : NIAZI, Sarfaraz, K.** [US/US]; 20 Riverside Drive, Deerfield, IL 60015 (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, CL, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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.

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

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*
- *the filing date of the international application is within two months from the date of expiration of the priority period (Rule 26bis.3)*

- (88) **Date of publication of the international search report:**
1 May 2014

(54) **Title:** CONCENTRATOR FILTER

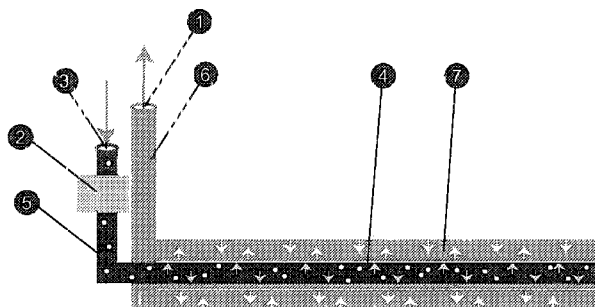


Figure 1(a)



Figure 1(b)

(57) **Abstract:** A method and an apparatus for separating suspended matter from liquid includes a concentrator filter that draws the liquid out of the suspension while the filter kept unblocked by a sparging filter that allows scrubbing of the concentrator filter by gas bubbles. This invention can be used to replace cross-flow filtration and centrifugation in the bioprocess industry and to reduce the volume of suspensions to concentrate the yield of the end product in the chemical industry.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/39109

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - B01D 29/56; B01D 29/62 (2012.01) USPC - 210/808; 210/151 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) IPC(8) - B01D 29/56; B01D 29/62 (2012.01) USPC - 210/808; 210/151 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched IPC(8) - B01D 29/56; B01D 29/62 (2012.01) USPC - 210/808; 210/151 (keyword delimited) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST (USPT,PGPB,EPAB,JPAB); Google, Google Patent Search terms used: filter concentrating sparging perfusion vacuum compressed gas membrane tube tubular surface contact sheath surround cover extraction		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0000775 A1 (Zha et al.) 05 January 2006 (05.01.2006), para [0019], [0041]-[0074]	1-9, 13, 14
Y		10-12, 15
Y	US 2008/0302713 A1 (Patrick) 11 December 2008 (11.12.2008), para [0019]-[0021]	10-12, 15
Y	US 2010/0108621 A1 (Zainiev) 06 May 2010 (06.05.2010), para [0031]; fig 5a	1-15
X, P	US 2011/0117538 A1 (Niazi) 19 May 2011 (19.05.2011), para [0004], [0012], [0031]-[0036]	1-15
X, P	US 2011/0201050 A1 (Niazi) 18 August 2011 (18.08.2011), Fig 1a, 1b; para [0021]-[0034]	1-15
☐ Further documents are listed in the continuation of Box C. ☐		
* 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 01 August 2012 (01.08.2012)		Date of mailing of the international search report 17 AUG 2012
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/39109

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.: 16, 17
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:

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 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.