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[Continued on nextpage]

(54) Title: PROCESSES AND APPARATUS FOR INHIBITING MEMBRANE BIO-FOULING

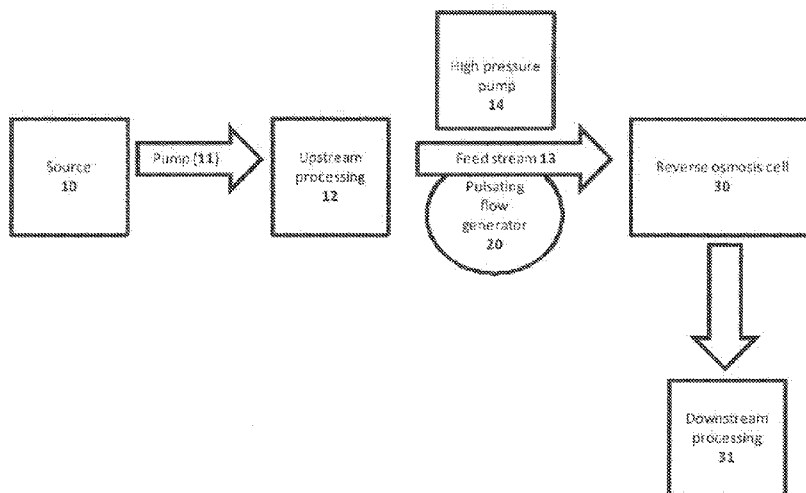


FIG * 1

(57) Abstract: Certain embodiments are directed to a process and apparatus for cleaning and/or regeneration of permeable or semi-permeable membranes comprising modulating pressure of a feed stream feeding the permeable or semipermeable membrane and providing intermittent pressure pulses for cleaning and/or regeneration of the permeable or semipermeable membrane.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 12/42881

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - C02F 1/44 (2012.01)
USPC - 210/636
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): C02F 1/44 (2012.01)
USPC: 210/636

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
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USPC: 210/636

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST; PGPB, USPT, EPAB, JPAB; Google Scholar; Google Patent; Search Terms: filter filtrate semi-permeable osmosis membrane permeate fluid water aqueous liquid inlet outlet clean dislodge clog porous fiber pressure wave pulse oscillate flow housing vessel solid suspension pump impeller offset eccentric impeller vane modulate frequency pulse

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/0246425 A1 (Lieberman) 25 October 2007 (25.10.2007) para. [0049], [0072H0084], [0093]-[0098]	1-6, 10, 11
X --- Y	US 2005/0023219 A1 (Kirker et al.) 03 February 2005 (03.02.2005) para. [0008H0368], Fig. 1-33	1, 2, 10, 11, 13 ----- 3-9
Y	US 2007/0295674 A1 (Kirker et al.) 27 December 2007 (27.12.2007) para. [0037], [0038], [0053], [0061]-[0080], Fig. 1	3-5, 7
Y	US 2006/0073173 A1 (Banach et al.) 06 April 2006 (06.04.2006) para. [0010], [0025], [0196], [0211]-[0218]	6, 8, 9
Y	US 2005/0023207 A1 (Kirker et al.) 03 February 2005 (03.02.2005) para. [0296], [0305], [0306], [0310]	4
A	US 2005/0254968 A1 (Patterson) 17 November 2005 (17.11.2005) para. [0030], [0032], [0035], [0045], [0046], Fig. 1	1-11, 13
A	US 2011/0000858 A1 (Geiger) 06 January 2011 (06.01.2011) entire document	1-11, 13
A	US 2005/0077227 A1 (Kirker et al.) 14 April 2005 (14.04.2005) entire document	1-11, 13

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 17 August 2012 (17.08.2012)	Date of mailing of the international search report 04 SEP 2012
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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
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/42881

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.: 12
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.