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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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(54) Title: METHOD OF RECOVERING OIL OR GAS AND TREATING THE RESULTING PRODUCED WATER

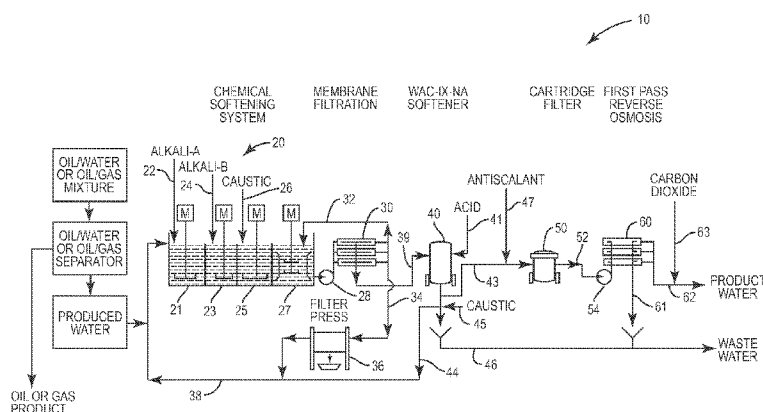


FIG. 1

(57) **Abstract:** A method or process for treating wastewater containing high organics, silica, boron, hardness, and suspended and dissolved solids. The method includes degasifying the wastewater for the removal of dissolved gases and thereafter chemically softening the wastewater. After the chemical softening step, the wastewater is directed through a media filter or membrane which removes additional solids and precipitants. Thereafter the wastewater is directed through a sodium ion exchange that further softens the wastewater. The effluent from the ion exchange is directed through a cartridge filter and the effluent from the cartridge filter is directed through one or more reverse osmosis units. At a selected phase of the process, prior to the wastewater reaching the reverse osmosis unit or units, the pH of the wastewater is raised and maintained such that the pH of the wastewater reaching a reverse osmosis unit is at a pH greater than 10.5.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/33188

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C02F 9/00 (2012.01)

USPC - 210/257.1; 210/799

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)

USPC: 210/257.1; 210/799

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)

PubWEST(USPT,PGPB,EPAB,JPAB); Google; Google Patents

Search Terms: produced water, softening, crystallization, pH, dissolved solids, calcium, magnesium, hydroxide, reverse osmosis, hydroxide, carbonate, free oil, ultraviolet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2008/0135478 A1 (Zuback et al.) 12 June 2008 (12.06.2008) fig. 1; para [0014]-[0017]; [0020]-[0024]; [0027]; [0032]-[0035]	1, 5, 15, 26 ----- 2-4, 6-14, 16-25
Y	US 2011/0005751 A1 (Audibert-Hayet) 13 January 2011 (13.01.2011) para [0013]-[0014]; [0113]	2, 25
Y	US 2010/0218946 A1 (Symington et al.) 02 September 2010 (02.09.2010) figs. 8A and 8B; para [0028]; [0205]; [0210]; [0253]; [0273]	3, 13-14, 21-24
Y	US 2,359,748 A (Clemens et al.) 10 October 1944 (10.10.1944) pg 1, col 1, ln 5-23	4
Y	US 2007/0051513 A1(Heins) 08 March 2007 (08.03.2007)para [0023]	6, 16-17, 23
Y	US 2008/0290033 A1 (Kimball et al.) 27 November 2008 (27.11.2008) fig. 3B; para [0019]; [0026]-[0027]; [0061]; [0113]	7-9, 19-24
Y	US 2008/0047901 A1 (Golden et al.) 28 February 2008 (28.02.2008) para [0043]-[0046]	10-12, 19-24
Y	US 3,316,116 A (Podschns) 25 April 1967 (25.04.1967) col 2, ln 24-28	18

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"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)

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

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"&" document member of the same patent family

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