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(54) Title: HIGH PRESSURE BIOREACTOR

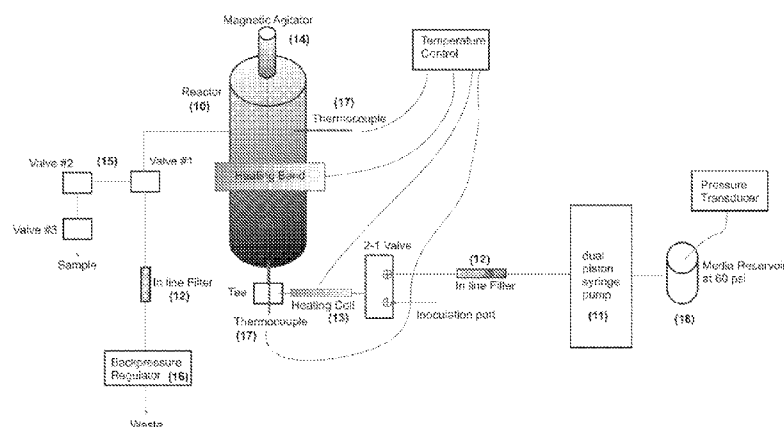


FIG. 6

(57) Abstract: The present invention relates generally to an integrated system, apparatus and method that allows for the continuous culturing of microorganisms under high pressure conditions and at a wide range of temperatures. More specifically, the system is configured to be gas tight and operate under aerobic or anaerobic conditions. The system is also configured to permit periodic sampling of the incubated organisms under such conditions with minimal physical/chemical disturbance inside the reactor and minimal impacts of shear forces on the collected biomass.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US15/18004

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C12M 1/04, 1/28, 1/34 (2015.01)

CPC - C12M 1/04, 1/34, 35/04

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): B01J 3/03; C12M1/02, 1/04, 1/28, 1/34; F16J12/00 (2015.01)

CPC: C12M1/02, 1/04, 1/28, 1/34, 1/3415, 33/04, 33/12, 35/04, 41/36, 41/40

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)

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google Scholar; ProQuest; EBSCO; Pressure, bioreactor, reactor, vessel, fermenter, high, elevated, MPa, continuous, chemostat, semi-continuous, retentostat, dissolved, gas, oxygen, hydrogen, nitrogen, carbon dioxide, microbe, organism, culture, batch, fed-batch, inoculate, sampling, hydrostatic, depressurize

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	(PARKES, RJ et al.) Culturable prokaryotic diversity of deep, gas hydrate sediments: first use of a continuous high-pressure, anaerobic, enrichment and isolation system for subseafloor sediments (DeeplsoBUG). Environmental Microbiology. Vol. 11, No. 12, 2009, pp. 3140-3153. pages 3141, 3143-3145; figure 6	1-16
Y	(NOMURA, K et al.) Pressure-Regulated Fermentation: A Revolutionary Approach that Utilizes Hydrostatic Pressure. Reviews in Agricultural Science. Vol. 2, 20 February 2014, pp. 1-10. pages 1, 7	1-16
Y	WO 1993/003135 A (BIOTEC RESEARCH & DEVELOPMENT, INC.) 18 February 1993; page 3, lines 11-14; page 12, lines 10-15; page 19, lines 31-33; page 22, lines 18-29; page 35, lines 17-25; column 37, line 28 to page 38, line 6	1-8, 10-16
Y	US 4,001,090 A (KALINA, V) 04 January 1977; column 2, lines 43-61; column 3, line 67 to column 4, line 5; column 5, lines 10-24	11, 16
Y	(PARKER AUTOCLAVE ENGINEERS) Needle Valves Options. 2013, pp. 1-4. [Retrieved from the Internet 30.04.2015]. [Retrieved from: <URL: http://www.autoclave.com/aefc_pdfs/NV_Options.pdf>]; page 2	14
Y	WO 2013/004670 A1 (DSM IP ASSETS B.V.) 10 January 2013; page 5, lines 12-22	3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"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

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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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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,571,720 A (GRANDICS, P et al.) 05 November 1996; column 5, lines 12-25	15
A	US 2002/0172629 A1 (JAHN, P et al.) 21 November 2002; entire document	1, 9
A	US 5,342,580 A (BRENNER, A) 30 August 1994; entire document	1, 9