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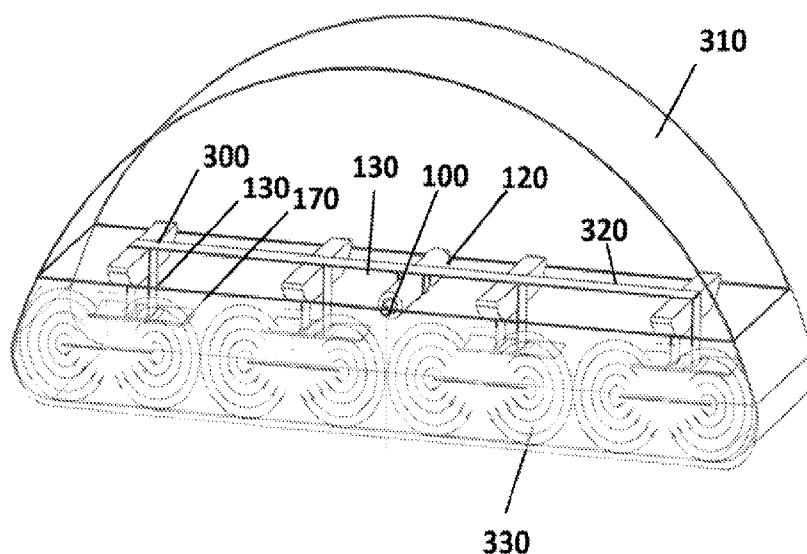
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

[Continued on next page]

(54) Title: MAGNETICALLY COUPLED SYSTEM FOR MIXING

Figure 14



(57) Abstract: The invention provides a mixing system comprising a magnetically coupled drive system and optionally a foil or a crossbar for cultivating algae, or cyanobacteria, in an open or enclosed vessel. The invention provides effective mixing, low energy usage, low capital expenditure, and ease of drive system component maintenance while maintaining the integrity of a sealed mixing vessel.



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.

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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))

— 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))

(88) Date of publication of the international search report:

7 February 2013

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/026632**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:

Group 1: Claims 1, 2 and 55 relate to a magnetically coupled mixing system characterized with its components such as a magnetic follower element and a drive element.

Group 2: Claims 3-54 relate to a magnetically coupled mixing system characterized with its component such as a specifically configured foil.

Group 3: Claims 56-62 relate to a mixing system comprising a foil moving by magnetic means in a linear direction and a method for using the system.

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 fee, this Authority did not invite payment of any additional fee.
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.:
1,2,55

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.

A. CLASSIFICATION OF SUBJECT MATTER***B01F 13/08(2006.01)i, B01F 15/00(2006.01)i, H02N 15/00(2006.01)i***

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)

B01F 13/08; C12N 5/02; C12M 1/06; C05F 17/02; C12M 1/02; A01C 3/02; B61B 13/00; C12P 7/64

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: mixing system, vessel, liquid, gas, drive conduit, drive element, follower member, magnetic follower element, mixing element, foil, cable, reversible motor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 05744351 A (MICHAEL BRYAN-BROWN) 28 April 1998. See the entire document.	1,2,55
A	JP 2010-233563 A (TOYO SEIKAN KAISHA LTD.) 21 October 2010. See the entire document.	1,2,55
A	JP 2004-123485 A (YOSHINO HIROYUKI) 22 April 2004. See the entire document.	1,2,55
A	US 6267058 B1 (MAX P. SCHLIENGER) 31 July 2001. See the entire document.	1,2,55
A	WO 2007-025145 A2 (SUNSOURCE INDUSTRIES) 01 March 2007. See the entire document.	1,2,55



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

"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 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

12 DECEMBER 2012 (12.12.2012)

Date of mailing of the international search report

14 DECEMBER 2012 (14.12.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
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CHANG, BONG HO

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/026632

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 05744351 A	28.04.1998	None	
JP 2010-233563 A	21.10.2010	CN 102348794 A JP 2011-087498 A US 2011-0318725 A1 WO 2010-103748 A1	08.02.2012 06.05.2011 29.12.2011 16.09.2010
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WO 2007-025145 A2	01.03.2007	AU 2006-282946 A1 AU 2006-282946 A1 BR P10615085A2 CN 101341243 A EP 1928994 A2 JP 2009-505660 A MX 2008002633 A WO 2007-025145 A3	01.03.2007 01.03.2007 28.06.2011 07.01.2009 11.06.2008 12.02.2009 26.09.2008 21.06.2007