(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 October 2012 (11.10.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/138741 A3

(51) International Patent Classification:
C12N 1/06 (2006.01) *C12N 13/00* (2006.01)
C12M 1/42 (2006.01) *C12Q 1/02* (2006.01)

(21) International Application Number:
PCT/US2012/032145

(22) International Filing Date:
4 April 2012 (04.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/471,612 4 April 2011 (04.04.2011) US
13/439,340 4 April 2012 (04.04.2012) US

(71) Applicant *(for all designated States except US)*: **BOARD OF REGENTS, THE UNIVERSITY OF TEXAS SYSTEM** [US/US]; 201 West 7th Street, Austin, TX 78701 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HEBNER, Robert, E.** [US/US]; 9600 Bitternut Cove, Austin, TX 78759 (US). **FLYNN, Mark, M.** [US/US]; 8204 Partridge Bend Cove, Austin, TX 78729-6480 (US). **WERST, Michael, D.** [US/US]; 10404 Schmidt Lane, Manor, TX 78653-3655 (US).

(74) Agents: **FLORES, Edwin, S.** et al.; Chalker Flores, LLP, 14951 North Dallas Parkway, Suite 400, Dallas, TX 75254 (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, MD, 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).

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) Title: BIPOLAR FLYBACK POWER SUPPLY

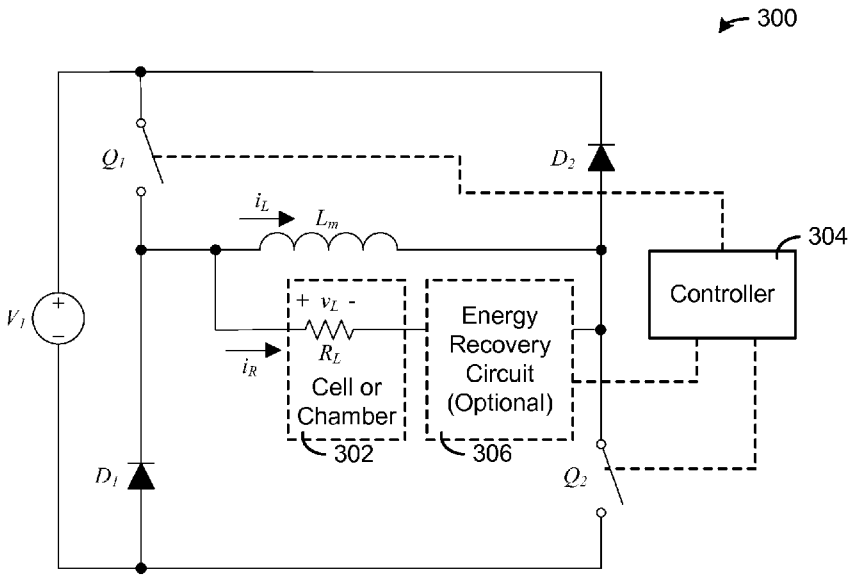

FIG. 3A

(57) Abstract: A device, system and method for treating biological cells includes a voltage source, a half-controlled bridge connected to the voltage source, and a load connected across the half-controlled bridge. The half- controlled bridge includes a first switch, a second switch, a first diode and a second diode. The load includes an inductor connected in parallel with a cell or chamber. A controller is connected to the first and second switches and operates the first switch and the second switch to selectively generate one or more bipolar pulses, wherein each bipolar pulse comprises a positive polarity voltage pulse and a negative polarity voltage pulse with a negligible delay between the positive polarity voltage pulse and the negative polarity voltage pulse.

WO 2012/138741 A3

— *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:
6 December 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/032145

A. CLASSIFICATION OF SUBJECT MATTER

C12N 1/06(2006.01)i, C12M 1/42(2006.01)i, C12N 13/00(2006.01)i, C12Q 1/02(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)

C12N 1/06; H01L 21/311; A61N 1/30; H02J 1/00; H03H 5/00; A61K 31/7088; G05F 3/08; C12N 1/42; C12M 3/00; B01J 19/08

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: biopolar, pulse, generator, voltage, half-controlled, bridge, switch, diode, cell, chamber, polarity

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6214297 B1 (ZHANG, Q. H. & QIU, X.) 10 April 2001 See abstract; figures 1-9; claims 1,10,15.	1-66
A	US 2011-0065161 A1 (KWASINSKI, A. et al.) 17 March 2011 See abstract; figures 1-6; claims 1,8,18.	1-66
A	US 2009-0087990 A1 (YATSUDA, K. & NISHIMURA, E.) 02 April 2009 See abstract; claim 1.	1-66
A	US 2008-0215032 A1 (RABUSSAY, D. P.) 04 September 2008 See abstract; claims 1-7.	1-66
A	US 2010-0231318 A1 (LONDON, S.) 16 September 2010 See abstract; figures 1-24; claim 1.	1-66
A	US 7767433 B2 (KUTHI, A. & GUNDERSEN, M. A.) 03 August 2010 See abstract; figures 1-8; claim 1.	1-66

☐ 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	Date of mailing of the international search report
27 SEPTEMBER 2012 (27.09.2012)	**27 SEPTEMBER 2012 (27.09.2012)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer
JEONG, JAE CHEOL
Telephone No. 82-42-481-8403

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/032145

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6214297 B1	10.04.2001	None	
US 2011-0065161 A1	17.03.2011	WO 2011-032149 A2	17.03.2011
		WO 2011-032149 A3	28.07.2011
US 2009-0087990 A1	02.04.2009	CN 101399189 A	01.04.2009
		JP 2009-099938 A	07.05.2009
		KR 10-0967924 B1	06.07.2010
US 2008-0215032 A1	04.09.2008	AU 2003-224759 A1	13.10.2003
		AU 2003-224759 B2	03.04.2008
		CA 2479028 A1	09.10.2003
		CN 100363492 C0	23.01.2008
		CN 1639330 A	13.07.2005
		EP 1487976 A2	22.12.2004
		EP 1487976 A4	30.03.2005
		JP 2005-521496 A	21.07.2005
		WO 03-083037 A2	09.10.2003
		WO 03-083037 A3	26.02.2004
US 2010-0231318 A1	16.09.2010	US 7902695 B2	08.03.2011
		WO 2010-104811 A1	16.09.2010
US 7767433 B2	03.08.2010	US 2007-0031959 A1	08.02.2007
		US 2009-0224813 A1	10.09.2009
		US 2010-0141043 A1	10.06.2010
		US 7901929 B2	08.03.2011
		US 7901930 B2	08.03.2011