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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,
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(54) Title: METHOD AND APPARATUS FOR ANTIBODY PRODUCTION AND PURIFICATION

(57) Abstract: The subject invention pertains to methods and apparatus for the production and purification of cell products, such as immunoglobulins. One aspect of the invention is an integrated cell culture and purification apparatus for the growth and maintenance of cells and the harvest and purification of cell products, such as immunoglobulins. Thus, the apparatus integrates a cell culture function with a purification function. Other aspects of the invention pertain to an automated method for producing immunogenic compositions such as vaccines.



INTERNATIONAL SEARCH REPORT

International application No.
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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)

C12M 3/02; C12M 1/00; A61K 31/70; C12N 5/06; A61K 39/095; C07K 1/36; C12M 1/02; C07K 16/06; C12M 3/04; G01N 33/53; C12M 3/00

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: cell, culture, purification, antibody, immunoglobulin, vaccine, etc.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2009-0269841 A1 (WOJCIECHOWSKI, ROBERT J. et al.) 29 October 2009 See claims 1-42; figures 1-31.	1-84
Y	WO 2005-090403 A2 (BIOVEST INTERNATIONAL, INC.) 29 September 2005 See claims 1-45.	1-84
A	US 5571720 A (GRANDICS, PETER et al.) 5 November 1996 See claims 1 and 2.	1-84
A	US 2010-0015696 A1 (CLAES, TOM et al.) 21 January 2010 See claims 1, 4, 8, and 9.	1-84
A	EP 1286696 B1 (STATENS INSTITUTT FOR FOLKEHELSE) 5 March 2003 See claims 1-9.	1-84
A	US 2007-0292410 A1 (CASHMAN, NEIL R. et al.) 20 December 2007 See claims 1, 19, and 20.	1-84

 Further documents are listed in the continuation of Box C. See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date		
US 2009-0269841 A1	29.10.2009	AT 496987 T	15.02.2011		
		DE 602007012238 D1	10.03.2011		
		EP 2027247 A2	25.02.2009		
		EP 2027247 B1	26.01.2011		
		EP 2029722 A1	04.03.2009		
		EP 2404991 A2	11.01.2012		
		US 2009-0215022 A1	27.08.2009		
		WO 2007-136821 A1	29.11.2007		
		WO 2007-139742 A1	06.12.2007		
		WO 2007-139746 A1	06.12.2007		
		WO 2007-139747 A1	06.12.2007		
		WO 2007-139748 A2	06.12.2007		
		WO 2005-090403 A2	29.09.2005	WO 2005-090403 A3	04.05.2006
US 05571720 A	05.11.1996	EP 0455757 A1	13.11.1991		
		EP 0455757 A4	03.02.1993		
		EP 0455757 B1	31.03.1999		
		WO 91-02049 A1	21.02.1991		
US 2010-0015696 A1	21.01.2010	CN 101460605 A	17.06.2009		
		EP 1961806 A2	27.08.2008		
		EP 1961806 A3	25.04.2012		
		EP 2018416 A2	28.01.2009		
		SG 176507 A1	29.12.2011		
		WO 2007-134267 A2	22.11.2007		
		WO 2007-134267 A3	04.09.2008		
EP 1286696 B1	15.11.2006	AP 200202681 D0	31.12.2002		
		AP1690A	31.12.2006		
		AT 345143 T	15.12.2006		
		AU 2001-64427 A1	11.12.2001		
		CA 2410652 A1	06.12.2001		
		DE 60124538 D1	28.12.2006		
		NO 20002828 D0	02.06.2000		
		OA 12278 A	11.05.2006		
		US 2004-0131642 A1	08.07.2004		
		WO 01-91788 A1	06.12.2001		
		US 2007-0292410 A1	20.12.2007	AU 2004-266324 A1	03.03.2005
				AU 2004-266324 B2	06.01.2011
AU 2004-266324 B8	06.01.2011				
AU 2007-219615 A1	07.09.2007				
CA 2437999 A1	20.02.2005				
CA 2536305 A1	03.03.2005				
CA 2642848 A1	07.09.2007				
EP 1668369 A1	14.06.2006				
EP 1989308 A1	12.11.2008				
EP 1989308 A4	30.12.2009				

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/041949

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 2495327 A2	05.09.2012
		EP 2495327 A3	17.10.2012
		EP 2502999 A2	26.09.2012
		EP 2502999 A3	23.01.2013
		JP 2007-502966 A	15.02.2007
		JP 2009-529498 A	20.08.2009
		JP 2010-265290 A	25.11.2010
		JP 4668191 B2	21.01.2011
		US 2006-0246517 A1	02.11.2006
		US 2007-0003977 A1	04.01.2007
		US 2008-0132685 A1	05.06.2008
		US 2008-0206251 A1	28.08.2008
		US 2009-0098151 A1	16.04.2009
		US 2011-0020358 A1	27.01.2011
		US 2011-0124018 A1	26.05.2011
		US 2011-0135673 A1	09.06.2011
		US 2011-305701 A1	15.12.2011
		US 2012-0077212 A1	29.03.2012
		US 7439324 B2	21.10.2008
		US 7763710 B2	27.07.2010
		US 7794692 B2	14.09.2010
		US 7887803 B2	15.02.2011
		US 7977314 B2	12.07.2011
		US 8075891 B2	13.12.2011
		WO 2005-019828 A1	03.03.2005
		WO 2007-098607 A1	07.09.2007