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(81) Designated States (unless otherwise indicated, for every

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WO 2012/031164 A3

(54) Title: DRUG DELIVERY BY CARBON NANOTUBE ARRAYS

(57) Abstract: The invention generally relates to carbon nanotube based drug delivery methods, devices, and compositions. More particularly, the invention relates to controlled drug delivery using anchored carbon nanotube arrays.

A. CLASSIFICATION OF SUBJECT MATTER*A61K 47/24(2006.01)i, A61K 47/26(2006.01)i, A61K 47/32(2006.01)i, A61K 47/48(2006.01)i, A61K 9/00(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)

A61K 47/24; A61L 27/44; A61M 25/10; A61K 9/00; A61K 38/43; A61L 27/54; A61K 47/04

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: carbon nanotube, angioplasty balloon, paclitaxel

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010-087971 A2 (CALIFORNIA INSTITUTE OF TECHNOLOGY) 05 August 2010 See paragraph 00061-00066, claims 4-5, & figure 6.	22-42
Y	US 2010-0010440 A1 (PARSONAGE,E. et al.) 14 January 2010 See paragraph 0023, 0034, example 7, & claim 1.	22-42
Y	SHELLER,B. et al. Paclitaxel balloon coating, a novel method for prevention and therapy of restenosis. Circulation. 2004, Vol.110, pages 810-814 See abstract, & methods on page 811.	22-42
Y	DE LABRIOLLE,A. et al. Paclitaxel-eluting balloon: from bench to bed. Catheterization and cardiovascular intervention. 2009, Vol.73, pages 643-652 See pages 644-646.	22-42
A	US 2008-0193490 A1 (HIRSCH,A. et al.) 14 August 2008 See the whole document.	22-42
A	US 2010-0010470 A1 (BATES,M.C.) 14 January 2010 See the whole document.	22-42

 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

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17 MAY 2012 (17.05.2012)

Name and mailing address of the ISA/KR


 Korean Intellectual Property Office
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 Seo-gu, Daejeon 302-701, Republic of Korea

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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.: 1-21, 43-59
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 1-21, 43-59 pertain to a method for the treatment of the human body by therapy as well as diagnostic methods, and thus relate to a subject matter which this International Searching Authority is not required, under Article 17(2)(a)(i) of the PCT and Rule 39.1(iv) of the Regulations under PCT, to search.
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:

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.:

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2011/050270

Patent document cited in search report	Publication date	Patent family member(s)	Publication date		
WO 2010-087971 A2	05.08.2010	EP 2081869 A2	29.07.2009		
		EP 2381972 A2	02.11.2011		
		US 2008-0145616 A1	19.06.2008		
		US 2009-0130370 A1	21.05.2009		
		US 2010-0196446 A1	05.08.2010		
		US 7955644 B2	07.06.2011		
		US 7959969 B2	14.06.2011		
		WO 2008-097257 A2	14.08.2008		
		WO 2009-064380 A2	22.05.2009		
		WO 2009-064380 A3	22.05.2009		
		WO 2009-064380 A8	22.05.2009		
		WO 2010-087971 A3	23.12.2010		
		WO 2010-087971 A3	05.08.2010		
		US 2010-0010440 A1	14.01.2010	AU 2002-356530 A8	07.04.2003
AU 2002-360251 A1	23.06.2003				
AU 2002-360251 A8	23.06.2003				
CA 2456918 A1	19.06.2003				
CA 2456918 C	22.02.2011				
CA 2457189 A1	03.04.2003				
CA 2457189 C	09.08.2011				
EP 1429683 A2	23.06.2004				
EP 2266501 A2	29.12.2010				
EP 2266501 A3	27.04.2011				
EP 2319453 A1	11.05.2011				
JP 04-460296 B2	19.02.2010				
JP 2005-503865 A	10.02.2005				
JP 2005-511212 A	28.04.2005				
US 2003-0065355 A1	03.04.2003				
US 2003-0093107 A1	15.05.2003				
US 2009-0227944 A1	10.09.2009				
US 7517353 B2	14.04.2009				
US 7591831 B2	22.09.2009				
US 8133250 B2	13.03.2012				
US 8137373 B2	20.03.2012				
WO 03-026532 A2	03.04.2003				
WO 03-026532 A3	03.04.2003				
WO 03-049795 A2	19.06.2003				
WO 03-049795 A3	19.06.2003				
US 2008-0193490 A1	14.08.2008			AU 2003-211042 A1	04.09.2003
				AU 2003-211042 A8	04.09.2003
		CA 2697093 A1	26.02.2009		
		EP 1476198 A2	17.11.2004		
		EP 2190410 A2	02.06.2010		
		JP 04-676701 B2	04.02.2011		
		JP 2006-502966 A	26.01.2006		
		US 2003-0180491 A1	25.09.2003		
		US 2004-0166152 A1	26.08.2004		

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2011/050270

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2004-0241173 A1	02.12.2004
		US 2006-0127470 A1	15.06.2006
		US 2008-0003293 A1	03.01.2008
		US 2011-0045031 A1	24.02.2011
		US 2011-0130580 A1	02.06.2011
		US 7070810 B2	04.07.2006
		US 7758889 B1	20.07.2010
		WO 03-068185 A2	21.08.2003
		WO 03-068185 A3	21.08.2003
		WO 2009-026315 A2	26.02.2009
		WO 2009-026315 A3	21.01.2010
US 2010-0010470 A1	14.01.2010	AU 2009-269104 A1	14.01.2010
		CA 2730273 A1	14.01.2010
		CN 102176932 A	07.09.2011
		EP 2313121 A2	27.04.2011
		JP 2011-527601 A	04.11.2011
		WO 2010-005575 A2	14.01.2010
		WO 2010-005575 A3	03.02.2011