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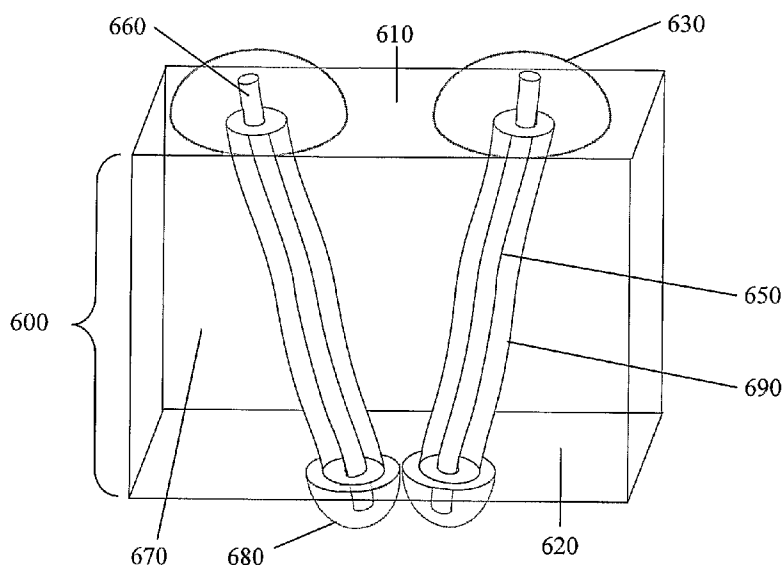
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(54) Title: APPARATUS AND METHODS FOR NANOLITHOGRAPHY USING NANOSCALE OPTICS



(57) Abstract: An apparatus and methods for nanolithography using nanoscale optics are disclosed herein. Submicron-scale structures may be obtained using standard photolithography systems (710) with a de-magnifying lens (600). A de-magnifying lens (600) for use in a standard photolithography system (710) includes a film (670) having a top surface (610), a bottom surface (620) and a plurality of cylindrical channels (160) containing a dielectric material (280); and an array of carbon nanotubes (640) penetrating the film (670) through the plurality of cylindrical channels (160), wherein an image on the top surface (610) of the film (670) is converted into a de-magnified image on the bottom surface (620) of the film (670) by the carbon nanotubes (640).

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G03F 7/00 (2007.01)
USPC - 430/8

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)

USPC - 430/8

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 430/5; and 257/e21.001, 002, 005 (text search - see terms below)

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

PubWEST(USPT,PGPB,EPAB,JPAB);

Search Terms: antenna, nanotube, lithography, optical antenna, demagnifying

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/0027675 A1 (Wu et al.) 12 February 2004 (12.02.2004), entire document	1-24
Y	US 2003/0189235 A1 (Watanabe et al.) 9 October 2003 (09.10.2003), entire document	1-24
Y	US 2005/0062668 A1 (Crowley) 24 March 2005 (24.03.2005), entire document	2-13, 15-18
A	US 2005/0116861 A1 (Anazawa, et al.) 2 June 2005 (02.06.2005)	1-24
A	US 2004/0239210 A1 (Pinkerton et al.) 2 December 2004 (02.12.2004)	1-24

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