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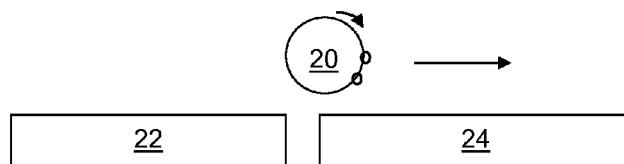
- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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

12 April 2012

(54) Title: SELECTIVE NANOPARTICLE ASSEMBLY SYSTEMS AND METHODS

**FIG. 2B**



(57) **Abstract:** Disclosed are methods and systems for transferring dry or semi-dry nanoparticles onto a substrate. In one embodiment, this includes the steps of providing a roller comprising an elastomeric stamp; transferring nanoparticles in a dry or semi-dry state, and which contact the surface of a donor substrate, from the donor substrate onto the elastomeric stamp; and depositing the dry or semi-dry nanoparticles from the elastomeric stamp onto a receiver substrate by rolling the elastomeric stamp onto the receiver substrate. The substrate, in other embodiments, can have a relief structure.

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## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/US2011/030951****A. CLASSIFICATION OF SUBJECT MATTER*****H01L 21/027(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)

H01L 21/027; H01L 21/28; H01L 21/02

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 modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKOMPASS(KIPO internal) & Keywords:contact printing,imprint, nanoparticles**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0199960 A1 (NUZZO RALPH G. et al.) 13 August 2009 See paragraphs [0036],[0037],[0050],[0070],[0086] and figures 1,2,13,20,21.	1-4,6-8,10,12-29 ,33,34,37 30-32
Y		
Y	MICHEL, B. et al., Printing meets lithography:Soft approaches to high-resolution patterning, IBM J. Res. & Dev, Setember 2001, Vol 45, No. 5, pages 697-719 See page 12 and Fig. 12(c)	30-32
A	KR 10-2009-0127680 A (KOREA INSTITUTE OF MACHINERY & MATERIALS) 14 December 2009 See page 7 and figures 2a-2c.	1-37

 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  
16 FEBRUARY 2012 (16.02.2012)

Date of mailing of the international search report

**17 FEBRUARY 2012 (17.02.2012)**Name and mailing address of the ISA/KR  
 Korean Intellectual Property Office  
 Government Complex-Daejeon, 189 Cheongsa-ro,  
 Seo-gu, Daejeon 302-701, Republic of Korea  
 Facsimile No. 82-42-472-7140

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**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/US2011/030951****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 I, claims [1-29, 33-37] are directed to a method or a system of transferring dry or semi-dry nanoparticles onto a substrate by depositing the nanoparticles from a elastomeric stamp onto a receiver substrate by rolling the elastomeric stamp onto the receiver substrate.

Group II, claims [30-32] are directed to a method of patterning a substrate by removing a portion of the nanoparticles from the substrate surface by rolling a elastomeric stamp onto the substrate surface, whereby remaining nanoparticles on the substrate surface form a negative of a relief structure of the stamp.

The inventions listed as Groups I - II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons; they are separate inventions with distinct fields of search.

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**

<input type="checkbox"/>	The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2011/030951**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0199960 A1	13.08.2009	CN 101120433 A0 CN 101120433 B CN 101632156 A CN 102097458 A EP 1759422 A2 EP 1915774 A2 JP 2007-027693 A JP 2007-281406 A JP 2008-502151 A JP 2009-508322 A KR 10-0798431 B1 KR 10-2007-0037484 A KR 10-2007-0100617 A KR 10-2008-0015921 A TW 284423 B US 2006-0038182 A1 US 2006-0286785 A1 US 2007-0032089 A1 US 2008-0157235 A1 US 2009-0294803 A1 US 2010-0059863 A1 US 2010-0072577 A1 US 2010-0289124 A1 US 7521292 B2 US 7557367 B2 US 7622367 B1 US 7799699 B2 US 7943491 B2 US 7982296 B2 US 8039847 B2 WO 2005-122285 A2 WO 2005-122285 A3 WO 2006-130721 A2 WO 2006-130721 A3	06.02.2008 08.12.2010 20.01.2010 15.06.2011 07.03.2007 30.04.2008 01.02.2007 25.10.2007 24.01.2008 26.02.2009 28.01.2008 04.04.2007 11.10.2007 20.02.2008 21.07.2007 23.02.2006 21.12.2006 08.02.2007 03.07.2008 03.12.2009 11.03.2010 25.03.2010 18.11.2010 21.04.2009 07.07.2009 24.11.2009 21.09.2010 17.05.2011 19.07.2011 18.10.2011 22.12.2005 22.12.2005 07.12.2006 07.12.2006
KR 10-2009-0127680 A	14.12.2009	None	