





# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2012/064755

## 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:

see additional sheet

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 fees, this Authority did not invite payment of additional fees.
  
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.

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A. CLASSIFICATION OF SUBJECT MATTER <b>INV. G03F7/20</b> ADD.		
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) <b>G03F H01L</b>		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) <b>EPO-Internal</b>		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<b>X</b>	<p>AUYEUNG R C Y ET AL: "Laser forward transfer based on a spatial light modulator" ,            APPLIED PHYSICS A; MATERIALS SCIENCE &amp; PROCESSING, SPRINGER, BERLIN , DE,            vol . 102 , no. 1 ,            3 October 2010 (2010-10-03) , pages 21-26,            XP019872341 ,            ISSN : 1432-0630, DOI :            10.1007/S00339-010-6054-9            abstract            sections 1 and 2;            figures 1,2</p> <p style="text-align: center;">-----</p> <p style="text-align: center;">-/- .</p>	<b>1-3 , 9 , 14, 15</b>
<div style="display: flex; justify-content: space-between;"> <div> <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.         </div> <div> <input checked="" type="checkbox"/> See patent family annex.         </div> </div>		
<div style="display: flex;"> <div style="flex: 1;"> <p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="flex: 1;"> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search  <div style="text-align: center; font-size: 1.2em;">30 April 2013</div>		Date of mailing of the international search report  <div style="text-align: center; font-size: 1.2em;">10/05/2013</div>
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer  <div style="text-align: center; font-size: 1.2em;">Weckesser, Jens</div>

## INTERNATIONAL SEARCH REPORT

International application No

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## C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/188016 A1 (DE JAGER PIETER WILLEM HERMAN [NL] ET AL) 4 August 2011 (2011-08-04) paragraphs [0078], [0082], [0160], [0171], [0225] - [0228]; figures 2,15,16,32 -----	1,3,6-15
X	US 5 124 927 A (HOPEWELL WILLIAM D [US] ET AL) 23 June 1992 (1992-06-23) abstract column 6, line 3 - column 8, line 29; figures 2,3,5 column 9, line 66 - column 10, line 25 -----	1,4-7, 14,15
X	US 2008/052925 A1 (HI RASH IMA TAKUYA [JP]) 6 March 2008 (2008-03-06) paragraphs [0039] - [0046], [0055] - [0057]; figure 1 -----	1,3,9, 11-15

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/064755

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011188016 A1	04-08-2011	CN 102203674 A	28-09-2011
		EP 2329322 A2	08-06-2011
		JP 2012503325 A	02-02-2012
		KR 20110073544 A	29-06-2011
		TW 201015244 A	16-04-2010
		US 2011188016 A1	04-08-2011
		WO 2010032224 A2	25-03-2010
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us 5124927 A	23-06-1992	DE 69121261 D1	19-09-1996
		DE 69121261 T2	20-02-1997
		EP 0444450 A1	04-09-1991
		JP H0760789 B2	28-06-1995
		JP H05315220 A	26-11-1993
		US 5124927 A	23-06-1992
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us 2008052925 A1	06-03-2008	CN 101135862 A	05-03-2008
		JP 2008058797 A	13-03-2008
		KR 20080020935 A	06-03-2008
		TW 200817845 A	16-04-2008
		US 2008052925 A1	06-03-2008
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## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3, 9, 14, 15

Closest prior art:

Document D1 (AU YEUNG R C Y ET AL: "Laser forward transfer based on a spatial light modulator", APPLIED PHYSICS A; MATERIALS SCIENCE & PROCESSING, SPRINGER, BERLIN, DE, vol. 102, no. 1, 3 October 2010 (2010-10-03), pages 21-26, XP019872341, ISSN: 1432-0630, DOI: 10.1007/S00339-010-6054-9) discloses the following features, the references in parentheses applying to this document:

A lithographic system (figure 2) comprising:

a lithographic apparatus comprising a projection system configured to project a radiation beam onto a layer of material on or above a substrate (lens L2 and microscope objective);  
an inspection system configured to inspect a pattern formed on the substrate, wherein the pattern is formed on the substrate by application of the radiation beam (page 23, left column, last paragraph, optical microscopy);  
and

a controller configured to control the formation of a pattern by the lithographic apparatus based on data from the inspection system relating to an inspection of a previously exposed pattern

(implicit), wherein

the inspection system is configured to inspect a pattern formed by droplets of the material on the substrate (page 23, left column, second paragraph), and

the lithographic apparatus comprises a programmable patterning device configured to provide a plurality of radiation beams

(figure 2; digital micromirror device DMD),

the projection system is configured to project the plurality of radiation beams

(page 22, left column, last line - page 23, left column, first paragraph).

Special technical feature, taking due account of the description and drawings:

Specific configuration of the lithographic apparatus comprising a programmable patterning device configured to generate a plurality of radiation beams and a projection system configured to project the plurality of radiation beams onto a layer of material above the substrate so as to cause local deposition of droplets of the material by a laser induced material transfer.

Technical effect of this special technical feature:

Improved patterning performance of laser induced material transfer by using a plurality of radiation beams.

Problem solved by this special technical feature:

How to improve the patterning performance of laser induced material transfer.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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## 2. claims : 4-8

Special technical feature, taking due account of the description and drawings:

In-situ inspection during patterning using two inspection systems upstream and downstream of the projection system with respect to the scanning movement of the substrate relative to the projection system, which inspect the substrate before and after patterning.

Technical effect of this special technical feature:

Inspect a pattern formed on the substrate almost instantaneously after it has been formed without interference of underlying layers.

Problem solved by this special technical feature:

Fast and accurate feedback control of the lithographic apparatus.

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## 3. claim: 10

Special technical feature, taking due account of the description and drawings:

Lithographic apparatus in the form of a rotor scanner comprising a programmable patterning device.

Technical effect of this special technical feature:

High-throughput pattern transfer.

Problem solved by this special technical feature:

How to increase the throughput of pattern transfer.

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## 4. claims : 11-13

Special technical feature, taking due account of the description and drawings:

Alignment system configured to image a fiducial marker on the substrate/substrate table at varying instants of time as the substrate moves relative to the projection system, and control the pattern formation based on the comparison of the images taken at different instants of time.

Technical effect of this special technical feature:

Form the pattern precisely on the target position of the substrate.

Problem solved by this special technical feature:

How to form the pattern precisely on the target position of the substrate, when the substrate is moving relative to the projection system.

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