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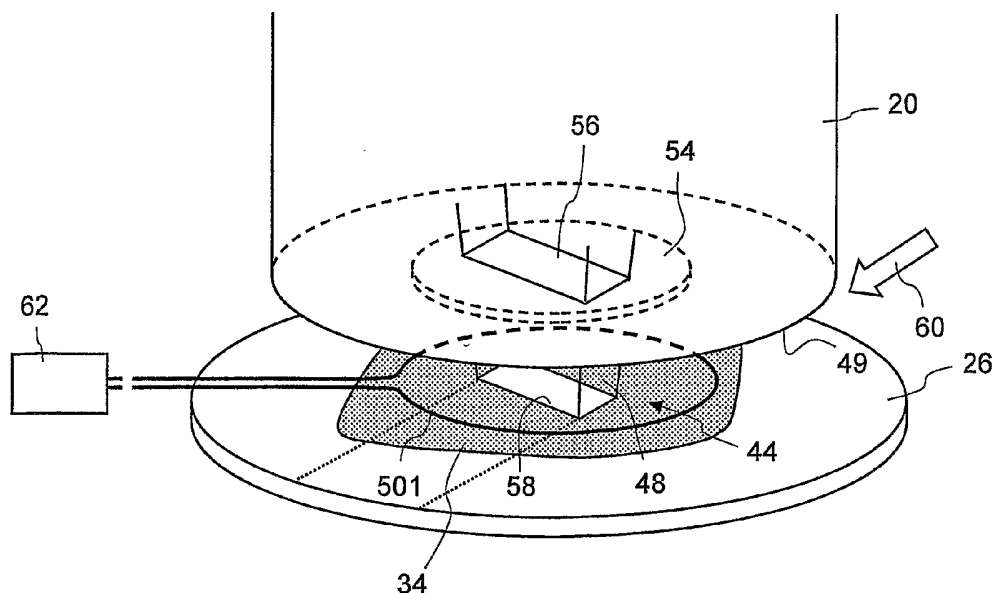
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**Declaration under Rule 4.17:**

— of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: EXPOSURE APPARATUS AND MEASURING DEVICE FOR A PROJECTION LENS



(57) Abstract: A microlithographic projection exposure apparatus includes a projection lens (20) that is configured for immersion operation. For this purpose an immersion liquid (34) is introduced into an immersion space (44) that is located between a last lens (L5; 54) of the projection lens (20) on the image side and a photosensitive layer (26) to be exposed. To reduce fluctuations of refractive index resulting from temperature gradients occurring within the immersion liquid (34), the projection exposure apparatus (10) includes heat transfer elements (50; 501; 502; 503; 504) with which zones of the immersion liquid (34) can be heated or cooled in a specified manner.



**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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

26 May 2006

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP2005/000246

**A. CLASSIFICATION OF SUBJECT MATTER**  
G03F7/20

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)  
G03F H01L

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 practical, search terms used)

EPO-Internal, WPI Data, INSPEC, COMPENDEX

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 610 683 A (TAKAHASHI ET AL) 11 March 1997 (1997-03-11)  abstract figures 1,2	1,5, 22-26, 30-32
Y	column 4, line 55 - column 5, line 20 column 9, lines 6-8 column 6, lines 31-48	27
Y	EP 1 369 743 A (BRION TECHNOLOGIES, INC) 10 December 2003 (2003-12-10) abstract figure 2 paragraph [0048]	27

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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 document 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 another 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

20 December 2005

Date of mailing of the international search report

3. 04. 2006

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2005/000246

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

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>OWA S ET AL: "Immersion lithography; its potential performance and issues" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US, vol. 5040, no. 1, 28 February 2003 (2003-02-28), pages 724-733, XP002294500 ISSN: 0277-786X abstract section 3</p> <p>-----</p>	1,27

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2005/000246

## Box 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 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 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.:

1-14, 22 (as far as referring to claim 1-14), 27-32, 34

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-14,22 (as far as referring to claim 1-14),27-32,34

Prior Art: D1 disclosing a immersion lithography apparatus having an immersion space which is filled by an immersion liquid the temperature of which is varied in a zone of the immersion space by a heat transfer element.

Special technical features (of suitably amended claims): The temperature variation being realised by a heat transfer element which is placed in the immersion space.

Problem solved: The variation of the temperature is controlled more closely.

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2. claims: 15-20,22-26(as far as referring to claims 15-20)

Prior Art: D1 disclosing a immersion lithography apparatus having an immersion space which is filled by an immersion liquid the temperature of which is varied in a zone of the immersion space by a heat transfer element.

Special technical feature: An evaporation barrier is realized around the immersion liquid (the enriched vapor phase department around the liquid of claim 17 is regarded as an evaporation berrier as well).

Problem solved: The loss of fluid is reduced whereby bad immersion conditions are avoided.

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3. claims: 21,22-26(as far as referring to claim 21),33

Prior Art: D1 disclosing a immersion lithography apparatus having an immersion space which is filled by an immersion liquid the temperature of which is varied in a zone of the immersion space by a heat transfer element.

Special technical feature: Claim 21 feature is the container above the immersion space which allows for the immersion liquid flowing as a result of gravity; claim 33 feature is the interruption of liquid flow pumping during exposure action.

Problem solved: Vibrations in the system which would deteriorate exposure are avoided.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2005/000246

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5610683	A	11-03-1997	NONE	
EP 1369743	A	10-12-2003	JP 2004251876 A	09-09-2004
			US 2003226951 A1	11-12-2003
			US 6806456 B1	19-10-2004
			US 2004119036 A1	24-06-2004
			US 2004140418 A1	22-07-2004