

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 July 2004 (08.07.2004)

PCT

(10) International Publication Number
WO 2004/057295 A3

(51) International Patent Classification⁷: G03F 7/20

Ulrich [DE/DE]; Erlenweg 5, 89551 Königsbronn (DE). SCHELLHORN, Uwe [DE/DE]; Hegelstrasse 40, 73431 Aalen (DE). STÜHLER, Joachim [DE/DE]; Han-nah-Arendt-Strasse 9, 73431 Aalen (DE).

(21) International Application Number:
PCT/EP2003/014663

(22) International Filing Date:
19 December 2003 (19.12.2003)

(74) Agent: PATENTANWÄLTE RUFF, WILHELM, BEIER, DAUSTER & PARTNER; Zusammenschluss nr. 16, Kronenstrasse 30, 70174 Stuttgart (DE).

(25) Filing Language: English

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(26) Publication Language: English

(30) Priority Data:
102 61 775.9 20 December 2002 (20.12.2002) DE

(71) Applicant (for all designated States except US): CARL ZEISS SMT AG [DE/DE]; Carl-Zeiss-Strasse 22, 73447 Oberkochen (DE).

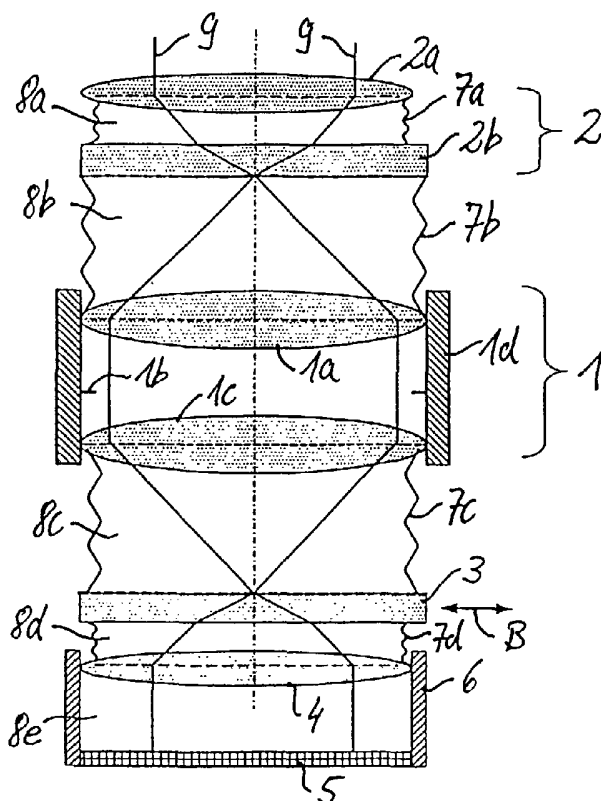
(84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

(72) Inventors; and

(75) Inventors/Applicants (for US only): WEGMANN,

[Continued on next page]

(54) Title: DEVICE AND METHOD FOR THE OPTICAL MEASUREMENT OF AN OPTICAL SYSTEM, A CONTAINER THEREFOR, AND A MICROLITHOGRAPHY PROJECTION EXPOSURE MACHINE



(57) Abstract: The invention relates to a device and a method for the optical measurement of an optical system (1), in particular an optical imaging system, the device comprising one or more object-side test optics components (2a, 2b) to be arranged in front of the optical system to be measured, and/or one or more image-side test optics components (3, 4, 5) to be arranged behind the optical system to be measured, to a container for use in such a device, to a microlithography projection exposure machine equipped with such a device, and to a method which can be carried out with the aid of this device. According to the invention, an immersion fluid can be introduced adjacent to at least one of the one or more object-side test optics components and/or image-side test optics components. Use, for example, for the optical measurement of microlithography projection objectives of high numerical aperture by means of wavefront detection using shearing or point diffraction interferometry or a Moiré measuring technique.

WO 2004/057295 A3



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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

Declaration under Rule 4.17:

— *of inventorship (Rule 4.17(iv)) for US only*

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

11 November 2004

Published:

— *with international search report*

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.

INTERNATIONAL SEARCH REPORT

International Application No

FCT/EP 03/14663

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 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)
IPC 7 G03F G01B

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, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/118370 A1 (NISHIDA HIROYUKI) 29 August 2002 (2002-08-29) paragraphs '0003!, '0064! - '0073! figure 1	1-3,6, 15,16
X	US 4 965 630 A (OHNO KOICHI ET AL) 23 October 1990 (1990-10-23) column 2, lines 3-16 column 6, lines 44-50 figures 1,6	1,2,15, 16
X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 05, 3 May 2002 (2002-05-03) -& JP 2002 022606 A (SONY CORP), 23 January 2002 (2002-01-23) abstract	1-3,6, 15,16
	----- -/-- -----	

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

14 September 2004

Date of mailing of the international search report

24/09/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Eisner, K

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/14663

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE WPI Section EI, Week 198241 Derwent Publications Ltd., London, GB; Class S02, AN 1982-N5379E XP002296076 -& SU 890 067 A (MOSCOW BAUMAN TECH COLL) 15 December 1981 (1981-12-15) abstract; figure 1 -----	1,2,4,6, 10,15,16
E	WO 2004/053596 A (CARL ZEISS SMT AG ; GRAEUPNER PAUL (DE)) 24 June 2004 (2004-06-24) page 11, line 28 - page 12, line 13 figure 1 -----	1,2,7, 15,16
A	WO 01/63233 A (ZEISS CARL ; ZEISS STIFTUNG (DE)) 30 August 2001 (2001-08-30) the whole document -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/14663

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
US 2002118370 A1	29-08-2002	JP 2002250678 A	06-09-2002	
US 4965630 A	23-10-1990	JP 2166719 A JP 2679195 B2	27-06-1990 19-11-1997	
JP 2002022606 A	23-01-2002	NONE		
SU 890067 A	15-12-1981	SU 890067 A1	15-12-1981	
WO 2004053596 A	24-06-2004	DE 10257766 A1 WO 2004053596 A2	15-07-2004 24-06-2004	
WO 0163233 A	30-08-2001	DE 10109929 A1 WO 0163233 A2 EP 1257882 A2 JP 2003524175 T TW 550377 B US 2002001088 A1	22-11-2001 30-08-2001 20-11-2002 12-08-2003 01-09-2003 03-01-2002	