



- (51) International Patent Classification:  
*G03F 7/20* (2006.01) *H05G 2/00* (2006.01)
- (21) International Application Number:  
PCT/EP2013/051093
- (22) International Filing Date:  
22 January 2013 (22.01.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
61/601,728 22 February 2012 (22.02.2012) US
- (71) Applicant: **ASML NETHERLANDS B.V.** [NL/NL]; P.O. Box 324, NL-5500 AH Veldhoven (NL).
- (72) Inventors: **SCHIMMEL, Hendrikus, Gijsbertus**; Tweede Westerparklaan 187, NL-3544 VP Utrecht (NL). **LABETSKI, Dzmityr**; Alberdingk Thijmstraat 19, NL-3532 VL Utrecht (NL).
- (74) Agent: **SIEM, Max Yoe Shé**; P.O. Box 324, NL-5500 AH Veldhoven (NL).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

- 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:  
17 October 2013

(54) Title: FUEL STREAM GENERATOR, SOURCE COLLECTOR APPARATUS AND LITHOGRAPHIC APPARATUS

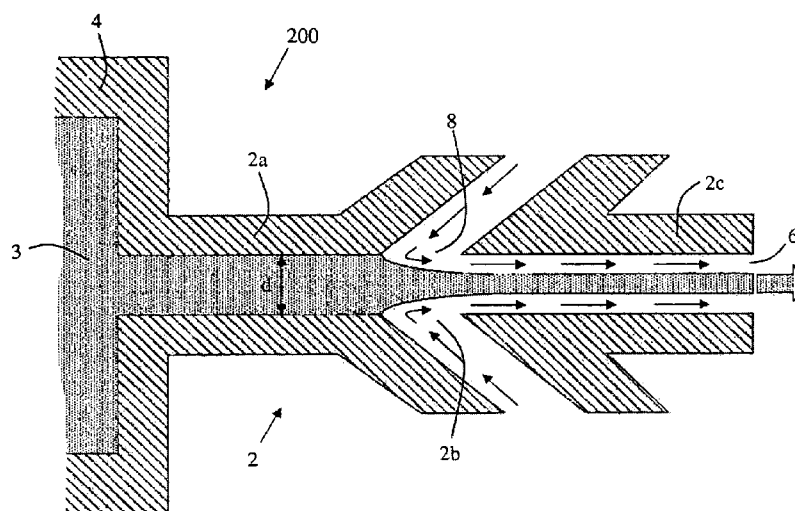


Figure 3

(57) Abstract: A fuel stream generator comprising a nozzle connected to a fuel reservoir, wherein the nozzle is provided with a gas inlet configured to provide a sheath of gas around fuel flowing along the nozzle is disclosed. Also disclosed are a method of generating fuel droplets and a lithography apparatus incorporating the fuel stream generator.



INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2013/051093

A. CLASSIFICATION OF SUBJECT MATTER  
INV. G03F7/20 H05G2/00  
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)  
G03F H05G B05B C23C

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)

EPO-Internal, 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         | WO 2011/082891 A1 (ASML NETHERLANDS BV [NL]; MESTROM WILBERT [NL]; LOOPSTRA ERIK [NL]; Sw) 14 July 2011 (2011-07-14) | 1-11,<br>14-28,<br>31-34 |
| Y         | paragraph [0034] - paragraph [0047];<br>figures 2,3a,3b  | 12,13,<br>29,30          |
| X         | -----<br>US 2006/043319 A1 (GAEBEL KAI [DE] ET AL) 2 March 2006 (2006-03-02)   | 1,14-18,<br>31-34        |
| X         | -----<br>US 2003/223546 A1 (MCGREGOR ROY D [US] ET AL) 4 December 2003 (2003-12-04)                                  | 1,14-16,<br>18,31-33     |
|           | -----<br>-/--  |                          |

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 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 | Date of mailing of the international search report |
| 6 August 2013   | 21/08/2013   |

|  |   |
|--|---|
| Name and mailing address of the ISA/<br>European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Authorized officer<br><br>van Toledo, Wiebo |
|--|---|

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2013/051093

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |  |                       |
|--|--|-----------------------|
| Category*  | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
| X  | WO 2011/116898 A1 (ETH ZUERICH [CH];<br>ABHARI REZA [CH]; GIOVANNINI ANDREA [CH])<br>29 September 2011 (2011-09-29)<br>page 9, line 10 - line 28; figures 2,5<br>----- | 1,14-16,<br>18,31-33  |
| X  | US 4 370 538 A (BROWNING JAMES A)<br>25 January 1983 (1983-01-25)<br>column 3, line 4 - column 5, line 56;<br>figures 1,2<br>-----                                     | 1                     |
| Y  | US 2010/200776 A1 (YABU TAKAYUKI [JP] ET<br>AL) 12 August 2010 (2010-08-12)<br>paragraph [0084]<br>-----   | 12,13,<br>29,30       |
| Y  | US 2006/192153 A1 (BYKANOV ALEXANDER N<br>[US] ET AL) 31 August 2006 (2006-08-31)<br>paragraph [0030] - paragraph [0032]<br>-----                                      | 12,13,<br>29,30       |
| A  | EP 1 150 169 A2 (TRW INC [US] NORTHROP<br>GRUMMAN CORP [US])<br>31 October 2001 (2001-10-31)<br>the whole document<br>-----  | 1,14-18,<br>31-34     |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

|   |
|---|
| International application No<br>PCT/EP2013/051093 |
|---|

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date  |  |
|--|------------------|-------------------------|---|--|
| WO 2011082891                          | A1               | 14-07-2011              | CN 102696283 A<br>JP 2013516773 A<br>KR 20120112521 A<br>US 2012280149 A1<br>WO 2011082891 A1                         | 26-09-2012<br>13-05-2013<br>11-10-2012<br>08-11-2012<br>14-07-2011                             |
| US 2006043319                          | A1               | 02-03-2006              | DE 102004042501 A1<br>JP 2006086119 A<br>US 2006043319 A1   | 16-03-2006<br>30-03-2006<br>02-03-2006   |
| US 2003223546                          | A1               | 04-12-2003              | EP 1367441 A2<br>JP 4349484 B2<br>JP 2004006365 A<br>US 2003223546 A1   | 03-12-2003<br>21-10-2009<br>08-01-2004<br>04-12-2003   |
| WO 2011116898                          | A1               | 29-09-2011              | NONE  |  |
| US 4370538                             | A                | 25-01-1983              | NONE  |  |
| US 2010200776                          | A1               | 12-08-2010              | JP 2010199560 A<br>US 2010200776 A1   | 09-09-2010<br>12-08-2010   |
| US 2006192153                          | A1               | 31-08-2006              | US 2006192153 A1<br>WO 2006093782 A2  | 31-08-2006<br>08-09-2006   |
| EP 1150169                             | A2               | 31-10-2001              | CN 1320840 A<br>DE 60103949 D1<br>DE 60103949 T2<br>EP 1150169 A2<br>JP 3118515 U<br>JP 2001319800 A<br>US 6661018 B1 | 07-11-2001<br>29-07-2004<br>11-11-2004<br>31-10-2001<br>02-02-2006<br>16-11-2001<br>09-12-2003 |