

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 April 2006 (13.04.2006)

PCT

(10) International Publication Number
WO 2006/038952 A2

(51) International Patent Classification:
G03B 27/04 (2006.01)

(21) International Application Number:

PCT/US2005/025454

(22) International Filing Date: 18 July 2005 (18.07.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/614,426 30 September 2004 (30.09.2004) US

(71) Applicant (for all designated States except US): **NIKON CORPORATION** [JP/JP]; Fuji Building, 2-3 Marunouchi 3-Chome, Chiyoda-Ku, Tokyo 100-8331 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **EBIHARA, Akimitsu** [JP/JP]; Toshiken 01 #205 3650-37, Oaza-Higashikata, Fukaya-shi, Saitama 205-3650-37 (JP). **LEE, Martin, E.** [US/US]; 1072 S. De Anza Boulevard, #372, San Jose, California 95129 (US). **YUAN, Bausan** [US/US]; 1577 Elmar Way, San Jose, California 95129 (US).

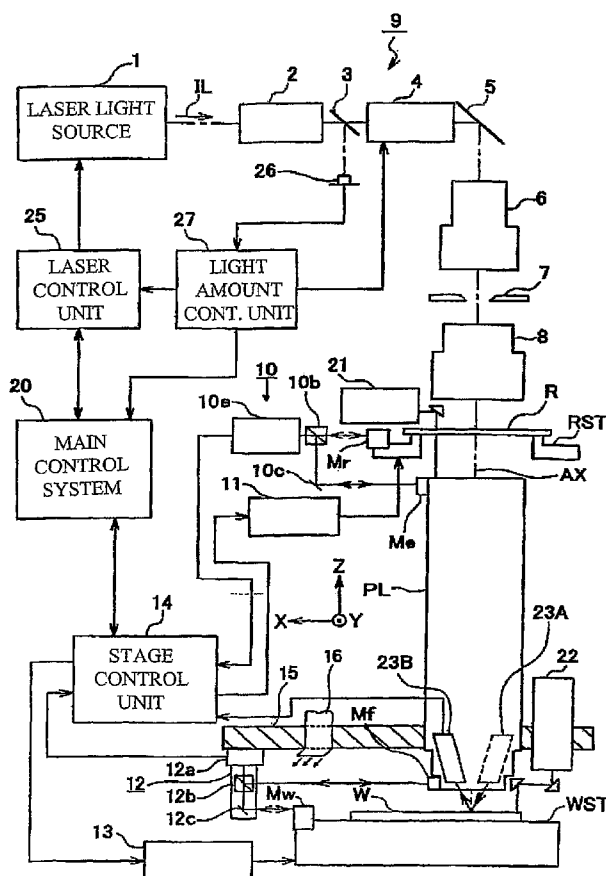
(74) Agent: **COSTANTINO, Mario, A.**; Oliff & Berridge PLC, 277 South Washington Street, Alexandria, Virginia 22314 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): 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, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,

[Continued on next page]

(54) Title: PROJECTION OPTICAL DEVICE AND EXPOSURE APPARATUS



(57) Abstract: A projection optical device includes a projection optical system which projects an image of a pattern, a support device having a flexible structure to support the projection optical system, and a positioning device having an actuator to position the projection optical system. The projection optical device can include a frame to which one end of the flexible structure is attached. The projection optical system may hang from the frame via the support device, or it may be supported from below by the support device. A projection optical device also can include a liquid supply which supplies a temperature-controlled liquid to a side surface of a projection optical system utilizing gravity to cause the temperature-controlled liquid to flow along the side surface of the projection optical system.



RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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.

Published:

— *without international search report and to be republished upon receipt of that report*