

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
25 August 2005 (25.08.2005)

PCT

(10) International Publication Number
WO 2005/077110 A2

(51) International Patent Classification: Not classified

(21) International Application Number:
PCT/US2005/004507

(22) International Filing Date: 10 February 2005 (10.02.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/543,613 11 February 2004 (11.02.2004) US
11/054,205 9 February 2005 (09.02.2005) US

(71) Applicant (for all designated States except US): **SIOPTICAL, INC.** [US/US]; 7540 Windsor Drive, Lower Level, Allentown, PA 18195 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **GHIRON, Margaret** [US/US]; 1875 Sherwood Road, Allentown, PA 18103 (US). **GOTHOSKAR, Prakash** [IN/US]; 6749 Windermere Court, Allentown, PA 18104 (US). **MONTGOMERY, Robert, Keith** [US/US]; 810 Howe Street, Easton, PA 18040 (US). **PATEL, Vipulkumar**

[US/US]; 8916 Grady Drive, Breinigsville, PA 18031 (US). **PATHAK, Soham** [US/US]; 6099 Palomino Drive, Allentown, PA 18106 (US). **SHASTRI, Kalpendu** [US/US]; 5529 Willow Way, Orefield, PA 18069 (US). **YANUSHEFSKI, Katherine, A.** [US/US]; 7487 Stein Road, Zionsville, PA 18092 (US).

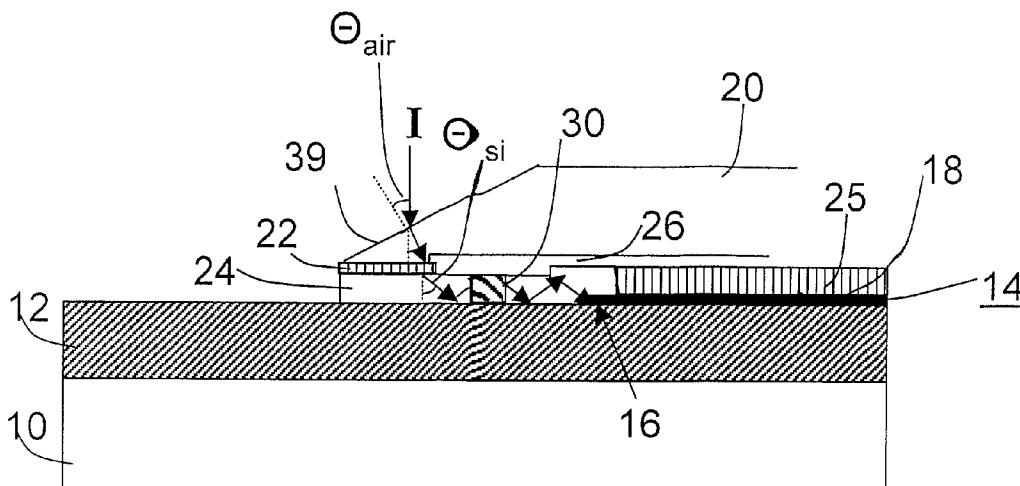
(74) Agent: **KOBA, Wendy, W.**; P.O. Box 556, Springtown, PA 18081 (US).

(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, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, 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.

(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,

[Continued on next page]

(54) Title: SILICON NANOTAPER COUPLERS AND MODE-MATCHING DEVICES



(57) Abstract: An arrangement for providing optical coupling between a free-space propagating optical signal and an ultrathin silicon waveguide formed in an upper silicon layer of a silicon-on-insulator (SOI) structure includes a silicon nanotaper structure formed in the upper silicon layer (SOI layer) of the SOI structure and coupled to the ultrathin silicon waveguide. A dielectric waveguide coupling layer, with a refractive index greater than the index of the dielectric insulating layer but less than the refractive index of silicon, is disposed so as to overly a portion of the dielectric insulating layer in a region where an associated portion of the SOI layer has been removed. An end portion of the dielectric waveguide coupling layer is disposed to overlap an end section of the silicon nanotaper to form a mode conversion region between the free-space propagating optical signal and the ultrathin silicon waveguide. A free-space optical coupling arrangement (such as a prism or grating) is disposed over the dielectric waveguide coupling layer and used to couple a propagating optical signal between free space and the dielectric waveguide coupling layer and thereafter into the ultrathin silicon waveguide.

WO 2005/077110 A2



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, MC, NL, PL, PT, 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*