

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
13 May 2004 (13.05.2004)

PCT

(10) International Publication Number
WO 2004/040720 A3

(51) International Patent Classification⁷: **H01S 5/187**, 5/42

Shallow Creek Lane, Plano, TX 75025 (US). **JOHNSON, Klein, L.**; 2845 Wear Circle, Orono, MN 55356 (US).

(21) International Application Number:
PCT/US2003/033611

(74) Agents: **ISRAELSEN, R. Burns** et al.; Workman, Nydegger & Seeley, 1000 Eagle Gate Tower, 60 East South Temple, Salt Lake City, UT 84111 (US).

(22) International Filing Date: 24 October 2003 (24.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/283,381 28 October 2002 (28.10.2002) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, 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, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant: **FINISAR CORPORATION** [US/US]; 1308 Moffett Park Drive, Sunnyvale, CA 94089-1133 (US).

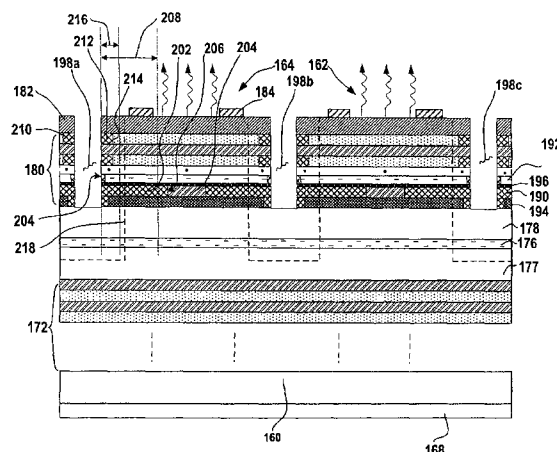
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors: **JOHNSON, Ralph, H.**; 211 Ridgeview Drive, Collin, TX 75094 (US). **HAWTHORNE, Robert, A.**; 2602 Lancaster Street, Garland, TX 75044 (US). **BIARD, James, R.**; 207 Martha Manor, Richardson, TX 75081 (US). **GUENTER, James, K.**; 214 Coral Ridge Drive, Garland, TX 75044 (US). **TATUM, Jimmy, A.**; 701

Published:
— with international search report

[Continued on next page]

(54) Title: DISTRIBUTED BRAGG REFLECTOR FOR OPTOELECTRONIC DEVICE



(57) Abstract: An oxide-confined VCSELs(100) having a distributed Bragg reflector (180, 238) with a heavily doped high Al content oxide aperture forming layer (190, 140) disposed between a low Al content first layer (192, 142) and a medium Al content second layer (194, 144). Between the first layer and the oxide aperture forming layer there may be a thin transition region (196, 146) wherein the Al content changes from a higher Al content to a lower Al content. In some embodiments, the Al concentration from the oxide aperture forming layer (190, 140) to the second layer (194, 144) may occur in a step. The oxide aperture forming layer (190, 140) may be disposed at or near a null or a node (y) of the electric field produced by resonant laser light. During the oxidation of the oxide aperture forming layer, all or some of the other aluminum bearing DBR layers (180) may also become oxidized, but to a substantially lesser degree. The junction (214) between the oxidized portion (212) and un-oxidized portion of these layers (180) as well as reducing the oxidation of other aluminum bearing layers of the DBR (180).



WO 2004/040720 A3



— *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:

10 September 2004