

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
3 January 2008 (03.01.2008)

PCT

(10) International Publication Number
WO 2008/002904 A2

(51) International Patent Classification:
H01J 7/26 (2006.01)

(21) International Application Number:
PCT/US2007/072096

(22) International Filing Date: 26 June 2007 (26.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/805,856 26 June 2006 (26.06.2006) US
11/768,067 25 June 2007 (25.06.2007) US

(71) Applicant (for all designated States except US): **THERMAL PROCESSING SOLUTIONS, INC.** [US/US];
16394 Downey Avenue, Paramount, CA 90723 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **PARKS, Richard, W.** [US/US]; 5935 Loomis Street, Lakewood, CA 90713 (US). **RAGAY, Peter, G.** [US/US]; 5400 Orangethorpe Avenue, #24, La Palma, CA 90623 (US). **GARCIA, Luis Alejandro, Rey** [US/US]; 3997 Vernon Street, Long Beach, CA 90815 (US). **KRUZEK, Raymond, G.** [US/US]; 1149 Cypress Point Lane, #108, Ventura, CA 93003 (US).

(74) Agent: **DULIN, Jacques, M.**; Innovation Law Group, Ltd., 237 N. Sequim, Avenue, Sequim, WA 98382 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, 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, MT, 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).

Declarations under Rule 4.17:

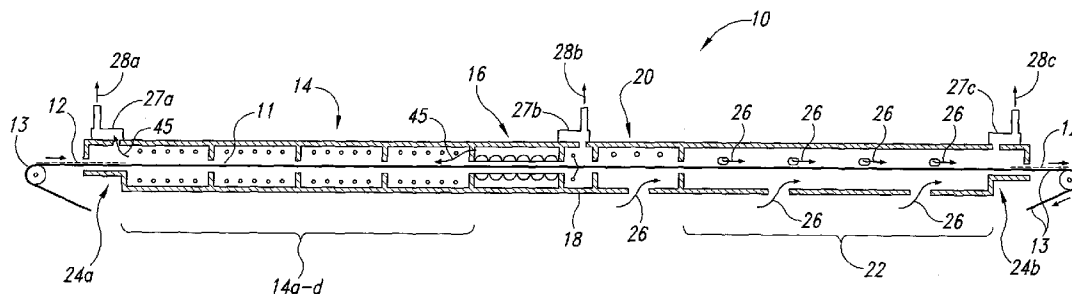
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- without international search report and to be republished upon receipt of that 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.

(54) Title: RAPID THERMAL FIRING IR CONVEYOR FURNACE HAVING HIGH INTENSITY HEATING SECTION



(57) Abstract: Isolation IR heat lamp module and method of firing multi-zone IR furnaces for solar cell processing comprising lamps disposed in individual parallel channels in a reflector/insulator body to provide a cooling air channel surrounding each tube; the channels are covered with IR-transmissive plate material to isolate each lamp from adjacent lamps and the process zone. Cooling air is exhausted and recycled upstream for energy conservation. Lamp spacing can be varied and power to each lamp individually controlled to provide infinite control of temperature profile in each heating zone. For a spike zone, and in combination with downstream quench control and annealing zones, steep heating and cooling curves with very short dwell (sharp) peak temperature profiles permit faster throughput due to operation of the lamps at essentially 100 % rated capacity, at a 2X or greater heating and throughput rate without compromising lamp life, while producing solar cells with improved output efficiency.

WO 2008/002904 A2