

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 March 2003 (20.03.2003)

PCT

(10) International Publication Number
WO 03/023814 A3

(51) International Patent Classification⁷: **H01J 37/34**,
C23C 14/35

(21) International Application Number: PCT/US02/28403

(22) International Filing Date:
6 September 2002 (06.09.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/949,181 7 September 2001 (07.09.2001) US

(71) Applicant: **SPUTTERED FILMS, INC.** [US/US]; 320
Nopal Street, Santa Barbara, CA 93103 (US).

(72) Inventor: **CLARKE, Peter, J.**; 304 Junipero Plaza, Santa
Barbara, CA 93105 (US).

(74) Agents: **PARKHURST, David, G.** et al.; Fulwider Patton
Lee & Utecht, LLP, Howard Hughes Center, Tenth Floor,
6060 Center Drive, Los Angeles, CA 90045 (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, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC,
VN, YU, ZA, ZM, ZW.

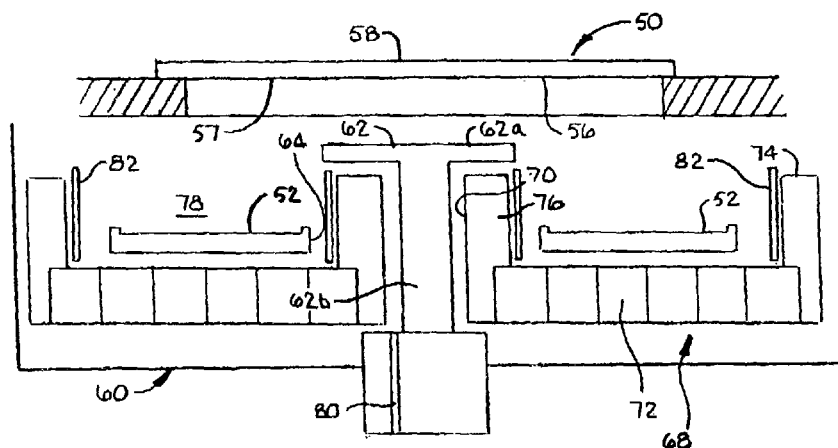
(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK,
TR), OAPI patent (BF, BJ, CF, CG, CI,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

Published:
— with international search report

(88) Date of publication of the international search report:
28 August 2003

[Continued on next page]

(54) Title: FLAT MAGNETRON SPUTTER APPARATUS



(57) **Abstract:** An electric field is provided in a first direction between an anode and a target having a flat disposition. A magnetic field is provided such that the magnetic flux lines are in a second direction substantially perpendicular to the first direction. The magnet structure may be formed from permanent magnets extending radially in a horizontal direction, like the spokes of a wheel, and from magnetizable pole pieces extending vertically from the opposite ends of the spokes. The permanent magnets and the pole pieces define a well. The target is disposed in the well so that its flat disposition is in the same direction as the magnetic flux lines. Molecules of an inert gas flow through the well. Electrons in the well move in a third direction substantially perpendicular to the first and second directions. The electrons ionize molecules of the inert gas. The ions are attracted to the target and sputter atoms from the surface of the target. The sputtered atoms become deposited on a substrate. Reflectors in the well near the radially outer walls of the magnet structures, and also in one embodiment near the radially inner walls of the magnet structures, prevent the electrons from striking the permanent magnets. The reflectors and the anode are cooled by a fluid (e.g. water). The resultant magnetron sputters as much as 65% of the material from the target on the substrate in contrast to a sputtering of approximately 35% of material from the targets on substrates in the prior art.



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.