PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H01J 37/32

A1

(11) International Publication Number: WO 99/57746

(43) International Publication Date: 11 November 1999 (11.11.99)

(21) International Application Number: PCT/US99/10087

(22) International Filing Date: 5 May 1999 (05.05.99)

(30) Priority Data:
09/073,141 6 May 1998 (06.05.98) US

(71) Applicants: TOKYO ELECTRON ARIZONA, INC. [US/US]; 2120 W. Guadalupe Road, Gilbert, AZ 85233-8205 (US). TOKYO ELECTRON LIMITED [JP/JP]; TBS Broadcast Center, 3-6, Akasaka 5-chome, Minato-ku, Tokyo 107 (JP).

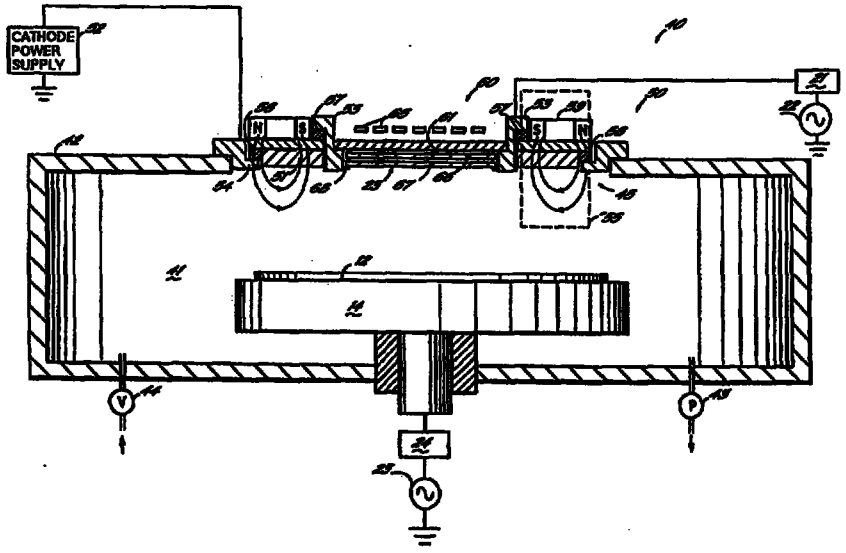
(72) Inventors: DREWERY, John, S.; 3945 East Kael Circle, Mesa, AZ 85215 (US). LICATA, Thomas, J.; 2440 E. Menlo Street, Mesa, AZ 85213 (US).

(74) Agents: JORDAN, Joseph, R. et al.; Wood, Herron & Evans, L.L.P., 2700 Carew Tower, Cincinnati, OH 45202 (US).

(81) Designated States: CH, CN, DE, GB, JP, KR, SG, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHOD AND APPARATUS FOR IONIZED PHYSICAL VAPOR DEPOSITION



(57) Abstract

Ionized physical vapor deposition (IPVD) is provided by a method of apparatus (40) for sputtering conductive metal coating material from an annular magnetron sputtering target (51). The sputtered material is ionized in a processing space within the chamber 41 between the target (51) and a substrate by generating a dense plasma in the space with energy coupled from a coil (65, 75) located outside of the vacuum chamber behind a dielectric window (61, 71, 81) in the chamber wall (42) at the center of the opening in the sputtering target (51). Faraday type shields (66, 67) physically shield the window to prevent coating material from coating the window, while allowing the inductive coupling of energy from the coil into the processing space. The location of the coil (65) in the plane of the target or behind the target allows the target to wafer spacing to be chosen to optimize film deposition rate and uniformity, and also provides for the advantages of a ring-shaped source without the problems associated with unwanted deposition in the opening at the target center.