



US007811421B2

(12) **United States Patent**
Chistyakov

(10) **Patent No.:** **US 7,811,421 B2**
(45) **Date of Patent:** ***Oct. 12, 2010**

- (54) **HIGH DEPOSITION RATE SPUTTERING**
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- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 896 days.

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(57) **ABSTRACT**

Methods and apparatus for high-deposition sputtering are described. A sputtering source includes an anode and a cathode assembly that is positioned adjacent to the anode. The cathode assembly includes a sputtering target. An ionization source generates a weakly-ionized plasma proximate to the anode and the cathode assembly. A power supply produces an electric field between the anode and the cathode assembly that creates a strongly-ionized plasma from the weakly-ionized plasma. The strongly-ionized plasma includes a first plurality of ions that impact the sputtering target to generate sufficient thermal energy in the sputtering target to cause a sputtering yield of the sputtering target to be non-linearly related to a temperature of the sputtering target.

48 Claims, 13 Drawing Sheets

- (21) Appl. No.: **11/183,463**
- (22) Filed: **Jul. 18, 2005**
- (65) **Prior Publication Data**
US 2005/0252763 A1 Nov. 17, 2005

Related U.S. Application Data

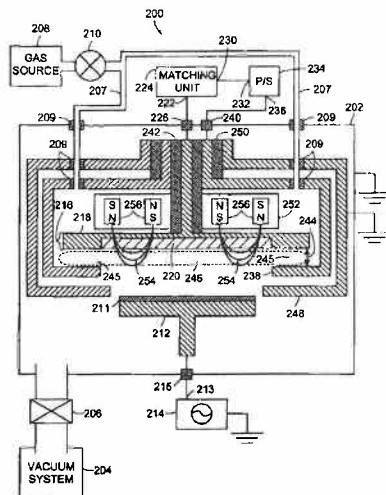
- (63) Continuation of application No. 11/091,814, filed on Mar. 28, 2005, now abandoned.

- (51) **Int. Cl.**
C23C 14/35 (2006.01)
- (52) **U.S. Cl.** **204/192.12; 204/298.08; 204/298.06**
- (58) **Field of Classification Search** **204/192.12, 204/298.06, 298.08**
See application file for complete search history.

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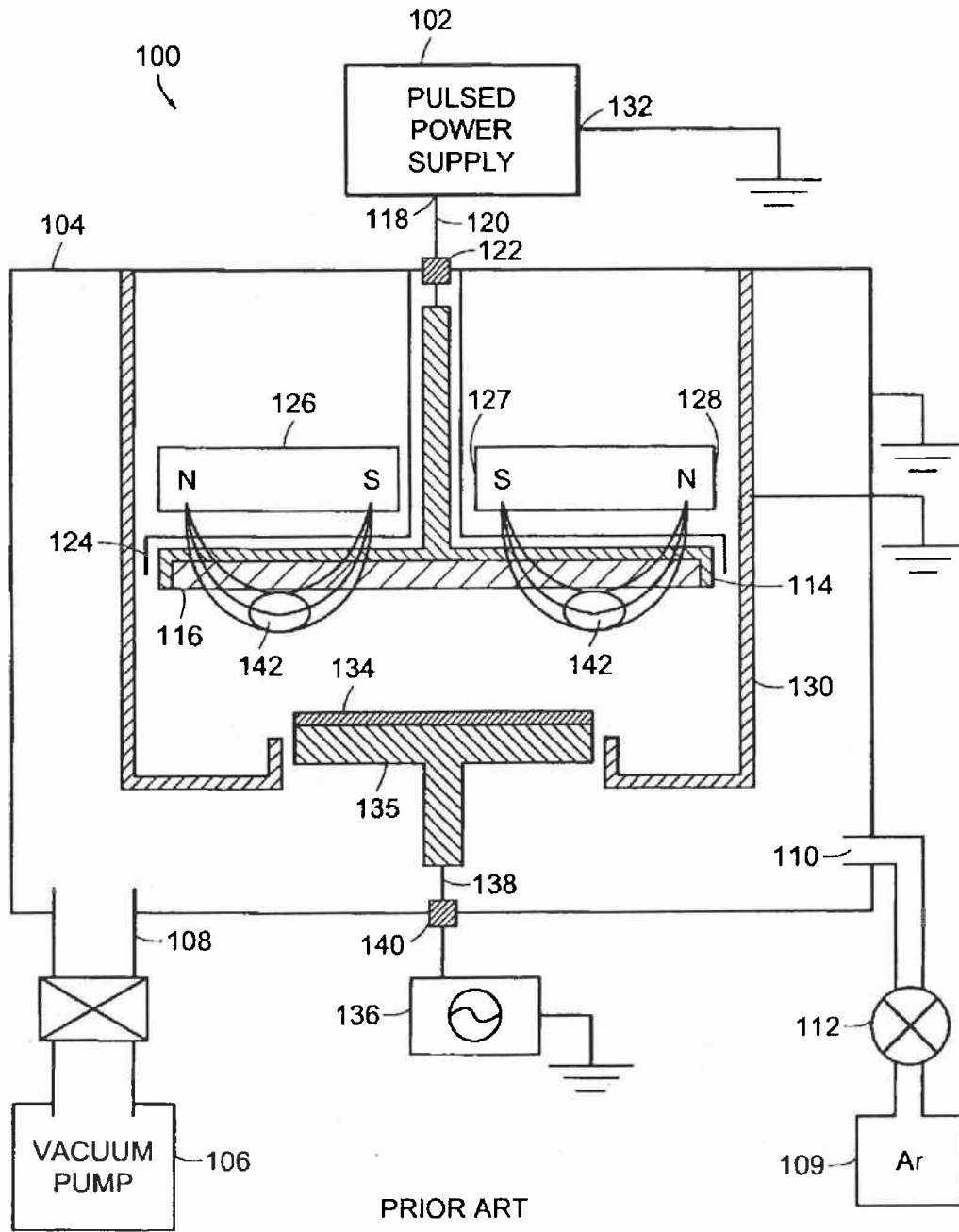
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PRIOR ART
FIG. 1

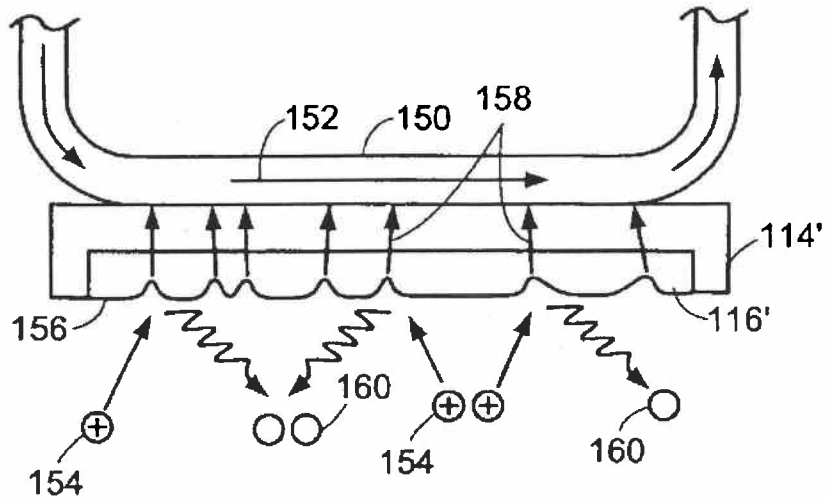


FIG. 2
PRIOR ART

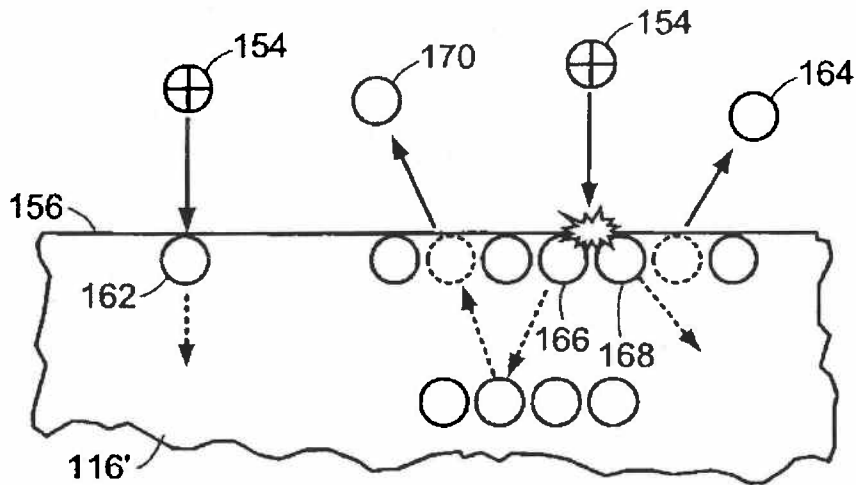


FIG. 3
PRIOR ART

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