



United States Patent [19]

[11] **Patent Number:** 5,830,327

Kolenkow

[45] **Date of Patent:** Nov. 3, 1998

[54] **METHODS AND APPARATUS FOR SPUTTERING WITH ROTATING MAGNET SPUTTER SOURCES**

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[21] Appl. No.: **724,792**

[57] **ABSTRACT**

[22] Filed: **Oct. 2, 1996**

A magnetron sputtering source for forming a sputtered film on a substrate in a magnetron sputtering apparatus includes a target having a surface from which material is sputtered and a magnet assembly that is rotatable about an axis of rotation with respect to the target. The magnet assembly produces on the target an erosion profile that is calculated to yield a desired depositional thickness distribution and inventory. A method for configuring the rotatable magnet assembly includes the steps of determining an optimal erosion profile that yields the desired depositional thickness distribution and inventory, determining a plasma track on the surface of the target that produces an acceptable approximation to the optimal erosion profile, and determining a magnet structure that produces the plasma track.

[51] **Int. Cl.⁶** **C23C 14/34**

[52] **U.S. Cl.** **204/192.12; 204/298.19; 204/298.2; 204/298.26**

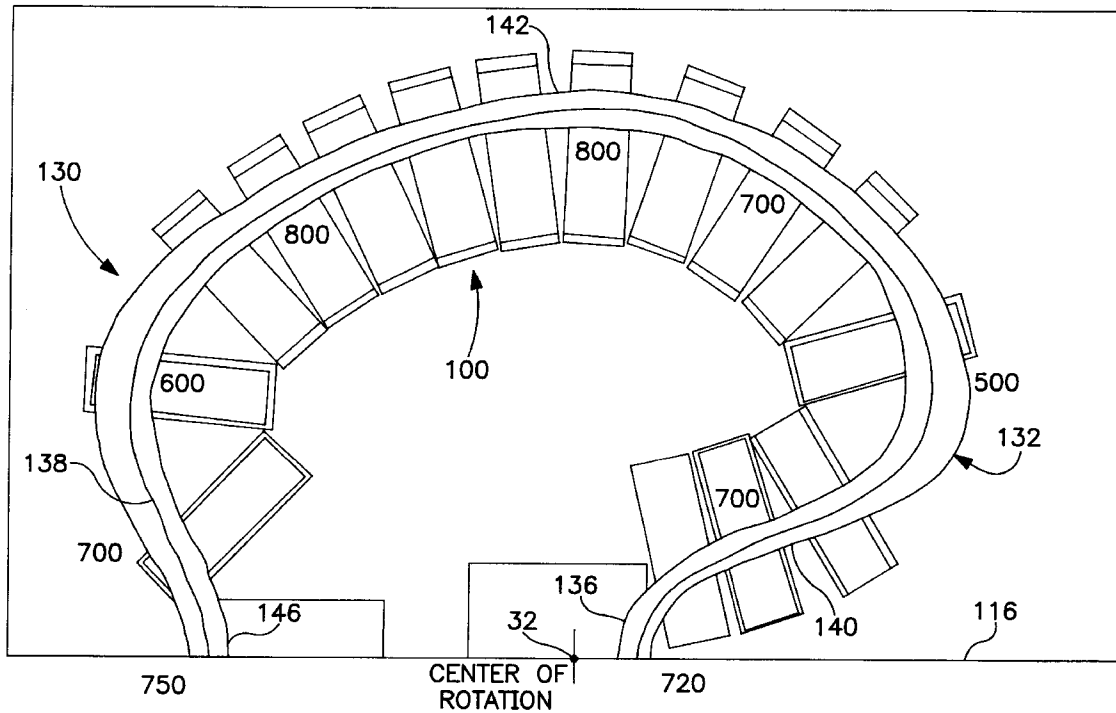
[58] **Field of Search** 204/192.12, 298.19, 204/298.2, 298.26, 192.2, 298.25

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17 Claims, 15 Drawing Sheets



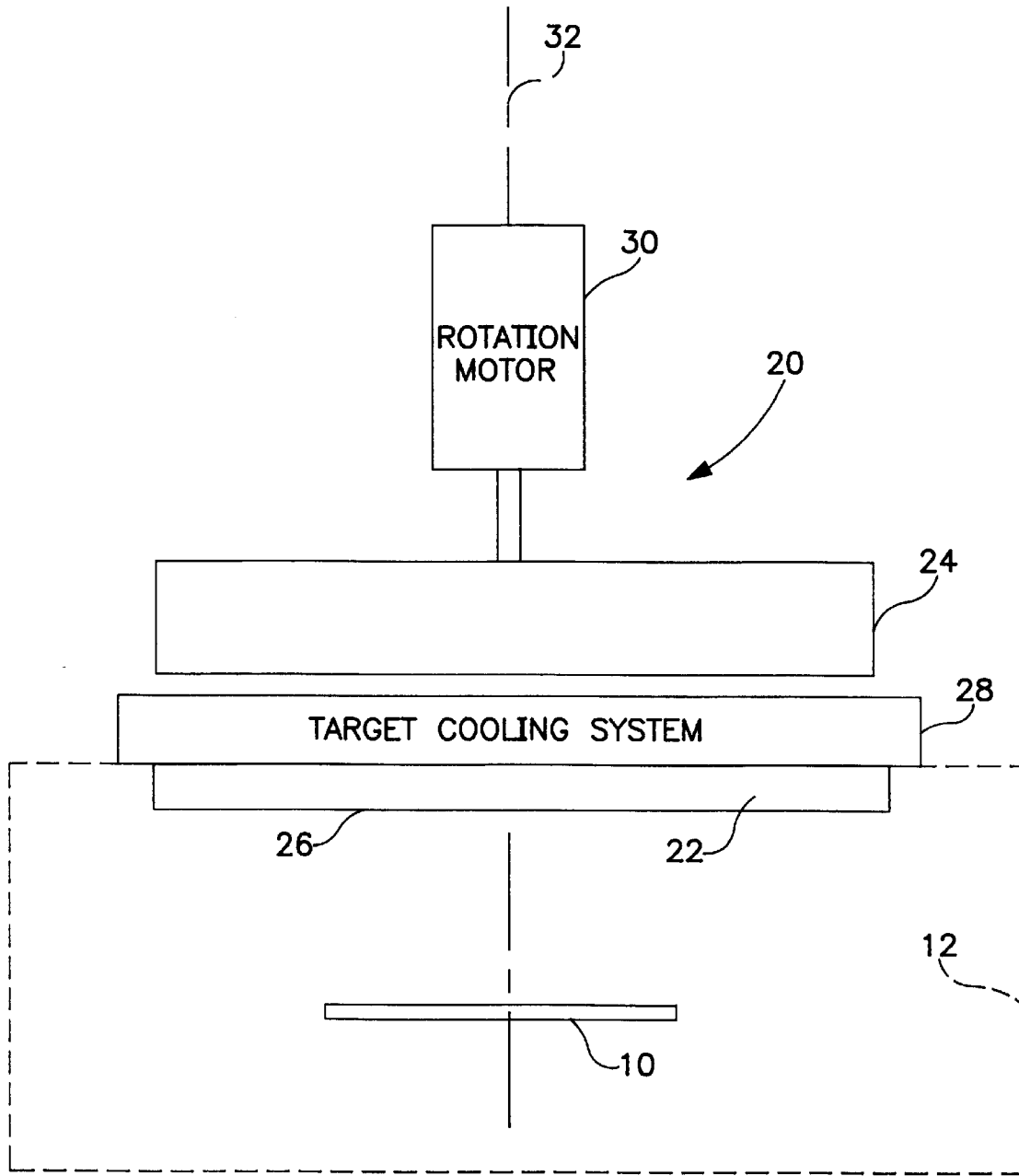


FIG. 1

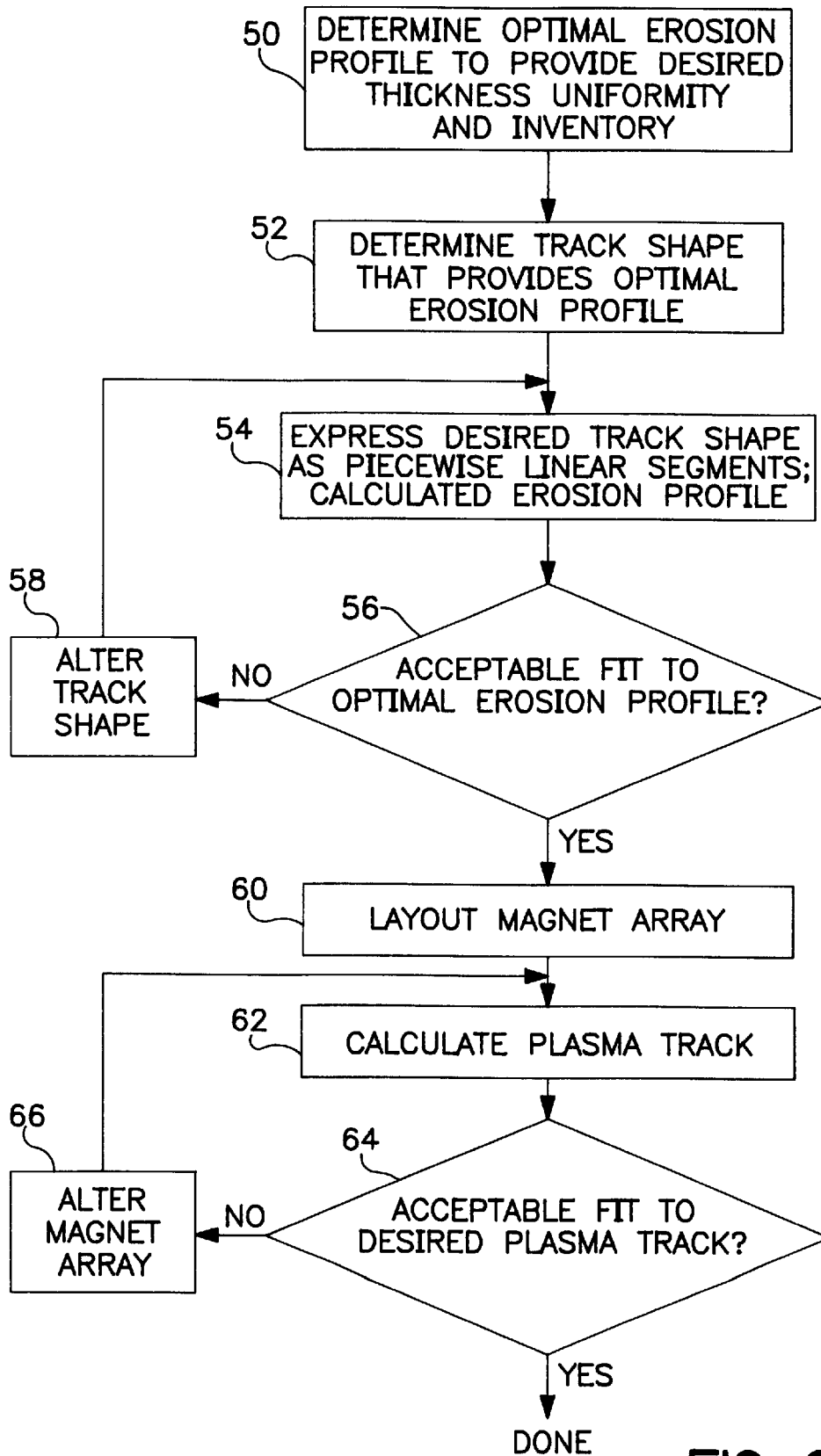


FIG. 2

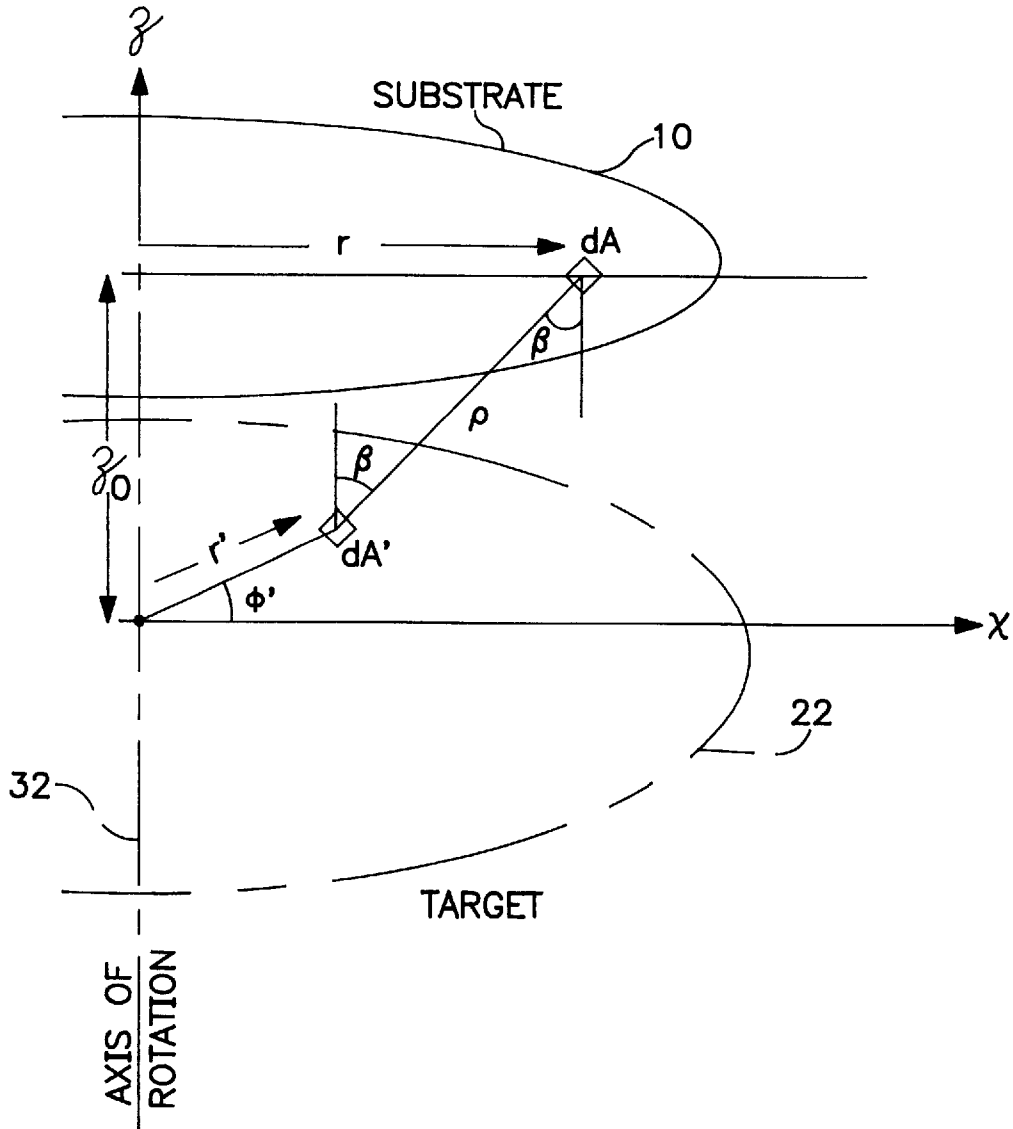


FIG. 3

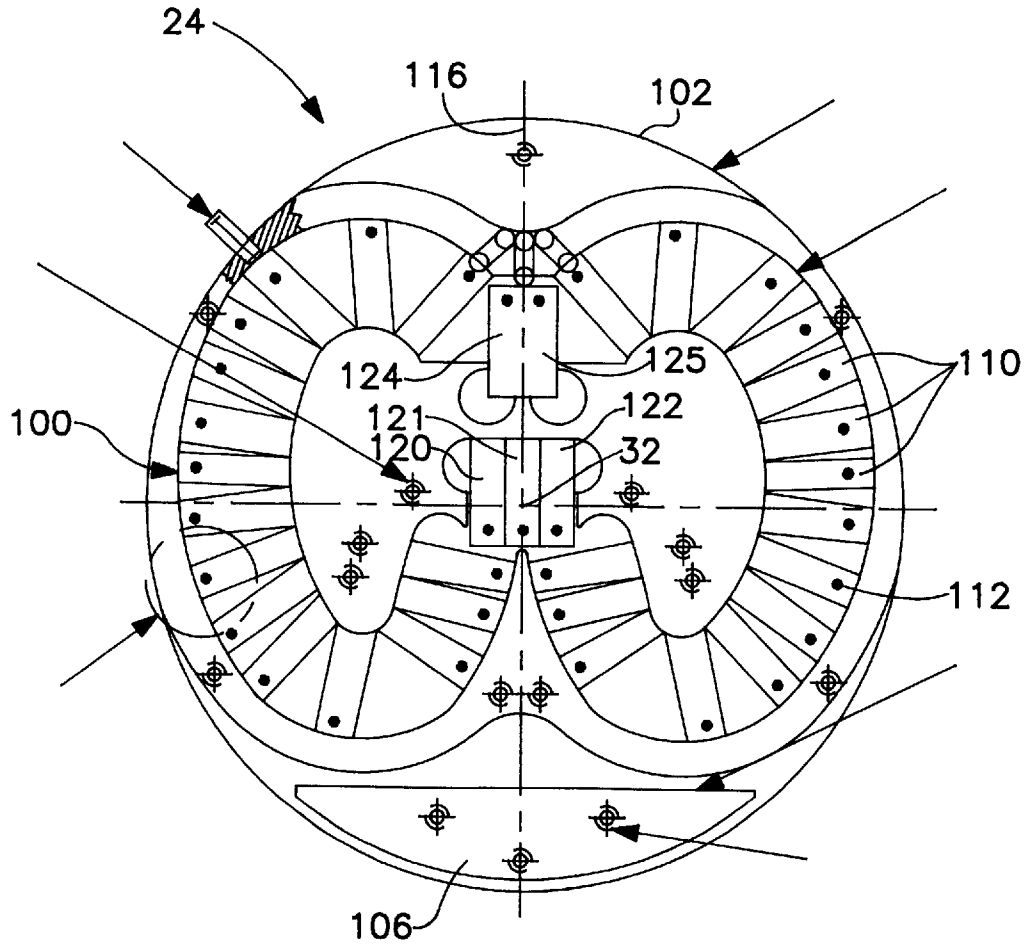


FIG. 4

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