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(12) **United States Patent**  
**Masuda et al.**

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(54) **PLASMA PROCESSING APPARATUS AND PLASMA PROCESSING METHOD**

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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 13 days.

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(22) Filed: **Feb. 23, 2001**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**<sup>7</sup> ..... **H01L 21/00**

(52) **U.S. Cl.** ..... **438/715; 156/345.44; 156/345.46; 156/345.48; 156/345.49; 216/68; 216/70; 438/729**

(58) **Field of Search** ..... **156/345 P, 345 C, 156/345 ME, 345 MG, 345 PH; 438/710, 715, 728, 729, 732; 216/67, 70, 71, 68**

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(57) **ABSTRACT**

In a plasma processing apparatus that has a vacuum chamber, a process gas supply means of supply gas to a processing chamber, an electrode to hold a sample inside said vacuum chamber, a plasma generator installed in said vacuum chamber opposite to said sample, and a vacuum exhaust system to decrease pressure of said vacuum chamber, a bias voltage of V<sub>dc</sub>=-300 to -50 V is applied and the surface temperature of said plate ranges from 100 to 200° C. In addition, the surface temperature fluctuation of the silicon-made plate in said plasma processing apparatus is kept within ±25° C.

**10 Claims, 7 Drawing Sheets**

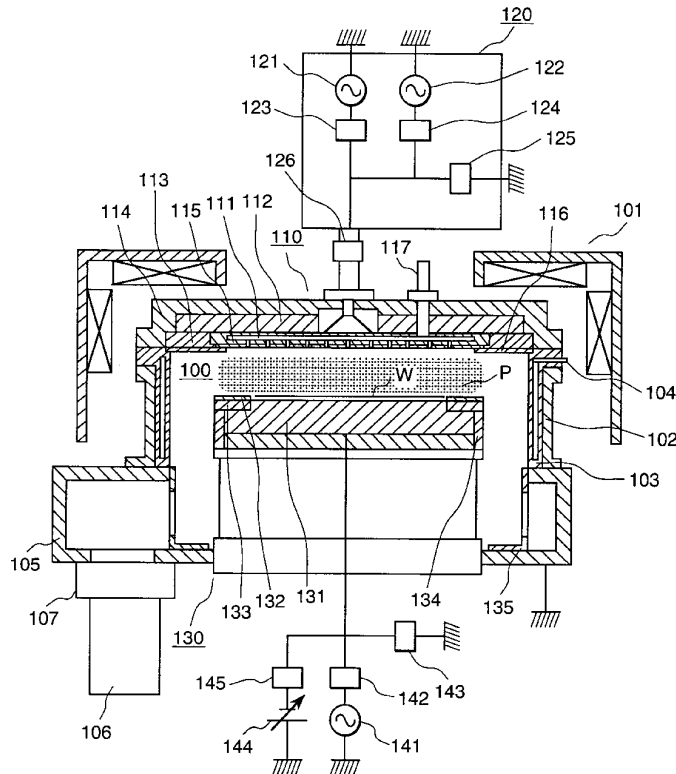


FIG. 1

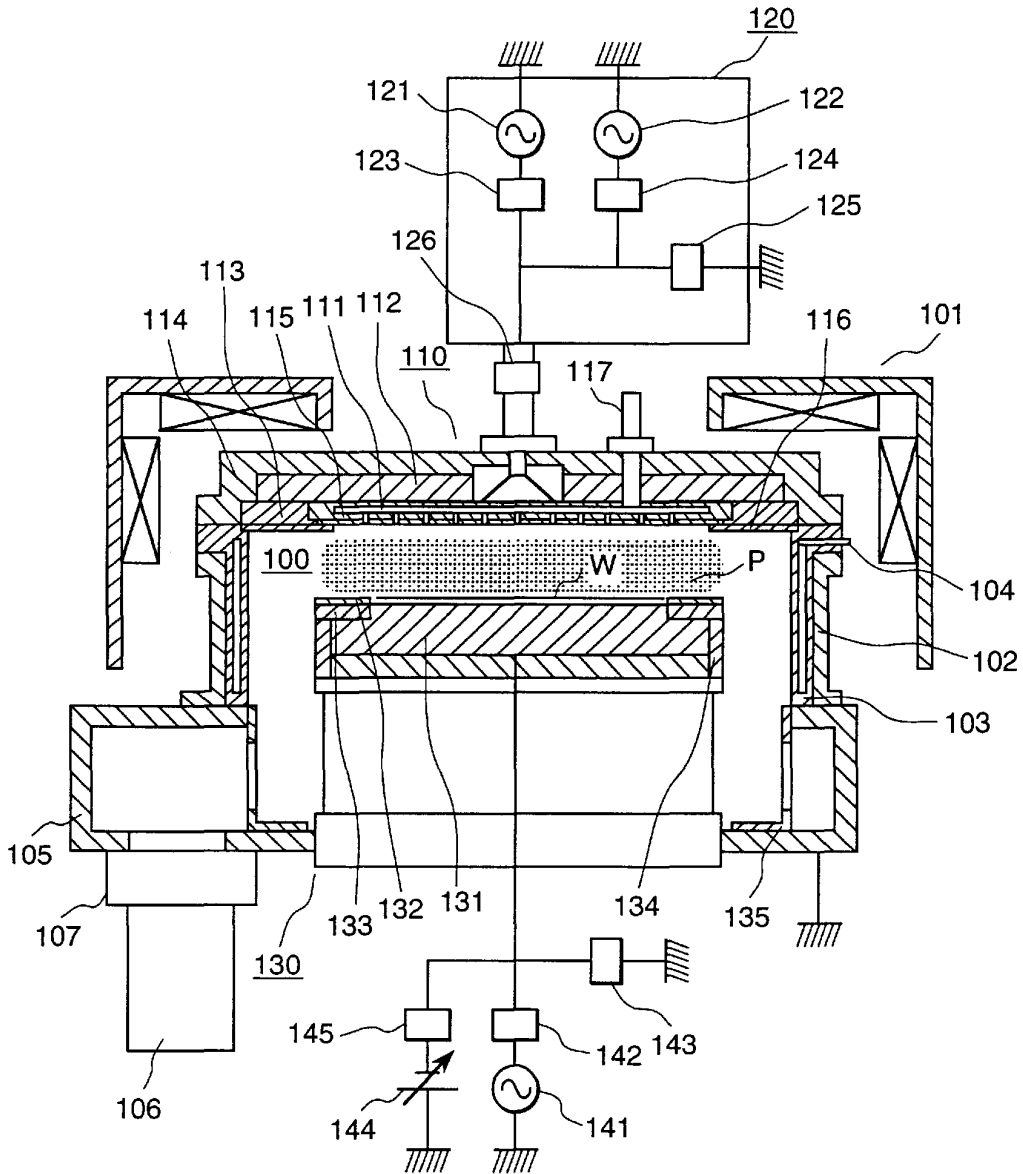


FIG. 2

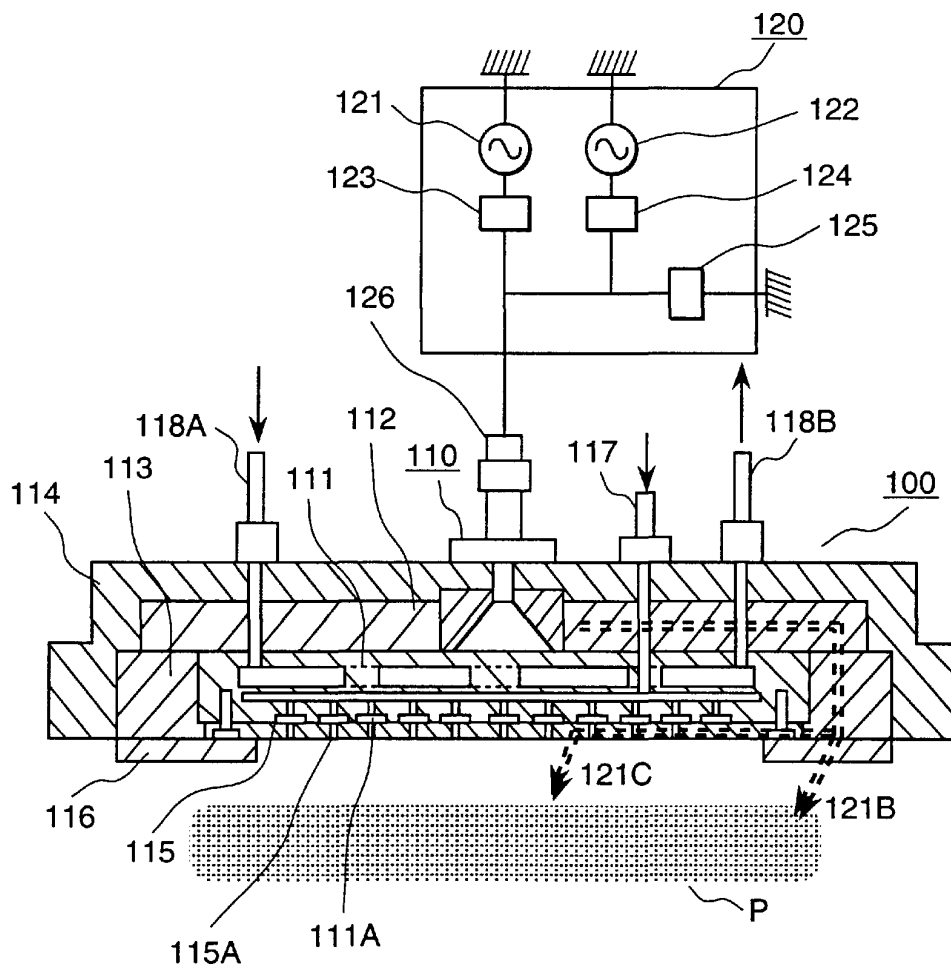


FIG. 3

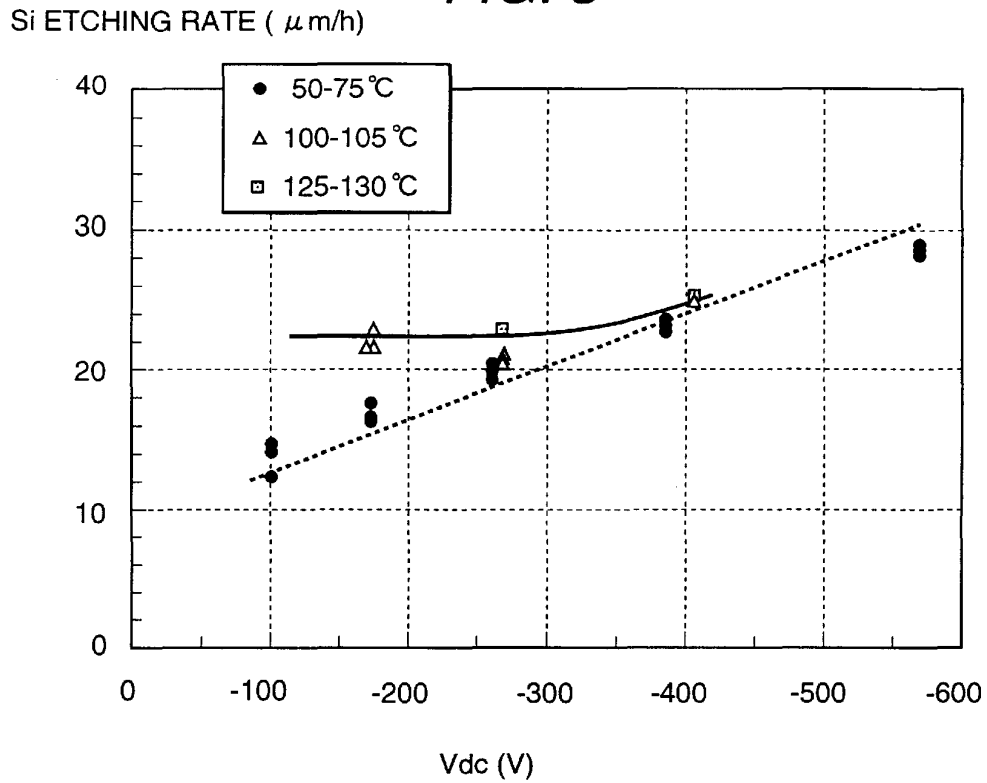


FIG. 4

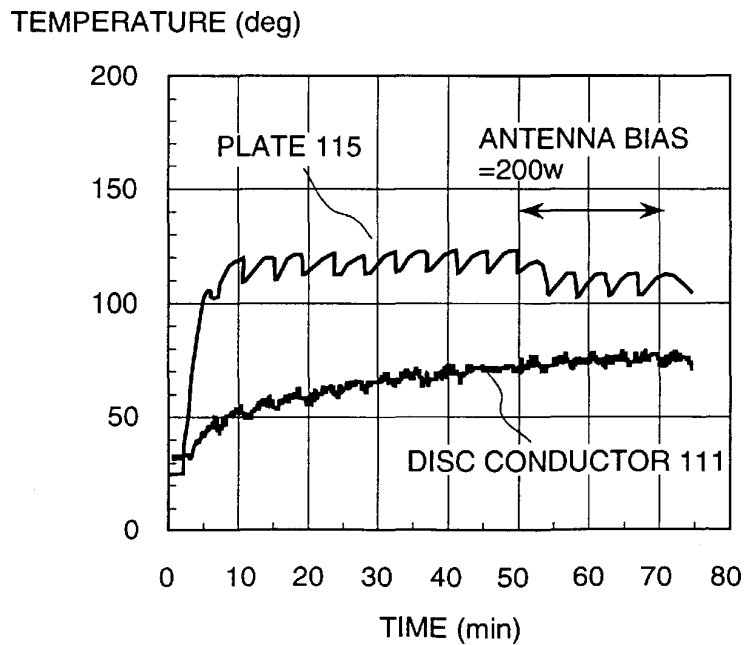


FIG. 5

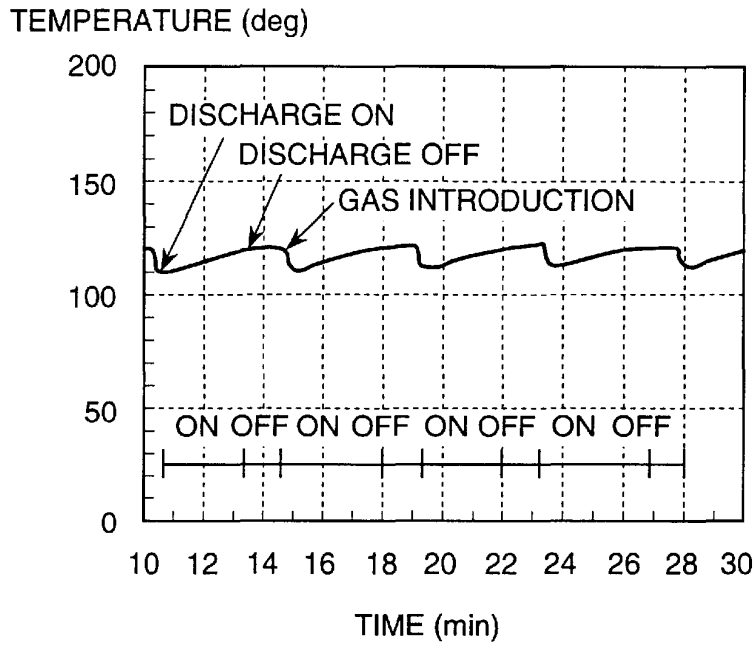
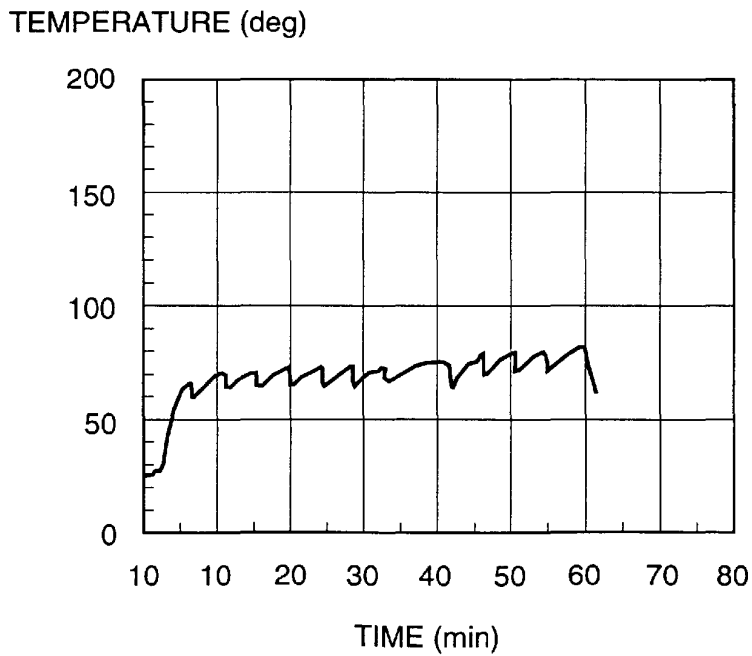


FIG. 6



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