

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

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(45) **Date of Patent:** **Jan. 29, 2002**

(54) **METHOD FOR PRODUCING  
PIEZOELECTRIC FILMS WITH ROTATING  
MAGNETRON SPUTTERING SYSTEM**

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\* cited by examiner

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

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(57) **ABSTRACT**

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(51) **Int. Cl.**<sup>7</sup> ..... **C23C 14/34**

(52) **U.S. Cl.** ..... **204/192.18; 204/192.13;**  
204/192.22; 204/192.3; 427/8; 216/38;  
29/25.35

(58) **Field of Search** ..... 204/192.12, 192.13,  
204/192.18, 192.22, 192.3; 427/8; 216/38;  
29/25.35

A quality-assurance method is described that is useful in the fabrication of piezoelectric films of electronic devices, particularly resonators for use in RF filters. For example, the method comprises determining the surface roughness of an insulating layer on which the piezoelectric film is to be deposited and achieving a surface roughness for the insulating layer that is sufficiently low to achieve the high-quality piezoelectric film. According to one aspect of the invention, the low surface roughness for the insulating layer is achieved with use of a rotating magnet magnetron system for improving the uniformity of the deposited layer. According to other aspects of the invention, the high-quality piezoelectric film is assured by optimizing deposition parameters including determination of a "cross-over point" for reactive gas flow and/or monitoring and correcting for the surface roughness of the insulating layer pre-fabrication of the piezoelectric film.

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**7 Claims, 4 Drawing Sheets**

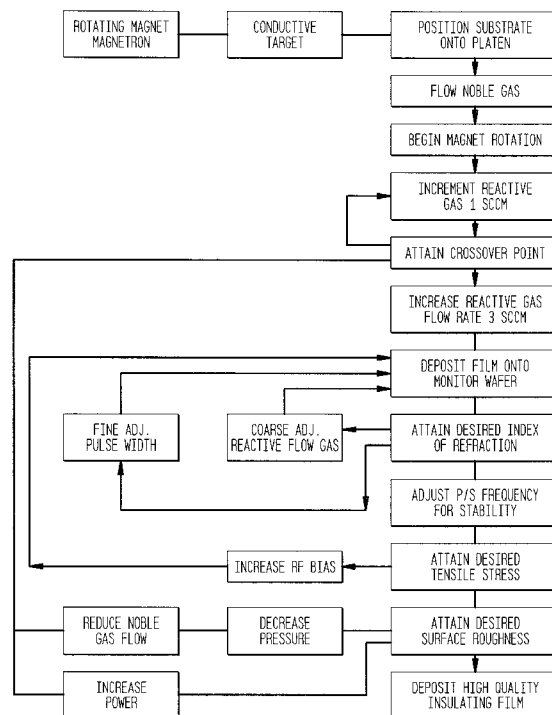
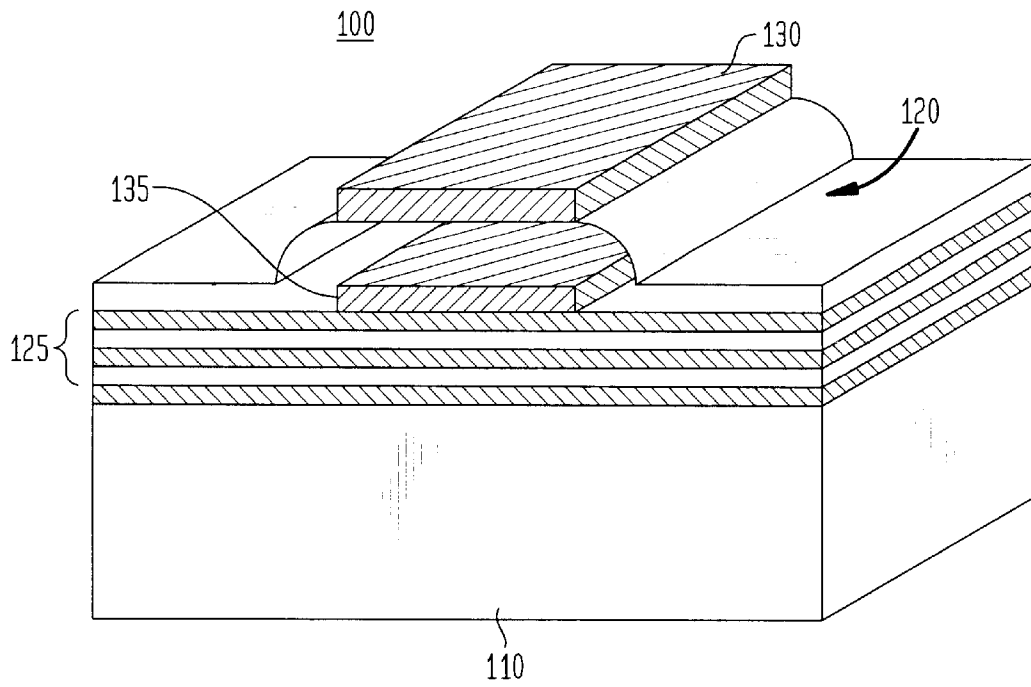


FIG. 1



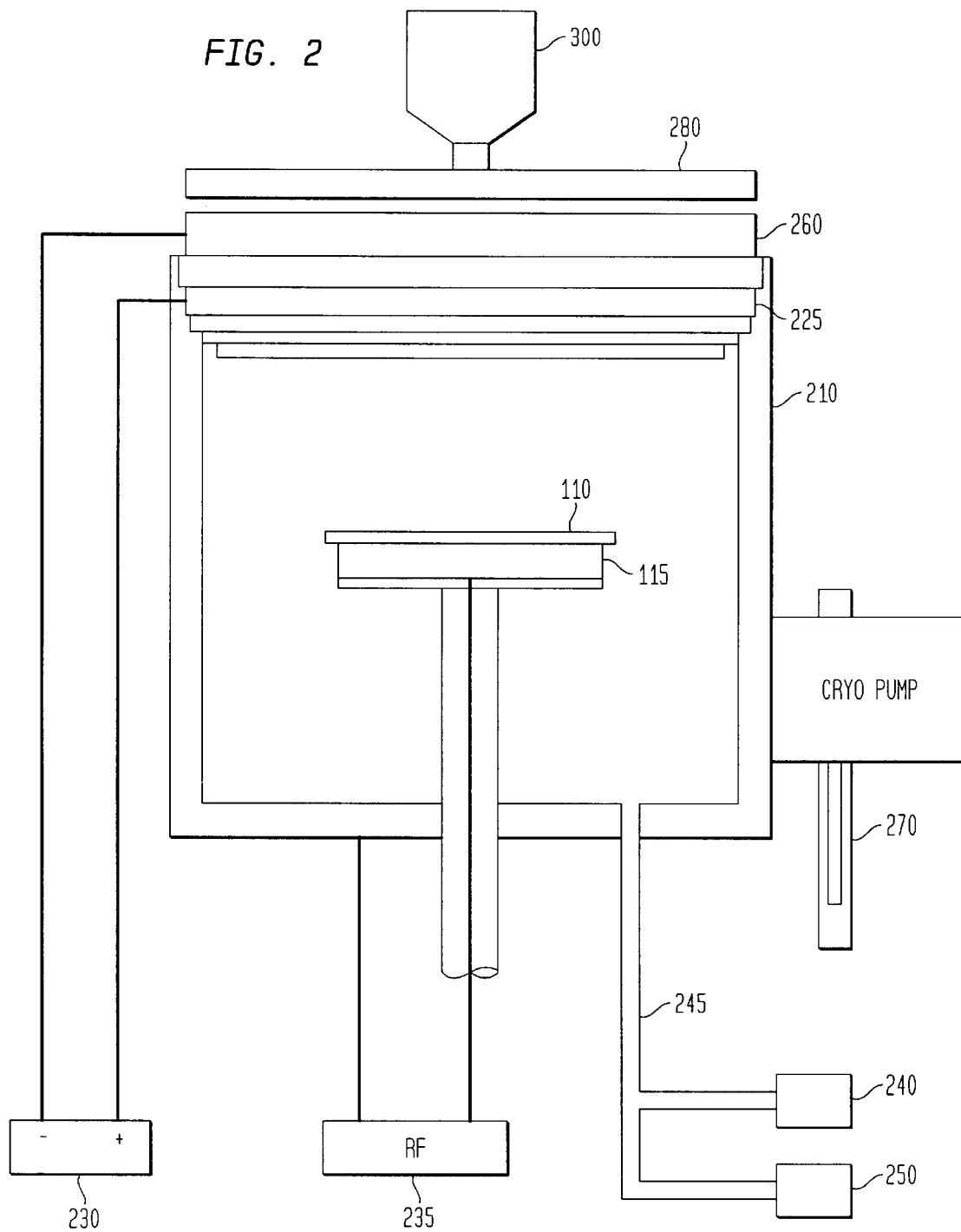


FIG. 3

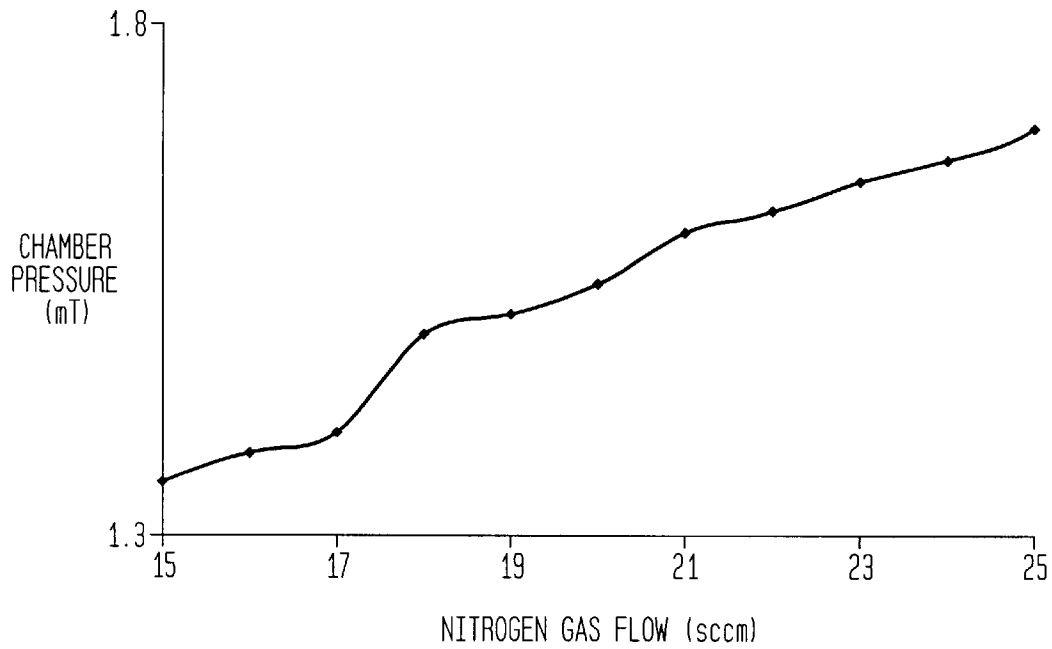


FIG. 4

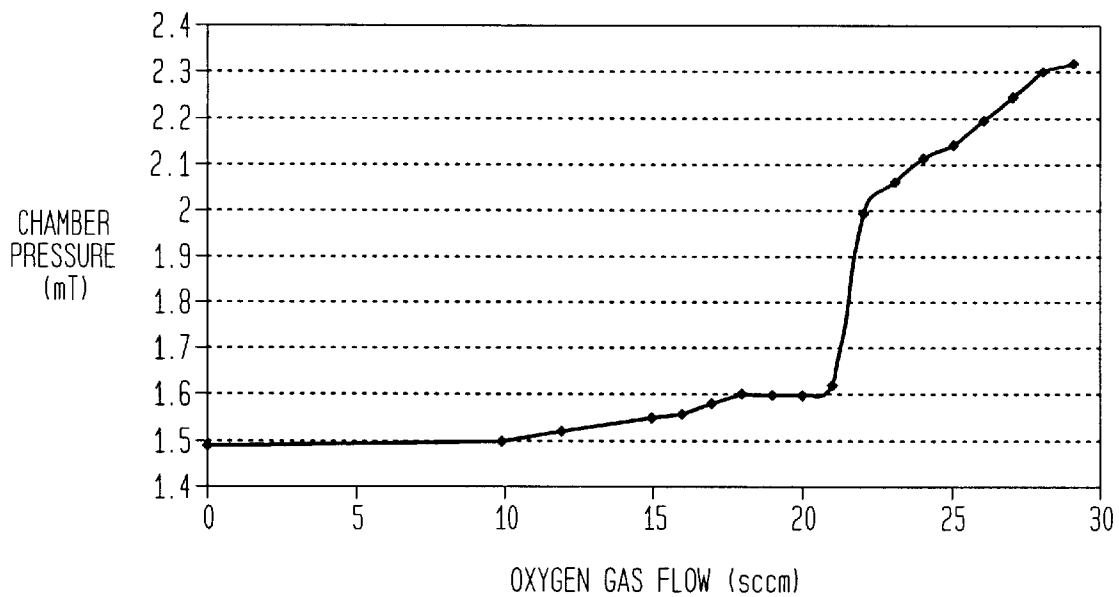
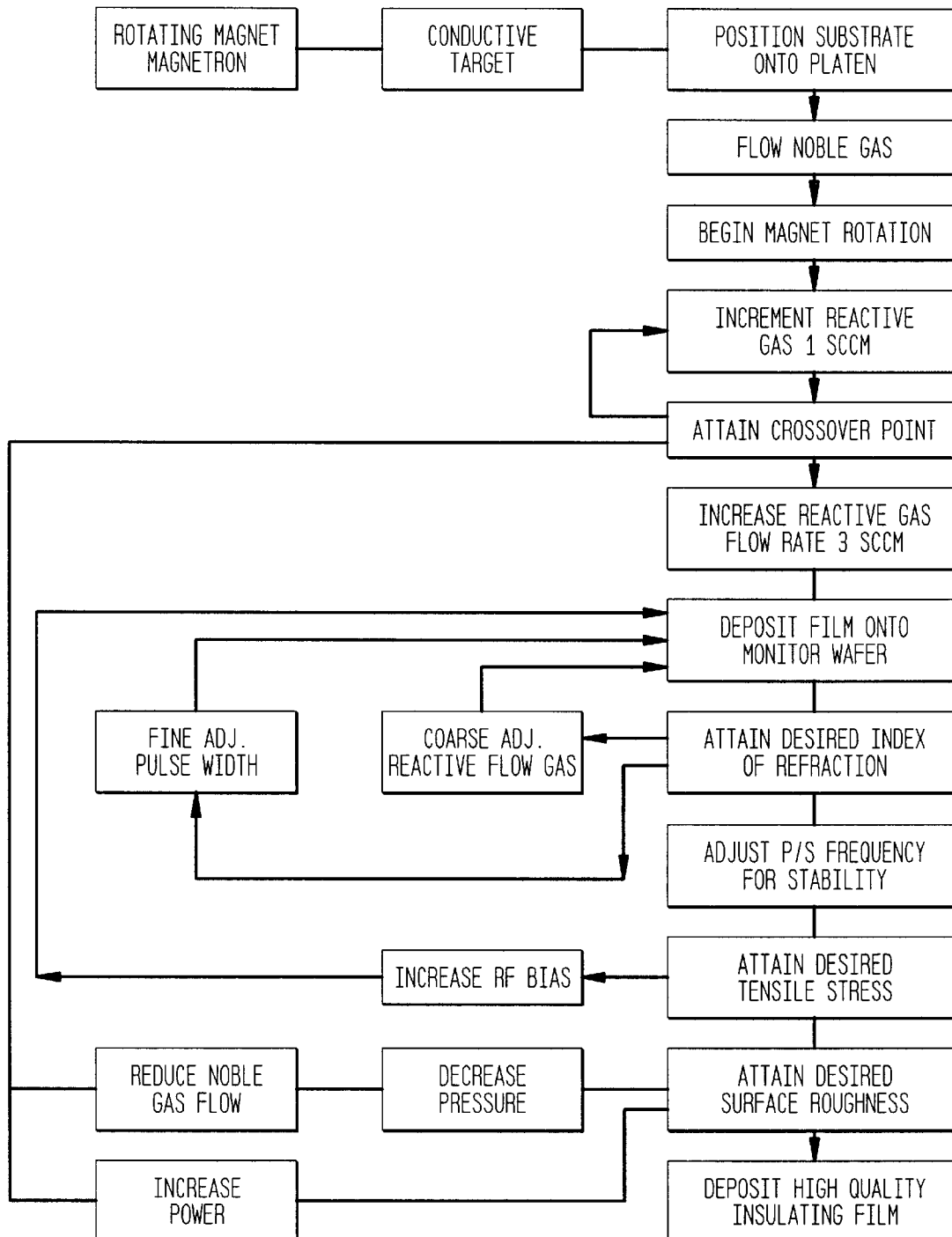


FIG. 5



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