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**Chistyakov**

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(54) **METHODS AND APPARATUS FOR GENERATING STRONGLY-IONIZED PLASMAS WITH IONIZATIONAL INSTABILITIES**

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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 882 days.

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**H05B 31/26** (2006.01)

(52) **U.S. Cl.** ..... **315/111.21; 315/111.41; 315/111.71**

(58) **Field of Classification Search** ..... 315/111.21-111.91; 216/67, 71; 118/723 VE, 118/723 R; 156/345.33; 204/192.12, 192.1, 204/298.08

See application file for complete search history.

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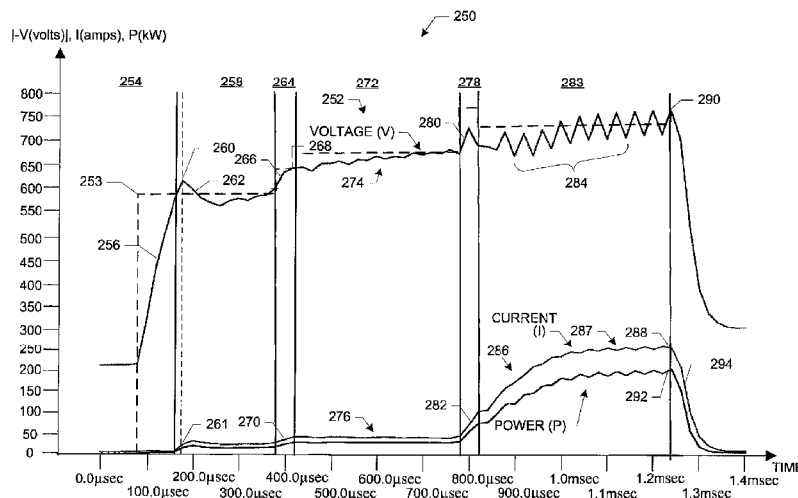
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(57) **ABSTRACT**

Methods and apparatus for generating strongly-ionized plasmas are disclosed. A strongly-ionized plasma generator according to one embodiment includes a chamber for confining a feed gas. An anode and a cathode assembly are positioned inside the chamber. A pulsed power supply is electrically connected between the anode and the cathode assembly. The pulsed power supply generates a multi-stage voltage pulse that includes a low-power stage with a first peak voltage having a magnitude and a rise time that is sufficient to generate a weakly-ionized plasma from the feed gas. The multi-stage voltage pulse also includes a transient stage with a second peak voltage having a magnitude and a rise time that is sufficient to shift an electron energy distribution in the weakly-ionized plasma to higher energies that increase an ionization rate which results in a rapid increase in electron density and a formation of a strongly-ionized plasma.

**20 Claims, 16 Drawing Sheets**



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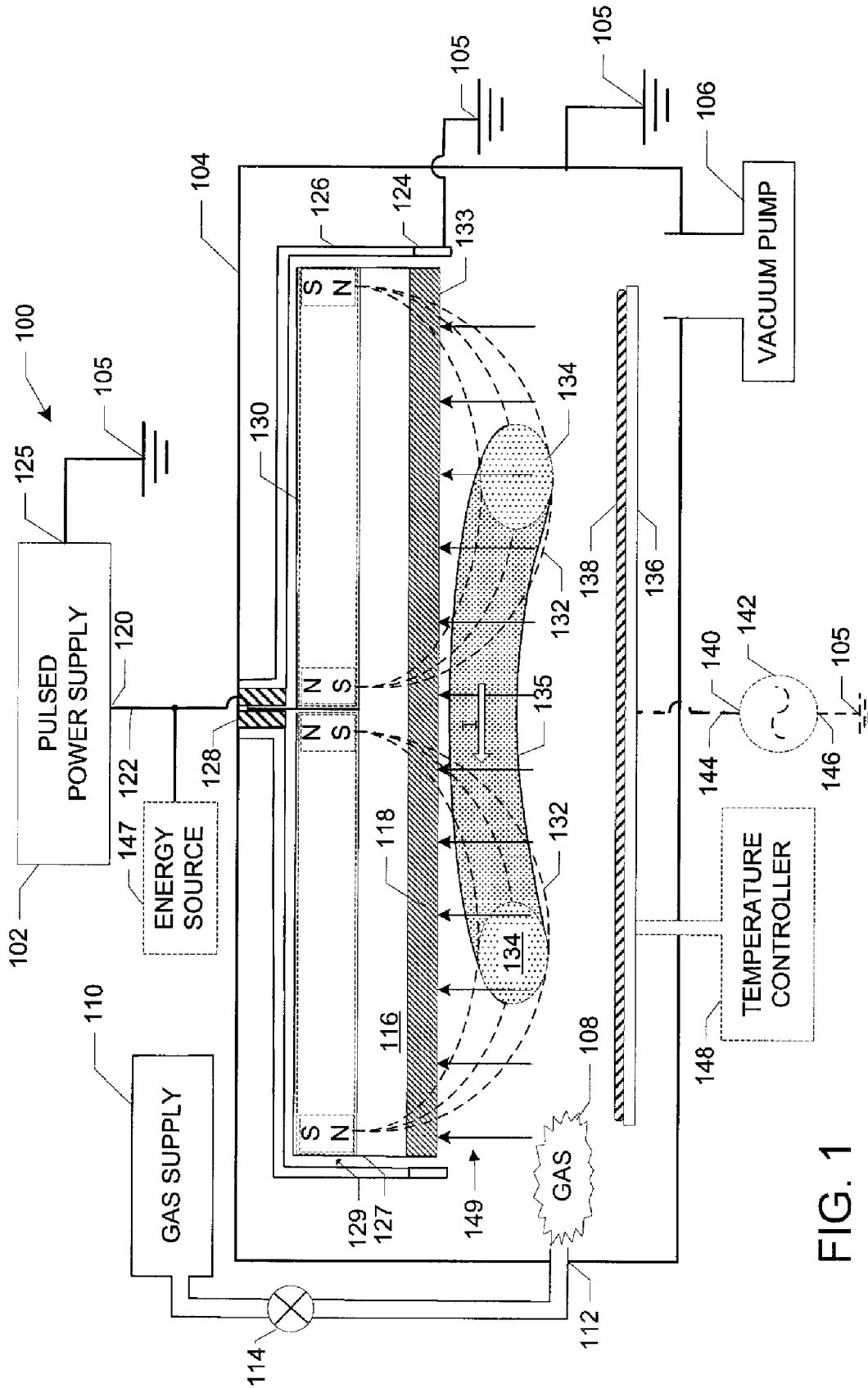


FIG. 1

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