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Chistyakov

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(54) **PLASMA GENERATION USING MULTI-STEP IONIZATION**

(75) Inventor: **Roman Chistyakov**, Andover, MA (US)

(73) Assignee: **Zond, Inc.**, Mansfield, MA (US)

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(52) **U.S. Cl.** ..... **204/298.36**; 204/298.37; 204/298.38; 118/723 VE; 118/723 R; 315/111.81; 315/111.91

(58) **Field of Search** ..... 315/111.81, 111.91, 315/111.71, 111.41, 111.21; 204/298.37, 298.38, 298.36; 118/723 VE, 723 R, 723 EB, 723 E; 250/28, 283, 377, 423, 435, 489

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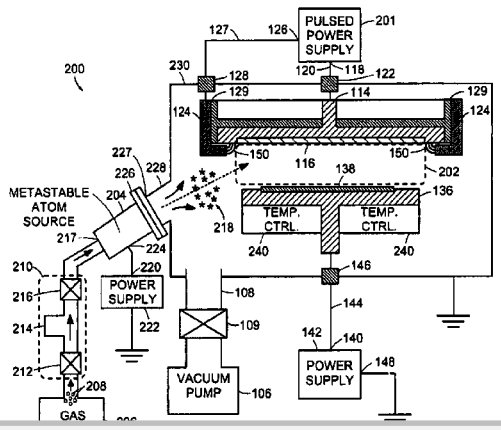
Primary Examiner—Tuyet T. Vo
(74) *Attorney, Agent, or Firm*—Kurt Rauschenbach; Rauschenbach Patent Law Group, LLC

(57) **ABSTRACT**

The present invention relates to a plasma generator that generates a plasma with a multi-step ionization process. The plasma generator includes an excited atom source that generates excited atoms from ground state atoms supplied by a feed gas source. A plasma chamber confines a volume of excited atoms generated by the excited atom source. An energy source is coupled to the volume of excited atoms confined by the plasma chamber. The energy source raises an energy of excited atoms in the volume of excited atoms so that at least a portion of the excited atoms in the volume of excited atoms is ionized, thereby generating a plasma with a multi-step ionization process.

46 Claims, 13 Drawing Sheets-



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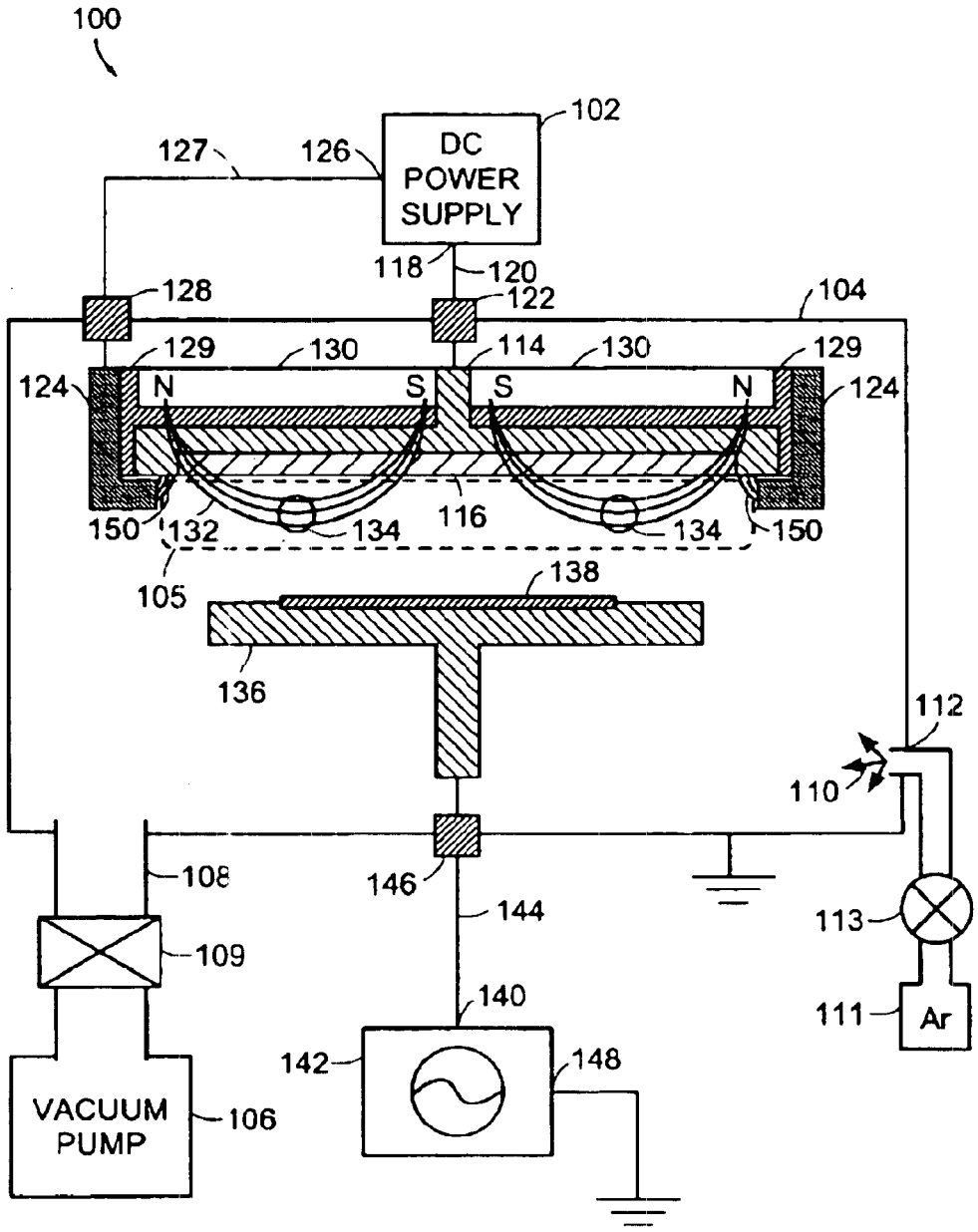

FIG. 1
PRIOR ART

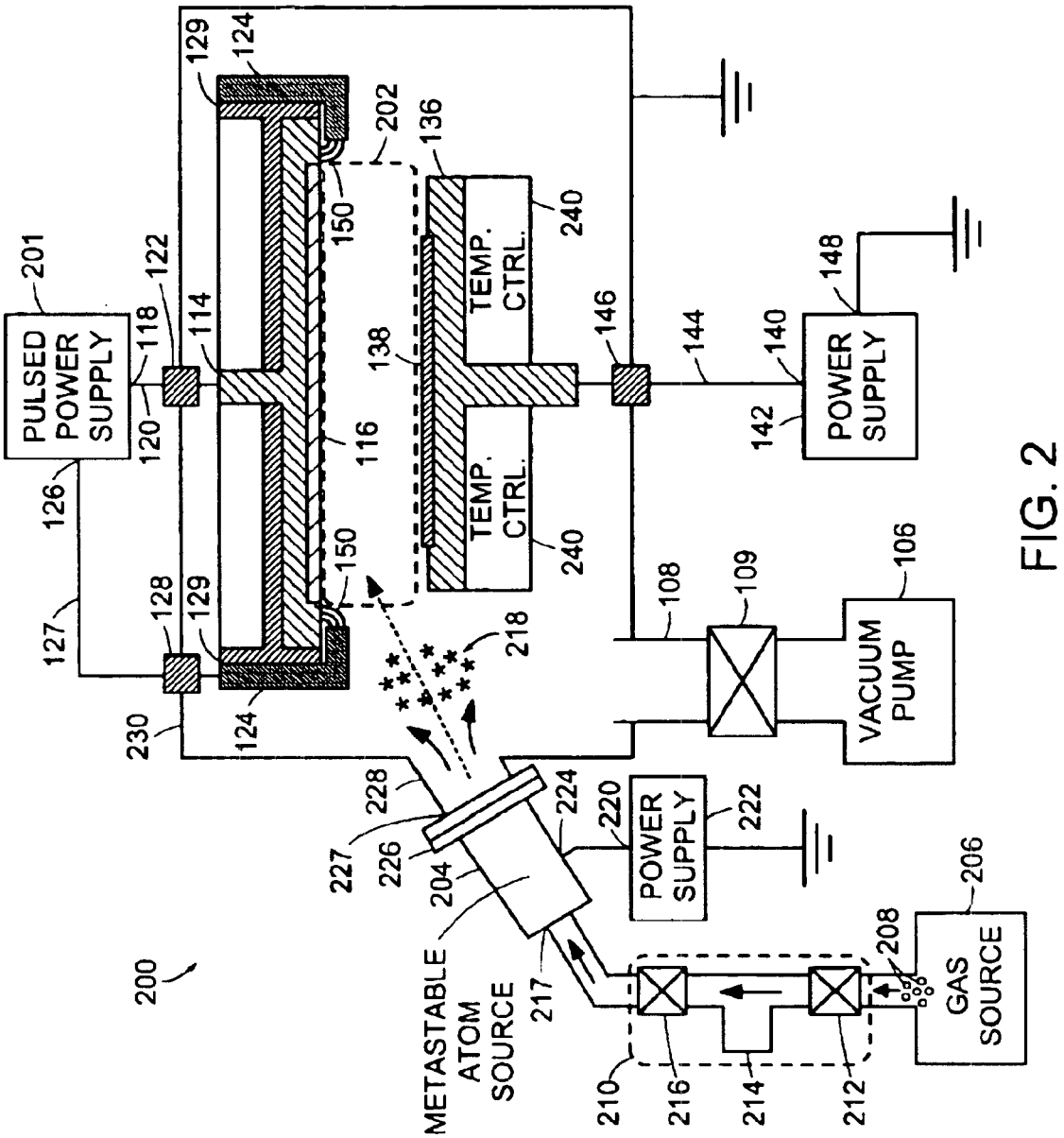

FIG. 2

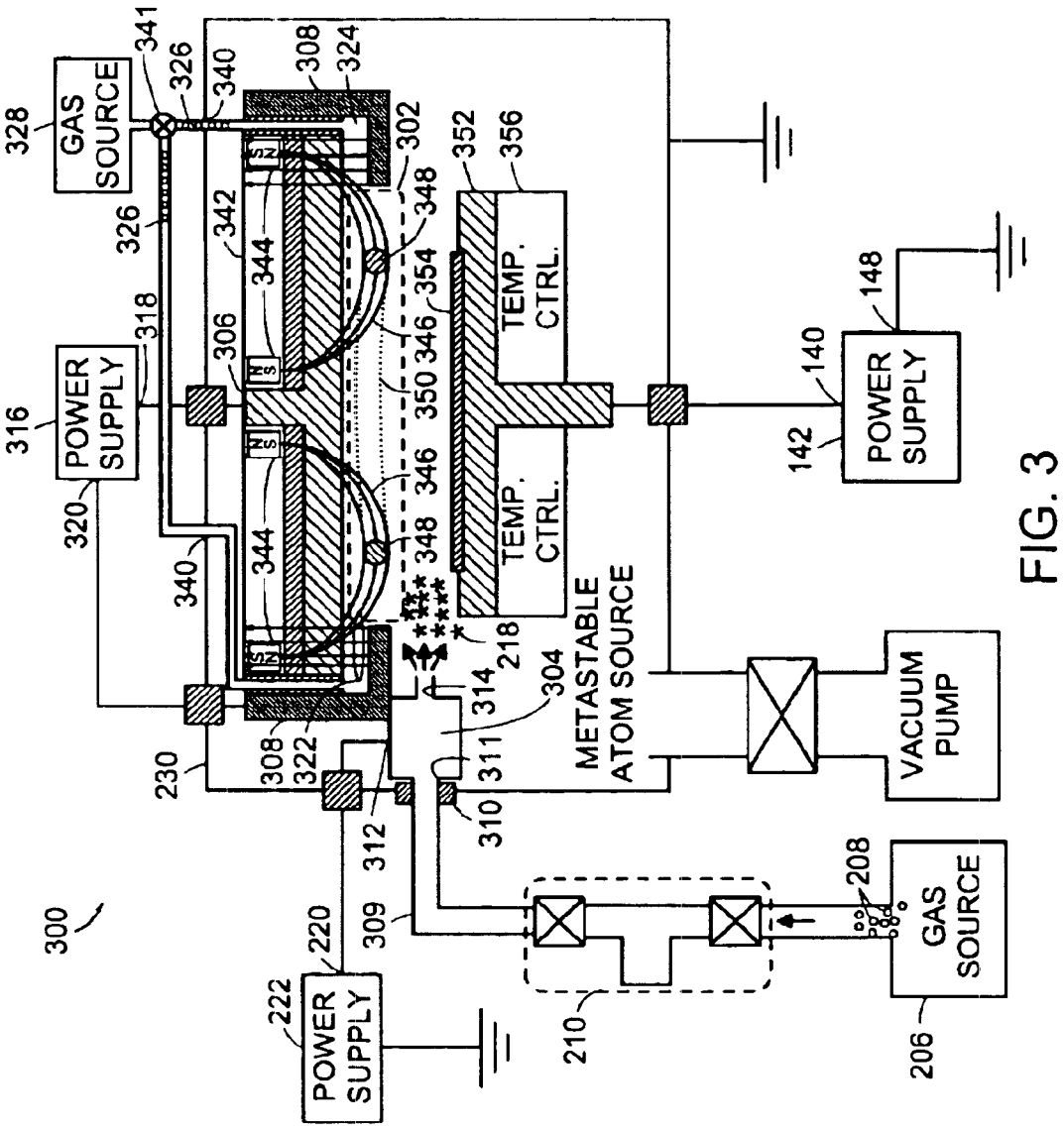

FIG. 3

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