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Melnychuk et al.

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(54) **EXTREME ULTRAVIOLET LIGHT SOURCE**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 10/384,967, filed on Mar. 8, 2003, which is a continuation-in-part of application No. 10/189,824, filed on Jul. 3, 2002, now Pat. No. 6,815,700, which is a continuation-in-part of application No. 10/120,655, filed on Apr. 10, 2002, now Pat. No. 6,744,060, which is a continuation-in-part of application No. 09/875,719, filed on Jun. 6, 2001, now Pat. No. 6,586,757, which is a continuation-in-part of application No. 09/875,721, filed on Jun. 6, 2001, now Pat. No. 6,566,668, which is a continuation-in-part of application No. 09/696,084, filed on Oct. 16, 2000, now Pat. No. 6,566,667, which is a continuation-in-part of application No. 09/590,962, filed on Jun. 9, 2000, now abandoned.

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(51) **Int. Cl.**[7] **H01J 35/20**

(52) **U.S. Cl.** ..... **250/504 R**; 250/493.1; 378/119

(58) **Field of Search** ..... 250/504 R, 493.1; 378/119; 372/5, 87

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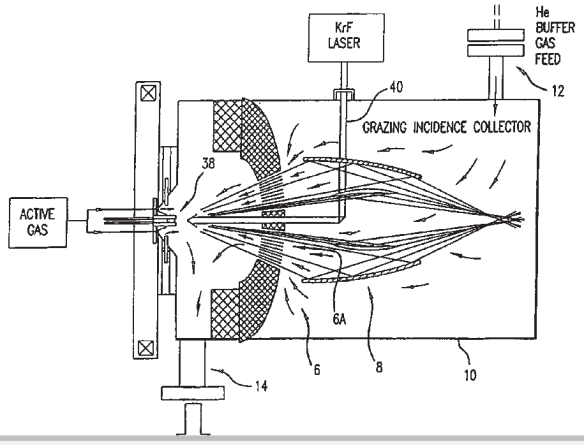
(57) **ABSTRACT**

The present invention provides a reliable, high-repetition rate, production line compatible high energy photon source. A very hot plasma containing an active material is produced in vacuum chamber. The active material is an atomic element having an emission line within a desired extreme ultraviolet (EUV) range. A pulse power source comprising a charging capacitor and a magnetic compression circuit comprising a pulse transformer, provides electrical pulses having sufficient energy and electrical potential sufficient to produce the EUV light at an intermediate focus at rates in excess of 5 Watts. In preferred embodiments designed by Applicants in-band, EUV light energy at the intermediate focus is 45 Watts extendable to 105.8 Watts.

78 Claims, 50 Drawing Sheets



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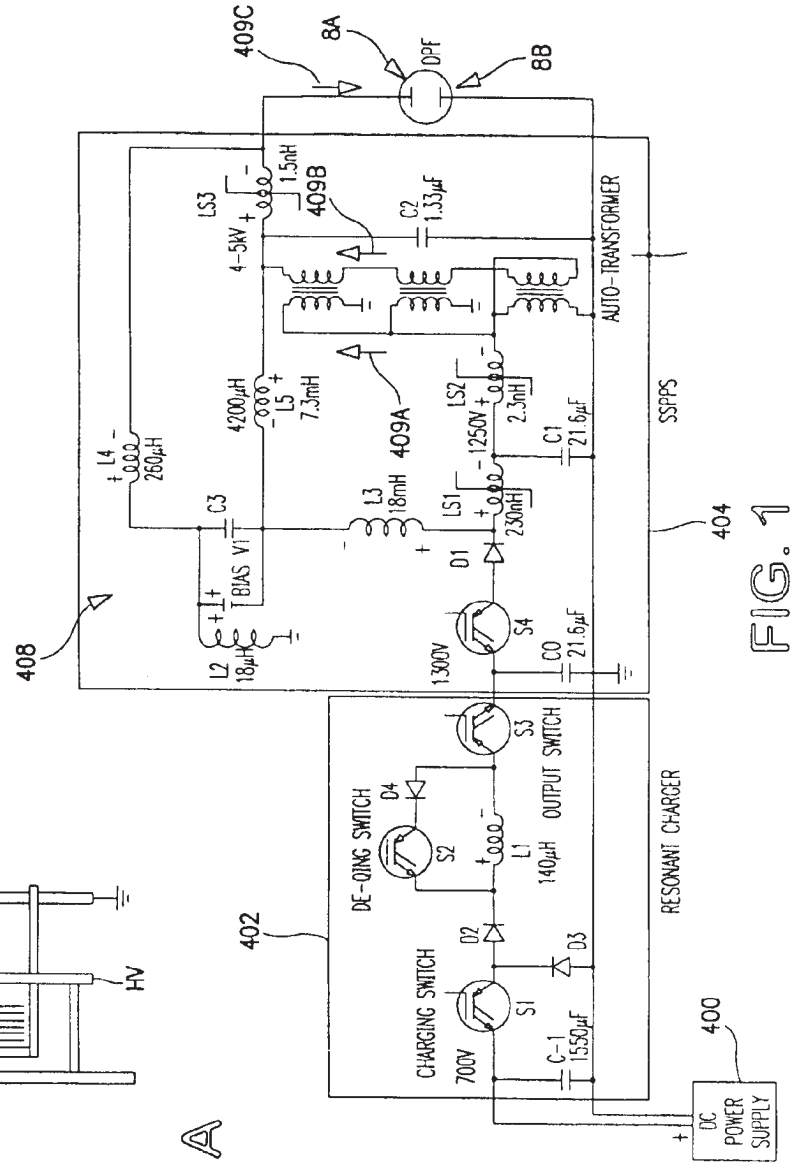

FIG. 1

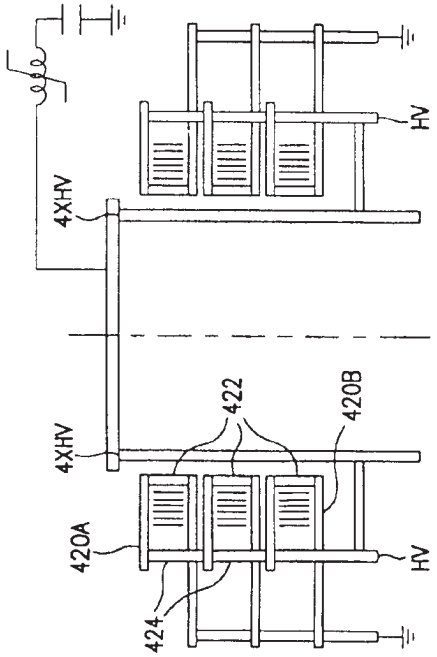

FIG. 1A

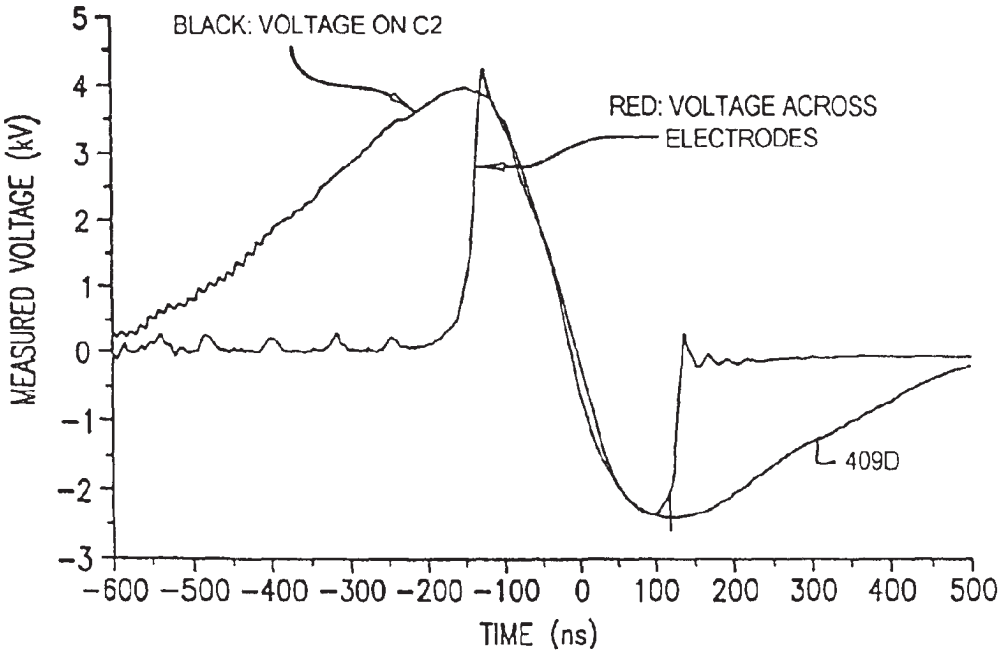

FIG. 1B

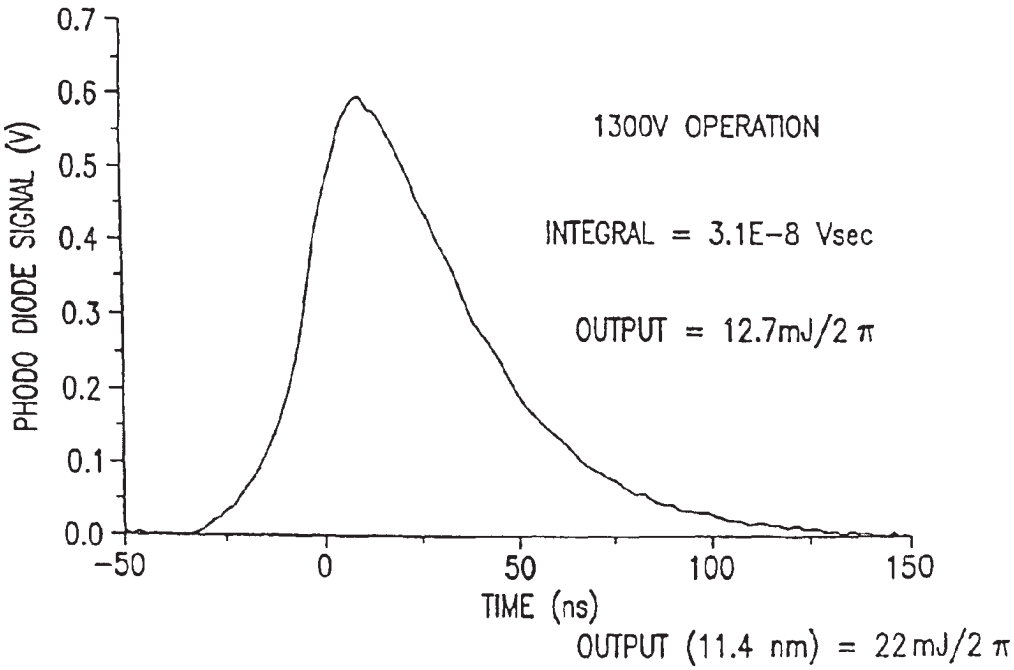

FIG. 1C

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