US 20220377870A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2022/0377870 A1**

Doi et al. (43) **Pub. Date: Nov. 24, 2022**

(54) **HIGH-FREQUENCY POWER CIRCUIT, PLASMA TREATMENT APPARATUS, AND PLASMA TREATMENT METHOD**

(71) Applicant: **ULVAC, INC.**, Chigasaki-shi (JP)

(72) Inventors: **Kenta Doi**, Chigasaki-shi (JP); **Toshiyuki Nakamura**, Chigasaki-shi (JP)

(21) Appl. No.: **17/634,208**

(22) PCT Filed: **Aug. 24, 2021**

(86) PCT No.: **PCT/JP2021/030948**

§ 371 (c)(1),
(2) Date: **Feb. 9, 2022**

(30) **Foreign Application Priority Data**

Nov. 20, 2020 (JP) 2020-193677

Publication Classification

(51) **Int. Cl.**

H05H 1/46	(2006.01)
H01J 37/16	(2006.01)
H01J 37/244	(2006.01)
H01Q 1/26	(2006.01)

(52) **U.S. Cl.**

CPC ***H05H 1/46*** (2013.01); ***H01J 37/16*** (2013.01); ***H01J 37/244*** (2013.01); ***H01Q 1/26*** (2013.01)

(57) **ABSTRACT**

A high-frequency power circuit includes a first antenna circuit and a second antenna circuit that are connected in parallel to a matching box connected to a high-frequency power supply. The first antenna circuit include a first antenna, a first distribution capacitor, and a first variable capacitor. The second antenna circuit includes a second antenna, a second distribution capacitor, and a second variable capacitor. A controller sets a capacitance of the first variable capacitor based on a detection result of a phase difference between current and voltage in a series-connected portion of the first antenna and the first variable capacitor during plasma production to reduce this phase difference and sets a capacitance of the second variable capacitor based on a detection result of a phase difference between current and voltage in a series-connected portion of the second antenna and the second variable capacitor during plasma production to reduce this phase difference.