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**Declarations under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

(54) **Title:** COMPACT MICROWAVE PLASMA APPLICATOR UTILIZING CONJOINING ELECTRIC FIELDS

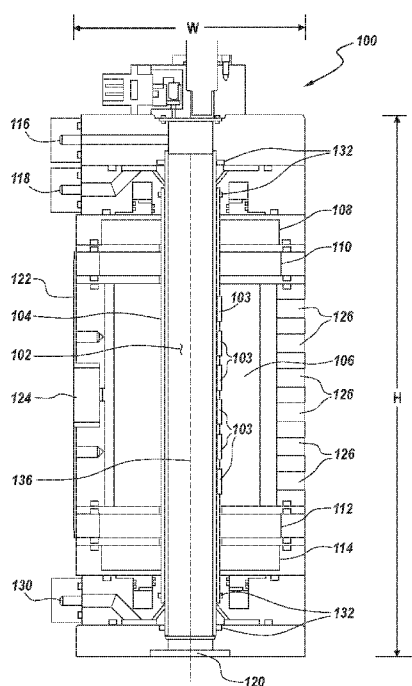


Fig. 1

(57) **Abstract:** A plasma applicator includes a plasma discharge tube and a microwave cavity at least partially surrounding a portion of the plasma discharge tube. Microwave energy is coupled to the microwave cavity via a coupling iris. At least two orthogonal dimensions of the microwave cavity are selected such that the microwave energy in the microwave cavity propagates in a transverse electric (TE) mode. Primary electric fields generated from the microwave energy combine with an evanescent electric field generated from the coupling iris, such that a combined electric field in the microwave cavity is substantially uniform along the longitudinal axis of the plasma discharge tube. A plurality of radial microwave chokes is disposed over an exterior of the plasma discharge tube. Positions of the microwave chokes are such that microwave energy propagating in the TE mode and a transverse electric magnetic (TEM) mode is attenuated.



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International application No.  
PCT/US2017/031275**A. CLASSIFICATION OF SUBJECT MATTER****H01J 37/32(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
H01J 37/32; H05H 1/24; C23F 1/00; C23F 1/02; H05H 1/00; C23C 16/511; B23K 10/00Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean utility models and applications for utility models  
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKOMPASS(KIPO internal) & keywords: Plasma, transverse, cavity, choke, microwave**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 7497922 B2 (SATYENDRA KUMAR et al.) 03 March 2009 See column 3, line 26 - column 6, line 5; claim 33; and figure 1A.	1-33
Y	EP 1102521 A2 (ARCHIMEDES TECHNOLOGY GROUP, INC.) 23 May 2001 See paragraphs [0018]-[0029]; and figures 1-2.	1-33
Y	US 2002-0112819 A1 (MOHAMMAD KAMAREHI et al.) 22 August 2002 See paragraphs [0070]-[0081]; and figures 1, 12.	8-11, 14-17, 23-33
A	US 2014-0290860 A1 (TOKYO ELECTRON LIMITED) 02 October 2014 See paragraphs [0050]-[0077]; and figures 1-4.	1-33
A	US 2004-0182834 A1 (MOHAMMAD KAMAREHI) 23 September 2004 See paragraphs [0024]-[0035]; and figures 1-3.	1-33

 Further documents are listed in the continuation of Box C. See patent family annex.

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