

# CPC COOPERATIVE PATENT CLASSIFICATION

**H05H PLASMA TECHNIQUE** (fusion reactors [G21B](#); ion-beam tubes [H01J 27/00](#); magnetohydrodynamic generators [H02K 44/08](#); producing X-rays involving plasma generation [H05G 2/00](#)); **PRODUCTION OF ACCELERATED ELECTRICALLY-CHARGED PARTICLES OR OF NEUTRONS** (obtaining neutrons from radioactive sources [G21](#), e.g. [G21B](#), [G21C](#), [G21G](#)); **PRODUCTION OR ACCELERATION OF NEUTRAL MOLECULAR OR ATOMIC BEAMS** (atomic clocks [G04F 5/14](#); devices using stimulated emission [H01S](#); frequency regulation by comparison with a reference frequency determined by energy levels of molecules, atoms, or subatomic particles [H03L 7/26](#))

<b>1/00</b>	<b>Generating plasma; Handling plasma</b>	<b>1/24</b>	Generating plasma {(gas-filled discharge reactors <a href="#">H01J 37/32</a> ; nuclear fusion reactors <a href="#">G21B 1/00</a> ; ohmic heating <a href="#">H05H 1/20</a> ; injection heating <a href="#">H05H 1/22</a> )}
1/0006	. {Investigating plasma, e.g. degree of ionisation (electron temperature)}		
1/0012	. . {by using radiation}		
1/0018	. . . {Details}	1/2406	. . {Dielectric barrier discharges}
1/0025	. . . {by using photoelectric means ( <a href="#">H05H 1/0031</a> - <a href="#">H05H 1/0043</a> take precedence)}	2001/2412	. . . {the dielectric being interposed between the electrodes}
1/0031	. . . {by interferometry}	2001/2418	. . . {the electrodes being embedded in the dielectric}
1/0037	. . . {by spectrometry (see <a href="#">G01N 3/00</a> )}	2001/2425	. . . {the electrodes being flush with the dielectric}
1/0043	. . . {by using infra-red or ultra-violet radiation}	2001/2431	. . . {Cylindrical electrodes}
1/005	. . . {by using X-rays or alpha rays (see <a href="#">G01N 23/00</a> )}	2001/2437	. . . {Multilayer systems}
1/0056	. . . {by using neutrons (see <a href="#">G01N 23/00</a> )}	2001/2443	. . . {Flow through, i.e. the plasma fluid flowing in a dielectric tube}
1/0062	. . . {by using microwaves (see <a href="#">G01N 23/223</a> )}	2001/245	. . . . {Internal electrodes}
1/0068	. . {by thermal means (see <a href="#">G01N 25/00</a> )}	2001/2456	. . . . {External electrodes}
1/0075	. . . {Langmuir probes}	2001/2462	. . . . {Ring electrodes}
1/0081	. . {by electric means (see <a href="#">G01N 27/00</a> , <a href="#">G01R</a> )}	2001/2468	. . . . {Spiral electrodes}
1/0087	. . {by magnetic means (see <a href="#">G01N 27/00</a> , <a href="#">G01R</a> )}	1/2475	. . {Acoustic pressure discharge}
1/0093	. . {by acoustic, e.g. ultrasonic means (see <a href="#">G01N 29/02</a> )}	2001/2481	. . . {Piezoelectric actuators}
1/02	. Arrangements for confining plasma by electric or magnetic fields; Arrangements for heating plasma ({ <a href="#">G21B 1/00</a> takes precedence;} electron optics <a href="#">H01J</a> )	2001/2487	. . . {Mechanical actuators}
1/03	. . using electrostatic fields	2001/2493	. . . {Horns}
1/04	. . using magnetic fields substantially generated by the discharge in the plasma	1/26	. . Plasma torches {(metal working with constricted arc <a href="#">B23K 10/00</a> , <a href="#">B23K 10/02</a> ; metal spraying <a href="#">B05B 7/18</a> , <a href="#">B05B 7/20</a> )}
1/06	. . . longitudinal pinch devices	1/28	. . . Cooling arrangements
1/08	. . . Theta pinch devices {, e.g. <a href="#">SCYLLA</a> }	1/30	. . . using applied electromagnetic fields, e.g. high frequency or microwave energy ( <a href="#">H05H 1/28</a> takes precedence)
1/10	. . using externally-applied magnetic field only {, e.g. Q-machines, Yin-Yang, base-ball}	1/32	. . . using an arc ( <a href="#">H05H 1/28</a> takes precedence)
1/105	. . . {using magnetic pumping}	1/34	. . . . Details, e.g. electrodes, nozzles {(cf. <a href="#">B23K 9/24</a> )}
1/11	. . . using cusp configuration ( <a href="#">H05H 1/14</a> takes precedence)	1/3405	. . . . . {Arc stabilising or constricting arrangements, e.g. by an additional gas flow (by externally applied magnetic field <a href="#">H05H 1/40</a> ; by using powders or liquids <a href="#">H05H 1/42</a> ; using coaxial protecting fluid <a href="#">H05H 1/341</a> )}
1/12	. . . wherein the containment vessel forms a closed or nearly closed loop {( <a href="#">G21B 1/05</a> takes precedence)}	1/341	. . . . . {using coaxial protecting fluid (arc stabilising or constricting arrangements <a href="#">H05H 1/3405</a> ; introducing materials into the plasma <a href="#">H05H 1/42</a> )}
1/14	. . . wherein the containment vessel is straight and has magnetic mirrors	2001/3415	. . . . . {indexing scheme associated with <a href="#">H05H 1/34</a> }
1/16	. . using externally-applied electric and magnetic field	2001/3421	. . . . . {transferred arc mode}
1/18	. . . wherein the field oscillate at very high frequency, e.g. in the microwave range {, e.g. using cyclotron resonance}	2001/3426	. . . . . {pilot arc}
1/20	. . Ohmic heating	2001/3431	. . . . . {coaxial cylindrical electrodes}
1/22	. . for injection heating {( <a href="#">G21B 1/15</a> takes precedence)}		

2001/3436	. . . . .	{hollow cathode with internal coolant flow}	<b>3/00</b>	<b>Production or acceleration of neutral particle beams, e.g. molecular or atomic beams</b>
2001/3442	. . . . .	{cathode with inserted tip}	3/02	. Molecular or atomic beam generation {(charge exchange devices <a href="#">G21K 1/14</a> ; polarising devices <a href="#">G21K 1/16</a> ; using resonance or molecular beams for analysing or investigating materials <a href="#">G01N 24/002</a> ; atomic clock <a href="#">G04F 5/14</a> ; beam masers <a href="#">H01S 1/06</a> )}
2001/3447	. . . . .	{rod-like cathode}		
2001/3452	. . . . .	{supplementary electrodes between cathode and anode, e.g. cascade}	3/04	. Acceleration by electromagnetic wave pressure
2001/3457	. . . . .	{nozzle protection devices}	3/06	. Generating neutron beams (targets for producing nuclear reactions <a href="#">H05H 6/00</a> ; neutron sources <a href="#">G21G 4/02</a> )
2001/3463	. . . . .	{oblique nozzle}		
2001/3468	. . . . .	{vortex generator}		
2001/3473	. . . . .	{safety means}		
2001/3478	. . . . .	{geometrical details}	<b>5/00</b>	<b>Direct voltage accelerators; Accelerators using single pulses (<a href="#">H05H 3/06</a> takes precedence)</b>
2001/3484	. . . . .	{convergent/divergent nozzle}	5/02	. Details (targets for producing nuclear reactions <a href="#">H05H 6/00</a> )
2001/3489	. . . . .	{contact starting}	5/03	. . Accelerating tubes (vessels or containers of electric discharge tubes with improved potential distribution over surface of vessel <a href="#">H01J 5/06</a> ; shields of X-ray tubes associated with vessels or containers <a href="#">H01J 35/16</a> )
2001/3494	. . . . .	{discharge parameter control}	5/04	. energised by electrostatic generators
1/36	. . . . .	Circuit arrangements ( <a href="#">H05H 1/38</a> , <a href="#">H05H 1/40</a> take precedence)	5/042	. . {of the van de Graaf type}
1/38	. . . . .	Guiding or centering of electrodes	5/045	. . {High voltage cascades, e.g. Greinacher cascade}
1/40	. . . . .	using applied magnetic fields, e.g. for focusing or rotating the arc {(cf. <a href="#">B23K 9/08</a> , <a href="#">B23K 9/073</a> )}	5/047	. . {Pulsed generators}
1/42	. . . . .	with provision for introducing materials into the plasma, e.g. powder, liquid (electrostatic spraying, spraying apparatus with means for charging the spray electrically <a href="#">B05B 5/00</a> {cf. <a href="#">B23K 9/324</a> , <a href="#">B05B 7/22</a> ; arc stabilising or constricting arrangements <a href="#">H05H 1/3405</a> ; coaxial protecting fluids <a href="#">H05H 1/341</a> })	5/06	. Multistage accelerators
1/44	. . . . .	using more than one torch	5/063	. . {Tandems}
1/46	. . . . .	using applied electromagnetic fields, e.g. high frequency or microwave energy ( <a href="#">H05H 1/26</a> takes precedence)	5/066	. . {Onion-like structures}
2001/4607	. . . . .	{Microwave discharges}	5/08	. Particle accelerators using step-up transformers, e.g. resonance transformers
2001/4615	. . . . .	{Surface waves}	<b>6/00</b>	<b>Targets for producing nuclear reactions (supports for targets or objects to be irradiated <a href="#">G21K 5/08</a> {preparation of tritium <a href="#">C01B 4/00</a>}); {targets, e.g. pellets for fusion reactions by laser or charged particles beam injection <a href="#">H05H 1/22</a>}</b>
2001/4622	. . . . .	{Waveguides}	2006/002	. {Windows}
2001/463	. . . . .	{Antennas or applicators}	6/005	. {Polarised targets (polarising devices, e.g. for obtaining a polarised ion beam <a href="#">G21K 1/16</a> )}
2001/4637	. . . . .	{Cables}	2006/007	. {Radiation protection arrangements, e.g. screens}
2001/4645	. . . . .	{Radiofrequency discharges}	<b>7/00</b>	<b>Details of devices of the types covered by groups <a href="#">H05H 9/00</a>, <a href="#">H05H 11/00</a>, <a href="#">H05H 13/00</a></b>
2001/4652	. . . . .	{Inductively coupled}	7/001	. {Arrangements for beam delivery or irradiation (irradiation systems per se <a href="#">G21K 5/00</a> )}
2001/466	. . . . .	{Electrodes}	2007/002	. . {for modifying beam trajectory, e.g. gantries}
2001/4667	. . . . .	{Coiled antennas}	2007/004	. . {for modifying beam energy, e.g. spread out Bragg peak devices}
2001/4675	. . . . .	{Capacitively coupled}	2007/005	. . {for modifying beam emittance, e.g. stochastic cooling devices, stripper foils}
2001/4682	. . . . .	{Associated power generators, e. G. Circuits, matching networks}	2007/007	. . {for focusing the beam to irradiation target}
2001/469	. . . . .	{Flow through, i.e the plasma fluid flowing in a non-dielectric vessel}	2007/008	. . {for measuring beam parameters}
2001/4692	. . . . .	{dielectric barrier discharge ( <a href="#">H05H 1/2406</a> takes precedence)}	7/02	. Circuits or systems for supplying or feeding radio-frequency energy (radio-frequency generators <a href="#">H03B</a> )
2001/4695	. . . . .	{Arc discharge}	2007/022	. . {Pulsed systems}
2001/4697	. . . . .	{Glow discharge}	2007/025	. . {Radiofrequency systems}
1/48	. . . . .	using an arc ( <a href="#">H05H 1/26</a> takes precedence)	2007/027	. . {Microwave systems}
2001/481	. . . . .	{Corona discharges}	7/04	. Magnet systems {, e.g. undulators, wigglers (free-electron laser <a href="#">H01S 3/0903</a> )}; Energisation thereof
2001/483	. . . . .	{Pointed electrodes}	2007/041	. . {for beam bunching, e.g. undulators}
2001/485	. . . . .	{Cylindrical electrodes, e.g. Rotary drums electrodes}	2007/043	. . {for beam focusing}
2001/486	. . . . .	{Filamentary electrodes}	2007/045	. . {for beam bending}
2001/488	. . . . .	{Segmented electrodes}	2007/046	. . {for beam deflection}
1/50	. . . . .	and using applied magnetic fields, e.g. for focusing or rotating the arc		
1/52	. . . . .	using exploding wires or spark gaps ( <a href="#">H05H 1/26</a> takes precedence; spark gaps in general <a href="#">H01T</a> )		
1/54	. . . . .	Plasma accelerators		

- 2007/048 . . {for modifying beam trajectory, e.g. gantry systems}
- 7/06 . Two-beam arrangements; Multi-beam arrangements {storage rings}; Electron rings
- 2007/065 . . {Multi-beam merging, e.g. funneling}
- 7/08 . Arrangements for injecting particles into orbits
- 2007/081 . . {Sources}
- 2007/082 . . . {Ion sources, e.g. ECR, duoplasmatron, PIG, laser sources}
- 2007/084 . . . {Electron sources}
- 2007/085 . . {by electrostatic means}
- 2007/087 . . {by magnetic means}
- 2007/088 . . {by mechanical means, e.g. stripping foils}
- 7/10 . Arrangements for ejecting particles from orbits
- 7/12 . Arrangements for varying final energy of beam
- 2007/122 . . {by electromagnetic means, e.g. RF cavities}
- 2007/125 . . {by mechanical means, e.g. stripping foils}
- 2007/127 . . {by emittance variation, e.g. stochastic cooling}
- 7/14 . Vacuum chambers ([H05H 5/03](#) takes precedence)
- 7/16 . . of the waveguide type
- 7/18 . . Cavities; Resonators {(travelling-wave tubes [H01J 23/18](#); hyperfrequency cavities in general [H01P 7/04](#), [H01P 7/06](#))}
- 7/20 . . . with superconductive walls
- 7/22 . Details of linear accelerators, e.g. drift tubes ([H05H 7/02](#) - [H05H 7/20](#) take precedence)
- 2007/222 . . {drift tubes}
- 2007/225 . . {coupled cavities arrangements}
- 2007/227 . . {power coupling, e.g. coupling loops}

#### 9/00 Linear accelerators

- 9/005 . {Dielectric wall accelerators}
- 9/02 . Travelling-wave linear accelerators {(travelling-wave tubes [H01J 25/34](#))}
- 9/04 . Standing-wave linear accelerators
- 9/041 . . {Hadron LINACS}
- 9/042 . . . {Drift tube LINACS}
- 9/044 . . . {Coupling cavity LINACS, e.g. side coupled}
- 9/045 . . . {Radio frequency quadrupoles}
- 9/047 . . . {Hybrid systems}
- 9/048 . . {Lepton LINACS}

#### 11/00 Magnetic induction accelerators, e.g. betatrons

- 11/02 . Air-cored betatrons
- 11/04 . Biased betatrons

#### 13/00 Magnetic resonance accelerators; Cyclotrons {(strophotrons, turbine tubes [H01J 25/62](#))}

- 13/005 . {Cyclotrons}
- 13/02 . Synchrocyclotrons, i.e. frequency modulated cyclotrons
- 13/04 . Synchrotrons
- 13/06 . Air-cored magnetic resonance accelerators
- 13/08 . Alternating-gradient magnetic resonance accelerators
- 13/085 . . {Fixed-field alternating gradient accelerators [FFAG]}
- 13/10 . Accelerators comprising one or more linear accelerating sections and bending magnets or the like to return the charged particles in a trajectory parallel to the first accelerating section, e.g. microtrons

#### 15/00 Methods or devices for acceleration of charged particles not otherwise provided for

##### 2240/00 Test

- 2240/10 . at atmospheric pressure
- 2240/20 . Non-thermal plasma

##### 2242/00 Auxiliary systems

- 2242/10 . Cooling arrangements
- 2242/1005 . . Power supply other than for plasma torches

##### 2245/00 test

- 2245/104 . spiral electrodes
- 2245/12 . Applications
- 2245/121 . . treatment of exhaust gas, e.g. Ambient air, ozonizers
- 2245/1215 . . . Exhaust gas
- 2245/122 . . medical applications {, e.g. plasma scalpels, blades, bistouri}
- 2245/1225 . . . Sterilization of objects
- 2245/123 . . surface treatments
- 2245/1235 . . . coating of large volume items
- 2245/124 . . production of nanostructures
- 2245/125 . . portable devices

##### 2277/00 Applications

- 2277/10 . Medical devices
- 2277/11 . . Radiotherapy
- 2277/113 . . . Diagnostic systems
- 2277/116 . . . Isotope production
- 2277/12 . Ion implantation
- 2277/13 . High energy applications, e.g. fusion
- 2277/14 . Portable devices
- 2277/1405 . . Detection systems