

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](#))

H05H 1/00**Generating plasma; Handling plasma**

- H05H 1/0006 . {Investigating plasma, e.g. degree of ionisation (electron temperature)}
- H05H 1/0012 . . {by using radiation}
- H05H 1/0018 . . . {Details}
- H05H 1/0025 . . . {by using photoelectric means ([H05H 1/0031](#) - [H05H 1/0043](#) take precedence)}
- H05H 1/0031 . . . {by interferometry}
- H05H 1/0037 . . . {by spectrometry (see [G01N 3/00](#))}
- H05H 1/0043 . . . {by using infra-red or ultra-violet radiation}
- H05H 1/005 . . . {by using X-rays or alpha rays (see [G01N 23/00](#))}
- H05H 1/0056 . . . {by using neutrons (see [G01N 23/00](#))}
- H05H 1/0062 . . . {by using microwaves (see [G01N 23/223](#))}
- H05H 1/0068 . . {by thermal means (see [G01N 25/00](#))}
- H05H 1/0075 . . . {Langmuir probes}
- H05H 1/0081 . . {by electric means (see [G01N 27/00](#), [G01R](#))}
- H05H 1/0087 . . {by magnetic means (see [G01N 27/00](#), [G01R](#))}
- H05H 1/0093 . . {by acoustic, e.g. ultrasonic means (see [G01N 29/02](#))}
- H05H 1/02 . Arrangements for confining plasma by electric or magnetic fields; Arrangements for heating plasma ({[G21B 1/00](#) takes precedence;} electron optics [H01J](#))
- H05H 1/03 . . using electrostatic fields
- H05H 1/04 . . using magnetic fields substantially generated by the discharge in the plasma
- H05H 1/06 . . . longitudinal pinch devices
- H05H 1/08 . . . Theta pinch devices {e.g. SCYLLA}
- H05H 1/10 . . using externally-applied magnetic field only {e.g. Q-machines, Yin-Yang, base-ball}
- H05H 1/105 . . . {using magnetic pumping}
- H05H 1/11 . . . using cusp configuration ([H05H 1/14](#) takes precedence)
- H05H 1/12 . . . wherein the containment vessel forms a closed or nearly closed loop ({[G21B 1/05](#) takes precedence)}

- H05H 1/14 . . . wherein the containment vessel is straight and has magnetic mirrors
- H05H 1/16 . . using externally-applied electric and magnetic field
- H05H 1/18 . . . wherein the field oscillate at very high frequency, e.g. in the microwave range {e.g. using cyclotron resonance}
- H05H 1/20 . . Ohmic heating
- H05H 1/22 . . for injection heating {(G21B 1/15 takes precedence)}
- H05H 1/24 . Generating plasma {(gas-filled discharge reactors H01J 37/32; nuclear fusion reactors G21B 1/00; ohmic heating H05H 1/20; injection heating H05H 1/22)}
- H05H 1/2406 . . {Dielectric barrier discharges}
- H05H 2001/2412 . . . {the dielectric being interposed between the electrodes}
- H05H 2001/2418 . . . {the electrodes being embedded in the dielectric}
- H05H 2001/2425 . . . {the electrodes being flush with the dielectric}
- H05H 2001/2431 . . . {Cylindrical electrodes}
- H05H 2001/2437 . . . {Multilayer systems}
- H05H 2001/2443 . . . {Flow through, i.e. the plasma fluid flowing in a dielectric tube}
- H05H 2001/245 {Internal electrodes}
- H05H 2001/2456 {External electrodes}
- H05H 2001/2462 {Ring electrodes}
- H05H 2001/2468 {Spiral electrodes}
- H05H 1/2475 . . {Acoustic pressure discharge}
- H05H 2001/2481 . . . {Piezoelectric actuators}
- H05H 2001/2487 . . . {Mechanical actuators}
- H05H 2001/2493 . . . {Horns}
- H05H 1/26 . . Plasma torches {(metal working with constricted arc B23K 10/00, B23K 10/02; metal spraying B05B 7/18, B05B 7/20)}
- H05H 1/28 . . . Cooling arrangements
- H05H 1/30 . . . using applied electromagnetic fields, e.g. high frequency or microwave energy (H05H 1/28 takes precedence)
- H05H 1/32 . . . using an arc (H05H 1/28 takes precedence)
- H05H 1/34 Details, e.g. electrodes, nozzles {(cf. B23K 9/24)}
- H05H 1/3405 {Arc stabilising or constricting arrangements, e.g. by an additional gas flow (by externally applied magnetic field H05H 1/40; by using powders or liquids H05H 1/42; using coaxial protecting fluid H05H 1/341)}
- H05H 1/341 {using coaxial protecting fluid (arc stabilising or constricting arrangements H05H 1/3405; introducing materials into the plasma H05H 1/42)}
- H05H 2001/3415 {indexing scheme associated with H05H 1/34}
- H05H 2001/3421 {transferred arc mode}
- H05H 2001/3426 {pilot arc}
- H05H 2001/3431 {coaxial cylindrical electrodes}
- H05H 2001/3436 {hollow cathode with internal coolant flow}

H05H 2001/3442	. . . . .	{cathode with inserted tip}
H05H 2001/3447	. . . . .	{rod-like cathode}
H05H 2001/3452	. . . . .	{supplementary electrodes between cathode and anode, e.g. cascade}
H05H 2001/3457	. . . . .	{nozzle protection devices}
H05H 2001/3463	. . . . .	{oblique nozzle}
H05H 2001/3468	. . . . .	{vortex generator}
H05H 2001/3473	. . . . .	{safety means}
H05H 2001/3478	. . . . .	{geometrical details}
H05H 2001/3484	. . . . .	{convergent/divergent nozzle}
H05H 2001/3489	. . . . .	{contact starting}
H05H 2001/3494	. . . . .	{discharge parameter control}
H05H 1/36	. . . . .	Circuit arrangements (H05H 1/38 , H05H 1/40 take precedence)
H05H 1/38	. . . . .	Guiding or centering of electrodes
H05H 1/40	. . . . .	using applied magnetic fields, e.g. for focusing or rotating the arc {(cf. B23K 9/08 , B23K 9/073)}
H05H 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 B05B 5/00 {cf. B23K 9/324 , B05B 7/22 ; arc stabilising or constricting arrangements H05H 1/3405 ; coaxial protecting fluids H05H 1/341 })
H05H 1/44	. . . . .	using more than one torch
H05H 1/46	. . . . .	using applied electromagnetic fields, e.g. high frequency or microwave energy (H05H 1/26 takes precedence)
H05H 2001/4607	. . . . .	{Microwave discharges}
H05H 2001/4615	. . . . .	{Surface waves}
H05H 2001/4622	. . . . .	{Waveguides}
H05H 2001/463	. . . . .	{Antennas or applicators}
H05H 2001/4637	. . . . .	{Cables}
H05H 2001/4645	. . . . .	{Radiofrequency discharges}
H05H 2001/4652	. . . . .	{Inductively coupled}
H05H 2001/466	. . . . .	{Electrodes}
H05H 2001/4667	. . . . .	{Coiled antennas}
H05H 2001/4675	. . . . .	{Capacitively coupled}
H05H 2001/4682	. . . . .	{Associated power generators, e. G. Circuits, matching networks}
H05H 2001/469	. . . . .	{Flow through, i.e the plasma fluid flowing in a non-dielectric vessel}
H05H 2001/4692	. . . . .	{dielectric barrier discharge (H05H 1/2406 takes precedence)}
H05H 2001/4695	. . . . .	{Arc discharge}
H05H 2001/4697	. . . . .	{Glow discharge}
H05H 1/48	. . . . .	using an arc (H05H 1/26 takes precedence)
H05H 2001/481	. . . . .	{Corona discharges}
H05H 2001/483	. . . . .	{Pointed electrodes}

- H05H 2001/485 {Cylindrical electrodes, e.g. Rotary drums electrodes}
- H05H 2001/486 {Filamentary electrodes}
- H05H 2001/488 {Segmented electrodes}
- H05H 1/50 . . . and using applied magnetic fields, e.g. for focusing or rotating the arc
- H05H 1/52 . . using exploding wires or spark gaps ([H05H 1/26](#) takes precedence; spark gaps in general [H01T](#))
- H05H 1/54 . Plasma accelerators

- H05H 3/00** **Production or acceleration of neutral particle beams, e.g. molecular or atomic beams**
- H05H 3/02 . Molecular or atomic beam generation {(charge exchange devices [G21K 1/14](#); polarising devices [G21K 1/16](#); using resonance or molecular beams for analysing or investigating materials [G01N 24/002](#); atomic clock [G04F 5/14](#); beam masers [H01S 1/06](#))}
- H05H 3/04 . Acceleration by electromagnetic wave pressure
- H05H 3/06 . Generating neutron beams (targets for producing nuclear reactions [H05H 6/00](#); neutron sources [G21G 4/02](#))

- H05H 5/00** **Direct voltage accelerators; Accelerators using single pulses ([H05H 3/06](#) takes precedence)**
- H05H 5/02 . Details (targets for producing nuclear reactions [H05H 6/00](#))
- H05H 5/03 . . Accelerating tubes (vessels or containers of electric discharge tubes with improved potential distribution over surface of vessel [H01J 5/06](#); shields of X-ray tubes associated with vessels or containers [H01J 35/16](#))
- H05H 5/04 . energised by electrostatic generators
- H05H 5/042 . . {of the van de Graaf type}
- H05H 5/045 . . {High voltage cascades, e.g. Greinacher cascade}
- H05H 5/047 . . {Pulsed generators}
- H05H 5/06 . Multistage accelerators
- H05H 5/063 . . {Tandems}
- H05H 5/066 . . {Onion-like structures}
- H05H 5/08 . Particle accelerators using step-up transformers, e.g. resonance transformers

- H05H 6/00** **Targets for producing nuclear reactions (supports for targets or objects to be irradiated [G21K 5/08](#) {preparation of tritium [C01B 4/00](#)}); {targets, e.g. pellets for fusion reactions by laser or charged particles beam injection [H05H 1/22](#)}**
- H05H 2006/002 . {Windows}
- H05H 6/005 . {Polarised targets (polarising devices, e.g. for obtaining a polarised ion beam [G21K 1/16](#))}
- H05H 2006/007 . {Radiation protection arrangements , e.g. screens}

- H05H 7/00** **Details of devices of the types covered by groups [H05H 9/00](#), [H05H 11/00](#), [H05H 13/00](#)**
- H05H 7/001 . {Arrangements for beam delivery or irradiation (irradiation systems per se [G21K 5/00](#))}
- H05H 2007/002 . . {for modifying beam trajectory , e.g. gantries}

- H05H 2007/004 . . {for modifying beam energy, e.g. spread out Bragg peak devices}
- H05H 2007/005 . . {for modifying beam emittance , e.g. stochastic cooling devices, stripper foils}
- H05H 2007/007 . . {for focusing the beam to irradiation target}
- H05H 2007/008 . . {for measuring beam parameters}
- H05H 7/02 . Circuits or systems for supplying or feeding radio-frequency energy ([radio-frequency generators H03B](#))
- H05H 2007/022 . . {Pulsed systems}
- H05H 2007/025 . . {Radiofrequency systems}
- H05H 2007/027 . . {Microwave systems}
- H05H 7/04 . Magnet systems {e.g. undulators, wigglers ([free-electron laser H01S 3/0903](#))}; Energisation thereof
- H05H 2007/041 . . {for beam bunching , e.g. undulators}
- H05H 2007/043 . . {for beam focusing}
- H05H 2007/045 . . {for beam bending}
- H05H 2007/046 . . {for beam deflection}
- H05H 2007/048 . . {for modifying beam trajectory , e.g. gantry systems}
- H05H 7/06 . Two-beam arrangements; Multi-beam arrangements {[storage rings](#)}; Electron rings
- H05H 2007/065 . . {Multi-beam merging , e.g. funneling}
- H05H 7/08 . Arrangements for injecting particles into orbits
- H05H 2007/081 . . {Sources}
- H05H 2007/082 . . . {Ion sources, e.g. ECR, duoplasmatron, PIG, laser sources}
- H05H 2007/084 . . . {Electron sources}
- H05H 2007/085 . . {by electrostatic means}
- H05H 2007/087 . . {by magnetic means}
- H05H 2007/088 . . {by mechanical means, e.g. stripping foils}
- H05H 7/10 . Arrangements for ejecting particles from orbits
- H05H 7/12 . Arrangements for varying final energy of beam
- H05H 2007/122 . . {by electromagnetic means , e.g. RF cavities}
- H05H 2007/125 . . {by mechanical means , e.g. stripping foils}
- H05H 2007/127 . . {by emittance variation , e.g. stochastic cooling}
- H05H 7/14 . Vacuum chambers ([H05H 5/03 takes precedence](#))
- H05H 7/16 . . of the waveguide type
- H05H 7/18 . . Cavities; Resonators {(travelling-wave tubes [H01J 23/18](#); hyperfrequency cavities in general [H01P 7/04](#), [H01P 7/06](#))}
- H05H 7/20 . . . with superconductive walls
- H05H 7/22 . Details of linear accelerators, e.g. drift tubes ([H05H 7/02 - H05H 7/20 take precedence](#))
- H05H 2007/222 . . {drift tubes}
- H05H 2007/225 . . {coupled cavities arrangements}
- H05H 2007/227 . . {power coupling , e.g. coupling loops}

H05H 9/00**Linear accelerators**

H05H 9/005

- {Dielectric wall accelerators}

H05H 9/02

- Travelling-wave linear accelerators {(travelling-wave tubes [H01J 25/34](#))}

H05H 9/04

- Standing-wave linear accelerators

H05H 9/041

- . {Hadron LINACS}

H05H 9/042

- . . {Drift tube LINACS}

H05H 9/044

- . . {Coupling cavity LINACS, e.g. side coupled}

H05H 9/045

- . . {Radio frequency quadrupoles}

H05H 9/047

- . . {Hybrid systems}

H05H 9/048

- . {Lepton LINACS}

H05H 11/00**Magnetic induction accelerators, e.g. betatrons**

H05H 11/02

- Air-cored betatrons

H05H 11/04

- Biased betatrons

H05H 13/00**Magnetic resonance accelerators; Cyclotrons {(strophotrons, turbine tubes [H01J 25/62](#))}**

H05H 13/005

- {Cyclotrons}

H05H 13/02

- Synchrocyclotrons, i.e. frequency modulated cyclotrons

H05H 13/04

- Synchrotrons

H05H 13/06

- Air-cored magnetic resonance accelerators

H05H 13/08

- Alternating-gradient magnetic resonance accelerators

H05H 13/085

- . {Fixed-field alternating gradient accelerators [FFAG]}

H05H 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

H05H 15/00**Methods or devices for acceleration of charged particles not otherwise provided for****H05H 2240/00****Test**

H05H 2240/10

- at atmospheric pressure

H05H 2240/20

- Non-thermal plasma

H05H 2242/00**Auxiliary systems**

H05H 2242/10

- Cooling arrangements

H05H 2242/1005

- . Power supply other than for plasma torches

H05H 2245/00**test**

H05H 2245/104

- spiral electrodes

H05H 2245/12

- Applications

H05H 2245/121

- . treatment of exhaust gas, e.g. Ambient air, ozonizers

H05H 2245/1215

- . . Exhaust gas

- H05H 2245/122 . . medical applications {e.g. plasma scalpels, blades, bistouri}
- H05H 2245/1225 . . . Sterilization of objects
- H05H 2245/123 . . surface treatments
- H05H 2245/1235 . . . coating of large volume items
- H05H 2245/124 . . production of nanostructures
- H05H 2245/125 . . portable devices

H05H 2277/00**Applications**

- H05H 2277/10 . Medical devices
- H05H 2277/11 . . Radiotherapy
- H05H 2277/113 . . . Diagnostic systems
- H05H 2277/116 . . . Isotope production
- H05H 2277/12 . Ion implantation
- H05H 2277/13 . High energy applications , e.g. fusion
- H05H 2277/14 . Portable devices
- H05H 2277/1405 . . Detection systems