

**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](#) to [H05H 1/0043](#) take precedence ) }
- H05H 1/0031 ... { by interferrometry }
- 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 23/34](#) ) }
- 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 { electron

- mirrors [G21K 1/08B](#) }
- 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](#), [H05H 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 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 ( <a href="#">H05H 1/38</a> , <a href="#">H05H 1/40</a> 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. <a href="#">B23K 9/08</a> , <a href="#">B23K 9/06C5</a> }
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 <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> }
H05H 1/44	....	using more than one torch
H05H 1/46	..	using applied electromagnetic fields, e.g. high frequency or microwave energy ( <a href="#">H05H 1/26</a> 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 ( <a href="#">H05H 1/2406</a> takes precedence )
H05H 2001/4695	....	Arc discharge
H05H 2001/4697	....	Glow discharge
H05H 1/48	..	using an arc ( <a href="#">H05H 1/26</a> 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 ( <a href="#">H05H 1/26</a> takes precedence; spark gaps in general <a href="#">H01T</a> )

- 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](#) to [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