

# CPC COOPERATIVE PATENT CLASSIFICATION

## H ELECTRICITY

(NOTE omitted)

## H05 ELECTRIC TECHNIQUES NOT OTHERWISE PROVIDED FOR

**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](#))

### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

- |             |  |           |   |
|-------------|--|-----------|---|
| <b>1/00</b> | <b>Generating plasma; Handling plasma</b>  | 1/14      | . . . wherein the containment vessel is straight and has magnetic mirrors   |
| 1/0006      | . {Investigating plasma, e.g. degree of ionisation (electron temperature)}   | 1/16      | . . using externally-applied electric and magnetic fields   |
| 1/0012      | . . {by using radiation}   | 1/18      | . . . wherein the fields oscillate at very high frequency, e.g. in the microwave range {, e.g. using cyclotron resonance}   |
| 1/0018      | . . . {Details}  | 1/20      | . . Ohmic heating   |
| 1/0025      | . . . {by using photoelectric means ( <a href="#">H05H 1/0031</a> - <a href="#">H05H 1/0043</a> take precedence)}  | 1/22      | . . for injection heating {( <a href="#">G21B 1/15</a> takes precedence)}   |
| 1/0031      | . . . {by interferometry}  | 1/24      | . 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> )} |
| 1/0037      | . . . {by spectrometry (see <a href="#">G01N 3/00</a> )}   | 1/2406    | . . {Dielectric barrier discharges}   |
| 1/0043      | . . . {by using infra-red or ultra-violet radiation}   | 2001/2412 | . . . {the dielectric being interposed between the electrodes}  |
| 1/005       | . . . {by using X-rays or alpha rays (see <a href="#">G01N 23/00</a> )}  | 2001/2418 | . . . {the electrodes being embedded in the dielectric}   |
| 1/0056      | . . . {by using neutrons (see <a href="#">G01N 23/00</a> )}  | 2001/2425 | . . . {the electrodes being flush with the dielectric}  |
| 1/0062      | . . . {by using microwaves (see <a href="#">G01N 23/223</a> )}   | 2001/2431 | . . . {Cylindrical electrodes}  |
| 1/0068      | . . {by thermal means (see <a href="#">G01N 25/00</a> )}   | 2001/2437 | . . . {Multilayer systems}  |
| 1/0075      | . . . {Langmuir probes}  | 2001/2443 | . . . {Flow through, i.e. the plasma fluid flowing in a dielectric tube}  |
| 1/0081      | . . {by electric means (see <a href="#">G01N 27/00</a> , <a href="#">G01R</a> )}   | 2001/245  | . . . . {Internal electrodes}   |
| 1/0087      | . . {by magnetic means (see <a href="#">G01N 27/00</a> , <a href="#">G01R</a> )}   | 2001/2456 | . . . . {External electrodes}   |
| 1/0093      | . . {by acoustic, e.g. ultrasonic means (see <a href="#">G01N 29/02</a> )}   | 2001/2462 | . . . . {Ring electrodes}   |
| 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> ) | 2001/2468 | . . . . {Spiral electrodes}   |
| 1/03        | . . using electrostatic fields   | 1/2475    | . . {Acoustic pressure discharge}   |
| 1/04        | . . using magnetic fields substantially generated by the discharge in the plasma   | 2001/2481 | . . . {Piezoelectric actuators}   |
| 1/06        | . . . Longitudinal pinch devices   | 2001/2487 | . . . {Mechanical actuators}  |
| 1/08        | . . . Theta pinch devices {, e.g. <a href="#">SCYLLA</a> }   | 2001/2493 | . . . {Horns}   |
| 1/10        | . . using externally-applied magnetic fields only {, e.g. Q-machines, Yin-Yang, base-ball}   | 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> )}                                       |
| 1/105       | . . . {using magnetic pumping}   | 1/28      | . . . Cooling arrangements  |
| 1/11        | . . . using cusp configuration ( <a href="#">H05H 1/14</a> takes precedence)   |           |   |
| 1/12        | . . . wherein the containment vessel forms a closed or nearly closed loop {( <a href="#">G21B 1/05</a> takes precedence)}  |           |   |

- 1/30 . . . using applied electromagnetic fields, e.g. high frequency or microwave energy ([H05H 1/28 takes precedence](#))
- 1/32 . . . using an arc ([H05H 1/28 takes precedence](#))
- 1/34 . . . Details, e.g. electrodes, nozzles {(cf. [B23K 9/24](#))}
- 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](#))}
- 1/341 . . . . {using coaxial protecting fluid (arc stabilising or constricting arrangements [H05H 1/3405](#); introducing materials into the plasma [H05H 1/42](#))}
- 2001/3415 . . . . {indexing scheme associated with [H05H 1/34](#)}
- 2001/3421 . . . . . {transferred arc mode}
- 2001/3426 . . . . . {pilot arc}
- 2001/3431 . . . . . {coaxial cylindrical electrodes}
- 2001/3436 . . . . . {hollow cathode with internal coolant flow}
- 2001/3442 . . . . . {cathode with inserted tip}
- 2001/3447 . . . . . {rod-like cathode}
- 2001/3452 . . . . . {supplementary electrodes between cathode and anode, e.g. cascade}
- 2001/3457 . . . . . {nozzle protection devices}
- 2001/3463 . . . . . {oblique nozzle}
- 2001/3468 . . . . . {vortex generator}
- 2001/3473 . . . . . {safety means}
- 2001/3478 . . . . . {geometrical details}
- 2001/3484 . . . . . {convergent/divergent nozzle}
- 2001/3489 . . . . . {contact starting}
- 2001/3494 . . . . . {discharge parameter control}
- 1/36 . . . . . Circuit arrangements ([H05H 1/38](#), [H05H 1/40](#) take precedence)
- 1/38 . . . . . Guiding or centering of electrodes
- 1/40 . . . . . using applied magnetic fields, e.g. for focusing or rotating the arc {(cf. [B23K 9/08](#), [B23K 9/073](#))}
- 1/42 . . . . with provisions 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](#)})
- 1/44 . . . . using more than one torch
- 1/46 . . . using applied electromagnetic fields, e.g. high frequency or microwave energy ([H05H 1/26 takes precedence](#))
- 2001/4607 . . . {Microwave discharges}
- 2001/4615 . . . {Surface waves}
- 2001/4622 . . . {Waveguides}
- 2001/463 . . . {Antennas or applicators}
- 2001/4637 . . . {Cables}
- 2001/4645 . . . {Radiofrequency discharges}
- 2001/4652 . . . {Inductively coupled}
- 2001/466 . . . {Electrodes}
- 2001/4667 . . . {Coiled antennas}
- 2001/4675 . . . {Capacitively coupled}
- 2001/4682 . . . . {Associated power generators, e. G. Circuits, matching networks}
- 2001/469 . . . {Flow through, i.e. the plasma fluid flowing in a non-dielectric vessel}
- 2001/4692 . . . . {dielectric barrier discharge ([H05H 1/2406 takes precedence](#))}
- 2001/4695 . . . . {Arc discharge}
- 2001/4697 . . . . {Glow discharge}
- 1/48 . . . using an arc ([H05H 1/26 takes precedence](#))
- 2001/481 . . . {Corona discharges}
- 2001/483 . . . . {Pointed electrodes}
- 2001/485 . . . . {Cylindrical electrodes, e.g. Rotary drums electrodes}
- 2001/486 . . . . {Filamentary electrodes}
- 2001/488 . . . . {Segmented electrodes}
- 1/50 . . . and using applied magnetic fields, e.g. for focusing or rotating the arc
- 1/52 . . . using exploding wires or spark gaps ([H05H 1/26 takes precedence](#); spark gaps in general [H01T](#))
- 1/54 . Plasma accelerators
- 3/00 Production or acceleration of neutral particle beams, e.g. molecular or atomic beams**
- 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](#))}
- 3/04 . Acceleration by electromagnetic wave pressure
- 3/06 . Generating neutron beams (targets for producing nuclear reactions [H05H 6/00](#); neutron sources [G21G 4/02](#))
- 5/00 Direct voltage accelerators; Accelerators using single pulses ([H05H 3/06 takes precedence](#))**
- 5/02 . Details (targets for producing nuclear reactions [H05H 6/00](#))
- 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](#))
- 5/04 . energised by electrostatic generators
- 5/042 . . {of the van de Graaf type}
- 5/045 . . {High voltage cascades, e.g. Greinacher cascade}
- 5/047 . . {Pulsed generators}
- 5/06 . Multistage accelerators
- 5/063 . . {Tandems}
- 5/066 . . {Onion-like structures}
- 5/08 . Particle accelerators using step-up transformers, e.g. resonance transformers
- 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](#)})**
- 2006/002 . {Windows}
- 6/005 . {Polarised targets (polarising devices, e.g. for obtaining a polarised ion beam [G21K 1/16](#))}
- 2006/007 . {Radiation protection arrangements, e.g. screens}
- 7/00 Details of devices of the types covered by groups [H05H 9/00](#), [H05H 11/00](#), [H05H 13/00](#)**

|             |   |   |  |
|-------------|---|---|--|
| 7/001       | . {Arrangements for beam delivery or irradiation (irradiation systems per se <a href="#">G21K 5/00</a> )}   | <b>11/00</b>  | <b>Magnetic induction accelerators, e.g. betatrons</b>   |
| 2007/002    | . . {for modifying beam trajectory, e.g. gantries}  | 11/02   | . Air-cored betatrons  |
| 2007/004    | . . {for modifying beam energy, e.g. spread out Bragg peak devices}   | 11/04   | . Biased betatrons   |
| 2007/005    | . . {for modifying beam emittance, e.g. stochastic cooling devices, stripper foils}   | <b>13/00</b>  | <b>Magnetic resonance accelerators; Cyclotrons</b>   |
| 2007/007    | . . {for focusing the beam to irradiation target}   | {(strophotrons, turbine tubes <a href="#">H01J 25/62</a> )} |  |
| 2007/008    | . . {for measuring beam parameters}   | 13/005  | . {Cyclotrons}   |
| 7/02        | . Circuits or systems for supplying or feeding radio-frequency energy (radio-frequency generators <a href="#">H03B</a> )  | 13/02   | . Synchrocyclotrons, i.e. frequency modulated cyclotrons   |
| 2007/022    | . . {Pulsed systems}  | 13/04   | . Synchrotrons   |
| 2007/025    | . . {Radiofrequency systems}  | 13/06   | . Air-cored magnetic resonance accelerators  |
| 2007/027    | . . {Microwave systems}   | 13/08   | . Alternating-gradient magnetic resonance accelerators   |
| 7/04        | . Magnet systems {, e.g. undulators, wigglers (free-electron laser <a href="#">H01S 3/0903</a> )}; Energisation thereof   | 13/085  | . . {Fixed-field alternating gradient accelerators [FFAG]}   |
| 2007/041    | . . {for beam bunching, e.g. undulators}  | 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 |
| 2007/043    | . . {for beam focusing}   | <b>15/00</b>  | <b>Methods or devices for acceleration of charged particles not otherwise provided for</b>   |
| 2007/045    | . . {for beam bending}  | <b>2240/00</b>  | <b>Test</b>  |
| 2007/046    | . . {for beam deflection}   | 2240/10   | . at atmospheric pressure  |
| 2007/048    | . . {for modifying beam trajectory, e.g. gantry systems}  | 2240/20   | . Non-thermal plasma   |
| 7/06        | . Two-beam arrangements; Multi-beam arrangements {storage rings}; Electron rings  | <b>2242/00</b>  | <b>Auxiliary systems</b>   |
| 2007/065    | . . {Multi-beam merging, e.g. funneling}  | 2242/10   | . Cooling arrangements   |
| 7/08        | . Arrangements for injecting particles into orbits  | 2242/1005   | . . Power supply other than for plasma torches   |
| 2007/081    | . . {Sources}   | <b>2245/00</b>  | <b>test</b>  |
| 2007/082    | . . . {Ion sources, e.g. ECR, duoplasmatron, PIG, laser sources}  | 2245/104  | . spiral electrodes  |
| 2007/084    | . . . {Electron sources}  | 2245/12   | . Applications   |
| 2007/085    | . . {by electrostatic means}  | 2245/121  | . . treatment of exhaust gas, e.g. Ambient air, ozonizers  |
| 2007/087    | . . {by magnetic means}   | 2245/1215   | . . . Exhaust gas  |
| 2007/088    | . . {by mechanical means, e.g. stripping foils}   | 2245/122  | . . medical applications {, e.g. plasma scalpels, blades, bistouri}  |
| 7/10        | . Arrangements for ejecting particles from orbits   | 2245/1225   | . . . Sterilization of objects   |
| 7/12        | . Arrangements for varying final energy of beam   | 2245/123  | . . surface treatments   |
| 2007/122    | . . {by electromagnetic means, e.g. RF cavities}  | 2245/1235   | . . . coating of large volume items  |
| 2007/125    | . . {by mechanical means, e.g. stripping foils}   | 2245/124  | . . production of nanostructures   |
| 2007/127    | . . {by emittance variation, e.g. stochastic cooling}   | 2245/125  | . . portable devices   |
| 7/14        | . Vacuum chambers ( <a href="#">H05H 5/03</a> takes precedence)   | <b>2277/00</b>  | <b>Applications</b>  |
| 7/16        | . . of the waveguide type   | 2277/10   | . Medical devices  |
| 7/18        | . . Cavities; Resonators {(travelling-wave tubes <a href="#">H01J 23/18</a> ; hyperfrequency cavities in general <a href="#">H01P 7/04</a> , <a href="#">H01P 7/06</a> )} | 2277/11   | . . Radiotherapy   |
| 7/20        | . . . with superconductive walls  | 2277/113  | . . . Diagnostic systems   |
| 7/22        | . Details of linear accelerators, e.g. drift tubes ( <a href="#">H05H 7/02</a> - <a href="#">H05H 7/20</a> take precedence)   | 2277/116  | . . . Isotope production   |
| 2007/222    | . . {drift tubes}   | 2277/12   | . Ion implantation   |
| 2007/225    | . . {coupled cavities arrangements}   | 2277/13   | . High energy applications, e.g. fusion  |
| 2007/227    | . . {power coupling, e.g. coupling loops}   | 2277/14   | . Portable devices   |
| <b>9/00</b> | <b>Linear accelerators</b>  | 2277/1405   | . . Detection systems  |
| 9/005       | . {Dielectric wall accelerators}  |   |  |
| 9/02        | . Travelling-wave linear accelerators {(travelling-wave tubes <a href="#">H01J 25/34</a> )}   |   |  |
| 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}   |   |  |