

# 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.

### 1/00 Generating plasma; Handling plasma

#### WARNING

Group [H05H 1/00](#) is impacted by reclassification into group [H05H 1/01](#).

Groups [H05H 1/00](#) and [H05H 1/01](#) should be considered in order to perform a complete search.

- 1/0006 . {Investigating plasma, e.g. measuring the degree of ionisation or the electron temperature}
- 1/0012 . . {using electromagnetic or particle radiation, e.g. interferometry}
- 1/0018 . . . {Details}
- 1/0025 . . . {by using photoelectric means  
([H05H 1/0031](#) - [H05H 1/0043](#) take precedence)}
- 1/0031 . . . {by interferometry}
- 1/0037 . . . {by spectrometry}
- 1/0043 . . . {by using infra-red or ultra-violet radiation}
- 1/005 . . . {by using X-rays or alpha rays}
- 1/0056 . . . {by using neutrons}
- 1/0062 . . . {by using microwaves}
- 1/0068 . . {by thermal means}
- 1/0075 . . . {Langmuir probes}
- 1/0081 . . {by electric means}
- 1/0087 . . {by magnetic means}
- 1/0093 . . {by acoustic means, e.g. ultrasonic}
- 1/01 . {Handling plasma, e.g. of subatomic particles}

#### WARNING

Group [H05H 1/01](#) is incomplete pending reclassification of documents from group [H05H 1/00](#).

Groups [H05H 1/00](#) and [H05H 1/01](#) should be considered in order to perform a complete search.

- 1/02 . Arrangements for confining plasma by electric or magnetic fields; Arrangements for heating plasma ([G21B 1/00](#) takes precedence; ) electron optics [H01J](#))
- 1/03 . . using electrostatic fields
- 1/04 . . using magnetic fields substantially generated by the discharge in the plasma
- 1/06 . . . Longitudinal pinch devices
- 1/08 . . . Theta pinch devices {, e.g. [SCYLLA](#)}
- 1/10 . . using externally-applied magnetic fields only {, e.g. Q-machines, Yin-Yang, base-ball}
- 1/105 . . . {using magnetic pumping}
- 1/11 . . . using cusp configuration ([H05H 1/14](#) takes precedence)
- 1/12 . . . wherein the containment vessel forms a closed or nearly closed loop {([G21B 1/05](#) takes precedence)}
- 1/14 . . . wherein the containment vessel is straight and has magnetic mirrors
- 1/16 . . using externally-applied electric and magnetic fields
- 1/18 . . . wherein the fields oscillate at very high frequency, e.g. in the microwave range {, e.g. using cyclotron resonance}
- 1/20 . . Ohmic heating
- 1/22 . . for injection heating {([G21B 1/15](#) takes precedence)}
- 1/24 . Generating plasma {(nuclear fusion reactors [G21B 1/00](#); gas-filled discharge reactors [H01J 37/32](#))}

#### WARNING

Group [H05H 1/24](#) is impacted by reclassification into groups [H05H 1/247](#) and [H05H 1/4697](#).

Groups [H05H 1/24](#), [H05H 1/247](#) and [H05H 1/4697](#) should be considered in order to perform a complete search.

- 1/2406 . . {using dielectric barrier discharges, i.e. with a dielectric interposed between the electrodes}

**WARNING**

Group [H05H 1/2406](#) is impacted by reclassification into groups [H05H 1/2439](#) and [H05H 1/2441](#).

Groups [H05H 1/2406](#), [H05H 1/2439](#) and [H05H 1/2441](#) should be considered in order to perform a complete search.

- 1/2418 . . . {the electrodes being embedded in the dielectric}
- 1/2425 . . . {the electrodes being flush with the dielectric}
- 1/2431 . . . {using cylindrical electrodes, e.g. rotary drums}
- 1/2437 . . . {Multilayer systems}
- 1/2439 . . . {Surface discharges, e.g. air flow control}

**WARNING**

Group [H05H 1/2439](#) is incomplete pending reclassification of documents from group [H05H 1/2406](#).

Groups [H05H 1/2406](#) and [H05H 1/2439](#) should be considered in order to perform a complete search.

- 1/2441 . . . {characterised by the physical-chemical properties of the dielectric, e.g. porous dielectric}

**WARNING**

Group [H05H 1/2441](#) is incomplete pending reclassification of documents from group [H05H 1/2406](#).

Groups [H05H 1/2406](#) and [H05H 1/2441](#) should be considered in order to perform a complete search.

- 1/2443 . . . {the plasma fluid flowing through a dielectric tube}
- 1/245 . . . . {the plasma being activated using internal electrodes}
- 1/246 . . . . {the plasma being activated using external electrodes ([H05H 1/245](#) takes precedence)}
- 1/2465 . . . . {the plasma being activated by inductive coupling, e.g. using coiled electrodes}
- 1/247 . . {using discharges in liquid media}

**WARNING**

Group [H05H 1/247](#) is incomplete pending reclassification of documents from group [H05H 1/24](#).

Groups [H05H 1/24](#) and [H05H 1/247](#) should be considered in order to perform a complete search.

- 1/2475 . . {using acoustic pressure discharges}
- 1/2481 . . . {the plasma being activated using piezoelectric actuators}
- 1/2487 . . . {the plasma being activated using mechanical actuators}
- 1/2493 . . . {the plasma being activated using horns}
- 1/26 . . Plasma torches
- 1/28 . . . Cooling arrangements

- 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

**WARNING**

Group [H05H 1/34](#) is impacted by reclassification into groups [H05H 1/3423](#) and [H05H 1/3425](#).

Groups [H05H 1/34](#), [H05H 1/3423](#) and [H05H 1/3425](#) should be considered in order to perform a complete search.

- 1/3405 . . . . . {Arrangements for stabilising or constricting the arc, e.g. by an additional gas flow}
- 1/341 . . . . . {Arrangements for providing coaxial protecting fluids}
- 1/3421 . . . . . {Transferred arc or pilot arc mode}
- 1/3423 . . . . . {Connecting means, e.g. electrical connecting means or fluid connections}

**WARNING**

Group [H05H 1/3423](#) is incomplete pending reclassification of documents from group [H05H 1/34](#).

Groups [H05H 1/34](#) and [H05H 1/3423](#) should be considered in order to perform a complete search.

- 1/3425 . . . . . {Melting or consuming electrodes}

**WARNING**

Group [H05H 1/3425](#) is incomplete pending reclassification of documents from group [H05H 1/34](#).

Groups [H05H 1/34](#) and [H05H 1/3425](#) should be considered in order to perform a complete search.

- 1/3431 . . . . . {Coaxial cylindrical electrodes}
- 1/3436 . . . . . {Hollow cathodes with internal coolant flow}
- 1/3442 . . . . . {Cathodes with inserted tip}
- 1/3447 . . . . . {Rod-like cathodes}
- 1/3452 . . . . . {Supplementary electrodes between cathode and anode, e.g. cascade}
- 1/3457 . . . . . {Nozzle protection devices}
- 1/3463 . . . . . {Oblique nozzles}
- 1/3468 . . . . . {Vortex generators}
- 1/3473 . . . . . {Safety means}
- 1/3478 . . . . . {Geometrical details}
- 1/3484 . . . . . {Convergent-divergent nozzles}
- 1/3489 . . . . . {Means for contact starting}
- 1/3494 . . . . . {Means for controlling discharge parameters}
- 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)
- 1/461 . . . {Microwave discharges}
- 1/4615 . . . {using surface waves}
- 1/4622 . . . {using waveguides}
- 1/463 . . . {using antennas or applicators}
- 1/4637 . . . {using cables}
- 1/4645 . . . {Radiofrequency discharges}
- 1/4652 . . . {using inductive coupling means, e.g. coils}
- 1/466 . . . {using capacitive coupling means, e.g. electrodes}
- 1/4697 . . {using glow discharges}

**WARNING**

Group [H05H 1/4697](#) is incomplete pending reclassification of documents from group [H05H 1/24](#).

Groups [H05H 1/24](#) and [H05H 1/4697](#) should be considered in order to perform a complete search.

- 1/47 . . {using corona discharges}
- 1/471 . . . {Pointed electrodes}
- 1/473 . . . {Cylindrical electrodes, e.g. rotary drums}
- 1/475 . . . {Filamentary electrodes}
- 1/477 . . . {Segmented electrodes}
- 1/48 . . using an arc ([H05H 1/26](#) takes precedence)

**WARNING**

Group [H05H 1/48](#) is impacted by reclassification into groups [H05H 1/481](#), [H05H 1/482](#), [H05H 1/484](#), [H05H 1/486](#) and [H05H 1/488](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 1/481 . . . {Hollow cathodes}

**WARNING**

Group [H05H 1/481](#) is incomplete pending reclassification of documents from group [H05H 1/48](#).

Groups [H05H 1/48](#) and [H05H 1/481](#) should be considered in order to perform a complete search.

- 1/482 . . . {Arrangements to provide gliding arc discharges}

**WARNING**

Group [H05H 1/482](#) is incomplete pending reclassification of documents from group [H05H 1/48](#).

Groups [H05H 1/48](#) and [H05H 1/482](#) should be considered in order to perform a complete search.

- 1/484 . . . {Arrangements to provide plasma curtains or plasma showers}

**WARNING**

Group [H05H 1/484](#) is incomplete pending reclassification of documents from group [H05H 1/48](#).

Groups [H05H 1/48](#) and [H05H 1/484](#) should be considered in order to perform a complete search.

- 1/486 . . . {Arrangements to provide capillary discharges}

**WARNING**

Group [H05H 1/486](#) is incomplete pending reclassification of documents from group [H05H 1/48](#).

Groups [H05H 1/48](#) and [H05H 1/486](#) should be considered in order to perform a complete search.

- 1/488 . . . {Liquid electrodes}

**WARNING**

Group [H05H 1/488](#) is incomplete pending reclassification of documents from group [H05H 1/48](#).

Groups [H05H 1/48](#) and [H05H 1/488](#) should be considered in order to perform a complete search.

- 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 <a href="#">H01J 5/06</a> ; shields of X-ray tubes associated with vessels or containers <a href="#">H01J 35/16</a> )	2007/125	. . {by mechanical means, e.g. stripping foils}
5/04	. energised by electrostatic generators	2007/127	. . {by emittance variation, e.g. stochastic cooling}
5/042	. . {of the van de Graaf type}	7/14	. Vacuum chambers ( <a href="#">H05H 5/03</a> takes precedence)
5/045	. . {High voltage cascades, e.g. Greinacher cascade}	7/16	. . of the waveguide type
5/047	. . {Pulsed generators}	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> )}
5/06	. Multistage accelerators	7/20	. . . with superconductive walls
5/063	. . {Tandems}	7/22	. Details of linear accelerators, e.g. drift tubes ( <a href="#">H05H 7/02</a> - <a href="#">H05H 7/20</a> take precedence)
5/066	. . {Onion-like structures}	2007/222	. . {drift tubes}
5/08	. Particle accelerators using step-up transformers, e.g. resonance transformers	2007/225	. . {coupled cavities arrangements}
6/00	<b>Targets for producing nuclear reactions</b> (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> )	2007/227	. . {power coupling, e.g. coupling loops}
2006/002	. {Windows}	9/00	<b>Linear accelerators</b>
6/005	. {Polarised targets (polarising devices, e.g. for obtaining a polarised ion beam <a href="#">G21K 1/16</a> )}	9/005	. {Dielectric wall accelerators}
2006/007	. {Radiation protection arrangements, e.g. screens}	9/02	. Travelling-wave linear accelerators {(travelling-wave tubes <a href="#">H01J 25/34</a> )}
7/00	<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>	9/04	. Standing-wave linear accelerators
7/001	. {Arrangements for beam delivery or irradiation (irradiation systems per se <a href="#">G21K 5/00</a> )}	9/041	. . {Hadron LINACS}
2007/002	. . {for modifying beam trajectory, e.g. gantries}	9/042	. . . {Drift tube LINACS}
2007/004	. . {for modifying beam energy, e.g. spread out Bragg peak devices}	9/044	. . . {Coupling cavity LINACS, e.g. side coupled}
2007/005	. . {for modifying beam emittance, e.g. stochastic cooling devices, stripper foils}	9/045	. . . {Radio frequency quadrupoles}
2007/007	. . {for focusing the beam to irradiation target}	9/047	. . . {Hybrid systems}
2007/008	. . {for measuring beam parameters}	9/048	. . {Lepton LINACS}
7/02	. Circuits or systems for supplying or feeding radio-frequency energy (radio-frequency generators <a href="#">H03B</a> )	11/00	<b>Magnetic induction accelerators, e.g. betatrons</b>
2007/022	. . {Pulsed systems}	11/02	. Air-cored betatrons
2007/025	. . {Radiofrequency systems}	11/04	. Biased betatrons
2007/027	. . {Microwave systems}	13/00	<b>Magnetic resonance accelerators; Cyclotrons</b> {(strophotrons, turbine tubes <a href="#">H01J 25/62</a> )}
7/04	. Magnet systems {, e.g. undulators, wigglers (free-electron laser <a href="#">H01S 3/0903</a> )}; Energisation thereof	13/005	. {Cyclotrons}
2007/041	. . {for beam bunching, e.g. undulators}	13/02	. Synchrocyclotrons, i.e. frequency modulated cyclotrons
2007/043	. . {for beam focusing}	13/04	. Synchrotrons
2007/045	. . {for beam bending}	13/06	. Air-cored magnetic resonance accelerators
2007/046	. . {for beam deflection}	13/08	. Alternating-gradient magnetic resonance accelerators
2007/048	. . {for modifying beam trajectory, e.g. gantry systems}	13/085	. . {Fixed-field alternating gradient accelerators [FFAG]}
7/06	. Two-beam arrangements; Multi-beam arrangements {storage rings}; Electron rings	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 {or rhodotrons}
2007/065	. . {Multi-beam merging, e.g. funneling}	15/00	<b>Methods or devices for acceleration of charged particles not otherwise provided for {, e.g. wakefield accelerators}</b>
7/08	. Arrangements for injecting particles into orbits	2240/00	<b>Testing</b>
2007/081	. . {Sources}	2240/10	. at atmospheric pressure
2007/082	. . . {Ion sources, e.g. ECR, duoplasmatron, PIG, laser sources}	2240/20	. Non-thermal plasma
2007/084	. . . {Electron sources}	2242/00	<b>Auxiliary systems</b>
2007/085	. . {by electrostatic means}	2242/10	. Cooling arrangements
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}		

- 2242/20 . . Power circuits

**WARNING**

Group [H05H 2242/20](#) is impacted by reclassification into groups [H05H 2242/22](#), [H05H 2242/24](#) and [H05H 2242/26](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 2242/22 . . DC, AC or pulsed generators

**WARNING**

Group [H05H 2242/22](#) is incomplete pending reclassification of documents from group [H05H 2242/20](#).

Groups [H05H 2242/20](#) and [H05H 2242/22](#) should be considered in order to perform a complete search.

- 2242/24 . . Radiofrequency or microwave generators

**WARNING**

Group [H05H 2242/24](#) is incomplete pending reclassification of documents from group [H05H 2242/20](#).

Groups [H05H 2242/20](#) and [H05H 2242/24](#) should be considered in order to perform a complete search.

- 2242/26 . . Matching networks

**WARNING**

Group [H05H 2242/26](#) is incomplete pending reclassification of documents from group [H05H 2242/20](#).

Groups [H05H 2242/20](#) and [H05H 2242/26](#) should be considered in order to perform a complete search.

**2245/00 Applications of plasma devices**

- 2245/10 . Treatment of gases  
2245/15 . . Ambient air; Ozonisers  
2245/17 . . Exhaust gases  
2245/20 . Treatment of liquids  
2245/30 . Medical applications

**WARNING**

Group [H05H 2245/30](#) is impacted by reclassification into groups [H05H 2245/32](#) and [H05H 2245/34](#).

Groups [H05H 2245/30](#), [H05H 2245/32](#) and [H05H 2245/34](#) should be considered in order to perform a complete search.

- 2245/32 . . Surgery, e.g. scalpels, blades or bistoury;  
Treatments inside the body

**WARNING**

Group [H05H 2245/32](#) is incomplete pending reclassification of documents from group [H05H 2245/30](#).

Groups [H05H 2245/30](#) and [H05H 2245/32](#) should be considered in order to perform a complete search.

- 2245/34 . . Skin treatments, e.g. disinfection or wound treatment

**WARNING**

Group [H05H 2245/34](#) is incomplete pending reclassification of documents from group [H05H 2245/30](#).

Groups [H05H 2245/30](#) and [H05H 2245/34](#) should be considered in order to perform a complete search.

- 2245/36 . . Sterilisation of objects, liquids, volumes or surfaces

- 2245/40 . Surface treatments

- 2245/42 . . Coating or etching of large items

- 2245/50 . Production of nanostructures

- 2245/60 . Portable devices

- 2245/70 . Automotive applications, e.g. engines

- 2245/80 . Burners or furnaces for heat generation, for fuel combustion or for incineration of wastes

**2277/00 Applications of particle accelerators**

- 2277/10 . Medical devices

- 2277/11 . . Radiotherapy

- 2277/113 . . . Diagnostic systems

- 2277/116 . . . Isotope production

- 2277/12 . Ion implantation

- 2277/13 . Nuclear physics, e.g. spallation sources, accelerator driven systems, search or generation of exotic elements

- 2277/14 . Portable devices

- 2277/1405 . . Detection systems, e.g. for safety