

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H01 BASIC ELECTRIC ELEMENTS

(NOTES omitted)

H01J ELECTRIC DISCHARGE TUBES OR DISCHARGE LAMPS (spark-gaps [H01T](#); arc lamps with consumable electrodes [H05B](#); particle accelerators [H05H](#))

NOTES

1. This subclass covers only devices for producing, influencing, or using a flow of electrons or ions, e.g. for controlling, indicating, or switching of electric current, counting electric pulses, producing light or other electromagnetic oscillations, such as X-rays, or for separating or analysing radiation or particles, and having a closed or substantially closed casing containing a chosen gas, vapour, or vacuum, upon the pressure and nature of which the characteristics of the device depend. Light sources using a combination (other than covered by group [H01J 61/96](#) of this subclass) of discharge and other kinds of light generation are dealt with in [H05B 35/00](#).
2. In this subclass, groups [H01J 1/00](#) - [H01J 7/00](#) relate only to:
 - i. details of an unspecified kind of discharge tube or lamp, or
 - ii. details mentioned in a specification as applicable to two or more kinds of tubes or lamps as defined by groups [H01J 11/00](#), [H01J 13/00](#), [H01J 15/00](#), [H01J 17/00](#), [H01J 21/00](#), [H01J 25/00](#), [H01J 27/00](#), [H01J 31/00](#), [H01J 33/00](#), [H01J 35/00](#), [H01J 37/00](#), [H01J 40/00](#), [H01J 41/00](#), [H01J 47/00](#), [H01J 49/00](#), [H01J 61/00](#), [H01J 63/00](#) or [H01J 65/00](#), hereinafter called basic kinds. A detail only described with reference to, or clearly only applicable to, tubes or lamps of a single basic kind is classified in the detail group appropriate to tubes or lamps of that basic kind, e.g. [H01J 17/04](#).
3. In this subclass, the following term is used with the meaning indicated:
 - "lamp" includes tubes emitting ultra-violet or infra-red light.
4. Attention is drawn to the definition of the expression "spark gaps" given in the Note following the title of subclass [H01T](#).
5. Apparatus or processes specially adapted for the manufacture of electric discharge tubes, discharge lamps, or parts thereof are classified in group [H01J 9/00](#).

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	Details of electrodes, of magnetic control means, of screens, or of the mounting or spacing thereof, common to two or more basic types of discharge tubes or lamps (details of electron-optical arrangements or of ion traps H01J 3/00)	1/144	. . . . with other metal oxides as an emissive material
		1/146	. . . . with metals or alloys as an emissive material
		1/148	. . . . with compounds having metallic conductive properties, e.g. lanthanum boride, as an emissive material
1/02	. Main electrodes	1/15	. . . Cathodes heated directly by an electric current
1/025	. . { Hollow cathodes }	1/16	. . . . characterised by the shape
1/04	. . Liquid electrodes, e.g. liquid cathode	1/18	. . . . Supports; Vibration-damping arrangements
1/05	. . . characterised by material	1/20	. . . Cathodes heated indirectly by an electric current; Cathodes heated by electron or ion bombardment
1/06	. . . Containers for liquid-pool electrodes; Arrangement or mounting thereof	1/22	. . . . Heaters
1/08	. . . Positioning or moving the cathode spot on the surface of a liquid-pool cathode	1/24	. . . . Insulating layer or body located between heater and emissive material
1/10	. . . Cooling, heating, circulating, filtering, or controlling level of liquid in a liquid-pool electrode	1/26	. . . . Supports for the emissive material
1/12	. . Cathodes having mercury or liquid alkali metal deposited on the cathode surface during operation of the tube	1/28	. . . . Dispenser-type cathodes, e.g. L-cathode
1/13	. . Solid thermionic cathodes	1/30	. . Cold cathodes, e.g. field-emissive cathode
1/135	. . . { Circuit arrangements therefor, e.g. for temperature control }	1/304	. . . Field-emissive cathodes
1/14	. . . characterised by the material	1/3042	. . . . {microengineered, e.g. Spindt-type }
1/142	. . . . with alkaline-earth metal oxides, or such oxides used in conjunction with reducing agents, as an emissive material	1/3044	. . . . . {Point emitters }
		1/3046	. . . . . {Edge emitters }
		1/3048	. . . . . {Distributed particle emitters }
		1/308	. . . Semiconductor cathodes, e.g. cathodes with PN junction layers

- 1/312 . . . having an electric field perpendicular to the surface, e.g. tunnel-effect cathodes of Metal-Insulator-Metal [MIM] type {[\(H01J 1/304 - H01J 1/308 take precedence\)](#)}
- 1/316 . . . having an electric field parallel to the surface, e.g. thin film cathodes
- 1/32 . . Secondary-electron-emitting electrodes ([H01J 1/35 takes precedence](#))
- 1/34 . . Photo-emissive cathodes ([H01J 1/35 takes precedence](#))
- 1/35 . . Electrodes exhibiting both secondary emission and photo-emission
- 1/36 . . Solid anodes; Solid auxiliary anodes for maintaining a discharge
- 1/38 . . . characterised by the material
- 1/40 . . . forming part of the envelope of the tube or lamp
- 1/42 . . . Cooling of anodes ([cooling rotary anodes H01J 1/44](#)); Heating of anodes
- 1/44 . . . Rotary anodes; Arrangements for rotating anodes; Cooling rotary anodes
- 1/46 . Control electrodes, e.g. grid ([for igniting arrangements H01J 7/30](#)); Auxiliary electrodes ([auxiliary anodes for maintaining a discharge H01J 1/36](#))
- 1/48 . . characterised by the material
- 1/50 . Magnetic means for controlling the discharge
- 1/52 . Screens for shielding; Guides for influencing the discharge; Masks interposed in the electron stream
- 1/53 . Electrodes intimately associated with a screen on or from which an image or pattern is formed, picked up, converted, or stored {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/54 . Screens on or from which an image or pattern is formed, picked up, converted, or stored; Luminescent coatings on vessels {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/56 . . acting as light valves by shutter operation, e.g. for eidophor {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/58 . . acting by discolouration, e.g. halide screen {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/60 . . Incandescent screens {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/62 . . Luminescent screens; Selection of materials for luminescent coatings on vessels {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/63 . . . characterised by the luminescent material
- 1/64 . . . characterised by the binder or adhesive for securing the luminescent material to its supports {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/66 . . . Supports for luminescent material
- 1/68 . . . with superimposed luminescent layers {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/70 . . . with protective, conductive, or reflective layers {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/72 . . . with luminescent material discontinuously arranged, e.g. in dots or lines {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/74 . . . with adjacent dots or lines of different luminescent material {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/76 . . . provided with permanent marks or references {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/78 . . Photoelectric screens; Charge-storage screens {[\(see provisionally also H01J 29/08 - H01J 29/36\)](#)}
- 1/88 . Mounting, supporting, spacing, or insulating of electrodes or of electrode assemblies
- 1/90 . . Insulation between electrodes or supports within the vacuum space
- 1/92 . . Mountings for the electrode assembly as a whole
- 1/94 . . Mountings for individual electrodes
- 1/96 . . Spacing members extending to the envelope
- 1/98 . . . without fixed connection between spacing member and envelope
- 3/00 Details of electron-optical or ion-optical arrangements or of ion traps common to two or more basic types of discharge tubes or lamps**
- 3/02 . Electron guns {[\(electron guns for discharge tubes with provision for introducing objects or material to be exposed to the discharge H01J 37/06; for cathode ray tubes H01J 29/48\)](#)}
- 3/021 . . {[Electron guns using a field emission, photo emission, or secondary emission electron source](#)}
- 3/022 . . . {[with microengineered cathode, e.g. Spindt-type](#)}
- 3/023 . . {[Electron guns using electron multiplication](#)}
- 3/024 . . {[Electron guns using thermionic emission of cathode heated by electron or ion bombardment or by irradiation by other energetic beams, e.g. by laser](#)}
- 3/025 . . {[Electron guns using a discharge in a gas or a vapour as electron source \(gas-filled discharge tubes with gaseous cathodes H01J 15/00\)](#)}
- 3/026 . . {[Eliminating deleterious effects due to thermal effects, electric or magnetic field \(H01J 3/021 - H01J 3/025 take precedence\)](#)}
- 3/027 . . {[Construction of the gun or parts thereof \(H01J 3/021 - H01J 3/025, H01J 3/026 and H01J 3/028 take precedence\)](#)}
- 3/028 . . {[Replacing parts of the gun; Relative adjustment \(H01J 3/021 - H01J 3/025 take precedence\)](#)}
- 3/029 . . {[Schematic arrangements for beam forming](#)}
- 3/04 . Ion guns {[\(see provisionally also H01J 27/00\)](#)}
- 3/06 . two or more guns being arranged in a single vacuum space, e.g. for plural-ray tubes ([H01J 3/07 takes precedence](#) {[see provisionally also H01J 29/46 - H01J 29/84](#)})
- 3/07 . Arrangements for controlling convergence of a plurality of beams {[\(see provisionally also H01J 29/46 - H01J 29/84\)](#)}
- 3/08 . Arrangements for controlling intensity of ray or beam ([H01J 3/02, H01J 3/04 take precedence](#) {[see provisionally also H01J 29/46 - H01J 29/84](#)})
- 3/10 . Arrangements for centering ray or beam ([H01J 3/02, H01J 3/04 take precedence](#) {[see provisionally also H01J 29/46 - H01J 29/84](#)})
- 3/12 . Arrangements for controlling cross-section of ray or beam; Arrangements for correcting aberration of beam, e.g. due to lenses ([H01J 3/02, H01J 3/04 take precedence](#) {[see provisionally also H01J 29/46 - H01J 29/84](#)})

- 3/14 . Arrangements for focusing or reflecting ray or beam ([H01J 3/02](#), [H01J 3/04](#) take precedence {see provisionally also [H01J 29/46](#) - [H01J 29/84](#)})
- 3/16 . . Mirrors {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/18 . . Electrostatic lenses {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/20 . . Magnetic lenses {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/22 . . . using electromagnetic means only {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/24 . . . using permanent magnets only {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/26 . Arrangements for deflecting ray or beam {([H01J 29/46](#) - [H01J 29/84](#) and [H01J 37/147](#) take precedence)}
- 3/28 . . along one straight line or along two perpendicular straight lines {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/30 . . . by electric fields only {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/32 . . . by magnetic fields only {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/34 . . along a circle, spiral, or rotating radial line {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/36 . Arrangements for controlling the ray or beam after passing the main deflection system, e.g. for post-acceleration or post-concentration {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/38 . Mounting, supporting, spacing, or insulating electron-optical or ion-optical arrangements {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 3/381 . . {Dispersed generators}
- 3/383 . . . {the generators exploiting regenerative energy}
- 3/385 {Solar energy (generation of electric power by conversion of light [H02S](#))}
- 3/386 {Wind energy (wind motors [F03D](#))}
- 3/388 . . . {using fuel cells (fuel cells [per se](#) [H01M 8/00](#))}
- 3/40 . Traps for removing or diverting unwanted particles, e.g. negative ions, fringing electrons; Arrangements for velocity or mass selection {(see provisionally also [H01J 29/46](#) - [H01J 29/84](#))}
- 5/00 Details relating to vessels or to leading-in conductors common to two or more basic types of discharge tubes or lamps**
- 5/02 . Vessels; Containers; Shields associated therewith; Vacuum locks
- 5/03 . . Arrangements for preventing or mitigating effects of implosion of vessels or containers
- 5/04 . . Vessels or containers characterised by the material thereof
- 5/06 . . Vessels or containers specially adapted for operation at high tension, e.g. by improved potential distribution over surface of vessel
- 5/08 . . provided with coatings on the walls thereof; Selection of materials for the coatings ([luminescent coatings](#) [H01J 1/62](#))
- 5/10 . . . on internal surfaces
- 5/12 . . Double-wall vessels or containers
- 5/125 . . . {with a gas tight space between both walls}
- 5/14 . . Dismountable vessels or containers, e.g. for replacing cathode heater
- 5/16 . . Optical or photographic arrangements structurally combined with the vessel
- 5/18 . . Windows permeable to X-rays, gamma-rays, or particles
- 5/20 . Seals between parts of vessels
- 5/22 . . Vacuum-tight joints between parts of vessel
- 5/24 . . . between insulating parts of vessel
- 5/26 . . . between insulating and conductive parts of vessel
- 5/28 . . . between conductive parts of vessel
- 5/30 . . . using packing-material, e.g. sealing-liquid or elastic insert
- 5/32 . Seals for leading-in conductors
- 5/34 . . for an individual conductor ([pinched-stem seals](#) [H01J 5/38](#); [end-disc seals](#) [H01J 5/40](#); [annular seals](#) [H01J 5/44](#))
- 5/36 . . . using intermediate part
- 5/38 . . Pinched-stem or analogous seals
- 5/40 . . End-disc seals, e.g. flat header
- 5/42 . . . using intermediate part
- 5/44 . . Annular seals disposed between the ends of the vessel
- 5/46 . Leading-in conductors
- 5/48 . Means forming part of the tube or lamp for the purpose of supporting it
- 5/50 . Means forming part of the tube or lamps for the purpose of providing electrical connection to it
- 5/52 . . directly applied to or forming part of the vessel
- 5/54 . . supported by a separate part, e.g. base
- 5/56 . . . Shape of the separate part
- 5/565 {Bases for circular lamps}
- 5/58 . . . Means for fastening the separate part to the vessel, e.g. by cement
- 5/60 for fastening by mechanical means
- 5/62 . . . Connection of wires protruding from the vessel to connectors carried by the separate part
- 7/00 Details not provided for in the preceding groups and common to two or more basic types of discharge tubes or lamps**
- 7/02 . Selection of substances for gas fillings; Specified operating pressure or temperature
- 7/04 . . having one or more carbon compounds as the principal constituent
- 7/06 . . having helium, argon, neon, krypton, or xenon as the principal constituent
- 7/08 . . having a metallic vapour as the principal constituent
- 7/10 . . . mercury vapour
- 7/12 . . . vapour of an alkali metal
- 7/14 . Means for obtaining or maintaining the desired pressure within the vessel
- 7/16 . . Means for permitting pumping during operation of the tube or lamp
- 7/18 . . Means for absorbing or adsorbing gas, e.g. by gettering
- 7/183 . . . {Composition or manufacture of getters}
- 7/186 . . . {Getter supports}
- 7/20 . . Means for producing, introducing, or replenishing gas or vapour during operation of the tube or lamp
- 7/22 . . Tubulations therefor, e.g. for exhausting; Closures therefor
- 7/24 . Cooling arrangements; Heating arrangements; Means for circulating gas or vapour within the discharge space

- 7/26 . . by flow of fluid through passages associated with tube or lamp
- 7/28 . . by latent heat or evaporation of cooling liquid
- 7/30 . Igniting arrangements
- 7/32 . . having resistive or capacitive igniter
- 7/34 . . . having resistive igniter only
- 7/36 . . Igniting by movement of a solid electrode
- 7/38 . . Igniting by movement of vessel as a whole, e.g. tilting
- 7/40 . . Igniting by associated radioactive materials or fillings
- 7/42 . Means structurally associated with the tube or lamp for indicating defects or previous use
- 7/44 . One or more circuit elements structurally associated with the tube or lamp
- 7/46 . . Structurally associated resonator having distributed inductance and capacitance
- 9/00 Apparatus or processes specially adapted for the manufacture {, installation, removal, maintenance} of electric discharge tubes, discharge lamps, or parts thereof; Recovery of material from discharge tubes or lamps**
- 9/003 . {Auxiliary devices for installing or removing discharge tubes or lamps}
- 9/006 . . {for fluorescent lamps}
- 9/02 . Manufacture of electrodes or electrode systems
- 9/022 . . {of cold cathodes}
- 9/025 . . . {of field emission cathodes}
- 9/027 . . . {of thin film cathodes}
- 9/04 . . of thermionic cathodes
- 9/042 . . . {Manufacture, activation of the emissive part}
- 9/045 {Activation of assembled cathode (regeneration [H01J 9/505](#))}
- 9/047 {Cathodes having impregnated bodies ([H01J 9/045](#) takes precedence)}
- 9/06 . . . Machines therefor
- 9/08 . . Manufacture of heaters for indirectly-heated cathodes
- 9/10 . . . Machines therefor
- 9/12 . . of photo-emissive cathodes; of secondary-emission electrodes
- 9/125 . . . {of secondary emission electrodes}
- 9/14 . . of non-emitting electrodes
- 9/142 . . . {of shadow-masks for colour television tubes}
- 9/144 {Mask treatment related to the process of dot deposition during manufacture of luminescent screen}
- 9/146 {Surface treatment, e.g. blackening, coating ([H01J 9/144](#) takes precedence)}
- 9/148 . . . {of electron emission flat panels, e.g. gate electrodes, focusing electrodes or anode electrodes}
- 9/16 . . . Machines for making wire grids
- 9/18 . . Assembling together the component parts of electrode systems
- 9/185 . . . {of flat panel display devices, e.g. by using spacers}
- 9/20 . Manufacture of screens on or from which an image or pattern is formed, picked up, converted or stored; Applying coatings to the vessel
- 9/205 . . {Applying optical coatings or shielding coatings to the vessel of flat panel displays, e.g. applying filter layers, electromagnetic interference shielding layers, anti-reflection coatings or anti-glare coatings}
- 9/22 . . Applying luminescent coatings
- 9/221 . . . {in continuous layers}
- 9/222 {constituted by coated granules emitting light of different colour}
- 9/223 {by uniformly dispersing of liquid}
- 9/224 {by precipitation}
- 9/225 {by electrostatic or electrophoretic processes}
- 9/227 . . . with luminescent material discontinuously arranged, e.g. in dots or lines
- 9/2271 {by photographic processes (final treatment of shadow-mask prior to or after dot deposition [H01J 9/144](#))}
- 9/2272 {Devices for carrying out the processes, e.g. light houses}
- 9/2273 {Auxiliary lenses and filters}
- 9/2274 {Light sources particularly adapted therefor}
- 9/2275 {including the exposition of a substance responsive to a particular radiation}
- 9/2276 {Development of latent electrostatic images ([per se G03G 15/06](#))}
- 9/2277 {by other processes, e.g. serigraphy, decalcomania}
- 9/2278 {Application of light absorbing material, e.g. between the luminescent areas}
- 9/233 . . Manufacture of photoelectric screens or charge-storage screens
- 9/236 . Manufacture of magnetic deflecting devices for cathode-ray tubes
- 9/24 . Manufacture or joining of vessels, leading-in conductors or bases
- 9/241 . . {the vessel being for a flat panel display ([H01J 9/261](#) takes precedence; flat discharge lamps [H01J 9/248](#))}
- 9/242 . . . {Spacers between faceplate and backplate}
- 9/244 . . {specially adapted for cathode ray tubes ([H01J 9/241](#), [H01J 9/26](#) take precedence)}
- 9/245 . . {specially adapted for gas discharge tubes or lamps ([H01J 9/241](#), [H01J 9/26](#) take precedence)}
- 9/247 . . . {specially adapted for gas-discharge lamps}
- 9/248 {the vessel being flat}
- 9/26 . . Sealing together parts of vessels
- 9/261 . . . {the vessel being for a flat panel display (for flat discharge lamps [H01J 9/268](#))}
- 9/263 . . . {specially adapted for cathode-ray tubes ([H01J 9/261](#) takes precedence)}
- 9/265 . . . {specially adapted for gas-discharge tubes or lamps ([H01J 9/261](#) takes precedence)}
- 9/266 {specially adapted for gas-discharge lamps}
- 9/268 {the vessel being flat}
- 9/28 . . Manufacture of leading-in conductors
- 9/30 . . Manufacture of bases
- 9/32 . . Sealing leading-in conductors
- 9/323 . . . {Sealing leading-in conductors into a discharge lamp or a gas-filled discharge device (for incandescent lamps [H01K 3/20](#), joining glass to metal [C03C 27/00](#))}
- 9/326 {making pinched-stem or analogous seals}

9/34	. . . Joining base to vessel	11/40	. . . . Layers for protecting or enhancing the electron emission, e.g. MgO layers
9/36	. . . Joining connectors to internal electrode system	11/42	. . . . Fluorescent layers
9/38	. . . Exhausting, degassing, filling, or cleaning vessels	11/44	. . . . Optical arrangements or shielding arrangements, e.g. filters, black matrices, light reflecting means or electromagnetic shielding means
9/385	. . . Exhausting vessels		
9/39	. . . Degassing vessels	11/46	. . . Connecting or feeding means, e.g. leading-in conductors
9/395	. . . Filling vessels	11/48	. . . Sealing, e.g. seals specially adapted for leading-in conductors
9/40	. . . Closing vessels	11/50	. . . Filling, e.g. selection of gas mixture
9/42	. . . Measurement or testing during manufacture	11/52	. . . Means for absorbing or adsorbing the gas mixture, e.g. by gettering
9/44	. . . Factory adjustment of completed discharge tubes or lamps to comply with desired tolerances	11/54	. . . Means for exhausting the gas
9/445	. . . {Aging of tubes or lamps, e.g. by "spot knocking" (cathode activation H01J 9/045)}	13/00	Discharge tubes with liquid-pool cathodes, e.g. metal-vapour rectifying tubes
9/46	. . . Machines having sequentially arranged operating stations	13/02	. . . Details
9/48	. . . with automatic transfer of workpieces between operating stations	13/04	. . . Main electrodes; Auxiliary anodes
9/50	. . . Repairing or regenerating used or defective discharge tubes or lamps	13/06	. . . . Cathodes
9/505	. . . {Regeneration of cathodes (activation H01J 9/045)}	13/08	. . . . characterised by the material
9/52	. . . Recovery of material from discharge tubes or lamps (H01J 9/50 takes precedence)	13/10	. . . . Containers for the liquid pool; Arrangements or mounting thereof
11/00	Gas-filled discharge tubes with alternating current induction of the discharge, e.g. AC-PDPs [Alternating Current Plasma Display Panels] (circuits or methods for driving PDPs G09G 3/28); Gas-filled discharge tubes without any main electrode inside the vessel; Gas-filled discharge tubes with at least one main electrode outside the vessel	13/12	. . . . Positioning or moving the cathode spot on the surface of the pool
	NOTES	13/14	. . . . Cooling, heating, circulating, filtering, or controlling level of the liquid
	1. When classifying in this group, classification is made in all appropriate places.	13/16	. . . . Anodes; Auxiliary anodes for maintaining the discharge
	2. In this group, the following term is used with the meaning indicated:	13/18	. . . . Cooling or heating of anodes
	. . . "main electrode" means any of a sustain electrode, scan electrode or address electrode.	13/20	. . . Control electrodes, e.g. grid (for igniting arrangements H01J 13/34)
11/10	. . . AC-PDPs with at least one main electrode being out of contact with the plasma	13/22	. . . Screens, e.g. for preventing or eliminating arcing-back
11/12	. . . with main electrodes provided on both sides of the discharge space	13/24	. . . Vessels; Containers
11/14	. . . with main electrodes provided only on one side of the discharge space	13/242	. . . . {characterised by the material}
11/16	. . . with main electrodes provided inside or on the side face of the spacers	13/244	. . . . {characterised by the shape}
11/18	. . . containing a plurality of independent closed structures for containing the gas, e.g. plasma tube array [PTA] display panels	13/246	. . . . {Treatment of, or coating on interior parts of vessel}
11/20	. . . Constructional details	13/248	. . . . {Envelope means outside vessel, i.e. screens, reflectors, filters}
11/22	. . . Electrodes, e.g. special shape, material or configuration	13/26	. . . Seals between parts of vessels; Seals for leading-in conductors; Leading-in conductors
11/24	. . . . Sustain electrodes or scan electrodes	13/263	. . . . {Leading-in conductors to the liquid electrode}
11/26	. . . . Address electrodes	13/266	. . . . {Leading-in conductors to the anode}
11/28	. . . . Auxiliary electrodes, e.g. priming electrodes or trigger electrodes	13/28	. . . Selection of substances for gas filling; Means for obtaining the desired pressure within the tube
11/30	. . . . Floating electrodes	13/30	. . . Means for permitting pumping during operation of the tube
11/32	. . . . Disposition of the electrodes	13/32	. . . Cooling arrangements; Heating arrangements (for cathodes H01J 13/14; for anodes H01J 13/18)
11/34	. . . Vessels, containers or parts thereof, e.g. substrates	13/34	. . . Igniting arrangements
11/36	. . . . Spacers, barriers, ribs, partitions or the like	13/36	. . . . having resistive or capacitive igniter
11/38	. . . . Dielectric or insulating layers	13/38	. . . . having resistive igniter only
		13/40	. . . Igniting by movement of a solid electrode
		13/405	. . . . {Interrupting contact with liquid cathode}
		13/42	. . . Igniting by movement of vessel as a whole, e.g. tilting
		13/44	. . . Devices for preventing or eliminating arcing-back
		13/46	. . . One or more circuit elements structurally associated with the tube

- 13/48 . . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
- 13/50 . Tubes having a single main anode
- 13/52 . . with control by one or more intermediate control electrodes
- 13/54 . . with control by igniter, e.g. single-anode ignitron
- 13/56 . Tubes having two or more main anodes
- 13/58 . . with control by one or more intermediate control electrodes
- 15/00 Gas-filled discharge tubes with gaseous cathodes, e.g. plasma cathode**
- 15/02 . Details, e.g. electrode, gas filling, shape of vessel
- 15/04 . . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
- 17/00 Gas-filled discharge tubes with solid cathode**
([H01J 25/00](#), [H01J 27/00](#), [H01J 31/00](#) - [H01J 41/00](#) {, [H01J 11/00](#)} take precedence; gas filled spark gaps [H01T](#); Marx converters [H02M 7/26](#))
- 17/005 . {specially adapted as noise generators (electronic circuits for generation of noise currents or voltages [H03B 29/00](#))}
- 17/02 . Details
- 17/04 . . Electrodes; Screens
- 17/06 . . . Cathodes
- 17/063 {Indirectly heated cathodes, e.g. by the discharge itself}
- 17/066 {Cold cathodes}
- 17/08 having mercury or liquid alkali metal deposited on the cathode surface during operation of the tube
- 17/10 . . . Anodes
- 17/12 . . . Control electrodes
- 17/14 . . Magnetic means for controlling the discharge
- 17/16 . . Vessels; Containers
- 17/18 . . Seals between parts of vessels; Seals for leading-in conductors; Leading-in conductors
- 17/183 . . . {Seals between parts of vessel}
- 17/186 . . . {Seals between leading-in conductors and vessel}
- 17/20 . . Selection of substances for gas fillings; Specified operating pressures or temperatures
- 17/22 . . Means for obtaining or maintaining the desired pressure within the tube
- 17/24 . . . Means for absorbing or adsorbing gas, e.g. by gettering
- 17/26 . . . Means for producing, introducing, or replenishing gas or vapour during operation of the tube
- 17/28 . . Cooling arrangements
- 17/30 . . Igniting arrangements
- 17/32 . . . Igniting by associated radioactive materials or fillings
- 17/325 {Current stabilising tubes, e.g. curpistors}
- 17/34 . . One or more circuit elements structurally associated with the tube
- 17/36 . . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
- 17/38 . Cold-cathode tubes
- 17/40 . . with one cathode and one anode, e.g. glow tubes, tuning-indicator glow tubes, voltage-stabiliser tubes, voltage-indicator tubes, ([cathode-glow lamps H01J 61/04](#))
- 17/42 . . . having one or more probe electrodes, e.g. for potential dividing
- 17/44 having one or more control electrodes
- 17/46 for preventing and then permitting ignition but thereafter having no control
- 17/48 . . with more than one cathode or anode, e.g. sequence-discharge tube, counting tube, dekatron
- 17/485 . . . {Plasma addressed liquid crystal displays [[PALC](#)]}
- 17/49 . . . Display panels, e.g. with crossed electrodes {, e.g. making use of direct current ([display panels making use of alternating current H01J 11/00](#))}
- 17/491 {with electrodes arranged side by side and substantially in the same plane, e.g. for displaying alphanumeric characters}
- 17/492 {with crossed electrodes}
- 17/494 {using sequential transfer of the discharges, e.g. of the self-scan type ([addressing circuits therefor G09G 3/29](#))}
- 17/495 {display panels using sequential transfer of the discharge along dielectric storage elements}
- 17/497 {for several colours}
- 17/498 {with a gas discharge space and a post acceleration space for electrons}
- 17/50 . Thermionic-cathode tubes
- 17/52 . . with one cathode and one anode
- 17/54 . . . having one or more control electrodes
- 17/56 for preventing and then permitting ignition, but thereafter having no control
- 17/58 . . with more than one cathode or anode
- 17/60 . . . the discharge paths priming each other in a predetermined sequence, e.g. counting tube
- 17/62 . . . with independent discharge paths controlled by intermediate electrodes, e.g. polyphase rectifier
- 17/64 . Tubes specially designed for switching or modulating in a waveguide, e.g. TR box
- 19/00 Details of vacuum tubes of the types covered by group [H01J 21/00](#)**
- 19/02 . Electron-emitting electrodes; Cathodes
- 19/04 . . Thermionic cathodes
- 19/06 . . . characterised by the material
- 19/062 with alkaline-earth metal oxides, or such oxides used in conjunction with reducing agents, as an emissive material
- 19/064 with other metal oxides as an emissive material
- 19/066 with metals or alloys as an emissive material
- 19/068 with compounds having metallic conductive properties, e.g. lanthanum boride, as an emissive material
- 19/08 . . . Cathodes heated directly by an electric current
- 19/10 . . . characterised by the shape
- 19/12 Supports; Vibration-damping arrangements
- 19/14 . . . Cathodes heated indirectly by an electric current; Cathodes heated by electron or ion bombardment
- 19/16 Heaters

19/18	. . . . Insulating layer or body located between heater and emissive material	21/105	. . . . {with microengineered cathode and control electrodes, e.g. Spindt-type}
19/20	. . . . Supports for the emissive material	21/12	. . . . Tubes with variable amplification factor
19/22	. . . . Dispenser-type cathodes, e.g. L-cathode	21/14	. . . . Tubes with means for concentrating the electron stream, e.g. beam tetrode
19/24	. . Cold cathodes, e.g. field-emissive cathode	21/16	. . . with external electrostatic control means and with or without internal control electrodes
19/28	. Non-electron-emitting electrodes; Screens	21/18	. . having magnetic control means; having both magnetic and electrostatic control means
19/30	. . characterised by the material	21/20	. Tubes with more than one discharge path; Multiple tubes, e.g. double diode, triode-hexode
19/32	. . Anodes	21/22	. . with movable electrode or electrodes
19/34	. . . forming part of the envelope	21/24	. . with variable amplification factor
19/36	. . . Cooling of anodes	21/26	. . with means for concentrating the electron stream
19/38	. . Control electrodes, e.g. grid	21/34	. Tubes with electrode system arranged or dimensioned so as to eliminate transit-time effect (with flat electrodes H01J 21/36)
19/40	. . Screens for shielding	21/36	. Tubes with flat electrodes, e.g. disc electrode
19/42	. Mounting, supporting, spacing, or insulating of electrodes or of electrode assemblies	23/00	Details of transit-time tubes of the types covered by group H01J 25/00
19/44	. . Insulation between electrodes or supports within the vacuum space	23/005	. {Cooling methods or arrangements (H01J 23/033 takes precedence)}
19/46	. . Mountings for the electrode assembly as a whole	23/02	. Electrodes; Magnetic control means; Screens (associated with resonator or delay system H01J 23/16)
19/48	. . Mountings for individual electrodes	23/027	. . Collectors
19/50	. . Spacing members extending to the envelope	23/0275	. . . {Multistage collectors}
19/52	. . . without fixed connection between spacing member and envelope	23/033	. . . Collector cooling devices
19/54	. Vessels; Containers; Shields associated therewith	23/04	. . Cathodes
19/56	. . characterised by the material of the vessel or container	23/05	. . . having a cylindrical emissive surface, e.g. cathodes for magnetrons
19/57	. . provided with coatings on the walls thereof; Selection of materials for the coatings	23/06	. . Electron or ion guns
19/58	. Seals between parts of vessels	23/065	. . . producing a solid cylindrical beam (H01J 23/075 takes precedence)
19/60	. Seals for leading-in conductors	23/07	. . . producing a hollow cylindrical beam (H01J 23/075 takes precedence)
19/62	. Leading-in conductors	23/075	. . . Magnetron injection guns
19/64	. Means forming part of the tube for the purpose supporting it	23/08	. . Focusing arrangements, e.g. for concentrating stream of electrons, for preventing spreading of stream
19/66	. Means forming part of the tube for the purpose of providing electrical connection to it (H01J 5/46 - H01J 5/62 take precedence)	23/083	. . . Electrostatic focusing arrangements
19/68	. Specified gas introduced into the tube at low pressure, e.g. for reducing or influencing space charge	23/087	. . . Magnetic focusing arrangements
19/70	. Means for obtaining or maintaining the vacuum, e.g. by gettering	23/0873	. . . . {with at least one axial-field reversal along the interaction space, e.g. P.P.M. focusing}
19/72	. . Tubulations therefor, e.g. for exhausting; Closures therefor	23/0876	. . . . {with arrangements improving the linearity and homogeneity of the axial field, e.g. field straightener}
19/74	. Cooling arrangements (cooling of anodes H01J 19/36)	23/09	. . Electric systems for directing or deflecting the discharge along a desired path, e.g. E-type (focusing arrangements H01J 23/08)
19/76	. Means structurally associated with the tube for indicating defects or previous use	23/10	. . Magnet systems for directing or deflecting the discharge along a desired path, e.g. a spiral path (magnetic focusing arrangements H01J 23/08)
19/78	. One or more circuit elements structurally associated with the tube	23/11	. . Means for reducing noise (in electron or ion gun H01J 23/06)
19/80	. . Structurally associated resonator having distributed inductance and capacitance	23/12	. Vessels; Containers
19/82	. Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for	23/14	. Leading-in arrangements; Seals therefor
21/00	Vacuum tubes (H01J 25/00, H01J 31/00 - H01J 40/00, H01J 43/00, H01J 47/00, H01J 49/00 take precedence; details of vacuum tubes H01J 19/00)	23/15	. . Means for preventing wave energy leakage structurally associated with tube leading-in arrangements, e.g. filters, chokes, attenuating devices
21/02	. Tubes with a single discharge path		
21/04	. . without control means, i.e. diodes		
21/06	. . having electrostatic control means only		
21/065	. . . {Devices for short wave tubes}		
21/08	. . . with movable electrode or electrodes		
21/10	. . . with one or more immovable internal control electrodes, e.g. triode, pentode, octode		

- 23/16 . . . Circuit elements, having distributed capacitance and inductance, structurally associated with the tube and interacting with the discharge
- 23/165 . . . {Manufacturing processes or apparatus therefore}
- 23/18 . . . Resonators
- 23/20 Cavity resonators; Adjustment or tuning thereof
- 23/207 Tuning of single resonator
- 23/213 Simultaneous tuning of more than one resonator, e.g. resonant cavities of a magnetron
- 23/22 Connections between resonators, e.g. strapping for connecting resonators of a magnetron
- 23/24 . . . Slow-wave structures {, e.g. delay systems}
- 23/26 Helical slow-wave structures; Adjustment therefor
- 23/27 Helix-derived slow-wave structures
- 23/28 Interdigital slow-wave structures; Adjustment therefor
- 23/30 Damping arrangements associated with slow-wave structures, e.g. for suppression of unwanted oscillations
- 23/34 . . . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
- 23/36 . . . Coupling devices having distributed capacitance and inductance, structurally associated with the tube, for introducing or removing wave energy
- 23/38 . . . to or from the discharge
- 23/40 . . . to or from the interaction circuit
- 23/42 the interaction circuit being a helix or a helix-derived slow-wave structure
([H01J 23/44](#) - [H01J 23/48](#) take precedence)
- 23/44 Rod-type coupling devices ([H01J 23/46](#), [H01J 23/48](#), [H01J 23/54](#) take precedence)
- 23/46 Loop coupling devices
- 23/48 for linking interaction circuit with coaxial lines; Devices of the coupled helices type
([H01J 23/46](#) takes precedence)
- 23/50 the interaction circuit being a helix or derived from a helix ([H01J 23/52](#) takes precedence)
- 23/52 the coupled helices being disposed coaxially around one another
- 23/54 . . . Filtering devices preventing unwanted frequencies or modes to be coupled to, or out of, the interaction circuit; Prevention of high frequency leakage in the environment
- 25/00** **Transit-time tubes, e.g. klystrons, travelling-wave tubes, magnetrons** ([details of transit-time tubes H01J 23/00](#); [particle accelerators H05H](#))
- 25/005 . . . {Gas-filled transit-time tubes}
- 25/02 . . . Tubes with electron stream modulated in velocity or density in a modulator zone and thereafter giving up energy in an inducing zone, the zones being associated with one or more resonators
- 25/025 . . . {with an electron stream following a helical path}
- 25/04 . . . Tubes having one or more resonators, without reflection of the electron stream, and in which the modulation produced in the modulator zone is mainly density modulation, e.g. Heaff tube
- 25/06 . . . Tubes having only one resonator, without reflection of the electron stream, and in which the modulation produced in the modulator zone is mainly velocity modulation, e.g. Lüdi-Klystron
- 25/08 with electron stream perpendicular to the axis of the resonator
- 25/10 . . . Klystrons, i.e. tubes having two or more resonators, without reflection of the electron stream, and in which the stream is modulated mainly by velocity in the zone of the input resonator
- 25/11 Extended interaction klystrons
- 25/12 with pencil-like electron stream in the axis of the resonators
- 25/14 with tube-like electron stream coaxial with the axis of the resonators
- 25/16 with pencil-like electron stream perpendicular to the axis of the resonators
- 25/18 with radial or disc-like electron stream perpendicular to the axis of the resonators
- 25/20 having special arrangements in the space between resonators, e.g. resistive-wall amplifier tube, space-charge amplifier tube, velocity-jump tube
- 25/22 . . . Reflex klystrons, i.e. tubes having one or more resonators, with a single reflection of the electron stream, and in which the stream is modulated mainly by velocity in the modulator zone
- 25/24 in which the electron stream is in the axis of the resonator or resonators and is pencil-like before reflection
- 25/26 in which the electron stream is coaxial with the axis of the resonator or resonators and is tube-like before reflection
- 25/28 in which the electron stream is perpendicular to the axis of the resonator or resonators and is pencil-like before reflection
- 25/30 in which the electron stream is perpendicular to the axis of the resonator or resonators and is radial or disc-like before reflection
- 25/32 . . . Tubes with plural reflection, e.g. Coeterier tube
- 25/34 . . . Travelling-wave tubes; Tubes in which a travelling wave is simulated at spaced gaps
- 25/36 . . . Tubes in which an electron stream interacts with a wave travelling along a delay line or equivalent sequence of impedance elements, and without magnet system producing an H-field crossing the E-field
- 25/38 the forward travelling wave being utilised
- 25/40 the backward travelling wave being utilised
- 25/42 . . . Tubes in which an electron stream interacts with a wave travelling along a delay line or equivalent sequence of impedance elements, and with a magnet system producing an H-field crossing the E-field ([with travelling wave moving completely around the electron space H01J 25/50](#))
- 25/44 the forward travelling wave being utilised
- 25/46 the backward travelling wave being utilised
- 25/48 . . . Tubes in which two electron streams of different velocities interact with one another, e.g. electron-wave tube
- 25/49 . . . Tubes using the parametric principle, e.g. for parametric amplification
- 25/50 . . . Magnetrons, i.e. tubes with a magnet system producing an H-field crossing the E-field ([with travelling wave not moving completely around the electron space H01J 25/42](#); [functioning with plural reflection or with reversed cyclotron action H01J 25/62](#), [H01J 25/64](#))

- 25/52 . . with an electron space having a shape that does not prevent any electron from moving completely around the cathode or guide electrode
- 25/54 . . . having only one cavity or other resonator, e.g. neutrode tubes
- 25/55 Coaxial cavity magnetrons
- 25/56 with interdigital arrangements of anodes, e.g. turbator tube
- 25/58 . . . having a number of resonators; having a composite resonator, e.g. a helix
- 25/587 Multi-cavity magnetrons
- 25/593 Rising-sun magnetrons
- 25/60 . . with an electron space having a shape that prevents any electron from moving completely around the cathode or guide electrode; Linear magnetrons
- 25/61 . Hybrid tubes, i.e. tubes comprising a klystron section and a travelling-wave section
- 25/62 . Strophotrons, i.e. tubes with H-field crossing the E-field and functioning with plural reflection
- 25/64 . Turbine tubes, i.e. tubes with H-field crossing the E-field and functioning with reversed cyclotron action
- 25/66 . Tubes with electron stream crossing itself and thereby interacting or interfering with itself
- 25/68 . Tubes specially designed to act as oscillator with positive grid and retarding field, e.g. for Barkhausen-Kurz oscillators (with secondary emission [H01J 25/76](#))
- 25/70 . . with resonator having distributed inductance with capacitance, e.g. Pintsch tube
- 25/72 . . in which a standing wave or a considerable part thereof is produced along an electrode, e.g. Clavier tube (with resonator having distributed inductance and capacitance [H01J 25/70](#))
- 25/74 . Tubes specially designed to act as transit-time diode oscillators, e.g. monotrons
- 25/76 . Dynamic electron-multiplier tubes, e.g. Farnsworth multiplier tube, multipactor
- 25/78 . Tubes with electron stream modulated by deflection in a resonator
- 27/00 Ion beam tubes ([H01J 25/00](#), [H01J 33/00](#), [H01J 37/00](#) take precedence; particle accelerators [H05H](#))**
- 27/02 . Ion sources; Ion guns {(for examination or processing discharge tubes [H01J 37/08](#); ion sources, ion guns for particle spectrometer or separator tubes [H01J 49/10](#); ion propulsion [F03H 1/00](#))}
- 27/022 . . {Details}
- 27/024 . . . {Extraction optics, e.g. grids}
- 27/026 . . {Cluster ion sources}
- 27/028 . . {Negative ion sources}
- 27/04 . . using reflex discharge, e.g. Penning ion sources {(electron bombardment ion sources [H01J 27/08](#))}
- 27/06 . . . without applied magnetic field
- 27/08 . . using arc discharge
- 27/10 . . . Duoplasmatrons {; [Duopigatrons](#)}
- 27/12 provided with an expansion cup
- 27/14 . . . Other arc discharge ion sources using an applied magnetic field
- 27/143 {Hall-effect ion sources with closed electron drift}
- 27/146 {End-Hall type ion sources, wherein the magnetic field confines the electrons in a central cylinder}
- 27/16 . . using high-frequency excitation, e.g. microwave excitation
- 27/18 . . . with an applied axial magnetic field
- 27/20 . . using particle {beam} bombardment, e.g. ionisers
- 27/205 . . . {with electrons, e.g. electron impact ionisation, electron attachment}
- 27/22 . . . Metal ion sources
- 27/24 . . using photo-ionisation, e.g. using laser beam
- 27/26 . . using surface ionisation, e.g. field effect ion sources, thermionic ion sources ([H01J 27/20](#), [H01J 27/24](#) take precedence)
- 29/00 Details of cathode-ray tubes or of electron-beam tubes of the types covered by group [H01J 31/00](#)**
- 29/003 . {Arrangements for eliminating unwanted electromagnetic effects, e.g. demagnetisation arrangements, shielding coils ([H01J 29/06](#), [H01J 29/867](#) take precedence; demagnetisation in general [H01F 13/00](#); circuit arrangements therefor [H04N 9/29](#); screening of apparatus against electric or magnetic fields [H05K 9/00](#))}
- 29/006 . {Arrangements for eliminating unwanted temperature effects}
- 29/02 . Electrodes; Screens; Mounting, supporting, spacing or insulating thereof
- 29/021 . . {arrangements for eliminating interferences in the tube ([H01J 29/484](#) takes precedence)}
- 29/023 . . {secondary-electron emitting electrode arrangements (secondary-emission tubes [H01J 43/00](#))}
- 29/025 . . {Mounting or supporting arrangements for grids ([H01J 29/028](#) takes precedence)}
- 29/026 . . {Mounting or supporting arrangements for charge storage screens not deposited on the frontplate}
- 29/028 . . {Mounting or supporting arrangements for flat panel cathode ray tubes, e.g. spacers particularly relating to electrodes}
- 29/04 . . Cathodes
- 29/06 . . Screens for shielding; Masks interposed in the electron stream
- 29/07 . . . Shadow masks for colour television tubes
- 29/073 {Mounting arrangements associated with shadow masks}
- 29/076 {characterised by the shape or distribution of beam-passing apertures}
- 29/08 . . Electrodes intimately associated with a screen on or from which an image or pattern is formed, picked-up, converted or stored, e.g. backing-plates for storage tubes or collecting secondary electrons
- 29/085 . . . {Anode plates, e.g. for screens of flat panel displays}
- 29/10 . . Screens on or from which an image or pattern is formed, picked up, converted or stored
- 29/12 . . . acting as light valves by shutter operation, e.g. for eidophor
- 29/14 . . . acting by discoloration, e.g. halide screen
- 29/16 . . . Incandescent screens
- 29/18 . . . Luminescent screens

- 29/182 {acting upon the lighting-up of the luminescent material other than by the composition of the luminescent material, e.g. by infra red or UV radiation, heating or electric fields}
 - 29/185 {measures against halo-phenomena}
 - 29/187 {screens with more than one luminescent material (as mixtures for the treatment of the screens) (for several superimposed luminescent layers [H01J 29/26](#); for adjacent dots or lines of different luminescent material [H01J 29/32](#))}
 - 29/20 characterised by the luminescent material {(for luminescent screens for X-ray purposes [G21K 4/00](#))}
 - 29/22 characterised by the binder or adhesive for securing the luminescent material to its support, e.g. vessel
 - 29/225 {photosensitive adhesive}
 - 29/24 Supports for luminescent material
 - 29/26 with superimposed luminescent layers
 - 29/28 with protective, conductive or reflective layers
 - 29/30 with luminescent material discontinuously arranged, e.g. in dots, in lines
 - 29/32 with adjacent dots or lines of different luminescent material, e.g. for colour television
 - 29/322 {with adjacent dots}
 - 29/325 {with adjacent lines}
 - 29/327 {Black matrix materials}
 - 29/34 provided with permanent marks or references
 - 29/36 . . . Photoelectric screens; Charge-storage screens
 - 29/38 not using charge storage, e.g. photo-emissive screen, extended cathode {(electrodes using photo-emission in general [H01J 1/34](#))}
 - 29/385 {Photocathodes comprising a layer which modified the wave length of impinging radiation (luminescent layers sensitive to UV and X-rays [C09K 11/00](#), [G21K 4/00](#))}
 - 29/39 Charge-storage screens {(H01J 29/395 takes precedence)}
 - 29/395 {charge-storage grids exhibiting triode effect}
 - 29/41 using secondary emission, e.g. for supericonoscope {(electrodes using secondary emission in general [H01J 1/32](#); secondary emission tubes [H01J 43/00](#))}
 - 29/413 {for writing and reading of charge pattern on opposite sides of the target, e.g. for superorthicon}
 - 29/416 {with a matrix of electrical conductors traversing the target}
 - 29/43 using photo-emissive mosaic, e.g. for orthicon, for iconoscope
 - 29/435 {with a matrix of conductors traversing the target}
 - 29/44 exhibiting internal electric effects caused by particle radiation, e.g. bombardment-induced conductivity {(particle detectors exhibiting internal electric effects [G01T 1/26](#))}
 - 29/45 exhibiting internal electric effects caused by electromagnetic radiation, e.g. photoconductive screen, photodielectric screen, photovoltaic screen {(photoconductive layers for electrography [G03G 5/00](#))}
 - 29/451 {with photosensitive junctions}
 - 29/453 {provided with diode arrays}
 - 29/455 {formed on a silicon substrate}
 - 29/456 {exhibiting no discontinuities, e.g. consisting of uniform layers}
 - 29/458 {pyroelectrical targets; targets for infra-red or ultra-violet or X-ray radiations}
 - 29/46 . . Arrangements of electrodes and associated parts for generating or controlling the ray or beam, e.g. electron-optical arrangement {(transit time tubes [H01J 23/00](#), [H01J 25/00](#); X-ray tubes [H01J 35/00](#); beam tubes for examining ions, e.g. electron or ion microscopes, or processing of objects or materials, e.g. electron or ion beam tubes [H01J 37/04](#); electron multipliers [H01J 43/04](#); handling of radiation or particles, e.g. focusing, deviating, not otherwise provided for [G21K 1/00](#))}
- NOTE**
- [H01J 29/48](#) takes precedence over groups [H01J 29/52](#) - [H01J 29/58](#).
- 29/462 . . {arrangements for interrupting the beam during inoperative periods}
 - 29/465 . . {for simultaneous focalisation and deflection of ray or beam}
 - 29/467 . . {Control electrodes for flat display tubes, e.g. of the type covered by group [H01J 31/123](#)}
 - 29/48 . . Electron guns
 - 29/481 . . . {Electron guns using field-emission, photo-emission, or secondary-emission electron source}
 - 29/482 . . . {Electron guns using electron multiplication}
 - 29/484 . . . {Eliminating deleterious effects due to thermal effects, electrical or magnetic fields; Preventing unwanted emission ([H01J 29/481](#) and [H01J 29/482](#) take precedence)}
 - 29/485 . . . {Construction of the gun or of parts thereof ([H01J 29/481](#), [H01J 29/482](#), [H01J 29/484](#) and [H01J 29/487](#) take precedence)}
 - 29/487 . . . {Replacing parts of the gun; Relative adjustment of the electrodes ([H01J 29/481](#) and [H01J 29/482](#) take precedence; vacuum locks [H01J 29/865](#))}
 - 29/488 . . . {Schematic arrangements of the electrodes for beam forming; Place and form of the electrodes}
 - 29/50 . . . two or more guns in a single vacuum space, e.g. for plural-ray tube ([H01J 29/51](#) takes precedence)
 - 29/503 {Three or more guns, the axes of which lay in a common plane}
 - 29/506 {guns in delta or circular configuration}
 - 29/51 . . . Arrangements for controlling convergence of a plurality of beams {by means of electric field only}
 - 29/52 . . Arrangements for controlling intensity of ray or beam, e.g. for modulation {(H01J 29/467 takes precedence)}

- 29/525 . . . {Digitally controlled systems, e.g. Digisplay}
- 29/54 . . Arrangements for centring ray or beam
{(H01J 29/467 takes precedence)}
- 29/56 . . Arrangements for controlling cross-section of ray or beam; Arrangements for correcting aberration of beam, e.g. due to lenses {(H01J 29/467 takes precedence)}
- 29/563 . . . {for controlling cross-section}
- 29/566 . . . {for correcting aberration}
- 29/58 . . Arrangements for focusing or reflecting ray or beam {(H01J 29/467, H01J 29/585 take precedence)}
- 29/585 . . . {in which the transit time of the electrons has to be taken into account}
- 29/60 . . . Mirrors
- 29/62 . . . Electrostatic lenses
- 29/622 {producing fields exhibiting symmetry of revolution}
- 29/624 {co-operating with or closely associated to an electron gun}
- 29/626 {producing fields exhibiting periodic axial symmetry, e.g. multipolar fields}
- 29/628 {co-operating with or closely associated to an electron gun}
- 29/64 . . . Magnetic lenses
- 29/66 using electromagnetic means only
- 29/68 using permanent magnets only
- 29/70 . . Arrangements for deflecting ray or beam
{(H01J 29/467, H01J 29/525 take precedence)}
- 29/701 . . . {Systems for correcting deviation or convergence of a plurality of beams by means of magnetic fields at least}
- 29/702 {Convergence correction arrangements therefor}
- 29/703 {Static convergence systems}
- 29/705 {Dynamic convergence systems}
- 29/706 {Deviation correction devices, i.e. having the same action on each beam}
- 29/707 {Arrangements intimately associated with parts of the gun and co-operating with external magnetic excitation devices}
- 29/708 . . . {in which the transit time of the electrons has to be taken into account}
- 29/72 . . . along one straight line or along two perpendicular straight lines
- 29/74 Deflecting by electric fields only
- 29/76 Deflecting by magnetic fields only
- 29/762 {using saddle coils or printed windings (coils per se H01F)}
- 29/764 {using toroidal windings}
- 29/766 {using a combination of saddle coils and toroidal windings}
- 29/768 {using printed windings (printed windings in general H01F 27/2804; manufacturing printed coils per se H01F 41/04; printed circuits and apparatus or processes for manufacturing printed circuits in general H05K 1/00, e.g. H05K 1/16, and H05K 3/00)}
- 29/78 . . . along a circle, spiral or rotating radial line, e.g. for radar display
- 29/80 . . Arrangements for controlling the ray or beam after passing the main deflection system, e.g. for post-acceleration or post-concentration, for colour switching {(H01J 29/701 takes precedence)}
- 29/803 {for post-acceleration or post-deflection, e.g. for colour switching}
- 29/806 {Electron lens mosaics, e.g. fly's eye lenses, colour selection lenses}
- 29/81 . . . using shadow masks
- 29/82 . . Mounting, supporting, spacing, or insulating electron-optical or ion-optical arrangements
- 29/823 {around the neck of the tube}
- 29/826 {Deflection arrangements}
- 29/84 . . Traps for removing or diverting unwanted particles, e.g. negative ions, fringing electrons; Arrangements for velocity or mass selection
- 29/845 . . {by means of magnetic systems}
- 29/86 . . Vessels; Containers; Vacuum locks
- 29/861 . . {Vessels or containers characterised by the form or the structure thereof}
- 29/862 . . . {of flat panel cathode ray tubes}
- 29/863 . . {Vessels or containers characterised by the material thereof}
- 29/864 . . {Spacers between faceplate and backplate of flat panel cathode ray tubes}
- 29/865 . . {Vacuum locks (for tubes for examining or processing of objects or materials, e.g. electron microscopes H01J 37/18)}
- 29/866 . . . {Devices for introducing a recording support into the vessel}
- 29/867 . . {Means associated with the outside of the vessel for shielding, e.g. magnetic shields (screens for shielding inside the vessel H01J 29/06; magnetic shielding in general H05K 9/00)}
- 29/868 . . . {Screens covering the input or output face of the vessel, e.g. transparent anti-static coatings, X-ray absorbing layers}
- 29/87 . . Arrangements for preventing or limiting effects of implosion of vessels or containers
- 29/88 . . provided with coatings on the walls thereof; Selection of materials for the coatings
{(H01J 29/868 and H01J 29/89 take precedence)}
- 29/89 . . Optical or photographic arrangements structurally combined {or co-operating} with the vessel {(H01J 29/866 and H01J 29/868 take precedence)}
- 29/892 . . . {using fibre optics}
- 29/894 . . . {Arrangements combined with the vessel for the purpose of image projection on a screen (projection arrangements for image reproduction, e.g. using eidophor H04N 5/74)}
- 29/896 . . . {Anti-reflection means, e.g. eliminating glare due to ambient light}
- 29/898 . . . {Spectral filters}
- 29/90 . . Leading-in arrangements; Seals therefor
- 29/92 . . Means forming part of the tube for the purpose of providing electrical connection to it
- 29/925 . . {High voltage anode feedthrough connectors for display tubes}
- 29/94 . . Selection of substances for gas fillings; Means for obtaining or maintaining the desired pressure within the tube, e.g. by gettering {(exhausting, degassing, gettering of electric discharge tubes in general H01J 9/38)}

- 29/96 . One or more circuit elements structurally associated with the tube
- 29/98 . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
- 31/00 Cathode ray tubes; Electron beam tubes**
([H01J 25/00](#), [H01J 33/00](#), [H01J 35/00](#), [H01J 37/00](#) take precedence; details of cathode ray tubes or of electron beam tubes [H01J 29/00](#))
- 31/02 . having one or more output electrodes which may be impacted selectively by the ray or beam, and onto, from, or over which the ray or beam may be deflected or de-focused {(pulse counting circuits therewith [H03K 29/06](#))}
- 31/04 . . with only one or two output electrodes {with only two electrically independant groups or electrodes}
- 31/06 . . with more than two output electrodes, e.g. for multiple switching or counting
- 31/065 . . . {for electrography or electrophotography, for transferring a charge pattern through the faceplate (leading-in arrangements [H01J 29/90](#); Lenard tubes [H01J 33/00](#); electrography or electrophotography per se [G03C](#))}
- 31/08 . having a screen on or from which an image or pattern is formed, picked up, converted, or stored
- 31/10 . . Image or pattern display tubes, i.e. having electrical input and optical output; Flying-spot tubes for scanning purposes
- 31/12 . . . with luminescent screen
- 31/121 {tubes for oscillography (colour display tubes [H01J 31/20](#); cathode ray oscillography [G01R 13/20](#))}
- 31/122 {Direct viewing storage tubes without storage grid (with storage grid [H01J 31/18](#))}
- 31/123 {Flat display tubes}
- 31/124 {using electron beam scanning}
- 31/125 {provided with control means permitting the electron beam to reach selected parts of the screen, e.g. digital selection}
- 31/126 {using line sources}
- 31/127 {using large area or array sources, i.e. essentially a source for each pixel group}
- 31/128 {provided with control means permitting the electron beam to reach selected parts of the screen, e.g. digitally controlled display tubes ([H01J 31/123](#) takes precedence)}
- 31/14 Magic-eye or analogous tuning indicators {(mounting of visual indicators in a radio set [H03J 1/04](#); circuits for timing indicators [H03J 3/14](#))}
- 31/15 with ray or beam selectively directed to luminescent anode segments {(printing by application of radiation [B41J 2/447](#))}
- 31/16 with mask carrying a number of selectively displayable signs, e.g. charactron, numeroscope {(tubes with a mask carrying a matrix of openings, a selection of which permits a sign to be displayed [H01J 31/128](#))}
- 31/18 with image written by a ray or beam on a grid-like charge-accumulating screen, and with a ray or beam passing through and influenced by this screen before striking the luminescent screen, e.g. direct-view storage tube {(charge storage grids exhibiting triode effect [H01J 29/395](#))}
- 31/20 . . . for displaying images or patterns in two or more colours {(circuits for colour television [H04N 9/16](#) - [H04N 9/28](#))}
- 31/201 {using a colour-selection electrode}
- 31/203 {with more than one electron beam}
- 31/205 {with three electron beams in delta configuration}
- 31/206 {with three coplanar electron beams}
- 31/208 {using variable penetration depth of the electron beam in the luminescent layer, e.g. penitrons}
- 31/22 . . . for stereoscopic displays
- 31/24 . . . with screen acting as light valve by shutter operation, e.g. eidophor {(projection arrangements for image reproduction, e.g. using eidophor [H04N 5/74](#))}
- 31/26 . . Image pick-up tubes having an input of visible light and electric output (tubes without defined electron beams and having a light ray scanning photo-emissive screen [H01J 40/20](#))
- 31/265 . . . {with light spot scanning}
- 31/28 . . . with electron ray scanning the image screen {([H01J 31/283](#), [H01J 31/286](#) take precedence)}
- 31/283 {with a target comprising semiconductor junctions}
- 31/286 {correlater tubes}
- 31/30 having regulation of screen potential at anode potential, e.g. iconoscope
- 31/32 Tubes with image amplification section, e.g. image-iconoscope, supericonoscope
- 31/34 having regulation of screen potential at cathode potential, e.g. orthicon
- 31/36 Tubes with image amplification section, e.g. image-orthicon
- 31/38 Tubes with photoconductive screen, e.g. vidicon
- 31/40 having grid-like image screen through which the electron ray passes and by which the ray is influenced before striking the output electrode, i.e. having "triode action"
- 31/42 . . . with image screen generating a composite electron beam which is deflected as a whole past a stationary probe to simulate a scanning effect, e.g. Farnsworth pick-up tube
- 31/44 Tubes with image amplification section
- 31/46 . . . Tubes in which electrical output represents both intensity and colour of image {(colour television cameras with only one tube [H04N 9/07](#))}
- 31/48 . . . Tubes with amplification of output effected by electron multiplier arrangements within the vacuum space
- 31/49 . . Pick-up adapted for an input of electromagnetic radiation other than visible light and having an electric output, e.g. for an input of X-rays, for an input of infra-red radiation

- 31/495 . . . Pick-up tubes adapted for an input of sonic, ultrasonic, or mechanical vibrations and having an electric output
- 31/50 . . . Image-conversion or image-amplification tubes, i.e. having optical, X-ray, or analogous input, and optical output
- 31/501 . . . {with an electrostatic electron optic system ([H01J 31/52](#) - [H01J 31/56](#) take precedence)}
- 31/502 {with means to interrupt the beam, e.g. shutter for high speed photography ([circuits using electron-beam shutters G03B 27/725](#))}
- 31/503 . . . {with an electromagnetic electron-optic system ([H01J 31/52](#) - [H01J 31/56](#) take precedence)}
- 31/505 . . . {flat tubes, e.g. proximity focusing tubes}
- 31/506 . . . {tubes using secondary emission effect}
- 31/507 {using a large number of channels, e.g. microchannel plates}
- 31/508 . . . {Multistage converters}
- 31/52 . . . having grid-like image screen through which the electron ray or beam passes and by which the ray or beam is influenced before striking the luminescent output screen, i.e. having "triode action"
- 31/54 . . . in which the electron ray or beam is reflected by the image input screen on to the image output screen
- 31/56 . . . for converting or amplifying images in two or more colours
- 31/58 . . . Tubes for storage of image or information pattern or for conversion of definition of television or like images, i.e. having electrical input and electrical output {(electrostatic memories using electron beam tubes [G11C 11/23](#))}
- 31/585 . . . {Monoscopes ([H01J 31/60](#) takes precedence)}
- 31/60 . . . having means for deflecting, either selectively or sequentially, an electron ray on to separate surface elements of the screen ([by circuitry alone H01J 29/08](#))
- 31/62 with separate reading and writing rays
- 31/64 on opposite sides of screen, e.g. for conversion of definition
- 31/66 . . . having means for allowing all but selected cross-section elements of a homogeneous electron beam to reach corresponding elements of the screen, e.g. selectron
- 31/68 . . . in which the information pattern represents two or more colours
- 33/00 Discharge tubes with provision for emergence of electrons or ions from the vessel ({irradiation devices [G21K](#)}; particle accelerators [H05H](#)); Lenard tubes**
- 33/02 . Details {(vessels for operation at high tension [H01J 5/06](#))}
- 33/04 . . Windows
- 35/00 X-ray tubes**
- 35/02 . Details
- 35/025 . . {X-ray tubes with structurally associated circuit elements}
- 35/04 . . Electrodes {; Mutual position thereof; Constructional adaptations therefor}
- 35/045 . . . {Electrodes for controlling the current of the cathode ray, e.g. control grids}
- 35/06 . . . Cathodes
- 35/064 {Details of the emitter, e.g. material or structure ([H01J 35/065](#) takes precedence)}
- 35/065 {Field emission, photo emission or secondary emission cathodes}
- 35/066 {Details of electron optical components, e.g. cathode cups}
- 35/08 . . . Anodes; Anti cathodes
- 35/10 Rotary anodes; Arrangements for rotating anodes; Cooling rotary anodes
- 35/101 {Arrangements for rotating anodes, e.g. supporting means, means for greasing, means for sealing the axle or means for shielding or protecting the driving}
- 35/1017 {Bearings for rotating anodes}
- 35/1024 {Rolling bearings}
- 35/103 {Magnetic bearings}
- 35/104 {Fluid bearings}
- 35/105 {Cooling of rotating anodes, e.g. heat emitting layers or structures}
- 35/106 {Active cooling, e.g. fluid flow, heat pipes}
- 35/107 {Cooling of the bearing assemblies}
- 35/108 {Substrates for and bonding of emissive target, e.g. composite structures}
- 35/112 {Non-rotating anodes ([H01J 35/12](#) takes precedence)}
- 35/116 {Transmissive anodes (acting as a window [H01J 35/186](#))}
- 35/12 Cooling non-rotary anodes
- 35/13 {Active cooling, e.g. fluid flow, heat pipes}
- 35/14 . . . Arrangements for concentrating, focusing, or directing the cathode ray
- 35/147 . . . {Spot size control}
- 35/153 . . . {Spot position control}
- 35/16 . . Vessels; Containers; Shields associated therewith
- 35/165 . . . {joining connectors to the tube}
- 35/18 . . . Windows
- 35/186 {used as targets or X-ray converters}
- 35/20 . . Selection of substances for gas fillings; Means for obtaining or maintaining the desired pressure within the tube, e.g. by gettering
- 35/22 . specially designed for passing a very high current for a very short time, e.g. for flash operation
- 35/24 . Tubes wherein the point of impact of the cathode ray on the anode or anticathode is movable relative to the surface thereof
- 35/26 . . by rotation of the anode or anticathode
- 35/28 . . by vibration, oscillation, reciprocation, or swash-plate motion of the anode or anticathode
- 35/30 . . by deflection of the cathode ray
- 35/305 . . . {by using a rotating X-ray tube in conjunction therewith}
- 35/32 . Tubes wherein the X-rays are produced at or near the end of the tube or a part thereof which tube or part has a small cross-section to facilitate introduction into a small hole or cavity
- 37/00 Discharge tubes with provision for introducing objects or material to be exposed to the discharge, e.g. for the purpose of examination or processing thereof ([H01J 33/00](#), [H01J 40/00](#), [H01J 41/00](#), [H01J 47/00](#), [H01J 49/00](#) take precedence)**
- 37/02 . Details

- 37/023 . . {Means for mechanically adjusting components not otherwise provided for (mechanically adjusting from the outside of electron or ion-optical components [H01J 37/067](#); positioning the object or material [H01J 37/20](#); vacuum locks, means for obtaining or maintaining the desired pressure within the tube [H01J 37/18](#); other manipulating devices [H01L 21/48](#), [G21F](#))}
- 37/026 . . {Means for avoiding or neutralising unwanted electrical charges on tube components}
- 37/04 . . Arrangements of electrodes and associated parts for generating or controlling the discharge, e.g. electron-optical arrangement, ion-optical arrangement {(electron or ion-optical systems for localised treatment of materials [H01J 37/3007](#); discharge control means in gas filled discharge tubes [H01J 37/32009](#))}
- 37/045 . . . {Beam blanking or chopping, i.e. arrangements for momentarily interrupting exposure to the discharge}
- 37/05 . . . Electron or ion-optical arrangements for separating electrons or ions according to their energy {or mass}(particle separator tubes [H01J 49/00](#))
- 37/06 . . . Electron sources; Electron guns {(electron sources in general [H01J 1/02](#), [H01J 19/02](#); electron guns in general [H01J 3/02](#))}
- 37/061 {Electron guns using electron multiplication}
- 37/063 Geometrical arrangement of electrodes for beam-forming
- 37/065 Construction of guns or parts thereof ([H01J 37/067](#) - [H01J 37/077](#) take precedence)
- 37/067 Replacing parts of guns; Mutual adjustment of electrodes ([H01J 37/073](#) - [H01J 37/077](#) take precedence; vacuum locks [H01J 37/18](#))
- 37/07 Eliminating deleterious effects due to thermal effects or electric or magnetic fields ([H01J 37/073](#) - [H01J 37/077](#) take precedence)
- 37/073 Electron guns using field emission, photo emission, or secondary emission electron sources
- 37/075 Electron guns using thermionic emission from cathodes heated by particle bombardment or by irradiation, e.g. by laser
- 37/077 Electron guns using discharge in gases or vapours as electron sources
- 37/08 . . . Ion sources; Ion guns
- 37/09 . . . Diaphragms; Shields associated with electron or ion-optical arrangements; Compensation of disturbing fields
- 37/10 . . . Lenses
- 37/12 electrostatic
- 37/14 magnetic
- 37/141 Electromagnetic lenses
- 37/1413 {Means for interchanging parts of the lens, e.g. pole pieces, within the tube (mechanically adjusting electron (ion) optical components [H01J 37/15](#))}
- 37/1416 {with superconducting coils}
- 37/143 Permanent magnetic lenses
- 37/145 Combinations of electrostatic and magnetic lenses
- 37/147 . . . Arrangements for directing or deflecting the discharge along a desired path (([H01J 37/045](#) take precedence;) lenses [H01J 37/10](#))
- 37/1471 {for centering, aligning or positioning of ray or beam}
- 37/1472 {Deflecting along given lines}
- 37/1474 {Scanning means}
- 37/1475 {magnetic}
- 37/1477 {electrostatic}
- 37/1478 {Beam tilting means, i.e. for stereoscopy or for beam channelling}
- 37/15 External mechanical adjustment of electron or ion optical components ([H01J 37/067](#), [H01J 37/20](#) take precedence)
- 37/153 . . . Electron-optical or ion-optical arrangements for the correction of image defects, e.g. stigmators
- 37/16 . . Vessels; Containers
- 37/165 . . . {Means associated with the vessel for preventing the generation of or for shielding unwanted radiation, e.g. X-rays}
- 37/18 . . Vacuum locks {; Means for obtaining or maintaining the desired pressure within the vessel (vacuum locks for electron-beam tubes in general [H01J 29/865](#))}
- 37/185 . . . {Means for transferring objects between different enclosures of different pressure or atmosphere}
- 37/20 . . Means for supporting or positioning the objects or the material; Means for adjusting diaphragms or lenses associated with the support {(introducing the objects [H01J 37/18](#))}
- 37/21 . . Means for adjusting the focus {(adjusting the focus while observing the image by photographic or optical means [H01J 37/22](#); means for observing the object or the point of impact on the object in tubes for the localised treatment of materials [H01J 37/3005](#))}
- 37/22 . . Optical or photographic arrangements associated with the tube {(using a CRT for the display of the image in a scanning electron microscope [H01J 37/28](#); observing the object or the point of impact on the object in tubes for the localised treatment of materials [H01J 37/3007](#))}
- 37/222 . . . {Image processing arrangements associated with the tube (image data processing or generation, in general [G06T](#))}
- 37/224 . . . {Luminescent screens or photographic plates for imaging (photosensitive materials for photographic purposes [G03C](#)); Apparatus specially adapted therefor, e.g. cameras, TV-cameras, photographic equipment, exposure control; Optical subsystems specially adapted therefor, e.g. microscopes for observing image on luminescent screen}
- 37/226 . . . {Optical arrangements for illuminating the object; optical arrangements for collecting light from the object}
- 37/228 {whereby illumination and light collection take place in the same area of the discharge}
- 37/24 . . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
- 37/241 . . . {High voltage power supply or regulation circuits (components [H01J 37/248](#))}

- 37/242 . . . {Filament heating power supply or regulation circuits ([H01J 37/241](#) takes precedence)}
- 37/243 . . . {Beam current control or regulation circuits ([H01J 37/241](#) takes precedence)}
- 37/244 . . Detectors; Associated components or circuits therefor
- 37/248 . . Components associated with high voltage supply {(means for measuring the high voltage [per se G01R 15/00](#))}
- 37/252 . Tubes for spot-analysing by electron or ion beams; Microanalysers
- 37/256 . . using scanning beams
- 37/26 . Electron or ion microscopes; Electron or ion diffraction tubes
- 37/261 . . {Details}
- 37/263 . . . {Contrast, resolution or power of penetration}
- 37/265 . . . {Controlling the tube; circuit arrangements adapted to a particular application not otherwise provided, e.g. bright-field-dark-field illumination}
- 37/266 . . {Measurement of magnetic- or electric fields in the object; Lorentz microscopy (emission microscopes [H01J 37/285](#); reflecting microscopes [H01J 37/29](#); spot analysing [H01J 37/252](#))}
- 37/268 . . . {with scanning beams}
- 37/27 . . Shadow microscopy
- 37/28 . . with scanning beams {([H01J 37/268](#), [H01J 37/292](#), [H01J 37/2955](#) take precedence)}
- 37/285 . . Emission microscopes, e.g. field-emission microscopes
- 37/29 . . Reflection microscopes
- 37/292 . . . {using scanning ray}
- 37/295 . . Electron or ion diffraction tubes
- 37/2955 . . . {using scanning ray}
- 37/30 . Electron-beam or ion-beam tubes for localised treatment of objects
- 37/3002 . . {Details}
- 37/3005 . . . {Observing the objects or the point of impact on the object}
- 37/3007 . . . {Electron or ion-optical systems (electron or ion-optical details [H01J 37/06](#) - [H01J 37/153](#))}
- 37/301 . . Arrangements enabling beams to pass between regions of different pressure
- 37/302 . . Controlling tubes by external information, e.g. programme control ([H01J 37/304](#) takes precedence)
- 37/3023 . . . {Programme control}
- 37/3026 {Patterning strategy}
- 37/304 . . Controlling tubes by information coming from the objects {or from the beam}, e.g. correction signals
- 37/3045 . . . {Object or beam position registration}
- 37/305 . . for casting, melting, evaporating or etching {(methods for casting or melting of metals with electron beam or gas discharges [C22B 9/22](#))}
- 37/3053 . . . {for evaporating or etching}
- 37/3056 {for microworking, e.g. etching of gratings, trimming of electrical components (trimming of resistors [H01C 17/22](#))}
- 37/31 . . for cutting or drilling {(methods for cutting or drilling metals with electron beams [B23K 15/00](#))}
- 37/315 . . for welding {(methods for welding metals with electron beams [B23K 15/00](#))}
- 37/317 . . for changing properties of the objects or for applying thin layers thereon, e.g. for ion implantation ([H01J 37/36](#) takes precedence)
- 37/3171 . . . {for ion implantation (plasma immersion ion implantation [H01J 37/32412](#))}
- 37/3172 {Maskless patterned ion implantation}
- 37/3174 . . . {Particle-beam lithography, e.g. electron beam lithography}
- 37/3175 {Projection methods, i.e. transfer substantially complete pattern to substrate}
- 37/3177 {Multi-beam, e.g. fly's eye, comb probe}
- 37/3178 . . . {for applying thin layers on objects}
- 37/32 . Gas-filled discharge tubes, {e.g. for surface treatment of objects such as coating, plating, etching, sterilising or bringing about chemical reactions}({general methods or devices for heat treatments of ferrous or non-ferrous metals or alloys by cathodic discharges [C21D 1/38](#); methods of carburising or nitriding of metals in general [C23C 8/00](#); methods for coating, plating or surface treating of or with metallic material [C23C 8/36](#), [C23C 14/32](#), [C23C 16/50](#); methods for coating, plating or surface treating of or with semiconductors [H01L 21/00](#);) heating by discharge [H05B](#))
- 37/32009 . . {Arrangements for generation of plasma specially adapted for examination or treatment of objects, e.g. plasma sources (plasma generation in general [H05H 1/24](#))}
- 37/32018 . . . {Glow discharge}
- 37/32027 {DC powered}
- 37/32036 {AC powered}
- 37/32045 {Circuits specially adapted for controlling the glow discharge}
- 37/32055 . . . {Arc discharge}
- 37/32064 {Circuits specially adapted for controlling the arc discharge (for plasma torches [H01H 1/36](#))}
- 37/32073 . . . {Corona discharge}
- 37/32082 . . . {Radio frequency generated discharge ([H01J 37/32357](#), [H01J 37/32366](#), [H01J 37/32394](#) and [H01J 37/32403](#) take precedence)}
- 37/32091 {the radio frequency energy being capacitively coupled to the plasma}
- 37/321 {the radio frequency energy being inductively coupled to the plasma}
- 37/3211 {Antennas, e.g. particular shapes of coils}
- 37/32119 {Windows}
- 37/32128 {using particular waveforms, e.g. polarised waves}
- 37/32137 {controlling of the discharge by modulation of energy}
- 37/32146 {Amplitude modulation, includes pulsing}
- 37/32155 {Frequency modulation}
- 37/32165 {Plural frequencies}
- 37/32174 {Circuits specially adapted for controlling the RF discharge}
- 37/32183 {Matching circuits, impedance matching circuits [per se H03H 7/38](#) and [H03H 7/40](#)}
- 37/32192 . . . {Microwave generated discharge ([H01J 37/32357](#), [H01J 37/32366](#), [H01J 37/32394](#), [H01J 37/32403](#) take precedence)}
- 37/32201 {Generating means}

- 37/32211 {Means for coupling power to the plasma}
- 37/3222 {Antennas}
- 37/32229 {Waveguides}
- 37/32238 {Windows}
- 37/32247 {Resonators}
- 37/32256 {Tuning means}
- 37/32266 {Means for controlling power transmitted to the plasma}
- 37/32275 {Microwave reflectors}
- 37/32284 {Means for controlling or selecting resonance mode}
- 37/32293 {using particular waveforms, e.g. polarised waves}
- 37/32302 {Plural frequencies}
- 37/32311 {Circuits specially adapted for controlling the microwave discharge}
- 37/32321 . . . {Discharge generated by other radiation ([H01J 37/32055](#), [H01J 37/32073](#), [H01J 37/32082](#), [H01J 37/32192](#), [H01J 37/32348](#) take precedence)}
- 37/3233 {using charged particles}
- 37/32339 {using electromagnetic radiation}
- 37/32348 . . . {Dielectric barrier discharge}
- 37/32357 . . . {Generation remote from the workpiece, e.g. down-stream}
- 37/32366 . . . {Localised processing}
- 37/32376 {Scanning across large workpieces}
- 37/32385 {Treating the edge of the workpieces}
- 37/32394 . . . {Treating interior parts of workpieces}
- 37/32403 . . . {Treating multiple sides of workpieces, e.g. 3D workpieces}
- 37/32412 . . . {Plasma immersion ion implantation}
- 37/32422 . . . {Arrangement for selecting ions or species in the plasma}
- 37/32431 . . {Constructional details of the reactor}
- 37/3244 . . . {Gas supply means}
- 37/32449 {Gas control, e.g. control of the gas flow}
- 37/32458 . . . {Vessel}
- 37/32467 {Material}
- 37/32477 {characterised by the means for protecting vessels or internal parts, e.g. coatings}
- 37/32486 {Means for reducing recombination coefficient}
- 37/32495 {Means for protecting the vessel against plasma}
- 37/32504 {Means for preventing sputtering of the vessel}
- 37/32513 {Sealing means, e.g. sealing between different parts of the vessel}
- 37/32522 {Temperature}
- 37/32532 . . . {Electrodes}
- 37/32541 {Shape}
- 37/3255 {Material}
- 37/32559 {Protection means, e.g. coatings}
- 37/32568 {Relative arrangement or disposition of electrodes; moving means}
- 37/32577 {Electrical connecting means}
- 37/32587 {Triode systems}
- 37/32596 {Hollow cathodes}
- 37/32605 {Removable or replaceable electrodes or electrode systems}
- 37/32614 {Consumable cathodes for arc discharge}
- 37/32623 . . . {Mechanical discharge control means}
- 37/32633 {Baffles}
- 37/32642 {Focus rings}
- 37/32651 {Shields, e.g. dark space shields, Faraday shields}
- 37/3266 . . . {Magnetic control means}
- 37/32669 {Particular magnets or magnet arrangements for controlling the discharge}
- 37/32678 {Electron cyclotron resonance}
- 37/32688 {Multi-cusp fields}
- 37/32697 . . . {Electrostatic control}
- 37/32706 {Polarising the substrate}
- 37/32715 . . . {Workpiece holder}
- 37/32724 {Temperature}
- 37/32733 . . . {Means for moving the material to be treated}
- 37/32743 {for introducing the material into processing chamber}
- 37/32752 {for moving the material across the discharge}
- 37/32761 {Continuous moving}
- 37/3277 {of continuous material}
- 37/32779 {of batches of workpieces}
- 37/32788 {for extracting the material from the process chamber}
- 37/32798 . . . {Further details of plasma apparatus not provided for in groups [H01J 37/3244](#) - [H01J 37/32788](#); special provisions for cleaning or maintenance of the apparatus}
- 37/32807 {Construction (includes replacing parts of the apparatus)}
- 37/32816 {Pressure}
- 37/32825 {Working under atmospheric pressure or higher}
- 37/32834 {Exhausting}
- 37/32844 {Treating effluent gases}
- 37/32853 {Hygiene}
- 37/32862 {*In situ* cleaning of vessels and/or internal parts}
- 37/32871 {Means for trapping or directing unwanted particles}
- 37/3288 {Maintenance}
- 37/32889 {Connection or combination with other apparatus}
- 37/32899 {Multiple chambers, e.g. cluster tools}
- 37/32908 {Utilities}
- 37/32917 . . {Plasma diagnostics}
- 37/32926 . . . {Software, data control or modelling}
- 37/32935 . . . {Monitoring and controlling tubes by information coming from the object and/or discharge}
- 37/32944 {Arc detection}
- 37/32954 {Electron temperature measurement}
- 37/32963 {End-point detection}
- 37/32972 {Spectral analysis}
- 37/32981 {Gas analysis}
- 37/3299 . . . {Feedback systems}
- 37/34 . . . operating with cathodic sputtering ([H01J 37/36](#) takes precedence (; methods of cathodic sputtering [C23C 14/34](#)))
- 37/3402 . . . {using supplementary magnetic fields}
- 37/3405 {Magnetron sputtering}
- 37/3408 {Planar magnetron sputtering}
- 37/3411 . . . {Constructional aspects of the reactor}

37/3414	. . . . {Targets}	40/18	. . with luminescent coatings for influencing the sensitivity of the tube, e.g. by converting the input wavelength
37/3417	. . . . . {Arrangements}	40/20	. . wherein a light-ray scans a photo-emissive screen
37/342	. . . . . {Hollow targets}	41/00	Discharge tubes for measuring pressure of introduced gas {or for detecting presence of gas}; Discharge tubes for evacuation by diffusion of ions
37/3423	. . . . . {Shape}	41/02	. Discharge tubes for measuring pressure of introduced gas {or for detecting presence of gas}
37/3426	. . . . . {Material}	41/04	. . with ionisation by means of thermionic cathodes
37/3429	. . . . . {Plural materials}	41/06	. . with ionisation by means of cold cathodes
37/3432	. . . . . {Target-material dispenser}	41/08	. . with ionisation by means of radioactive substances, e.g. alphas
37/3435	. . . . {Target holders (includes backing plates and endblocks)}	41/10	. . of particle spectrometer type (particle spectrometers per se H01J 49/00)
37/3438	. . . . {Electrodes other than cathode}	41/12	. Discharge tubes for evacuating by diffusion of ions, e.g. ion pumps, getter ion pumps
37/3441	. . . . {Dark space shields}	41/14	. . with ionisation by means of thermionic cathodes
37/3444	. . . . {Associated circuits}	41/16	. . . using gettering substances
37/3447	. . . . {Collimators, shutters, apertures}	41/18	. . with ionisation by means of cold cathodes
37/345	. . . . {Magnet arrangements in particular for cathodic sputtering apparatus (material of magnets or magnets in general H01F 1/00, H01F 7/00)}	41/20	. . . using gettering substances
37/3452	. . . . . {Magnet distribution}	43/00	Secondary-emission tubes; Electron-multiplier tubes (dynamic electron-multiplier tubes H01J 25/76)
37/3455	. . . . . {Movable magnets}	43/02	. Tubes in which one or a few electrodes are secondary-electron emitting electrodes
37/3458	. . . . . {Electromagnets in particular for cathodic sputtering apparatus (electromagnets in general H01F 7/06)}	43/025	. . {Circuits therefor}
37/3461	. . . . {Means for shaping the magnetic field, e.g. magnetic shunts}	43/04	. Electron multipliers {(if forming part of electron gun H01J 3/023)}
37/3464	. . . {Operating strategies}	43/045	. . {Position sensitive electron multipliers}
37/3467	. . . . {Pulsed operation, e.g. HIPIMS}	43/06	. . Electrode arrangements
37/347	. . . . {Thickness uniformity of coated layers or desired profile of target erosion}	43/08	. . . Cathode arrangements {(photo-emissive electrodes H01J 1/34, H01J 1/35) ; construction of photo cathodes H01J 40/06, H01J 40/16, H01J 47/00, H01J 49/08)
37/3473	. . . . {Composition uniformity or desired gradient}	43/10	. . . Dynodes (H01J 43/24, H01J 43/26 take precedence)
37/3476	. . . {Testing and control}	43/12	. . . Anode arrangements
37/3479	. . . . {Detecting exhaustion of target material}	43/14	. . . Control of electron beam by magnetic field
37/3482	. . . . {Detecting or avoiding eroding through}	43/16	. . . Electrode arrangements using essentially one dynode
37/3485	. . . . {Means for avoiding target poisoning}	43/18	. . . Electrode arrangements using essentially more than one dynode
37/3488	. . . {Constructional details of particle beam apparatus not otherwise provided for, e.g. arrangement, mounting, housing, environment; special provisions for cleaning or maintenance of the apparatus}	43/20	. . . . Dynodes consisting of sheet material, e.g. plane, bent
37/3491	. . . . {Manufacturing of targets}	43/22	. . . . Dynodes consisting of electron-permeable material, e.g. foil, grid, tube, venetian blind
37/3494	. . . . {Adaptation to extreme pressure conditions}	43/24	. . . . Dynodes having potential gradient along their surfaces
37/3497	. . . . {Temperature of target}	43/243	. . . . . {Dynodes consisting of a piling-up of channel-type dynode plates}
37/36	. . for cleaning surfaces while plating with ions of materials introduced into the discharge, e.g. introduced by evaporation {(condensing of electrically charged vapour onto a surface for covering materials with metals C23C 14/32)}	43/246	. . . . . {Microchannel plates [MCP] (image amplification tubes using MCP H01J 31/507)}
40/00	Photoelectric discharge tubes not involving the ionisation of a gas (H01J 49/00 takes precedence)	43/26	. . . . . Box dynodes
40/02	. Details	43/28	. . Vessels {wall of the tube}; Windows; Screens; Suppressing undesired discharges or currents
40/04	. . Electrodes	43/30	. . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
40/06	. . . Photo-emissive cathodes		
40/08	. . Magnetic means for controlling discharge		
40/10	. . Selection of substances for gas fillings		
40/12	. . One or more circuit elements structurally associated with the tube		
40/14	. . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for		
40/16	. having photo- emissive cathode, e.g. alkaline photoelectric cell (operating with secondary emission H01J 43/00)		

45/00	Discharge tubes functioning as thermionic generators ({structural combination of fuel element with thermoelectric element G21C 3/40 ; nuclear power plants using thermionic converters G21D 7/04 ; structural combination of a radioactive source with a thermionic converter, e.g. radioisotope batteries G21H 1/10 ; generators in which thermal or kinetic energy is converted into electrical energy by ionisation of a fluid and removal of the charge therefrom H02N 3/00 })	47/1272	. . {BF ₃ tubes}
		47/1277	. . {Light-nuclei-recoil ionisation detectors, e.g. using protons, alpha-particles}
		47/1283	. . . {Ionisation chambers}
		47/1288	. . . {Counters}
		47/1294	. . . . {Multi-wire counters}
		47/14	. Parallel electrode spark or streamer chambers; Wire spark or streamer chambers {(circuit arrangements with multi-wire or parallel-plate chambers for recording of movements or tracks of particles G01T 5/12)}
47/00	Tubes for determining the presence, intensity, density or energy of radiation or particles ({discharge tubes using igniting by associated radioactive materials or fillings, e.g. current stabilising tubes H01J 17/32 }; photoelectric discharge tubes not involving the ionisation of a gas H01J 40/00 }; discharge tubes for measuring the pressure, partial pressure of introduced gas or for detecting presence of gas H01J 41/02 ; ionisation chambers using a solid dielectric G01T 3/008 })	47/16	. . characterised by readout of each individual wire
		47/18	. . . the readout being electrical (H01J 47/20 takes precedence)
		47/20	. . . the readout employing electrical or mechanical delay lines, e.g. magnetostrictive delay lines
		47/22	. . characterised by another type of readout
		47/24	. . . the readout being acoustical
		47/26	. . . the readout being optical
		49/00	Particle spectrometers or separator tubes
			NOTE
			In classifying particle separators, no distinction is made between spectrometry and spectrography, the difference being only in the manner of detection which in the first case is electrical and in the second case is by means of a photographic film.
47/001	. {Details}	49/0004	. {Imaging particle spectrometry}
47/002	. . {Vessels or containers}	49/0009	. {Calibration of the apparatus}
47/003	. . . {using tissue-equivalent materials}	49/0013	. {Miniaturised spectrometers, e.g. having smaller than usual scale, integrated conventional components}
47/004	. . . {Windows permeable to X-rays, gamma-rays, or particles (windows for discharge tubes with provision for emergence of electrons or ions from the vessel H01J 33/04 ; windows for X-ray tubes H01J 35/18)}	49/0018	. . {Microminiaturised spectrometers, e.g. chip-integrated devices, MicroElectro-Mechanical Systems [MEMS]}
47/005	. . {Gas fillings (H01J 47/12 takes precedence); Maintaining the desired pressure within the tube}	49/0022	. {Portable spectrometers, e.g. devices comprising independent power supply, constructional details relating to portability (small scale devices per se H01J 49/0013 and H01J 49/0018)}
47/006	. . . {Tissue equivalent gas fillings}	49/0027	. {Methods for using particle spectrometers}
47/007	. {Flash detectors}	49/0031	. . {Step by step routines describing the use of the apparatus (H01J 49/0081 takes precedence)}
47/008	. {Drift detectors}	49/0036	. . {Step by step routines describing the handling of the data generated during a measurement (recognising patterns in signals G06K 9/00496)}
47/02	. Ionisation chambers	49/004	. {Combinations of spectrometers, tandem spectrometers, e.g. MS/MS, MSn}
47/022	. . {Calibration thereof}	49/0045	. . {characterised by the fragmentation or other specific reaction}
47/024	. . {Well-type ionisation chambers}	49/005	. . . {by collision with gas, e.g. by introducing gas or by accelerating ions with an electric field}
47/026	. . {Gas flow ionisation chambers}	49/0054	. . . {by an electron beam, e.g. electron impact dissociation, electron capture dissociation}
47/028	. . {using a liquid dielectric}	49/0059	. . . {by a photon beam, photo-dissociation}
47/04	. . Capacitive ionisation chambers, e.g. the electrodes of which are used as electrometers	49/0063	. . . {by applying a resonant excitation voltage}
47/06	. Proportional counter tubes	49/0068	. . . {by collision with a surface, e.g. surface induced dissociation}
47/062	. . {Multiwire proportional counter tubes}	49/0072	. . . {by ion/ion reaction, e.g. electron transfer dissociation, proton transfer dissociation}
47/065	. . {Well-type proportional counter tubes}	49/0077	. . . {specific reactions other than fragmentation}
47/067	. . {Gas flow proportional counter tubes}	49/0081	. . {Tandem in time, i.e. using a single spectrometer}
47/08	. Geiger-Müller counter tubes {(gas filling with very short deionisation times H01J 17/64 , H01T)}	49/0086	. . {Accelerator mass spectrometers}
47/10	. Spark counters (H01J 47/14 takes precedence; spark gaps H01T)		
47/12	. Neutron detector tubes, e.g. BF ₃ tubes		
47/1205	. . {using nuclear reactions of the type (n, alpha) in solid materials, e.g. Boron-10 (n,alpha) Lithium-7, Lithium-6 (n, alpha)Hydrogen-3}		
47/1211	. . . {Ionisation chambers}		
47/1216	. . . . {Gamma compensated}		
47/1222	. . . {Proportional counters}		
47/1227	. . {Fission detectors}		
47/1233	. . . {Ionisation chambers}		
47/1238	. . . {Counters}		
47/1244	. . . . {Multiwire counters}		
47/125	. . {Helium ionisation detectors}		
47/1255	. . . {Ionisation chambers}		
47/1261	. . . {Counters}		
47/1266	. . . . {Multi-wire counters}		

- 49/009 . . {Spectrometers having multiple channels, parallel analysis}
- 49/0095 . {Particular arrangements for generating, introducing or analyzing both positive and negative analyte ions (ion/ion reactions [H01J 49/0072](#))}
- 49/02 . Details
- 49/022 . . {Circuit arrangements, e.g. for generating deviation currents or voltages (regulating electric or magnetic variables in general, e.g. current, magnetic field [G05F](#)); Components associated with high voltage supply (high voltage supply [per se](#) [H02M](#))}
- 49/025 . . {Detectors specially adapted to particle spectrometers (data acquisition [H01J 49/0036](#); detectors [per se](#) [G01T](#), e.g. [G01T 1/28](#), [G01T 1/29](#))}
- 49/027 . . . {detecting image current induced by the movement of charged particles ([H01J 49/38](#) takes precedence)}
- 49/04 . . Arrangements for introducing or extracting samples to be analysed, e.g. vacuum locks; Arrangements for external adjustment of electron- or ion-optical components
- 49/0404 . . . {Capillaries used for transferring samples or ions (electrospray nozzles [H01J 49/167](#))}
- 49/0409 . . . {Sample holders or containers (containers for retaining a material to be analyzed, [B01L 3/50](#), for DNA, [C12Q 1/6834](#), for biological materials, [G01N 33/543](#))}
- 49/0413 {for automated handling}
- 49/0418 {for laser desorption, e.g. matrix-assisted laser desorption/ionisation [MALDI], surface enhanced laser desorption/ionisation [SELDI] plates}
- 49/0422 . . . {for gaseous samples (interfaces to gas chromatographs [G01N 30/7206](#))}
- 49/0427 {using a membrane permeable to gases}
- 49/0431 . . . {for liquid samples (interfaces to liquid chromatographs [G01N 30/7233](#))}
- 49/0436 {using a membrane permeable to liquids}
- 49/044 {with means for preventing droplets from entering the analyzer; Desolvation of droplets}
- 49/0445 {with means for introducing as a spray, a jet or an aerosol (electrospray ion sources [H01J 49/165](#))}
- 49/045 {with means for using a nebulising gas, i.e. pneumatically assisted}
- 49/0454 {with means for vaporising using mechanical energy, e.g. by ultrasonic vibrations}
- 49/0459 . . . {for solid samples}
- 49/0463 {Desorption by laser or particle beam, followed by ionisation as a separate step (sample holder [per se](#) [H01J 49/0418](#))}
- 49/0468 . . . {with means for heating or cooling the sample}
- 49/0472 {with means for pyrolysis}
- 49/0477 {using a hot fluid}
- 49/0481 {with means for collisional cooling}
- 49/0486 {with means for monitoring the sample temperature}
- 49/049 {with means for applying heat to desorb the sample; Evaporation}
- 49/0495 . . . {Vacuum locks; Valves (valves [per se](#) [F16K](#))}
- 49/06 . . Electron- or ion-optical arrangements
- 49/061 . . . {Ion deflecting means, e.g. ion gates}
- 49/062 . . . {Ion guides (linear ion traps performing mass selection [H01J 49/4225](#), mass filters [H01J 49/421](#))}
- 49/063 {Multipole ion guides, e.g. quadrupoles, hexapoles}
- 49/065 {having stacked electrodes, e.g. ring stack, plate stack}
- 49/066 {Ion funnels}
- 49/067 . . . {Ion lenses, apertures, skimmers}
- 49/068 . . . {Mounting, supporting, spacing, or insulating electrodes}
- 49/08 . . Electron sources, e.g. for generating photo-electrons, secondary electrons or Auger electrons
- 49/10 . . Ion sources; Ion guns
- 49/102 . . . {using reflex discharge, e.g. Penning ion sources}
- 49/105 . . . {using high-frequency excitation, e.g. microwave excitation, Inductively Coupled Plasma [ICP]}
- 49/107 . . . {Arrangements for using several ion sources}
- 49/12 . . . using an arc discharge, e.g. of the duoplasmatron type
- 49/123 {Duoplasmatrons}
- 49/126 {Other arc discharge ion sources using an applied magnetic field}
- 49/14 . . . using particle bombardment, e.g. ionisation chambers
- 49/142 {using a solid target which is not previously vapourised}
- 49/145 {using chemical ionisation}
- 49/147 {with electrons, e.g. electron impact ionisation, electron attachment ([H01J 49/145](#) takes precedence)}
- 49/16 . . . using surface ionisation, e.g. field-, thermionic- or photo-emission
- 49/161 {using photoionisation, e.g. by laser}
- 49/162 {Direct photo-ionisation, e.g. single photon or multi-photon ionisation}
- 49/164 {Laser desorption/ionisation, e.g. matrix-assisted laser desorption/ionisation [MALDI] (sample holders [H01J 49/0418](#))}
- 49/165 {Electrospray ionisation}
- 49/167 {Capillaries and nozzles specially adapted therefor; (electrostatic spraying [per se](#) [B05B 5/00](#))}
- 49/168 {field ionisation, e.g. corona discharge (atmospheric pressure corona discharge [per se](#) [H01T 19/00](#))}
- 49/18 . . . using spark ionisation
- 49/20 . . Magnetic deflection
- 49/22 . . Electrostatic deflection
- 49/24 . . Vacuum systems, e.g. maintaining desired pressures
- 49/26 . Mass spectrometers or separator tubes
- 49/28 . . Static spectrometers
- 49/282 . . . {using electrostatic analysers}
- 49/284 . . . {using electrostatic and magnetic sectors with simple focusing, e.g. with parallel fields such as Aston spectrometer}

- 49/286 {with energy analysis, e.g. Castaing filter (in cathode-ray or electron-beam tubes [H01J 29/84](#); electron-or ion-optical arrangements for separating electrons or ions from an analysing or processing beam [H01J 37/05](#); micro- or spot-analysing tubes [H01J 37/252](#))}
- 49/288 {using crossed electric and magnetic fields perpendicular to the beam, e.g. Wien filter}
- 49/30 . . . using magnetic analysers {, e.g. Dempster spectrometer}
- 49/305 {with several sectors in tandem}
- 49/32 . . . using double focusing
- 49/322 {with a magnetic sector of 90 degrees, e.g. Mattauch-Herzog type}
- 49/324 {with an electrostatic section of 90 degrees, e.g. Nier-Johnson type}
- 49/326 {with magnetic and electrostatic sectors of 90 degrees}
- 49/328 {with a cycloidal trajectory by using crossed electric and magnetic fields, e.g. trochoidal type}
- 49/34 . . Dynamic spectrometers
- 49/36 . . . Radio frequency spectrometers, e.g. Bennett-type spectrometers, Redhead-type spectrometers
- 49/38 Omegatrons {Using ion cyclotron resonance}
- 49/40 . . . Time-of-flight spectrometers ([H01J 49/36 takes precedence](#))
- 49/401 {characterised by orthogonal acceleration, e.g. focusing or selecting the ions, pusher electrode}
- 49/403 {characterised by the acceleration optics and/or the extraction fields}
- 49/405 {characterised by the reflectron, e.g. curved field, electrode shapes}
- 49/406 {with multiple reflections (electrostatic traps [H01J 49/4245](#))}
- 49/408 {with multiple changes of direction, e.g. by using electric or magnetic sectors, closed-loop time-of-flight}
- 49/42 . . . Stability-of-path spectrometers, e.g. monopole, quadrupole, multipole, farvitrons
- 49/4205 {Device types}
- 49/421 {Mass filters, i.e. deviating unwanted ions without trapping}
- 49/4215 {Quadrupole mass filters ([H01J 49/4225 takes precedence](#))}
- 49/422 {Two-dimensional RF ion traps (ion guides without mass selection [H01J 49/062](#))}
- 49/4225 {Multipole linear ion traps, e.g. quadrupoles, hexapoles}
- 49/423 {with radial ejection}
- 49/4235 {Stacked rings or stacked plates}
- 49/424 {Three-dimensional ion traps, i.e. comprising end-cap and ring electrodes}
- 49/4245 {Electrostatic ion traps ([H01J 49/422 takes precedence](#); multi-reflection time of flight spectrometers [H01J 49/406](#))}
- 49/425 {with a logarithmic radial electric potential, e.g. orbitraps}
- 49/4255 {with particular constructional features}
- 49/426 {Methods for controlling ions}
- 49/4265 {Controlling the number of trapped ions, preventing space charge effects}
- 49/427 {Ejection and selection methods}
- 49/4275 {Applying a non-resonant auxiliary oscillating voltage, e.g. parametric excitation}
- 49/428 {Applying a notched broadband signal}
- 49/4285 {Applying a resonant signal, e.g. selective resonant ejection matching the secular frequency of ions ([H01J 49/429](#), [H01J 49/428 take precedence](#))}
- 49/429 {Scanning an electric parameter, e.g. voltage amplitude or frequency}
- 49/4295 {Storage methods}
- 49/44 . . Energy spectrometers, e.g. alpha-, beta-spectrometers
- 49/443 . . {Dynamic spectrometers}
- 49/446 . . . {Time-of-flight spectrometers}
- 49/46 . . Static spectrometers
- 49/463 . . . {using static magnetic fields}
- 49/466 . . . {using crossed electric and magnetic fields perpendicular to the beam, e.g. Wien filter ([see also H01J 49/288](#))}
- 49/48 . . . using electrostatic analysers, e.g. cylindrical sector, Wien filter
- 49/482 {with cylindrical mirrors}
- 49/484 {with spherical mirrors}
- 49/486 {with plane mirrors, i.e. uniform field}
- 49/488 {with retarding grids}

Discharge lamps

- 61/00 Gas-discharge or vapour-discharge lamps (arc lamps with consumable electrodes [H05B](#); electroluminescent lamps [H05B](#))**
- 61/02 . Details
- 61/025 . . {Associated optical elements}
- 61/04 . . Electrodes (for igniting [H01J 61/54](#)); Screens; Shields
- 61/045 . . . {Thermic screens or reflectors (heat-reflecting coatings on the wall of the vessel [H01J 61/35](#))}
- 61/06 . . . Main electrodes
- 61/067 for low-pressure discharge lamps
- 61/0672 {characterised by the construction of the electrode}
- 61/0675 {characterised by the material of the electrode}
- 61/0677 {characterised by the electron emissive material}
- 61/073 for high-pressure discharge lamps
- 61/0732 {characterised by the construction of the electrode}
- 61/0735 {characterised by the material of the electrode}
- 61/0737 {characterised by the electron emissive material}
- 61/09 Hollow cathodes
- 61/10 . . . Shields, screens, or guides for influencing the discharge
- 61/103 {Shields, screens or guides arranged to extend the discharge path ([H01J 61/106 takes precedence](#))}

- 61/106 {using magnetic means}
- 61/12 . . Selection of substances for gas fillings; Specified operating pressure or temperature
- 61/125 {having an halogenide as principal component}
- 61/14 . . . having one or more carbon compounds as the principal constituents
- 61/16 . . . having helium, argon, neon, krypton, or xenon as the principle constituent
- 61/18 . . . having a metallic vapour as the principal constituent
- 61/20 mercury vapour
- 61/22 vapour of an alkali metal
- 61/24 . . Means for obtaining or maintaining the desired pressure within the vessel
- 61/26 . . . Means for absorbing or adsorbing gas, e.g. by gettering; Means for preventing blackening of the envelope
- 61/28 . . . Means for producing, introducing, or replenishing gas or vapour during operation of the lamp
- 61/30 . . Vessels; Containers
- 61/302 {characterised by the material of the vessel}
- 61/305 {Flat vessels or containers}
- 61/307 {with folded elongated discharge path}
- 61/32 . . . Special longitudinal shape, e.g. for advertising purposes {[H01J 61/305 takes precedence](#)}
- 61/322 {Circular lamps}
- 61/325 {U-shaped lamps}
- 61/327 {"Compact"-lamps, i.e. lamps having a folded discharge path}
- 61/33 . . . Special shape of cross-section, e.g. for producing cool spot
- 61/34 . . . Double-wall vessels or containers
- 61/35 . . . provided with coatings on the walls thereof; Selection of materials for the coatings
(using coloured coatings [H01J 61/40](#); using luminescent coatings [H01J 61/42](#))
- 61/36 . . Seals between parts of vessels; Seals for leading-in conductors; Leading-in conductors
- 61/361 {Seals between parts of vessel}
- 61/363 {End-disc seals or plug seals}
- 61/365 {Annular seals disposed between the ends of the vessel ([H01J 61/363 takes precedence](#))}
- 61/366 {Seals for leading-in conductors}
- 61/368 {Pinched seals or analogous seals}
- 61/38 . . Devices for influencing the colour or wavelength of the light
- 61/40 . . . by light filters; by coloured coatings in or on the envelope
- 61/42 . . . by transforming the wavelength of the light by luminescence
- 61/44 Devices characterised by the luminescent material
- 61/46 Devices characterised by the binder or other non-luminescent constituent of the luminescent material, e.g. for obtaining desired pouring or drying properties
- 61/48 Separate coatings of different luminous materials
- 61/50 . . Auxiliary parts or solid material within the envelope for reducing risk of explosion upon breakage of the envelope, e.g. for use in mines
- 61/52 . . Cooling arrangements; Heating arrangements; Means for circulating gas or vapour within the discharge space {[heating or cooling arrangements to promote ionisation for starting H01J 61/54](#)}
- 61/523 {Heating or cooling particular parts of the lamp}
- 61/526 {heating or cooling of electrodes}
- 61/54 . . Igniting arrangements, e.g. promoting ionisation for starting
- 61/541 {using a bimetal switch}
- 61/542 {and an auxiliary electrode inside the vessel}
- 61/544 {and an auxiliary electrode outside the vessel}
- 61/545 {using an auxiliary electrode inside the vessel ([H01J 61/542 takes precedence](#))}
- 61/547 {using an auxiliary electrode outside the vessel ([H01J 61/544 takes precedence](#))}
- 61/548 {using radioactive means to promote ionisation}
- 61/56 . . One or more circuit elements structurally associated with the lamp
- 61/58 . Lamps with both liquid anode and liquid cathode
- 61/60 . Lamps in which the discharge space is substantially filled with mercury before ignition
- 61/62 . Lamps with gaseous cathode, e.g. plasma cathode
- 61/64 . Cathode glow lamps
- 61/66 . . having one or more specially shaped cathodes, e.g. for advertising purposes {[alphanumeric](#)}
- 61/68 . Lamps in which the main discharge is between parts of a current-carrying guide, e.g. halo lamp
- 61/70 . Lamps with low-pressure unconstricted discharge {[having a cold pressure < 400 Torr](#)}
- 61/72 . . having a main light-emitting filling of easily vaporisable metal vapour, e.g. mercury
- 61/74 . . having a main light-emitting filling of difficult vaporisable metal vapour, e.g. sodium
- 61/76 . . having a filling of permanent gas or gases only
- 61/78 . . . with cold cathode; with cathode heated only by discharge, e.g. high-tension lamp for advertising
- 61/80 . . Lamps suitable only for intermittent operation, e.g. flash lamp
- 61/82 . Lamps with high-pressure unconstricted discharge {[having a cold pressure > 400 Torr](#)}
- 61/822 . . . {High-pressure mercury lamps}
- 61/825 . . . {High-pressure sodium lamps}
- 61/827 . . . {Metal halide arc lamps}
- 61/84 . Lamps with discharge constricted by high pressure
- 61/86 . . with discharge additionally constricted by close spacing of electrodes, e.g. for optical projection
- 61/88 . . with discharge additionally constricted by envelope
- 61/90 . . Lamps suitable only for intermittent operation, e.g. flash lamp
- 61/92 . Lamps with more than one main discharge path
- 61/94 . . Paths producing light of different wavelengths, e.g. for simulating daylight
- 61/95 . Lamps with control electrode for varying intensity or wavelength of the light, e.g. for producing modulated light
- 61/96 . Lamps with light-emitting discharge path and separately-heated incandescent body within a common envelope, e.g. for simulating daylight

61/98	. Lamps with closely spaced electrodes heated to incandescence by light-emitting discharge, e.g. tungsten arc lamp	2201/2867	. . . . Spiral or helix
63/00	Cathode-ray or electron-stream lamps	2201/2871	. . . . being flattened
63/02	. Details, e.g. electrode, gas filling, shape of vessel	2201/2875	. . . . being double, reverse helix or interwoven
63/04	. . Vessels provided with luminescent coatings; Selection of materials for the coatings	2201/2878	. . . Thin film or film-like
63/06	. Lamps with luminescent screen excited by the ray or stream	2201/2882	. . . Variable winding density
63/08	. Lamps with gas plasma excited by the ray or stream	2201/2885	. . . Twisted
65/00	Lamps without any electrode inside the vessel; Lamps with at least one main electrode outside the vessel	2201/2889	. . Characterised by material
65/04	. Lamps in which a gas filling is excited to luminesce by an external electromagnetic field or by external corpuscular radiation, e.g. for indicating { plasma display panels }	2201/2892	. . Coatings
65/042	. . { by an external electromagnetic field }	2201/2896	. . . Insulating layers
65/044	. . . { the field being produced by a separate microwave unit }	2201/30	. Cold cathodes
65/046	. . . { the field being produced by using capacitive means around the vessel }	2201/304	. . Field emission cathodes
65/048	. . . { the field being produced by using an excitation coil }	2201/30403	. . . characterised by the emitter shape
65/06	. Lamps in which a gas filling is excited to luminesce by radioactive material structurally associated with the lamp, e.g. inside the vessel	2201/30407	. . . . Microengineered point emitters
65/08	. Lamps in which a screen or coating is excited to luminesce by radioactive material located inside the vessel {(direct conversion of radiation energy from radioactive sources into light G21H 3/02)}	2201/30411	. . . . . conical shaped, e.g. Spindt type
99/00	Subject matter not provided for in other groups of this subclass	2201/30415	. . . . . needle shaped
		2201/30419	. . . . . Pillar shaped emitters
		2201/30423	. . . . . Microengineered edge emitters
		2201/30426	. . . . . Coatings on the emitter surface, e.g. with low work function materials
		2201/3043	. . . . . Fibres
		2201/30434	. . . . . Nanotubes
		2201/30438	. . . . . Particles
		2201/30442	. . . . . Whiskers
		2201/30446	. . . characterised by the emitter material
		2201/30449	. . . . . Metals and metal alloys
		2201/30453	. . . . . Carbon types
		2201/30457	. . . . . Diamond
		2201/30461	. . . . . Graphite
		2201/30465	. . . . . Fullerenes
		2201/30469	. . . . . Carbon nanotubes (CNTs)
		2201/30473	. . . . . Amorphous carbon
		2201/30476	. . . . . Diamond-like carbon [DLC]
		2201/3048	. . . . . Semiconductor materials
		2201/30484	. . . . . Carbides
		2201/30488	. . . . . Nitrides
		2201/30492	. . . . . Borides
		2201/30496	. . . . . Oxides
		2201/306	. . Ferroelectric cathodes
		2201/308	. . Semiconductor cathodes, e.g. having PN junction layers
		2201/312	. . having an electric field perpendicular to the surface thereof
		2201/3125	. . . Metal-insulator-Metal [MIM] emission type cathodes
		2201/316	. . having an electric field parallel to the surface thereof, e.g. thin film cathodes
		2201/3165	. . . Surface conduction emission type cathodes
		2201/317	. . combined with other synergetic effects, e.g. secondary, photo- or thermal emission
		2201/319	. . Circuit elements associated with the emitters by direct integration
		2201/3195	. . . Resistive members, e.g. resistive layers
		2201/32	. Secondary emission electrodes
		2201/34	. Photoemissive electrodes
		2201/342	. . Cathodes
		2201/3421	. . . Composition of the emitting surface
		2201/3423	. . . . Semiconductors, e.g. GaAs, NEA emitters
		2201/3425	. . . . Metals, metal alloys
		2201/3426	. . . . Alkaline metal compounds, e.g. Na-K-Sb
		2201/3428	. . . . Organo-metallic compounds, e.g. Ferrocene
2201/00	Electrodes common to discharge tubes		
2201/02	. Arrangements for eliminating deleterious effects		
2201/025	. . charging		
2201/19	. Thermionic cathodes		
2201/193	. . Thin film cathodes		
2201/196	. . Emission assisted by other physical processes, e.g. field- or photo emission		
2201/28	. Heaters for thermionic cathodes		
2201/2803	. . Characterised by the shape or size		
2201/2807	. . . Block		
2201/281	. . . Cage-like construction		
2201/2814	. . . . being a mesh-like network		
2201/2817	. . . Rods		
2201/2821	. . . Envelope or cross-section		
2201/2825	. . . . being oval or elliptic		
2201/2828	. . . . being rectangular or square		
2201/2832	. . . . being circular		
2201/2835	. . . Folded		
2201/2839	. . . . Hair-pin or simple bend		
2201/2842	. . . Conic		
2201/2846	. . . Loop		
2201/285	. . . Plurality of elements		
2201/2853	. . . Serpentine		
2201/2857	. . . . being coiled		
2201/286	. . . . being looped		
2201/2864	. . . Ribbon or bar		

2203/00	Electron or ion optical arrangements common to discharge tubes or lamps	2209/268	. . . treated surfaces and surface preparations, e.g. to improve adhesion
2203/02	. Electron guns	2209/38	. Control of maintenance of pressure in the vessel
2203/0204	. . using cold cathodes, e.g. field emission cathodes	2209/383	. . Vacuum pumps
2203/0208	. . . Control electrodes	2209/385	. . Gettering
2203/0212	. . . . Gate electrodes	2209/3855	. . . Getter materials
2203/0216	. . . . characterised by the form or structure	2209/387	. . Gas filling
2203/022	. . . . . Shapes or dimensions of gate openings	2209/389	. . Degassing
2203/0224	. . . . . Arrangement of gate openings	2209/3893	. . . by a discharge
2203/0228	. . . . . Curved/extending upwardly	2209/3896	. . . by heating
2203/0232	. . . . . characterised by the material	2209/46	. Handling of tube components during manufacture
2203/0236	. . . . . Relative position to the emitters, cathodes or substrates	2209/463	. . Identifying or selecting component pieces
2203/024	. . . . Focusing electrodes	2209/466	. . . Marking, e.g. bar-codes
2203/0244	. . . . . characterised by the form or structure	2211/00	Plasma display panels with alternate current induction of the discharge, e.g. AC-PDPs
2203/0248	. . . . . Shapes or dimensions of focusing electrode openings		(plasma display panels making use of direct current H01J 2217/00)
2203/0252	. . . . . Arrangement of focusing electrode openings	2211/10	. AC-PDPs with at least one main electrode being out of contact with the plasma
2203/0256	. . . . . characterised by the material	2211/12	. . with main electrodes provided on both sides of the discharge space
2203/026	. . . . . Relative position to the gateelectrodes, emitters, cathodes or substrates	2211/14	. . with main electrodes provided only on one side of the discharge space
2203/0264	. . . . . In the same plane as the gate electrodes or cathodes	2211/16	. . with main electrodes provided inside or on the side face of the spacers
2203/0268	. . . Insulation layer	2211/18	. . containing a plurality of independent closed structures for containing the gas, e.g. plasma tube array [PTA] display panels
2203/0272	. . . . for gate electrodes	2211/20	. Constructional details
2203/0276	. . . . for focusing electrodes	2211/22	. . Electrodes
2203/028	. . . . characterised by the shape	2211/225	. . . Material of electrodes
2203/0284	. . . . . Dimensions of openings	2211/24	. . . Sustain electrodes or scan electrodes
2203/0288	. . . . . characterised by the material	2211/245	. . . . Shape, e.g. cross section or pattern
2203/0292	. . . Potentials applied to the electrodes	2211/26	. . . Address electrodes
2203/0296	. . Spin-polarised beams	2211/265	. . . . Shape, e.g. cross section or pattern
2203/04	. Ion guns	2211/28	. . . Auxiliary electrodes, e.g. priming electrodes or trigger electrodes
2209/00	Apparatus and processes for manufacture of discharge tubes	2211/30	. . . Floating electrodes
2209/01	. Generalised techniques	2211/32	. . . Disposition of the electrodes
2209/012	. . Coating	2211/323	. . . . Mutual disposition of electrodes
2209/015	. . . Machines therefor	2211/326	. . . . Disposition of electrodes with respect to cell parameters (H01J 2211/323 takes precedence), e.g. electrodes within the ribs
2209/017	. . Cleaning	2211/34	. . Vessels, containers or parts thereof, e.g. substrates
2209/02	. Manufacture of cathodes	2211/36	. . . Spacers, barriers, ribs, partitions or the like
2209/022	. . Cold cathodes	2211/361	. . . . characterized by the shape
2209/0223	. . . Field emission cathodes	2211/363	. . . . . Cross section of the spacers
2209/0226	. . . . Sharpening or reshaping of emitting point or edge	2211/365	. . . . . Pattern of the spacers
2209/18	. Assembling together the component parts of the discharge tube	2211/366	. . . . . characterized by the material
2209/185	. . Machines therefor, e.g. electron gun assembling devices	2211/368	. . . . Dummy spacers, e.g. in a non display region
2209/236	. Manufacture of magnetic deflecting devices	2211/38	. . . Dielectric or insulating layers
2209/2363	. . Coils	2211/40	. . . Layers for protecting or enhancing the electron emission, e.g. MgO layers
2209/2366	. . . Machines therefor, e.g. winding, forming, welding, or the like	2211/42	. . . Fluorescent layers
2209/26	. Sealing parts of the vessel to provide a vacuum enclosure	2211/44	. . . Optical arrangements or shielding arrangements, e.g. filters or lenses
2209/261	. . Apparatus used for sealing vessels, e.g. furnaces, machines or the like	2211/442	. . . . Light reflecting means; Anti-reflection means
2209/262	. . . means for applying sealing materials, e.g. frit paste dispensers	2211/444	. . . . Means for improving contrast or colour purity, e.g. black matrix or light shielding means
2209/264	. . Materials for sealing vessels, e.g. frit glass compounds, resins or structures		
2209/265	. . Surfaces for sealing vessels		
2209/267	. . . shaped surfaces or flanges		

- 2211/446 Electromagnetic shielding means; Antistatic means
- 2211/448 Near infrared shielding means
- 2211/46 . . Connecting or feeding means, e.g. leading-in conductors
- 2211/48 . . Sealing, e.g. seals specially adapted for leading-in conductors
- 2211/50 . . Filling, e.g. selection of gas mixture
- 2211/52 . . Means for absorbing or adsorbing the gas mixture, e.g. by gettering
- 2211/54 . . Means for exhausting the gas
- 2211/62 . . Circuit arrangements ([circuits or methods for driving PDP's G09G 3/28](#))
- 2211/66 . . Cooling arrangements ([cooling or supporting means not being part of the tube H05K](#))
- 2217/00 Gas-filled discharge tubes ([H01J 2211/00](#) takes precedence)**
 - 2217/04 . . Electrodes ([for display panels not making use of alternating current H01J 2217/492](#); [for discharge tubes in general H01J 2201/00](#))
 - 2217/06 . . Cathodes
 - 2217/062 . . . thermionic
 - 2217/065 . . . heated by the discharge
 - 2217/067 . . . Cold cathodes
 - 2217/10 . . Anodes
 - 2217/12 . . Control electrodes
 - 2217/38 . . Cold-cathode tubes
 - 2217/40 . . Gas discharge switches
 - 2217/402 . . . Multiple switches
 - 2217/4025 for addressing electro-optical devices, i.e. LCD's
 - 2217/49 . . Display panels, e.g. not making use of alternating current ([H01J 2211/10](#) takes precedence)
 - 2217/491 . . . characterised by problems peculiar to plasma displays
 - 2217/4915 Luminosity
 - 2217/492 . . . Details
 - 2217/49207 Electrodes
 - 2217/49214 Shape
 - 2217/49221 Mutual disposition
 - 2217/49228 Crossed electrodes
 - 2217/49235 Side-by-side electrodes
 - 2217/49242 Auxiliary electrodes
 - 2217/4925 Mounting, supporting, spacing
 - 2217/49257 Means for isolating electrodes from the discharge, e.g. dielectric layers
 - 2217/49264 Vessels
 - 2217/49271 Spacers between front and back panels
 - 2217/49278 Coatings ([H01J 2217/49292](#) takes precedence)
 - 2217/49285 Associated optical means ([combined with electromagnetic screens H01J 2217/49292](#))
 - 2217/49292 Filters
 - 2217/494 . . . A.C. panels
 - 2217/498 . . . Hybrid panels (AC and DC)
 - 2223/00 Details of transit-time tubes of the types covered by group [H01J 2225/00](#)**
 - 2223/005 . . Cooling methods or arrangements
 - 2223/02 . . Electrodes; Magnetic control means; Screens
 - 2223/027 . . Collectors
 - 2223/0275 . . . Multistage collectors
 - 2223/033 . . . Collector cooling devices
 - 2223/04 . . Cathodes
 - 2223/05 . . . having a cylindrical emissive surface, e.g. cathodes for magnetrons
 - 2223/06 . . Electron or ion guns
 - 2223/065 . . . producing a solid cylindrical beam
 - 2223/07 . . . producing a hollow cylindrical beam
 - 2223/075 . . . Magnetron injection guns
 - 2223/08 . . Focusing arrangements, e.g. for concentrating stream of electrons, for preventing spreading of stream
 - 2223/083 . . . Electrostatic focusing arrangements
 - 2223/087 . . . Magnetic focusing arrangements
 - 2223/0873 with at least one axial- field reversal along the interaction space, e.g. P.P.M. focusing
 - 2223/0876 with arrangements improving the linearity and homogeneity of the axial field, e.g. field straightener
 - 2223/09 . . Electric system for directing or deflecting the discharge along a desired path, e.g. E-type
 - 2223/10 . . Magnet systems for directing or deflecting the discharge along a desired path, e.g. a spiral path
 - 2223/11 . . Means for reducing noise
 - 2223/12 . . Vessels; Containers
 - 2223/14 . . Leading-in arrangements; Seals therefor
 - 2223/15 . . Means for preventing wave energy leakage structurally associated with tube leading-in arrangements, e.g. filters, chokes, attenuating devices
 - 2223/16 . . Circuit elements, having distributed capacitance and inductance, structurally associated with the tube and interacting with the discharge
 - 2223/165 . . . Manufacturing processes or apparatus therefore
 - 2223/18 . . Resonators
 - 2223/20 . . . Cavity resonators; Adjustment or tuning thereof
 - 2223/207 Tuning of single resonator
 - 2223/213 Simultaneous tuning of more than one resonator, e.g. resonant cavities of a magnetron
 - 2223/22 . . . Connections between resonators, e.g. strapping for connecting resonators of a magnetron
 - 2223/24 . . Slow-wave structures, e.g. delay systems
 - 2223/26 . . . Helical slow-wave structures; Adjustment therefor
 - 2223/27 Helix-derived slow-wave structures
 - 2223/28 Interdigital slow-wave structures; Adjustment therefor
 - 2223/30 . . . Damping arrangements associated with slow-wave structures, e.g. for suppression of unwanted oscillations
 - 2223/34 . . Circuit arrangements not adapted to a particular application of the tube and not otherwise provided for
 - 2223/36 . . Coupling devices having distributed capacitance and inductance, structurally associated with the tube, for introducing or removing wave energy
 - 2223/38 . . . to or from the discharge
 - 2223/40 . . . to or from the interaction circuit
 - 2223/42 . . . the interaction circuit being a helix or a helix-derived slow- wave structure
 - 2223/44 . . . Rod-type coupling devices
 - 2223/46 . . . Loop coupling devices
 - 2223/48 . . . for linking interaction circuit with coaxial lines; Devices of the coupled helices type

- 2223/50 . . . the interaction circuit being a helix or derived from a helix
- 2223/52 . . . the coupled helices being disposed coaxially around one another
- 2223/54 . . Filtering devices preventing unwanted frequencies or modes to be coupled to, or out of, the interaction circuit; Prevention of high frequency leakage in the environment
- 2225/00 Transit-time tubes, e.g. Klystrons, travelling-wave tubes, magnetrons**
- 2225/005 . Gas-filled transit-time tubes
- 2225/02 . Tubes with electron stream modulated in velocity or density in a modulator zone and thereafter giving up energy in an inducing zone, the zones being associated with one or more resonators
- 2225/025 . . with an electron stream following a helical path
- 2225/04 . . Tubes having one or more resonators, without reflection of the electron stream, and in which the modulation produced in the modulator zone is mainly density modulation, e.g. Heaff tube
- 2225/06 . . Tubes having only one resonator, without reflection of the electron stream, and in which the modulation produced in the modulator zone is mainly velocity modulation, e.g. Lüdi-Klystron
- 2225/08 . . . with electron stream perpendicular to the axis of the resonator
- 2225/10 . . Klystrons, i.e. tubes having two or more resonators, without reflection of the electron stream, and in which the stream is modulated mainly by velocity in the zone of the input resonator
- 2225/11 . . . Extended interaction Klystrons
- 2225/12 . . . with pencil-like electron stream in the axis of the resonators
- 2225/14 . . . with tube-like electron stream coaxial with the axis of the resonators
- 2225/16 . . . with pencil-like electron stream perpendicular to the axis of the resonators
- 2225/18 . . . with radial or disc-like electron stream perpendicular to the axis of the resonators
- 2225/20 . . . having special arrangements in the space between resonators, e.g. resistive-wall amplifier tube, space-charge amplifier tube, velocity-jump tube
- 2225/22 . . Reflex Klystrons, i.e. tubes having one or more resonators, with a single reflection of the electron stream, and in which the stream is modulated mainly by velocity in the modulator zone
- 2225/24 . . . in which the electron stream is in the axis of the resonator or resonators and is pencil-like before reflection
- 2225/26 . . . in which the electron stream is coaxial with the axis of the resonator or resonators and is tube-like before reflection
- 2225/28 . . . in which the electron stream is perpendicular to the axis of the resonator or resonators and is pencil-like before reflection
- 2225/30 . . . in which the electron stream is perpendicular to the axis of the resonator or resonators and is radial or disc-like before reflection
- 2225/32 . . Tubes with plural reflection, e.g. Coeterier tube
- 2225/34 . Travelling-wave tubes; Tubes in which a travelling wave is simulated at spaced gaps
- 2225/36 . . Tubes in which an electron stream interacts with a wave travelling along a delay line or equivalent sequence of impedance elements, and without magnet system producing an H-field crossing the E-field
- 2225/38 . . . the forward travelling wave being utilised
- 2225/40 . . . the backward travelling wave being utilised
- 2225/42 . . Tubes in which an electron stream interacts with a wave travelling along a delay line or equivalent sequence of impedance elements, and with a magnet system producing an H-field crossing the E-field
- 2225/44 . . . the forward travelling wave being utilised
- 2225/46 . . . the backward travelling wave being utilised
- 2225/48 . . Tubes in which two electron streams of different velocities interact with one another, e.g. electron-wave tube
- 2225/49 . . Tubes using the parametric principle, e.g. for parametric amplification
- 2225/50 . Magnetrons, i.e. tubes with a magnet system producing an H-field crossing the E-field
- 2225/52 . . with an electron space having a shape that does not prevent any electron from moving completely around the cathode or guide electrode
- 2225/54 . . . having only one cavity or other resonator, e.g. neutrode tube
- 2225/55 Coaxial cavity magnetrons
- 2225/56 with interdigital arrangements of anodes, e.g. turbator tube
- 2225/58 . . . having a number of resonators; having a composite resonator, e.g. a helix
- 2225/587 Multi-cavity magnetrons
- 2225/593 Rising-sun magnetrons
- 2225/60 . . with an electron space having a shape that prevents any electron from moving completely around the cathode or guide electrode; Linear magnetrons
- 2225/61 . Hybrid tubes, i.e. tubes comprising a klystron section and a travelling-wave section
- 2225/62 . Strophotrons, i.e. tubes with H-field crossing the E-field and functioning with plural reflection
- 2225/64 . Turbine tubes, i.e. tubes with H-field crossing the E-field and functioning with reversed cyclotron action
- 2225/66 . Tubes with electron stream crossing itself and thereby interacting or interfering with itself
- 2225/68 . Tubes specially designed to act as oscillator with positive grid and retarding field, e.g. for Barkhausen-Kurz oscillators
- 2225/70 . . with resonator having distributed inductance with capacitance, e.g. Pintsch tube
- 2225/72 . . in which a standing wave or a considerable part thereof is produced along an electrode, e.g. Clavier tube
- 2225/74 . Tubes specially designed to act as transit-time diode oscillators, e.g. monotron
- 2225/76 . Dynamic electron-multiplier tubes, e.g. Farnsworth multiplier tube, multipactor
- 2225/78 . Tubes with electron stream modulated by deflection in a resonator
- 2229/00 Details of cathode ray tubes or electron beam tubes (H01J 2329/00 takes precedence)**
- 2229/0007 . Elimination of unwanted or stray electromagnetic effects

2229/0015	. . Preventing or cancelling fields leaving the enclosure	2229/4865	. . . . . rectangle
2229/0023	. . . Passive means	2229/4868	. . . . . with rounded end or ends
2229/003	. . Preventing or cancelling fields entering the enclosure	2229/4872	. . . . . circular
2229/0038	. . . Active means	2229/4875	. . . . . oval
2229/0046	. . Preventing or cancelling fields within the enclosure	2229/4879	. . . . . non-symmetric about field scanning axis
2229/0053	. . . Demagnetisation	2229/4882	. . . . . non-symmetric about line scanning axis
2229/0061	. Cooling arrangements	2229/4886	. . . . . polygonal
2229/0069	. . Active means, e.g. fluid flow	2229/4889	. . . . . cross shaped
2229/0076	. . . applied to the faceplate	2229/4893	. . . . . Interconnected apertures
2229/0084	. . . . Translucent coolant, e.g. flowing across faceplate	2229/4896	. . . . . complex and not provided for
2229/0092	. . Passive means, e.g. fins, heat conductors	2229/50	. . Plurality of guns or beams
2229/07	. Shadow masks	2229/502	. . . Three beam guns, e.g. for colour CRTs
2229/0705	. . Mounting arrangement of assembly to vessel	2229/505	. . . Arrays
2229/0711	. . . Spring and plate (clip) type	2229/507	. . . Multi-beam groups, e.g. number of beams greater than number of cathodes
2229/0716	. . Mounting arrangements of aperture plate to frame or vessel	2229/56	. Correction of beam optics
2229/0722	. . Frame	2229/563	. . Aberrations by type
2229/0727	. . Aperture plate	2229/5632	. . . Spherical
2229/0733	. . . characterised by the material	2229/5635	. . . Astigmatism
2229/0738	. . . Mitigating undesirable mechanical effects	2229/5637	. . . Colour purity
2229/0744	. . . . Vibrations	2229/568	. . using supplementary correction devices
2229/075	. . . Beam passing apertures, e.g. geometrical arrangements	2229/5681	. . . magnetic
2229/0755	. . . . characterised by aperture shape	2229/5682	. . . . Permanently magnetised materials, e.g. permanent magnets
2229/0761	. . . . . Uniaxial masks having parallel slit apertures, i.e. Trinitron type	2229/5684	. . . . . Magnetic materials, e.g. soft iron
2229/0766	. . . Details of skirt or border	2229/5685	. . . . . Cross-arms field shaper
2229/0772	. . . . Apertures, cut-outs, depressions, or the like	2229/5687	. . . . . Auxiliary coils
2229/0777	. . . Coatings	2229/5688	. . . . . Velocity modulation
2229/0783	. . . . improving thermal radiation properties	2229/58	. Electron beam control inside the vessel
2229/0788	. . . Parameterised dimensions of aperture plate, e.g. relationships, polynomial expressions	2229/581	. . by magnetic means
2229/0794	. . Geometrical arrangements, e.g. curvature	2229/582	. . by electrostatic means
2229/18	. Phosphor screens	2229/583	. . at the source
2229/183	. . multi-layer	2229/5835	. . . cooperating with the electron gun
2229/186	. . Geometrical arrangement of phosphors	2229/585	. . at the screen
2229/48	. Electron guns	2229/587	. . between the source and the screen
2229/4803	. . Electrodes	2229/70	. Electron beam control outside the vessel
2229/4806	. . . Shield centering cups	2229/703	. . by magnetic fields
2229/481	. . . Focusing electrodes	2229/7031	. . . Cores for field producing elements, e.g. ferrite
2229/4813	. . . . Pre-focusing	2229/7032	. . . Conductor design and distribution
2229/4817	. . . Accelerating electrodes	2229/7033	. . . . Winding
2229/482	. . . Extraction grids	2229/7035	. . . . Wires and conductors
2229/4824	. . Constructional arrangements of electrodes	2229/7036	. . . . . Form of conductor
2229/4827	. . . Electrodes formed on surface of common cylindrical support	2229/7037	. . . . . flat, e.g. foil, or ribbon type
2229/4831	. . . Electrode supports	2229/7038	. . . Coil separators and formers
2229/4834	. . Electrical arrangements coupled to electrodes, e.g. potentials	2229/86	. Vessels and containers
2229/4837	. . . characterised by the potentials applied	2229/8603	. . Neck or cone portions of the CRT vessel
2229/4841	. . . . Dynamic potentials	2229/8606	. . . characterised by the shape
2229/4844	. . characterised by beam passing apertures or combinations	2229/8609	. . . . Non circular cross-sections
2229/4848	. . . Aperture shape as viewed along beam axis	2229/8613	. . Faceplates
2229/4851	. . . . trapezoidal	2229/8616	. . . characterised by shape
2229/4855	. . . . . with rounded end or ends	2229/862	. . . . Parameterised shape, e.g. expression, relationship or equation
2229/4858	. . . . parallelogram	2229/8623	. . Substrates
2229/4862	. . . . . square	2229/8626	. . Frames
		2229/863	. Passive shielding means associated with the vessel
		2229/8631	. . Coatings
		2229/8632	. . . characterised by the material
		2229/8633	. . Meshes and patterns
		2229/8634	. . Magnetic shielding
		2229/8635	. . Antistatic shielding
		2229/8636	. . Electromagnetic shielding

2229/8637	. . Mechanical shielding, e.g. against water or abrasion	2231/50	. Imaging and conversion tubes
2229/8638	. . Ionising radiation shielding, e.g. X-rays	2231/50005	. . characterised by form of illumination
2229/87	. Means for avoiding vessel implosion	2231/5001	. . . Photons
2229/875	. . Means substantially covering the output face, e.g. resin layers, protective panels	2231/50015	. . . . Light
2229/88	. Coatings	2231/50021	. . . . . Ultra-violet
2229/882	. . having particular electrical resistive or conductive properties	2231/50026	. . . . . Infra-red
2229/885	. . having particular electrical insulation properties	2231/50031	. . . . . High energy photons
2229/887	. . having particular X-ray shielding properties	2231/50036	. . . . . X-rays
2229/89	. Optical components associated with the vessel	2231/50042	. . . . Particles
2229/8901	. . Fixing of optical components to the vessel	2231/50047	. . . . . Charged particles
2229/8903	. . Fibre optic components	2231/50052	. . . . Mechanical vibrations, e.g. sound
2229/8905	. . Direction sensitive devices for controlled viewing angle	2231/50057	. . characterised by form of output stage
2229/8907	. . Image projection devices	2231/50063	. . . . Optical
2229/8909	. . Baffles, shutters, apertures or the like against external light	2231/50068	. . . . Electrical
2229/8911	. . . Large-scale devices, e.g. foldable screens	2231/50073	. . . . . Charge coupled device [CCD]
2229/8913	. . Anti-reflection, anti-glare, viewing angle and contrast improving treatments or devices	2231/50078	. . . . . Resistive anode
2229/8915	. . . Surface treatment of vessel or device, e.g. controlled surface roughness	2231/50084	. . . . . using light or electron beam scanning
2229/8916	. . . inside the vessel	2231/50089	. . . . Having optical stage before electrical conversion
2229/8918	. . . by using interference effects	2231/50094	. . . . . Charge coupled device [CCD]
2229/892	. . . Effect varying over surface	2231/501	. . including multiplication stage
2229/8922	. . . Apparatus attached to vessel and not integral therewith	2231/5013	. . . with secondary emission electrodes
2229/8924	. . having particular properties for protecting the vessel, e.g. against abrasion, water or shock	2231/5016	. . . . Microchannel plates [MCP]
2229/8926	. . Active components, e.g. LCD's, indicators, illuminators and moving devices	2231/503	. . with scanning or gating optics
2229/8928	. . Laser CRTs	2231/5033	. . . electrostatic
2229/893	. . using lenses	2231/5036	. . . magnetic
2229/899	. . Photographic devices (permanent recording of images)	2231/505	. . with non-scanning optics
2229/92	. Means providing or assisting electrical connection with or within the tube	2231/5053	. . . electrostatic
2229/922	. . within the tube	2231/5056	. . . magnetic
2229/925	. . associated with the high tension [HT], e.g. anode potentials	2235/00	X-ray tubes
2229/927	. . associated with digital scanning	2235/02	. Electrical arrangements
2229/94	. Means for obtaining or maintaining the desired pressure within the tube	2235/023	. . Connecting of signals or tensions to or through the vessel
2229/96	. Circuit elements other than coils, reactors or the like, associated with the tube	2235/0233	. . . High tension
2229/962	. . associated with the HT	2235/0236	. . . Indirect coupling, e.g. capacitive or inductive
2229/964	. . associated with the deflection system	2235/06	. Cathode assembly
2229/966	. . associated with the gun structure	2235/062	. . Cold cathodes
2229/968	. . . Resistors	2235/064	. . Movement of cathode
2231/00	Cathode ray tubes or electron beam tubes (H01J 2329/00 takes precedence)	2235/066	. . . Rotation
2231/12	. CRTs having luminescent screens	2235/068	. . Multi-cathode assembly
2231/121	. . Means for indicating the position of the beam, e.g. beam indexing	2235/08	. Targets (anodes) and X-ray converters
2231/123	. . . by direct current detection, e.g. collecting electrodes	2235/081	. . Target material
2231/125	. . with a plurality of electron guns within the tube envelope	2235/082	. . . Fluids, e.g. liquids, gases
2231/1255	. . . two or more neck portions containing one or more guns	2235/083	. . Bonding or fixing with the support or substrate
		2235/084	. . . Target-substrate interlayers or structures, e.g. to control or prevent diffusion or improve adhesion
		2235/085	. . Target treatment, e.g. ageing, heating
		2235/086	. . Target geometry
		2235/088	. . Laminated targets, e.g. plurality of emitting layers of unique or differing materials
		2235/10	. Drive means for anode (target) substrate
		2235/1006	. . Supports or shafts for target or substrate
		2235/1013	. . . Fixing to the target or substrate
		2235/102	. . . Materials for the shaft
		2235/1026	. . Means (motors) for driving the target (anode)
		2235/1033	. . . mounted within the vacuum vessel
		2235/104	. . . characterised by the shape
		2235/1046	. . Bearings and bearing contact surfaces
		2235/1053	. . . Retainers or races

2235/106	. . . Dynamic pressure bearings, e.g. helical groove type	details common to gas or plasma discharge of the above mentioned tubes: H01J 2237/00 - H01J 2237/2487
2235/1066	. . . Treated contact surfaces, e.g. coatings	Imaging or analysing: H01J 2237/25 - H01J 2237/2857
2235/1073	. . . Magnetic bearings	particle beam processing: H01J 2237/30 - H01J 2237/31798
2235/108	. . Lubricants	plasma processing: H01J 2237/32 - H01J 2237/339
2235/1086	. . . liquid metals	
2235/1093	. . Measures for preventing vibration	
2235/12	. Cooling	
2235/1204	. . of the anode	
2235/1208	. . of the bearing assembly	
2235/1212	. . of the cathode	
2235/1216	. . of the vessel	
2235/122	. . of the window	
2235/1225	. . characterised by method	
2235/1229	. . . employing layers with high emissivity	
2235/1233	. . . . characterised by the material	
2235/1237	. . . . . Oxides	
2235/1241	. . . . Bonding layer to substrate	
2235/1245	. . . Increasing emissive surface area	
2235/125	. . . . with interdigitated fins or slots	
2235/1254	. . . . with microscopic surface features	
2235/1258	. . . Placing objects in close proximity	
2235/1262	. . . Circulating fluids	
2235/1266	. . . . flow being via moving conduit or shaft	
2235/127	. . . . Control of flow	
2235/1275	. . . . characterised by the fluid	
2235/1279	. . . . . Liquid metals	
2235/1283	. . . . in conjunction with extended surfaces (e.g. fins or ridges)	
2235/1287	. . . . Heat pipes	
2235/1291	. . . Thermal conductivity	
2235/1295	. . . . Contact between conducting bodies	
2235/16	. Vessels	
2235/161	. . Non-stationary vessels	
2235/162	. . . Rotation	
2235/163	. . shaped for a particular application	
2235/164	. . . Small cross-section, e.g. for entering in a body cavity	
2235/165	. . Shielding arrangements	
2235/166	. . . against electromagnetic radiation	
2235/167	. . . against thermal (heat) energy	
2235/168	. . . against charged particles	
2235/18	. Windows, e.g. for X-ray transmission	
2235/183	. . Multi-layer structures	
2235/20	. Arrangements for controlling gases within the X-ray tube	
2235/205	. . Gettering	
2237/00	Discharge tubes exposing object to beam, e.g. for analysis treatment, etching, imaging	
	NOTES	
	1. For features of general interest which may be found in other types of discharge tubes, an indexing code corresponding to general schemes H01J 2201/00 - H01J 2203/00 is given, e.g. for cathodes, vessels, cooling means or the like	
	2. Same rules apply for manufacturing procedures (H01J 2209/00), unless really specific to the tube concerned.	
	3. The codes in this main group are grouped according to the following principle:	
2237/002	. Cooling arrangements (of objects being observed or treated H01J 2237/2001)	
2237/004	. Charge control of objects or beams	
2237/0041	. . Neutralising arrangements	
2237/0042	. . . Deflection of neutralising particles	
2237/0044	. . . of objects being observed or treated	
2237/0045	. . . . using secondary electrons	
2237/0047	. . . . using electromagnetic radiations, e.g. UV, X-rays, light	
2237/0048	. . Charging arrangements	
2237/006	. Details of gas supplies, e.g. in an ion source, to a beam line, to a specimen or to a workpiece, (H01J 37/3244 takes precedence; environmental cells for electron microscopes H01J 2237/2003 ; microscopes with environmental specimen chamber H01J 2237/2608)	
2237/02	. Details	
2237/0203	. . Protection arrangements	
2237/0206	. . . Extinguishing, preventing or controlling unwanted discharges	
2237/0209	. . . Avoiding or diminishing effects of eddy currents	
2237/0213	. . . Avoiding deleterious effects due to interactions between particles and tube elements	
2237/0216	. . Means for avoiding or correcting vibration effects	
2237/022	. . Avoiding or removing foreign or contaminating particles, debris or deposits on sample or tube	
2237/0225	. . . Detecting or monitoring foreign particles	
2237/024	. . Moving components not otherwise provided for (diaphragms H01J 2237/0458 ; objects H01J 2237/202)	
2237/0245	. . . Moving whole optical system relatively to object	
2237/026	. . Shields	
2237/0262	. . . electrostatic	
2237/0264	. . . magnetic	
2237/0266	. . . electromagnetic	
2237/0268	. . . Liner tubes	
2237/028	. . Particle traps	
2237/03	. Mounting, supporting, spacing or insulating electrodes	
2237/032	. . Mounting or supporting	
2237/036	. . Spacing	
2237/038	. . Insulating	
2237/04	. Means for controlling the discharge	
2237/041	. . Beam polarising means	
2237/043	. . Beam blanking	
2237/0432	. . . High speed and short duration	
2237/0435	. . . Multi-aperture	
2237/0437	. . . . Semiconductor substrate	
2237/045	. . Diaphragms	
2237/0451	. . . with fixed aperture	
2237/0453	. . . . multiple apertures	
2237/0455	. . . with variable aperture	

2237/0456	. . . Supports	2237/121	. . . characterised by shape
2237/0458	. . . . movable, i.e. for changing between differently sized apertures	2237/1215	. . . . Annular electrodes
2237/047	. . Changing particle velocity	2237/14	. . magnetic
2237/0473	. . . accelerating	2237/1405	. . . Constructional details
2237/04732	. . . . with magnetic means	2237/141	. . . . Coils (superconducting H01J 2237/142)
2237/04735	. . . . with electrostatic means	2237/1415	. . . . Bores or yokes, i.e. magnetic circuit in general
2237/04737	. . . . . radio-frequency quadrupole [RFQ]	2237/142	. . . with superconducting coils
2237/0475	. . . decelerating	2237/15	. Means for deflecting or directing discharge
2237/04753	. . . . with magnetic means	2237/1501	. . Beam alignment means or procedures
2237/04756	. . . . with electrostatic means	2237/1502	. . Mechanical adjustments
2237/049	. . Focusing means	2237/1503	. . . Mechanical scanning
2237/0492	. . . Lens systems (individual lenses H01J 2237/10)	2237/1504	. . Associated circuits
2237/04922	. . . . electromagnetic	2237/1505	. . Rotating beam around optical axis
2237/04924	. . . . electrostatic	2237/1506	. . Tilting or rocking beam around an axis substantially at an angle to optical axis
2237/04926	. . . . combined	2237/1507	. . . dynamically, e.g. to obtain same impinging angle on whole area
2237/04928	. . . . Telecentric systems	2237/1508	. . Combined electrostatic-electromagnetic means
2237/05	. Arrangements for energy or mass analysis	2237/151	. . Electrostatic means
2237/053	. . electrostatic	2237/1512	. . . Travelling wave deflectors
2237/0535	. . . Mirror analyser	2237/1514	. . . Prisms
2237/055	. . magnetic	2237/1516	. . . Multipoles
2237/057	. . Energy or mass filtering	2237/1518	. . . for X-Y scanning
2237/06	. Sources	2237/152	. . Magnetic means
2237/061	. . Construction	2237/1523	. . . Prisms
2237/062	. . . Reducing size of gun	2237/1526	. . . For X-Y scanning
2237/063	. . Electron sources	2237/153	. Correcting image defects, e.g. stigmators
2237/06308	. . . Thermionic sources	2237/1532	. . Astigmatism
2237/06316	. . . . Schottky emission	2237/1534	. . Aberrations
2237/06325	. . . Cold-cathode sources	2237/1536	. . Image distortions due to scanning
2237/06333	. . . . Photo emission	2237/1538	. . Space charge (Boersch) effect compensation (neutralising means H01J 2237/0041)
2237/06341	. . . . Field emission	2237/16	. Vessels (liner tubes H01J 2237/0268)
2237/0635	. . . . . Multiple source, e.g. comb or array	2237/162	. . Open vessel, i.e. one end sealed by object or workpiece
2237/06358	. . . . Secondary emission	2237/164	. . Particle-permeable windows
2237/06366	. . . . Gas discharge electron sources	2237/166	. . Sealing means
2237/06375	. . . Arrangement of electrodes	2237/18	. Vacuum control means
2237/06383	. . . Spin polarised electron sources	2237/182	. . Obtaining or maintaining desired pressure
2237/06391	. . . Positron sources	2237/1825	. . . Evacuating means
2237/065	. . Source emittance characteristics	2237/184	. . Vacuum locks
2237/0653	. . . Intensity	2237/186	. . Valves
2237/0656	. . . Density	2237/188	. . Differential pressure
2237/08	. . Ion sources	2237/20	. Positioning, supporting, modifying or maintaining the physical state of objects being observed or treated
2237/0802	. . . Field ionization sources	2237/2001	. . Maintaining constant desired temperature
2237/0805	. . . . Liquid metal sources	2237/2002	. . Controlling environment of sample
2237/0807	. . . . Gas field ion sources [GFIS]	2237/2003	. . . Environmental cells
2237/081	. . . Sputtering sources	2237/2004	. . . . Biological samples
2237/0812	. . . Ionized cluster beam [ICB] sources	2237/2005	. . Seal mechanisms
2237/0815	. . . Methods of ionisation	2237/2006	. . . Vacuum seals
2237/0817	. . . . Microwaves	2237/2007	. . Holding mechanisms
2237/082	. . . . Electron beam	2237/2008	. . specially adapted for studying electrical or magnetical properties of objects
2237/0822	. . . Multiple sources	2237/201	. . for mounting multiple objects
2237/0825	. . . . for producing different ions simultaneously	2237/202	. . Movement
2237/0827	. . . . for producing different ions sequentially	2237/20207	. . . Tilt
2237/083	. . Beam forming	2237/20214	. . . Rotation
2237/0835	. . . Variable cross-section or shape	2237/20221	. . . Translation
2237/10	. Lenses	2237/20228	. . . . Mechanical X-Y scanning
2237/103	. . characterised by lens type		
2237/1035	. . . Immersion lens		
2237/12	. . electrostatic		
2237/1202	. . . Associated circuits		
2237/1205	. . . Microlenses		
2237/1207	. . . Einzel lenses		

- 2237/20235 Z movement or adjustment
- 2237/20242 Eucentric movement
- 2237/2025 Sensing velocity of translation or rotation
- 2237/20257 Magnetic coupling
- 2237/20264 Piezoelectric devices
- 2237/20271 Temperature responsive devices
- 2237/20278 Motorised movement
- 2237/20285 computer-controlled
- 2237/20292 Means for position and/or orientation registration
- 2237/204 Means for introducing and/or outputting objects ([locks H01J 2237/184](#))
- 2237/206 Modifying objects while observing
- 2237/2062 Mechanical constraints
- 2237/2065 Temperature variations ([maintaining constant desired temperature H01J 2237/2001](#))
- 2237/2067 Surface alteration
- 2237/208 Elements or methods for movement independent of sample stage for influencing or moving or contacting or transferring the sample or parts thereof, e.g. probe needles or transfer needles in FIB/SEM systems
- 2237/21 Focus adjustment ([lenses H01J 2237/10](#))
- 2237/213 during electron or ion beam welding or cutting
- 2237/216 Automatic focusing methods
- 2237/22 Treatment of data ([mixing signals H01J 2237/24495](#))
- 2237/221 Image processing
- 2237/223 Fourier techniques
- 2237/225 Displaying image using synthesised colours
- 2237/226 Image reconstruction
- 2237/228 Charged particle holography
- 2237/244 Detection characterized by the detecting means
- 2237/24405 Faraday cages
- 2237/2441 Semiconductor detectors, e.g. diodes
- 2237/24415 X-ray
- 2237/2442 Energy-dispersive (Si-Li type) spectrometer
- 2237/24425 Wavelength-dispersive spectrometer
- 2237/2443 Scintillation detectors
- 2237/24435 Microchannel plates
- 2237/2444 Electron Multiplier
- 2237/24445 using avalanche in a gas
- 2237/2445 Photon detectors for X-rays, light, e.g. photomultipliers
- 2237/24455 Transmitted particle detectors
- 2237/2446 Position sensitive detectors
- 2237/24465 Sector detectors, e.g. quadrants
- 2237/2447 Imaging plates
- 2237/24475 Scattered electron detectors
- 2237/2448 Secondary particle detectors
- 2237/24485 Energy spectrometers
- 2237/2449 Detector devices with moving charges in electric or magnetic fields
- 2237/24495 Signal processing, e.g. mixing of two or more signals
- 2237/245 Detection characterised by the variable being measured
- 2237/24507 Intensity, dose or other characteristics of particle beams or electromagnetic radiation
- 2237/24514 Beam diagnostics including control of the parameter or property diagnosed ([H01J 2237/30472 takes precedence](#))
- 2237/24521 Beam diameter
- 2237/24528 Direction of beam or parts thereof in view of the optical axis, e.g. beam angle, angular distribution, beam divergence, beam convergence or beam landing angle on sample or workpiece ([means for deflecting or directing discharge H01J 2237/15](#))
- 2237/24535 Beam current
- 2237/24542 Beam profile
- 2237/2455 Polarisation (electromagnetic beams)
- 2237/24557 Spin polarisation (particles)
- 2237/24564 Measurements of electric or magnetic variables, e.g. voltage, current, frequency
- 2237/24571 Measurements of non-electric or non-magnetic variables
- 2237/24578 Spatial variables, e.g. position, distance
- 2237/24585 Other variables, e.g. energy, mass, velocity, time, temperature
- 2237/24592 Inspection and quality control of devices
- 2237/248 Components associated with the control of the tube
- 2237/2482 Optical means
- 2237/2485 Electric or electronic means
- 2237/2487 using digital signal processors
- 2237/25 Tubes for localised analysis using electron or ion beams
- 2237/2505 characterised by their application
- 2237/2511 Auger spectrometers
- 2237/2516 Secondary particles mass or energy spectrometry
- 2237/2522 of electrons (ESCA, XPS)
- 2237/2527 Ions [SIMS]
- 2237/2533 Neutrals [SNMS]
- 2237/2538 Low energy electron microscopy [LEEM]
- 2237/2544 Diffraction [LEED]
- 2237/255 Reflection diffraction [RHEED]
- 2237/2555 Microprobes, i.e. particle-induced X-ray spectrometry
- 2237/2561 electron
- 2237/2566 ion
- 2237/2572 proton
- 2237/2577 atomic
- 2237/2583 using tunnel effects, e.g. STM, AFM
- 2237/2588 Lorenz microscopy (magnetic field measurement)
- 2237/2594 Measuring electric fields or potentials
- 2237/26 Electron or ion microscopes
- 2237/2602 Details
- 2237/2605 operating at elevated pressures, e.g. atmosphere
- 2237/2608 with environmental specimen chamber ([environmental cells H01J 2237/2003](#))
- 2237/2611 Stereoscopic measurements and/or imaging
- 2237/2614 Holography or phase contrast, phase related imaging in general, e.g. phase plates
- 2237/2617 Comparison or superposition of transmission images; Moiré
- 2237/262 Non-scanning techniques
- 2237/2623 Field-emission microscopes
- 2237/2626 Pulsed source
- 2237/28 Scanning microscopes
- 2237/2801 Details
- 2237/2802 Transmission microscopes
- 2237/2803 characterised by the imaging method
- 2237/2804 Scattered primary beam
- 2237/2805 Elastic scattering

2237/2806	. . . .	Secondary charged particle	2237/3165	. . . .	Changing chemical properties
2237/2807	. . . .	X-rays	2237/317	. .	Processing objects on a microscale
2237/2808	. . . .	Cathodoluminescence	2237/31701	. . . .	Ion implantation
2237/2809	. . . .	characterised by the imaging problems involved	2237/31703	. . . .	Dosimetry
2237/281	. . . .	Bottom of trenches or holes	2237/31705	. . . .	Impurity or contaminant control
2237/2811	. . . .	Large objects	2237/31706	. . . .	characterised by the area treated
2237/2812	. . . .	Emission microscopes	2237/31708	. . . . .	unpatterned
2237/2813	. . . .	characterised by the application	2237/3171	. . . . .	patterned
2237/2814	. . . .	Measurement of surface topography	2237/31711	. . . . .	using mask
2237/2815	. . . . .	Depth profile	2237/31713	. . . . .	Focused ion beam
2237/2816	. . . . .	Length	2237/31732	. . . .	Depositing thin layers on selected microareas (ion plating H01J 2237/3142)
2237/2817	. . . . .	Pattern inspection	2237/31733	. . . . .	using STM
2237/2818	. . . .	Scanning tunnelling microscopes	2237/31735	. . . .	Direct-write microstructures
2237/282	. .	Determination of microscope properties	2237/31737	. . . . .	using ions
2237/2823	. . . .	Resolution	2237/31738	. . . . .	using STM
2237/2826	. . . .	Calibration (for object processing apparatus H01J 2237/30433)	2237/3174	. . . .	Etching microareas
2237/285	. .	Emission microscopes	2237/31742	. . . . .	for repairing masks
2237/2852	. . . .	Auto-emission (i.e. field-emission)	2237/31744	. . . . .	introducing gas in vicinity of workpiece
2237/2855	. . . .	Photo-emission	2237/31745	. . . . .	for preparing specimen to be viewed in microscopes or analyzed in microanalysers
2237/2857	. . . .	Particle bombardment induced emission	2237/31747	. . . . .	using STM
2237/30	. .	Electron or ion beam tubes for processing objects	2237/31749	. . . .	Focused ion beam
2237/303	. .	Electron or ion optical systems	2237/3175	. . . .	Lithography
2237/304	. .	Controlling tubes	2237/31752	. . . . .	using particular beams or near-field effects, e.g. STM-like techniques
2237/30405	. . . .	Details	2237/31754	. . . . .	using electron beams
2237/30411	. . . . .	using digital signal processors [DSP]	2237/31755	. . . . .	using ion beams
2237/30416	. . . . .	Handling of data (for lithography H01J 37/3174)	2237/31757	. . . . .	hybrid, i.e. charged particles and light, X- rays, plasma
2237/30422	. . . . .	Data compression	2237/31759	. . . . .	using near-field effects, e.g. STM
2237/30427	. . . . .	using neural networks or fuzzy logic	2237/31761	. . . . .	Patterning strategy
2237/30433	. . . .	System calibration (for microscopes H01J 2237/2826)	2237/31762	. . . . .	Computer and memory organisation
2237/30438	. . . . .	Registration	2237/31764	. . . . .	Dividing into sub-patterns
2237/30444	. . . . .	Calibration grids	2237/31766	. . . . .	Continuous moving of wafer
2237/3045	. . . . .	Deflection calibration (deflecting in general H01J 2237/15; specific to material treating H01J 2237/30483)	2237/31767	. . . . .	Step and repeat
2237/30455	. . . .	Correction during exposure	2237/31769	. . . . .	Proximity effect correction
2237/30461	. . . . .	pre-calculated	2237/31771	. . . . .	using multiple exposure
2237/30466	. . . .	Detecting endpoint of process (for plasma apparatus H01J 37/32963, for sputtering apparatus H01J 37/3479)	2237/31772	. . . . .	Flood beam
2237/30472	. . . .	Controlling the beam	2237/31774	. . . . .	Multi-beam
2237/30477	. . . . .	Beam diameter	2237/31776	. . . . .	Shaped beam
2237/30483	. . . . .	Scanning	2237/31777	. . . . .	by projection
2237/30488	. . . . .	Raster scan	2237/31779	. . . . .	from patterned photocathode
2237/30494	. . . . .	Vector scan	2237/31781	. . . . .	from patterned cold cathode
2237/31	. .	Processing objects on a macro-scale	2237/31783	. . . . .	M-I-M cathode
2237/3104	. . . .	Welding	2237/31784	. . . . .	Semiconductor cathode
2237/3109	. . . .	Cutting	2237/31786	. . . . .	Field-emitting cathode
2237/3114	. . . .	Machining	2237/31788	. . . . .	through mask
2237/3118	. . . .	Drilling	2237/31789	. . . . .	Reflection mask
2237/3123	. . . .	Casting	2237/31791	. . . . .	Scattering mask
2237/3128	. . . .	Melting	2237/31793	. . . . .	Problems associated with lithography
2237/3132	. . . .	Evaporating	2237/31794	. . . . .	affecting masks
2237/3137	. . . . .	Plasma-assisted co-operation	2237/31796	. . . . .	affecting resists
2237/3142	. . . .	Ion plating	2237/31798	. . . . .	detecting pattern defects (with SEM H01J 2237/2817; correcting H01J 2237/31735, H01J 2237/3174)
2237/3146	. . . . .	Ion beam bombardment sputtering	2237/32	. .	Processing objects by plasma generation
2237/3151	. . . .	Etching	2237/327	. .	Arrangements for generating the plasma
2237/3156	. . . .	Curing	2237/33	. .	characterised by the type of processing
2237/316	. . . .	Changing physical properties	2237/332	. . . .	Coating
			2237/3321	. . . . .	CVD [Chemical Vapor Deposition]
			2237/3322	. . . . .	Problems associated with coating

2237/3323	. . . . .	uniformity	2329/0439	. . . . .	characterised by the emitter material
2237/3325	. . . . .	large area	2329/0442	. . . . .	Metals or metal alloys
2237/3326	. . . . .	high speed	2329/0444	. . . . .	Carbon types
2237/3327	. . . . .	Coating high aspect ratio workpieces	2329/0447	. . . . .	Diamond
2237/3328	. . . . .	adhesion, stress, lift-off of deposited films	2329/0449	. . . . .	Graphite
2237/334	. . .	Etching	2329/0452	. . . . .	Fullerenes
2237/3341	. . . . .	Reactive etching	2329/0455	. . . . .	Carbon nanotubes (CNTs)
2237/3342	. . . . .	Resist stripping	2329/0457	. . . . .	Amorphous carbon
2237/3343	. . . . .	Problems associated with etching	2329/046	. . . . .	Diamond-like carbon [DLC]
2237/3344	. . . . .	isotropy	2329/0463	. . . . .	Semiconductor materials
2237/3345	. . . . .	anisotropy	2329/0465	. . . . .	Carbides
2237/3346	. . . . .	Selectivity	2329/0468	. . . . .	Nitrides
2237/3347	. . . . .	bottom of holes or trenches	2329/0471	. . . . .	Borides
2237/3348	. . . . .	control of ion bombardment energy	2329/0473	. . . . .	Oxides
2237/335	. . .	Cleaning	2329/0476	. . .	Ferroelectric cathodes
2237/3355	. . . . .	Holes or apertures, i.e. inprinted circuit boards	2329/0478	. . .	Semiconductor cathodes, e.g. having PN junction layers
2237/336	. . .	Changing physical properties of treated surfaces	2329/0481	. . .	Cold cathodes having an electric field perpendicular to the surface thereof (H01J 2329/0407 - H01J 2329/0478 take precedence)
2237/3365	. . . . .	Plasma source implantation	2329/0484	. . . . .	Metal-Insulator-Metal [MIM] emission type cathodes
2237/338	. . .	Changing chemical properties of treated surfaces	2329/0486	. . .	Cold cathodes having an electric field parallel to the surface thereof, e.g. thin film cathodes
2237/3382	. . . . .	Polymerising	2329/0489	. . . . .	Surface conduction emission type cathodes
2237/3385	. . . . .	Carburising	2329/0492	. . .	Cold cathodes combined with other synergetic effects, e.g. secondary, photo- or thermal emission
2237/3387	. . . . .	Nitriding	2329/0494	. . .	Circuit elements associated with the emitters by direct integration
2237/339	. . .	Synthesising components	2329/0497	. . . . .	Resistive members, e.g. resistive layers
Details			2329/08	. . .	Anode electrodes
2261/00	Gas- or vapour-discharge lamps		2329/18	. . .	Luminescent screens
2261/02	. . .	Details	2329/20	. . .	characterised by the luminescent material
2261/38	. . .	Devices for influencing the colour or wavelength of the light	2329/22	. . .	characterised by the binder or adhesive for securing the luminescent material to its support, e.g. substrate
2261/385	. . .	Non-chemical aspects of luminescent layers, e.g. thickness profile, shape and distribution of luminescent coatings	2329/28	. . .	with protective, conductive or reflective layers
2329/00	Electron emission display panels, e.g. field emission display panels		2329/30	. . .	Shape or geometrical arrangement of the luminescent material
2329/002	. . .	Cooling means	2329/32	. . .	Means associated with discontinuous arrangements of the luminescent material
2329/005	. . .	Multi-directional displaying, i.e. with multiple display faces facing in different directions	2329/323	. . .	Black matrix
2329/007	. . .	Vacuumless display panels, i.e. with phosphor directly applied to emitter without intermediate vacuum space	2329/326	. . .	Color filters structurally combined with the luminescent material
2329/02	. . .	Electrodes other than control electrodes	2329/46	. . .	Arrangements of electrodes and associated parts for generating or controlling the electron beams
2329/04	. . .	Cathode electrodes	2329/4604	. . .	Control electrodes
2329/0402	. . . . .	Thermionic cathodes	2329/4608	. . . . .	Gate electrodes
2329/0405	. . . . .	Cold cathodes other than those covered by H01J 2329/0407 - H01J 2329/0492	2329/4613	. . . . .	characterised by the form or structure
2329/0407	. . . . .	Field emission cathodes	2329/4617	. . . . .	Shapes or dimensions of gate openings
2329/041	. . . . .	characterised by the emitter shape	2329/4621	. . . . .	Arrangement of gate openings
2329/0413	. . . . .	Microengineered point emitters	2329/4626	. . . . .	Curved or extending upwardly
2329/0415	. . . . .	conical shaped, e.g. Spindt type	2329/463	. . . . .	characterised by the material
2329/0418	. . . . .	needle shaped	2329/4634	. . . . .	Relative position to the emitters, cathodes or substrates
2329/0421	. . . . .	Pillar shaped emitters	2329/4639	. . . . .	Focusing electrodes
2329/0423	. . . . .	Microengineered edge emitters	2329/4643	. . . . .	characterised by the form or structure
2329/0426	. . . . .	Coatings on the emitter surface, e.g. with low work function materials	2329/4647	. . . . .	Shapes or dimensions of focusing electrode openings
2329/0428	. . . . .	Fibres	2329/4652	. . . . .	Arrangement of focusing electrode openings
2329/0431	. . . . .	Nanotubes			
2329/0434	. . . . .	Particles			
2329/0436	. . . . .	Whiskers			

2329/4656	. . . . characterised by the material	2893/0005	. . . . Fixing of electrodes
2329/466	. . . . Relative position to the gate electrodes, emitters, cathodes or substrates	2893/0006	. . . . Mounting
2329/4665	. . . . . In the same plane as the gate electrodes or cathodes	2893/0007	. . . . . Machines for assembly
2329/4669	. . . Insulation layers	2893/0008	. . . . . Supply leads; Electrode supports via rigid connection to vessel
2329/4673	. . . for gate electrodes	2893/0009	. . . . . Electrode system pressing against vessel wall
2329/4678	. . . for focusing electrodes	2893/001	. . . Non-constructive schematic arrangements
2329/4682	. . . characterised by the shape	2893/0011	. . . Non-emitting electrodes
2329/4686	. . . . Dimensions of openings	2893/0012	. . . Constructional arrangements
2329/4691	. . . characterised by the material	2893/0013	. . . Sealed electrodes
2329/4695	. . Potentials applied to the electrodes	2893/0015	. . . Non-sealed electrodes
2329/86	. Vessels	2893/0016	. . . . Planar grids
2329/8605	. . Front or back plates	2893/0017	. . . . Cylindrical, helical or annular grids
2329/861	. . . characterised by the shape	2893/0018	. . . . Bar or cage-like grids
2329/8615	. . . characterised by the material	2893/0019	. . . Chemical composition and manufacture
2329/862	. . Frames	2893/002	. . . . chemical
2329/8625	. . Spacing members	2893/0021	. . . . . carbon
2329/863	. . . characterised by the form or structure	2893/0022	. . . . . Manufacture
2329/8635	. . . . having a corrugated lateral surface	2893/0023	. . . . . carbonising and other surface treatments
2329/864	. . . characterised by the material	2893/0024	. . . . . Planar grids
2329/8645	. . . with coatings on the lateral surfaces thereof	2893/0025	. . . . . by winding wire upon a support
2329/865	. . . Connection of the spacing members to the substrates or electrodes	2893/0026	. . . Machines for manufacture of grids or anodes
2329/8655	. . . . Conductive or resistive layers	2893/0027	. . . Mitigation of temperature effects
2329/866	. . . . Adhesives	2893/0029	. Electron beam tubes
2329/8665	. . . Spacer holding means	2893/003	. Tubes with plural electrode systems
2329/867	. . Seals between parts of vessels	2893/0031	. Tubes with material luminescing under electron bombardment
2329/8675	. . . Seals between the frame and the front and/or back plate	2893/0032	. Tubes with variable amplification factor
2329/868	. . Passive shielding means of vessels	2893/0033	. Vacuum connection techniques applicable to discharge tubes and lamps
2329/8685	. . . Antistatic shielding	2893/0034	. . Lamp bases
2329/869	. . . Electromagnetic shielding	2893/0035	. . . shaped as flat plates, in particular metallic
2329/8695	. . . Mechanical shielding, e.g. against water or abrasion	2893/0036	. . . having wires, ribbons or tubes placed between two vessel walls and being perpendicular to at least one of said walls
2329/88	. . Coatings on walls of the vessels (H01J 2329/18 , H01J 2329/868 , H01J 2329/89 take precedence)	2893/0037	. . Solid sealing members other than lamp bases
2329/89	. . Optical components structurally combined with the vessel	2893/0038	. . . Direct connection between two insulating elements, in particular via glass material
2329/892	. . . Anti-reflection, anti-glare, viewing angle and contrast improving means	2893/0039	. . . . Glass-to-glass connection, e.g. by soldering
2329/895	. . . Spectral filters	2893/004	. . . . Quartz-to-quartz connection
2329/897	. . . Lenses	2893/0041	. . . Direct connection between insulating and metal elements, in particular via glass material
2329/90	. Leading-in arrangements; seals therefor	2893/0043	. . . . Glass-to-metal or quartz-to-metal, e.g. by soldering
2329/92	. Means forming part of the display panel for the purpose of providing electrical connection to it	2893/0044	. . . Direct connection between two metal elements, in particular via material a connecting material
2329/94	. Means for exhausting the vessel or maintaining vacuum within the vessel	2893/0045	. . Non-solid connections, e.g. liquid or rubber
2329/941	. . Means for exhausting the vessel	2893/0046	. . Lamp base with closure
2329/943	. . Means for maintaining vacuum within the vessel	2893/0047	. . Closure other than lamp base
2329/945	. . . by gettering	2893/0048	. Tubes with a main cathode
2329/946	. . . . characterised by the position or form of the getter	2893/0049	. . Internal parts
2329/948	. . . . characterised by the material of the getter	2893/005	. . Cathodes
2329/96	. Circuit elements structurally associated with the display panels (H01J 2329/0494 takes precedence)	2893/0051	. . Anode assemblies; screens for influencing the discharge
2893/00	Discharge tubes and lamps	2893/0052	. . . Anode supporting means
2893/0001	. Electrodes and electrode systems suitable for discharge tubes or lamps	2893/0053	. . . Leading in for anodes; Protecting means for anode supports
2893/0002	. . Construction arrangements of electrode systems	2893/0054	. . . Cooling means
2893/0003	. . . Anodes forming part of vessel walls	2893/0055	. . Movable screens
2893/0004	. . . . Anodes formed in central part	2893/0056	. . Parts inside tubes brought to incandescence by the discharge
		2893/0058	. . Grids; Auxiliary internal or external electrodes

- 2893/0059 . Arc discharge tubes
- 2893/006 . Tubes with electron bombarded gas (e.g. with plasma filter)
- 2893/0061 . Tubes with discharge used as electron source
- 2893/0062 . Tubes with temperature ionized gas as electron source
- 2893/0063 . Plasma light sources
- 2893/0064 . Tubes with cold main electrodes (including cold cathodes)
- 2893/0065 . . Electrode systems
- 2893/0066 . . . Construction, material, support, protection and temperature regulation of electrodes; Electrode cups
- 2893/0067 . . . Electrode assembly without control electrodes, e.g. including a screen
- 2893/0068 . . . electrode assembly with control electrodes, e.g. including a screen
- 2893/0069 . Tubes for displaying characters
- 2893/007 . Sequential discharge tubes
- 2893/0072 . Disassembly or repair of discharge tubes
- 2893/0073 . . Discharge tubes with liquid poolcathodes; constructional details
- 2893/0074 . . . Cathodic cups; Screens; Reflectors; Filters; Windows; Protection against mercury deposition; Returning condensed electrode material to the cathodic cup; Liquid electrode level control
- 2893/0075 Cathodic cups
- 2893/0076 Liquid electrode materials
- 2893/0077 Cathodic cup construction; Cathodic spot control
- 2893/0078 Mounting cathodic cups in the discharge tube
- 2893/0079 Means for limiting the cathodic spot movement
- 2893/008 Means for stabilising the cathodic spot
- 2893/0081 Cooling means
- 2893/0082 Returning condensed electrode material to the cathodic cup, e.g. including cleaning
- 2893/0083 Liquid electrode level control
- 2893/0084 Protection against mercury deposition
- 2893/0086 Gas fill; Maintaining or maintaining desired pressure; Producing, introducing or replenishing gas or vapour during operation of the tube; Getters; Gas cleaning; Electrode cleaning
- 2893/0087 Igniting means; Cathode spot maintaining or extinguishing means
- 2893/0088 . . Tubes with at least a solid principal cathode and solid anodes
- 2893/0089 . . . Electrode systems
- 2893/009 . . . Anode systems; Screens
- 2893/0091 Anode supporting means
- 2893/0092 Anodic screens or grids
- 2893/0093 Anodic arms
- 2893/0094 . . . Electrode arrangements; Auxiliary electrodes
- 2893/0095 . . Tubes with exclusively liquid main electrodes
- 2893/0096 . Transport of discharge tube components during manufacture, e.g. wires, coils, lamps, contacts, etc.
- 2893/0097 . . Incandescent wires of coils
- 2893/0098 . . Vessels