

## SECTION H — ELECTRICITY

## H05 ELECTRIC TECHNIQUES NOT OTHERWISE PROVIDED FOR

**H05B ELECTRIC HEATING; ELECTRIC LIGHTING NOT OTHERWISE PROVIDED FOR** (apparatus for special application, see the relevant places, e.g. A47J, B21J, B21K, C21, C22, C23, F21, F24, F27)

**Note(s)**

Attention is drawn to Note III following the Contents of Section of section H.

**Subclass index**

## HEATING

Produced by: resistance; electric, magnetic, or electromagnetic fields; discharge.....3/00, 6/00, 7/00  
 Combined types.....11/00  
 Details.....1/00

## LIGHTING

Light sources: arc; electro- luminescent.....31/00, 33/00  
 Combined types.....35/00  
 Circuit arrangements:  
   general.....37/00  
   for incandescent lamps.....39/00  
   for discharge lamps.....41/00  
   other.....43/00

**Heating**

	3/22	• • non-flexible
	3/24	• • • heating conductor being self-supporting
	3/26	• • • heating conductor mounted on insulating base
	3/28	• • • heating conductor embedded in insulating material
	3/30	• • • on or between metallic plates
	3/32	• • • heating conductor mounted on insulators on a metallic frame
	3/34	• • flexible, e.g. heating nets or webs
	3/36	• • • heating conductor embedded in insulating material
	3/38	• • • • Powder conductors
	3/40	• Heating elements having the shape of rods or tubes (H05B 3/62, H05B 3/68, H05B 3/78 take precedence)
	3/42	• • non-flexible
	3/44	• • • heating conductor arranged within rods or tubes of insulating material
	3/46	• • • heating conductor mounted on insulating base
	3/48	• • • heating conductor embedded in insulating material
	3/50	• • • • heating conductor arranged in metal tubes, the radiating surface having heat-conducting fins
	3/52	• • • • Apparatus or processes for filling or compressing insulating material in tubes
	3/54	• • flexible
	3/56	• • • Heating cables
	3/58	• • • Heating hoses; Heating collars
<b>1/00 Details of electric heating devices</b>		
1/02 • Automatic switching arrangements specially adapted to heating apparatus (control of temperature in general G05D 23/00; thermally-actuated switches H01H 37/00)		
<b>3/00 Ohmic-resistance heating</b>		
3/02 • Details		
3/03 • • Electrodes (electrothermic treatment of ores C22B 4/00) [2]		
3/04 • • Waterproof or air-tight seals for heaters		
3/06 • • Heater elements structurally combined with coupling elements or with holders		
3/08 • • • having electric connections specially adapted for high temperatures		
3/10 • Heating elements characterised by the composition or nature of the materials or by the arrangement of the conductor (compositions <u>per se</u> , see the relevant subclasses)		
3/12 • • characterised by the composition or nature of the conductive material		
3/14 • • • the material being non-metallic		
3/16 • • • the conductor being mounted on an insulating base		
3/18 • • • the conductor being embedded in an insulating material		
3/20 • Heating elements having extended surface area substantially in a two-dimensional plane, e.g. plate-heater (H05B 3/62, H05B 3/68, H05B 3/78, H05B 3/84 take precedence) [5]		

## H05B

- 3/60 • Heating arrangements wherein the heating current flows through granular, powdered or fluid material, e.g. for salt-bath furnace, electrolytic heating (H05B 3/38 takes precedence)
- 3/62 • Heating elements specially adapted for furnaces (H05B 3/60 takes precedence; arrangements of such elements in furnaces F27, e.g. F27D 11/00)
- 3/64 • • using ribbon, rod, or wire heater
- 3/66 • • Supports or mountings for heaters on or in the wall or roof
- 3/68 • Heating arrangements specially adapted for cooking plates or analogous hot-plates

### Note(s)

Group H05B 3/76 takes precedence over groups H05B 3/70-H05B 3/74.

- 3/70 • • Plates of cast metal
- 3/72 • • Plates of sheet metal
- 3/74 • • Non-metallic plates
- 3/76 • • Plates with spirally-wound heating tubes
- 3/78 • Heating arrangements specially adapted for immersion heating
- 3/80 • • Portable immersion heaters
- 3/82 • • Fixedly-mounted immersion heaters
- 3/84 • Heating arrangements specially adapted for transparent or reflecting areas, e.g. for demisting or de-icing windows, mirrors or vehicle windshields [5]
- 3/86 • • the heating conductors being embedded in the transparent or reflecting material [5]

### 6/00 Heating by electric, magnetic, or electromagnetic fields (for therapeutic purposes A61N 5/00; joining of preformed parts by heating of plastics or substances in a plastic state B29C 65/02) [3]

- 6/02 • Induction heating [3]
- 6/04 • • Sources of current [3]
- 6/06 • • Control, e.g. of temperature, of power [3]
- 6/08 • • • using compensating or balancing arrangements [3]
- 6/10 • • Induction heating apparatus, other than furnaces, for specific applications [3]
- 6/12 • • • Cooking devices [3]
- 6/14 • • • Tools, e.g. nozzles, rollers, calenders [3]
- 6/16 • • Furnaces having endless cores (H05B 6/34 takes precedence) [3]
- 6/18 • • • having melting basin [3]
- 6/20 • • • having melting channel only [3]
- 6/22 • • Furnaces without an endless core (H05B 6/34 takes precedence) [3]
- 6/24 • • • Crucible furnaces (H05B 6/30 takes precedence) [3]
- 6/26 • • • • using vacuum or particular gas atmosphere [3]
- 6/28 • • • • Protective systems [3]
- 6/30 • • • Arrangements for remelting or zone melting [3]
- 6/32 • • • Arrangements for simultaneous levitation and heating [3]
- 6/34 • • Arrangements for circulation of melts [3]
- 6/36 • • Coil arrangements [3]
- 6/38 • • • specially adapted for fitting into hollow spaces of workpieces [3]
- 6/40 • • • Establishing desired heat distribution, e.g. to heat particular parts of workpieces [3]
- 6/42 • • • Cooling of coils [3]
- 6/44 • • • having more than one coil or coil segment [3]
- 6/46 • Dielectric heating (H05B 6/64 take precedence) [3]

- 6/48 • • Circuits [3]
  - 6/50 • • • for monitoring or control [3]
  - 6/52 • • Feed lines [3]
  - 6/54 • • Electrodes [3]
  - 6/56 • • • Rolling electrodes [3]
  - 6/58 • • • "sewing machine" type [3]
  - 6/60 • • Arrangements for continuous movement of material [3]
  - 6/62 • • Apparatus for specific applications [3]
  - 6/64 • Heating using microwaves [3]
  - 6/66 • • Circuits [3]
  - 6/68 • • • for monitoring or control [3]
  - 6/70 • • Feed lines [3]
  - 6/72 • • Radiators or aerials [3]
  - 6/74 • • Mode transformers or mode stirrers [3]
  - 6/76 • • Prevention of microwave leakage, e.g. door sealings [3]
  - 6/78 • • Arrangements for continuous movement of material [3]
  - 6/80 • • Apparatus for specific applications (stoves or ranges F24C 7/02) [3]
- ### 7/00 Heating by electric discharge (electron beam or ion beam tubes for localised treatment of objects H01J 37/30; plasma torches H05H 1/26)
- 7/02 • Details
  - 7/06 • • Electrodes
  - 7/07 • • • designed to melt in use [2]
  - 7/08 • • • non-consumable [2]
  - 7/085 • • • • mainly consisting of carbon [2]
  - 7/09 • • • • Self-baking electrodes [2]
  - 7/10 • • Mountings, supports, terminals, or arrangements for feeding or guiding electrodes [2]
  - 7/101 • • • Mountings, supports, or terminals at head of electrode, i.e. at the end remote from the arc [2]
  - 7/102 • • • specially adapted for consumable electrodes [2]
  - 7/103 • • • Mountings, supports, or terminals with jaws (H05B 7/101 takes precedence) [2]
  - 7/105 • • • • comprising more than two jaws equally spaced along circumference, e.g. ring holders [2]
  - 7/107 • • • specially adapted for self-baking electrodes [2]
  - 7/109 • • • Feeding arrangements (H05B 7/107 takes precedence; where the electrode movement is a part of a closed loop for automatic control of power H05B 7/148) [2]
  - 7/11 • • Arrangements for conducting current to the electrode terminals (non-insulated conductors or conductive bodies in general H01B 5/00; insulated conductors or cables in general H01B 7/00) [2]
  - 7/12 • • Arrangements for cooling, sealing, or protecting electrodes [2]
  - 7/14 • • Arrangements or methods for connecting successive electrode sections [2]
  - 7/144 • • Power supplies specially adapted for heating by electric discharge; Automatic control of power, e.g. by positioning of electrodes (circuit arrangements for supplying electric power in general H02J) [2]

- 7/148 • • • Automatic control of power (electrode feeding arrangements H05B 7/109; automatic feeding or moving of electrodes for spot or seam welding or cutting B23K 9/12; disposition of electrodes in or on furnaces F27D 11/10; control of position in general G05D 3/00; regulating electric characteristics of arcs in general G05F 1/02; regulating electric power in general G05F 1/66) [2]
- 7/152 • • • • by electromechanical means for positioning of electrodes [2]
- 7/156 • • • • by hydraulic or pneumatic means for positioning of electrodes [2]
- 7/16 • Heating by glow discharge
- 7/18 • Heating by arc discharge
- 7/20 • • Direct heating by arc discharge, i.e. where at least one end of the arc directly acts on the material to be heated, including additional resistance heating by arc current flowing through the material to be heated [2]
- 7/22 • • Indirect heating by arc discharge [2]
- 11/00 Heating by combined application of processes covered by two or more of groups H05B 3/00-H05B 7/00** (H05B 7/20 takes precedence)
- Lighting**
- 31/00 Electric arc lamps** (regulating electric characteristics of arcs G05F 1/02; with non-consumable electrodes H01J 61/00)
- 31/02 • Details
- 31/04 • • Housings
- 31/06 • • Electrodes
- 31/08 • • • Carbon electrodes
- 31/10 • • • • Cored carbon electrodes
- 31/12 • • • • Beck-effect electrodes
- 31/14 • • • Metal electrodes
- 31/16 • • • Apparatus or processes specially adapted for manufacturing electrodes
- 31/18 • • Mountings for electrodes; Electrode feeding devices
- 31/20 • • • Mechanical arrangements for feeding electrodes
- 31/22 • • • Electromagnetic arrangements for feeding electrodes
- 31/24 • • Cooling arrangements
- 31/26 • • Influencing the shape of arc discharge by gas blowing devices
- 31/28 • • Influencing the shape of arc discharge by magnetic means
- 31/30 • • Starting; Igniting
- 31/32 • • Switching-off
- 31/34 • • Indicating consumption of electrodes
- 31/36 • having two electrodes in line
- 31/38 • • specially adapted for ac
- 31/40 • having two electrodes at an angle
- 31/42 • • specially adapted for ac
- 31/44 • having two parallel electrodes
- 31/46 • • specially adapted for ac
- 31/48 • having more than two electrodes
- 31/50 • • specially adapted for ac
- 31/52 • • • electrodes energised from different phases of the supply
- 33/00 Electroluminescent light sources** (discharge lamps H01J 61/00-H01J 65/00; semi-conductor devices with at least one particular jump barrier or surface barrier specially adapted for light emission H01L 27/15, H01L 33/00; organic light emitting devices H01L 27/32, H01L 51/50; lasers H01S 3/00, H01S 5/00; compositions *per se*, *see* the relevant subclasses) [1, 2006.01]
- 33/02 • Details
- 33/04 • • Sealing arrangements
- 33/06 • • Electrode terminals
- 33/08 • • Circuit arrangements not adapted to a particular application
- 33/10 • Apparatus or processes specially adapted to the manufacture of electroluminescent light sources
- 33/12 • Light sources with substantially two-dimensional radiating surfaces
- 33/14 • • characterised by the chemical or physical composition or the arrangement of the electroluminescent material
- 33/18 • • characterised by the nature or concentration of the activator
- 33/20 • • characterised by the chemical or physical composition or the arrangement of the material in which the electroluminescent material is embedded
- 33/22 • • characterised by the chemical or physical composition or the arrangement of auxiliary dielectric or reflective layers
- 33/24 • • • of metallic reflective layers (H05B 33/26 takes precedence)
- 33/26 • • characterised by the composition or arrangement of the conductive material used as an electrode
- 33/28 • • • of translucent electrodes
- 35/00 Electric light sources using a combination of different types of light generation**
- 37/00 Circuit arrangements for electric light sources in general**
- 37/02 • Controlling
- 37/03 • Detecting lamp failure
- 37/04 • • Circuits providing for substitution of the light source in case of its failure
- 39/00 Circuit arrangements or apparatus for operating incandescent light sources and not adapted to a particular application**
- 39/02 • Switching-on, e.g. with predetermined rate of increase of lighting current
- 39/04 • Controlling
- 39/06 • • Switching arrangements, e.g. from series operation to parallel operation
- 39/08 • • by shifting phase of trigger voltage applied to gas-filled controlling tubes
- 39/09 • in which the lamp is fed by pulses
- 39/10 • Circuits providing for substitution of the light source in case of its failure
- 41/00 Circuit arrangements or apparatus for igniting or operating discharge lamps**
- 41/02 • Details
- 41/04 • • Starting switches
- 41/06 • • • thermal only
- 41/08 • • • • heated by glow discharge
- 41/10 • • • magnetic only
- 41/12 • • • combined thermal and magnetic

## H05B

- 41/14 • Circuit arrangements
- 41/16 • • in which the lamp is fed by dc or by low-frequency ac, e.g. by 50 cycles/sec ac (H05B 41/26 takes precedence)
- 41/18 • • • having a starting switch
- 41/19 • • • • for lamps having an auxiliary starting electrode
- 41/20 • • • having no starting switch
- 41/22 • • • • for lamps having an auxiliary starting electrode
- 41/23 • • • • for lamps not having an auxiliary starting electrode
- 41/231 • • • • • for high-pressure lamps
- 41/232 • • • • • for low-pressure lamps
- 41/233 • • • • • using resonance circuitry
- 41/234 • • • • • to eliminate stroboscopic effects, e.g. feeding two lamps with different phases
- 41/24 • • in which the lamp is fed by high-frequency ac (H05B 41/26 takes precedence)
- 41/26 • • in which the lamp is fed by power derived from dc by means of a converter, e.g. by high-voltage dc
- 41/28 • • • using static converters
- 41/282 • • • • with semiconductor devices (H05B 41/288, H05B 41/295 take precedence) [7]
- 41/285 • • • • • Arrangements for protecting lamps or circuits against abnormal operating conditions [7]
- 41/288 • • • • with semiconductor devices and specially adapted for lamps without preheating electrodes, e.g. for high-intensity discharge lamps, high-pressure mercury or sodium lamps or low-pressure sodium lamps [7]
- 41/292 • • • • • Arrangements for protecting lamps or circuits against abnormal operating conditions [7]
- 41/295 • • • • • with semiconductor devices and specially adapted for lamps with preheating electrodes, e.g. for fluorescent lamps [7]
- 41/298 • • • • • Arrangements for protecting lamps or circuits against abnormal operating conditions [7]
- 41/30 • • in which the lamp is fed by pulses, e.g. flash lamp
- 41/32 • • • for single flash operation
- 41/34 • • • to provide a sequence of flashes
- 41/36 • • Controlling
- 41/38 • • • Controlling the intensity of light
- 41/39 • • • • continuously
- 41/391 • • • • • using saturable magnetic devices
- 41/392 • • • • • using semiconductor devices, e.g. thyristor
- 41/40 • • • • discontinuously
- 41/42 • • • • • in two steps only
- 41/44 • • • for providing special optical effects, e.g. progressive motion of light
- 41/46 • • Circuits providing for substitution in case of failure of the lamp
- 43/00** • **Circuit arrangements for light sources, not otherwise provided for** (H05B 37/00 takes precedence)
- 43/02 • • for light sources using a charge of combustible material

## H05C **ELECTRIC CIRCUITS OR APPARATUS SPECIALLY DESIGNED FOR USE IN EQUIPMENT FOR KILLING, STUNNING, ENCLOSING OR GUIDING LIVING BEINGS** (stationary means for catching or killing insects by electric means A01M 1/22; apparatus for the destruction of noxious animals, other than insects, by electricity A01M 19/00; electric traps for animals A01M 23/38; slaughtering or stunning by electric current A22B 3/06)

- 1/00** • **Circuits or apparatus for generating electric shock effects**
- 1/02 • providing continuous feeding of dc or ac voltage
- 1/04 • providing pulse voltages
- 1/06 • • operating only when touched
- 3/00** • **Other circuits or apparatus**

## H05F **STATIC ELECTRICITY; NATURALLY-OCCURRING ELECTRICITY**

### Note(s)

1. This subclass covers methods or arrangements for preventing the formation of electrostatic charges on bodies or for carrying-off these charges after their formation.
2. This subclass does not cover specific applications of the above-mentioned methods or arrangements. Such arrangements are covered by the relevant subclasses, e.g. arrangements in large containers B65D 90/46.

- 1/00** • **Preventing the formation of electrostatic charges**
- 1/02 • by surface treatment
- 3/00** • **Carrying-off electrostatic charges** (from living beings A61N 1/14)
- 3/02 • by means of earthing connections
- 3/04 • by means of spark gaps or other discharge devices (devices providing for corona discharge H01T 19/00) [2]
- 3/06 • by means of ionising radiation
- 7/00** • **Use of naturally-occurring electricity**

**H05G X-RAY TECHNIQUE** (apparatus for radiation diagnosis A61B 6/00; X-ray therapy A61N; testing by X-rays G01N; apparatus for X-ray photography G03B; filters, conversion screens, microscopes G21K; X-ray tubes H01J 35/00; TV systems having X-ray input H04N 5/321)

1/00	<b>X-ray apparatus involving X-ray tubes; Circuits therefor</b>	1/44	• • • • • in which the switching instant is determined by measuring the amount of radiation directly
1/02	• Constructional details		
1/04	• • Mounting the X-ray tube within a closed housing	1/46	• • • • Combined control of different quantities, e.g. exposure time as well as voltage or current
1/06	• • • X-ray tube and at least part of the power supply apparatus being mounted within the same housing	1/48	• • • • Compensating the voltage drop occurring at the instant of switching-on of the apparatus (regulating supply without reference to operating characteristics of the apparatus G05F)
1/08	• Electrical details		
1/10	• • Power supply arrangements for feeding the X-ray tube		
1/12	• • • with dc or rectified single-phase ac	1/50	• • • • Passing the tube current only during a restricted portion of the voltage waveform
1/14	• • • with single-phase low-frequency ac		
1/16	• • • • Reducing the peak-inverse voltage	1/52	• • • • Target size or shape; Direction of electron beam, e.g. in tubes with one anode and more than one cathode
1/18	• • • with polyphase ac of low frequency		
1/20	• • • with high-frequency ac; with pulse trains		
1/22	• • • with single pulses	1/54	• • • Protecting (overload protection combined with control H05G 1/46)
1/24	• • • • Obtaining pulses by using energy storage devices (pulse generators H03K)	1/56	• • Switching-on; Switching-off
1/26	• • Measuring, controlling, protecting (measuring electric values G01R; measuring X-ray intensity G01T)	1/58	• • Switching arrangements for changing-over from one mode of operation to another, e.g. from radioscopy to radiography, from radioscopy to irradiation
1/28	• • • Measuring or recording actual exposure time; Counting number of exposures; Measuring required exposure time	1/60	• • Circuit arrangements for obtaining a series of X-ray photographs or for X-ray cinematography
1/30	• • • Controlling	1/61	• • • for obtaining stereoscopic photographs [5]
1/32	• • • • Supply voltage of the X-ray apparatus or tube (regulating supply without reference to operating characteristics of the apparatus G05F)	1/62	• • Circuit arrangements for obtaining X-ray photography at predetermined instants in the movement of an object, e.g. X-ray stroboscopy
1/34	• • • • Anode current, heater current, heater voltage of X-ray tube (regulating supply without reference to operating characteristics of the apparatus G05F)	1/64	• • Circuit arrangements for X-ray apparatus incorporating electronic image converters, e.g. image intensifiers [5]
1/36	• • • • Temperature of anode; Brightness of image	1/66	• • Circuit arrangements for X-ray tubes with target movable relatively to the anode
1/38	• • • • Exposure time	1/68	• • Circuit arrangements for Lilienfeld tubes; Circuit arrangements for gas-filled X-ray tubes
1/40	• • • • • using adjustable time switch	1/70	• • Circuit arrangements for X-ray tubes with more than one anode; Circuit arrangements for apparatus comprising more than one X-ray tube
1/42	• • • • • using arrangements for switching when a predetermined dose of radiation has been applied, e.g. in which the switching instant is determined by measuring the electrical energy supplied to the tube	2/00	<b>Apparatus or processes specially adapted for producing X-rays, not involving X-ray tubes, e.g. involving generation of a plasma</b> (X-ray lasers H01S 4/00; plasma technique in general H05H) [5]

**H05H PLASMA TECHNIQUE** (ion-beam tubes H01J 27/00; magnetohydrodynamic generators H02K 44/08; producing X-rays involving plasma generation H05G 2/00); **PRODUCTION OF ACCELERATED ELECTRICALLY- CHARGED PARTICLES OR OF NEUTRONS** (obtaining neutrons from radioactive sources G21, e.g. G21B, G21C, G21G); **PRODUCTION OR ACCELERATION OF NEUTRAL MOLECULAR OR ATOMIC BEAMS** (atomic clocks G04F 5/14; devices using stimulated emission H01S; frequency regulation by comparison with a reference frequency determined by energy levels of molecules, atoms, or subatomic particles H03L 7/26)

#### Note(s)

1. This subclass covers:
  - a. generating or handling plasma;
  - b. devices not covered by subclass H01J and in which electrons, ion beams, or neutral particles are accelerated to high energies;
  - c. devices for producing neutral particle beams;
  - d. targets for (a), (b), or (c).
2. Attention is drawn to subclass G21K.

**Subclass index**

PLASMA TECHNIQUE.....	1/00
PRODUCTION OR ACCELERATION OF NEUTRAL PARTICLE BEAMS.....	3/00
TARGETS FOR NUCLEAR REACTIONS.....	6/00
<b>PARTICLE ACCELERATORS</b>	
Direct voltage accelerators, accelerators using single pulses.....	5/00
Linear; magnetic induction; magnetic resonance.....	9/00, 11/00, 13/00
Others.....	15/00
Details.....	7/00

<b>1/00</b>	<b>Generating plasma; Handling plasma</b> (application of plasma technique in thermonuclear fusion reactors G21B 1/00)	3/02	• Molecular or atomic-beam generation, e.g. resonant beam generation (gas masers H01S 1/06) [3]
1/02	• Arrangements for confining plasma by electric or magnetic fields; Arrangements for heating plasma (electron optics H01J)	3/04	• Acceleration by electromagnetic wave pressure [3]
1/03	• • using electrostatic fields [3]	3/06	• Generating neutron beams (targets for producing nuclear reactions H05H 6/00; neutron sources G21G 4/02) [5]
1/04	• • using magnetic fields substantially generated by the discharge in the plasma	<b>5/00</b>	<b>Direct voltage accelerators; Accelerators using single pulses</b> (H05H 3/06 takes precedence) [5]
1/06	• • • Longitudinal pinch devices	5/02	• Details (targets for producing nuclear reactions H05H 6/00) [3]
1/08	• • • Theta pinch devices	5/03	• • Accelerating tubes (vessels or containers of electric discharge tubes with improved potential distribution over surface of vessel H01J 5/06; shields of X-ray tubes associated with vessels or containers H01J 35/16) [4]
1/10	• • using applied magnetic fields only	5/04	• energised by electrostatic generators, e.g. by van de Graaff generator [4]
1/11	• • • using cusp configuration (H05H 1/14 takes precedence) [3]	5/06	• Tandem accelerators; Multi-stage accelerators
1/12	• • • wherein the containment vessel forms a closed loop, e.g. stellarator	5/08	• Particle accelerators using step-up transformers, e.g. resonance transformers [4]
1/14	• • • wherein the containment vessel is straight and has magnetic mirrors	<b>6/00</b>	<b>Targets for producing nuclear reactions</b> (supports for targets or objects to be irradiated G21K 5/08) [3]
1/16	• • using applied electric and magnetic fields	<b>7/00</b>	<b>Details of devices of the types covered by groups H05H 9/00-H05H 13/00</b> (targets for producing nuclear reactions H05H 6/00) [3]
1/18	• • • wherein the fields oscillate at a very high frequency, e.g. in the microwave range	7/02	• Circuits or systems for supplying or feeding radio-frequency energy (radio-frequency generators H03B)
1/20	• • Ohmic heating	7/04	• Magnet systems; Energisation thereof
1/22	• • for injection heating	7/06	• Two-beam arrangements; Multi-beam arrangements
1/24	• Generating plasma [2]	7/08	• Arrangements for injecting particles into orbits
1/26	• • Plasma torches [2]	7/10	• Arrangements for ejecting particles from orbits
1/28	• • • Cooling arrangements [3]	7/12	• Arrangements for varying final energy of beam
1/30	• • • using applied electromagnetic fields, e.g. high-frequency or microwave energy (H05H 1/28 takes precedence) [3]	7/14	• Vacuum chambers (H05H 5/03 takes precedence) [4]
1/32	• • • using an arc (H05H 1/28 takes precedence) [3]	7/16	• • of the waveguide type [4]
1/34	• • • • Details, e.g. electrodes, nozzles [3]	7/18	• • Cavities; Resonators [4]
1/36	• • • • • Circuit arrangements (H05H 1/38, H05H 1/40 take precedence) [3]	7/20	• • • with superconductive walls [4]
1/38	• • • • • Guiding or centering of electrodes [3]	7/22	• Details of linear accelerators, e.g. drift tubes (H05H 7/02-H05H 7/20 take precedence) [4]
1/40	• • • • • using applied magnetic fields, e.g. for focusing or rotating the arc [3]	<b>9/00</b>	<b>Linear accelerators</b> (H05H 11/00 takes precedence)
1/42	• • • • • with provisions for introducing materials into the plasma, e.g. powder, liquid (electrostatic spraying, spraying apparatus with means for charging the spray electrically B05B 5/00) [3]	9/02	• Travelling-wave linear accelerators
1/44	• • • • • using more than one torch [3]	9/04	• Standing-wave linear accelerators
1/46	• • using applied electromagnetic fields, e.g. high frequency or microwave energy (H05H 1/26 takes precedence) [3]	<b>11/00</b>	<b>Magnetic induction accelerators, e.g. betatrons</b>
1/48	• • using an arc (H05H 1/26 takes precedence) [3]	11/02	• Air-cored betatrons
1/50	• • • and using applied magnetic fields, e.g. for focusing or rotating the arc [3]	11/04	• Biased betatrons
1/52	• • using exploding wires or spark gaps (H05H 1/26 takes precedence; spark gaps in general H01T) [3]	<b>13/00</b>	<b>Magnetic resonance accelerators; Cyclotrons</b>
1/54	• Plasma accelerators [3]	13/02	• Synchrocyclotrons, i.e. frequency-modulated cyclotrons
<b>3/00</b>	<b>Production or acceleration of neutral particle beams, e.g. molecular or atomic beams [3]</b>	13/04	• Synchrotrons
		13/06	• Air-cored magnetic resonance accelerators

- 13/08 • Alternating-gradient magnetic resonance accelerators
- 13/10 • Accelerators comprising one or more linear accelerating sections and bending magnets or the like to return the charged particles in a trajectory parallel to the first accelerating section, e.g. microtrons [4]

**15/00 Methods or devices for acceleration of charged particles not otherwise provided for [4]**

**H05K PRINTED CIRCUITS; CASINGS OR CONSTRUCTIONAL DETAILS OF ELECTRIC APPARATUS; MANUFACTURE OF ASSEMBLAGES OF ELECTRICAL COMPONENTS** (details of instruments or comparable details of other apparatus not otherwise provided for G12B; thin-film or thick-film circuits H01L 27/01, H01L 27/13; non-printed means for electric connections to or between printed circuits H01R; casings for, or constructional details of, particular types of apparatus, see the relevant subclasses; processes involving only a single technical art, e.g. heating, spraying, for which provision exists elsewhere, see the relevant classes)

**Note(s)**

1. This subclass covers:
  - combinations of a radio or television receiver with apparatus having a different main function;
  - printed circuits structurally associated with non-printed electric components.
2. In this subclass, the following expression is used with the meaning indicated:
  - "printed circuits" covers all kinds of mechanical constructions of circuits that consist of an insulating base or support carrying the conductor and are combined structurally with the conductor throughout their length, especially in a two-dimensional plane, the conductors of which are secured to the base in a non-dismountable manner, and also covers the processes or apparatus for manufacturing such constructions, e.g. forming the circuit by mechanical or chemical treatment of a conductive foil, paste, or film on an insulating support.

**Subclass index**

PRINTED CIRCUITS ASSOCIATED OR NOT ASSOCIATED WITH NON-PRINTED ELECTRIC COMPONENTS

Types; manufacture.....	1/00, 3/00
CASINGS, CABINETS OR DRAWERS; CONSTRUCTIONAL DETAILS.....	5/00, 7/00
SCREENING.....	9/00
COMBINATIONS OF A RADIO OR TELEVISION RECEIVER WITH OTHER APPARATUS.....	11/00
MANUFACTURE OF ELECTRONIC ASSEMBLAGES.....	13/00
ARRANGEMENTS FOR IMPROVING THE OPERATING RELIABILITY.....	10/00

<p><b>1/00 Printed circuits</b> (assemblies of a plurality of individual semiconductor or solid state devices H01L 25/00; devices consisting of a plurality of solid state components formed in or on a common substrate, e.g. integrated circuits, thin-film or thick-film circuits, H01L 27/00)</p> <ul style="list-style-type: none"> <li>1/02 • Details</li> <li>1/03 • • Use of materials for the substrate [3]</li> <li>1/05 • • • Insulated metal substrate [3]</li> <li>1/09 • • Use of materials for the metallic pattern [3]</li> <li>1/11 • • Printed elements for providing electric connections to or between printed circuits [3]</li> <li>1/14 • • Structural association of two or more printed circuits (providing electric connection to or between printed circuits H05K 1/11, H01R 12/00)</li> <li>1/16 • incorporating printed electric components, e.g. printed resistor, capacitor, inductor</li> <li>1/18 • Printed circuits structurally associated with non-printed electric components (H05K 1/16 takes precedence)</li> </ul> <p><b>3/00 Apparatus or processes for manufacturing printed circuits</b> (photomechanical production of textured or patterned surfaces, materials or originals therefor, apparatus specially adapted therefor, in general G03F; involving the manufacture of semiconductor devices H01L) [3]</p>	<ul style="list-style-type: none"> <li>3/02 • in which the conductive material is applied to the surface of the insulating support and is thereafter removed from such areas of the surface which are not intended for current conducting or shielding</li> <li>3/04 • • the conductive material being removed mechanically, e.g. by punching</li> <li>3/06 • • the conductive material being removed chemically or electrolytically, e.g. by photo-etch process</li> <li>3/07 • • • being removed electrolytically [3]</li> <li>3/08 • • the conductive material being removed by electric discharge, e.g. by spark erosion</li> <li>3/10 • in which conductive material is applied to the insulating support in such a manner as to form the desired conductive pattern</li> <li>3/12 • • using printing techniques to apply the conductive material</li> <li>3/14 • • using spraying techniques to apply the conductive material</li> <li>3/16 • • • by cathodic sputtering</li> <li>3/18 • • using precipitation techniques to apply the conductive material</li> <li>3/20 • • by affixing prefabricated conductor pattern</li> <li>3/22 • Secondary treatment of printed circuits</li> <li>3/24 • • Reinforcing of the conductive pattern</li> <li>3/26 • • Cleaning or polishing of the conductive pattern</li> <li>3/28 • • Applying non-metallic protective coatings</li> <li>3/30 • Assembling printed circuits with electric components, e.g. with resistor</li> </ul>
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## H05K

- 3/32 • • electrically connecting electric components or wires to printed circuits
- 3/34 • • • by soldering
- 3/36 • Assembling printed circuits with other printed circuits
- 3/38 • Improvement of the adhesion between the insulating substrate and the metal [3]
- 3/40 • Forming printed elements for providing electric connections to or between printed circuits [3]
- 3/42 • • Plated through-holes [3]
- 3/44 • Manufacturing insulated metal core circuits [3]
- 3/46 • Manufacturing multi-layer circuits [3]

### 5/00 Casings, cabinets or drawers for electric apparatus (in general A47B; radio receiver cabinets H04B 1/08; television receiver cabinets H04N 5/64)

- 5/02 • Details
- 5/03 • • Covers
- 5/04 • Metal casings
- 5/06 • Hermetically-sealed casings

### 7/00 Constructional details common to different types of electric apparatus (casings, cabinets, drawers H05K 5/00)

- 7/02 • Arrangements of circuit components or wiring on supporting structure
- 7/04 • • on conductive chassis
- 7/06 • • on insulating boards
- 7/08 • • • on perforated boards
- 7/10 • • Plug-in assemblages of components
- 7/12 • • Resilient or clamping means for holding component to structure (holding two-part couplings together H01R 13/00)
- 7/14 • Mounting supporting structure in casing or on frame or rack
- 7/16 • • on hinges or pivots
- 7/18 • Construction of rack or frame
- 7/20 • Modifications to facilitate cooling, ventilating, or heating

### 9/00 Screening of apparatus or components against electric or magnetic fields (devices for absorbing radiation from an aerial H01Q 17/00)

### 10/00 Arrangements for improving the operating reliability of electronic equipment, e.g. by providing a similar stand-by unit

## Note(s)

Attention is drawn to the following appropriate places:

- G05B 9/03.....Electric redundant control systems
- G06F 11/16.....Error detection or correction of data by redundancy in digital computer hardware
- G08B 29/16.....Security signalling or alarm systems
- H02H 3/05.....Redundant emergency protective circuit arrangements
- H02J 3/38.....Arrangements for parallelly feeding a single network
- H02J 9/04.....Circuit arrangements with stand-by power supply
- H03K 19/003.....Modifications for increasing the reliability of logic circuits or inverting circuits
- H03K 19/007.....Fail-safe logic circuits or inverting circuits
- H03L 7/07.....Redundant clock signal generation in generators of electronic oscillations or pulses
- H04B 1/74.....Transmission systems using redundant channels or apparatus
- H04L 1/22.....Redundant apparatus for increasing reliability of arrangements used for the transmission of digital information.

### 11/00 Combinations of a radio or television receiver with apparatus having a different main function

- 11/02 • with vehicles

### 13/00 Apparatus or processes specially adapted for manufacturing or adjusting assemblages of electric components

- 13/02 • Feeding of components (in general B65G)
- 13/04 • Mounting of components
- 13/06 • Wiring by machine
- 13/08 • Monitoring manufacture of assemblages