

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H01 ELECTRIC ELEMENTS

(NOTES omitted)

H01G CAPACITORS; CAPACITORS, RECTIFIERS, DETECTORS, SWITCHING DEVICES, LIGHT-SENSITIVE OR TEMPERATURE-SENSITIVE DEVICES OF THE ELECTROLYTIC TYPE (selection of specified materials as dielectric [H01B 3/00](#); capacitors having potential barriers [H01L 29/00](#))

NOTE

In this subclass, group [H01G 11/00](#) takes precedence over groups [H01G 4/00](#) and [H01G 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.

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|-------------|---|--------|-----------|--|
| 2/00 | Details of capacitors not covered by a single one of groups H01G 4/00-H01G 11/00 | 4/10 | | Metal-oxide dielectrics (H01G 4/085 takes precedence)} |
| 2/02 | . Mountings | 4/105 | | {Glass dielectric} |
| 2/04 | . . specially adapted for mounting on a chassis | 4/12 | | Ceramic dielectrics (H01G 4/085 takes precedence)} |
| 2/06 | . . specially adapted for mounting on a printed-circuit support | 4/1209 | | {characterised by the ceramic dielectric material (H01G 4/1272 , H01G 4/1281 take precedence)} |
| 2/065 | . . . {for surface mounting, e.g. chip capacitors} | 4/1218 | | {based on titanium oxides or titanates (H01G 4/1245 takes precedence)} |
| 2/08 | . Cooling arrangements; Heating arrangements; Ventilating arrangements | 4/1227 | | {based on alkaline earth titanates} |
| 2/10 | . Housing; Encapsulation | 4/1236 | | {based on zirconium oxides or zirconates (H01G 4/1263 takes precedence)} |
| 2/103 | . . {Sealings, e.g. for lead-in wires; Covers} | 4/1245 | | {containing also titanates} |
| 2/106 | . . {Fixing the capacitor in a housing} | 4/1254 | | {based on niobium or tungsten, tantalum oxides or niobates, tantalates} |
| 2/12 | . Protection against corrosion (H01G 2/10 takes precedence) | 4/1263 | | {containing also zirconium oxides or zirconates} |
| 2/14 | . Protection against electric or thermal overload (by cooling H01G 2/08) | 4/1272 | | {Semiconductive ceramic capacitors} |
| 2/16 | . . with fusing elements | 4/1281 | | {with grain boundary layer} |
| 2/18 | . . with breakable contacts | 4/129 | | {containing a glassy phase, e.g. glass ceramic} |
| 2/20 | . Arrangements for preventing discharge from edges of electrodes | 4/14 | | Organic dielectrics |
| 2/22 | . Electrostatic or magnetic shielding | 4/145 | | {vapour deposited} |
| 2/24 | . Distinguishing marks, e.g. colour coding | 4/16 | | of fibrous material, e.g. paper |
| 4/00 | Fixed capacitors; Processes of their manufacture (electrolytic capacitors H01G 9/00) | 4/18 | | of synthetic material, e.g. derivatives of cellulose (H01G 4/16 takes precedence) |
| 4/002 | . Details | 4/183 | | {Derivatives of cellulose (H01G 4/145 takes precedence)} |
| 4/005 | . . Electrodes | 4/186 | | {halogenated (H01G 4/145 takes precedence)} |
| 4/008 | . . . Selection of materials | 4/20 | | using combinations of dielectrics from more than one of groups H01G 4/02 - H01G 4/06 (H01G 4/12 takes precedence) |
| 4/0085 | {Fried electrodes} | 4/203 | | {Fibrous material or synthetic material} |
| 4/01 | . . . Form of self-supporting electrodes | 4/206 | | {inorganic and synthetic material} |
| 4/012 | . . . Form of non-self-supporting electrodes | 4/22 | | impregnated |
| 4/015 | . . . Special provisions for self-healing | | | |
| 4/018 | . . Dielectrics | | | |
| 4/02 | . . . Gas or vapour dielectrics | | | |
| 4/04 | . . . Liquid dielectrics | | | |
| 4/06 | . . . Solid dielectrics | | | |
| 4/08 | Inorganic dielectrics | | | |
| 4/085 | {Vapour deposited} | | | |

- 4/221 {characterised by the composition of the impregnant}
- 4/222 {halogenated}
- 4/224 . . Housing; Encapsulation
- 4/228 . . Terminals
- 4/232 . . . electrically connecting two or more layers of a stacked or rolled capacitor
- 4/2325 {characterised by the material of the terminals}
- 4/236 . . . leading through the housing, i.e. lead-through
- 4/242 . . . the capacitive element surrounding the terminal
- 4/245 Tabs between the layers of a rolled electrode
- 4/248 . . . the terminals embracing or surrounding the capacitive element, e.g. caps ([H01G 4/252 takes precedence](#))
- 4/252 . . . the terminals being coated on the capacitive element ([H01G 4/232 takes precedence](#))
- 4/255 . . Means for correcting the capacitance value
- 4/258 . . Temperature compensation means
- 4/26 . . Folded capacitors
- 4/28 . . Tubular capacitors
- 4/30 . . Stacked capacitors ([H01G 4/33 takes precedence](#))
- 4/302 . . {obtained by injection of metal in cavities formed in a ceramic body}
- 4/304 . . {obtained from another capacitor}
- 4/306 . . {made by thin film techniques}
- 4/308 . . {made by transfer techniques}
- 4/32 . . Wound capacitors
- 4/33 . . Thin- or thick-film capacitors {(thin- or thick-film circuits [H01L 27/00](#); capacitors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof, multistep manufacturing processes therefor [H01L 28/40](#))}
- 4/35 . . Feed-through capacitors or anti-noise capacitors
- 4/38 . . Multiple capacitors, i.e. structural combinations of fixed capacitors
- 4/385 . . {Single unit multiple capacitors, e.g. dual capacitor in one coil}
- 4/40 . . Structural combinations of fixed capacitors with other electric elements, the structure mainly consisting of a capacitor, e.g. RC combinations
- 5/00 Capacitors in which the capacitance is varied by mechanical means, e.g. by turning a shaft; Processes of their manufacture**
- 5/01 . . Details
- 5/011 . . . Electrodes
- 5/012 . . . at least one of the electrodes being a displaceable liquid or powder
- 5/013 . . Dielectrics
- 5/0132 . . . {Liquid dielectrics}
- 5/0134 . . . {Solid dielectrics}
- 5/0136 {with movable electrodes}
- 5/0138 {with movable dielectrics}
- 5/014 . . Housing; Encapsulation
- 5/015 . . Current collectors
- 5/017 . . Temperature compensation
- 5/019 . . Means for correcting the capacitance characteristics
- 2005/02 . . {having air, gas, or vacuum as the dielectric}
- 5/04 . . using variation of effective area of electrode
- 5/06 . . due to rotation of flat or substantially flat electrodes
- 5/08 . . . becoming active in succession
- 5/10 . . due to rotation of helical electrodes
- 5/12 . . due to rotation of part-cylindrical, conical, or spherical electrodes
- 5/14 . . due to longitudinal movement of electrodes
- 5/145 . . . {with profiled electrodes}
- 5/16 . . using variation of distance between electrodes
- 5/18 . . due to change in inclination, e.g. by flexing, by spiral wrapping
- 5/38 . . Multiple capacitors, e.g. ganged
- 5/40 . . Structural combinations of variable capacitors with other electric elements not covered by this subclass, the structure mainly consisting of a capacitor, e.g. RC combinations
- 7/00 Capacitors in which the capacitance is varied by non-mechanical means; Processes of their manufacture**
- 7/02 . . Electrets, i.e. having a permanently-polarised dielectric
- 7/021 . . . {having an organic dielectric}
- 7/023 {of macromolecular compounds}
- 7/025 . . . {having an inorganic dielectric}
- 7/026 {with ceramic dielectric}
- 7/028 . . . {having a heterogeneous dielectric}
- 7/04 . . having a dielectric selected for the variation of its permittivity with applied temperature
- 7/06 . . having a dielectric selected for the variation of its permittivity with applied voltage, i.e. ferroelectric capacitors ([electrets H01G 7/02](#))
- 9/00 Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture**
- 9/0003 . . {Protection against electric or thermal overload; cooling arrangements; means for avoiding the formation of cathode films ([H01G 9/12 takes precedence](#))}
- 9/0029 . . {Processes of manufacture}
- 9/0032 . . . {formation of the dielectric layer}
- 9/0036 . . . {Formation of the solid electrolyte layer}
- 9/004 . . Details
- 9/008 . . Terminals
- 9/012 . . . specially adapted for solid capacitors
- 9/02 . . Diaphragms; Separators
- 9/022 . . Electrolytes; Absorbents
- 9/025 . . . Solid electrolytes ([H01G 11/54 takes precedence](#))
- 9/028 Organic semiconducting electrolytes, e.g. TCNQ
- 9/032 Inorganic semiconducting electrolytes, e.g. MnO₂
- 9/035 . . . Liquid electrolytes, e.g. impregnating materials ([H01G 11/54 takes precedence](#))
- 9/04 . . Electrodes {or formation of dielectric layers thereon}
- 9/042 . . . characterised by the material ([H01G 11/22 takes precedence](#))
- 9/0425 {specially adapted for cathode}
- 9/045 based on aluminium
- 9/048 . . . characterised by their structure ([H01G 11/22 takes precedence](#))

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| 2009/05 | {consisting of tantalum, niobium, or sintered material; Combinations of such electrodes with solid semiconductive electrolytes, e.g. manganese dioxide} | 9/2081 | . . . {Serial interconnection of cells} |
| 9/052 | Sintered electrodes | 9/2086 | . . . {Photoelectrochemical cells in the form of a fiber} |
| 9/0525 | {Powder therefor} | 9/209 | . . {Light trapping arrangements} |
| 9/055 | Etched foil electrodes | 9/2095 | . . {comprising a flexible substrate} |
| 9/06 | . . . Mounting in containers | 9/21 | . Temperature-sensitive devices |
| 9/07 | . . Dielectric layers | 9/22 | . Devices using combined reduction and oxidation, e.g. redox arrangement or solion |
| 9/08 | . . Housing; Encapsulation | 9/26 | . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices with each other |
| 9/10 | . . . Sealing, e.g. of lead-in wires | 9/28 | . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices with other electric components not covered by this subclass |
| 9/12 | . . . Vents or other means allowing expansion | | |
| 9/14 | . . Structural combinations {or circuits} for modifying, or compensating for, electric characteristics of electrolytic capacitors | | |
| 9/145 | . Liquid electrolytic capacitors (H01G 11/00 takes precedence) | 11/00 | Hybrid capacitors, i.e. capacitors having different positive and negative electrodes; Electric double-layer [EDL] capacitors; Processes for the manufacture thereof or of parts thereof |
| 9/15 | . Solid electrolytic capacitors (H01G 11/00 takes precedence) | | NOTE |
| 9/151 | . . {with wound foil electrodes} | | Group H01G 11/02 takes precedence over groups H01G 11/04 - H01G 11/14 |
| 9/153 | . . {Skin fibre} | | |
| 9/16 | . specially for use as rectifiers or detectors (H01G 9/22 takes precedence) | 11/02 | . using combined reduction-oxidation reactions, e.g. redox arrangement or solion |
| 9/18 | . Self-interrupters | 11/04 | . Hybrid capacitors |
| 9/20 | . Light-sensitive devices | 11/06 | . . with one of the electrodes allowing ions to be reversibly doped therein, e.g. lithium ion capacitors [LIC] |
| 9/2004 | . . {characterised by the electrolyte, e.g. comprising an organic electrolyte} | 11/08 | . Structural combinations, e.g. assembly or connection, of hybrid or EDL capacitors with other electric components, at least one hybrid or EDL capacitor being the main component |
| 9/2009 | . . . {Solid electrolytes} | 11/10 | . Multiple hybrid or EDL capacitors, e.g. arrays or modules (housings, cases, encapsulations or mountings thereof H01G 11/78) |
| 9/2013 | . . . {the electrolyte comprising ionic liquids, e.g. alkyl imidazolium iodide} | 11/12 | . . Stacked hybrid or EDL capacitors |
| 9/2018 | . . . {characterised by the ionic charge transport species, e.g. redox shuttles} | 11/14 | . Arrangements or processes for adjusting or protecting hybrid or EDL capacitors (emergency protective circuit arrangements specially adapted for capacitors, and effecting automatic switching in the event of an undesired change from normal working conditions H02H 7/16; emergency protective circuit arrangements for limiting excess current or voltages without disconnection H02H 9/00) |
| 9/2022 | . . {characterized by the counter electrode} | 11/16 | . . against electric overloads, e.g. including fuses |
| 9/2027 | . . {comprising an oxide semiconductor electrode} | 11/18 | . . against thermal overloads, e.g. heating, cooling or ventilating |
| 9/2031 | . . . {comprising titanium oxide, e.g. TiO ₂ (H01G 9/2036 takes precedence)} | 11/20 | . . Reformation or processes for removal of impurities, e.g. scavenging |
| 9/2036 | . . . {comprising mixed oxides, e.g. ZnO covered TiO ₂ particles} | 11/22 | . Electrodes |
| 9/204 | . . . {comprising zinc oxides, e.g. ZnO (H01G 9/2036 takes precedence)} | 11/24 | . . characterised by structural features of the materials making up or comprised in the electrodes, e.g. form, surface area or porosity; characterised by the structural features of powders or particles used therefor |
| 9/2045 | . . {comprising a semiconductor electrode comprising elements of the fourth group of the Periodic Table with or without impurities, e.g. doping materials} | 11/26 | . . characterised by their structure, e.g. multi-layered, porosity or surface features |
| 9/205 | . . {comprising a semiconductor electrode comprising AIII-BV compounds with or without impurities, e.g. doping materials} | 11/28 | . . . arranged or disposed on a current collector; Layers or phases between electrodes and current collectors, e.g. adhesives |
| 9/2054 | . . {comprising a semiconductor electrode comprising AII-BVI compounds, e.g. CdTe, CdSe, ZnTe, ZnSe, with or without impurities, e.g. doping materials (H01G 9/2027 takes precedence)} | 11/30 | . . characterised by their material |
| 9/2059 | . . {comprising an organic dye as the active light absorbing material, e.g. adsorbed on an electrode or dissolved in solution} | 11/32 | . . . Carbon-based |
| 9/2063 | . . . {comprising a mixture of two or more dyes} | | |
| 9/2068 | . . {Panels or arrays of photoelectrochemical cells, e.g. photovoltaic modules based on photoelectrochemical cells} | | |
| 9/2072 | . . . {comprising two or more photoelectrodes sensible to different parts of the solar spectrum, e.g. tandem cells} | | |
| 9/2077 | . . . {Sealing arrangements, e.g. to prevent the leakage of the electrolyte} | | |

H01G

- 11/34 characterised by carbonisation or activation of carbon
- 11/36 Nanostructures, e.g. nanofibres, nanotubes or fullerenes
- 11/38 Carbon pastes or blends; Binders or additives therein
- 11/40 Fibres
- 11/42 Powders or particles, e.g. composition thereof
- 11/44 Raw materials therefor, e.g. resins or coal
- 11/46 . . . Metal oxides
- 11/48 . . . Conductive polymers
- 11/50 . . . specially adapted for lithium-ion capacitors, e.g. for lithium-doping or for intercalation
- 11/52 . Separators
- 11/54 . Electrolytes
- 11/56 . . Solid electrolytes, e.g. gels; Additives therein
- 11/58 . . Liquid electrolytes
- 11/60 . . . characterised by the solvent
- 11/62 . . . characterised by the solute, e.g. salts, anions or cations therein
- 11/64 . . . characterised by additives
- 11/66 . Current collectors
- 11/68 . . characterised by their material
- 11/70 . . characterised by their structure
- 11/72 . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
- 11/74 . Terminals, e.g. extensions of current collectors
- 11/76 . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
- 11/78 . Cases; Housings; Encapsulations; Mountings
- 11/80 . . Gaskets; Sealings
- 11/82 . . Fixing or assembling a capacitive element in a housing, e.g. mounting electrodes, current collectors or terminals in containers or encapsulations
- 11/84 . Processes for the manufacture of hybrid or EDL capacitors, or components thereof
- 11/86 . . specially adapted for electrodes ([carbonisation or activation of carbon for the manufacture of electrodes H01G 11/34](#))
- 13/00 Apparatus specially adapted for manufacturing capacitors; Processes specially adapted for manufacturing capacitors not provided for in groups [H01G 4/00](#) - [H01G 11/00](#)**
- 13/003 . {Apparatus or processes for encapsulating capacitors}
- 13/006 . {Apparatus or processes for applying terminals}
- 13/02 . Machines for winding capacitors
- 13/04 . Drying; Impregnating
- 13/06 . with provision for removing metal surfaces
- 15/00 Structural combinations of capacitors or other devices covered by at least two different main groups of this subclass with each other (involving at least one hybrid or electric double-layer [EDL] capacitor as the main component [H01G 11/08](#))**
- 17/00 Structural combinations of capacitors or other devices covered by at least two different main groups of this subclass with other electric elements, not covered by this subclass, e.g. RC combinations**