## CPC COOPERATIVE PATENT CLASSIFICATION

### H ELECTRICITY

*(NOTE omitted)*

### H01 BASIC ELECTRIC ELEMENTS

*(NOTE omitted)*

### H01G CAPACITORS; CAPACITORS, RECTIFIERS, DETECTORS, SWITCHING DEVICES OR LIGHT-SENSITIVE DEVICES, OF THE ELECTROLYTIC TYPE (selection of specified materials as dielectric H01B 3/00; {ceramics C04B})

**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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**WARNING**

Not complete, see also H01G 4/224

| 2/03 | . . {Sealings, e.g. for lead-in wires; Covers}                                    |
| 2/06 | . . {Fixing the capacitor in a housing}                                           |
| 2/12 | . Protection against corrosion (H01G 2/10 takes precedence)                        |
| 2/14 | . Protection against electric or thermal overload (by cooling H01G 2/08)          |
| 2/16 | . . with fusing elements                                                          |
| 2/18 | . . with breakable contacts                                                       |
| 2/20 | . Arrangements for preventing discharge from edges of electrodes                  |
| 2/22 | . Electrostatic or magnetic shielding                                             |
| 2/24 | . Distinguishing marks, e.g. colour coding                                        |

### 4/00 Fixed capacitors; Processes of their manufacture (electrolytic capacitors H01G 9/00)

| 4/002 | . . Details                                                                      |
| 4/005 | . . Electrodes                                                                  |
| 4/008 | . . Selection of materials                                                      |
| 4/0085| . . {Fried electrodes}                                                          |
| 4/01 | . . Form of self-supporting electrodes                                           |
| 4/012 | . . Form of non-self-supporting electrodes                                      |
| 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}                                                        |
| 4/10 | . . . . Metal-oxide dielectrics (H01G 4/085 takes precedence)                    |

| 4/105 | . . . . {Glass dielectric}                                                     |
| 4/12 | . . . . Ceramic dielectrics (H01G 4/085 takes precedence; ceramic materials per se C04B 35/00 |
| 4/1209| . . . . {characterised by the ceramic dielectric material (H01G 4/1272, H01G 4/1281 take precedence}) |
| 4/1218| . . . . {based on titanium oxides or titanates (H01G 4/1245 takes precedence}) |
| 4/1227| . . . . {based on alkaline earth titanates}                                    |
| 4/1236| . . . . {based on zirconium oxides or zirconates (H01G 4/1263 takes precedence)} |
| 4/1245| . . . . {containing also titanates}                                            |
| 4/1254| . . . . {based on niobium or tungsten, tantalum oxides or niobates, tantalates} |
| 4/1263| . . . . {containing also zirconium oxides or zirconates}                        |
| 4/1272| . . . . {Semicontductive ceramic capacitors}                                    |
| 4/1281| . . . . {with grain boundary layer}                                            |
| 4/129 | . . . . {containing a glassy phase, e.g. glass ceramic}                          |
| 4/14 | . . . Organic dielectrics                                                       |
| 4/145 | . . . {vapour deposited}                                                       |
| 4/16 | . . . of fibrous material, e.g. paper                                           |
| 4/18 | . . . of synthetic material, e.g. derivatives of cellulose (H01G 4/16 takes precedence) |
| 4/183 | . . . {Derivatives of cellulose (H01G 4/145 takes precedence)}                 |
| 4/186 | . . . {halogenated (H01G 4/145 takes precedence)}                               |
| 4/20 | . . . using combinations of dielectrics from more than one of groups H01G 4/02 - H01G 4/06 (H01G 4/12 takes precedence) |
| 4/203 | . . . {Fibrous material or synthetic material}                                 |
| 4/206 | . . . {inorganic and synthetic material}                                       |
| 4/22 | . . . impregnated                                                              |
| 4/221 | . . . {characterised by the composition of the impregnant}                      |
| 4/222 | . . . {halogenated}                                                            |
| 4/224 | . . . Housing; Encapsulation                                                   |
| 4/228 | . . . Terminals                                                                |
... electrically connecting two or more layers of a stacked or rolled capacitor

[characterised by the material of the terminals]

leading through the housing, i.e. lead-through

capacitive element surrounding the terminal

Tabs between the layers of a rolled electrode

the terminals embracing or surrounding the capacitive element, e.g. caps (H01G 4/252 takes precedence)

the terminals being coated on the capacitive element (H01G 4/232 takes precedence)

Means for correcting the capacitance value

Temperature compensation means

Folded capacitors

Tubular capacitors

Stacked capacitors (H01G 4/33 takes precedence)

{obtained by injection of metal in cavities formed in a ceramic body}

{obtained from another capacitor}

{made by thin film techniques}

{made by transfer techniques}

Wound capacitors

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))

Feed-through capacitors or anti-noise capacitors

Multiple capacitors, i.e. structural combinations of fixed capacitors

{Single unit multiple capacitors, e.g. dual capacitor in one coil}

{Liquid dielectrics}

{Solid dielectrics}

{with movable electrodes}

{with movable dielectrics}

Housing; Encapsulation

Current collectors

Temperature compensation

Means for correcting the capacitance characteristics

[IPC5 having air, gas, or vacuum as the dielectric]

using variation of effective area of electrode

due to rotation of flat or substantially flat electrodes

becoming active in succession

due to rotation of helical electrodes

due to rotation of part-cylindrical, conical, or spherical electrodes

due to longitudinal movement of electrodes

{with profiled electrodes}

using variation of distance between electrodes

due to change in inclination, e.g. by flexing, by spiral wrapping

Multiple capacitors, e.g. ganged

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 (RC-filters H03H)

Capacitors in which the capacitance is varied by non-mechanical means; Processes of their manufacture (capacitors with potential jump or surface barrier H01L 29/00)

Electrets, i.e. having a permanently-polarised dielectric

{having an organic dielectric}

{of macromolecular compounds}

{having an inorganic dielectric}

{with ceramic dielectric}

{having a heterogeneous dielectric}

having a dielectric selected for the variation of its permittivity with applied temperature

having a dielectric selected for the variation of its permittivity with applied voltage, i.e. ferroelectric capacitors (electrets H01G 7/02)

Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture

Protection against electric or thermal overload; cooling arrangements; means for avoiding the formation of cathode films (H01G 9/12 takes precedence)

{Double layer capacitors}

{Temperature sensitive devices}

{Solid electrolytic capacitors}

{with wound foil electrodes}

{Skin fibre}

{Liquid electrolytic capacitors}

{Processes of manufacture}

{formation of the dielectric layer (anodisation in general C25D)}

{Formation of the solid electrolyte layer}

Details

Terminals

specially adapted for solid capacitors

{specially adapted for double-layer capacitors}

{Diaphragms; Separators}

Electrolytes, absorbents (electrolytic or electrophoretic processes, apparatus therefor C25; for primary, secondary or fuel cells H01M)

Solid electrolytes (H01G 11/54 takes precedence)

Organic semiconducting electrolytes, e.g. TCNQ

Inorganic semiconducting electrolytes, e.g. MnO₂

Liquid electrolytes, e.g. impregnating materials (H01G 11/54 takes precedence)
H01G

9/038 . . . [Electrolytes specially adapted for double-layer capacitors]

WARNING
This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to group H01G 11/54

9/04 . . . Electrodes [or formation of dielectric layers thereon]

2009/0404 . . . [characterised by the material (alloys in general see C22C)]
2009/0408 . . . [on Al basis]
2009/0412 . . . [characterised by the structure]
2009/0416 . . . [Etched foil electrodes (etching of metal in general C23F; electro-etching of metal in general C25F)]

9/042 . . . characterised by the material (H01G 11/22 takes precedence)
9/0425 . . . [specially adapted for cathode]
9/045 . . . based on aluminum
9/048 . . . characterised by their structure (H01G 11/22 takes precedence)

2009/05 . . . [consisting of tantalum, niobium, or sintered material; Combinations of such electrodes with solid semiconductive electrolytes, e.g. manganese dioxide]
9/052 . . . Sintered electrodes
9/0525 . . . [Powder therefor (metallic powder in general B22F)]
9/055 . . . Etched foil electrodes
9/058 . . . [specially adapted for double-layer capacitors]

WARNING
This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to group H01G 11/22

9/06 . . . Mounting in containers

9/07 . . . Dielectric layers
9/08 . . . Housing; Encapsulation
9/10 . . . Sealing, e.g. of lead-in wires
9/12 . . . Vents or other means allowing expansion
9/14 . . . Structural combinations [or circuits] for modifying, or compensating for, electric characteristics of electrolytic capacitors (impedance networks H03H)

9/145 . . . Liquid electrolytic capacitors (H01G 11/00 takes precedence)
9/15 . . . Solid electrolytic capacitors (H01G 11/00 takes precedence)
9/151 . . . [with wound foil electrodes]
9/153 . . . [Skin fibre]

9/155 . . . [Double-layer capacitors]

WARNING
This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to group H01G 11/00 and its subgroups

9/16 . . . specially for use as rectifiers or detectors (H01G 9/22 takes precedence)
9/18 . . . Self-interrupters
9/20 . . . Light-sensitive devices
9/2004 . . . [characterised by the electrolyte, e.g. comprising an organic electrolyte]
9/2009 . . . [Solid electrolytes]
9/2013 . . . [the electrolyte comprising ionic liquids, e.g. alkyl imidazolium iodide]
9/2018 . . . [characterised by the ionic charge transport species, e.g. redox shuttles]
9/2022 . . . [characterised by the counter electrode]
9/2027 . . . [comprising an oxide semiconductor electrode]
9/2031 . . . [comprising titanium oxide, e.g. TiO₂ (H01G 9/2036 takes precedence)]
9/2036 . . . [comprising mixed oxides, e.g. ZnO covered TiO₂ particles]
9/204 . . . [comprising zinc oxides, e.g. ZnO (H01G 9/2036 takes precedence)]
9/2045 . . . [comprising a semiconductor electrode comprising elements of the fourth group of the Periodic System (C, Si, Ge, Sn, Pb) with or without impurities, e.g. doping materials]
9/205 . . . [comprising a semiconductor electrode comprising AlIII-BV compounds with or without impurities, e.g. doping materials]
9/2054 . . . [comprising a semiconductor electrode comprising AlIII-BVI compounds, e.g. CdTe, CdSe, ZnTe, ZnSe, with or without impurities, e.g. doping materials (H01G 9/2027 takes precedence)]
9/2059 . . . [comprising an organic dye as the active light absorbing material, e.g. adsorbed on an electrode or dissolved in solution]
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]
9/2081 . . . [Serial interconnection of cells]
9/2086 . . . [Photoelectrochemical cells in the form of a fiber]
9/209 . . . [Light trapping arrangements]
9/2095 . . . [comprising a flexible sustrate]
9/21 . . . Temperature-sensitive devices
9/22 . . . Devices using combined reduction and oxidation, e.g. redox arrangement or solion
9/26 . . . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices with each other
11/00 Hybrid capacitors, i.e. capacitors having different positive and negative electrodes; Electric double-layer (EDL) capacitors [EDLCs]; Processes specially adapted for the manufacture thereof or of parts thereof

**NOTE**

Group H01G 11/02 takes precedence over groups H01G 11/04 - H01G 11/14

**WARNING**

Groups H01G 11/00 - H01G 11/86 are incomplete pending reclassification of documents from groups H01M 12/00 and H01M 12/005. All groups listed in this Warning should be considered in order to perform a complete search.

11/02 . . . using combined reduction-oxidation reactions, e.g. redox arrangement or solion
11/04 . . . Hybrid capacitors
11/06 . . . with one of the electrodes allowing ions or anions to be reversibly doped thereinto, e.g. lithium-ion capacitors [LICs]
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
11/10 . . . Multiple hybrid or EDL capacitors, e.g. arrays or modules (housings, cases or mountings thereof H01G 11/78)
11/12 . . . Stacked hybrid or EDL capacitors
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)
11/16 . . . against electric overloads, e.g. including fuses
11/18 . . . against thermal overloads, e.g. heating, cooling or ventilating
11/20 . . . Reformation or processes for removal of impurities, e.g. scavenging
11/22 . . . Electrodes
11/24 . . . characterised by structural features, e.g. forms, shapes, surface areas, porosities or dimensions, of the materials making up or comprised in the electrodes; characterised by the structural features of powders or particles used therefor
11/26 . . . characterised by the structures of the electrodes, e.g. multi-layered, shapes, dimensions, porosities or surface features
11/28 . . . arranged or disposed on a current collector; Layers or phases between electrodes and current collectors, e.g. adhesives
11/30 . . . characterised by their materials
11/32 . . . Carbon-based, e.g. activated carbon materials
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, e.g. ruthenium oxide
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 materials
11/70 . . . . . . . . characterised by their structures
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]
13/007 . . . Machines for winding capacitors (winding in general B65H)
13/04 . . . Drying (in general F26B); 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 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 (thin- or thick-film circuits H01L 27/00; RC-filters H03H)