

# CPC COOPERATIVE PATENT CLASSIFICATION

## H ELECTRICITY

(NOTE omitted)

## H01 ELECTRIC ELEMENTS

(NOTES omitted)

## H01C RESISTORS

### NOTES

1. In this subclass, the term "adjustable" means mechanically adjustable.
2. Variable resistors, the value of which is changed non-mechanically, e.g. by voltage or temperature, are classified in group [H01C 7/00](#).

### 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.

|             |   |             |   |
|-------------|---|-------------|---|
| <b>1/00</b> | <b>Details</b>  | 1/14        | • Terminals or tapping points {or electrodes} specially adapted for resistors (in general <a href="#">H01R</a> ); Arrangements of terminals or tapping points {or electrodes} on resistors              |
| 1/01        | • Mounting; Supporting  | 1/1406      | • • {Terminals or electrodes formed on resistive elements having positive temperature coefficient}  |
| 1/012       | • • the base extending along and imparting rigidity or reinforcement to the resistive element ( <a href="#">H01C 1/016</a> takes precedence; the resistive element being formed in two or more coils or loops as a spiral, helical or toroidal winding <a href="#">H01C 3/18</a> , <a href="#">H01C 3/20</a> ; the resistive element being formed as one or more layers or coatings on a base <a href="#">H01C 7/00</a> ) | 1/1413      | • • {Terminals or electrodes formed on resistive elements having negative temperature coefficient}  |
| 1/014       | • • the resistor being suspended between and being supported by two supporting sections ( <a href="#">H01C 1/016</a> takes precedence)  | 1/142       | • • the terminals or tapping points being coated on the resistive element   |
| 1/016       | • • with compensation for resistor expansion or contraction   | 1/144       | • • the terminals or tapping points being welded or soldered  |
| 1/02        | • Housing; Enclosing; Embedding; Filling the housing or enclosure   | 1/146       | • • the resistive element surrounding the terminal  |
| 1/022       | • • the housing or enclosure being openable or separable from the resistive element   | 1/148       | • • the terminals embracing or surrounding the resistive element ( <a href="#">H01C 1/142</a> takes precedence)   |
| 1/024       | • • the housing or enclosure being hermetically sealed ( <a href="#">H01C 1/028</a> , <a href="#">H01C 1/032</a> , <a href="#">H01C 1/034</a> take precedence)  | 1/16        | • Resistor networks not otherwise provided for  |
| 1/026       | • • • with gaseous or vacuum spacing between the resistive element and the housing or casing  | <b>3/00</b> | <b>Non-adjustable metal resistors made of wire or ribbon, e.g. coiled, woven or formed as grids</b>   |
| 1/028       | • • the resistive element being embedded in insulation with outer enclosing sheath  | 3/005       | • {Metallic glasses therefor}   |
| 1/03        | • • • with powdered insulation  | 3/02        | • arranged or constructed for reducing self-induction, capacitance or variation with frequency  |
| 1/032       | • • plural layers surrounding the resistive element ( <a href="#">H01C 1/028</a> takes precedence)  | 3/04        | • Iron-filament ballast resistors; Other resistors having variable temperature coefficient  |
| 1/034       | • • the housing or enclosure being formed as coating or mould without outer sheath ( <a href="#">H01C 1/032</a> takes precedence)   | 3/06        | • Flexible or folding resistors, whereby such a resistor can be looped or collapsed upon itself   |
| 1/036       | • • • on wound resistive element  | 3/08        | • Dimension or characteristic of resistive element changing gradually or in discrete steps from one terminal to another   |
| 1/04        | • Arrangements of distinguishing marks, e.g. colour coding  | 3/10        | • the resistive element having zig-zag or sinusoidal configuration  |
| 1/06        | • Electrostatic or electromagnetic shielding arrangements   | 3/12        | • • lying in one plane  |
| 1/08        | • Cooling, heating or ventilating arrangements  | 3/14        | • the resistive element being formed in two or more coils or loops continuously wound as a spiral, helical or toroidal winding ( <a href="#">H01C 3/02</a> - <a href="#">H01C 3/12</a> take precedence) |
| 1/082       | • • using forced fluid flow   | 3/16        | • • including two or more distinct wound elements or two or more winding patterns   |
| 1/084       | • • using self-cooling, e.g. fins, heat sinks   | 3/18        | • • wound on a flat or ribbon base ( <a href="#">H01C 3/16</a> takes precedence)  |
| 1/12        | • Arrangements of current collectors  |             |   |
| 1/125       | • • of fluid contacts   |             |   |

- 3/20 . . wound on cylindrical or prismatic base  
([H01C 3/16](#) takes precedence)
- 7/00 Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material (consisting of loose powdered or granular material [H01C 8/00](#); resistors having potential barriers, e.g. field-effect resistors, [H10D 1/40](#) - [H10D 1/43](#), [H10K 10/10](#); semiconductor devices sensitive to electromagnetic or corpuscular radiation, e.g. photoresistors, [H10F 30/00](#); magnetic field controlled resistors [H10N 50/10](#); bulk negative resistance effect devices [H10N 80/00](#))**
- 7/001 . {Mass resistors}
- 7/003 . {Thick film resistors}
- 7/005 . . {Polymer thick films}
- 7/006 . {Thin film resistors}
- 7/008 . {Thermistors ([H01C 7/02](#) - [H01C 7/06](#) take precedence)}
- 7/02 . having positive temperature coefficient {(ceramics [C04B](#))}
- 7/021 . . {formed as one or more layers or coatings}
- 7/022 . . {mainly consisting of non-metallic substances ([H01C 7/021](#) takes precedence)}
- 7/023 . . . {containing oxides or oxidic compounds, e.g. ferrites}
- 7/025 . . . . {Perovskites, e.g. titanates}
- 7/026 . . . . {Vanadium oxides or oxidic compounds, e.g. VOx}
- 7/027 . . {consisting of conducting or semi-conducting material dispersed in a non-conductive organic material}
- 7/028 . . {consisting of organic substances}
- 7/04 . having negative temperature coefficient {(thermometers using resistive elements [G01K 7/16](#))}
- NOTE**
- {In groups [H01C 7/043](#) - [H01C 7/049](#), the last place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the last appropriate place.}
- 7/041 . . {formed as one or more layers or coatings}
- 7/042 . . {mainly consisting of inorganic non-metallic substances ([H01C 7/041](#) takes precedence)}
- 7/043 . . . {Oxides or oxidic compounds}
- 7/044 . . . . {Zinc or cadmium oxide}
- 7/045 . . . . {Perovskites, e.g. titanates}
- 7/046 . . . . {Iron oxides or ferrites}
- 7/047 . . . . {Vanadium oxides or oxidic compounds, e.g. VOx}
- 7/048 . . . {Carbon or carbides}
- 7/049 . . {mainly consisting of organic or organo-metal substances ([H01C 7/041](#) takes precedence)}
- 7/06 . including means to minimise changes in resistance with changes in temperature
- 7/10 . voltage responsive, i.e. varistors
- 7/1006 . . {Thick film varistors}
- 7/1013 . . {Thin film varistors}
- 7/102 . . Varistor boundary, e.g. surface layers ([H01C 7/12](#) takes precedence)
- 7/105 . . Varistor cores ([H01C 7/12](#) takes precedence)
- 7/108 . . . Metal oxide
- 7/112 . . . . ZnO type
- 7/115 . . . . Titanium dioxide- or titanate type
- 7/118 . . . Carbide, e.g. SiC type
- 7/12 . . Overvoltage protection resistors {(series resistors structurally associated with spark gaps [H01T 1/16](#))}
- 7/123 . . . {Arrangements for improving potential distribution}
- 7/126 . . . {Means for protecting against excessive pressure or for disconnecting in case of failure}
- 7/13 . current responsive
- NOTE**
- Groups [H01C 7/02](#) - [H01C 7/13](#) take precedence over groups [H01C 7/18](#) - [H01C 7/22](#).
- 7/18 . comprising a plurality of layers stacked between terminals
- 7/20 . the resistive layer or coating being tapered
- 7/22 . Elongated resistive element being bent or curved, e.g. sinusoidal, helical
- 8/00 Non-adjustable resistors consisting of loose powdered or granular conducting, or powdered or granular semi-conducting material**
- 8/02 . Coherers or like imperfect resistors for detecting electromagnetic waves
- 8/04 . Overvoltage protection resistors; Arresters
- 10/00 Adjustable resistors**
- 10/005 . {Surface mountable, e.g. chip trimmer potentiometer}
- 10/02 . Liquid resistors
- 10/025 . . {Electrochemical variable resistors (trimming resistors by electrolytic treatment [H01C 17/2412](#), [H01C 17/262](#))}
- 10/04 . with specified mathematical relationship between movement of resistor actuating means and value of resistance, other than direct proportional relationship
- 10/06 . adjustable by short-circuiting different amounts of the resistive element
- 10/08 . . with intervening conducting structure between the resistive element and the short-circuiting means, e.g. taps
- 10/10 . adjustable by mechanical pressure or force
- 10/103 . . {by using means responding to magnetic or electric fields, e.g. by addition of magnetisable or piezoelectric particles to the resistive material, or by an electromagnetic actuator}
- 10/106 . . {on resistive material dispersed in an elastic material ([H01C 10/103](#) and [H01C 10/12](#) take precedence; for electric switches [H01H 1/029](#))}
- 10/12 . . by changing surface pressure between resistive masses or resistive and conductive masses, e.g. pile type
- 10/14 . adjustable by auxiliary driving means
- 10/16 . including plural resistive elements
- 10/18 . . including coarse and fine resistive elements
- 10/20 . . Contact structure or movable resistive elements being ganged

- 10/22 . resistive element dimensions changing gradually in one direction, e.g. tapered resistive element ([H01C 10/04](#) takes precedence)
- 10/23 . resistive element dimensions changing in a series of discrete, progressive steps
- 10/24 . the contact moving along turns of a helical resistive element, or vice versa
- 10/26 . resistive element moving ([H01C 10/16](#), [H01C 10/24](#) take precedence)
- NOTE**  
Groups [H01C 10/02](#) - [H01C 10/26](#) take precedence over groups [H01C 10/28](#) - [H01C 10/50](#).
- 10/28 . the contact rocking or rolling along resistive element or taps
- 10/30 . the contact sliding along resistive element
- 10/301 . . {consisting of a wire wound resistor}
- 10/303 . . . {the resistor being coated, e.g. lubricated, conductive plastic coated, i.e. hybrid potentiometer}
- 10/305 . . {consisting of a thick film}
- 10/306 . . . {Polymer thick film, i.e. PTF}
- 10/308 . . {consisting of a thin film}
- 10/32 . . the contact moving in an arcuate path
- 10/34 . . . the contact or the associated conducting structure riding on collector formed as a ring or portion thereof
- 10/345 . . . . {the collector and resistive track being situated in 2 parallel planes}
- 10/36 . . . structurally combined with switching arrangements
- 10/363 . . . . {by axial movement of the spindle, e.g. pull-push switch ([H01C 10/366](#) takes precedence)}
- 10/366 . . . . {using an electromagnetic actuator}
- 10/38 . . the contact moving along a straight path
- 10/40 . . . screw operated
- 10/42 . . . . the contact bridging and sliding along resistive element and parallel conducting bar or collector
- 10/44 . . . the contact bridging and sliding along resistive element and parallel conducting bar or collector ([H01C 10/42](#) takes precedence)
- 10/46 . Arrangements of fixed resistors with intervening connectors, e.g. taps ([H01C 10/28](#), [H01C 10/30](#) take precedence)
- 10/48 . . including contact movable in an arcuate path
- 10/50 . structurally combined with switching arrangements ([H01C 10/36](#) takes precedence)
- 11/00 Non-adjustable liquid resistors**
- 13/00 Resistors not provided for elsewhere**
- 13/02 . Structural combinations of resistors ([impedance networks per se H03H](#))
- 17/00 Apparatus or processes specially adapted for manufacturing resistors (providing fillings for housings or enclosures [H01C 1/02](#); reducing insulation surrounding a resistor to powder [H01C 1/03](#); manufacture of thermally variable resistors [H01C 7/02](#), [H01C 7/04](#))**
- 17/003 . {using lithography, e.g. photolithography (lithographic compositions and processing in general [G03F](#))}
- 17/006 . {adapted for manufacturing resistor chips}
- 17/02 . adapted for manufacturing resistors with envelope or housing
- 17/04 . adapted for winding the resistive element
- 17/06 . adapted for coating resistive material on a base
- 17/065 . . by thick film techniques, e.g. serigraphy
- 17/06506 . . . {Precursor compositions thereof, e.g. pastes, inks, glass frits}
- 17/06513 . . . . {characterised by the resistive component}
- 17/0652 . . . . . {containing carbon or carbides}
- 17/06526 . . . . . {composed of metals}
- 17/06533 . . . . . {composed of oxides}
- 17/0654 . . . . . {Oxides of the platinum group}
- 17/06546 . . . . . {Oxides of zinc or cadmium}
- 17/06553 . . . . . {composed of a combination of metals and oxides}
- 17/0656 . . . . . {composed of silicides ([H01C 17/0652](#) takes precedence)}
- 17/06566 . . . . . {composed of borides ([H01C 17/0652](#) takes precedence)}
- 17/06573 . . . . {characterised by the permanent binder}
- 17/0658 . . . . . {composed of inorganic material}
- 17/06586 . . . . . {composed of organic material}
- 17/06593 . . . . {characterised by the temporary binder}
- 17/07 . . by resistor foil bonding, e.g. cladding
- 17/075 . . by thin film techniques ([H01C 17/20](#) takes precedence)}
- 17/08 . . . by vapour deposition
- 17/10 . . . by flame spraying
- 17/12 . . . by sputtering
- 17/14 . . . by chemical deposition
- 17/16 . . . . using electric current
- 17/18 . . . . without using electric current
- 17/20 . . by pyrolytic processes
- 17/22 . adapted for trimming
- 17/23 . . by opening or closing resistor geometric tracks of predetermined resistive values, {e.g. snapistors}
- 17/232 . . Adjusting the temperature coefficient; Adjusting value of resistance by adjusting temperature coefficient of resistance
- 17/235 . . Initial adjustment of potentiometer parts for calibration
- 17/24 . . by removing or adding resistive material ([H01C 17/23](#), [H01C 17/232](#), [H01C 17/235](#) take precedence)
- 17/2404 . . . {by charged particle impact, e.g. by electron or ion beam milling, sputtering, plasma etching}
- 17/2408 . . . {by pulsed voltage erosion, e.g. spark erosion}
- 17/2412 . . . {by electrolytic treatment, e.g. electroplating (for anodic oxydation [H01C 17/262](#))}
- 17/2416 . . . {by chemical etching}
- 17/242 . . . by laser {(trimming by laser in general [B23K 26/351](#))}
- 17/245 . . . by mechanical means, e.g. sand blasting, cutting, ultrasonic treatment
- 17/26 . . by converting resistive material
- 17/262 . . . {by electrolytic treatment, e.g. anodic oxydation}

## H01C

- 17/265 . . . {by chemical or thermal treatment, e.g. oxydation, reduction, annealing ([etching H01C 17/2416](#))}
- 17/267 . . . . {by passage of voltage pulses or electric current}
- 17/28 . . adapted for applying terminals
- 17/281 . . {by thick film techniques}
- 17/283 . . . {Precursor compositions therefor, e.g. pastes, inks, glass frits}
- 17/285 . . . . {applied to zinc or cadmium oxide resistors}
- 17/286 . . . . {applied to TiO<sub>2</sub> or titanate resistors}
- 17/288 . . {by thin film techniques}
- 17/30 . . adapted for baking