

CPC**COOPERATIVE PATENT CLASSIFICATION****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](#).

H01C 1/00**Details****H01C 1/01**

- Mounting; Supporting

H01C 1/012

- the base extending along and imparting rigidity or reinforcement to the resistive element ([H01C 1/016 takes precedence](#); the resistive element being formed in two or more coils or loops as a spiral, helical or toroidal winding [H01C 3/18](#), [H01C 3/20](#); the resistive element being formed as one or more layers or coatings on a base [H01C 7/00](#))

H01C 1/014

- the resistor being suspended between and being supported by two supporting sections ([H01C 1/016 takes precedence](#))

H01C 1/016

- with compensation for resistor expansion or contraction

H01C 1/02

- Housing; Enclosing; Embedding; Filling the housing or enclosure

H01C 1/022

- the housing or enclosure being openable or separable from the resistive element

H01C 1/024

- the housing or enclosure being hermetically sealed ([H01C 1/028](#), [H01C 1/032](#), [H01C 1/034 take precedence](#))

H01C 1/026

- with gaseous or vacuum spacing between the resistive element and the housing or casing

H01C 1/028

- the resistive element being embedded in insulation with outer enclosing sheath

H01C 1/03

- with powdered insulation

H01C 1/032

- plural layers surrounding the resistive element ([H01C 1/028 takes precedence](#))

H01C 1/034

- the housing or enclosure being formed as coating or mold without outer sheath ([H01C 1/032 takes precedence](#))

H01C 1/036

- on wound resistive element

H01C 1/04

- Arrangements of distinguishing marks, e.g. colour coding

H01C 1/06

- Electrostatic or electromagnetic shielding arrangements

H01C 1/08

- Cooling, heating or ventilating arrangements

H01C 1/082

- using forced fluid flow

H01C 1/084

- using self-cooling, e.g. fins, heat sinks

H01C 1/12

- Arrangements of current collectors

H01C 1/125

- of fluid contacts

H01C 1/14

- Terminals or tapping points {or electrodes} specially adapted for resistors ([in general H01R](#)); Arrangements of terminals or tapping points {or electrodes} on resistors

- H01C 1/1406
 - {Terminals or electrodes formed on resistive elements having positive temperature coefficient}
- H01C 1/1413
 - {Terminals or electrodes formed on resistive elements having negative temperature coefficient}
- H01C 1/142
 - the terminals or tapping points being coated on the resistive element
- H01C 1/144
 - the terminals or tapping points being welded or soldered
- H01C 1/146
 - the resistive element surrounding the terminal
- H01C 1/148
 - the terminals embracing or surrounding the resistive element ([H01C 1/142 takes precedence](#))
- H01C 1/16
 - Resistor networks not otherwise provided for
- H01C 3/00**

Non-adjustable metal resistors made of wire or ribbon, e.g. coiled, woven or formed as grids
- H01C 3/005
 - {Metallic glasses therefor}
- H01C 3/02
 - arranged or constructed for reducing self-induction, capacitance or variation with frequency
- H01C 3/04
 - Iron-filament ballast resistors; Other resistors having variable temperature coefficient
- H01C 3/06
 - Flexible or folding resistors, whereby such a resistor can be looped or collapsed upon itself
- H01C 3/08
 - Dimension or characteristic of resistive element changing gradually or in discrete steps from one terminal to another
- H01C 3/10
 - the resistive element having zig-zag or sinusoidal configuration
- H01C 3/12
 - Lying in one plane
- H01C 3/14
 - the resistive element being formed in two or more coils or loops continuously wound as a spiral, helical or toroidal winding ([H01C 3/02 - H01C 3/12 take precedence](#))
- H01C 3/16
 - including two or more distinct wound elements or two or more winding patterns
- H01C 3/18
 - wound on a flat or ribbon base ([H01C 3/16 takes precedence](#))
- H01C 3/20
 - wound on cylindrical or prismatic base ([H01C 3/16 takes precedence](#))
- H01C 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](#); {measuring deformation in a solid state using the change in resistance formed by printed-circuit technique [G01B 7/20](#); insulating materials [H01B 3/00](#); passive thin-film or thick-film semiconductor or solid state devices [H01L 27/00](#); resistors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof, multistep manufacturing processes therefor [H01L 28/20](#); resistors with a potential-jump barrier or surface barrier, e.g. field effect resistors [H01L 29/00](#); semiconductor devices sensitive to electro-magnetic or corpuscular radiation, e.g. photoresistors, [H01L 31/00](#); devices using superconductivity [H01L 39/00](#); devices using galvanomagnetic or similar magnetic effects, e.g. magnetic-field-controlled resistors, [H01L 43/00](#); solid state devices for rectifying, amplifying, oscillating or switching without a potential-jump barrier or surface barrier [H01L 45/00](#); bulk negative resistance effect devices [H01L 47/00](#); {ohmic resistance heating [H05B 3/00](#); printed circuits [H05K](#)})

- H01C 7/001 . {Mass resistors}
- H01C 7/003 . {Thick film resistors}
- H01C 7/005 . . {Polymer thick films}
- H01C 7/006 . {Thin film resistors}
- H01C 7/008 . {Thermistors ([H01C 7/02](#) - [H01C 7/06](#) take precedence)}
- H01C 7/02 . having positive temperature coefficient {(ceramics [C04B](#))}
- H01C 7/021 . . {formed as one or more layers or coatings}
- H01C 7/022 . . {mainly consisting of non-metallic substances ([H01C 7/021](#) takes precedence)}
- H01C 7/023 . . . {containing oxides or oxidic compounds, e.g. ferrites}
- H01C 7/025 {Perovskites, e.g. titanates}
- H01C 7/026 {Vanadium oxides or oxidic compounds, e.g. VOx}
- H01C 7/027 . . {consisting of conducting or semi-conducting material dispersed in a non-conductive organic material}
- H01C 7/028 . . {consisting of organic substances}
- H01C 7/04 . having negative temperature coefficient {(thermometers using resistive elements [G01K 7/16](#))}
- H01C 7/041 . . {formed as one or more layers or coatings}
- H01C 7/042 . . {mainly consisting of inorganic non-metallic substances ([H01C 7/041](#) takes precedence)}

NOTE

In groups [H01C 7/043](#) - [H01C 7/049](#), in the absence of an indication to the contrary, classification is made in the last appropriate place

- H01C 7/043 . . . {Oxides or oxidic compounds}
- H01C 7/044 {Zinc or cadmium oxide}
- H01C 7/045 {Perovskites, e.g. titanates}
- H01C 7/046 {Iron oxides or ferrites}
- H01C 7/047 {Vanadium oxides or oxidic compounds, e.g. VOx}
- H01C 7/048 . . . {Carbon or carbides}
- H01C 7/049 . . {mainly consisting of organic or organo-metal substances ([H01C 7/041](#) takes precedence)}
- H01C 7/06 . including means to minimise changes in resistance with changes in temperature
- H01C 7/10 . voltage responsive, i.e. varistors
- H01C 7/1006 . . {Thick film varistors}
- H01C 7/1013 . . {Thin film varistors}
- H01C 7/102 . . Varistor boundary, e.g. surface layers ([H01C 7/12](#) takes precedence)
- H01C 7/105 . . Varistor cores ([H01C 7/12](#) takes precedence)
- H01C 7/108 . . . Metal oxide
- H01C 7/112 ZnO type
- H01C 7/115 Titanium dioxide- or titanate type
- H01C 7/118 . . . Carbide, e.g. SiC type

- H01C 7/12
 - . . . Overvoltage protection resistors {(series resistors structurally associated with spark gaps [H01T 1/16](#))}
 - H01C 7/123
 - . . . {Arrangements for improving potential distribution}
 - H01C 7/126
 - . . . {Means for protecting against excessive pressure or for disconnecting in case of failure}
 - H01C 7/13
 - current responsive
- NOTE**
- Groups [H01C 7/02](#) - [H01C 7/13](#) take precedence over groups [H01C 7/18](#) - [H01C 7/22](#).
- H01C 7/18
 - comprising a plurality of layers stacked between terminals
 - H01C 7/20
 - the resistive layer or coating being tapered
 - H01C 7/22
 - Elongated resistive element being bent or curved, e.g. sinusoidal, helical
- H01C 8/00** **Non-adjustable resistors consisting of loose powdered or granular conducting, or powdered or granular semi-conducting material**
- H01C 8/02
 - Coherers or like imperfect resistors for detecting electromagnetic waves
 - H01C 8/04
 - Overvoltage protection resistors; Arresters
- H01C 10/00** **Adjustable resistors**
- H01C 10/005
 - {Surface mountable, e.g. chip trimmer potentiometer}
 - H01C 10/02
 - Liquid resistors
 - H01C 10/025
 - . . {Electrochemical variable resistors (trimming resistors by electrolytic treatment [H01C 17/2412](#), [H01C 17/262](#))}
 - H01C 10/04
 - with specified mathematical relationship between movement of resistor actuating means and value of resistance, other than direct proportional relationship
 - H01C 10/06
 - adjustable by short-circuiting different amounts of the resistive element
 - H01C 10/08
 - . . with intervening conducting structure between the resistive element and the short-circuiting means, e.g. taps
 - H01C 10/10
 - adjustable by mechanical pressure of force
 - H01C 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}
 - H01C 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](#))}
 - H01C 10/12
 - . . by changing surface pressure between resistive masses or resistive and conductive masses, e.g. pile type
 - H01C 10/14
 - adjustable by auxiliary driving means
 - H01C 10/16
 - including plural resistive elements
 - H01C 10/18
 - . . including coarse and fine resistive elements
 - H01C 10/20
 - . . Contact structure or movable resistive elements being ganged
 - H01C 10/22
 - resistive element dimensions changing gradually in one direction, e.g. tapered resistive element ([H01C 10/04](#) takes precedence)
 - H01C 10/23
 - resistive element dimensions changing in a series of discrete, progressive steps

- H01C 10/24 . the contact moving along turns of a helical resistive element, or vice versa
- H01C 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](#).
- H01C 10/28 . the contact rocking or rolling along resistive element or taps
- H01C 10/30 . the contact sliding along resistive element
- H01C 10/301 . . {consisting of a wire wound resistor}
- H01C 10/303 . . . {the resistor being coated, e.g. lubricated, conductive plastic coated, i.e. hybrid potentiometer}
- H01C 10/305 . . {consisting of a thick film}
- H01C 10/306 . . . {Polymer thick film, i.e. PTF}
- H01C 10/308 . . {consisting of a thin film}
- H01C 10/32 . . the contact moving in an arcuate path
- H01C 10/34 . . . the contact or the associated conducting structure riding on collector formed as a ring or portion thereof
- H01C 10/345 {the collector and resistive track being situated in 2 parallel planes}
- H01C 10/36 . . . structurally combined with switching arrangements
- H01C 10/363 {by axial movement of the spindle, e.g. pull-push switch ([H01C 10/366](#) takes precedence)}
- H01C 10/366 {using an electromagnetic actuator}
- H01C 10/38 . . the contact moving along a straight path
- H01C 10/40 . . . screw operated
- H01C 10/42 the contact bridging and sliding along resistive element and parallel conducting bar or collector
- H01C 10/44 . . . the contact bridging and sliding along resistive element and parallel conducting bar or collector ([H01C 10/42](#) takes precedence)
- H01C 10/46 . Arrangements of fixed resistors with intervening connectors, e.g. taps ([H01C 10/28](#), [H01C 10/30](#) take precedence)
- H01C 10/48 . . including contact movable in an arcuate path
- H01C 10/50 . structurally combined with switching arrangements ([H01C 10/36](#) takes precedence)
- H01C 11/00 Non-adjustable liquid resistors**
- H01C 13/00 Resistors not provided for elsewhere**
- H01C 13/02 . Structural combinations of resistors ([impedance networks per se H03H](#))
- H01C 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](#))
- H01C 17/003 . {using lithography, e.g. photolithography (lithographic compositions and processing in general [G03F](#))}

- H01C 17/006 . {adapted for manufacturing resistor chips}
- H01C 17/02 . adapted for manufacturing resistors with envelope or housing
- H01C 17/04 . adapted for winding the resistive element
- H01C 17/06 . adapted for coating resistive material on a base
- H01C 17/065 . . by thick film techniques, e.g. serigraphy
- H01C 17/06506 . . . {Precursor compositions therefor, e.g. pastes, inks, glass frits}
- H01C 17/06513 {characterised by the resistive component}
- H01C 17/0652 {containing carbon or carbides}
- H01C 17/06526 {composed of metals}
- H01C 17/06533 {composed of oxides}
- H01C 17/0654 {Oxides of the platinum group}
- H01C 17/06546 {Oxides of zinc or cadmium}
- H01C 17/06553 {composed of a combination of metals and oxides}
- H01C 17/0656 {composed of silicides (H01C 17/0652 takes precedence)}
- H01C 17/06566 {composed of borides (H01C 17/0652 takes precedence)}
- H01C 17/06573 {characterised by the permanent binder}
- H01C 17/0658 {composed of inorganic material}
- H01C 17/06586 {composed of organic material}
- H01C 17/06593 {characterised by the temporary binder}
- H01C 17/07 . . by resistor foil bonding, e.g. cladding
- H01C 17/075 . . by thin film techniques {(H01C 17/20 takes precedence)}
- H01C 17/08 . . . by vapour deposition
- H01C 17/10 . . . by flame spraying
- H01C 17/12 . . . by sputtering
- H01C 17/14 . . . by chemical deposition
- H01C 17/16 using electric current
- H01C 17/18 without using electric current
- H01C 17/20 . . by pyrolytic processes
- H01C 17/22 . adapted for trimming
- H01C 17/23 . . by opening or closing resistor geometric tracks of predetermined resistive values, {e.g. snapistors}
- H01C 17/232 . . Adjusting the temperature coefficient; Adjusting value of resistance by adjusting temperature coefficient of resistance
- H01C 17/235 . . Initial adjustment of potentiometer parts for calibration
- H01C 17/24 . . by removing or adding resistive material (H01C 17/23, H01C 17/232, H01C 17/235 take precedence)
- H01C 17/2404 . . . {by charged particle impact e.g. by electron or ion beam milling, sputtering, plasma etching}
- H01C 17/2408 . . . {by pulsed voltage erosion, e.g. spark erosion}
- H01C 17/2412 . . . {by electrolytic treatment e.g. electroplating (for anodic oxydation H01C 17/262)}

- H01C 17/2416 . . . {by chemical etching}
- H01C 17/242 . . . by laser {(trimming by laser in general [B23K 26/351](#))}
- H01C 17/245 . . . by mechanical means, e.g. sand blasting, cutting, ultrasonic treatment
- H01C 17/26 . . . by converting resistive material
- H01C 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](#))}
- H01C 17/267 {by passage of voltage pulses or electric current}
- H01C 17/28 . . . adapted for applying terminals
- H01C 17/281 . . . {by thick film techniques}
- H01C 17/283 . . . {Precursor compositions therefor, e.g. pastes, inks, glass frits}
- H01C 17/285 {applied to zinc or cadmium oxide resistors}
- H01C 17/286 {applied to TiO₂ or titanate resistors}
- H01C 17/288 . . . {by thin film techniques}
- H01C 17/30 . . . adapted for baking