

CPC**COOPERATIVE PATENT CLASSIFICATION****H01C****RESISTORS****NOTE**

In this subclass, the term "adjustable" means mechanically adjustable.

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
- H01C 1/012
 - . Mounting; Supporting
 - . . 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](#) to [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](#) })
[m1112]

- 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](#) to [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](#) to [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 to H01C 7/13](#) take precedence over groups [H01C 7/18 to 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 1/02B](#)) }
- 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](#) to [H01C 10/26](#) take precedence over groups [H01C 10/28](#) to [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 26/0003](#)) }
- 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