

**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](#).

**Guidance heading:****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](#) 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 .... {Perowskites, 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 .... {Perowskites, 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 TiO<sub>2</sub> or titanate resistors }
- H01C 17/288       ..     {by thin film techniques }
  
- H01C 17/30       .     adapted for baking