

H01C

RESISTORS

Definition statement

This place covers:

- Passive two-terminal electrical components per se that implement electrical resistance as a circuit element, thereby enabling typically a direct proportion between the current and the voltage across the component's terminals.
- Non-adjustable metal resistors made of wire or ribbon, per se, e.g. iron-filament ballast resistors, or metallic glasses therefor, coiled, woven or formed as grids. Configurations thereof may include flexible or folding resistors, changes in dimensions or characteristics of the resistive element from one terminal to another, resistors having sinusoidal or zig-zag configurations or arranged for reducing self-induction, capacitance or variation with frequency.
- Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material (excluding loose powder or granular material) with or without insulating material. Resistors whose effective value is varied non-mechanically such as by temperature (thermistors, e.g. exhibiting positive or negative temperature coefficient), voltage (varistors and overvoltage protection resistors) or current (including over-current protection resistors) and having a non-linear behaviour, e.g. typically a sharp change in resistance values upon reaching critical or threshold values of non-mechanical parameters. Compositions and arrangements thereof.
- Non-adjustable resistors consisting of loose powdered or granular conducting, or powdered or granular semi-conducting material, e.g. coherers or like imperfect resistors for detecting electromagnetic waves; overvoltage protection resistors or arresters.
- Non-adjustable liquid resistors.
- Electrical resistors whose effective value is mechanically adjustable, including liquid resistors or adjustable resistors structurally comprising a plurality of resistors, with changing dimensions and/or forms of the resistors, arrangements of fixed resistors with intervening connector or structurally in combination with switching arrangements. Resistors whose resistance is adjustable by short-circuiting different amounts of the resistive element, by mechanical pressure or force, by auxiliary driving means, by resistor movement or by action of actuation means, e.g. contacts, said contacts rocking or rolling along resistive element or taps, sliding along resistive element, e.g. moving along a straight path, in an accurate path or along turns of a helical resistive element.
- Resistors not provided for elsewhere, e.g. structural combinations of resistors excluding impedance networks.
- Apparatus or processes specially adapted for manufacturing resistors adapted for manufacturing resistor chips, for manufacturing resistors with envelope or housing, for winding the resistive element or for coating resistive material on a base, e.g. by thick (including precursor compositions therefor) or thin film techniques (e.g. vapour or chemical deposition, sputtering or flame spraying) by pyrolytic processes or by resistor foil bonding; adapted for trimming, for applying terminals or for baking.
- Details common to two or more main types of devices or processes covered by this subclass, e.g. special adaption for mounting; housings, encapsulations; Arrangements for distinguishing marks (e.g. colour coding), electrostatic or electromagnetic shielding, cooling, heating and ventilating or of current collectors; Terminals or tapping points.
- Variable resistors, the value of which is changed non-mechanically, e.g. by voltage, current or temperature.
- Fixed resistors whose effective value is, or is presumed to be, non-variable.
- Details of, or for, resistors.

References

Limiting references

This place does not cover:

| | |
|---|---|
| Apparatus or processes for filling or compressing insulating material in heating element tubes | H05B 3/52 |
| Resistors having potential barriers, e.g. field-effect resistors | H10D 1/40 - H10D 1/43 |
| Photoresistors and similar semiconductor devices in which radiation controls flow of current through the device | H10F 30/00 |
| Organic resistors having potential barriers | H10K 10/10 |
| Magnetic-field-controlled resistors and similar devices using galvanomagnetic or similar magnetic effects | H10N 50/00 |
| Hall-effect devices | H10N 52/00 |
| Bulk negative resistance effect devices | H10N 80/00 |

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

| | |
|--|----------------------------|
| Resistance strain gauges for measuring linear expansion or contraction | G01B |
| Measuring temperature using resistive elements | G01K 7/16 |
| Measuring force or stress by measuring variations in ohmic resistance of solid materials | G01L 1/20 |
| Resistors used for electric measuring electrical or magnetic variables | G01R 1/203 |
| Impedance networks | H03H |
| Resistors as a component of an integrated circuit | H10D 1/47 |

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Powder metallurgy | B22F |
| Trimming of electrical components | B23K 26/351 |
| Layered products | B32B |
| Compositions of ceramic materials, e.g. for resistors or varistors and based on zinc oxides | C04B 35/453 |
| Compositions of ceramic materials, e.g. for resistors or thermistors, and based on titanium oxide or titanates | C04B 35/46 |
| Compositions of ceramic materials, e.g. for resistors or thermistors, and based on zirconium oxides or zirconates | C04B 35/48 |
| Compositions of ceramic materials, e.g. for resistors or thermistors, and based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or vanadates, niobates, tantalates, molybdates or tungstates | C04B 35/495 |
| Polymeric films or sheets | C08J 5/18 |
| Indicating or measuring liquid level, or level of fluent solid material by measuring variations of resistance of resistors due to contact with conductor fluid | G01F 23/24 |

| | |
|--|------------------------------|
| Investigating or analysing material by investigating resistance | G01N 27/04 |
| Arrangements for measuring resistance | G01R 27/00 |
| Measuring dielectric properties, e.g. dielectric constants | G01R 27/2617 |
| Selection of specified materials as dielectric | H01B 3/00 |
| Terminals or tapping points in general | H01R |
| Overvoltage arresters using spark gaps | H01T 4/00 |
| Emergency protective circuit arrangements responsive to excess current | H02H 9/02 |
| Emergency protective circuit arrangements responsive to excess voltage | H02H 9/04 |
| Ohmic-resistance heating | H05B 3/00 |
| Printed circuits incorporating printed electric components, e.g. printed resistor, capacitor or inductor | H05K 1/16 |
| Printed circuits structurally associated with non-printed electric components | H05K 1/18 |
| Casings for electrical apparatus in general | H05K 5/00 |
| Passive two-terminal components without a potential-jump or surface barrier for integrated circuits | H10D 1/00 |
| Devices using superconductivity or hyperconductivity | H10N 60/00 |
| Solid state devices for rectifying, amplifying, oscillating or switching having no potential barrier | H10N 70/00 |
| Thin- or thick-film solid state devices | H10N 97/00 |

Special rules of classification

Variable resistors, the value of which is changed non-mechanically, e.g. by voltage or temperature, are classified in group [H01C 7/00](#).

Electrodes and terminals for resistors in main group [H01C 7/00](#) are covered by main group [H01C 1/00](#), more specifically group [H01C 1/14](#) and subgroups.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|------------|--|
| thermistor | type of resistor whose resistance varies significantly with temperature, typically as sharp or sudden change, when a threshold temperature value is reached. |
| varistor | also referred as voltage dependent resistor is a resistor that conducts significantly increased current when voltage is excessive |
| adjustable | mechanically adjustable |

H01C 1/00

Details

Definition statement

This place covers:

- Mounting, Supporting
- Color coding

Definition statement

- Shielding arrangements
- Current collectors
- Terminals
- Resistor networks

H01C 1/012

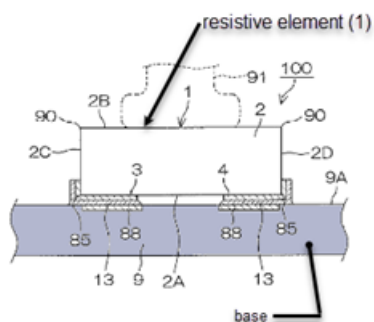
the base extending along and imparting rigidity or reinforcement to the resistive element ([H01C 1/016](#) takes precedence; the resistive element being formed in two or more coils or loops as a spiral, helical or toroidal winding [H01C 3/18](#), [H01C 3/20](#); the resistive element being formed as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

Definition statement

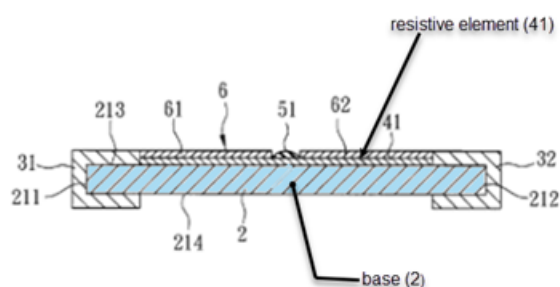
This place covers:

Illustrative examples of subject matter classified in this place:

1. Resistive element mounted on a printed circuit support



2. Terminals embracing the resistive elements



References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Compensation for resistor expansion or contraction | H01C 1/016 |
| Resistive elements being formed in two or more coils or loops as a spiral, helical or toroidal winding wound on a flat or ribbon base | H01C 3/18 |
| Resistive elements being formed in two or more coils or loops as a spiral, helical or toroidal winding wound on cylindrical or prismatic base | H01C 3/20 |

| | |
|---|---------------------------|
| Resistive elements being formed as one or more layers or coatings on a base | H01C 7/00 |
|---|---------------------------|

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|------|-----------------------------|
| base | substrate or support member |
|------|-----------------------------|

H01C 1/014

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

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Compensation for resistor expansion or contraction | H01C 1/016 |
|--|----------------------------|

H01C 1/022

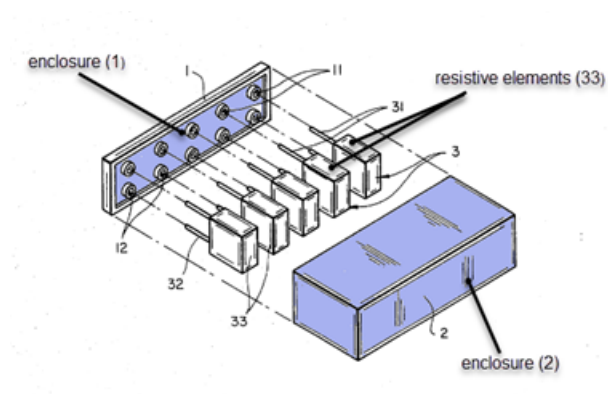
the housing or enclosure being openable or separable from the resistive element

Definition statement

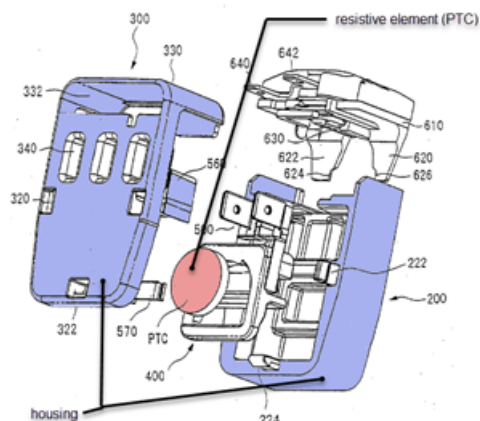
This place covers:

Illustrative examples of subject matter classified in this place:

1. Structural arrangement of resistive elements



2. PTC thermistor arrangement



H01C 1/024

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

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Resistive elements being embedded in insulation with outer enclosing sheath | H01C 1/028 |
| Plural layers surrounding the resistive element | H01C 1/032 |
| Housing or enclosure being formed as coating or mold without outer sheath | H01C 1/034 |

H01C 1/032

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

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Resistive elements being embedded in insulation with outer enclosing sheath | H01C 1/028 |
|---|----------------------------|

H01C 1/034

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

References**Limiting references**

This place does not cover:

| | |
|---|----------------------------|
| Plural layers surrounding the resistive element | H01C 1/032 |
|---|----------------------------|

H01C 1/14

Terminals or tapping points specially adapted for resistors; Arrangements of terminals or tapping points on resistors

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------|
| Terminals or tapping points in general | H01R |
|--|----------------------|

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "terminals", "electrodes", "leads", "conductors"

H01C 1/148

the terminals embracing or surrounding the resistive element ([H01C 1/142](#) takes precedence)

Definition statement

This place covers:

Resistive element having multilayers.

References**Limiting references**

This place does not cover:

| | |
|---|----------------------------|
| Terminals or tapping points being coated on the resistive element | H01C 1/142 |
|---|----------------------------|

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)

References**Limiting references**

This place does not cover:

| | |
|---|---------------------------|
| Resistors arranged or constructed for reducing self-induction, capacitance or variation with frequency | H01C 3/02 |
| Iron-filament ballast resistors; Other resistors having variable temperature coefficient | H01C 3/04 |
| Flexible or folding resistors, whereby such a resistor can be looped or collapsed upon itself | H01C 3/06 |
| Dimension or characteristic of resistive element changing gradually or in discrete steps from one terminal to another | H01C 3/08 |
| Resistive element having zig-zag or sinusoidal configuration | H01C 3/10 |
| Lying in one plane | H01C 3/12 |

H01C 3/18

wound on a flat or ribbon base ([H01C 3/16](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|--|---------------------------|
| Resistive elements including two or more distinct wound elements or two or more winding patterns | H01C 3/16 |
|--|---------------------------|

H01C 3/20

wound on cylindrical or prismatic base ([H01C 3/16](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|--|---------------------------|
| Resistive elements including two or more distinct wound elements or two or more winding patterns | H01C 3/16 |
|--|---------------------------|

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](#); 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](#))

References

Limiting references

This place does not cover:

| | |
|---|---|
| Resistors 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 |
| Semiconductor devices sensitive to electro-magnetic or corpuscular radiation, e.g. photoresistors | H10F 30/00 |
| Organic resistors having potential barriers | H10K 10/10 |
| Magnetic field controlled resistors | H10N 50/10 |
| Bulk negative resistance effect devices | H10N 80/00 |

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Measuring deformation in a solid state using the change in resistance formed by printed-circuit technique | G01B 7/20 |
| Insulating materials | H01B 3/00 |
| Ohmic resistance heating | H05B 3/00 |
| Printed circuits | H05K |
| Resistors without a potential-jump or surface barrier specially adapted for integrated circuits | H10D 1/47 |
| Devices using superconductivity | H10N 60/00 |
| Solid state devices for rectifying, amplifying, oscillating or switching having no potential barriers | H10N 70/00 |

H01C 7/02

having positive temperature coefficient

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|----------|----------------------|
| Ceramics | C04B |
|----------|----------------------|

H01C 7/04

having negative temperature coefficient

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---------------------------------------|---------------------------|
| Thermometers using resistive elements | G01K 7/16 |
|---------------------------------------|---------------------------|

H01C 7/06

including means to minimise changes in resistance with changes in temperature

Definition statement

This place covers:

Chemical compositions, materials or arrangements with terminals, to minimize changes in resistance with changes in temperature.

H01C 7/102

Varistor boundary, e.g. surface layers ([H01C 7/12](#) takes precedence)

Definition statement

This place covers:

The structure of the varistor boundary, e.g. surface layers.

References

Limiting references

This place does not cover:

| | |
|----------------------------------|---------------------------|
| Overvoltage protection resistors | H01C 7/12 |
|----------------------------------|---------------------------|

H01C 7/105

Varistor cores ([H01C 7/12](#) takes precedence)

Definition statement

This place covers:

The structure of varistor cores.

References

Limiting references

This place does not cover:

| | |
|----------------------------------|---------------------------|
| Overvoltage protection resistors | H01C 7/12 |
|----------------------------------|---------------------------|

H01C 7/12

Overvoltage protection resistors; Arresters

Definition statement

This place covers:

Resistors that provide protection of electronic components from voltage surges.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|---------------------------|
| Series resistors structurally associated with spark gaps | H01T 1/16 |
|--|---------------------------|

H01C 7/13

current-responsive

Special rules of classification

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

Definition statement

This place covers:

Resistors formed by two or more layers stacked between terminals.

- The plurality of layers can include ceramic and conductive layers.
- The plurality of layers can include stacking of resistor components.

H01C 10/00

Adjustable resistors

Special rules of classification

Groups [H01C 10/02](#) - [H01C 10/26](#) take precedence over groups [H01C 10/28](#) - [H01C 10/50](#).

H01C 10/16

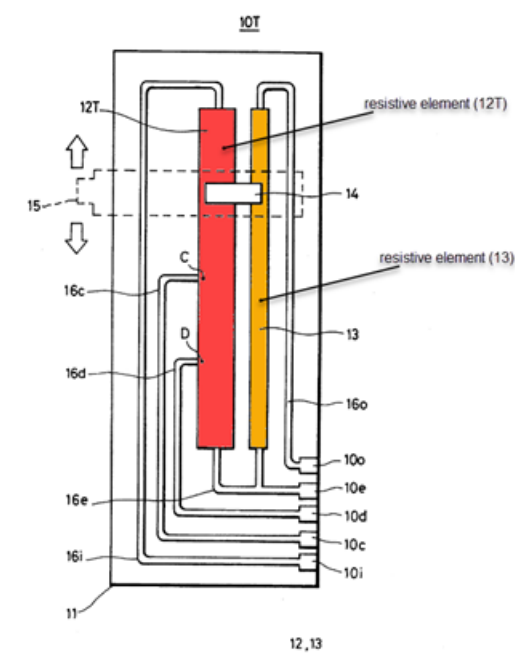
including plural resistive elements

Definition statement

This place covers:

Illustrative example of subject matter classified in this place:

Adjustable resistor



H01C 10/22

resistive element dimensions changing gradually in one direction, e.g. tapered resistive element ([H01C 10/04](#) takes precedence)

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| With specified mathematical relationship between movement of resistor actuating means and value of resistance, other than direct proportional relationship | H01C 10/04 |
|--|----------------------------|

H01C 10/26

resistive element moving ([H01C 10/16](#), [H01C 10/24](#) take precedence)

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Plural resistive elements | H01C 10/16 |
| Contacts moving along turns of a helical resistive element, or vice versa | H01C 10/24 |

H01C 10/44

the contact bridging and sliding along resistive element and parallel conducting bar or collector ([H01C 10/42](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|---|----------------------------|
| Contact bridging and sliding along resistive element and parallel conducting bar or collector | H01C 10/42 |
|---|----------------------------|

H01C 10/46

Arrangements of fixed resistors with intervening connectors, e.g. taps ([H01C 10/28](#), [H01C 10/30](#) take precedence)

References**Limiting references**

This place does not cover:

| | |
|--|----------------------------|
| Contact rocking or rolling along resistive element or taps | H01C 10/28 |
| Contact sliding along resistive element | H01C 10/30 |

H01C 10/50

structurally combined with switching arrangements ([H01C 10/36](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|---|----------------------------|
| Contact moving in an arcuate path structurally combined with switching arrangements | H01C 10/36 |
|---|----------------------------|

H01C 13/02

Structural combinations of resistors

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---------------------------|----------------------|
| 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](#))

References

Limiting references

This place does not cover:

| | |
|--|---|
| 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 17/006

{adapted for manufacturing resistor chips}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|---------------------------|
| Resistors as a component of an integrated circuit | H10D 1/47 |
|---|---------------------------|

H01C 17/02

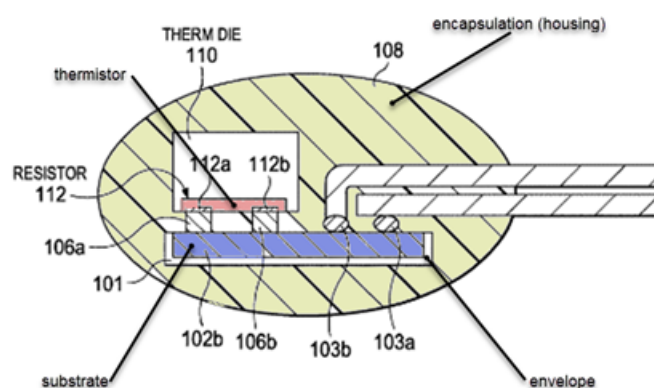
adapted for manufacturing resistors with envelope or housing (apparatus or processes for filling or compressing insulating material in heating element tubes [H05B 3/52](#))

Definition statement

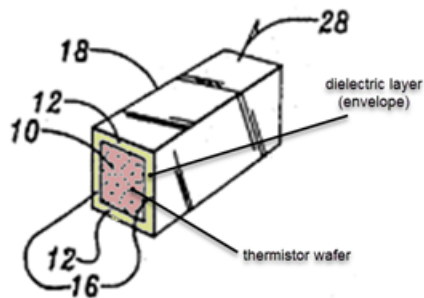
This place covers:

Illustrative examples of subject matter classified in this place:

1. Encapsulated resistor



2. Encapsulated resistor



H01C 17/06506

{Precursor compositions therefor, e.g. pastes, inks, glass frits or green body}

Definition statement

This place covers:

- Precursor compositions per se that may or may not be adapted for coating on a base.
- The base can be a support or supporting member, e.g. substrate.

H01C 17/24

by removing or adding resistive material ([H01C 17/23](#), [H01C 17/232](#), [H01C 17/235](#) take precedence)

References

Limiting references

This place does not cover:

| | |
|---|-----------------------------|
| By opening or closing resistor geometric tracks of predetermined resistive values, e.g. snapistors | H01C 17/23 |
| Adjusting the temperature coefficient; Adjusting value of resistance by adjusting temperature coefficient of resistance | H01C 17/232 |
| Initial adjustment of potentiometer parts for calibration | H01C 17/235 |

H01C 17/242

by laser

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|------------------------------|-----------------------------|
| Trimming by laser in general | B23K 26/351 |
|------------------------------|-----------------------------|

H01C 17/28

adapted for applying terminals

Definition statement

This place covers:

- Terminals or electrodes.
- The terminals can be applied to single layer resistive elements or multilayer resistive elements.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---------------------------------------|----------------------------|
| Terminals coated on resistive element | H01C 1/142 |
|---------------------------------------|----------------------------|