

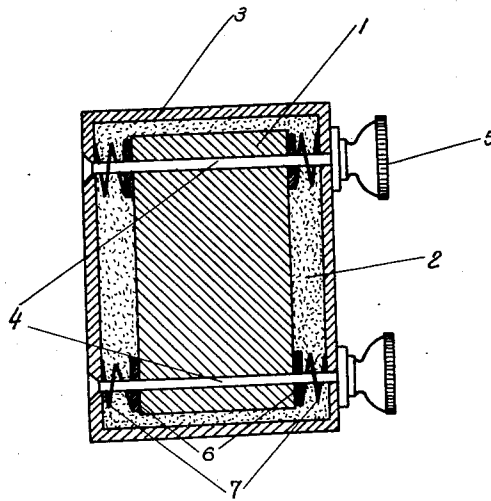
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VARIABLE CONDUCTOR OF HIGH NEGATIVE TEMPERATURE CO-EFFICIENT

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VARIABLE CONDUCTOR OF HIGH NEGATIVE TEMPERATURE CO-EFFICIENT

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This invention relates to conductors having high negative temperature coefficient and automatic variable resistance, and methods for producing the same.

The object of this invention, more particularly, is to provide an electrically conductive element having, in addition to the characteristics described above, and more definitely, though not in limitation, a resistance range from infinity to zero through a temperature range of 0°C. – 100°C. , said element being capable of cooling rapidly.

The element is adapted for use in rheostats, thermostats and current regulating devices.

The invention comprises, broadly, silver compounded with a more fusible metalloid, such as sulphur or phosphorus.

The element may be made by adding to powdered silver an excess of sulphur and heating the mixture to a temperature over 800°C. , whereat the mass fuses and may be cast to give it the desired form.

Where the element is to be employed in a device of slow action, it will have a large area of radiation surface; if it is to be used in a quick action device, it will have little radiation surface, it being obvious, in these cases, that the quicker the temperature of the element is raised to its operative limit, the greater will be the flow of current and the faster the response. If it is desired to raise the temperature of the element still more quickly, it may be covered with heat insulating material.

The rapidity of action of the device may be controlled, of course, in addition, by varying the dimensions of the element, such as its length and diameter in conformity with the electric power to be dissipated. If the power to be dissipated is relatively large and should be so treated under high tension then the conductor will be long and thin. If on the contrary, the power to be dissipated is relatively small and should be so treated under low pressure, then the conductor will be short and thick.

In explanation of the chemistry involved in the formation of the element, it may be said that the sulphur and the silver do not seemingly enter into chemical combination to form silver sulphide, but rather a solid

mixture of sulphur and colloid silver, the silver being fused or alloyed with the sulphur. This seems to be indicated by the fact that when direct current is passed through the element it disintegrates somewhat, or becomes modified. Coating the element with molten sulphur therefore prevents this deleterious action. The element should be enclosed in a hermetic tube so that the melted sulphur may not flow over other parts of the device of which it is a part.

Alternating current seems not to affect the chemical or physical composition of the element, and under these conditions it is not necessary to coat the element with the sulphur as aforesaid. However, in this case, should the element be subjected to a temperature in excess of 100°C. , it should be coated with molten sulphur.

The connections of the conductor to the external circuit must be ensured by the medium of silver contacts, because when using other substances than silver it might happen that the resistance of the circuit be not the same for the different polarities applied at one terminal of the conductor.

The accompanying drawing illustrates by way of example a cross-section of a resistance element constructed in accordance with the invention.

The mass 1 is a solid mixture of sulphur and colloid silver, the silver having been fused or alloyed with the sulphur. The dimensions and form of said mass 1 will be determined by the use to which the resistance element is to be adapted in accordance with the considerations previously set forth. A coating 2 of sulphur surrounds said mass 1 and is maintained in proper position by a casing 3.

A plurality of metallic rods 4 pass through mass 1 and casing 3 as shown to maintain said mass in vertical spaced relation to said casing 3. Knurled thumb nuts 5 are threaded on said rods 4 to secure the same with respect to the casing 3. A plurality of washers 6 encircle said rods 4 on either side of the mass 1 and a plurality of helical springs 7 also encircle said rods 4 and abut said washers and the casing 3, thus maintaining a laterally

spaced relation between the mass 1 and casing 3.

Of course without departing from the spirit of the invention other methods may be imagined for the manufacture of the special conductor, as well as various other applications than those given by way of example.

Having described my invention, what I claim is:

10 1. Variable-resistance conducting material having a high negative temperature coefficient comprising silver and a more fusible metalloid in quantity greater than that which is necessary to bind all of said silver and in
15 a manner to form a saturated combination of said silver and said metalloid.

2. Variable-resistance conducting material having a high negative temperature coefficient, comprising silver and sulphur in quantity larger than that necessary to form silver
20 sulphide with the total quantity of silver used.

3. Variable-resistance conducting material having a high negative temperature coefficient, comprising silver and sulphur in quantity greater than that required to form silver sulphide with the total quantity of silver
25 used, a layer of fused sulphur surrounding the solid part of the substance.

30 4. Variable-resistance conductor substance having a high negative temperature coefficient, comprising silver and sulphur in quantity greater than that required to form silver sulphide with the total quantity of silver
35 used, a layer of fused sulphur held by an outer envelope surrounding the solid part of the substance.

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