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MINIATURE TEMPERATURE-RESPONSIVE RESISTOR

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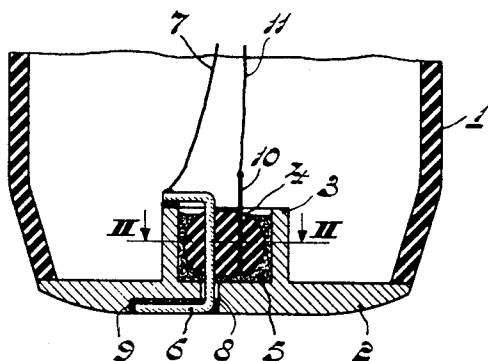


Fig. 1

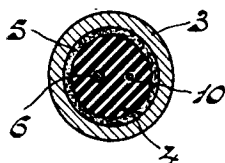


Fig. 2

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MINIATURE TEMPERATURE-RESPONSIVE RESISTOR

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5 Claims. (Cl. 201—63)

This invention relates to miniature temperature-responsive resistors.

Miniature temperature-responsive resistors generally comprise a resistance material in the form of a sphere or droplet in which are embedded a pair of electrical conductors for effecting external circuit connection thereto. Suitable materials are the ceramic resistive materials which have high negative temperature coefficient of resistance, e. g., the oxides of manganese, nickel, iron, cobalt, etc. Since such materials exhibit poor heat conduction properties, the resultant resistors suffer from high thermal inertia, i. e., they have a slow response characteristic, and a low load capacity.

The main object of the present invention is to provide a construction for a temperature-responsive miniature resistor of the foregoing type in which the thermal inertia is minimised and the load capacity is increased.

The invention is based on the discovery that the disadvantages inherent in the heretofore known arrangements can be materially eliminated, and satisfactory operation assured, by effecting the transmission of heat from the external environment to the portion of the resistive material between the electric conductors by one of the electric conductors. This is accomplished, according to the invention, by providing a construction in which one of the electric conductors is thermally connected at opposite ends to a good heat-conducting member. Moreover, the size and the materials of the electric conductors are so chosen that most of the transmission of heat to the portion of the resistive material between the electric conductors occurs via the electric conductor connected to the good heat-conductive member. To this end, the material of the electric conductor connected to the good heat-conductive member preferably has a high coefficient of thermal conductivity, and the cross-section thereof preferably exceeds that of any of the other electric conductors.

The invention will now be described with reference to the accompanying drawing in which:

Fig. 1 shows a cross-sectional view on an enlarged scale of one embodiment of the resistance element according to the invention;

Fig. 2 is a cross-sectional view along the line II—II of Fig. 1.

The resistive device of the invention comprises a tubular holder 1 made from plastics, only the end of which is shown, at one end of which is provided a metal, good, heat-conductive closing plate 2 having a bevelled edge. The inner surface of the plate 2 is provided with a collar 3 enclosing a cylindrical space containing a substantially round resistive mass 4 of temperature-sensitive or responsive ceramic material. This mass is retained in place by means of a thermo-setting synthetic resin 5, and is traversed by two electric conductors extending in the axial direction of the holder 1. One electric conductor consists of a platinum wire 6, for example, 100 μ thick, which is bent over at both sides of the mass 4. The upper bent portion of the platinum wire 6 is soldered to the upper edge of the collar 3. This collar has also secured to it a

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connecting wire 7 extending through the holder 1 and serving as an external connection for the conductor 6. The lower portion of the wire 6 extends through an opening 8 of the plate 2 and is soldered with its bent portion in a cavity 9 at the outer surface of said plate in a manner such that the outer surface of plate 2 and the bent portion of the wire 6 extend in the same plane.

The other electric conductor embedded in the resistance mass 4 consists of a thin platinum-iridium wire 10, for example, of 25 μ diameter. This wire passes, parallel with the wire 6, from above and through the resistive mass and terminates at the lower outline thereof. Beyond and above the mass 4, the wire 10 has secured to it a connecting wire 11, which, similarly to the aforesaid wire 7, extends through the holder 1. The two connecting wires 7 and 11 permit the resistance element to be connected in a measuring circuit. The device shown is suitable for measuring the temperature of the skin.

When bringing the aforesaid skin thermometer with the plate 2 into contact with the skin, the temperature of which is to be measured electrically, exchange of heat occurs between the interior of the resistive mass 4 and the skin, the heat passing through the good heat-conductive wire 6. Hence, the resistive mass 4 assumes very rapidly, particularly with respect to the zone between the wire 6 and the wire 10 which is mainly responsible for the electric resistance between said electric conductors, the temperature of the object contacting with the plate 2 and the lower bent portion of the wire 6. Alternatively, for the single thick electric conductor 6, there may be substituted a number of wires, if desired thinner, which are jointly connected beyond the mass 4 to the collar 3 and the plate 2.

While I have described my invention in connection with specific embodiments and applications, other modifications thereof will be readily apparent to those skilled in this art without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A miniature temperature-responsive resistor comprising a ceramic temperature-sensitive resistive material, a pair of spaced electric conductors embedded in said ceramic material, and a good heat-conducting member, one of said conductors having opposite ends thermally connected to said good heat-conducting member, said one conductor being constituted by a material and having a size at which it transmits heat to and away from the ceramic material substantially better than said other conductor.

2. A resistor as claimed in claim 1 in which said one electric conductor consists of a plurality of parts each of which individually traverse the resistive material.

3. A resistor as claimed in claim 1 in which the cross-section of said one electric conductor exceeds that of the other conductor.

4. A resistor as claimed in claim 1 in which the material of said one electric conductor has a thermal conductivity exceeding that of the material of the other conductor.

5. A resistor as claimed in claim 1 in which the good heat-conducting member comprises a flat plate having a cylindrical enclosure on one side thereof, said ceramic material being housed in said enclosure, said one electric conductor being connected at one end to the end of said enclosure remote from said plate and at its other end to the outer surface of the plate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,526,139	Grondahl	Feb. 10, 1925
2,463,984	Lederer	Mar. 8, 1949