Feb. 26, 1946. N. Y. PRIESSMAN 2,395,759

RESISTOR

Filed April 24, 1943

FIG. 2

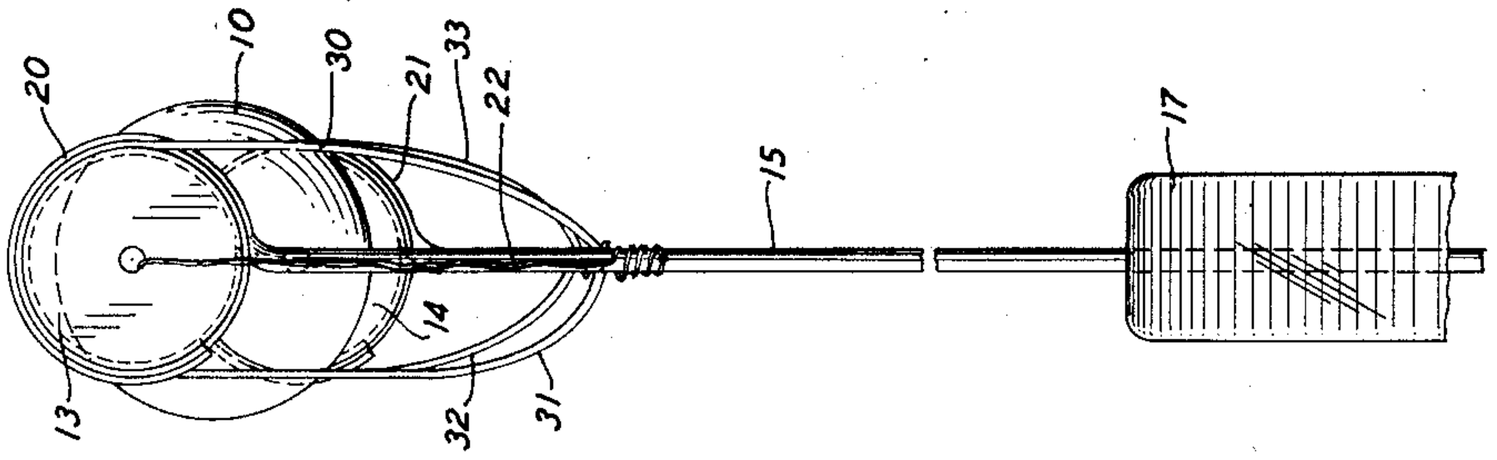
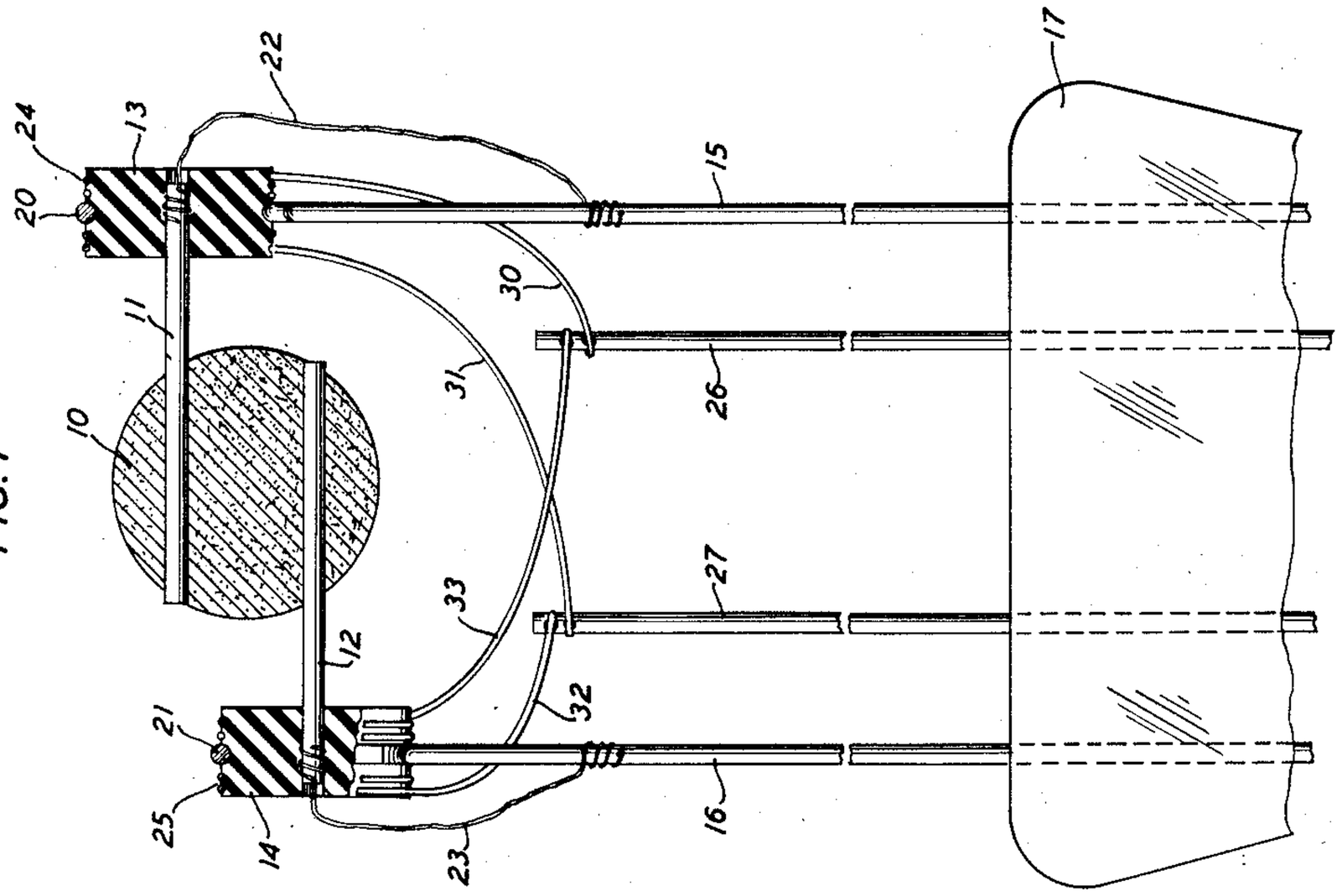


FIG. 1



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RESISTOR

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7 Claims. (Cl. 201—63)

This invention relates to resistors and more particularly to means for mounting relatively small size resistors.

Resistors having a relatively high temperature coefficient of resistance, that is, those whose resistance varies greatly with changes in temperatures, having for convenience been called "thermistors." Wherever this term is used in this specification or the appended claims such a resistor is intended. Thermistors may be made in various forms one of which is known as a bead thermistor. The bead thermistor comprises a small body or bead of thermistor material supported by a plurality of wires or leads. These wires have a portion of each embedded in the bead to serve as an electrode and an extending portion which serves as a connecting lead and support. In view of the temperature dependence of resistance inherent in these thermistors, it is desirable in certain applications thereof to inhibit the loss of heat from the thermistor body. This is done in one way by making the connecting leads very small in cross-section to cut down thermal conduction as much as possible consistent with adequate electrical conduction. Because of the use of these fine lead wires as bead supports it has been found, that, under some circumstances, the mechanical stability of the thermister body was not as good as desired.

It is an object of this invention to improve the mechanical stability of thermistor mountings without seriously affecting the heat loss therefrom.

A feature of this invention resides in the use of very short but stiff leads between the thermistor body and the support means, there being relatively fine, flexible leads connected to said stiff leads for completing the electrical circuit.

A further cooperating feature of the invention lies in the use of small bodies of insulating material between the ends of the stiff leads and the support means, said bodies having a relatively low thermal conductivity.

Another feature of this invention resides in the use of auxiliary heater means associated with the insulating bodies, the purpose of said heater means being to lower the temperature gradient between the thermistor body and the insulator bodies. Other and further objects and features of this invention will appear more fully and clearly from the following description of an illustrative embodiment thereof taken in connection with the appended drawing in which:

Fig. 1 is an elevational view on an enlarged scale with certain parts in section of an illustrative embodiment of the invention; and

Fig. 2 is a side view of the device shown in Fig. 1.

The device which has been chosen to illustrate this invention comprises a generally spherical thermistor body 10 having relatively short, stiff leads 11 and 12 embedded therein in spaced relation. The thermistor body 10 may be made of any suitable material having a high resistance-temperature coefficient, such as, for example, one or more of the oxides of manganese, nickel, cobalt or copper. The leads 11 and 12 may be made of a suitable metal or alloy, such as platinum or 70 per cent platinum alloyed with 30 per cent iridium.

The ends of the leads 11 and 12 are secured respectively in members 13 and 14 of insulating material. These members besides being electrically insulating should be chosen also for their low thermal conductivity. The members 13 and 14 may be mounted on conductive supports 15 and 16 projecting from a base 17 of insulating material such as glass. The member 17 is illustrated as the so-called press of the usual glass envelope in which thermistors are often mounted.

The upper ends of the supports 15 and 16 are formed respectively into loops 20 and 21 surrounding the insulating members 13 and 14 as will be more clearly seen from an inspection of Fig. 2. Electrical connection may be made to the leads 11 and 12, respectively, by means of relatively fine wires 22 and 23 which may extend from the ends of leads 11 and 12 to intermediate portions of supports 15 and 16, as illustrated. These fine leads 22 and 23 may be secured to the heavier leads and supports by any suitable technique such as welding. In the modification illustrated the fine wires are wound several times around the heavier members and spot-welded at several points to secure them in place.

Each of the insulator members 13 and 14 is provided with a heater which may be, as in the illustrated embodiment, a coil of resistance wire. The heater coils 24 and 25 are wound, respectively, on the insulators 13 and 14, care being taken to avoid any contact with the supporting loops 20 and 21.

The two coils 24 and 25 may be connected in parallel to lead-in wires 26 and 27. The connections from coil 24 are made respectively by leads 30 and 31, those from coil 25 by leads 32 and 33. These leads may be the end portions of the coils and may be secured to the lead-ins 26 and 27 by welding or any other suitable technique.

The supports 15 and 16 and the lead-ins 26 and 27 pass through the press 17 to suitable exterior connections, not shown.

With the construction illustrated it will be seen that although heat may be rather easily conducted away from the resistor body 10 by the heavy leads 11 and 12, it is not conducted beyond the insulator bodies to any appreciable degree. The low thermal conductivity of the insulator bodies themselves tends to prevent the flow down the supports 15 and 16 by way of said bodies and the relatively fine wires 22 and 23 inhibit heat conduction by way of the electrical circuit.

In order to further inhibit conductive loss of heat from the body 10, the insulators 13 and 14 may be supplied, as in the illustrated modification, with heaters 24 and 25 so that the temperature of the insulators may be kept approximately at that of the thermistor body, e. g. by means of an auxiliary power source. Thus with a negligible or very small temperature gradient between the body 10 and the bodies 13 and 14, the heat flow through the leads 11 and 12 will be minimized. The construction of this invention thus affords a relatively stable mechanical suport for the resistor and at the same time avoids appreciable heat loss therefrom by conduction.

Although this invention has been disclosed by means of an illustrative embodiment thereof it is not intended that it be limited thereby but by the scope of the appended claims only.

What is claimed is:

1. Means for rigidly supporting a small body of high resistance-temperature coefficient material and at the same time inhibiting conductive heat loss therefrom, that comprises relatively short, stiff leads secured to said body, relatively fine leads secured to the ends of said short leads, bodies of electrical insulating material having a high thermal resistance secured to the ends of said short leads, means for rigidly supporting said bodies, and electrical heaters, one secured on each of said bodies of insulating material.

2. Means for rigidly supporting a resistor body and at the same time inhibiting conductive heat loss therefrom, that comprises, relatively short, stiff conductors secured to said body, relatively fine leads secured to the end of said short conductors, rigidly supported bodies of electrical insulating material having a high thermal resistance secured to said short conductors and spaced from the resistor body, and separate heater means associated with each insulating body, whereby the temperature of the insulating body may be maintained substantially as high as that of the resistor body.

3. A resistor device comprising spaced, relatively rigid, electrically conductive support means, electrical insulator bodies having low thermal conductivity secured to the support means in spaced relation to each other, a resistor in the space intermediate said insulator bodies and rigidly supported by short, relatively stiff conductors, one extending from each insulator body to the resistor, and fine wires having a relatively high thermal resistance, one leading from each short conductor to a corresponding support means for making external electrical connection for the resistor.

4. Means for rigidly supporting a small body of high resistance-temperature coefficient material and at the same time inhibiting conductive heat loss therefrom, that comprises relatively short, stiff leads secured to said body, relatively fine leads secured to the ends of said short leads, supporting bodies of electrical insulating material having a high thermal resistance secured to the ends of said short leads, and electrical heaters, one secured on each of said bodies of insulating material.

5. Support means for a small high resistance-temperature coefficient resistor comprising short, rigid conductors secured to said resistor, a body of electrical insulating material having a high thermal resistance secured to the end of each short conductor, electrically conductive means insulated respectively from each of said conductors by an insulating body for rigidly supporting each of said bodies, electrical heater means, one secured to each of said bodies and insulated from said conductors and said support means, and means for making circuit connections to said resistor, said means comprising fine wires connected respectively from each short conductor to a corresponding support means.

6. A resistor device comprising an insulating base, a plurality of rigid lead-in conductors projecting from said base, and electrical insulating bodies of low thermal conductivity secured to the extremities of each of certain of said lead-in conductors, a resistor body, a plurality of short, stiff conductors secured to said body, each of said short conductors also secured to one of said insulating bodies, an electric heater secured to each insulating body, a plurality of fine wires one each connected between a short conductor and the corresponding lead-in conductor, and means for connecting the heaters to the remaining lead-in conductors.

7. A resistor device comprising an insulating base, a plurality of conductors projecting from said base, the extremities of two of said conductors supporting bodies of electrical insulating material having a low thermal conductivity, a resistor body having a pair of short, relatively stiff conductors projecting oppositely therefrom, each of said conductors being secured in an orifice in one of said insulating bodies, a fine wire of low thermal conductivity connecting each of said short conductors to the corresponding supporting conductor, a coil heater secured on the outside of each insulating body, and means for connecting the two heaters in parallel to an exterior circuit.

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