Jan. 23, 1951 G. J. MUCHER 2,538,977

RESISTOR

Filed Nov. 23, 1949

Fig. 1

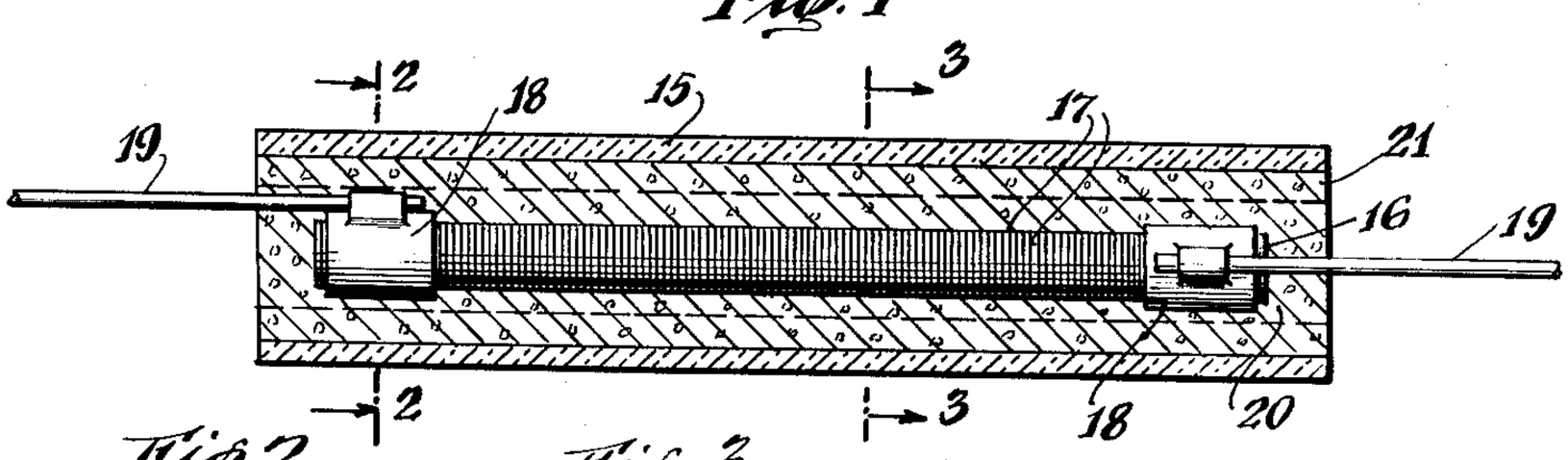


Fig. 2

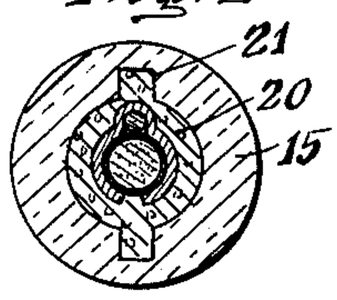
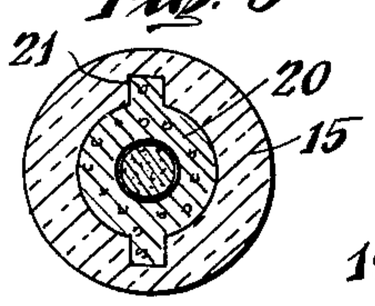


Fig. 3



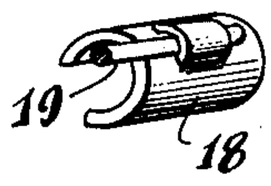


Fig. 4

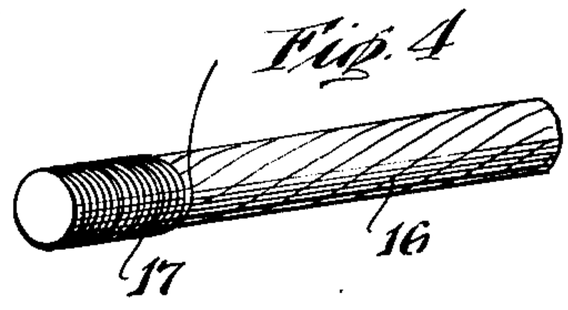


Fig. 5

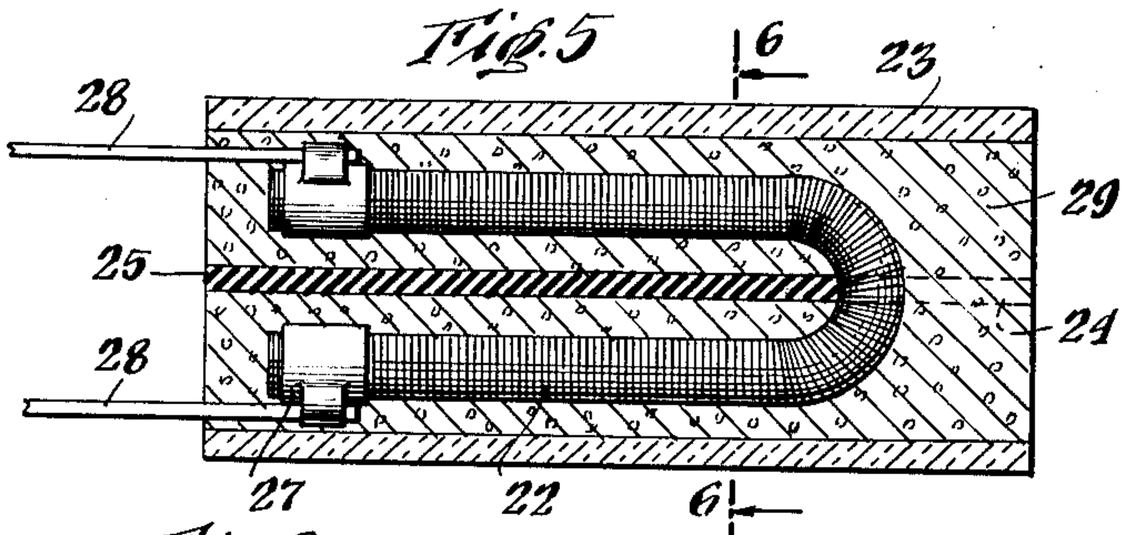


Fig. 6

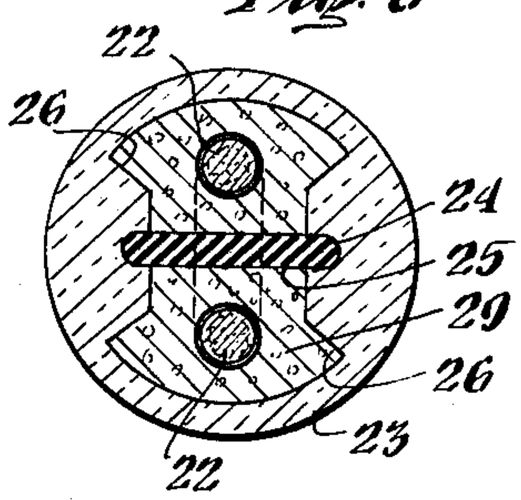


Fig. 8

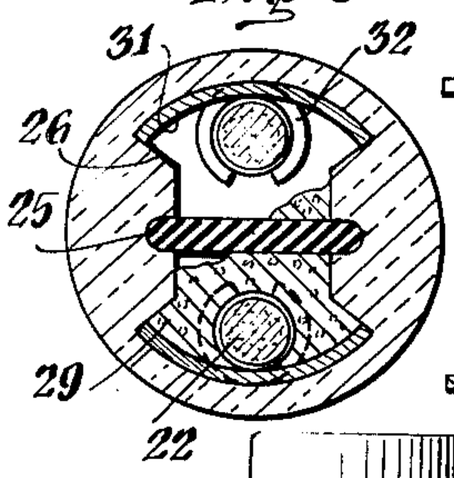


Fig. 7

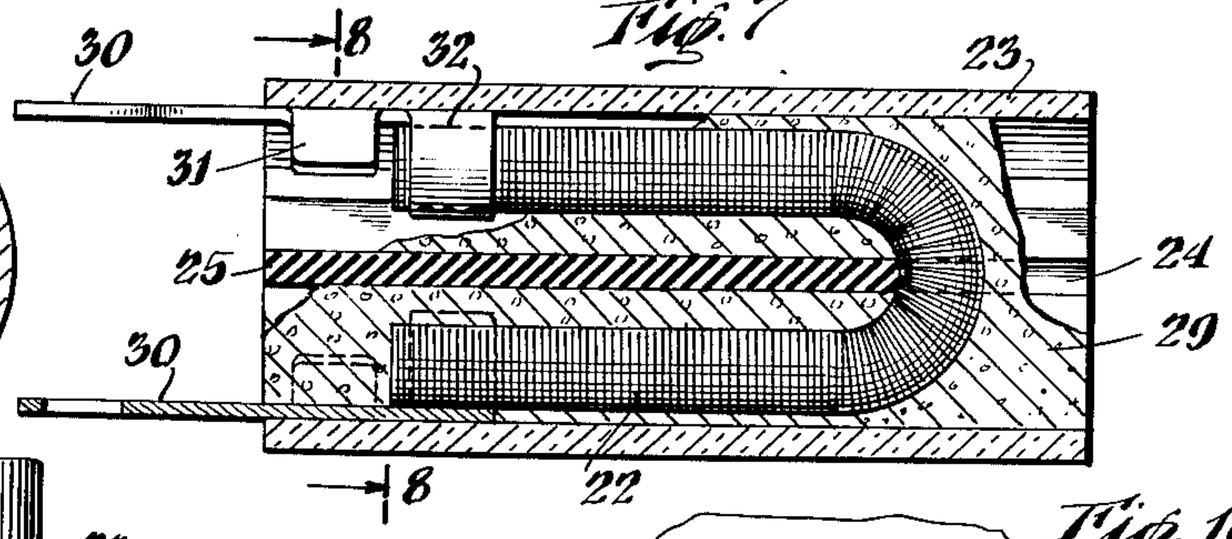


Fig. 9

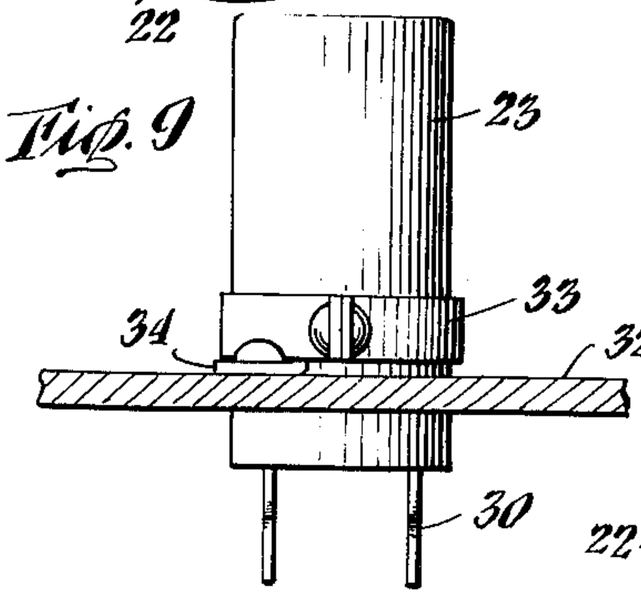


Fig. 10

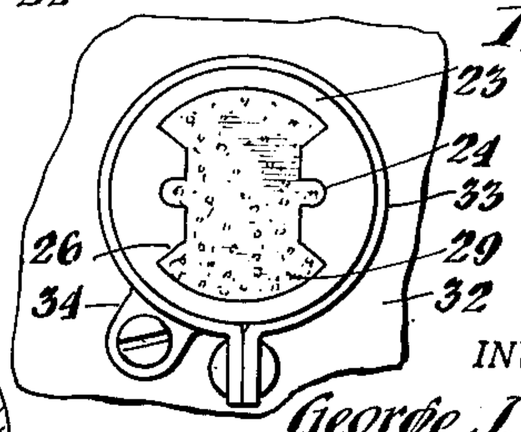
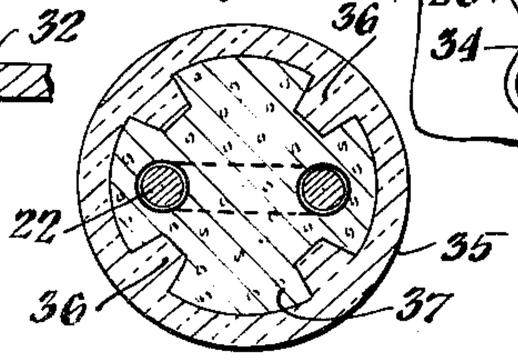


Fig. 11



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RESISTOR

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10 Claims. (Cl. 201—67)

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This invention relates to a structurally and functionally improved electrical resistor.

It is an object of the invention to provide a resistor structure in which undesired heat will be readily dissipated.

A further object is that of furnishing a unit of this type, the several parts of which will be firmly supported against displacement with respect to each other.

A still further object is that of designing a resistor which may be economically manufactured by quantity production technique and without the employment of especially skilled labor; the resultant article having a long effective life even when subjected to overloading and other abuses.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a sectional side view of a resistor;

Figs. 2 and 3 are transverse sectional views taken along the lines 2—2 and 3—3 respectively, and in the direction of the arrows as indicated in Fig. 1;

Fig. 4 is a perspective view of the inner element of the resistor with the terminal separated from the core;

Fig. 5 is a view similar to Fig. 1 but showing an alternative form of construction;

Fig. 6 is a transverse sectional view taken along the lines 6—6 and in the direction of the arrows as indicated in Fig. 5;

Fig. 7 is a sectional side view similar to Figs. 1 and 5, but illustrating a further form of construction;

Fig. 8 is a transverse view taken along the lines 8—8 and in the direction of the arrows as in Fig. 7;

Fig. 9 shows a resistor in mounted position;

Fig. 10 is a top plan view of the unit of Fig. 9; and

Fig. 11 is a transverse sectional view of a preferred form of unit.

Primarily referring to Figs. 1 to 4 inclusive, the numeral 15 indicates the body of a tube, preferably of ceramic material, and within which there is disposed the resistor unit. The latter preferably involves a core 16 of fiber-glass or other suitable material on which are disposed the convolutions 17 of current-conducting wire. Adjacent the ends of the unit terminals are applied. These conveniently include encircling portions in the form of clips 18 to which leads 19 are suitably secured; the length of these

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leads being such that they extend substantially beyond the ends of the tube 15 when the unit is disposed therein.

As is apparent, the windings 17, may be applied to the core 16 by a machine which is substantially automatic in operation. Thus, a core of any desired length may be provided and a section of that core may be selected which will furnish a resistor unit of a desired value according to the length of core and windings associated therewith which are severed from the main core body. As will be hereinafter apparent, such a unit may be bent upon itself or otherwise disposed so as to properly fit within a desired space.

With the resistor unit in place within the tube, the space intervening the several surfaces of the unit and the inner tube face is filled with a cement-like material 20. This material should incorporate di-electric properties and have the characteristics of relatively high heat conductivity. The inner face of the tube 15 may be formed with one or more grooves into which the mass of material may extend, thus keying and interlocking the several parts against movement. Incident to the high heat-conducting properties of the material, it is apparent that heat generated in the windings of the resistor unit will be quickly transferred through to the outer face of tube 15 and dissipated therefrom.

In the form of construction shown in Figs. 5 and 6, the body 22 of the resistor unit is bent upon itself to embrace a U-shaped configuration. It is disposed within a tube 23 of ceramic or other suitable material which is formed with a pair of opposed grooves 24 in its inner face. Within these grooves a strip of mica 25 or other suitable material is positioned. Thus, this strip acts as a fixed partition to separate the legs of the unit 22 and to maintain the latter in position. Additionally the tube 23 may include opposed recess portions 26 which provide spaces adequate for the legs of the unit 22. Applied to the latter are suitable terminal units 27 from which leads 28 extend beyond the body of the tube. As in Figs. 1 to 4, the spaces intervening the surfaces of the resistor unit, the inner face of the tube and the strip 25 are filled with a mass 29 of material which has insulating characteristics and high heat conductivity.

The unit illustrated in Figs. 7 and 8 is basically substantially identical with that shown in Figs. 5 and 6. For this reason similar reference numerals have been employed to designate the same parts. However, in the latter figures in lieu of the terminals 27, terminals 30 are employed. These

include arcuately extending arms 31 and clips or encircling portions 32. As will be observed, the arms 31 have a length such that they may bear against the opposed surfaces of the recesses 26. The arms 32 intimately engage the convolutions of body 22 adjacent its ends to establish proper electrical connection therewith. Thus, the ends of the unit 22 are firmly fixed against displacement and all parts will therefore be maintained in proper positions with respect to each other.

As shown in Figs. 9 and 10, a resistor involving a body which is disposed, for example in U-shape, may be mounted to extend through and above a supporting panel 32'. Due to the disposition of the resistor element the length of the unit will not be excessive. Only a base portion will project below that panel. Such support is conveniently achieved by encircling the body of the tube 23 with a mounting strap 33, which may have a foot portion 34 suitably attached to the panel 32. When thus disposed, any heat generated by the resistor will be dissipated through the walls of the tube 23 and move upwardly beyond the surface of panel 32. The connections to the terminals 30 of the resistor will all be below such panel. As will readily be understood, this is a most desirable arrangement both from the viewpoint of long life as well as repair and maintenance.

In Fig. 11 a somewhat preferred form of structure is illustrated. The numeral 35 indicates the tubular body which in this embodiment is formed with inwardly extending portions or ribs 36 spaced conveniently 90 degrees from each other. The resistor 22 is disposed within the body and the strip 25 may conveniently be eliminated. In the usual manner, terminals of the type shown in Fig. 7 and 8 are applied to the ends of the resistor and these terminals have their arm portion 31 disposed within the recesses defined between the ribs 36. Therefore, the end and body of the resistor will be firmly anchored in place. Accordingly, the mass of material 37 (which is preferably employed) may thereupon be introduced and the unit will then be complete.

In common with the previously described structures, an operator will be able to select the manner in which the resistor is to be disposed within the tube. Thereupon, after application of the terminals, such disposition may be assured as afore described. It will be understood that as herein shown, while the outer encasing body of the assembly is preferably circular in outline, it might include a hollow body of any desired configuration. Therefore, the word "tube" as employed in this specification and claims is to be construed in the generic rather than in a limited sense.

Thus, among others, the several objects of the invention as specifically afore-noted are achieved. Obviously numerous changes in the construction might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A resistor including a tube, a resistor element having its body bent to extend in the form of a U with the outer ends of its legs disposed adjacent one end of said tube, leads extending from the ends of said element beyond said tube, a mass of material having di-electric and heat-conducting properties filling the space between the legs of the element and also between the element and the inner surfaces of said tube, said tube being formed with a pair of opposed grooves and a strip of material extending across said tube with its edge portions in said grooves, said strip engaging the base of said element and extending between the legs of the same.

2. A resistor including a tube, a U-shaped resistor element enclosed within said tube with its ends adjacent to one end of the same, terminals secured to such ends and extending beyond said tube, said tube being formed with grooves in its inner face, a mounting strip extending across the bore of said tube and having its edges disposed within said grooves and said strip extending between the legs of said element.

3. A resistor including a tube, opposed angularly extending faces formed within said tube, a resistor element disposed within said tube, a terminal connected to said element and extending beyond said tube and arcuately extending arms forming a part of said terminal and having their ends in bearing engagement with said tube faces to prevent displacement of said element with respect to said tube.

4. A resistor including a tube presenting a bore having on its opposite sides a pair of opposed surfaces, a U-shaped resistor element disposed within said bore, terminals secured to the outer ends of said elements, arms forming a part of said terminals and having their opposite end portions bearing against the opposed tube surfaces to anchor said element against displacement with respect to said tube, said tube being formed with grooves in its inner face and a mounting strip having its edges extending into said grooves, its body lying within the space between the legs of said element.

5. In a resistor as a sub-combination, a terminal for application to a resistor body, said terminal comprising an encircling portion to intimately engage the end of a resistor body, an arcuate bracing portion extending to points beyond the side faces of said encircling portion for anchoring said terminal against displacement with respect to surfaces adjacent thereto and a portion to be connected to a current-conducting lead.

6. A unit of the type described including a hollow body, ribs extending inwardly within said body and defining between them an annular series of recesses, a resistor disposable within said body, terminals secured to the ends of said resistor and means extending from said terminals and selectively engageable with the walls of said recesses to anchor said resistor against displacement.

7. A resistor including in combination a tube, ribs forming a part thereof and extending into the bore of said tube, a resistor element within said bore, a terminal to be connected to a lead and having an end portion extending beyond said tube, a part of said terminal encircling said element adjacent its end and an arm portion also forming a part of said terminal to extend transversely of and beyond said encircling part to have its ends bear against the side faces of said ribs.

8. A resistor including in combination a tube, ribs forming a part thereof and extending into the bore of said tube at points substantially spaced 90° from each other, a resistor element within said bore, a terminal to be connected to a lead and having an end portion extending beyond said tube, a part of said terminal encircling said element adjacent its end and an arm portion also forming a part of said terminal to extend transversely of and beyond said encircling part to have its ends bear against the side faces of said ribs;

said arm portion being curved to lie in contact with the bore face of the tube between said ribs.

9. In a resistor as a sub-combination, a terminal body comprising a portion for connection with a lead, a resistor-encircling portion and a part embracing arms lying substantially transversely from the side faces of said encircling portions, said arms presenting outwardly extending end edges to engage the surface of a resistor-ensleeving member.

10. In a resistor as a sub-combination, a tubular body to receive within its bore a resistor element, the exterior of said body being substantially cylindrical, ribs forming a part of said body and extending inwardly within the bore thereof towards the tube axis and the side faces of said ribs lying in planes substantially radial to said axis and presenting surfaces to be engaged by the ends of arms forming part of a terminal coupled to the resistor element.

GEORGE J. MUCHER.

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