

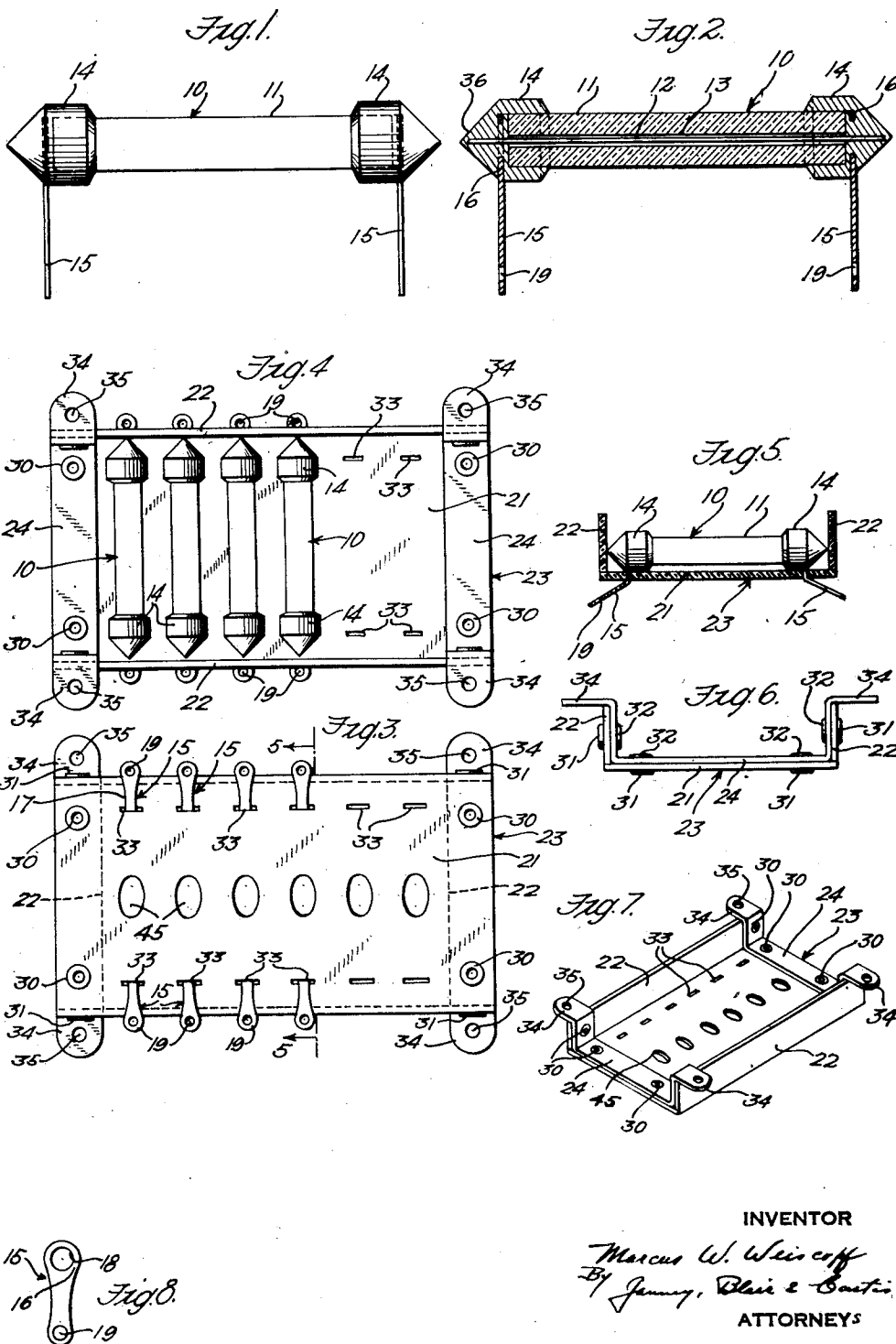
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RESISTANCE

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RESISTANCE

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The invention relates to a mounting for resistors.

One of the objects of the invention is to provide a mounting for resistors on which the resistors may be quickly and easily assembled. Another object of the invention is to provide a resistor readily adaptable for mounting on a suitable support. Another object of the invention is to provide a support for a plurality of resistors which is of strong and durable construction. Another object of the invention is to provide a mounting for resistors which may be produced at a low cost. Another object of the invention is to provide a mounting for resistors which substantially encases the resistors, so that they will not become broken even though subjected to rough handling. Another object of the invention is to provide a resistor gang construction readily adaptable for use in a radio cabinet or in similar apparatus. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combination of elements, and arrangements of parts, as will be exemplified in the structure to be hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown one of various possible embodiments of the mechanical features of this invention,

Figure 1 is an elevation of a single resistor before mounting,

Figure 2 is a longitudinal sectional view of the resistor,

Figure 3 is a front elevation of the mounting for a gang of resistors with the resistors in position,

Figure 4 is a rear elevation of the mounting showing the resistors in position.

Figure 5 is a cross sectional view of the mounting, the section taken on the line 5—5 of Figure 3,

Figure 6 is an end view of the mounting,

Figure 7 is a perspective view of the mounting showing its rear or inside face without the resistors, and

Figure 8 is a view of one of the terminals used in constructing the resistors,

Similar reference characters refer to similar parts throughout the several views of the drawing.

Referring first to Figures 1 and 2, the resistor, which is indicated generally by the numeral 10, preferably consists of a rod or bar of porcelain or other insulating substance 11 having a capil-

lary passage 12 through which extends a resistance conductor 13 embedded in metal end pieces 14. The resistance conductor 13 preferably comprises a glass rod or filament covered with a conductive coating of high resistance material, such as carbon. The conductor 13 is in intimate contact with the wall of the capillary passage 12, the diameter of the conductor being preferably as near to the diameter of the capillary passage 12 as is practicable. The porcelain insulator 11 is a good dielectric, so that there is no leakage of current through it, but as it readily conducts heat, any heat generated by the resistance element 13 is quickly dissipated.

The metal end pieces 14, 14 are rigidly connected to the porcelain insulator rod 11. This may be done by relating the rod and the projecting ends of the resistance conductor 13 which is supported by the rod 11 to a suitable mold and molding the metal end pieces 14, 14 on said insulating rod 11, thereby embedding the ends of the resistance conductor 13, as is clearly shown in Figure 2. Preferably the metal end pieces 14, 14 are of readily moldable metal, such as type metal, which in cooling contracts and firmly grips the ends of the porcelain rod 11 so as to form a firm and rigid body.

Referring now more particularly to Figure 8, there are provided a pair of terminals 15 for each resistor 10, an exemplary embodiment of such terminals being illustrated in Figure 8. As shown in that figure, each terminal 15 comprises a portion of relatively large diameter 16 on one end of an elongated portion 17, there being a hole 18 in the portion 16 and a hole 19 in one end of the elongated portion 17. The portion 16, by reason of having included in it the hole 18 which is comparatively large, is substantially an annulus merging, however, into the elongated portion 17 in one end of which is the hole 19 which is comparatively small.

The terminals 15 are desirably formed of sheet metal and may be made into the shape described by a stamping operation from a sheet or strip of material. The terminals 15 are desirably made of a good conducting material, such as copper, so that the resistance of each resistor 10 may be substantially completely embodied in the resistance of the resistance conductor 13. If made of copper, they may be coated with tin in order to prevent or retard corrosion. A further advantage of the use of copper for the terminals 15 is that when bent they take a new shape and do not spring back into original position, and this is a desirable feature and assists in

securing the separate resistors in position in their mounting, as will more fully appear hereinafter. Other metal of relatively high conductivity and low elastic limit might be substituted for copper in the making of the terminals 15.

In the manufacture of the resistors 10 a terminal 15 is related to each end of the rod or bar 11 of insulated substance before the metal end pieces are molded. Referring now to Figure 2, the portions 16 of relatively large diameter of a pair of terminals 15 are placed against the ends of a rod or bar 11, the terminals 15 thus lying in parallel planes, with the elongated portions 17 substantially parallel and therefore projecting from the same side of the resistor being formed. The resistance conductor 13 extends, at its opposite ends, through the large hole 18 in each terminal 15. Type metal is then poured into the molds and completely embeds the portions 16, and when the type metal has cooled, the rod 11, the resistance conductor 13, the terminals 15 and the metal end pieces 14 constitute an integral unit and the elongated portions 17 of the terminals 15, which are flexible, extend laterally from this unit. Preferably the annular portion 16 is completely embedded in the type metal so that the metal end caps 14 constitute a continuous piece, thus making the article exceedingly strong.

Referring now to Figures 3 to 7 inclusive, I provide a rectangular sheet of insulating substance 21. Preferably this substance is bakelite or a phenolic condensation product which is strong, not brittle, has a high dielectric strength, and is not damaged by water or oil. One of the features of my invention is that the finished gang of resistors may be given relatively hard usage without being broken. In accordance with certain features of my invention, other substances such as hard rubber and sheet fiber might be used instead of bakelite.

Preferably the mounting for the resistance includes besides the rectangular sheet of insulating material 21 a pair of strips of insulating material, preferably bakelite, 22, 22. These strips 22, 22 are fastened to the rectangular sheet 21 to form a generally channel shaped body 23 of insulating material. A plurality of resistors 10 are included within the space contained within this generally channel shaped insulating body 23 so that the resistors 10 are well protected from damage during handling of these gang resistor units of the invention.

In accordance with certain features of the invention, I have devised a very effective way of connecting the strips 22, 22 on either side of the sheet 21 to said sheet. Referring to Figures 4 to 7 inclusive, a pair of generally U-shaped pieces of flat metal 24, 24 are secured to the inner surfaces of the sheet 21 and the strips 22 respectively, extending along the end portions of said sheet. A hole is made near either end in each strip 22, and a corresponding hole is made in either leg of the generally U-shaped pieces 24. Also holes are made near the four corners of the rectangular sheet 21, and corresponding holes are made in the connecting portions of the U-shaped metal pieces, the several sets of holes being so spaced that when the strips 22, 22 and the rectangular sheet 21 are placed together over a metal piece 24, the holes in the sheet 21 and strips 22 register with the holes in the flat metal pieces.

The rectangular sheet 21 and the strips 22, 22

of bakelite or other insulating material are then riveted to the generally U-shaped metal pieces, there being a U-shaped metal piece at each end of the channel shaped mounting 23. This riveting is preferably done by means of tubular metal fasteners 30; the tubular metal fasteners 30 constituting hollow cylinders with an end flange 31. They may be simply placed through the registering holes, and then the end without a flange may be expanded by means of a suitable tool, which give the tubular fastener a second flange 32, and thus firmly encloses the metal piece 24 and the rectangular sheet 21 or one of the strips 22 between the opposite flanges of the tubular fasteners. This mode of attachment of the U-shaped metal pieces 24 to the insulating material has the further advantage that the operation which produces the second flange actually presses the parts being fastened firmly together, and so produces an article which is rigid at the joints.

Referring particularly to Figures 3 and 7, a plurality of slots 33 are made in the rectangular sheet of insulating material 21. In accordance with certain features of my invention, these slots 33 are formed in parallel rows, with the slots of each row spaced similarly to the slots of the other row, so that a pair of opposed slots are the same distance apart and lines joining any pair of opposed slots are parallel. Referring now to Figure 4, a plurality of resistors 10 are located inside the channel shaped mounting 23 with their terminals 15 extending through slots 33. Each resistor 10 has terminals 15 extending through a pair of oppositely located slots 33, and as a result of the spacing of the slots in the manner shown the resistors are parallel one to another. The terminals 15 extend through to the outside of the channel shaped member 23, and said terminals having been pushed through the slots until the metal end pieces 14, 14 are in direct contact with the back side of the rectangular sheet 21, the terminals 15 are then bent over in order to secure each resistor 10 in position. By this mode of attaching the resistors 10 to the channel shaped mounting 23 the resistors 10 are firmly fixed to the channel shaped mounting 23, and may be removed therefrom by bending the portions 16 of the terminals 15 so that they extend at right angles to the axis of the resistors 10.

Referring now particularly to Figure 3, the portions 17 of the terminals 15 that extend through the slots 33 and the holes 19 in these portions lie spaced from the mounting 23. One or more resistors may be connected in any desired circuit by passing a conductor through the holes 19 in the opposite sides of said resistor. The conductors may be soldered to the terminals 15 at the holes 19, or the union may be a mechanical one in which the resistance to deformation of the terminals presses the metal thereof, particularly the sides of the holes 19, against the conductor. The terminals 15 thus comprise an effective binding post for the attachment of wire and at the same time they mechanically hold the resistors 10 in place in the channel shaped mounting 23.

The U shaped metal strips 24 each have a pair of laterally extending portions 34 in which are holes 35 by means of which the entire unit may be fastened either with nails, screws or any other suitable fasteners to a radio cabinet or other desired electric apparatus.

Desirably the resistors 10 are of different re-

sistance value, so that many different resistance effects may be obtained from a single gang unit. The resistors 10 may be marked in any suitable manner to indicate their resistance value, and peep holes 45 are preferably provided in order that the value of each resistor may be determined from either front or back of the article. Separate resistance devices 10 may be connected together in series or in parallel. The entire unit is extremely durable and owing to the fact that the separate resistors 10 are enclosed and protected, as well as owing to the construction of the resistors 10 themselves and their attachment to an insulating body, there is no danger of a short circuit in the apparatus. One or more resistors 10 may be removed from the channel shaped mounting 23 if desired.

It will thus be seen that there has been provided by this invention an apparatus in which the various objects hereinabove set forth, together with many thoroughly practical advantages, are successfully achieved.

As many possible embodiments may be made of the above invention, and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In apparatus of the class described, a rectangular sheet of insulating material, there being a row of slots near both sides of the sheet and the rows being parallel, a plurality of resistors comprising insulating rods having therein resistance conductors, metal end caps on the ends of the insulating rods, bendable metal terminals at each end of each resistor, said terminals having one end embedded in said caps and projecting sideways from said caps, the terminals extending through the slots securing the resistors on the rectangular sheet in parallel relation and providing for electric connection of the resistors in circuit with any apparatus, a pair of rectangular strips of insulating material united to the aforesaid sheet and forming with said sheet a generally channel shaped insulating support for the resistors, U shaped metal pieces on the ends of the sheet of insulating material and of the aforesaid strips, being fastened to them and holding these three parts together, and tubular metal fasteners securing the U shaped metal pieces to the sheet and to the strips of insulating material.

2. A resistor comprising an elongated body including a resistance conductor, a generally flat piece of metal having an annular portion at one end through which said resistance conductor passes the plane of the metal being substantially perpendicular to the principal dimension of the projecting portion of the resistance conductor and said piece of metal having a low elastic limit and a relatively high fusion point, and said flat piece of metal being irremovably secured to the elongated body, thereby adapting the resistor for attachment to a panel.

3. In apparatus of the class described, three sheets of insulating material, U-shaped metal

pieces connecting said sheets together in channel shape, tubular metal fasteners fastening the sheets to the U-shaped metal pieces, there being aligned holes in the central sheet, and a plurality of resistors having bendable metal terminals at each end thereof extending through said holes.

4. In apparatus of the class described, a plurality of resistors each comprising an elongated body, metal terminals permanently affixed to the ends of said body and constituting electrical terminals of the resistance of said resistors, thin flat bendable metal pieces including an annular portion integrally attached to said terminals each having a hole for the attachment of a conductor, and a sheet of insulating material having slots through which said terminals are passed to secure the resistors to the material without short-circuiting them or intercircuited them.

5. A resistor comprising an elongated body, metal end caps on opposite ends of said elongated body shaped to exactly fit the ends of said body and irremovably fastened thereto by close contact therewith, flat bendable metal terminals of low elastic limit integrally secured to the metal end caps and extending therefrom in the same direction, the plane of the flat metal where it joins the metal end caps being perpendicular to the axis of the body and there being apertures near the ends of said flat metal terminals, which terminals may be bent to extend away from both ends of the elongated body to secure the resistor to a panel by means of slots therein through which the terminals extend.

6. Means for mounting a resistor element on an insulating support comprising a combined terminal, connection post and mounting member composed of sheet metal formed to receive an end of the resistor element and provided with an extension formed to receive a connecting conductor, said support having an aperture through which a portion of the extension protrudes to be bent over to secure the resistor element to the support.

7. Resistance apparatus comprising a flat panel made of insulating substance and having two parallel rows of slots therethrough said slots being elongated in the direction of the rows and opposite slots being positioned in parallel lines, a plurality of cylindrical resistor bodies, metal end caps on the opposite ends of each resistor body in firm engagement with the cylindrical surface, flat metal terminal and mounting members one extending from each end cap and integrally attached to its end cap, the plane of the metal being perpendicular to the axis of the resistor at the junction point with the cap and each terminal having a low elastic limit and a high melting point said flat metal terminal mounting members each extending through a slot and being bent over to hold the resistors in place with the cylindrical end caps tangent to the panel, and there being detents in the far ends of the flat metal terminal mounting members for the ready attachment of wires by solder.

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