April 19, 1960 H. M. WUTZ 2,933,709

ELECTRICAL ELEMENT ASSEMBLY

Filed Oct. 16, 1958

Fig. 1.

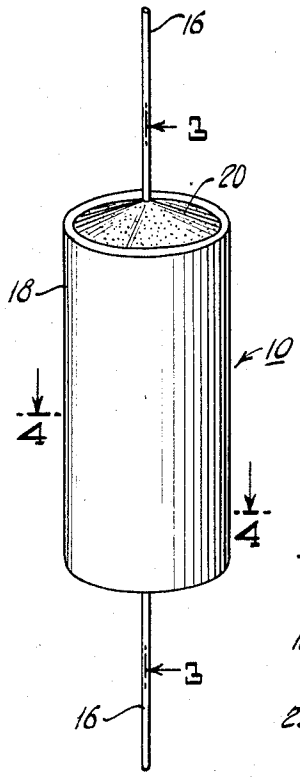


Fig. 3.

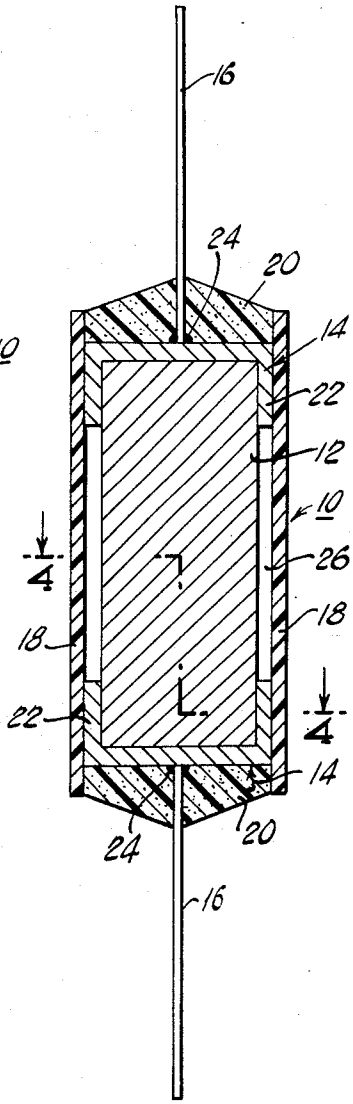


Fig. 2.

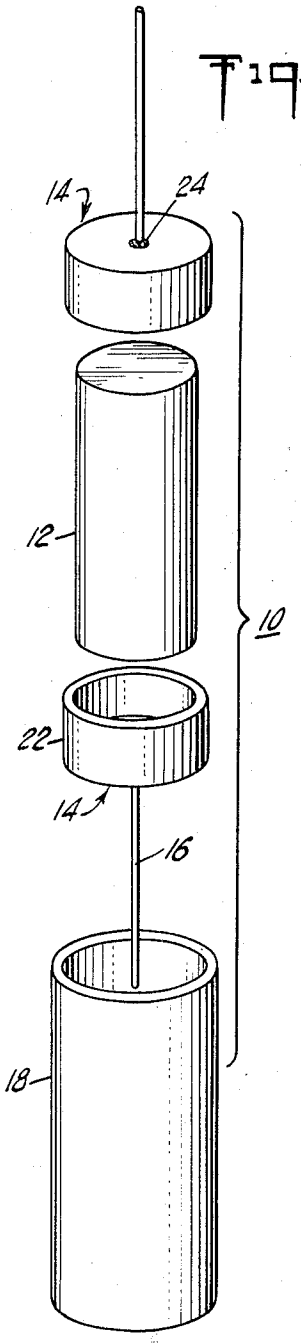
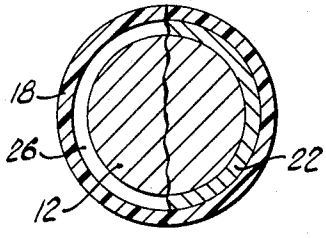


Fig. 4.



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ELECTRICAL ELEMENT ASSEMBLY

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5 Claims. (Cl. 338—275)

This invention relates to electrical elements and more particularly to assemblies of electrical elements, such as capacitors, inductances and resistors, which are mechanically rigid and hermetically sealed.

Resistor assemblies have heretofore generally included a component body having a resistive element affixed thereon with extended wire leads attached to each end of the element and a ceramic shell enclosing the component body in such a manner that the leads protrude therefrom. If the ends of the shell are open solder is often used to close up these ends and seal the assembly. These prior assemblies, however, lack positive mechanical anchorage between the component body and the shell and the solder engaging the lead wires is usually the only support of the resistive element in the shell. The solder which seals the ends, also holds the wires centered and, thus, holds the body in place within the seal. This is particularly disadvantageous where the assembly is subjected to vibration and shocks under which conditions the resistive element may be jarred out of position and in marginal cases the seal might be jarred loose.

Accordingly, it is an object of the present invention to provide an inexpensive, easily assembled yet structurally strong electrical element assembly of improved structural strength. It is a further object to provide a resistor assembly which is durable and more rugged then the ceramic shell resistors used heretofore. It is a still further object to provide an assembly wherein the component body with its resistive element is held mechanically in a fixed position within the shell independently of any seal at the ends of the shell.

According to this invention, one provides an assembly wherein a sealing material adheres tenaciously both to the outer shell and to metal caps which are placed over the ends of the resistive element.

In the accompanying drawing a preferred embodiment of the present invention is shown and certain modifications are suggested in the specification. It is to be understood that these are not intended to be exhaustive or limiting of the invention, but, on the contrary, are for the purpose of illustrating and describing the invention in order that others skilled in the art may fully understand the invention, its principles and the application thereof, and that they may embodying it and adapt it in numerous forms, each as may be best suited to the requirements of the particular usage.

In the drawings:

Figure 1 is a longitudinal perspective view of a resistor assembly in accordance with the present invention;

Figure 2 is an exploded longitudinal perspective view of the resistor assembly of Figure 1 but not including the plastic sealing compound at each end of the plastic shell;

Figure 3 is a longitudinal sectional view taken on line 3—3 in the direction indicated by the arrows 3—3 on Figure 1; and

Figure 4 is a transverse sectional view of the resistor assembly of Figure 1 taken on line 4—4, in the direction

of the arrows 4—4, on Figure 3. The proportional thickness shown in Figures 2, 3 and 4 are distorted for easier reading. In ordinary practice the metal of caps **14** will be much thinner than the plastic tubular wall **18**; but these thicknesses are not a part of the present invention.

Referring now to Figures 1, 2 and 3 of the drawings, an illustrative embodiment of the present invention in the form of a resistor assembly is geenrally indicated at **10**. This assembly **10** comprises a component body **12**, a pair of metal contact caps **14**, a pair of lead wires **16**, one being attached to each cap e.g. by welding or brazing, an outer plastic shell **18** tightly fitted around the end caps **14** and also surrounding the component body **12**, and a seal **20** of a compatible plastic sealing compound at each end of the shell **18**.

The component body **12** includes a suitable core which is a resistive element itself, or it may carry a resistive element. For example, the core may be of porcelain and the resistive element may be a wire wound thereon in one or several layers, or it may be a sprayed or adhesively bonded coating of a more or less conductive material, for example carbon. Since the selection of the core and resistive element is already well known and dependent on the particular situation for which the assembly will be used, the resistive element in the illustrated embodiment will be considered in this specification as a conventional unit and referred to as the "component body" **12**.

Fitted on the ends of the component body **12** are metal end caps **14**. In one embodiment of the present invention end caps of brass proved very satisfactory. The caps **14** have a skirt or flange **22** which fits snugly about the ends of the component body **12**, thus providing good contact between the caps and the resistive element.

Attached to each cap **14** is an extended lead wire **16** which is fixed to the cap by suitable means such as welding or soldering at **24**.

After the caps **14** have been fitted onto the body **12**, this sub-assembly is placed within the plastic shell **18**. In order to insure that the body and caps will be substantially rigidly positioned with the shell **18**, the maximum diameter of each cap **14** is advantageously slightly greater than the inside diameter of the shell **18**. By so constructing the caps and shell, when the shell **18** is forced over the end caps **14** a mechanically rigid structure is obtained. This forced fit between the caps and shell insures that the component body **12**, with its attached resistive element, will be securely held in spaced relation with the shell **18**. This fixed spaced relation of the comcomponent body **12** within the shell **18** prevents the shell influencing the characteristics of the resistive element. Further, when the seal **20** is applied at each end of the shell **18** the tight joint between the caps **14** and the shell **18** insures that the seal **20**, if applied in a liquid state, will not flow past the cap **14** and into the annular space **26** between the component body **12** and the inner wall of the shell **18**.

By having the body **12**, the caps **14**, and the shell **18** rigidly secured together the seal **20** is only required to act as an hermetic seal and it need not perform the additional function of structurally stabilizing the assembly.

In a preferred embodiment of a resistor assembly in accordance with the present invention the plastic shell **18** is advantageously made from an epoxy resin base compound and the sealing compound used to form the seal **20** is also an epoxy type potting resin or sealer. The use of an epoxy resin base material provides a plastic shell which is relatively rigid and yet is not fragile, but other resins may be used such as nylon, vinyl chloride, polyesters, synthetic rubbers, etc., and much advantage can be had from this invention using metal caps tightly fitted on the body and in the shell even when both are made of usual ceramic materials. The epoxy resin seal-

ing compound has extremely good adhesive qualities and it adheres tenaciously to the shell **18** and to the metal cap **14**. Thus, the epoxy resin compound provides a very effective hermetic seal.

The caps **14** are preferably set inward from the edges of the shell **18**; e.g., in one embodiment of a resistor assembly it was found satisfactory to have the shell **18** protrude about one-eighth of its length beyond the caps **14** at each end.

From the foregoing description it will be appreciated that the present invention provides a new and unique component assembly which is rigid and mechanically stable. It will thus be appreciated that the present invention accomplishes the aforementioned and other advantageous objects. However, it should also be emphasized that the foregoing description of the particular embodiment which is shown in the accompanying drawings is intended to be illustrative of the invention and is not exhaustive of the invention.

I claim:

1. An electrical resistor assembly or like component comprising a body having a resistive element attached thereto, metallic end caps fitted over each end of said body, lead wires attached to each cap, a plastic tubular shell surrounding said body and said caps, said lead wires protruding from said shell, and a sealing compound hermetically sealing each end of said shell, the outside diameter of said metallic caps being slightly greater than the inner diameter of said shell whereby a mechanical bond between said shell and said caps is maintained, said body being in fixed spaced relation with the inner surface of said shell.

2. An electrical resistor assembly or like component as set forth in claim 1, wherein said caps are each set back within said shell a distance approximately ⅛ the length of said shell.

3. An electrical resistor assembly or like component as set forth in claim 1, wherein the ends of said tubular shell are sealed with an organic plastic sealing compound.

4. An electrical resistor assembly or like component as set forth in claim 1, wherein said tubular shell is made of an epoxy resin base compound and said shell is cemented to the end caps by an epoxy resin sealing compound whereby said assembly is hermetically sealed.

5. An electrical resistor assembly or the like comprising a body having an electrical element attached thereto, metallic end caps fitted over each end of said body, lead wires attached to each of said caps, a plastic tubular shell surrounding said body and tightly fitting about said caps, said lead wires protruding from said shell, and a sealing compound filling in each end of said shell and hermetically sealing said caps and body within said said shell, the outside diameter of said metallic caps being slightly greater than the inner diameter of said shell whereby a strong mechanical bond between said shell and caps is maintained independent of said sealing compound, said caps maintaining the tubular shell in fixed spaced relation from the electrical element whereby the characteristics of the element are independent of influence from the shell; said shell being comprised of an epoxy resin base plastic and said sealing compound being comprised of a compatible epoxy resin base plastic compound.

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