March 26, 1957 C. E. ROEMER 2,786,976

CIRCUIT COMPONENT

Filed July 24, 1952

FIG. 1

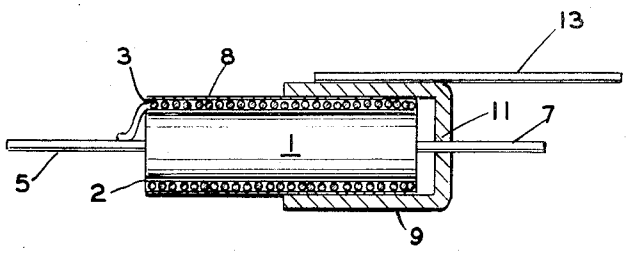


FIG. 2

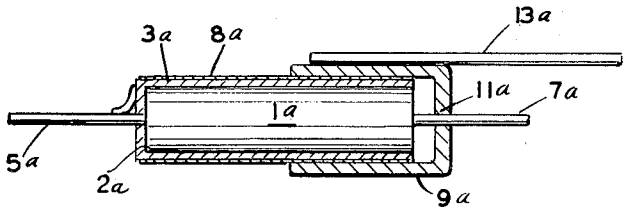
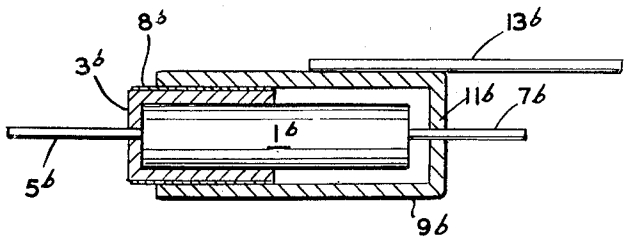


FIG. 3



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CIRCUIT COMPONENT

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This invention relates to components for use in electrical circuits and more particularly to such components employed at high impedance points in electrical circuits.

One object of the present invention is to provide a shielded resistor for use at high impedance points in electrical circuits to minimize pick-up voltages.

Another object is to provide a combined resistor and condenser wherein the resistor is shielded to minimize pick-up voltages.

Another object is to provide a combined resistor and condenser wherein the capacitance of the condenser may be readily varied.

The shielded resistor alone or the combined resistor and condenser is especially adapted for use in the input grid circuit of a high gain voltage amplifier, where the resistor is likely to pick up unwanted voltages. The combined resistor and condenser comprises a conventional resistor of carbon or other material having an insulating coating thereon. A metallic coating may be applied over the insulating coating on the resistor in the form of a wound wire, a cylindrical sleeve, or in any other manner, and the metallic coating may be connected to one of the resistor leads. The outer surface of the metallic coating may be covered with a dielectric such as paper or mica, and an electrically conductive member may be positioned over the dielectric and be slidable on the dielectric and the other resistor lead relative to the resistor and associated metallic coating. The metallic coating forms one plate of the condenser and the member forms the other plate of the condenser and the coating and member cooperate to shield the resistor. The capacity of the condenser may be varied by sliding the member on the other resistor lead and when the condenser is adjusted to a suitable capacity, the member may be secured to the other lead and held in position thereby.

The foregoing and other objects and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawing wherein three embodiments of the inventions are illustrated. It is to be expressly understood, however, that the drawing is for the purposes of illustration and description only, and is not to be construed as defining the limits of the invention. Accordingly, although the specification hereinafter states that the slidable member which constitutes the adjustable electrode of the condenser may be soldered to one resistor lead, it is understood that one aspect of the present invention contemplates the provision of a novel unit comprising a resistor cooperating with an adjustable condenser and that the solder is mentioned simply to suggest one of several possible means by which such resistor and adjustable condenser may be locked together when and if it is found desirable to lock the setting of the condenser after its adjustment for the particular circuit application intended.

In the drawing, Figure 1 is a longitudinal vertical section of a combined resistor and adjustable condenser constructed according to the invention, and

Figures 2 and 3 are longitudinal vertical sections showing other forms of the invention.

Referring now to the drawing for a more detailed description of the novel circuit component of the present invention, the component is shown in Figure 1 as comprising a resistor **1** of carbon or other suitable material having an elongated body with the usual insulating coating, such as a ceramic shell **2**, on its outer surface. A low resistance bore or uninsulated wire **3** is wound helically on the insulating coating **2** over the outer surface of the resistor so that the wire is insulated from the resistor by the insulating coating. A pair of leads **5** and **7** are connected to the ends of the resistor and lead **5** is connected to one end of wire **3**. Wire **3** provides a shield for the resistor to minimize pickup voltages when the resistor is used at a high impedance point in an electric circuit.

Wire **3** may also form one plate of a condenser and, in this event, a dielectric **8**, such as paper or mica, is placed over the wire. A cylindrical cup-shaped electrically conductive member **9** surrounds resistor **1** and associated wire **3** and has an aperture **11** in its end to receive lead **7**. Member **9** forms the other plate of the condenser and is slidable on insulation **2** and lead **7** relative to wire **3** to vary the capacity of the condenser. When the capacity of the condenser has been suitably adjusted, the cup-shaped member may be secured to lead **7** by soldering, welding, or in any other suitable manner. A wire-like element **13** may be secured to member **9** to facilitate manually adjusting member **9** relative to wire **3**, particularly when the circuit component is located in a relatively inaccessible place.

The combined shielded resistor and adjustable condenser is especially adapted for use in the input grid circuit of a high gain voltage amplifier, particularly where it is necessary to accurately phase the voltages applied to the grid by adjusting the condenser capacity.

In Figure 2, the shielded resistor and adjustable condenser unit is substantially the same as the arrangement shown in Figure 1 except that the shield **3***a* may be formed by directly plating a metallic film on the insulated carbon resistor **1***a* or by providing a metallic cylinder on the resistor which may be secured to lead **5***a*. The outer surface of the cylinder **3***a* may be covered by a dielectric **8***a*, such as paper, mica or other suitable material, and cylindrical electrically conductive cup-shaped member **9***a* receives the resistor and associated shield and may be adjusted to any suitable position on lead **7***a* to vary the capacity of the condenser formed by metallic cylinder **3***a* and member **9***a*.

While wire **3** in Figure 1 and the member **3***a* in Figure 2 are shown as fixed to resistors **1** and **1***a*, respectively, and extend the entire length of the resistors, and while members **9** and **9***a* are shown as extending approximately one-half the length of the associated resistors, it should be understood that the relative length of the members **3** and **3***a* and cylindrical members **9** and **9***a* is immaterial as long as they are telescoped one within another to overlap, so that the resistor is completely shielded by one or both of the members.

The arrangement shown in Figure 3 is substantially the same as the arrangements shown in Figures 1 and 2 except that a cylindrical electrically conductive cup-shaped member **3***b* extends substantially only one-half of the resistor length and a slidable electrically conductive member **9***b*, substantially the same length as resistor **1***b*, slides on member **3***b* and on lead **7***b*. Member **9***b*, after adjustment, may be soldered or otherwise secured to lead **7***b* substantially in the manner described in connection with Figures 1 and 2.

Although but three embodiments of the invention have been illustrated and described in detail, it is to be ex-

pressly understood that the invention is not limited thereto. Various changes can be made in the design and arrangement of the parts without departing from the spirit and scope of the invention as the same will be understood by those skilled in the art.

What is claimed is:

1. A circuit component of the class described comprising a resistor, and a pair of telescoping members of electrically conducting material insulated from and surrounding said resistor to shield said resistor and forming the plates of a variable condenser, said members being slidable relative to one another to vary the capacity of the condenser formed by said members.

2. A circuit unit of the class described comprising a resistor having an elongated body, a lead at each end of said resistor body for connecting said resistor in an electric circuit, and a condenser comprising a pair of overlapping condenser electrode members insulated from and surrounding said resistor body and forming a shield for said resistor, one of said members being connected to one of said leads and the other member being slidable along the other lead relative to said first member to adjust the capacity of said condenser.

3. A circuit unit of the class described comprising a resistor, a pair of overlapping members of electrically conducting material insulated from and surrounding said resistor to shield said resistor and forming the plates of a variable condenser, said members being slidable relative to one another to vary the capacity of the condenser formed by said members, and one of said members having an element secured thereto to facilitate adjustment of said member.

4. A circuit unit of the class described comprising a resistor, a shield of electrically conducting material insulated from the resistor and surrounding at least a portion of said resistor and forming one plate of a variable condenser, and a member of electrically conducting material receiving one end of said resistor and shield and cooperating with said shield to form the other plate of the condenser, said members being slidable relative to one another to vary the capacity of the condenser formed by said members.

5. A circuit unit comprising an elongated resistor, and a condenser insulated from the resistor and having as its electrodes a pair of relatively movable overlapping cup-shaped cylindrical electrode members which together substantially completely enclose said resistor to form a shield therefor which completely isolates said resistor from the influence of external electrical fields.

6. A circuit unit comprising a resistor, and a pair of overlapping electrically conductive members insulated from the resistor and each surrounding at least a portion of said resistor to shield said resistor from stray electrical fields and forming the electrodes of a condenser, said members being movable relative to each other to adjust the capacitance of the condenser formed by said members.

7. A circuit unit comprising an elongated resistor, a pair of overlapping cup-shaped cylindrical electrode members insulated from the resistor and having a capacitance therebetween and together completely enclosing said resistor, the base of one of said members being disposed adjacent one end of said resistor and the base of said other member being disposed adjacent the other end of said resistor, one of said members being longitudinally slidable with respect to the other member to adjust the capacitance therebetween.

8. A unit according to claim 7 wherein there is provided a layer of solid dielectric material between the overlapping portions of said members, said one slidable member being slidable on said insulation layer.

9. A circuit unit comprising an elongated resistor, a lead at each end of said resistor for connecting said resistor in an electric circuit, a shield of electrically conducting material insulated from said resistor and receiving one end of said resistor and surrounding at least a portion thereof and electrically connected to the lead at said one end, and an electrically conductive member receiving said shield and the other end of said resistor, said member being slidably adjustable along said other lead relative to said shield to form a variable condenser and adapted for rigid electrical connection to said other lead when adjustment of said member is completed.

10. A circuit unit of the class described comprising an elongated resistor, insulation means disposed on the outer surface of said resistor, a bare wire of electrically conductive material wound around the outer surface of the resistor on said insulation means so as to be insulated from said resistor and forming a shield for said resistor, and a cup-shaped electrically conductive member adapted to receive one end of said resistor and slidable relative to said wire to form a capacitance with said wire which varies with the sliding of said member.

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