United States Patent [19]

Dumas

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[54] **VOLTAGE DIVIDER ASSEMBLY WITH THICK FILM RESISTANCE ELEMENTS**

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[52] **U.S. Cl.** **338/48,** 338/174

[51] **Int. Cl.** **H01c 9/02**

[58] **Field of Search** 338/48, 174

[56] **References Cited**

UNITED STATES PATENTS

3,585,559 6/1971 Rozema et al. 338/48

Primary Examiner—Gerald Goldberg

Attorney, Agent, or Firm—Leo J. Aubel

[57] **ABSTRACT**

An assembly including a variable resistance comprising a resistive thick film for providing a variable voltage dividing function. The thick film is connectable across a source of voltage. A rotor mounted to make slidable contact with the thick film, provides an adjustable output voltage; and, the assembly includes a rectifier means for providing a feedback control voltage through the rectifier to the film.

4 Claims, 6 Drawing Figures

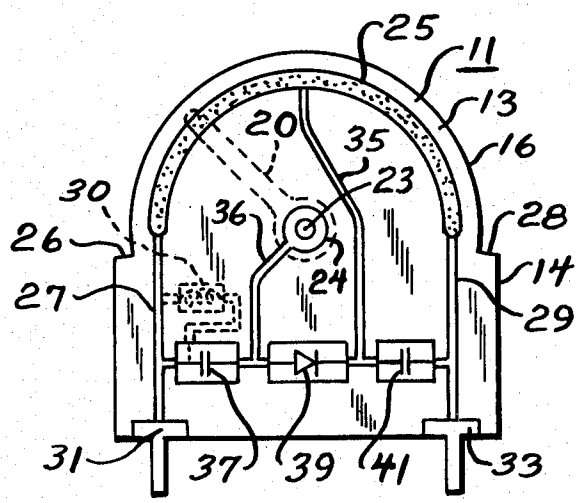


Fig. 1

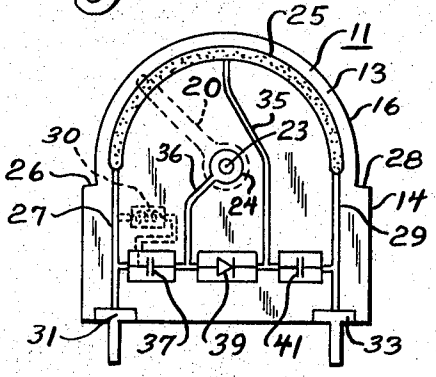
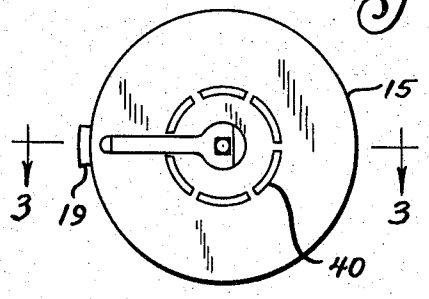


Fig. 2



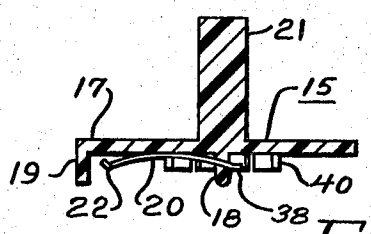
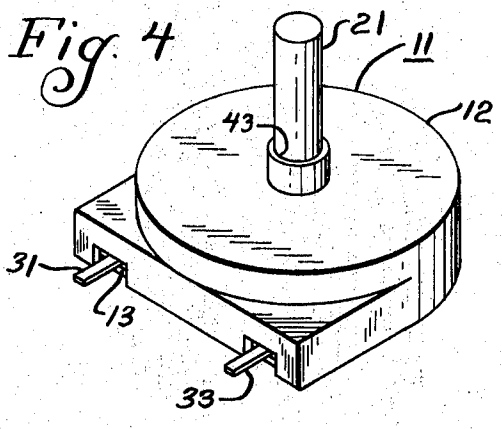


Fig. 3

Fig. 4



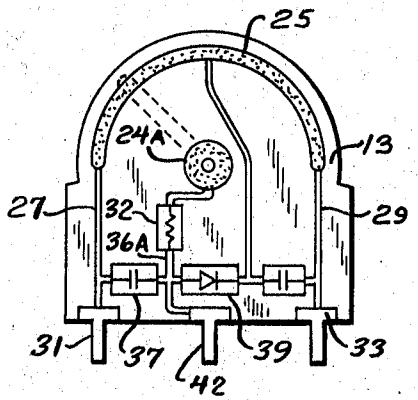


Fig. 5

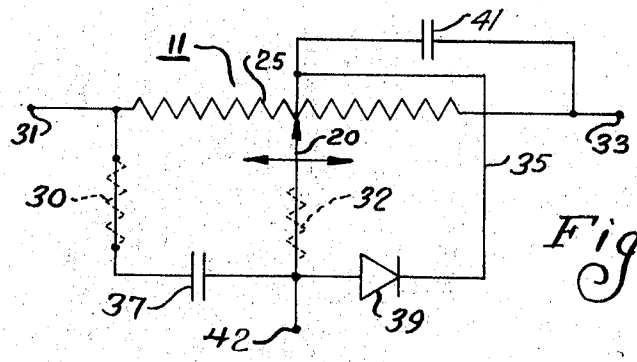


Fig. 6

VOLTAGE DIVIDER ASSEMBLY WITH THICK FILM RESISTANCE ELEMENTS

BACKGROUND OF THE INVENTION

Variable voltage dividers of various types are known in the art. Normally such voltage dividers comprise a resistive path and means for varying the voltage across the resistive path or across portion of the resistive path.

It is an object of the present invention to provide a variable divider of small construction which includes a thick film resistance element formed on a substrate, and has manual means for varying the voltage. Components for filtering the voltage developed across the resistance element, are included for providing a voltage which is a smooth, filtered D.C. voltage.

It is another object of the present invention to provide an improved voltage divider assembly having a conductive resistance film form on a ceramic substrate, having an adjustable contactor mounted on the substrate for varying effective resistance provided by the film, and capacitor components mounted on said substrate and electrically connected to the resistive path to provide a filtered D.C. output which closely tracks a source voltage.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the substrate portion of a variable voltage divider in accordance with the invention;

FIG. 2 is a plan view of the rotor including the movable contactor;

FIG. 3 is a cross sectional view taken along the lines 3—3 of FIG. 2 showing the details of the rotor;

FIG. 4 is an isometric view of the voltage divider assembly in accordance with the invention.

FIG. 5 is a plan view showing an alternative embodiment of the substrate portion; and

FIG. 6 is an electrical representation of the structure of the voltage divider of the invention.

DESCRIPTION OF THE INVENTION

The present invention is directed to a variable resistance voltage divider assembly comprising a thick film resistive path mounted on a substrate and having associated components for providing a stable output voltage relatively free of voltage spikes and transient excursions.

Referring now to the drawings, the voltage divider assembly **11** comprises a housing **12**, which in a preferred construction has a rectangular bottom portion **14** and a circular upper portion **16**. A rotor **15** is mounted on a substrate **13**. The rotor **15** includes a centering pin **18** which is received in a center hole **23** in substrate **13**. The rotor **15** includes a depending stop **19** which engages the shoulders **26** and **28** of substrate **13** to limit the extremes of its angular positions. An upstanding knob **21** on rotor **15** passes through a suitable central aperture **43** formed on the top of housing **12**. Referring specifically to FIG. **4**, the substrate **13** forms the bottom of the assembly, and rotor **15** is positioned (sandwiched) between the substrate **13** and the housing **12**.

Housing **12**, substrate **13** and rotor **15** are all formed of a non-conductive material such as for example ceramic.

The substrate **13** includes an electrically resistive path **25** which in the embodiment shown is in the shape of a semicircle. The path **25** comprises a thick film, that is, a component of electrically resistive material with a suitable dispersion of metal deposited on the substrate **13**. Any one of several commercially available materials may be used to form a resistive path **25**.

The ends of the path **25** are electrically connected by conductive connectors (leads) **27** and **29** of any suitable conductive material deposited on substrate **13** to terminal connector pads **31** and **33** respectively. Note, that the path **25** can be extended at either or both ends toward the pads **31** and **33**. Pads **31** and **33** are formed of a conductive material deposited on substrate **13**, and include suitable extensions for connection to the associated electronic carcuitry.

The rotor **15** includes a metalic conductive spring contactor or tap **20** which is formed and constrained to be anchored to the rotor such as by pin **18** and depending segments **40** and to be moved thereby. Contactor or tap **20** includes an end portion **22** which slidably contacts the resistive path **25** to provide an electrical connection thereto. The other end **38** of the contactor **20** contacts a suitable conductor material **24** deposited or formed on the substrate **13**.

A circuit of electronic components comprising serially connected capacitor **37**, diode **39** and capacitor **41**, may be connected between connectors **27** and **29**. Other electronic components such as the impedance **30** indicated by the dotted line can be connected as shown. In the latter case, the capacitor **37** would be connected to the impedance **30**, thence to connector **27**.

FIG. **6** shows a schematic diagram of the voltage divider **11** circuit arrangement and is useful in explaining the electrical operation of the circuitry. One use for such circuit is a centering circuit in television receivers. The resistive path **25**, essentially a potentiometer having one terminal **31** connected to an A.C. source such as a transformer and the other terminal **33** connected to the horizontal deflection yoke of the picture tube. develops a voltage thereacross. The diode **39** has its cathode connected to a midpoint on resistive path **25** and its anode connected to the readily adjustable contactor **20** through the conductive connector **36** and collector **24**. Diode **39** may also be connected in an opposite polarity, that is, its anode electrde connected to the midpoint on resistive path **25** and its cathode electrode connected to contactor **20**.

In operation, diode **39** rectifies a portion of the current flowing through the resistive path **25** and couples this rectified current through the adjustable tap **20** back to the resistive path **25** to provide a D.C. bias. The D.C. voltage or bias supplied to the deflection yoke can thus be changed causing the center of deflection of the picture or raster to be changed. The voltate divider **11** thus provides the capability of controlling both the right and left movement of the raster.

The resistance of the resistive path **25** and the polarity connection of diode **39** depends on the voltage desired and the amount of centering required. In one embodiment a **20** ohm resistive path is used to obtain plus or minus one-half inch center variation of the picture positioning.

Capacitors **37** and **41**, of a relatively low capacitance, function as transient filter capacitors to suppress any spikes (voltage transients) which may be produced by

the diode at the voltage transition points. In certain instances where any spiking by the diode may be tolerated or acceptable, either or both capacitors may not be necessary.

A conductive connector (lead) **35** similar to connectors **27** and **29** electrically connects a midpoint of resistive path to the junction of diode **39** and capacitor **41.**

Note, that metallic contactor **20** is bowed along its center portion as shown in FIG. **3** so that there is no electrical contact between contactor **20** and connector **35.**

Another embodiment of the invention is shown in FIG. **5** wherein the center contactor **24A** is a resistive material and includes a resistance **32** which may either a discrete resistance or of a deposited material similar to resistive path **25.** Resistance **32** is connected either directly or through conductive connector **36A** to a third terminal pad **42** in turn connected to the junction of capacitor **37** and diode **39.** The resistor **32** functions as a pulse limiter during adjustment.

The terminal pad **42** is useful to provide a means to connect a selected voltage from the yoke, to effect feedback control to compensate for picture changes due to station or receiver phase changes.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that changes in form and details may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A variable voltage divider comprising an electrically non-conductive substrate, a plurality of conductive terminations supported on a surface of said substrate, a resistive path supported on said surface and electrically connected at its ends to respective conductive terminations, a first conductive connector supported on said surface and having one end electrically connected to a intermediate point on said resistive path, a center conductive collector supported on said surface, adjusting means supported for movement relative to the substrate, a conductive contactor constrained to move with the adjusting means to wipingly engage the resistive path and the conductive collector, a second conductive connector having one end connected to the collector, rectifier means having one electrode connected to said first conductive connector and the other electrode connected to the conductive contactor and the collector to thereby provide a variation in the output voltage and a feedback control voltage bias.

2. A variable voltage divider as in claim **1** further including at least one capacitor connected to said rectifier means to filter the voltage appearing there across.

3. A variable voltage divider as in claim **1** wherein said conductive collector comprises a thick film resistance.

4. A variable volage divider as in claim **2** wherein a conductive termination is connected to the junction of the capacitor and the rectifier means with the moveable connector to provide a selected output voltage.

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