United States Patent [19]

Brandi

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[54] **FILM RESISTORS**

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[52] **U.S. Cl.** **338/260**, 338/262, 338/273, 338/275, 338/292, 338/309, 338/314, 338/329

[51] **Int. Cl.** **H01c 1/14**

[58] **Field of Search** 338/260, 262, 273, 338/275, 276, 292, 293, 309, 313, 314, 329, 328, 322

[56] **References Cited**

UNITED STATES PATENTS

2,680,184	1/1954	Cox	338/292
3,518,603	6/1970	Kepata	338/260

FOREIGN PATENTS OR APPLICATIONS

627,262	9/1961	Canada	338/292

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[57] **ABSTRACT**

A metal film resistor adapted to be combined with like resistors to form a resistor network. The film is deposited on a dielectric as a nickel-chrome alloy being fused thereto as by means of a glass medium. Leads are connected to the back or front sides of the resistor by means of silverized terminals which are fused to the dielectric on two sides and the intervening edge of its dielectric thereby affording such option and allowing the film to be deposited over the entire surface of its front side when the leads are connected on the back side. The resistance path is formed in the film between slots cut through both the deposited film and the dielectric whereby the resistance of the film may be adjusted extremely accurately to the desired ohmage.

7 Claims, 4 Drawing Figures

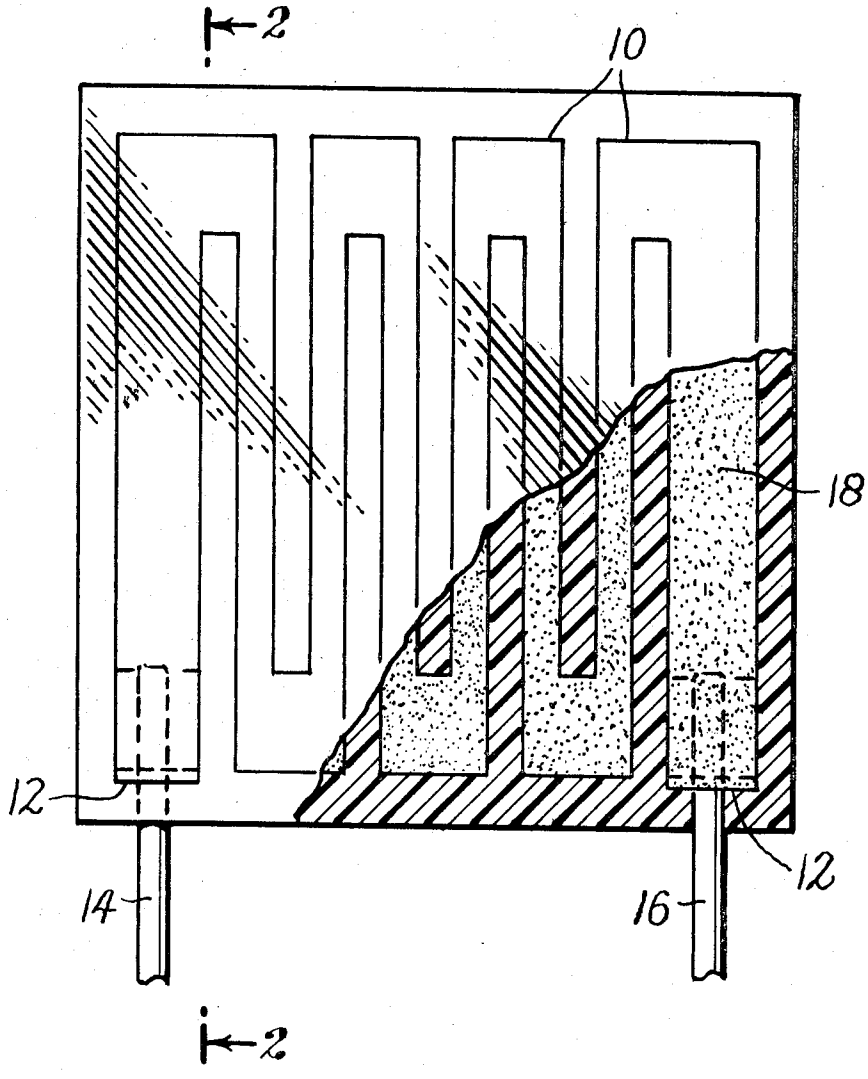


Fig 1

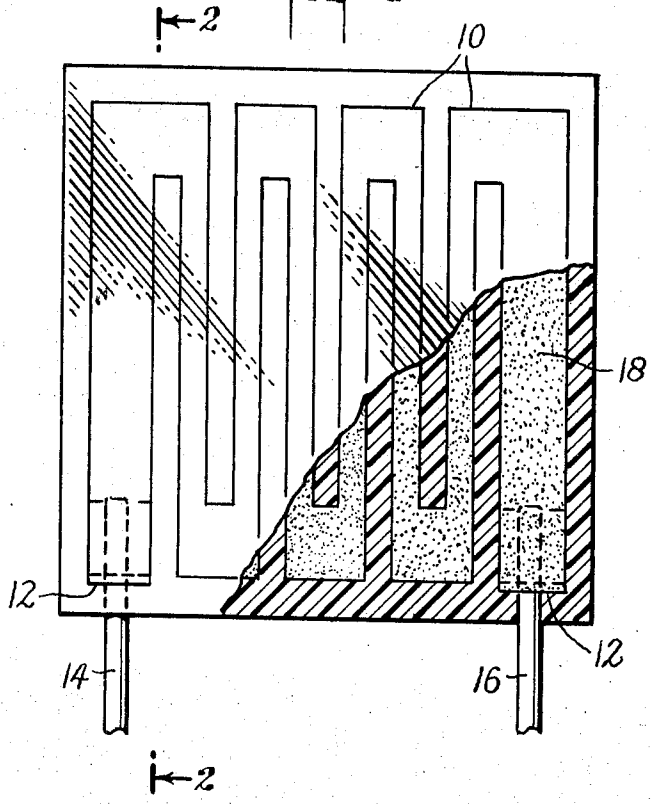


Fig 2

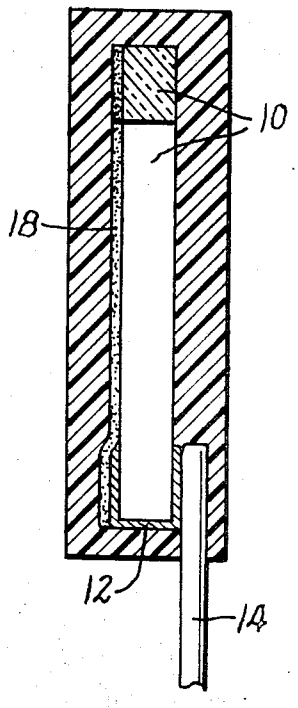


Fig 3

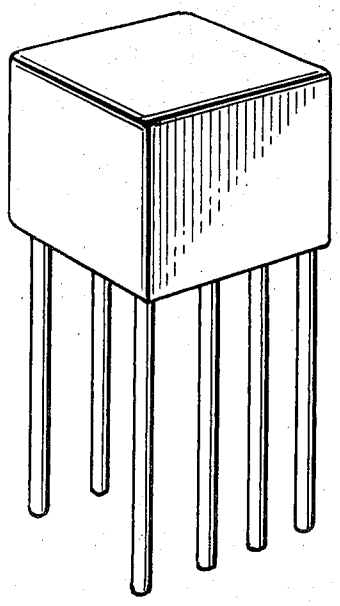
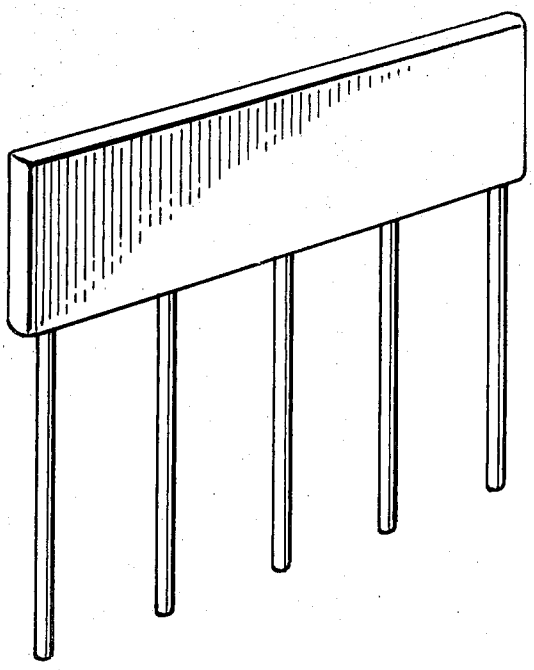


Fig 4



FILM RESISTORS

The present invention relates to electric resistor components and, in particular, to such components employing metallic films as the resistor substance.

Hitherto, film resistors have typically utilized cylindrically shaped ceramic bodies on which metallic film is deposited. The film is connected to end caps by fused end terminals, the leads being welded to the caps, See U. S. Pat. No. 3,643,200.

The parameters of the known metal film resistors are adversely affected in operation as a consequence of the means employed to connect the leads to the resistors film. According to the present invention the dielectric substrate is formed of a flat body having slots which determine the filmed resistive pathway, formed therein either prior or subsequent to the deposit of the film. The leads are then bonded to silver terminations which have been thermally fused to the substrate on one edge and two sides thereof so that the bonding can be effected on the reverse side thereof prior to film deposit over the entire surface of the substrate without affecting said parameters. The component is then encapsulated in a clear epoxy.

One object of the invention is to provide an improved metallic film resistor having a long term stability in operation under extreme atmosphere and temperature conditions.

Another object of the invention is to provide a metal film resistor having low temperature coefficiency.

Other objects and advantages of the invention may be appreciated on reading the following detailed description of one embodiment thereof which is taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an elevational view of the film resistor with a portion thereof broken away;

FIG. 2 is a section taken on the line 2—2 of FIG. 1;

FIG. 3 is a perspective view showing a plurality of resistors in side by side relation to form a resistive network; and

FIG. 4 is a perspective view showing a plurality of resistors in end to end relation to form a resistive network.

Referring to the drawings, the dielectric base or substrate **10** for the film resistor is fabricated of a glass-ceramic. Silverized terminations **12** are thermally fused to the two lower corners of the base on its front face, the lower edge and the back side thereof as shown in FIG. **2.** Leads **14** and **16** are soldered to the terminations on the back side of the substrate.

There is deposited on one side of the base a nickel-chrome resistor film **18.** The ohmic resistance of the film is adjusted highly accurately to the desired value by grinding straight slots into the film and dielectric alternating from the top and bottom edges of the component as shown in FIG. **1.** For standard size resistors, it may be preferred to precut the slots in the substrate prior to depositing the resistive film thereon. The resulting product is a highly stable, low noise resistor having a low temperature coefficiency. The particular expedient used to bond the leads of the silver terminals allows not only the elimination of end caps, but minimizes contact resistance. The resistor is finally encapsulated in a high temperature epoxy material **20** as protection against moisture or other contamination.

The particular construction of the film resistor lends itself to either side by side combination, as shown in FIG. **3,** or end to end combination, as shown in FIG. **4,** of individual components to form a network of resistors which are adapted for easy insertion into a socket provided by an external circuit. The combination is then encapsulated in an epoxy covering.

Various modifications of the invention may be effected by persons skilled in the art without departing from the scope and principle of the invention as defined in the appended claims.

What is claimed is:

1. A film resistor comprising a flat base of a dielectric material, a metal material forming terminations discretely fused to said base, wire leads bonded to said metal material, a metallic film deposited on one side of said base, slots formed in said dielectric material and film to form a resistive path in said film, and a packing material encapsulating said resistor.

2. A film resistor as defined in claim **1** wherein silverized metal material is continuously formed on two sides and the intervening edge of the dielectric material and the leads are soldered to the terminations on the other side of said base.

3. A film resistor as defined in claim **1** wherein said dielectric material is a glass ceramic and said resistive path is formed between straight lined slots ground in said film.

4. A film resistor as defined in claim **2** wherein said dielectric material is a glass ceramic and said resistive path is formed between straight lined slots ground in said film.

5. A film resistor as defined in claim **4** wherein said metallic film is fabricated of a nickel-chrome alloy.

6. A film resistor as defined in claim **5** wherein said straight lined slots are ground in the film and ceramic alternately from one edge and an opposing edge of the resistor, each slot extending less than the entire distance between said edges.

7. A resistive network comprising two or more film resistors as defined in claim **6** which have been encapsulated in a common packing material.

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