Dec. 25, 1956 F. G. JOHNSON 2,775,673

RESISTOR

Filed May 26, 1954

Fig. 1

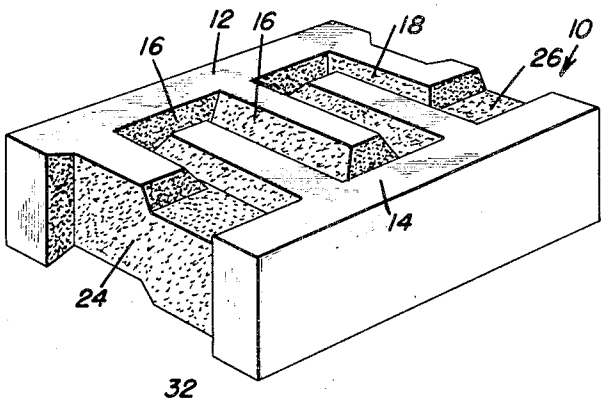
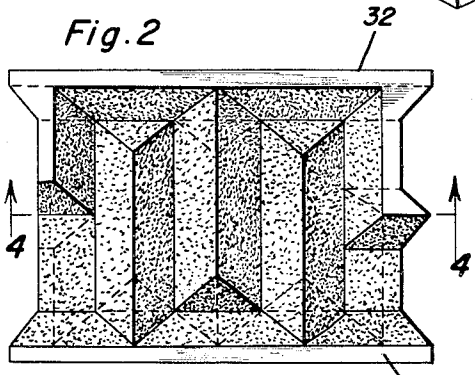


Fig. 2



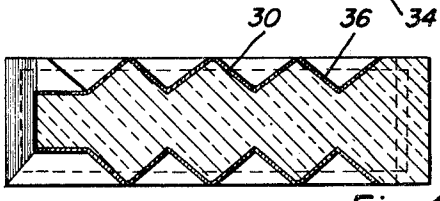


Fig. 4

Fig. 3

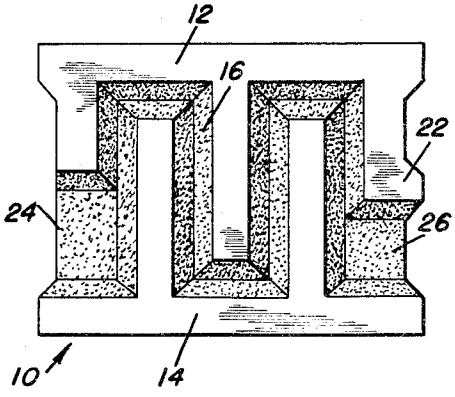


Fig. 5

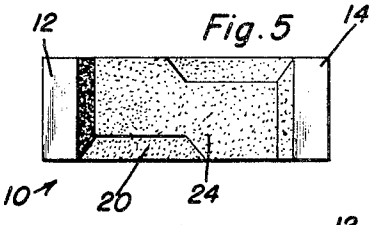


Fig. 6

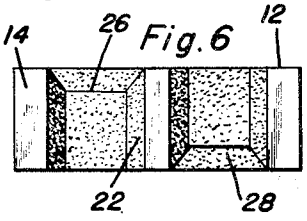
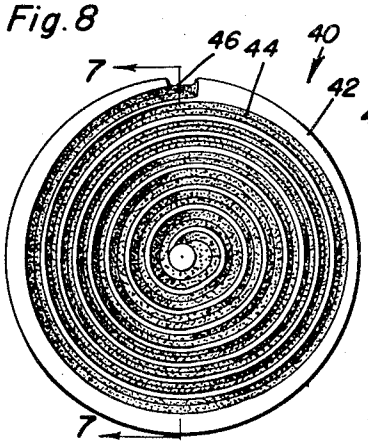


Fig. 8



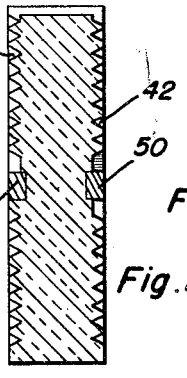


Fig. 7

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2,775,673

RESISTOR

Frank G. Johnson, Columbus, Nebr.

Application May 26, 1954, Serial No. 432,350

3 Claims. (Cl. 201—63)

This invention relates to an electrical element and more particularly to a novel resistor.

The primary object of the present invention resides in the provision of a novel metal film or carbon film resistor which has a structure peculiarly adaptable for use in various electrical and electronic circuits by being capable of disseminating a quantity of heat even though being of relatively small size.

A further object of the invention resides in the provision of a novel resistor which has means for connecting a terminal which can serve as a tap for the resistor without adversely affecting the major portion of the heat dissipating area of the resistor.

Another object of the invention resides in the provision of a resistor which is adapted to be manufactured in a much simpler manner and which can be adapted for use in conjunction with a printed circuit such as those circuits which can be printed on a ceramic base, and which is inexpensive to produce while being highly efficient in operation thereby permitting wide distribution and utilization.

These, together with the various ancillary objects and features of the invention which will become apparent as the following description proceeds, are attained by this resistor, preferred embodiments of which have been illustrated in the accompanying drawings, by way of example only, wherein:

Figure 1 is a perspective view of a resistor constructed in accordance with the concepts of the invention and being of the shape of a rectangular parallelopiped;

Figure 2 is a plan view of the resistor shown in an intermediate stage of manufacture;

Figure 3 is another plan view of the resistor showing the resistor as completed;

Figure 4 is a vertical sectional view as taken along the plane of line 4—4 in Figure 2;

Figure 5 is a side elevational view of the resistor;

Figure 6 is another side elevational view of the resistor looking at the opposite side of the resistor from that shown in Figure 5;

Figure 7 is a vertical sectional view as taken along the plane of line 7—7 in Figure 8; and

Figure 8 is a plan view of a modified form or resistor which is of disk shape.

With continuing reference to the accompanying drawings wherein like reference numerals designate similar parts throughout the various views, and with initial attention to Figures 1 and 3, it will be noted that the resistor generally designated by reference numeral **10** is of the shape of a rectangular parallelopiped and has lands **12** and **14** forming a portion of the body of insulative material such as ceramics and the like from which the resistor is formed. The lands are spaced and parallel to each other and extending between the lands **12** and **14** are substantially V-shaped grooves as at **16** which have portions of the lands thereof extending in parallelism with other portions so as to form a tortuous path for the conductive material which as is indicated at **18** is coated directly thereon and may be carbon or a suitable metallic film. It is to be noted that another groove **20** which is likewise coated with a conductive film is formed on the bottom of the resistor **10**. The resistor also has a central land **22** along one side thereof. The entire resistor **10** is thus arranged that a connection between the upper groove **16** and the lower groove **20** is provided as at **24** so that a terminal secured at point **26** in connection to the conductive film of groove **16** would be electrically further separated from another terminal at the point **28**.

The side **24** of the resistor **10** forms a peculiarly advantageous portion for affixing a further terminal for tapping the resistor. It is to be noted that because of the tortuous path of the resistor **10** a considerable space for cooling the resistor **10** by disseminating heat is achieved thereby permitting the utilization of this resistor in circuits employing greater wattage.

The resistor **10** is formed from a blank such as is indicated in Figures 2 and 4 within which the V-shaped grooves **30** are formed in the upper lower surfaces of the blank between the portions **30** and **32** which eventually become the lands **12** and **14**. Then, the entire body is coated with either a metal film or a carbon film by any satisfactory method known to the art. This film is applied with sufficient thickness so that it is possible to fold in the range of the resistance desired when the resistor is completed. After the body has been coated it is then ground so that the tortuous path is formed by forming the insulation lands between the grooves. After grinding and measuring the resistance of the blank, being careful not to exceed the desired resistance, the blank can be ground to within 1% of the desired resistance on the lowest side then being ground. After this grinding operation suitable caps or leads, not shown, are cemented in place with some conductive cement or attached by any other means known to the art. Then a protective coating is applied such as silicon or other waterproof varnish as is known to the art. In the cross-sectional view shown in Figure 4, the coating of conductive material is generally designated by reference numeral **36**.

Referring now to the embodiment of the invention shown in Figure 8, it will be noted that herein the resistor generally designated by reference numeral **40** is of dish shape and has a body **42** provided with a spiral groove **44** therein which is of substantially V-shape in cross-section and which is formed on either side of the disk the end portions of which are interconnected as at **46** to form a completed circuit with opposed contact leads **48** and **50** formed in the central portion of the disk body **42**. The resistor is formed in the same manner and is ground to the desired value to form the insulation lands between the groove portions forming the tortuous path.

From the foregoing, the construction and operation of the device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

What is claimed as new is as follows:

1. A resistor comprising a body of insulative ceramic material having tortuous grooves on top and bottom thereof, said grooves being substantially V-shaped in cross-section, a layer of conductive material overlying said grooves, and a layer of conductive material on one side of said body joining said grooves on the top and bottom of said body.

2. A resistor comprising a body of insulative ceramic material having tortuous grooves on top and bottom thereof, said grooves being substantially V-shaped in cross-

section, a layer of conductive material overlying said grooves, and a layer of conductive material on one side of said body joining said grooves on the top and bottom of said body, said resistor being dish shaped, said grooves being spiral in configuration.

3. A resistor comprising a body of insulative ceramic material having tortuous grooves on top and bottom thereof, said grooves being substantially V-shaped in cross-section, a layer of conductive material overlying said grooves, and a layer of conductive material on one side of said body joining said grooves on the top and bottom of said body, said resistor having the shape substantially of a rectangular parallelopiped, said grooves extending

from one side of said body to the other side thereof and having parts of its length arranged in parallelism with respect to each other, said grooves being spaced between parallel lands of insulative material.

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