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LOW INDUCTANCE RESISTOR

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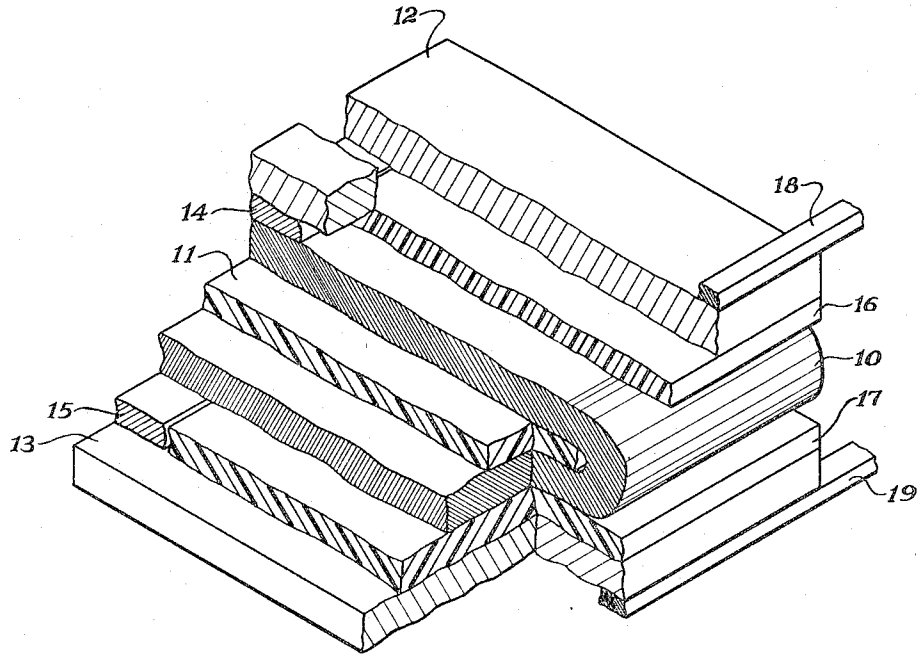

WITNESSES:

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LOW INDUCTANCE RESISTOR

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2 Claims. (Cl. 201—73)

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This invention relates to a resistor and more particularly to a low inductance resistor capable of conducting currents of large magnitude.

In measuring the characteristics of a spark-gap it is necessary to measure current passing therethrough as a function of time. One process for accomplishing this requires that a resistor be inserted in series in the circuit and the voltage generated thereacross be measured. A resistor for this purpose should have a low resistance value so as not to appreciably impede the current being measured. The resistor should also have an inductance value which is negligible compared to its resistance value in order that the observed voltage be directly proportional to the instantaneous value of the current rather than the time rate of change of the current. These characteristics are particularly important in the measurements of the current in a spark-gap where the time rate of current change may be of the order of 10^{10} amperes per second.

Prior to this invention, resistors having low inductance have fallen in two categories. One comprises a carbon material while the second makes use of bifilar-wound metal conductor. In the first category a resistor comprising carbon material requires a large amount of carbon material and therefore is bulky, unhandy to use and is unstable in characteristics.

The second category of low inductance resistors requires a large diameter construction in order to withstand currents of a high value and thus is bulky and difficult to use. In addition, the bifilar type resistor is susceptible to flash-over between separated portions thereof.

It is therefore an object of this invention to provide a low resistance, low inductance resistor.

Another object of this invention is to provide a low resistance, low inductance resistor which is compact and rugged.

A further object of this invention is to provide a low resistance, low inductance resistor capable of conducting currents of high value.

It is a further object of this invention to provide a resistor particularly adapted to the use of measuring the current in spark-gap switches where the time rate of current change may be of the order of 10^{10} amperes per second.

Other objects and advantages of the present invention will become apparent to persons skilled in the art from the following description of the presently preferred embodiment taken in connection with the drawing made part of this specification.

It has been found that the above and other objects can be accomplished and the enumerated difficulties overcome according to this invention by a resistor having low inductance, low resistance and the property of withstanding currents of high value. The resistor comprises essentially a single sheet of resistive material such as an alloy consisting of 80 per cent nickel and 20 per cent chromium folded in a U-shape having dielectric material between the folds and metallic conductors connected to its ends. The geometric configuration of a resistor so formed causes the magnetic field set up by the current in passing through one portion of the resistor to be in opposition to the magnetic field created by the adjacent portion, thereby resulting in negligible inductance.

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One embodiment of the present invention is shown in the accompanying drawing made a part of this specification for the purpose of illustration only but in no way intended to limit the scope of the present invention.

The drawing is a perspective view of a resistor constructed in accordance with the present invention.

Referring now to the drawing, the resistive material 10 is a single sheet folded in a U-shape with enough separation between the folded parts to permit insulating material 11 to be inserted therein, the free ends of resistive material 10 thus being separated sufficiently to prevent arc-over within the range of currents to be measured. Two plates 12 and 13 of a suitable conductive material such as copper are connected to the free edges of the resistive element 10 to provide terminal plates as well as an enclosure therefor. To provide continuity between the resistive element 10 and the conducting plates 12 and 13 two strips of conducting material 14 and 15 are connected between the resistive material 10 and the conducting material 12 and 13. Separating the conducting plates 12 and 13 and the resistive material 10 are two sheets of insulating material 16 and 17.

In order that the resistor may be connected in a circuit that is to be tested, a pair of terminals 18 and 19 are provided and are connected to the conducting plates 12 and 13. These terminals 18 and 19 which are connected to the outer edge of the conducting plates 12 and 13 may be soldered or otherwise fastened to make good electrical contact.

Although an alloy consisting of 80 per cent nickel and 20 per cent chromium is employed as the resistance material and copper as the conducting material in the illustrative embodiment

of the invention, the invention is not restricted to the use of these materials as other equivalent materials may be used. The insulating material used, however, must be of a type having high resistance and a high dielectric constant.

It will thus be seen that what has been described is a simple low resistance, low inductance resistor. Other variations will be apparent to those skilled in the art without departing from the principles of this invention. Therefore the present invention is to be considered limited only by the appended claims as interpreted in view of the prior art.

What is claimed is:

1. A resistance device comprising a sheet of material offering resistance to electric current, said sheet being continuous and being folded upon itself and having insulation between the folded portions, stiff metallic conductors having a width substantially equal to that of the sheet of material and of low resistivity enclosing said folded sheet and providing a current path, said metallic conductors connected to the entire ends of said folded sheet, insulation between said enclosing metallic conductors and said folded sheet of resistive material, and terminal means connected to the free ends of said metallic conductors, whereby the arrangement of said folded sheet with said supporting metallic conductors cancels the inductive effect due to the current passing therethrough.

2. A resistance device comprising a U-shaped unbroken sheet of resistive material, a bar of conducting material secured to each outer wall of said U-shaped sheet adjacent to and along its entire end and covering only a relatively small portion of said outer wall, conducting plates secured at one end to the entire length of said conducting bars and substantially covering the outer walls of said U-shaped sheet, sheets of dielectric material substantially filling the spaces between the inner walls of said U-shaped sheet and between the outer walls of said U-shaped sheet and said conducting plates, and terminals attached to the outer surfaces of said conducting plates adjacent their other ends, whereby the magnetic field set up by a current passing through one portion of said U-shaped sheet is in opposition to the magnetic field created by the adjacent portion, thus giving said device a negligible inductance.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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