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ELECTRICAL RESISTOR

Original Filed May 10, 1940

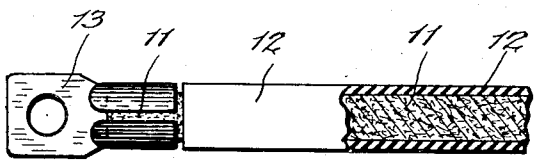

Fig. 1.



Fig. 2.

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ELECTRICAL RESISTOR

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7 Claims. (Cl. 201—75)

This application is a division of my co-pending application Ser. No. 334,419, filed May 10, 1940 (Patent No. 2,311,608, granted February 16, 1943).

This invention relates to electrical resistors and has particular relation to flexible resistors having predetermined desired electrical and mechanical characteristics.

It has been found that for certain uses it is desirable to provide a flexible resistor of substantially cylindrical form and relatively large diameter and high resistance as compared with ordinary resistance wire or the like, which can be made in continuous lengths, may be provided with an insulating covering, and may be coiled up and uncoiled or otherwise flexed as desired.

The application of such a resistor to one particular use is set forth in my aforesaid co-pending application, having reference to a static discharge device which may be used on aircraft. In a system of the character referred to in that application, this type of resistor is utilized as one of the component parts of a composite electrical conductor which may be projected from an aircraft in flight to extend in trailing relation thereto for the purpose of discharging static electrical charges in a desired manner. The relatively large diameter of the resistor prevents corona discharge therefrom, while its relatively high resistance serves to damp oscillatory currents in the discharge circuit. The properties and characteristics of such a resistor also make it applicable to other uses.

The primary object of the present invention is to provide a resistor having the qualities of flexibility and relatively large diameter and high resistance as above indicated.

It is a further object of the invention to provide a resistor of the above-indicated character which shall be of substantially uniform electrical resistivity throughout and shall retain this characteristic permanently.

A further object of the invention is to provide such a resistor with an effective insulating and protective covering to render the resistance element impervious to moisture and other external effects without impairing the flexibility or other desired characteristics of the construction.

A further object is to provide a resistor of the above-indicated character which shall have high mechanical strength and durability and shall be economical to manufacture and convenient to handle.

This invention achieves the foregoing and other objects and advantages which will be apparent to those skilled in the art by providing a resistor having a body of substantially nonconducting rope-like material, such as jute, hemp, or the like, impregnated with a conducting material such as colloidal graphite. A flexible waterproof covering of rubber or other suitable material is applied to the rope-like body after impregnation thereof, and this construction is made in any desired lengths which may be coiled up for use or storage or handled in any other convenient manner.

A preferred embodiment of the invention is illustrated in the accompanying drawing forming a part hereof, in which

Fig. 1 is a view partly in elevation and partly in longitudinal section of a fragmentary length of a resistor made in accordance with the invention, and

Fig. 2 is a transverse sectional view of the same.

Referring to the drawing, the resistor comprises a body 11 of fibrous, flexible, rope-like material, such as jute, hemp, or the like, impregnated with colloidal graphite, which may be derived from an aqueous graphite dispersion such as is commercially available under the name "aquadag." It will be understood, of course, that after the rope-like body has been impregnated to the desired extent, it will be dried and the graphite will then be left deposited in extremely minute particles uniformly distributed throughout the fibers of the body and the interstices therein, thus converting the body into an electrical resistance element of definite, relatively high resistivity. These graphite particles may be referred to for convenience as being in granular form, but it is not to be inferred from this that they are of more than minute size.

Over the impregnated body 11 is placed, by extrusion, molding, or any other suitable process, a watertight insulating covering 12 of rubber or other suitable material. This covering renders the resistor impervious to moisture and other external influences which might have detrimental chemical or mechanical effects upon the resistor body or resistance element, with resulting detriment to the electrical or mechanical characteristics thereof, if such a covering were not provided.

Electrical connections may be made to the resistance element 11 by terminal members such as 13, or by any other suitable means.

As an illustrative example, the diameter of the rope-like body 11 may be on the order of three-sixteenths of an inch, but it will be understood that it may be made in any desired size, depending upon the electrical and mechanical charac-

teristics desired. The electrical resistivity of the body 11 also depends upon the process of treatment thereof and the resulting character and extent of impregnation by the graphite. However, a suitably processed resistor of the size mentioned by way of example above may have a resistance on the order of fifty thousand ohms per foot of length.

It will be seen that a resistor may be made according to the foregoing disclosure, having an accurately predeterminable and highly uniform degree of resistivity, which will remain constant in use by reason of the impervious protective covering applied to the resistor body. The composite construction including the protective covering has a high degree of flexibility, mechanical strength and durability, and the material may be produced in any desired lengths to be applied to various useful purposes.

While only one specific embodiment of the invention has been illustrated and described herein, it will be apparent to those skilled in the art that various changes and modifications may be made in the details of construction and the process of manufacture without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed as new and is desired to secure by Letters Patent is:

1. An electrical resistor having a body of jute, granular graphite distributed throughout its length and carried by said jute, and a flexible rubber covering encompassing said jute and granular graphite and extending throughout the length of said resistor.

2. An electrical resistor comprising a fibrous rope body of jute, hemp, or the like having interstices, granular resistance material carried by said rope within said interstices and a waterproof, flexible material covering said fibrous rope and confining said granular resistance material within the interstices of said rope.

3. As an article of manufacture, an electrical resistor consisting of a rope-like fibrous body of jute, hemp, or the like, having interstices, a liquid-borne granular resistance material substantially uniformly distributed throughout said rope-like fibrous body, and a waterproof, flexible covering of nonconducting material about said rope-like fibrous body.

4. An electrical resistor comprising a rope-like body of fibrous strands of jute, hemp, or the like, having interstices, colloidal graphite substantially uniformly distributed along and carried by said body within said interstices, and a flexible, waterproof covering surrounding said body.

5. An electrical resistor comprising a rope-like body of fibrous strands of nonconducting material, colloidal graphite distributed in minute particles throughout said body by impregnation of the latter with an aqueous dispersion of such graphite, and a flexible, waterproof covering surrounding said body.

6. An electrical resistor comprising a rope-like body of jute strands, colloidal graphite distributed in minute particles throughout said body by impregnation of the latter with an aqueous dispersion of such graphite, and a flexible, waterproof covering surrounding said body.

7. An electrical resistor of relatively large diameter and high resistance as compared with resistance wire, comprising a rope-like body of fibrous strands of nonconducting material, colloidal graphite distributed along and carried by said body, and a flexible, waterproof covering surrounding said body.

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