

E. G. GILSON.
RESISTANCE DEVICE.
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1,365,481.

Patented Jan. 11, 1921.

Fig. 1.

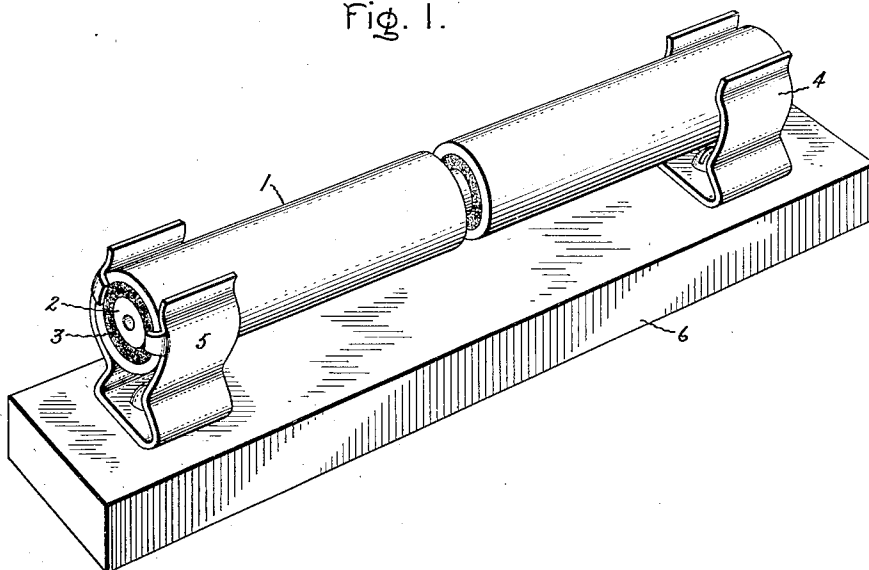
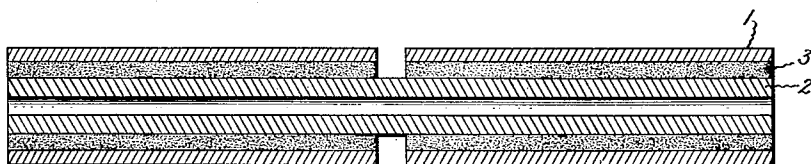


Fig. 2.



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UNITED STATES PATENT OFFICE.

EMERY G. GILSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

RESISTANCE DEVICE.

1,365,481.

Specification of Letters Patent.

Patented Jan. 11, 1921.

Application filed April 23, 1920. Serial No. 375,987.

To all whom it may concern:

Be it known that I, EMERY G. GILSON, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Resistance Devices, of which the following is a specification.

The present invention relates to electrical resistances which comprise a mass of finely divided conducting material, and its object is to provide a resistance device which is substantially regular and reproducible in its operation and is of sturdy construction.

My invention is particularly applicable to self-reducing resistors containing a material such, for example, as cuprous oxid, silicon, or the like, having a marked negative thermal coefficient of resistance. These substances are brittle and non-ductile and therefore cannot be fashioned in the same manner as a metal to remain in a state of coherence, to give a substantially constant electrical resistance and maintain good electrical contacts both with the terminals and between the individual particles of material constituting the resistance waves. Because of the physical characteristics of this class of materials it is also difficult to prevent mechanical injury and chemical deterioration.

My invention comprises a reliable resistance device which is particularly useful for connection in series with a translating device, such as a motor, to interpose a high resistance upon starting which will automatically be reduced by the heating effect of the current.

In the construction herein described and illustrated embodying my invention, a resistance material having a marked negative thermal coefficient is compacted around a suitable conducting core within a metallic shell which is in compressive relation to the mass of resistance material, thereby providing the most intimate electrical contact and also protecting the material from mechanical injury and chemical change.

In the accompanying drawings, Figure 1 illustrates in perspective one form of device embodying my invention, and Fig. 2 illustrates this device in longitudinal section.

In the manufacture of the device illustrated in the drawing, a tubular shell 1 of ductile metal, such as iron or copper, is provided with a core 2, also of ductile metal. Between the core and shell is packed a layer

3 consisting of cuprous oxid, Cu_2O , cupric oxid, CuO , silicon, silicon carbid, magnetite, or other material having a marked negative thermal coefficient of resistance. This material preferably is introduced as discrete particles in a fine state of division and compacted as much as possible by tapping. With the materials thus assembled the diameter of the entire article is reduced and its length increased, as by swaging, rolling, or other appropriate mechanical means. In order to prevent the loss of the filling of resistance material suitable plugs may be introduced at the ends of the assembled parts before swaging.

Swaging or rolling uniformly compresses and packs the resistance material between the core and shell, and produces intimate electrical contact between the particles constituting the resistance mass and between the mass as a whole and the core and shell constituting the terminals. When the resistance unit has been reduced to a diameter which will compress the layer of resistance material to a sufficient degree, the compacted rod is cut into sections proportionate to give the desired conductivity. In some cases the area of the cross-section is reduced about 35% by swaging.

Preferably a unit is prepared, as shown in the drawing, constituted of two layers of resistance material connected in series through the core 2. This is done by cutting out a section of the shell 1 and resistance layer 3 in a lathe or by other appropriate means. For convenience such a double section resistance device is inserted as shown in Fig. 1 in contact clips 4, 5, engaging the ends of the outer shell 1, contact clips being mounted upon a suitable base 6. The core 2 may be made hollow to favor the dissipation of heat.

The described device may be employed with suitable circuit arrangements to be connected in series with a motor upon starting, and an automatic device may be provided to short-circuit the starting resistor when the motor has been brought up to speed.

When I claim as new and desire to secure by Letters Patent of the United States, is:—

1. An electric resistance comprising the combination of a metal shell, a metal core therein, and an intermediate conducting layer consisting essentially of discrete parti-

cles in a compact coherent state of material having a marked temperature resistance characteristic.

2. A self-reducing resistance comprising
5 the combination of two metal contact bodies and a conducting layer of material located between said bodies consisting essentially of fine particules of material having a marked
negative temperature resistance characteris-
10 tic, said layer being in a dense, compressed state.

3. A self-reducing electric resistance comprising the combination of a plurality of metal shells, metal cores therefor, a conduct-

ing material having a marked negative tem- 15
perature resistance coefficient filling the space between said respective shells and cores, means for electrically connecting said cores and electrical contacts engaging with said shells. 20

4. A self-reducing electric resistance comprising a mass of dense granular cuprous oxid and electric terminals therefor, said terminals being in compressive relation to said mass of oxid. 25

In witness whereof I have hereunto set my hand this 22 day of April, 1920.

EMERY G. GILSON.