

April 2, 1946.

E. F. SEAMAN

2,397,568

SHOCK PROOF ELECTRICAL RESISTOR

Filed March 11, 1944

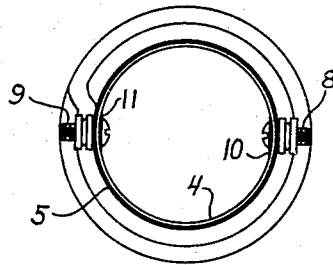


FIGURE 1

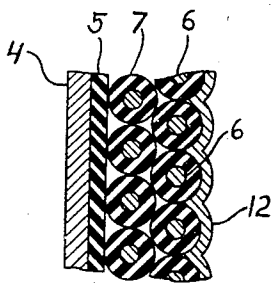


FIGURE 3

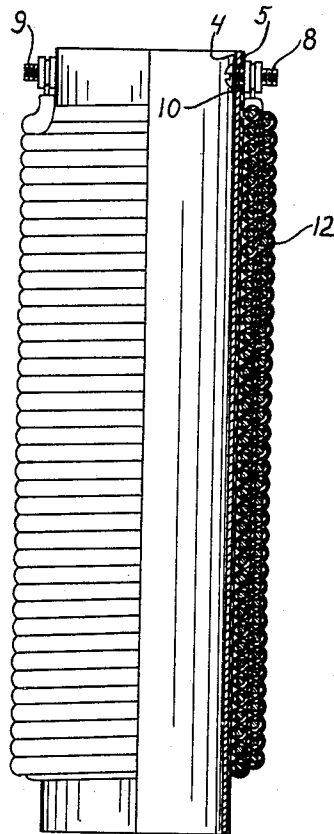


FIGURE 2

INVENTOR
ELLSWORTH F. SEAMAN
BY *W. J. Seaman*
ATTORNEY

UNITED STATES PATENT OFFICE

2,397,568

SHOCKPROOF ELECTRICAL RESISTOR

Ellsworth F. Seaman, Washington, D. C.

Application March 11, 1944, Serial No. 526,105

7 Claims. (Cl. 201—67)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

My invention relates generally to resistors, and particularly to an improved type of resistor which is greatly resistant to both mechanical and thermal shock.

In some electrical installations, as aboard warships, aircraft, etc. where all equipment is subjected to tremendous shocks during battle conditions, and to severe vibration for long periods, failure of electrical resistor elements has rendered equipment useless.

I have invented an improved construction utilizing a metal supporting tube for the resistance wire in conjunction with certain of the high temperature insulations, whereby it is possible to use these insulations both as a mechanical spacer element and as electrical insulating material, in order that the electrical function of the resistor may be adequately accomplished under conditions of high impact shock and vibration, as encountered aboard warships or aircraft, etc.

It is the primary purpose of this invention to provide an improved electrical resistor which has greatly improved characteristics of mechanical and thermal shock resistance and ruggedness.

Other objects will appear as the description progresses, and in connection with the accompanying drawing in which:

Fig. 1 is a top or end view of a resistor illustrating one embodiment of my invention;

Fig. 2 is a side elevation, half in cross-section, of the resistor of Fig. 1;

Fig. 3 is an enlarged view of a portion of the sectioned part of Fig. 2.

The resistor comprises a metal base 4 in the form of a cylindrical tube, although it is to be understood that the tube may have any other suitable cross-sectional form, as that of an oval, etc., and its axis may be curved. Preferably, the tubular base 4 should be of aluminum, although any suitable metal such as copper having a high thermal conductivity and resistance to shock and fatigue may be used. Ceramic materials are particularly unsuitable for the base because of their low shock resistance. The exterior of the tube is covered with a nonhygroscopic, flexible high temperature resistant insulation material 5. I have found that one particularly suitable insulation for the purpose of this invention is a layer of asbestos or glass tape impregnated with a silicone resin. Alternately the base may be covered with a material having exceptionally high heat resistance such as "POLY F 1114" which is a polymerized tetrafluoroethylene. This will withstand higher temperatures than the silicone resins and will not crack.

The resistance wire 6 which is wound on the base 4 over the insulation 5, is first covered with an insulating material 7 which is substantially unaffected by high temperature. The insulation 7 may be either a covering of fiber glass impregnated with silicone resin, or it may be the exceptionally high heat resistant insulating material "POLY F 1114."

The insulation covered wire 6 is closely wound in one or more layers on the base as shown in the drawing wherein two layers are provided. As shown, the first layer terminates adjacent the end of the base, and the second layer is a continuation of and is closely wound over the first layer, terminating adjacent the beginning of the first layer. The ends of the wire are electrically connected to binding posts 8 and 9 respectively, these posts being electrically insulated from the metal base 4 as by insulating bushings 10 and 11.

In order to protect the resistor unit from the effects of moisture and from abrasion, it is covered by an exterior protective sheath or film 12. This sheath may be a sprayed layer of copper which is subsequently soft-annealed to remove brittleness. Instead of the copper spray, the sheath may comprise metal foil wrapped around the outside of the wire and bound with glass twine or the like. If the temperature of the completed resistor is to be low enough so that the heat radiating capacity of the sheath is not important, the sheath may be an insulating material. In this case it should be one such as the "POLY F 1114" which will not crack due to temperature or other drying conditions.

Where the resistor is of the variable type and the wire 6 is bare for contact with a wiper or contact arm, the wire is wound on the insulation 5 with its turns spaced. The spaces between the turns of wire may then be filled with an insulating spacer which may comprise strings or the like of fiber glass or the like, impregnated with silicone resin or "POLY F 1114."

Neither the form of the terminals shown, nor the means for mounting the resistor are a part of this invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substan-

tially unaffected by high temperatures; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature; and an exterior moisture proof sheath over said resistance wire, said exterior sheath comprising a polymerized tetrafluoroethylene.

2. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substantially unaffected by high temperatures, said insulating covering comprising fibre glass impregnated with a silicone resin; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature; and an exterior moisture proof sheath over said resistance wire.

3. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substantially unaffected by high temperatures, said insulating covering comprising a polymerized tetrafluoroethylene; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature; and an exterior moisture proof sheath over said resistance wire.

4. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substantially unaffected by high temperatures; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature, said insulation material comprising fiber glass impregnated with

a silicone resin; and an exterior moisture proof sheath over said resistance wire.

5. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substantially unaffected by high temperatures; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature, said insulation material comprising a polymerized tetrafluoroethylene; and an exterior moisture proof sheath over said resistance wire.

6. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substantially unaffected by high temperatures; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature; and an exterior moisture proof sheath over said resistance wire, said exterior sheath, said insulating covering on said base, and said insulation material on said wire each comprising a polymerized tetrafluoroethylene.

7. An electrical resistor comprising a tubular metal base having a high resistance to shock and fatigue; an insulating covering over the exterior of said base, said covering being substantially unaffected by high temperatures; a resistance wire wound over said covering and around said base, the turns of said resistance wire being covered with an insulation material substantially unaffected by high temperature, said insulating covering on said base and said insulation material on said wire each comprising fiber glass impregnated with a silicone resin; and an exterior moisture proof sheath over said resistance wire.

ELLSWORTH F. SEAMAN.