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C. J. KAWIECKI

3,413,587

ELECTRICAL RESISTOR

Filed Feb. 21, 1966

FIG. 2

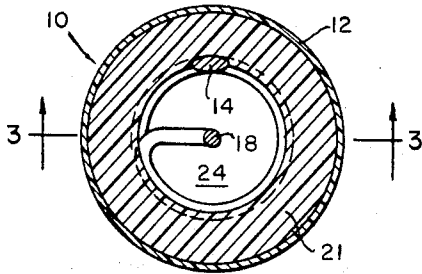


FIG. 1

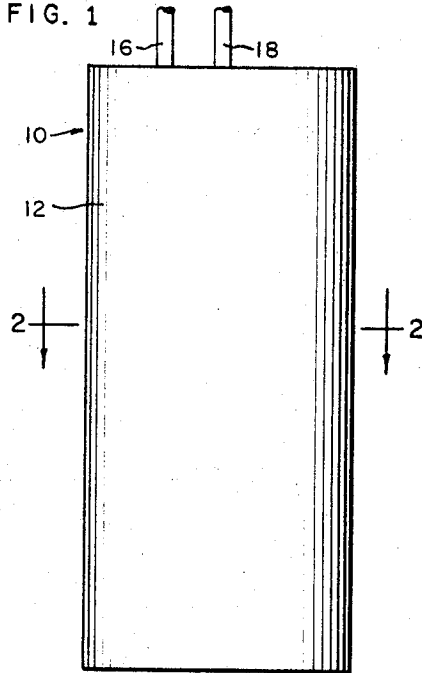


FIG. 3

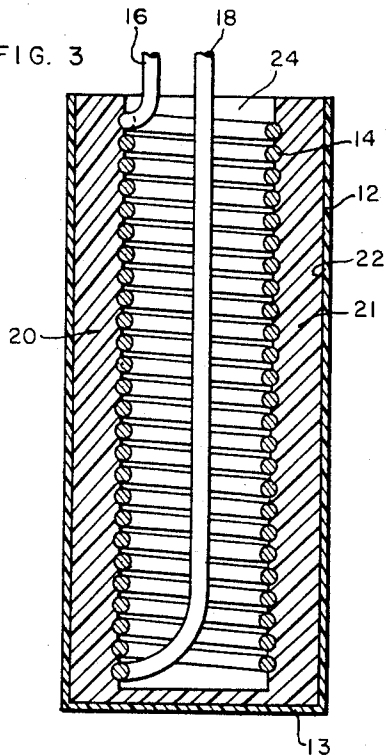
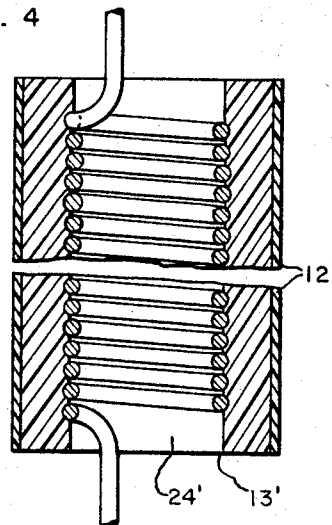


FIG. 4



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3,413,587

ELECTRICAL RESISTOR

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1 Claim. (Cl. 338—57)

ABSTRACT OF THE DISCLOSURE

An electrical resistor having a helically coiled resistance wire coaxially disposed within a cylindrical casing and a layer of cementitious insulating material filling the annular base between the wire and the sidewalls of the casing. The space interiorly of the coiled wire is completely open to expose the interior surface of the wire, thereby to facilitate ventilation thereof.

This invention relates to electrical resistance devices and, more particularly, to such devices capable of withstanding high wattage loads for short periods of time.

Resistors embodying helically coiled wires embedded in cementitious material and encased within a tube are widely used because the absence of organic materials in their construction makes them inherently capable of high wattage ratings. In such resistors the cementitious insulating material is usually caused to fill the entire tube, including the interior of the wire coil as well as the space between the exterior of the coil and the interior of the tube. If the cementitious material does not fill the interior of the coil, a separate rigid core is generally used around which the wire is wound. In either instance the resistance wire is wholly embedded which inhibits the escape of heat and steam generated from moisture in the cementitious material as a result of high wattage passing through the coil which typically is heated to red heat. Accordingly, the cementitious material frequently cracks and spalls.

It is an object of the present invention, therefore, to provide an improved electrical resistor for high current loads which will be easy to ventilate, thereby to permit the escape of heat and steam generated as a result of the heating effect of the current passing through the coil.

It is a further object of the present invention to provide such an electrical resistor which is easy and inexpensive to construct.

These and other objects and advantages are achieved by providing an electrical resistor in which a helically coiled resistance wire is coaxially disposed within a cylindrical casing and spaced from the side walls thereof, but in which the cementitious insulating material fills only the annular space between the coil of wire and the side walls of the casing leaving a hollow core at the center of the coil. The hollow core thus formed facilitates ventilation of the resistor, readily permitting the escape of any heat and steam which may be generated as current is passed through the coil.

In the accompanying drawings FIG. 1 is a side-elevational view of an electrical resistor constructed in accordance with my invention;

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2; and

FIG. 4 is a sectional view similar to FIG. 3, but disclosing an alternate form of construction.

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In accordance with the embodiment of the invention illustrated in FIGS. 1—3, there is disclosed an electrical resistor 10 having an outer cylindrical tube or casing 12 with a bottom 13 and formed of hard plastic material, such as a phenolic. Coaxially disposed within the casing 12 is a helically coiled resistance wire 14 having terminal ends 16 and 18 which extend outwardly of the casing.

A layer of cementitious insulating material 20 completely fills the annular space 21 between the coiled resistance wire 14 and the side walls 22 of the casing. The cementitious insulating material may desirably comprise an ordinary mortar of portland cement and sand in about a 1 to 4 ratio. Since the insulating material 20 completely fills only the annular space between the coiled resistance wire 14 and the side walls 22 of the casing 12, a hollow core 24 is formed which is open to the atmosphere. This form of construction permits the escape of heat and any steam which may be generated as the result of heating the mortar during the period that the current passes through the coil. I have found that the cementitious material 20 may be poured around the coiled wire 14 when the resistor 10 is being constructed and it will not flow into the interior of the coil. If desired, however, a cardboard tube may be inserted within the coiled wire 14 while the mortar is being poured, thereby to insure that none of the cementitious insulating material 20 flows into the hollow core 24.

An alternative form of construction is shown in FIG. 4, wherein the casing 12' is open at one end 13', such that the hollow core 24' can extend completely through the resistor should the requirements for dissipation of heat so necessitate.

A resistor was designed in accordance with the present invention for an installation which requires a 0.4 ohm resistor capable of taking current loads of 700 to 800 amperes for short periods of time. The casing 12 was made of a phenolic thermosetting resin and had an outer diameter of 2½ inches and was 6 inches long. The wire coil 14 was made from 10 feet of a nickel-chromium alloy wire 0.182 inch in diameter. The cementitious insulating material was made of portland cement and sand in a 1 to 4 ratio. It was poured around the coil 14 into the casing 12, which acted as a mold. The resistor was found to be satisfactory for the current loads above mentioned.

In the foregoing description, the invention has been described with reference to certain particular preferred embodiments although it is to be understood that the specific details shown are merely illustrative and that the invention may be carried out in other ways without departing from the true spirit and scope of the following appended claim.

I claim:

1. An electrical resistor capable of withstanding high wattage loads for short periods of time, comprising:

a hollow tubular casing,
a helically coiled resistance wire coaxially disposed within said casing and spaced from the side walls thereof,

said coiled resistance wire having terminal ends extending outwardly of said casing, and

an annular layer of cement insulating material cast in situ and filling only the annular space between said helically coiled resistance wire and the interior side walls of said tubular casing, the space interiorly of said helically coiled resistance wire being completely open to expose the interior surface of said resistance

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wire thereby to facilitate ventilation of said resistor,
said cement insulating material comprising a mixture
of sand and portland cement.

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