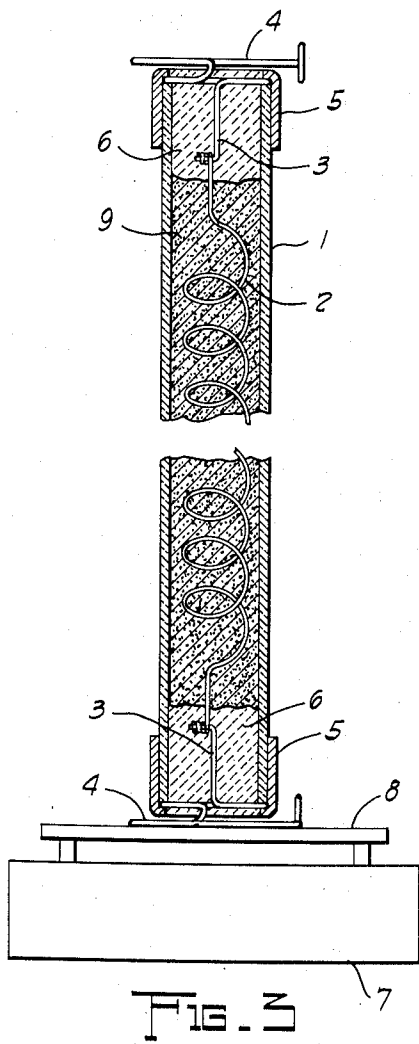
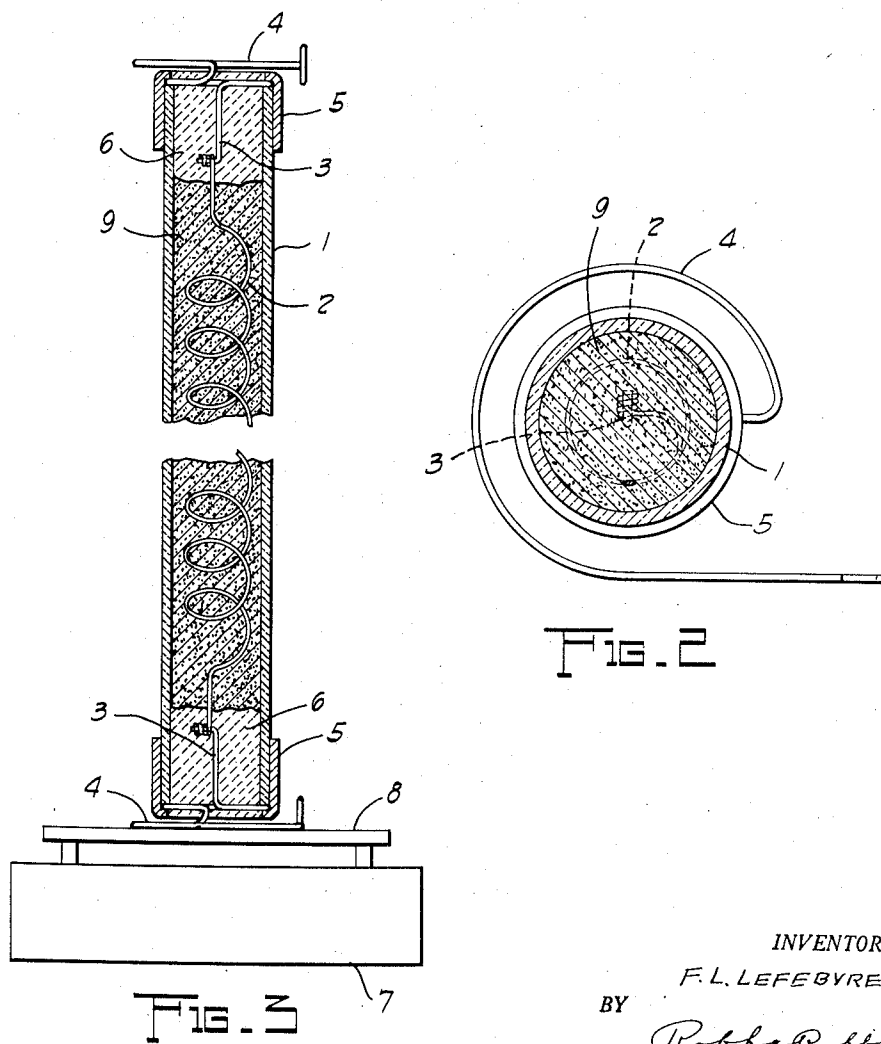
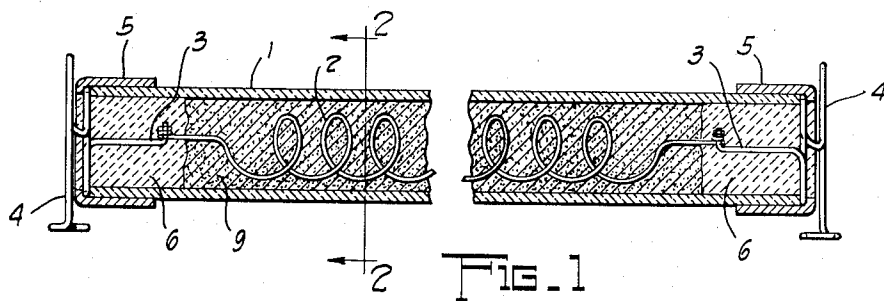


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RADIANT HEATER UNIT
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RADIANT HEATER UNIT

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1 Claim. (Cl. 201—63)

This invention relates to electric heaters and primarily to radiant heaters of this class which are constructed with tubular fused quartz sheaths.

While heretofore many types of radiant tubular heaters have been produced, the same have primarily relied upon increasing the size or gauge of the resistor, where increased power output was sought to be attained. This method is only satisfactory within limits and of necessity involves substantially increased costs by reason of the expense of the metal alloy from which the resistor is fabricated. This is not the only problem inherent in such approach, since there are other factors involved which add to the costs without proportionate advantage.

With the concept herein availed of, the foregoing disadvantages are not only obviated but in fact the power output or increase in radiation may be accomplished at only a relatively minor increase in cost of materials, and actually makes feasible longer life of such heater units as well as unlimited arrangement thereof as respects the operating positions of the same.

It is therefore a principal object of this invention to provide a radiant heater unit which may be operated in any position.

A further object of the invention is to provide a unit of the class described which is capable of increased power output by incorporating in the structure a material having excellent radiating properties which used by itself would not be entirely satisfactory.

Another object of the invention is to provide a tubular radiant electric heater having a fused quartz sheath, a resistor therewithin, and a material surrounding said resistor and confined within the sheath, which material is itself capable of producing a substantial quantity of radiation during operation of the heater.

Yet a further object of the invention is to provide a tubular radiant electric heater having a fused quartz sheath, a suitable resistor of wire within the sheath, and a finely divided material, such as graphite, intimately packed in the sheath, the resistor and finely divided material being sealed therein, suitable leads for the resistor being provided.

Another object of this invention is to provide a method of fabricating an electric heater unit of the class described which provides a substantial increase in the radiating capacity thereof.

Other and further objects of the invention will be understood from a consideration of the specification appended hereto, and set forth in the drawings wherein:

Figure 1 is a longitudinal sectional view showing a heater constructed in accordance with this invention, the same being of any preferred diameter and length.

Figure 2 is a vertical sectional view taken about on the line 2—2 of Figure 1 looking in the direction of the arrows.

Figure 3 is a sectional view of a heater such as shown in Figure 1, showing the method of manufacture thereof so as to increase the radiating properties.

Referring initially to Figure 1, it is pointed out that the

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heater unit of this invention may preferably comprise a tubular quartz sheath, the same being of the fused type denoted 1, such sheath being of any preferred length and diameter in accordance with the desired output thereof as is determined by the resistor and other constituents of the unit.

Within the sheath and comprising a coiled element, is the resistor denoted 2, which resistor may be formed of any suitable metal alloy, the resistor extending between and being connected to suitable lead parts 3, there being one of the above at each end of the tube, which lead parts extend outwardly and are in turn a part of the supporting elements 4 in each case. The element 4 may in turn be connected to any suitable source of electric current as is well known, in order to operate the resistor. The supporting element 4 is suitably connected to a ferrule 5, the ferrule 5 being adapted to receive and support the quartz sheath 1 therewithin.

It is understood that each end of the tube is equipped in the manner previously described, and at the ends and extending a short distance, approximately the distance of the ferrule or equivalent to the length thereof, is a ceramic insulating material as indicated at 6, which insulating material is of any preferred type and adapted to solidify so as to seal the end of the tube with which it is associated.

The purpose of using the ceramic sealing and insulating material 6 will be understood particularly in reference to Figure 3 wherein is shown the method of fabricating the unit, such figure illustrating the unit including the various parts heretofore described as being supported in a vertical position on a vibrating unit 7, which unit may be of any preferred known construction and forms no part of this invention. Suffice it to say that the unit 7 is equipped with a table 8 which may be vibrated at any preferred frequency for purposes which will hereinafter be set forth.

It being assumed that the heater unit including the quartz sheath 1, the resistor 2, and the other parts 3, 4, and 5 are in place upon such tube, and that one end of the tube is sealed with the ceramic material 6, thereafter the finely divided material such as graphite is introduced at the upper end of the unit and the vibrating table 8 set into action. Thereafter by supplying the powdered graphite into the interior of the tube, the same is compacted and intimately incloses the resistor 2 therewithin, in essence forming a rod by reason of the vibration, within which is the resistor and by reason of the density of the material caused by the vibration, certain advantages are attained as will hereinafter be more clearly explained.

Assuming that the unit, including the sheath 1, has been filled, thereafter ceramic material 6 is poured into the upper end of the tube and permitted to solidify therein so that the tube now becomes a sealed unit with the various parts in assembled relation as shown in Figure 1. During the vibration of the unit, substantially all of the air otherwise trapped therewithin has been excluded and the sealing of both ends of the tube provides a unit which has no voids or air trapped within the unit.

The heater unit having been assembled as above set forth, the same may subsequently be placed in operation in any position as will be apparent, in view of the fact that the resistor therewithin is supported by the surrounding graphite or similar radiation producing material. Heretofore in fused quartz heaters of this class, the same have only generally been suitable for use in a horizontal position, by reason of the eventual sagging of the resistor 2 if operated in vertical position, the sagging being apparent as being caused by the heating of the resistor and its substantial loss of strength during such heating.

In addition to the desirable advantage of being able to use the heater unit in a vertical position, the availing of the powdered graphite for example as a supporting

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material likewise increases the radiating effect of the heater as a whole. The powdered graphite is a very good radiator in its own right, and when intimately packed and virtually compressed as heretofore explained, in conjunction with the resistor 2, the radiating capacity of the heater will be seen to be substantially increased. The elimination of the air and voids in the manufacture of the heater, of course increases this ability to produce radiation and in conjunction with the quartz sheath which does not absorb radiation to any great extent, higher power output of the unit is possible. In addition, the graphite cannot be oxidized by reason of the fact that the same is sealed within the quartz sheath and further the resistor 2 is similarly protected from oxidation and the destructive effects thereof.

It will be apparent that the increased radiation of the unit is accomplished by reason of the fact that more surface from which radiation may be generated is in effect provided by reason of the graphite powder. Under certain conditions as a result of the ability to pack the graphite within the fused quartz sheath, the resistor itself may be reduced in size or in the alternative the same resistor may be used and a substantial power output increase accomplished.

It might be noted for example that certain metal alloy resistors, in the form of wire coils such as suggested in this heater, are limited for good wire life to a temperature

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range of 1800 to 1900 degrees F. and thus cannot be used where oven temperatures generated by the heaters are desired over 1600 degrees F. This permissible oven temperature may be increased by the use of the powdered graphite and the increased radiation permitted or provided thereby.

I claim:

5 An electric heater unit comprising a tubular sheath of fused quartz, a metallic alloy resistor in said sheath, and
10 finely divided graphite packed in said sheath, surrounding and supporting said resistor, said sheath being sealed.

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