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ELECTRIC INFRARED EMITTER

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FIG. 1.

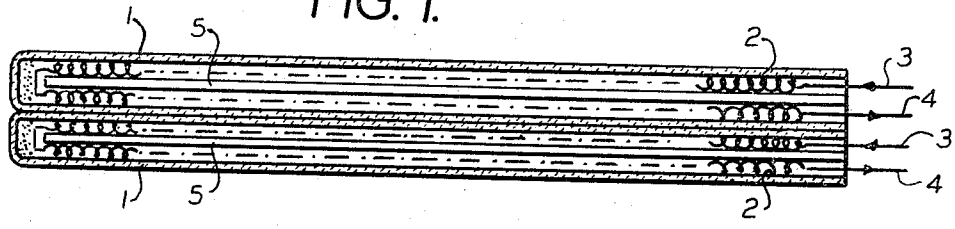


FIG. 2.

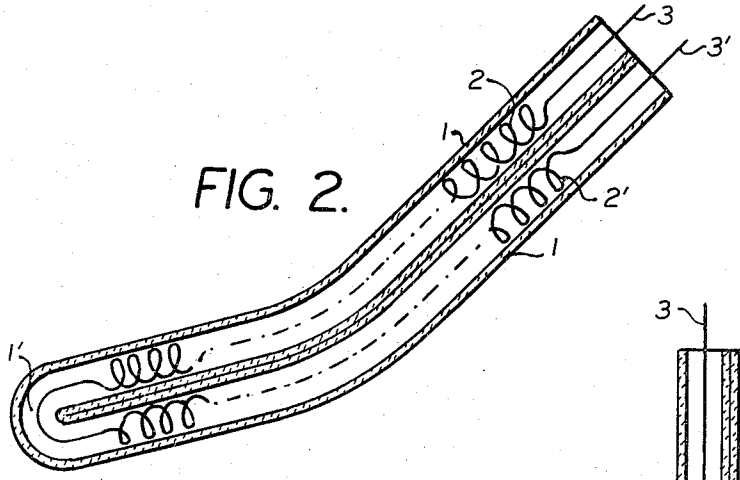
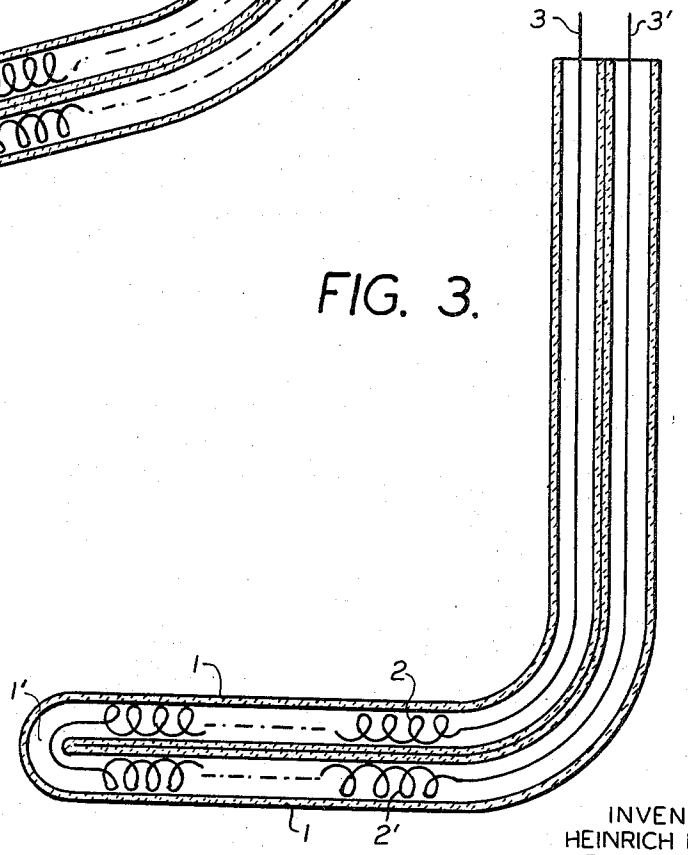


FIG. 3.



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ELECTRIC INFRARED EMITTER

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The present invention relates to an electric infrared emitter which comprises at least two parallel radiating elements.

Infrared emitters are nowadays employed very extensively for many technical, scientific, and therapeutic purposes. Because of their excellent radiating properties, especially those infrared emitters have proved successful in which the emitter or radiating element consists of a tube of an opaque quartz ware, quartz glass, or a glass of a high melting point in which an electric heating conductor is provided, for example, in the form of a heating coil. The cross-sectional shape of the tube encasing the conductor may be circular, oval, or the like.

There are infrared emitters already known which consist of two or more parallel radiating elements which may also be mounted in front of a reflector. These infrared emitters usually have the disadvantage that their mechanical stability and resistance to breakage is very low.

It is an object of the present invention to provide an electric infrared emitter which is highly resistant to breakage, possesses a high mechanical stability, and may be produced in a very simple and inexpensive manner.

According to the invention, this object is attained by providing an electric infrared emitter which comprises at least two substantially parallel radiating elements consisting of individual tubes of opaque quartz ware, quartz glass, or glass of a high melting point, in each of which an electric heating conductor is mounted, and by connecting these tubes containing the radiating elements by at least partly fusing them together along their adjacent edges. The operation of fusing the tubes together may be carried out without any technical difficulties. An electric infrared emitter of this construction has a very high mechanical stability and resistance to breakage. According to a preferred embodiment of the invention one end of the tubes of the radiating elements may be closed by being fused together so that the infrared emitter has its electrical connections at only one end. If the infrared emitter consists, for example, of two radiating elements, the heating conductor of one element may be used as a leading or inlet conductor and the heating conductor of the other element as a return conductor for the electric current. The individual tubes encasing the heating conductors of an infrared heater according to the invention may also consist of different materials. Thus, for example, the tube of one radiating element may consist of quartz ware, while the tube of another element which is partly fused together with the first may consist of quartz glass.

An infrared emitter according to the invention which consists of two radiating elements, the tubes of which are partly fused together along their contact surfaces may be employed, for example, as an ignition device for heating oil in an oil furnace. The encasing tubes which preferably have an oval cross section then contain a heating coil. For attaining an emitter with electric connections at only one end the tubes are fused together at one end in a manner so as to form a passage from one tube to the other. The heating conductor then passes from the outside into and through one tube as a leading conductor and through the other tube and back to the outside as a return conductor. At their ends adjacent to the connecting passage of the two tubes both conductors are fused together. It is, however, also possible to install a leading and return conductor within each tube. In this case, the tubes of both emitter elements are fused closed at one end and this end of one tube is fused together with the corresponding end of the other tube. The parallel tubes may be bent at an angle at the radiating end portion and thus form an angular infrared emitter unit which is composed of two radiating elements. By bending this end portion, the heat is accumulated therein so that a very high temperature is attained for the purpose of igniting the oil.

Infrared emitters according to the invention in which the radiating elements are fused together and are thus closed at one end may also be employed as immersion heaters. Such an immersion heater has the particular advantage that if the heating part thereof is bent at a right angle to the part containing the lead-in wires it may be used especially for heating the contents of a container near the bottom thereof. The double-tube unit should then preferably be bent edgewise, that is, at a right angle to the common plane of both tubes, so that, when seen in the vertical projection, the bent end portion will offer the smallest possible surface for collecting sediments or other matter. The infrared emitters according to the invention when used in a sufficient number or in the form of larger units may also be employed for room-heating purposes. This requires a mass production of the individual emitters which may be very economically carried out when designing them according to the invention. They also have the great advantage of having a high mechanical stability and resistance against breakage.

The features and advantages of this invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which—

FIGURES 1, 2 and 3 show longitudinal sections of infrared emitters according to three different embodiments of the invention.

The infrared emitter as shown in FIGURE 1 comprises a pair of tubes **1** which are closed at one end and are fused together at different points along their adjacent edge surfaces. Both tubes **1** contain heating conductors in the form of coils **2**, the lead-in wires **3** and **4** of which are adapted to be connected in the usual manner to a source of current. The leading and return coils of the heating conductor in each tube **1** are separated by a strip of quartz ware or quartz glass **5**.

The infrared emitter according to the modification of the invention as shown in FIGURE 2 consists of two radiating tubes **1** which are fused together along the entire length of their adjacent contact surfaces and one end of each tube is fused together with the corresponding end of the other tube in a manner so as to form a continuous passage **1'** from one tube to the other. Each tube **1** contains a heating coil **2** or **2'**, respectively, and the ends of the two coils within the end passage **1'** are electrically connected so that one heating coil **2** forms a leading conductor, while the other coil **2'** forms a return conductor. The free ends **3** and **3'** of these conductors extend through the open other ends of tubes **1** to the outside and are to be connected in the usual manner to a source of current. One part of this infrared emitter may be bent at a slight angle relative to the other.

FIGURE 3 shows another modification of the infrared emitter according to the invention which likewise consists of two radiating tubes **1** which are fused together along their entire length and are connected at one end to form a passage **1'**. The difference between this infrared emitter and that as shown in FIGURE 2 is the fact that its lower portion is bent at a right angle to the upper part and that the coil-shaped parts **2** and **2'** of the heating conductors are only located in this bent end

portion from which they lead as straight wires to the connecting ends 3 and 3'.

Although our invention has been illustrated and described with reference to the preferred embodiments thereof, we wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed our invention, what we claim is:

1. An electric infrared radiation emitter comprising a plurality of substantially parallel radiation permeable tubes of a material selected from the group consisting of opaque quartz ware, quartz glass and high melting point glass, said tubes being fused together at a plurality of points along their adjacent surfaces, each tube having one end fused together with a similar end of another tube to define a common passage between said tubes, said tubes being bent at a location intermediate to their fused ends and their opposite ends to position the length portions of said tubes between their fused ends and the bending location at a predetermined angle with respect to the remaining length portions of said tubes, an electrical resistance heating coil disposed within each of said tubes for extension therein, said heating coil being approximately equal in diameter to the internal diameter of its associated tube, and an electrical conductor extending through said passage and conductively connecting said heating elements together in series each heating coil having a lead conductor extending from the end of its associated tube remote from the fused end thereof and disposed for connection to an external source of electricity for energization of the heating coil thereby to generate and emit infrared radiation.

2. The electric infrared emitter according to claim 1 wherein said tubes are bent at a right angle at said bending location.

3. The electric infrared emitter according to claim 2 wherein the heating coil for each tube extends within the limits of the length portion thereof adjacent to the fused end of the tube and the lead conductor of said heating coil extends through the remaining length portion of the tube and out the end thereof remote from the fused end.

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