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ELECTRICAL HEATER

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Fig. 1

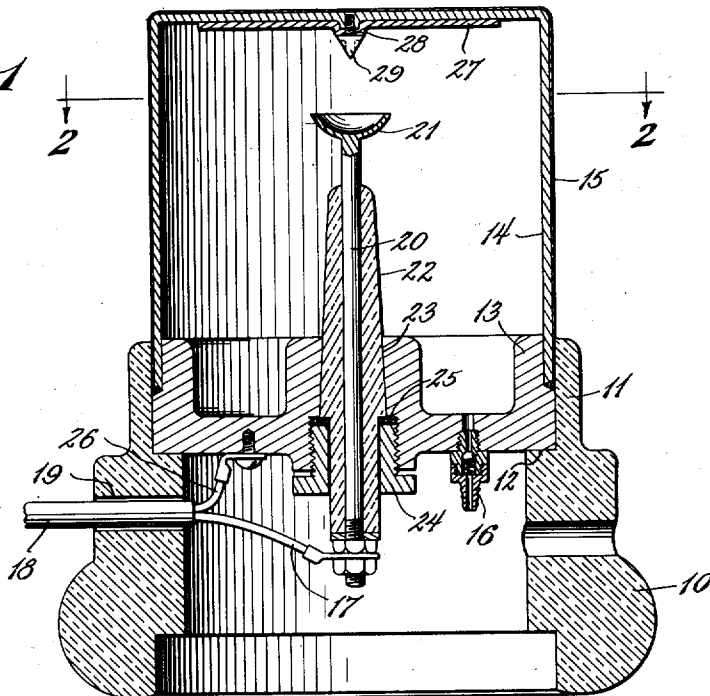
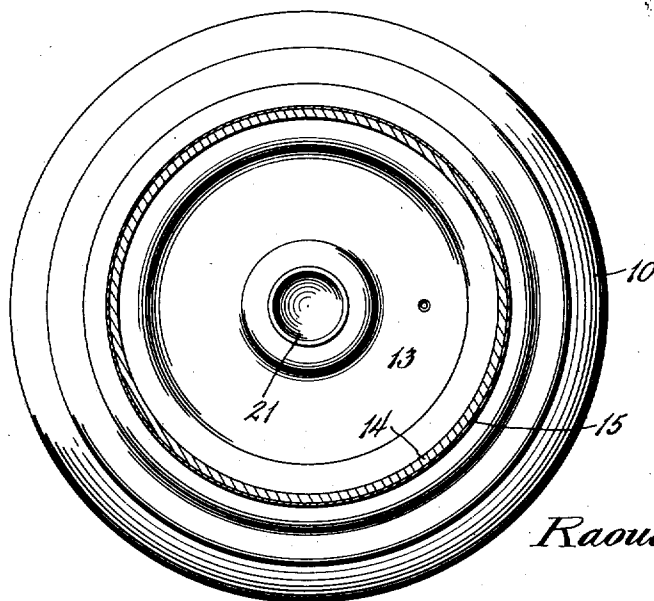


Fig. 2



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ELECTRICAL HEATER

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7 Claims. (Cl. 219—19)

This invention relates to electrical heaters and, among other objects, aims to provide an improved, relatively simple, highly efficient and inexpensive type of electrical heater employing cathode rays instead of the usual resistance elements. The main idea is to provide a heater which can be manufactured as a compact unit and sold at a reasonable price to be used for heating or cooking and which has no electrical parts requiring replacement.

Other aims and advantages of the invention will appear in the specification, when considered in connection with the accompanying drawing, wherein:

Fig. 1 is a vertical sectional view of one embodiment of heater embodying the invention; and Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Referring particularly to the drawing, the illustrated form of heater is designed to operate on the same general principle as the commercial cathode ray tubes except that it employs an evacuated metal casing or shell adapted to radiate or transfer heat. In this example, the heater embodies a hollow support or pedestal 10 made of porcelain or other suitable insulating material. It is shown as having an upstanding cylindrical flange 11 providing a seat 12 to receive the base 13 of the heater unit which is made of metal. On the metal base 13 there is shown a hollow cylindrical shell 14 made of sheet metal and preferably welded around the base as shown to make an airtight joint. The construction is such that the shell and its base can be inserted in the seat in the pedestal.

Since the shell is made of sheet metal and is adapted to be evacuated to act as a cathode tube, it is highly desirable to prevent the infiltration of air through the metal when it is heated. It is therefore coated or plated with metal of a higher atomic number. It is preferably, though not necessarily, electroplated. Assuming that it is made of steel or bronze, it may be electro-plated with nickel or chromium, for example, the coating 15 being shown of an exaggerated thickness for the sake of illustration.

The air is adapted to be evacuated or exhausted from the shell through a valved nipple 16 conveniently projecting from the base 13 into the hollow pedestal 10 and the pedestal is shown as having a lateral opening through which an exhausting tube or pipe (not shown) may be inserted and connected to the nipple.

The illustrated design of heater is adapted to operate on direct current, although it is to be

understood that slight changes may be made to adapt it to operate on alternating current. In this example, one conductor 17 leading from a cable 18 projecting through an opening 19 in the pedestal is electrically connected to a conductor in the form of a rod 20 carrying a cup-shaped cathode 21 in the form of a parabolic reflector preferably arranged on the axis of the shell within a short distance of the top. The cathode conductor 20 is shown as being imbedded in an insulating bushing 22 which is preferably molded thereon and is tapered toward its upper end. This bushing is inserted in a tapered opening 23 extending through the center of the base. It is held firmly seated in said opening by means of a packing gland 24 and a suitable packing 25. The construction is such that the joint is always maintained airtight to prevent infiltration of air through it to destroy the vacuum in the shell. The other conductor 26 is shown as being electrically connected to the base 13 so that the circuit is completed through the cathode and the shell through the base.

In this instance, the cathode cooperates with an anti-cathode plate 27 conveniently made in the form of a disk in contact with the upper wall of the shell. While this anti-cathode may be made of any suitable metal having a high fusion point, it is preferably made of an alloy which, for example, is composed of copper, nickel and tin. These metals may be melted together in suitable proportions and cast to form the plate. However, it is sometimes convenient to make the plates of metal powder by what is known as the cold process. In the latter example, the powder of the metals in the proper proportion may be formed into a paste by the addition of mercury and the paste molded under pressure into the proper form. As an example of an alloy composed of the above metals, I prefer to employ approximately 30% by weight of nickel, 50% by weight of copper and 20% by weight of tin, all in the form of a metal powder or fine particles. This is converted into a paste by adding mercury. To increase the fusion point and the hardness of the plate, a minute quantity of beryllium is added to the batch.

Referring to Fig. 1, the anti-cathode plate is shown as having a central opening and is secured centrally to the upper wall of the shell by means of a screw 28 having a conical head 29 which constitutes the anode. The conical head is arranged axially of the casing and points directly into the cup-shaped cathode, it being understood that the conical head delivers ions into the cathode which

converts them into electrons to bombard the plate which absorbs them. The action of the released electrons increases the motion of all of the neighboring elements, thereby raising the temperature of the anti-cathode. The heat thus generated in the plate is transmitted to the shell and radiated therefrom.

In the practical application of the illustrated apparatus, it has been found that the relation between the diameter of the cathode and the anti-cathode plate should be approximately one to four. The distance between the tip of the anode and the bottom of the cathode reflector should be approximately the same as the diameter of the cathode reflector. It is contemplated that the heater may be operated at various voltages and that the current consumed will be dependent upon the mass and the ultimate temperature required. It was found desirable to evacuate as much air as possible from the shell and that the heater worked more efficiently by introducing a very minute quantity of conductive gas, such as neon.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly, since it may be employed advantageously in various combinations and sub-combinations.

What is claimed is:

1. A portable cathode ray heater comprising, in combination, an evacuated metal casing; a concave reflector-shaped cathode within the casing; an anti-cathode plate secured in heat transferring relation to a wall of the casing opposite the cathode so that the cathode rays bombard substantially the entire inner surface thereof; and a relatively small anode on the inner face of said plate directly opposite the cathode.

2. A cathode ray heater comprising, in combination, an evacuated substantially vertical, cylindrical, metal casing; a base supporting said casing; a concave cathode arranged axially of the casing and directed toward the upper wall thereof; a disk-shaped anti-cathode plate secured in heat transferring relation to the upper wall of the casing opposite the cathode; a pointed anode in the center of the said anti-cathode plate directly opposite the cathode; and electrical conductors connected to the cathode and the casing.

3. In a cathode ray heater of the character described, an evacuated metal casing; a concave cathode within the casing directed toward a wall

thereof; a thin anti-cathode plate arranged in heat transferring relation to the said wall of the casing; and a relatively small, pointed anode of different material from said anti-cathode plate and connected thereto to discharge directly into the cathode.

4. A portable cathode ray heater of the character described comprising, in combination, a vertical, evacuated metal casing; a hollow base of insulating material supporting said casing; a conductor projecting from the inside of the base into the casing and electrically insulated therefrom; a cup-shaped cathode on the upper end of said conductor directed toward the upper wall of said casing; an anti-cathode plate in heat transferring relation to the upper wall of the casing; and a substantially conical anode secured centrally to said plate and arranged directly opposite the bottom of said cup-shaped cathode.

5. A cathode ray heater comprising, in combination, an airtight metal casing; a cupped cathode within the casing spaced from and directed toward one wall thereof; and a thin anti-cathode plate having a higher fusion point than said casing and secured in heat transferring relation to said wall opposite the cupped cathode and so arranged that the cathode rays bombard substantially the entire inner surface thereof.

6. A cathode ray heater of the character described comprising, in combination, an evacuated casing having a substantially flat wall; a concave cathode positioned within the casing and directed toward the central portion of said flat wall; a disk-shaped anti-cathode plate secured in heat transferring relation to the inside face of said flat wall and of a diameter considerably greater than the diameter of said cathode; and a pointed anode secured to the center of said plate and pointing toward the center of the cathode and spaced therefrom a distance substantially equal to the diameter of the cathode.

7. In a cathode ray heater of the character described, a closed casing; a concave cathode within the casing; a disk-shaped anti-cathode plate secured in heat transferring relation to one wall of the casing and of a diameter substantially four times that of the cathode; an anode arranged approximately in the center of said plate and directed toward the bottom of said cathode, the tip of said anode being spaced from the bottom of the cathode a distance substantially equal to the diameter of the cathode.

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