

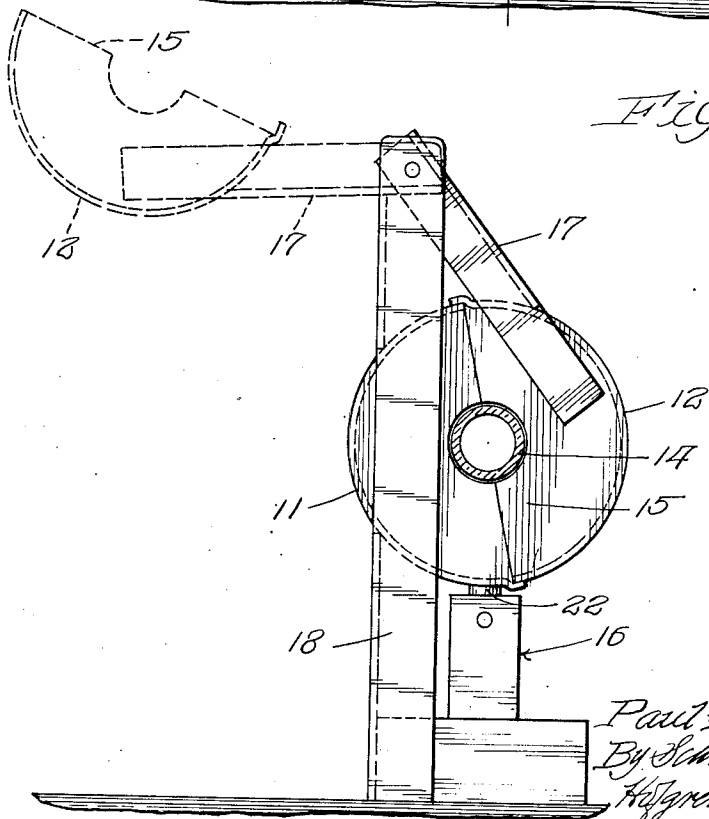
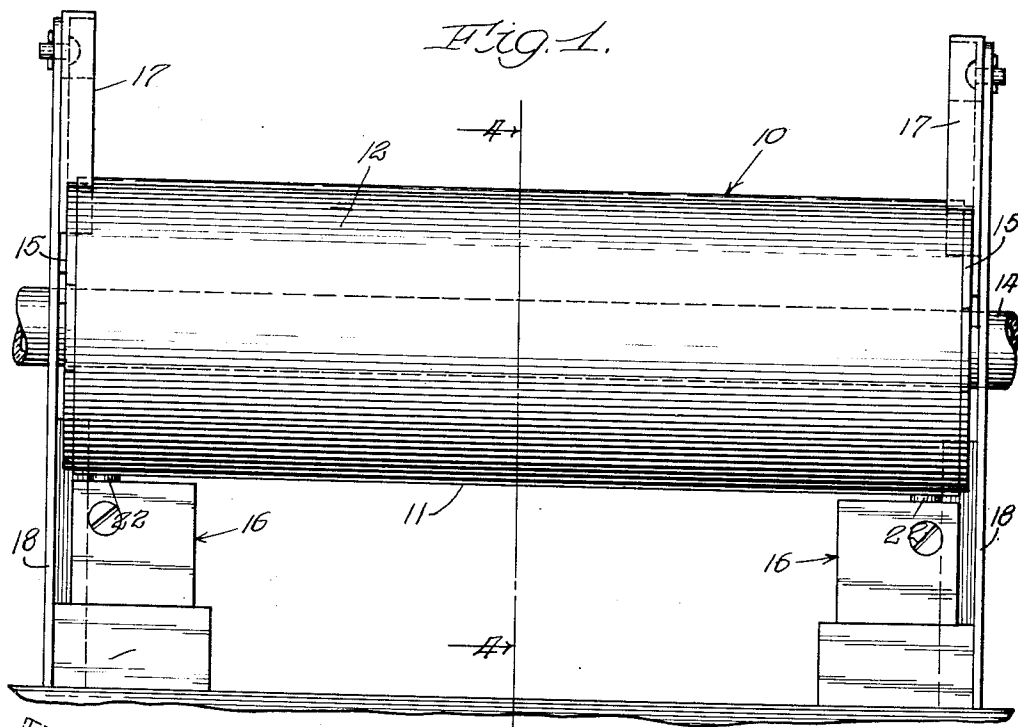
March 2, 1954

P. H. SHERRICK
RADIANT HEATING FURNACE

2,671,123

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2 Sheets-Sheet 1



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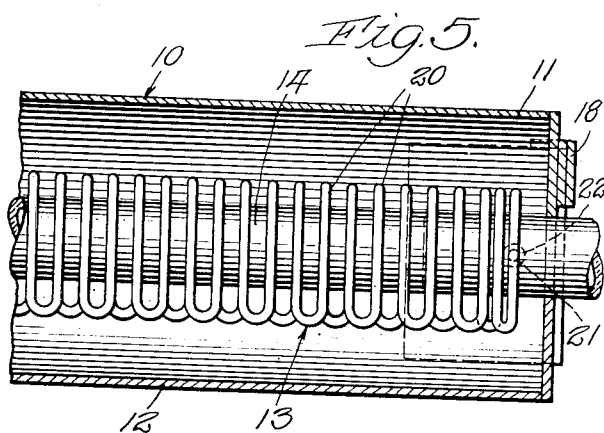
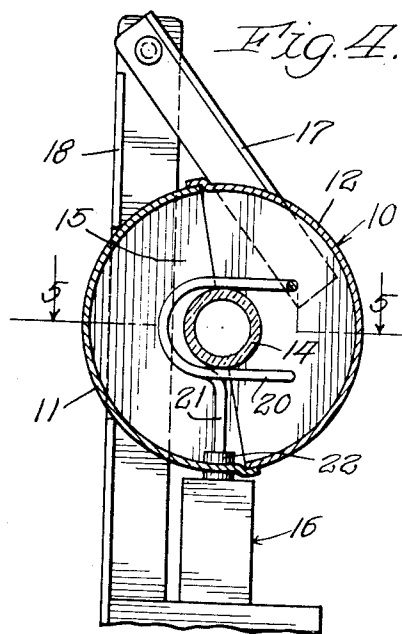
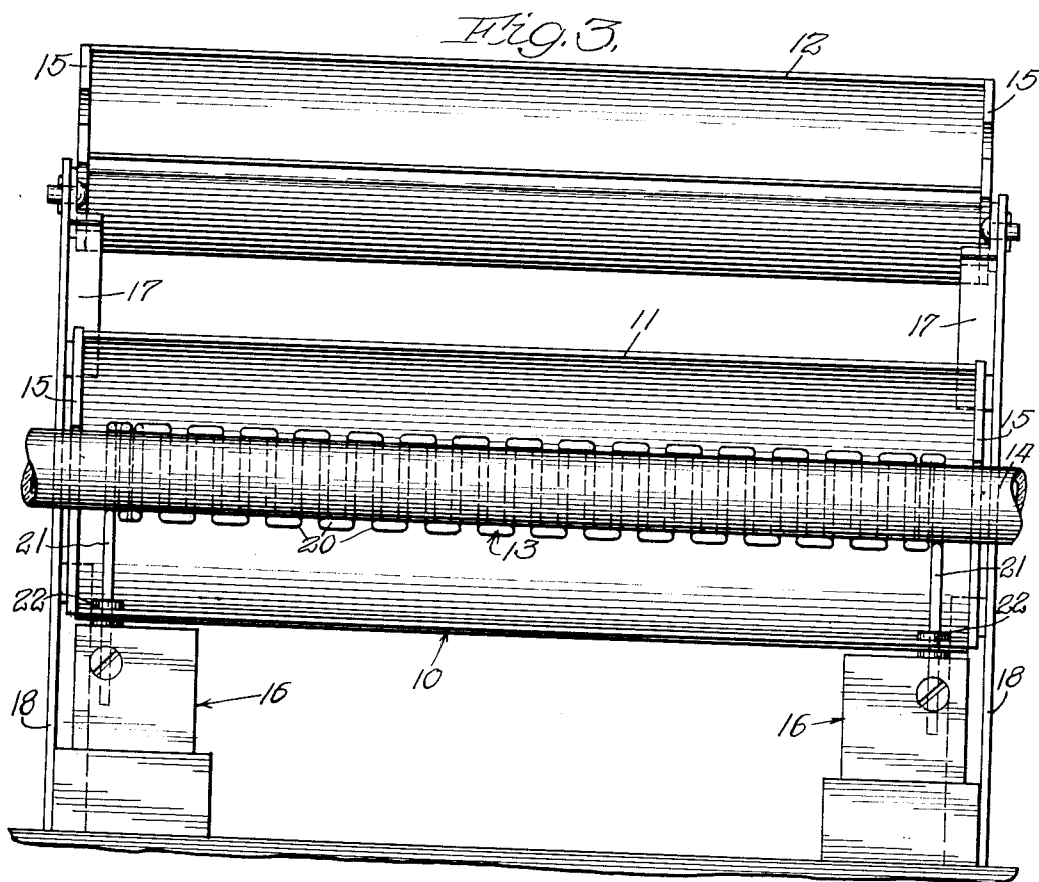
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UNITED STATES PATENT OFFICE

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RADIANT HEATING FURNACE

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2 Claims. (Cl. 13-20)

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This invention relates to a radiant heating furnace and more particularly to a radiant heating furnace for micro-chemical combustion analysis.

In making a micro-chemical combustion analysis it is common laboratory practice to place the sample to be analyzed in a glass or quartz combustion tube. This tube is then rapidly heated to a temperature sufficient to burn the sample, the temperature range being from about 800° to 1200° C. or higher depending on the type of sample. The resulting combustion products are then swept out of the tube and analyzed.

A preferred type of furnace for heating the combustion tube is a radiant type heating furnace. It includes a casing generally of aluminum and having a cylindrically shaped inner surface. This inner surface is coated with aluminum oxide which serves as the heat reflector. A resistance wire heating element is positioned within the confines of the casing and adapted to hold the combustion tube containing the sample to be analyzed concentrically about and parallel to the longitudinal axis of the casing.

A number of problems arise in attempting to obtain an efficiently operative type of radiant heating furnace for micro-chemical combustion analysis, particularly when the casing is thin, cylindrically shaped aluminum, the inner surface of which has a generally smooth aluminum oxide coating. The serviceable temperature limit of such prior radiant heating furnaces was lower than the maximum value desired by the laboratory analysts using them. Rivets, screws and the like extended through the aluminum oxide coating and into the aluminum casing, constituting "weak points" where heat was absorbed and transmitted by conduction to the aluminum producing melting of the aluminum in the areas about these elements at temperatures below the desired maximum value. It is important to eliminate these "weak points" and to increase the maximum operation temperature of this type of furnace. In addition, it is advantageous from an operational standpoint to increase the rates of heating and cooling of the sample, and to insert and remove the combustion tube laterally with respect to the interior of the casing.

As disclosed hereinafter, the radiant heating furnace of this invention has features which overcome these problems. Melting of the aluminum due to the presence of "weak points" on the aluminum oxide coating is eliminated, en-

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abling the furnace to operate at the desired and increased maximum combustion temperature; the rates of heating and cooling of the sample are increased; and the combustion tube can be inserted and removed laterally with respect to the interior of the casing.

Other features and advantages will be apparent from the following description of the drawings illustrating a preferred embodiment of my invention, in which:

Figure 1 is a fragmentary, side elevational view of the furnace showing the combustion tube partly in dotted lines;

Figure 2 is an inside end elevational view of the furnace illustrating the movable half section in two positions;

Figure 3 is a fragmentary, side elevational view of the furnace in an open position;

Figure 4 is a fragmentary sectional view taken along line 4-4 of Figure 1; and

Figure 5 is a fragmentary sectional view taken along line 5-5 of Figure 4.

In the particular embodiment of the invention as illustrated, a thin, cylindrical shaped casing 10 is comprised of two inter-fitting semi-cylindrical half sections 11 and 12, preferably made of aluminum. The inner surface of this casing is generally smooth and has an aluminum oxide coating thereon. A self-sustaining resistance wire heating element 13 is positioned within the confines of this casing and adapted to hold a quartz or glass combustion tube 14 therein, concentrically about and parallel to the longitudinal axis of the casing.

The casing 10 includes semi-circular shaped end plates 15 which, when the casing is closed, form two opposing circular end plates. Each of these have a hole therethrough to permit the combustion tube 14 to extend beyond the ends of the casing.

As shown in Figures 2, 3 and 4, one of the half sections 11 of the casing is fixedly mounted at the bottom end portions atop the support elements 16, the longitudinally extending edges of this section being about ten degrees from vertical. The other half section 12 is secured to the end portions of arms 17, each of the semi-circular end plates of this section being welded to one of these arms. The other end of each of these arms is rotatably mounted to upwardly extending posts 18 above the level of the top of the casing 10. By movement of the arms 17 upwardly, half section 12 is moved away from fixedly mounted half section 11, thereby opening the casing 10 and permitting lateral insertion

and removal of the combustion tube 14. It is to be noted that opening of the casing 10 in the above described manner permits rapid cooling of a sample contained in the combustion tube and heated in a casing 10.

Self-sustaining resistance wire heating element 13, as shown in Figures 3, 4 and 5, consists of a plurality of spaced, generally parallel U-shaped self-sustaining wire heating segments 20 which are joined together at alternate ends of the U to form a continuous, longitudinally extending open-sided heating element and is preferably made of Chromel metal. This heating element is mounted in the casing 10 by means of resistance wire leads 21 which extend downwardly from the heating element at the ends thereof through passageways 22 in the fixedly mounted half section 11 and into the support elements 16 where they are electrically adapted to be connected to an electrical source of power not shown in the drawings. This open-sided heating element 13 is adapted to hold the combustion tube 14 between the legs of the U-shaped segments 20 and is positioned within the casing 10 so that the combustion tube, when mounted between the legs of the U-shaped segments, is concentric about and extends parallel to the longitudinal axis of the casing 10. In addition, the open side of the heating element 13 faces the movable half section 12 in such a manner that a plane passing through the ends of the U-shaped segments 20 is substantially perpendicular to the horizontal plane passing through the longitudinal axis of the casing 10. In this way, when the half section 12 is moved away from the fixedly mounted half section 11 and to the position as shown in dotted lines in Figure 2, the combustion tube 14 can be inserted laterally between the legs of the U-shaped segments 20 or removed laterally therefrom.

It is to be noted that the aluminum oxide coating on the inner surface of the thin aluminum, cylindrically shaped casing 10 is free of any material having a heat conductivity greater than aluminum oxide. As a result, the radiant heating furnace of this invention can be operated at temperatures of 1200° C. and higher without causing melting of the aluminum in localized areas. In addition, the rate of heating in the casing is increased as a result of this feature.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom as some modifications will be obvious to those skilled in the art.

I claim:

1. A radiant heating furnace for micro-chem-

ical combustion analysis, comprising: a casing, the inner surface of said casing being of generally smooth, cylindrical shape and having a coating of aluminum oxide thereon; and a plurality of spaced, generally parallel, U-shaped self-sustaining resistance wire heating segments joined together at alternate ends of the U to form a continuous longitudinally extending open sided heating element adapted to hold a combustion tube between the legs of the U-shaped segments, said heating element being positioned within the confines of said casing so as to hold a combustion tube concentrically about and extending parallel to the longitudinal axis of said casing.

2. A radiant heating furnace for micro-chemical combustion analysis, comprising: a thin aluminum casing substantially cylindrical in shape, said casing being formed from at least a pair of inter-fitting, semi-cylindrically shaped sections and adapted to be opened and closed by relative movement of the two sections away from and toward each other, the inner surface of each of said sections having an aluminum oxide coating thereon; means for moving the two sections away from and toward each other to open and close said casing; and a plurality of spaced, generally parallel U-shaped self-sustaining resistance wire heating segments joined together at alternate ends of the U to form a continuous longitudinally extending open-sided heating element adapted to hold a combustion tube between the legs of the U-shaped segments and positioned within the confines of said casing to hold a combustion tube concentrically about and extending parallel to the longitudinal axis of said casing, said casing being adapted to open and the heating element being positioned so as to permit insertion and removal laterally of a combustion tube between the legs of the U-shaped heating element segments when said casing is open.

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