

Sept. 2, 1958

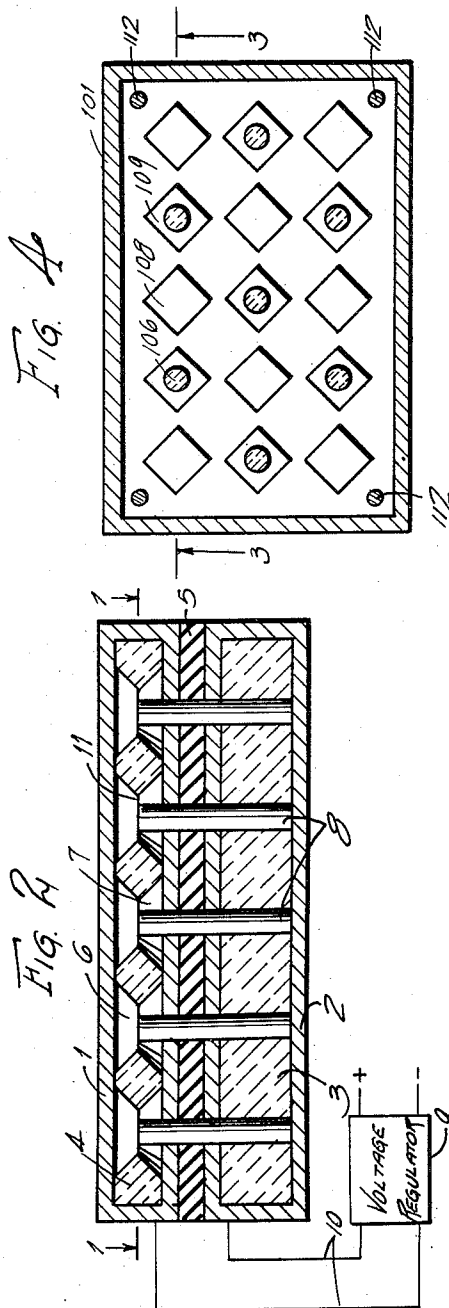
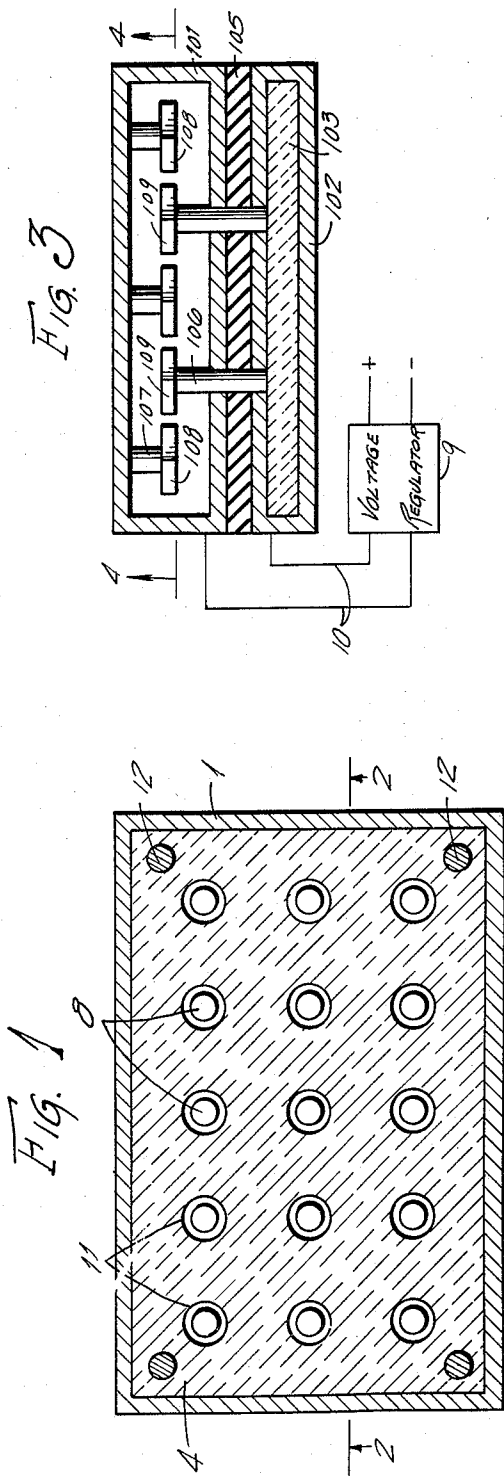
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2,850,554

HIGH-INTENSITY CARBON-ARC SURFACE HEATER

Filed April 16, 1956

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 5

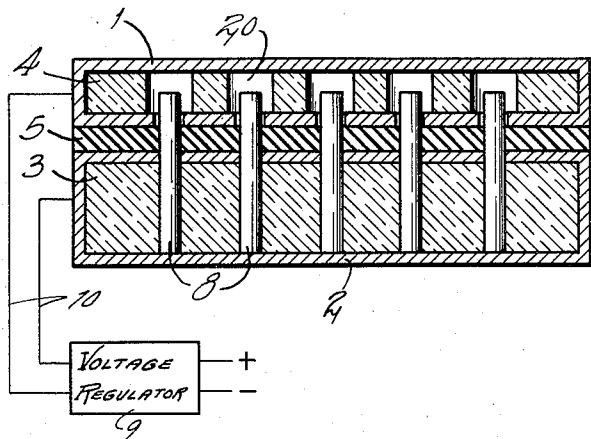
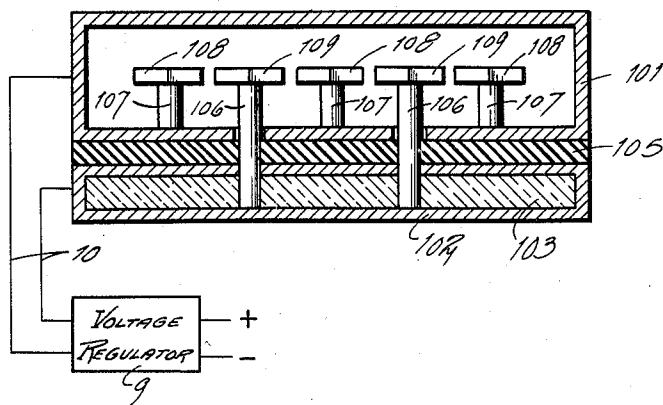


Fig. 6



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HIGH-INTENSITY CARBON-ARC SURFACE HEATER

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8 Claims. (Cl. 13—1)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to electric furnaces of the high intensity carbon-arc type. These furnaces are used where specimens are required to be raised to a very high temperature and at a very rapid rate.

Systems currently in use include the infra-red systems, electric blankets and also small electric furnaces. However, these systems suffer from the disadvantages that they are initially expensive, their heating rates are relatively low, and the maximum temperature of the furnace or heating unit is limited.

The object of this invention therefore is a heating unit which has a very high heating rate, and a relatively high maximum temperature limit.

A further object of this invention is a furnace which is inexpensive to manufacture, can be inexpensively and easily maintained, and is readily adaptable to almost any use.

A further object of this invention is a heating unit which attains the utmost degree of portability.

A further object of this invention is a novel method of starting up a furnace or heating unit of the hot-arc type.

These and other advantages will be readily apparent to those skilled in the art from an examination of the written disclosure and drawings wherein:

Figure 1 is a cross-sectional elevation view of the heating unit along section lines 1—1 of Figure 2,

Figure 2 is another cross-sectional view along lines 2—2 of Figure 1,

Figure 3 is a cross-sectional view similar to Figure 2 of a modification of the heating unit,

Figure 4 is a view similar to Figure 1 of the second modification,

Figure 5 is a sectional view of a view similar to Figure 2 showing a modification of the device of Figure 1, and

Figure 6 is a sectional view showing a further modification of the invention.

The heater (Figures 1 and 2) consists of an upper metallic housing 1 in the form of a hollow rectangular box. Within the housing 1 is inserted a layer of sheet carbon 4; prior to insertion of the layer, a plurality of holes 6 are countersunk on one side of the sheet and matching countersunk holes 7 are made on the other side with the countersunk faces joining to form a narrow neck 11 in each continuous port 6, 7.

A second housing 2 is made into a similar shape as the upper housing, which second housing also has contained therein a layer of sheet carbon 3. Sandwiched between the two housings is a continuous strip 5 of electrical insulation such as mica. The two housings are manufactured from any highly conductive metal, such as copper.

Appropriate ports are drilled in the lower face of the upper housing, the insulator separator, the upper face of

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the lower housing, and the enclosed refractory 3 for receiving the carbon rods 8. For best efficiency, the upper section of each rod is at the neck junction 11.

A plurality of mica rods 12 spaced at strategic points of the structure fasten the separate units into a single assembly; power leads 10 are joined to the upper housing 1 and the lower housing 2; are connected to a voltage regulator 9; and are thence connected to the source of power supply.

In starting the heater, a small carbon or copper washer may be inserted over each rod 8 thus shorting the current supply through the two plates 3 and 4. As the arc commences, the washer is burned away. Another method of starting can be by utilizing an initial high voltage surge to bridge the gap.

After a steady state condition of arcing has been maintained, the heat output may be varied by an adjustment of the regulator 9.

It is obvious that although a rectangular heater is shown, the heater may be of any size or shape depending upon the amount of total heat output desired and the particular application of the heater.

In certain applications the sheet 4 may be substituted by a thin flat sheet with ordinary cylindrical ports 20 in lieu of the countersunk sections 6, 7, as shown in Figure 5.

In another obvious modification, the facing sections of rods 8 may be tipped similar to the neck sections 11 to increase the arcing effect.

In another modification, shown in Figures 3 and 4, housings 101 and 102 are made similar to the equivalent structures, 1, 2 of Figures 1 and 2 and are separated by an electrical insulator 105.

Projecting upward from the carbon layer 103 within the lower housing 102 are a plurality of rods 106 terminating in rectangular caps 109; projecting toward an opposite direction are a plurality of rods 107 also terminating in end caps 108. The squares of the caps or tips 108, 109 are arranged so that their corners are in juxtaposition with the four corners of any member 109 bounded by a separate corner of one of the members 108. With such pointed tip juxtapositioning, the arcing effect is increased.

Current is supplied to the housings 101 and 102 and the heater action is initiated as mentioned in the prior modification, however, in lieu of a washer, a thin fuse strip may be substituted therefor.

With all the modifications, explicit or implied, either A. C. or D. C. current may be used depending upon the nature of the supply source.

In a modification of Figures 3 and 4, it is understood that rods 107 and 106 may extend from the same side of the housing, provided an electrical separation is maintained, as shown in Figure 6, and the function and operation of the unit is in no way altered.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An electrical heating unit, comprising a hollow metallic housing having a plurality of spaced, lateral apertures, conductive refractory means mounted in said housing and disposed between said apertures, a layer of conductive refractory disposed in parallel relation to said housing and insulated therefrom, a plurality of elongated conductive refractory members projecting laterally from said layer of refractory and extending into said apertures for electrical cooperation with said conductive refractory means in said housing to produce an arc and high temperature.

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2. The device of claim 1 including a second hollow metallic housing encasing said conductive layer and having lateral apertures through which said elongated conductive refractory members protrude to extend into said first named metallic housing.

3. The device of claim 1 in which said conductive refractory means comprises a second layer of conductive refractory having apertures corresponding with said apertures in said first named metallic housing.

4. The device of claim 1 in which said conductive refractory means comprises a second plurality of elongated refractory members mounted in said housing.

5. The device of claim 4 in which said elongated refractory members are provided with end caps having corners and said corners are in juxtaposition with the corners of adjacent caps.

6. In a heating unit, a first layer of conductive refractory, a second layer of conductive refractory, means electrically separating the two layers, hour glass-shaped ports within one of said layers, and means extending from within the other of said layers to adjacent the necks of said hour glass-shaped ports.

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7. The unit of claim 6, further including housings for each of said layers, and means connecting said housings to an electrical power supply.

8. The unit of claim 7, further including voltage regulator means in said connecting means.

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