Nov. 5, 1968 T. A. J. JAQUES 3,409,728

ELECTRICAL RESISTANCE FURNACES

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Fig. 1.

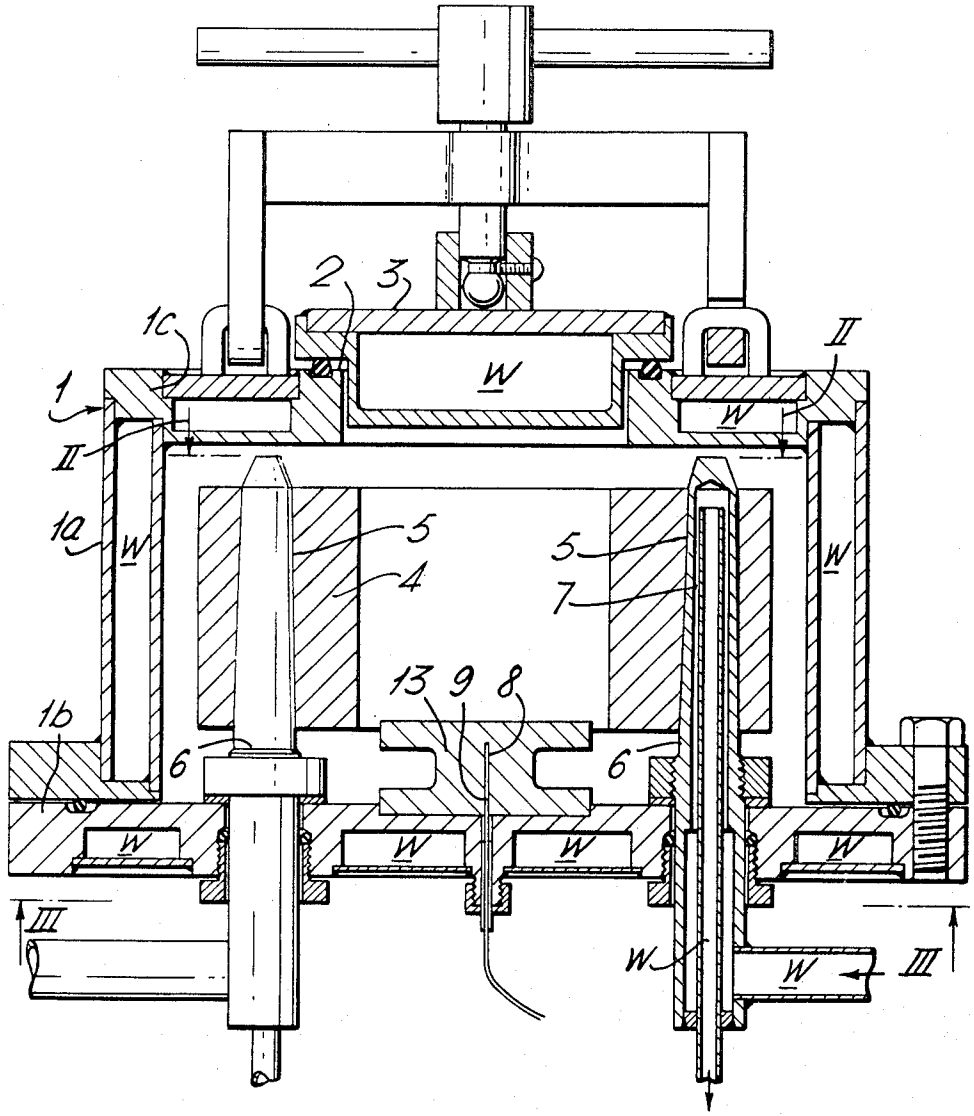

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Fig. 2.

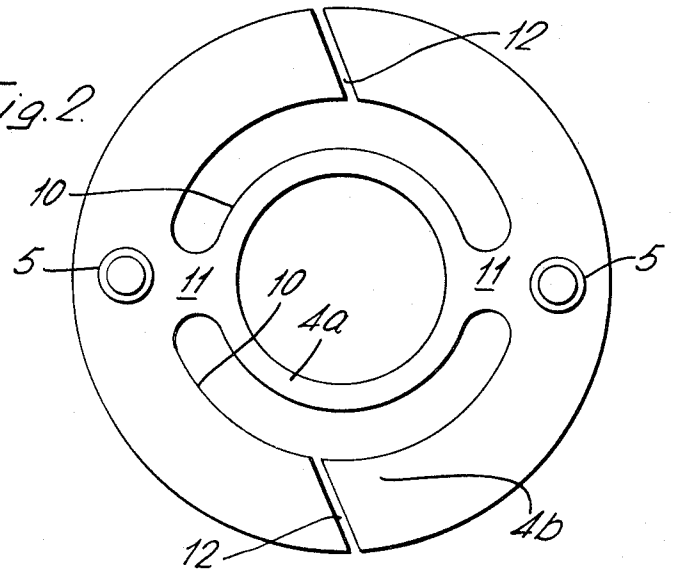

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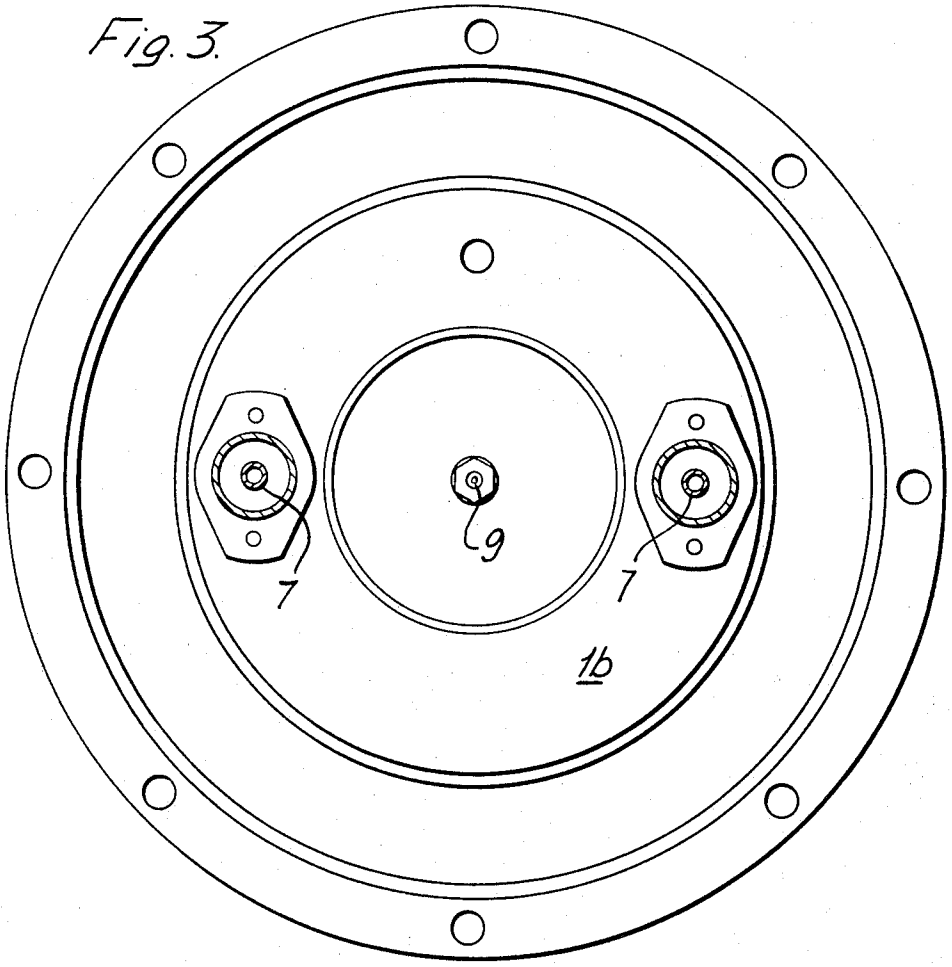
Fig. 3.



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ELECTRICAL RESISTANCE FURNACES

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4 Claims. (Cl. 13—25)

ABSTRACT OF THE DISCLOSURE

An electrical resistance heating element for a furnace is a tube of graphite or similar material supported by at least two tapering electrode pins which enter correspondingly tapered holes in the tube wall. The tube wall can be formed with longitudinal slots which lie within the wall thickness between the holes so that the current path between the electrodes lies through axially extending webs coextensive with the heated length of the tube.

This invention relates to electrical resistance furnaces. Electrical resistance furnaces for the high temperature treatment of materials commonly take the form of a tube of a refractory material having a high electrical resistivity such that when a large current passes in the material, the tube is raised to a very high temperature. Tubular furnaces of this kind are commonly coupled to the electrical supply by way of electrode clamps which are secured to axially spaced regions of the tube with the inevitable result that the temperature distribution along the tube length is uneven and there being a gradual reduction in the temperature of the tube wall from a peak temperature at the centre towards the electrodes. Thus the maximum temperature is achieved only over a short length of the tube situated mid-way between the electrodes.

According to the present invention an electrical resistance heating element in the form of a tubular member has tapered holes formed at diametrically opposite positions in the tube wall for the reception of correspondingly shaped electrodes.

In this way a large temperature gradient along the axial length of the tube wall of the furnace is avoided. In a preferred construction, the electrical connections are formed by pin connectors which enter holes drilled at diametrically opposed positions in the tube wall and parallel with the tube axis.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

FIGURE 1 is a side elevation mainly in cross section of an electrical resistance furnace.

FIGURE 2 is a view on the line II—II showing the heating element itself, and

FIGURE 3 is a plan view on the line III—III of FIGURE 1.

The furnace shown in FIGURE 1 comprises a water cooled casing **1** with cylindrical side walls **1***a*, base **1***b*, and top **1***c*, the latter having an entry port **2** shown closed by door **3**. The water cooled channels are indicated at W. The interior of the casing is occupied by an electrical resistance heating element **4** of graphite in the form of a thick walled tube having two taper holes **5** (No. 2 Morse taper) which are drilled at diametrically opposed positions and parallel to the tube axis. Mounted in the base **1***b* are a pair of electrode pins **6** which protrude into

the casing interior where they are of complementary taper to the holes **5**. The pins enter the taper holes **5** and so support the element **4** centrally within the furnace, and make good electrical contact therewith. The electrode pins **6** are hollow to accommodate water cooling pipes **7**. Beneath the heating element **4** and resting on the base **1***b* of the casing is a support block **13** on which the material to be heated is placed. The block **13** which is preferably of graphite, conveniently accommodates a thermocouple **8** in a bore **9** therein.

The heating element **4**, as shown in plan in FIGURE 2, has two arcuate grooves **10**, which penetrate the full extent of the tube wall, formed one on either side of the diametric plane containing the axis of the taper holes **5**, the curvature of these grooves extends to divide the tube wall into two, inner and outer, concentric cylinders **4***a*, **4***b* joined only by radial webs **11** opposite each of the electrodes. The outer cylinder is divided by saw cuts **12** and hence the flow path between electrodes lies through the interconnecting webs **11** and through the inner cylinder **4***a*. As the web **11** extends axially the full length of the tube, the power supply from the electrodes is applied axially of the cylinder so avoiding the production of a temperature gradient along the furnace which is raised to a substantially uniform temperature throughout its length. Means not shown are provided for creating an inert atmosphere wall within the furnace prior to operation and the furnace casing forming a hermetical seal maintains this atmosphere during operation. Of course, materials other than graphite may be employed for the heating element if desired.

I claim:

1. An electrical resistance heating element for a furnace comprising an axially extending tubular member having tapered holes formed within the thickness of the wall of the member substantially parallel to the axis of the member, a support for the element, said support including a plurality of correspondingly tapered electrode pins each of which extends in one of the holes from a common end face to support the element.

2. An electrical resistance element as claimed in claim **1** in which the electrode pins extend from a support which serves as the base of the furnace, the tubular element being at least in part maintained by the weight of the heating element.

3. An electrical resistance element as claimed in claim **2** in which the heating element is unrestrained except for the said maintenance by the weight of the heating element.

4. A heating element as claimed in claim **1** in which the tubular member is composed of a thick-walled tube of high electrical resistivity material, the tube having a plurality of arcuate slots extending through the tube wall from one end face to the other end face so as to define between the arcuate slots diametrically opposed webs, said webs having taper holes therein for the reception of electrodes, the outer wall of the tube having radial slots to intersect said arcuate slots.

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