April 20, 1965 B. A. CASH ETAL 3,179,731

SUPPORT MEANS FOR RESISTANCE FURNACE

Filed April 17, 1963 2 Sheets-Sheet 1

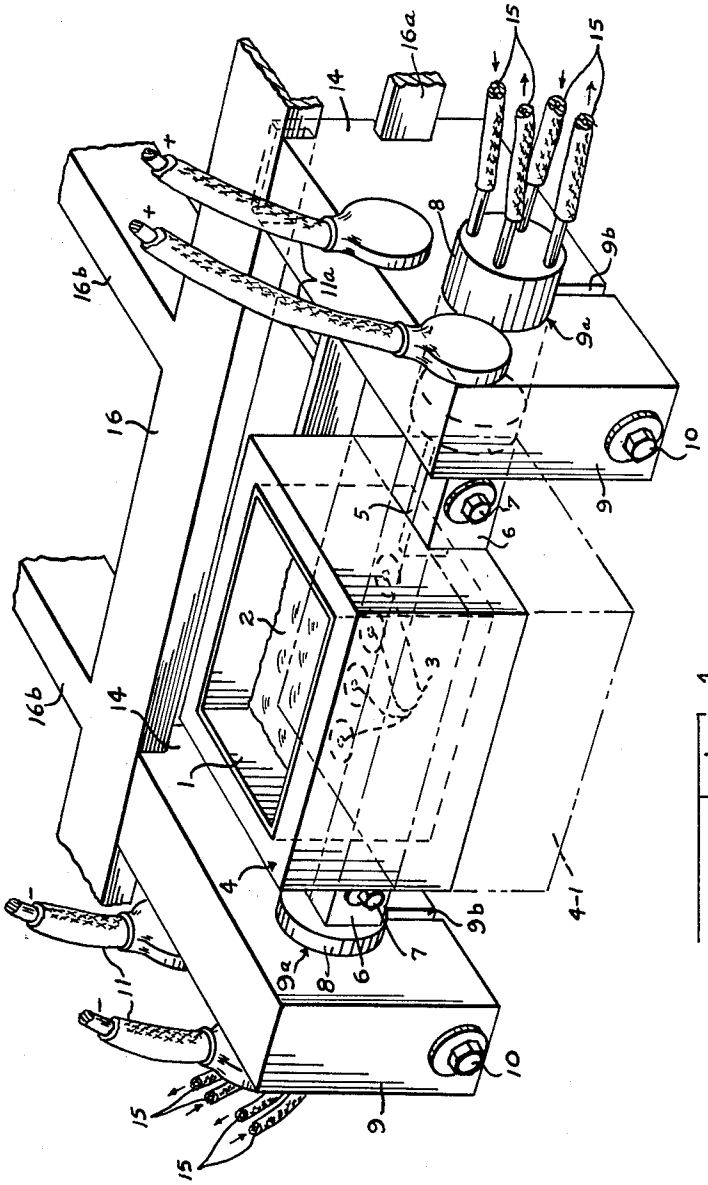


Fig-1

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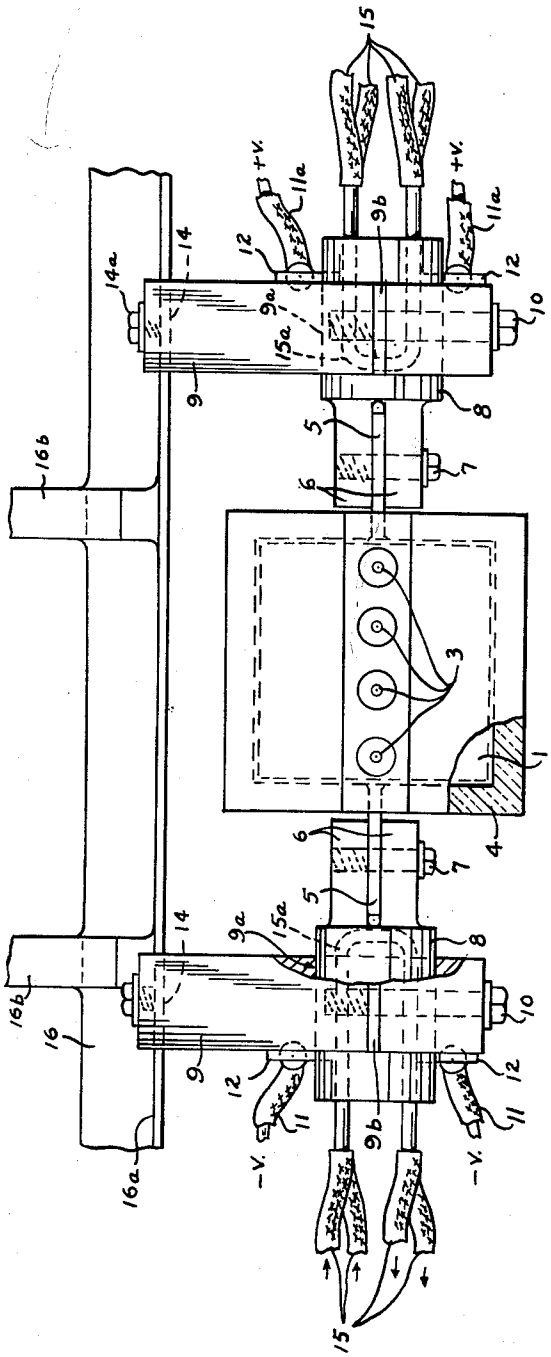


Fig. 2

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United States Patent Office 3,179,731 Patented Apr. 20, 1965

3,179,731

SUPPORT MEANS FOR RESISTANCE FURNACE

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Filed Apr. 17, 1963, Ser. No. 273,798
5 Claims. (Cl. 13—6)

This invention relates to electrically conductive support means for resistance furnaces which may contain molten glass or the like.

Means employed in the past to support high-temperature resistance furnaces and to conduct current to and from such furnaces have been relatively rigid. Furnaces of platinum or platinum alloys which contain glass or other vitreous materials have coefficients of thermal expansion which differ from that of the glass, so that each time the furnace is shut down the furnace contracts a different amount than the glass within the furnace. The difference in contraction causes damage to the furnace sufficient in amount to result in the destruction of the furnace after only a few shutdowns. To minimize damage to the furnace it is desired to dump the molten glass out of the furnace after operation, prior to reducing the temperature of the furnace to the extent that the glass becomes solidified, and it is difficult to do this with the furnace-supporting means heretofore provided.

It is therefore an object of the invention to provide improved means for supporting a high-temperature resistance furnace.

Another object is the provision of rotatable and slidable electrode support means, for a furnace which is heated by passage of electrical current therethrough, said furnace containing molten glass, in which the support means provides means for emptying of the furnace by rotation on a horizontal axis, and also providing for contraction of the furnace without disengagement from the support means, by reason of a portion of said support means sliding laterally through another portion thereof.

A further object of the invention is the provision of a high-temperature resistance furnace and electroconductive supporting structure, including horizontally-spaced electroconductive supports having aligned trunnion bearings formed therein with an electrical resistance heated glass melt receptacle furnace having electroconductive aligned trunnion members extending horizontally from the opposite sides of the furnace receptacle and journalled in said trunnion bearings for rotative and axial sliding electroconductive relation in the spaced electroconductive supports to permit inversion of the furnace and dumping of a glass melt from the furnace receptacle while in molten condition and permit expansion and contraction of the furnace structure relative to the spaced electroconductive supports.

A further object is the provision of means for clamping the trunnion bearing in tight electroconductive relation with the trunnions to retain the glass melt receptacle in upright relation during operation of the device.

A further object is the provision of means for circulating a cooling medium through the trunnion members during operation of the device to keep the trunnion members and the electroconductive supports cool.

A further object is the provision of a main support means for supporting the electroconductive supports in

spaced parallel relation to each other which is adapted to permit adjustment of the electroconductive supports along the main support means to different spaced relations to each other.

Other objects and advantages of the invention will become apparent from the drawing and following description in which like characters refer to like parts in the several figures.

FIGURE 1 is a fragmentary perspective view of the device of the invention, showing the electrical resistance furnace glass melt receptacle in upright or glass-dispensing condition in full lines, and in glass-dumping position in dot and dash lines.

FIGURE 2 is a bottom plan view of the device, as shown in full lines in FIGURE 1, parts being broken away, other parts broken away and shown in section.

Referring now to the drawings, the reference numeral 1 denotes an electrical resistance heated glass furnace, which may be made of a platinum alloy, such as 90% platinum and 10% rhodium, or any other suitable alloy, and may contain a batch of molten glass 2.

In the bottom of the furnace, particularly as seen in FIGURE 2, are a plurality of tubular orifice members 3 from which glass fiber yarn (not shown) may be drawn. The balance of the bottom, sides, and ends of the glass melt receptacle 1 is surrounded by suitable thick insulation material indicated at 4.

The opposite ends of the receptacle 1, adjacent the bottom and extending through the insulation layer 4 are laterally, or oppositely extending electrically conductive lug members or arms 5. These lug members are clamped between the bifurcated ends 6, which extend toward the receptacle 1, and are formed on the ends of cylindrical or trunnion electroconductive members 8. The bifurcated ends 6 being clamped in electrical contact with the lugs 5 by clamp screws 7.

The trunnion members 8 extend through horizontally-spaced electroconductive parallel, adjustable supports 9 in axially-aligned trunnion bearings 9*a* in the supports. The supports 9 are slit from the bottom up into the trunnion bearings 9*a*, as indicated at 9*b*, to provide means for tightening the trunnion bearing 9*a* around the trunnions 8 to establish good electrical contact between the trunnions 8 and the bearings 9*a*, the supports 9 being provided with clamp screws or bolts 10 which when loosened permit the lower portion of the supports to separate sufficiently to permit the trunnions 8 to rotate in the bearings 9*a* and to slide axially in those bearings, thus permitting the receptacle 1 to be inverted as shown in dot and dash lines in FIGURE 1, also permitting axial movement of the trunnions in the electroconductive supports due to contraction (or expansion) of the relatively thin-walled electrical resistance heated glass melting furnace 1, thus permitting the glass melt 2 therein to be dumped from the receptacle and the same to cool without distortion due to contraction thereof.

The receptacle may be returned to its "up" position and electrically heated in which event if the clamp screws 10 are not fully tightened will permit the expansion of the receptacle 1, and the supporting elements 5, 6 and 8 to expand relative to the supporting brackets or arms 9 without undue stress being present. After the above expansion has occurred, the clamp screw means 10 may be fully tightened to secure intimate electrical contact between the adjacent surfaces of the trunnions 8 and their

bearings 9*a*, in the supports 9, and retain the receptacle in its upright position.

The means for supplying the electrical potential to the spaced supporting brackets or arm members are indicated at 11 and 11*a*, these being connected by the terminal connection 12 to the spaced supports 9 as shown.

The electroconductive supports 9 for the receptacle 1 may be mounted in insulated relation to each other at their rear ends 14 by any suitable fixed support means, for instance, an upper rail 16 and a lower rail 16*a* carried by rigid main supporting means 16*b*.

The ways or rails 16 and 16*a* and the interconnection thereof with the ends 14 may provide means for adjusting the distance or space between the members 9, so that furnaces of different lengths may be accommodated.

Water tubes 15 are preferably provided and connected to suitably formed conduits 15*a* extending in the trunnion members 8 whereby cooling water may be circulated through the tubes 15 and passages 15*a* to cool the trunnion support means 8 to thereby prevent the heat from the furnace 1 from being conducted to the supports 9, in order to prevent oxidization and deterioration of the support means for the receptacle, particularly between the cylindrical surfaces of the trunnion members 8 and the trunnion bearings 9*a* in the electroconductive supports 9.

As seen in FIGURE 2, suitable clamp means 14*a* may be provided for fixing the supporting arms or brackets 9 on the rail 16 against longitudinal movements.

In use, an electric current at a low voltage and high amperage is passed through the conductors 11 and 11*a* from suitable electrical supply means for providing such current which, for simplicity, are not shown. Current flows from one set of electrical conductors through one of the arms 9, thence through one of the trunnion supports 8, thence through the furnace, thence through the other trunnion member 8, thence outwardly through the other electrical conductors, thus completing the electrical heating resistance circuit through the furnace. Suitable current may, for example, be supplied at 90 amperes and 2 volts, the furnace being heated by the resistance of the material thereof to the passage of electrical current therethrough and glass 2 in the receptacle 1 is thus maintained in suitable molten condition whereby strands thereof may be withdrawn through the glass strand drawing apertures 3.

When it is desired to cease operation both of the clamping screws (or bolts) 10 are loosened, after which the trunnion members 8 are rotated in the trunnion bearings 9*a* through an arc of 180° so that the furnace 1 is in an inverted position and the molten glass 2 remaining in the receptacle can be dumped therefrom, the electrical circuit being shut off.

One or the other, or both of the trunnion members, slide axially in the trunnion bearings 9*a* toward the receptacle, as the furnace 1 cools and contracts and damage to the furnace resulting from cooling and contraction is thus minimized.

When it is desired to again begin operation, the current is turned on. The furnace either before or after it has reached the desired temperature is rotated into upright position. After the furnace has reached the desired working temperature both of the screws (or bolts) 10 are tightened to securely fasten the furnace in the desired position. The furnace is then operated in the manner desired, operation of the furnace being no part of this invention.

Suitable means (not shown) may be provided for rotating the furnace between its upright and inverted positions (when the clamp screws 10 are unscrewed). Such means may comprise a lever, or crank and gears for a small furnace, to power means when the installation includes a large furnace.

For purposes of exemplification, a particular embodiment of the invention has been shown and described to the best understanding thereof. However, it will be apparent that changes and modifications in the arrangement and construction of the parts thereof may be resorted to without departing from the true spirit and scope of the invention as defined by the following claims.

We claim:

1. A high-temperature electrical resistance heated invertible glass melting furnace comprising a thin wall resistance heated receptacle having an open top and glass strand drawing apertures in the bottom thereof, electroconductive lug members projecting in opposite aligned directions from the opposite ends of the receptacle, electroconductive trunnion members having bifurcated clamping ends receiving said lug members therein, clamp means for securing the trunnion members to said lug members in electrical contacting relation with the trunnion portions thereof disposed in axial alignment in spaced relation to the opposite ends of said receptacle, horizontally-spaced parallel electroconductive supports having aligned trunnion receiving openings formed therethrough slidably and rotatably receiving the trunnion portions aforesaid therethrough, releasable clamping means on said supports for clamping said trunnion portions in said trunnion openings to retain said receptacle in upright position and provide maximum electroconductive relation between said supports and said trunnion members, said clamping means being releasable to allow said trunnion members to rotate in said trunnion receiving openings for tilting said receptacle toward inverted dumping position and permit axial movement between said trunnion members and said supports due to expansion or contraction of said receptacle, and electroconductive means connected to each of said supports, adapted to be connected to an electrical heating circuit for resistance heating said receptacle.

2. A high-temperature electrical resistance heated invertible glass melting receptacle as set forth in claim 1 including coolant circulating passages formed in said trunnion members, and means for circulating a coolant through said passages to control the temperature of said trunnion portions.

3. An electrical resistance heated invertible furnace as set forth in claim 2, including a fixed support for supporting said spaced parallel electroconductive supports in different spaced relations to each other to accommodate resistance heated furnaces of different lengths, and means between the spaced supports and said fixed support for fixedly securing said spaced electroconductive supports on said fixed support in predetermined fixed spaced relation to each other.

4. An electrical resistance glass melting furnace comprising a pair of horizontally-spaced electroconductive parallel supports, electrical conductor means connected to one of said supports for connecting one terminal of an electrical circuit to one of said supports and electrical conductor means connected to the other for connecting the other terminal of said circuit thereto, said supports each having a trunnion bearing receiving aperture therein disposed in horizontal axial alignment, said supports being slotted from said apertures outwardly to the outer edge thereof to provide for contraction of the size of said apertures, a thin wall electrical resistance heated type rectangular glass melting receptacle disposed between said supports having electroconductive supporting lugs projecting from the opposite ends of said receptacle in axial alignment, a pair of electroconductive trunnion members fixed to said lugs in axial alignment having trunnion portions rotatably and axially slidable in said trunnion bearing apertures to provide for inversion of said furnace to dump molten glass remaining therein prior to shutdown and provide for contraction and expansion of the receptacle between said supports, means for circulating a cooling medium through said trunnion portions to cool the same and said supports, and clamp means carried by said support for tightening said trunnion apertures around said trunnion portions to retain said receptacle in upright position and establish maximum electrical contact relation

between said electroconductive supports and said trunnion members.

5. Apparatus as claimed in claim 4, in which said electrical resistance heating receptacle comprises a thin wall metallic container of rectangular shape having an open top, and a relatively thick layer of heat insulation enclosing the sides, ends and a portion of the bottom thereof with said electroconductive lug members fixed to the opposite ends of said container, projecting through said heat insulation layer in opposite aligned directions.

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