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C. A. BRAYTON, JR

CORE FOR INDUCTION FURNACES

Filed Sept. 24, 1920

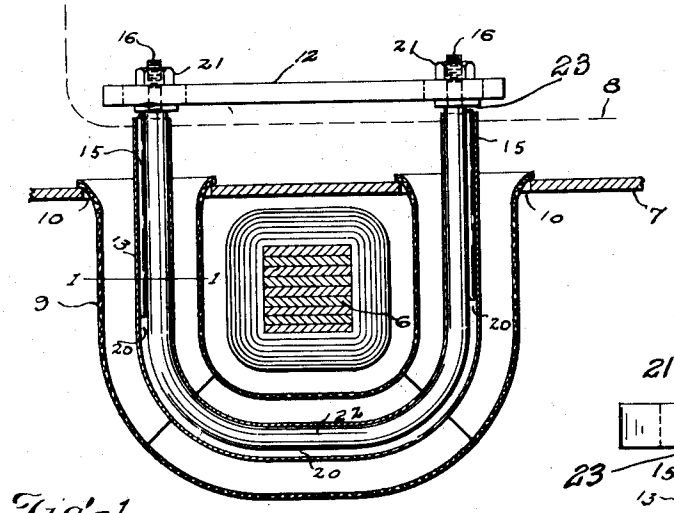


Fig.-1

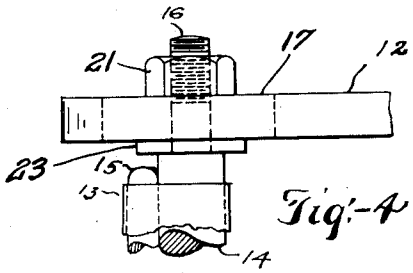


Fig.-4

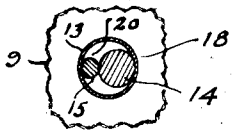


Fig.-3

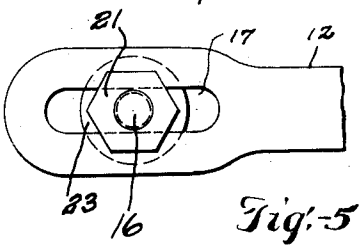


Fig.-5

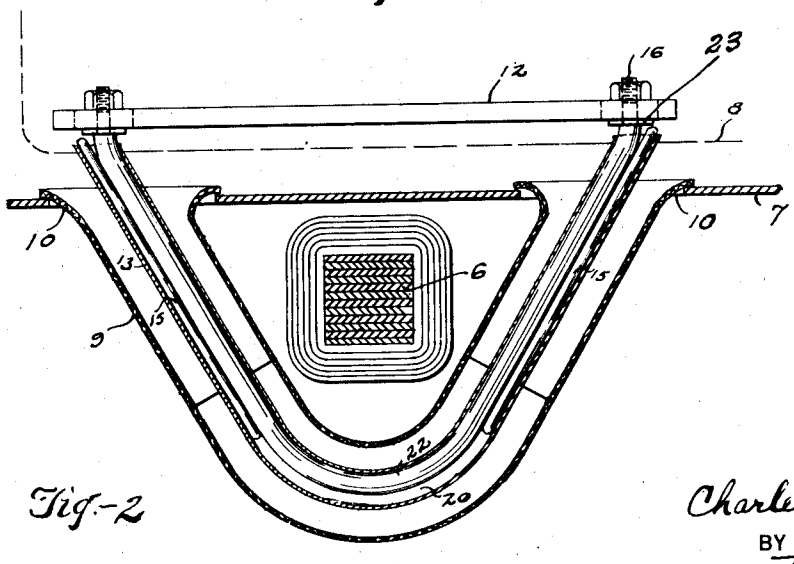


Fig.-2

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UNITED STATES PATENT OFFICE.

CHARLES A. BRAYTON, JR., OF CLEVELAND, OHIO, ASSIGNOR TO THE INDUCTION FURNACE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

CORE FOR INDUCTION FURNACES.

Application filed September 24, 1920. Serial No. 412,550.

This invention relates to the forming of the channels in the construction of electric induction furnaces.

The purpose of my invention is to produce a fusible core that can be suspended within molds, such as are utilized in the construction of induction furnaces of the closed channel type, such as I have shown in my application of September 24, 1920, Serial No. 412,551.

Another purpose is to provide a fusible core which can be utilized in starting a furnace of the aforesaid type that will avoid irregular resistances upon the starting of the furnace.

A further purpose is to prevent the occurrence of cracks along the inside of the channel wall heretofore caused by solid fusible cores expanding laterally against the refractory material and cracking the same.

A further purpose is to provide a temporary metallic secondary that may be used to start the furnace without first charging the same with molten metal.

Additional purposes will be evident in the specification and claims.

An embodiment of my invention is set forth in the drawings and is hereinafter more fully described in reference to the same and the essential features of the invention are set out in the claims.

In the drawings Figs. 1 and 2 are cross sectional views of channel wall molds showing the relative position of the cores to the molds; Fig. 3 is a transverse section of a mold and core taken at the line 1—1 of Fig. 1; Figs. 4 and 5 are enlarged views of the terminals of the core.

Referring to the parts designated by numerals, in Fig. 1 which represents an embodiment of my invention as used in forming channels of a U-shape, 6 represents a cross section of the primary, while 7 represents the base or supporting plate of the bath basin, the contour of which is shown in dotted lines 8. The channel wall mold 9 is formed of expanded or other suitable metal which may be easily bent to the desired shape.

In Fig. 2, a representation of the adaptability of the invention in molding a modified V-shaped channel is shown.

The core is of sufficient length to permit the terminals to project into the bath and may be constructed of a relatively thin circular bent tubular jacket 13, Fig. 3, a solid round core rod 14 threaded at the ends and a removable spacing bar 15. A tie bar 12 may connect the terminals of the core as shown at 16, Figs. 4 and 5.

The mold 9 is formed to the desired shape with the core unit on the inside of the same, after which the ends of the mold are inserted in the openings of the basin supporting plate 7 and bent outwardly to form a seat as shown at 10, Figs. 1 and 2, and the refractory material molded about the core in the manner I have set forth in my application Serial No. 412,551 filed September 24, 1920.

The core jacket 13 which I prefer to make from a thin tube is held in definite relation to the core rod 14 by wedging bar 15, which exerts a binding force between the rod and jacket and positions the latter with relation to the core rod so that a longitudinal space 20 may be provided within the jacket after the bar 15 has been withdrawn.

The threaded terminals of the core rod pass thru elongated openings 17 of the tie bar 12 and the bar is secured to the rod by nuts 21, that clamp the bar on the washers 23, which rest on the ends of the core jacket as shown in Fig. 4, with just sufficient pressure to insure good conduction but to also permit an expanding movement of the rod.

The core is held in coaxial position with relation to the mold by suitable means and the plastic refractory material is then dropped into the mold and tamped to a uniform consistency about the core. The bath basin is then formed of the same material with the terminals of the core protruding into the bath basin.

During the time the lining is passing through the drying and setting period it gradually shrinks away from the core jacket and upon the completion of this action there is a small space between the core jacket and the refractory material. The bars 15 are withdrawn after this period and the furnace may be started by charging the basin with molten metal or with scrap chips heaped about the tie bar, which may act as a conductor between the terminals of the core. As the resistance caused by the current induced in the same heats the core, the core rod expands longitudinally and diametrically.

The expansion is provided for as fol-

lows:—The elongation of that part of the core designated at 22 causes the core rod 14 to shift outwardly from the primary 6 into the hollow space 20 of the core jacket 13, with a corresponding shifting action taking place between the tie bar 12 and the terminals 16. As the longitudinal expansion greatly exceeds the diametrical expansion, the center of the rod is shifted towards the space 20 and away from the inside wall of the core jacket 13. After the core jacket expands in the same manner, until the void caused by the drying of the lining is filled, it is then opposed by the refractory lining, and a subsequent contraction or buckling takes place in the walls of the jacket due to the expanding movement of the jacket being restricted. The pressure on the refractory material caused by this diversion in the direction of the expansion of the jacket, however, is greatly reduced by making the same of relatively thin metal.

During the period the expanding movements of the jacket and core rod are taking place the tie bar is maintained in conductive contact with the core, and thereafter until the core is heated to the fusing point and becomes absorbed by the furnace charge.

It is readily seen that in my invention I have provided an inexpensive means for properly molding the closed channels of an induction furnace that requires no extra labor in removing the core at the time the furnace is ready for operation and that a core such as I have herein set forth will expand without cracking the channel lining and that it will present and maintain a closed secondary without arcing or breaking the current path. Furthermore, a channel of uniform cross-section is assured by the use of such a core.

Having thus described my invention, I claim:

1. In an induction furnace, an expanding channel core wherein an unfilled space is provided longitudinally of the channel centre, whereby part of said space may be occupied upon a subsequent shifting of the core members.

2. In an induction furnace, means for coring a closed channel, said means comprising a relatively thin coring jacket bent to form a channel communication at the ends thereof with the interior of the furnace, and an electrically conducting core rod within the jacket and having the longitudinal axis thereof substantially parallel to that of the jacket, the surface on the outer portion of the bend being separated from the adjacent walls of the jacket, whereby when the rod is subsequently heated, the said surface of the rod will approach, without forcing against such adjacent walls of the jacket.

3. In an induction furnace, an expanding core for forming a closed channel wherein an unfilled space and an electrically conducting means is provided, whereby the subsequent cross-sectional increase of said conducting means may occupy part of said space.

4. An expanding core for forming the channels of an induction furnace, comprising a relatively thin coring jacket, the expanding pressure of which will not be materially greater than the subsequent hydrostatic pressure exerted by the bath upon the channel walls and an electrically conducting member the major portion of the exterior surfaces of which are in spaced relation to said jacket, said members having terminal connecting means constituting the secondary of the furnace.

5. In an induction furnace, an expanding and electrically conducting channel core wherein the expansion of one member of the core displaces the longitudinal axis thereof toward the centre of the cored area, and the expansion of another member of the core is in a circumferential direction about the centre of the cored area.

6. In an induction furnace, a tubular channel communicating at its ends with the interior of the furnace, an expanding core member a portion of which is eccentric to the channel and enclosed thereby, whereby when heated the longitudinal expansion of the core member displaces the axis of said core member toward the center of the channel.

7. In an induction furnace, means for coring a closed channel, said means comprising a relatively thin coring jacket and an electrically conducting core rod therefor, substantially smaller in diameter than the inside of the jacket.

8. In an induction furnace, means for coring a closed channel including a coring jacket, an electrically conducting core rod within said jacket and having surfaces materialy spaced from the jacket wall and a connection across the terminals of the core rod whereby the core may become the closed secondary of the furnace.

9. In an induction furnace, a wall portion having a tubular channel communicating at the ends thereof with the interior of the furnace, an expanding core located within such channel and a removable core member for maintaining the expanding core in definite relation to the channel while the channel is being formed, means whereby said relation is temporarily maintained when such removable core member is withdrawn, said relation admitting subsequent shifting of the core, when expanded by heat, in a direction away from the channel wall.

10. An expanding core for forming the channels of an induction furnace, comprising a relatively thin metal coring jacket, the

expanding pressure of which will not be materially greater than the subsequent hydrostatic pressure exerted by the bath upon the channel walls, a removable spacing bar and an electrically conducting member with terminal connecting means constituting the secondary of the furnace.

11. In a channel core, a relatively thin coring jacket, an electrically conducting core rod within the jacket, a spacing bar maintaining a given surface of said core rod in spaced relation to said jacket and short circuiting means for connecting the terminals of said core rod.

12. In a fusible core, a relatively thin metallic jacket, a core rod therefor, a spacing element for maintaining the jacket and rod in relative position, and an adjustable connecting bar whereby the terminals of said core rod may be conductively connected.

In testimony whereof, I hereunto affix my signature.

CHARLES A. BRAYTON, JR.