

UNITED STATES PATENT OFFICE

2,563,883

WORKPIECE SUPPORT AND GUIDE FOR
INDUCTION HEATING FURNACES

Harold A. Strickland, Jr., Detroit, Mich., assignor,
by mesne assignments, to The Ohio Crankshaft
Company, Cleveland, Ohio, a corporation of
Ohio

Application January 16, 1948, Serial No. 2,613

1 Claim. (Cl. 219—47)

1

This invention relates to tubular induction heating furnaces with special reference to the means for guiding a workpiece into the furnace chamber and for supporting the workpiece therein.

In prior furnaces of this general type, such as is shown in my Patent #2,373,719, the workpiece is guided into the tubular furnace chamber by means of a metal casting substantially flat in form, provided with a central mouthpiece, opening and, rearwardly from the edges of the opening, a plurality of separate fingers which converge to a point adjacent the inlet opening of the furnace chamber. By this construction, the workpiece may be guided direct to the chamber. While useful, this construction is cumbersome and relatively costly and involves problems of relative adjustment between the casting and the furnace inlet opening.

Among the objects of the invention, therefore, are the following: to provide a workpiece inlet guide for the chamber of an induction heating furnace which is substantially integral and continuous with the support rods of the workpiece inside the chamber; to provide a support rod extension which will permit the elimination of massive castings in furnace construction for feed-in purposes; and to provide, in general, a more efficient cheaper and resistant feed guide for induction heating furnace workpieces.

The above objects of the invention are attained through the structure hereinbelow described and shown in the accompanying drawing, in which:

Figure 1 is an elevation of the induction heating coil unit of the furnace in which the support rods and feed guide structure are installed;

Figure 2 is a view of the feed end of the furnace showing the workpiece guide structure;

Figure 3 is a section in part of the furnace taken along lines 3—3 of Fig. 2 showing the arrangement of the support rods and lug and retainer elements;

Figure 4 is a section through the furnace chamber taken along lines 4—4 of Fig. 3;

Figure 5 is a detail section along lines 5—5 of Fig. 3 to illustrate the supporting means for the workpiece guide extension rods;

Figure 6 is a detail section through one of the support rods and the joined retainer and lug elements showing the mode of attachment of one form of the elements;

Figure 7 is a section through the rod and attached elements of a modification of the lug elements; and

Figure 8 is a view of one of the rods with the

2

attached elements positioned along the length thereof.

Referring more particularly to Figs. 1 and 2, the furnace is shown as consisting of a cylindrical section 11 having end plates 12 and 13 formed of a heat resistant asbestos composition. These end plates are attached together and to the cylinder 11 by any appropriate means, such as through bolts 9 extending between the plates. The furnace coil, as shown in Figs. 3 and 4, is formed of a spiral of hollow square conductor 14 adapted to carry a coolant, the material of the conductor being preferably copper. These turns are separated from each other by insulation 15. External to the conductor coil are insulating slabs 16 of heat resistant material, such as an asbestos composition, these slabs being held in position by an external metal shield 17.

Inside the conductor coil are layers of insulation 18 and 19, such as mica compositions, and within the layer 19 is a layer 20 of fire brick. Extending axially within the body of the fire brick and forming a grille or framework conforming in shape to that of the furnace chamber, are a number of rods or tubes 21, frequently referred to as rails, which are intended to constitute the support means not only for the fire brick wall, but also for the workpiece. These rails are secured at their ends to the end pieces 12 and 13, the rear end of each rail being held in position by a radial bolt 22 attached to a bracket on the rear end plate 12 and the front end of each rail having attachment to the end piece 13 through means hereinafter described.

In order to hold the fire brick in place in the furnace cam, a plurality of retainer strips 25 are silver soldered to the inner surface of the rail. These retainers extend crosswise of the rail, the extensions being adapted to overlie the fire brick units and hold them in place. Adjacent these retainers are inwardly projecting lugs 26 of hardened metal which are notched on one side as at 7 so as to provide a recess for close positioning of the lug and retainer as shown in Fig. 6. The lug is formed with a cut off corner 8 at the forward edge of the same to provide an inclined surface for the inwardly moving workpiece. In the form of the combination shown in Fig. 6, the lug 26 is attached not only to the rail, but also to the adjacent retainer on the inner surface thereof thus securing a compact rigid unit resistant to workpiece impact. In the form of the lug retainer combination, shown in Fig. 7, the lug 26a is modified by forming therein a notch 7a thicker than the retainer 25 so that there is no fastening

between the elements but each is directly secured to the rail adjacent and in continuation of each other. In both lug forms and in the construction of the retainer, the axial length is sharply reduced over corresponding lengths in prior constructions so as to substantially eliminate stresses arising from bending of the rail support.

Fig. 8 illustrates the spaced positioning of these element units along the length of the rail 21. It is apparent that the percentage area of contact between the elements and the rail is definitely limited. This figure also illustrates the shape of the rail prior to assembly in the grill or framework of the furnace chamber. It is observed that the rail proper, indicated by the numeral 27, has a definite curvature prior to the assembly in the furnace and also that the front end of the rail 23 diverges from the section 27 at an acute angle from the extension of the rail length, the rail terminating in a coolant connection end 29 where the rail is in the form of tubing. When assembled in the furnace, these diverging sections 28 of the rail form a spider or fingered guide unit with sections converging inwardly toward the furnace mouth. These sections constitute the feed guide for the furnace chamber.

In order to protect the guide sections 28 from injury of impact from the workpieces, the inner side of these sections is covered with a layer of wear-resistant material 30, such as a cobalt alloy composition, consisting of tungsten 12 to 17%, chromium 35%, carbon 2.25 to 2.75% and the balance cobalt. This material is fused on to the flared sections of the front ends of the rails and inwardly along the rails at the heel of flared sections to the point of placement of the first end retainer at which point the material is formed to overlie and hold the retainer end and to protrude inwardly of the chamber in line with the envelope formed in the chamber by the various projecting lugs. Thereby, a smooth transitional area is provided between the feed guide and the furnace interior.

The flared sections 28 of the rails are each rigidly secured to the front end plate 13 by means of web plates 31 which are soldered or otherwise fixed to the outer side of the rail sections 28 and at the end plate are secured to flat strips 6 bonded to this plate. These webs serve not only to retain the rails in position in the furnace chamber, but also provide support for the feed guide against impact of entering workpieces.

In the manufacture of the rail units, the retainer and lug elements are first silver soldered to the stainless alloy tube base and the wear-resistant protector 30 and web 31 attached as hereinabove described. The whole rail unit is then copper plated so that in use, the corrosive effect of condensation on the outer sides of the tubes may be eliminated.

It may be seen from the description as hereinabove made that a construction is provided in

which the feed guide is essentially integral with the support rails and that the support rails serve as a means not only for supporting the mouthpiece, but also the fire brick of the furnace wall and the workpiece itself. Also, by utilizing the wear-resistant layer on the flared section of the feed guide, not only is the life of the apparatus extended, but the deformation due to workpiece impact is avoided and a smooth transitional area is provided between the mouthpiece and the support means within the furnace chamber.

The subject matter, as shown and described, is primarily illustrative, it being apparent that modification may be made in accordance with various installations coming within the scope of the claim as hereto appended.

What is claimed is:

In an induction heating furnace wherein a tubular furnace structure having an open end includes parallel spaced apart linear supports in the form of water tubes extending therethrough to form a tubular work supporting structure and wherein said water tubes protrude beyond the open end of said induction furnace and are flared outwardly at said open end, that improvement comprising in combination, workpiece contact members affixed along the length of said linear supports within said tubular furnace, rigid supports extending along substantially the full curvature of the protruding portions of said water tubes at the open end of said furnace and bearing against said end of said furnace and wear resistant, impact resistant protective cover members forming an integral inner face for said water tubes and positioned about the curvature of each of said flared tubes at the mouth of said furnace in the form of a wear resistant, impact resistant protective grill-like funnel for properly guiding workpieces into said furnace, said protecting members having their inner end at substantially the same level as the level of said workpiece contact members adjacent the open end of said furnace, to provide a smooth continuous guiding surface for a workpiece, whereby accidental destruction of the furnace structure by workpiece manipulation is substantially eliminated.

HAROLD A. STRICKLAND, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,753,220	Stanbery et al.	Apr. 8, 1930
2,373,719	Strickland	Apr. 17, 1945
2,400,660	Strickland	May 21, 1946

OTHER REFERENCES

Pages 290 and 291 of Trinks' "Industrial Furnaces," vol. I, third edition, copyright 1934, published by John Wiley and Sons, New York, N. Y.