May 7, 1968 C. C. ELLIS 3,381,950

SHAKER HEARTH FURNACES

Filed Oct. 7, 1965 2 Sheets-Sheet 1

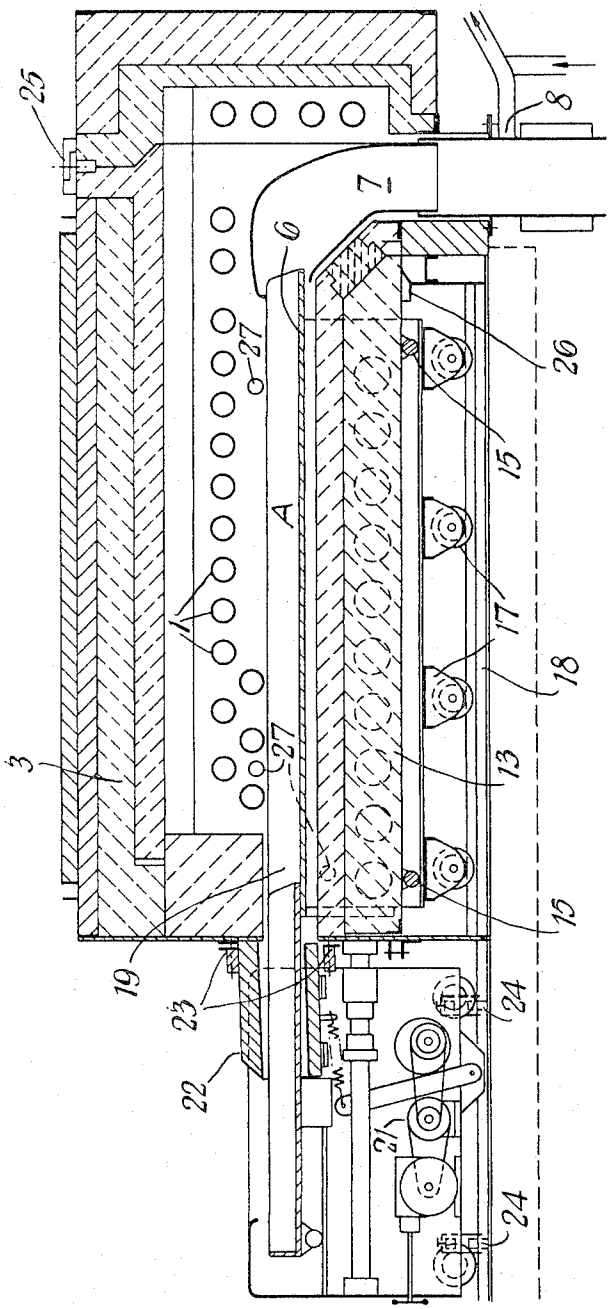


FIG. 1

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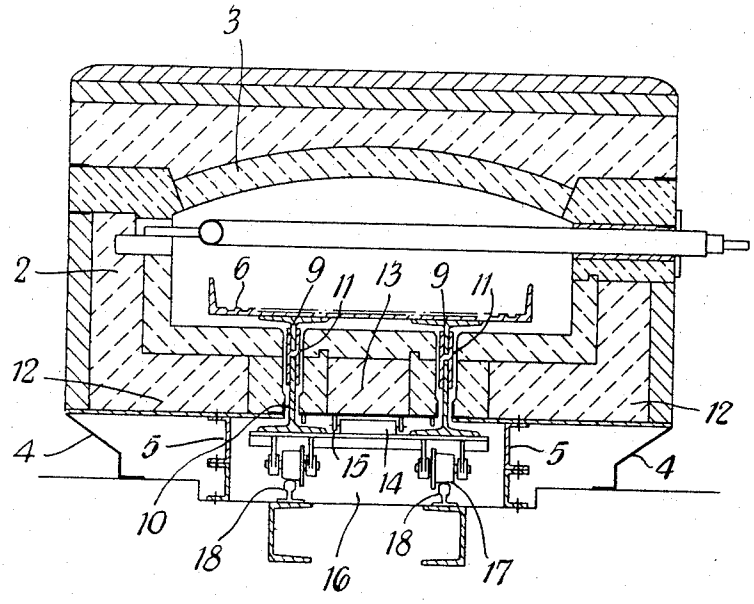


FIG.2

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SHAKER HEARTH FURNACES

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7 Claims. (Cl. 266—24)

ABSTRACT OF THE DISCLOSURE

A shaker hearth furnace in which no wearing parts are located within the heating zone, achieved by supporting the work-conveying tray upon rollers working beneath a floor of the heating zone through the medium of bearers passed through narrow slots extending along the whole length of the floor.

Shaker hearth furnaces employ a tray for the transport of work pieces from an inlet zone to a discharge zone, and such trays are normally supported within the furnace upon metal or refractory skids or upon rollers or even hanging on arms. Such types of supports are subject to quite rapid wear and their renewal necessitates removal from the furnace.

According to this invention, I provide a shaker hearth furnace in which the tray is supported upon rollers located beneath the furnace floor through the medium of bearers extending through narrow slots extending longitudinally of the said floor.

Conveniently the rollers are mounted on parallel rails fixed below the furnace chamber upon the furnace support framework.

Two or more sets of rails may be used accordng to the width of the furnace, and the section or sections of furnace floor between the slots are supported only at their front and rear ends.

The bearers may take the form of H girders whose webs pass through the aforesaid slots. These webs may be split to incorporate heat insulating joining sleeves to minimise heat transfer through the metal of the bearers and minimise thermal distortion.

The sets of rollers may be interconnected by a trolley structure on to which the intervening floor section may be lowered for removal upon support rollers for inspection or renewal.

The substructure of the furnace which houses the rails and rollers may be totally enclosed by extensions of the furnace case work and the treatment atmosphere such as endopropane, propane or ammonia or a mixture of such gases may circulate freely within the whole enclosure. If desired such atmosphere may be introduced cold beneath the furnace floor to assist in cooling the rollers.

Conventional drive gear for the imparting of the appropriate shaking motion to the tray bearers may be mounted upon extensions of the rails at the inlet end of the furnace and may lie beneath a loading tray coupled to the main conveyor tray.

The furnace may be heated in any conventional manner, and is suitable for example for use with gas-fired radiant tube elements.

The above and other features of the invention are incorporated in one preferred form of furnace which will now be described in some detail by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic central longitudinal section.

FIGURE 2 is a section on the line II—II of FIGURE 1.

The furnace has a treatment zone A of a total length of about thirteen feet, of which the first eight feet from the work entry end is the most intensely heated by gas fired radiant tubes 1. The width of the furnace chamber is about four feet.

The sides 2 and slightly arched roof 3 of the furnace are built up from refractory blocks and liners in more or less conventional form, but a sheet casing 4 of the furnace body is extended downwardly to enclose a substructure including the support frame 5 of the furnace body.

A shaker tray 6 some ten feet long extends from the furnace mouth to the lip of a discharge chute 7 for finished work. Such discharge chute may enter or be led to a quenching tank (not shown) and be provided with an atmosphere outlet 8 for burning off treatment gas.

The shaker tray 6 is in the form of a shallow channel some three feet wide and has a downward slope of a little over an inch from the inlet to the outlet end.

The base of the tray is fixed throughout its length to a pair of spaced parallel T bars 9 whose webs face downwardly. These webs are connected throughout their length to the upstanding webs of a similar pair of T bars 10, whose flanges underlie the furnace floor, by a pair of sleeves or cuffs 11 of heat insulating material.

The furnace floor is made in three sections, the outer pair of which are constiuted by inwardly extending parts of L shaped blocks 12 which form also the furnace side walls, and the middle one of which 13 is carried on a steel bearer 14. This steel bearer is supported beneath the furnace mouth at one end and at the exit chute entrance at the opposite end. Sets of rollers 15 are fitted to the bearer base for the introduction or removal of the central floor section, as will be described later.

A longitudinal gap is left between both sides of the central floor section 13 and both of the side sections 12 to define a pair of narrow slots in which the webs of the tray bearers 9, 10, 11 are a neat, but not touching fit.

The T bars 10 which constitute the lower part of the tray bearers are carried by the upper surface of a flat trolley 16 mounted upon four longitudinally spaced sets of flanged rollers 17.

The rollers 17 run upon a pair of parallel rails 18, which extend from about the entry of the exit chute 7 to a position some way outside the furnace mouth. These rails are carried by the framework of the furnace body or upon the site floor as may be convenient.

The front wall of the furnace is provided with an inlet aperture 19, possibly including a conventional gas curtain, and a forwardly extending tray 20, coupled to the main shaker tray 6, constitutes a work loading station.

Drive gear 21 of the spring loaded drop cam type for shaking the trolley is mounted upon a base plate clamped at 24 to the forward extension of the rails 18. The chassis of the drive gear also carries an inlet canopy 22 of the furnace mouth, which is located against the front wall of the treatment chamber by releasable clamps 23.

Release of the drive gear and canopy clamps 24, 23 enables these two items to be withdrawn easily upon the rails.

The rear wall of the treatment chamber, of conventional metal-encased refractory construction, is fixed to the furnace roof by releasable hinges 25 so that it is easily removed for access to the interior of the furnace.

The rollers 15 on the bearer 14 of the central floor section can be lowered into contact with the surface of the shaker tray trolley 16 upon withdrawal of wedge supports such as 26 upon which its ends are carried. When so lowered the central section can be withdrawn over the trolley after the drive gear and canopy assembly 21, 22 have been unclamped and withdrawn.

Inlets 27 for treatment gas are provided at spaced positions in the furnace walls and one or more of such inlets debouches into the space beneath the shaker tray.

In operation of the furnace distortion of the shaker tray is largely eliminated by its attachment to bearers which extend over its full length, while the rollers being located in a cool atmosphere have a much longer working life than conventionally. Also mechanical power loss is diminished due to the elimination of internal hot friction.

It will be understood that the invention is not restricted to the details of the specific embodiment described which may be varied without departing from the scope of the following claims.

I claim:

1. A shaker hearth furnace comprising, in combination,

a furnace having a roof, opposite side walls, an end wall, and a floor defining an enclosure having an entrance opening opposite said end wall, and having a discharge chute adjacent said end wall,

heating means within said enclosure,

a shaker tray within said enclosure overlying, but spaced above said floor and having an inner discharge end in registry with said discharge chute,

support means for supporting said shaker tray for longitudinal shaking movement,

drive means for longitudinally shaking said shaker tray to discharge articles thereon over its inner discharge end into said discharge chute,

said support means comprising a pair of trackways disposed exteriorly of said enclosure and extending beneath said floor along the path of movement of said shaker tray, bearer members rigidly fixed in depending relation to said shaker tray, said floor having longitudinal slots in registery above said track ways, and said bearer members projecting through said slots into roller bearing contact with said trackways, said support means constituting the sole support for said shaker tray and confining relatively movable parts of said support means to a region exterior to said enclosure whereby such relatively movable parts are free of the destructive temperature of said enclosure.

2. The shaker hearth furnace as defined in claim 1 wherein said bearer members are in the form of beams having webs projecting through said slots, said beams having lengths substantially equal to the longitudinal lengths of said shaker tray and being fixed along their lengths to the shaker tray so as to resist distortion of said shaker tray while it is being heated within said enclosure.

3. The shaker hearth furnace as defined in claim 2 wherein said webs are longitudinally split and are joined by heat insulating means.

4. The shaker hearth furnace as defined in claim 1 wherein said support means also includes a trolley plate disposed in spaced relation below said floor, said bearer members being fixed to said trolley plate to form an integral structure therewith, and a plurality of rollers carried by said trolley plate and engaging said trackways.

5. The shaker hearth furnace as defined in claim 1 wherein said support means also includes a trolley plate disposed in spaced relation below said floor, said bearer members being fixed to said trolley plate to form an integral structure therewith,

said slots in the floor presenting a separate and removable floor section therebetween, disposed in overlying spaced relation to said trolley plate,

and means removably supporting said floor section on said furnace structure for lowering movement into supported relation on said trolley plate.

6. A shaker hearth furnace as defined in claim 1 including skirt means enclosing the region beneath said floor,

and means for circulating treatment atmosphere into said enclosure and said region enclosed by said skirt means.

7. A shaker hearth furnace comprising, in combination,

a furnace having a roof, opposite side walls, an end wall, and a floor defining an enclosure having an entrance opening opposite said end wall,

heating means within said enclosure,

a shaker tray within said enclosure overlying, but spaced above said floor,

support means for supporting said shaker tray for longitudinal shaking movement,

drive means located outside said enclosure for longitudinally shaking said shaker tray,

said support means comprising trackways disposed exteriorly of said enclosure and extending beneath said floor along the path of movement of said shaker tray, bearer members fixed in depending relation to said shaker tray, said floor having slots extending the whole length of the said floor above said trackways, and said bearer members projecting through said slots and carrying rollers running upon said trackways, said floor and slots confining relatively movable parts of said support means to a region exterior to said enclosure whereby such relatively movable parts are free of the destructive temperature of said enclosure.

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