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CONVEYOR FURNACE FOR HEAT-TREATMENT OF PARTS

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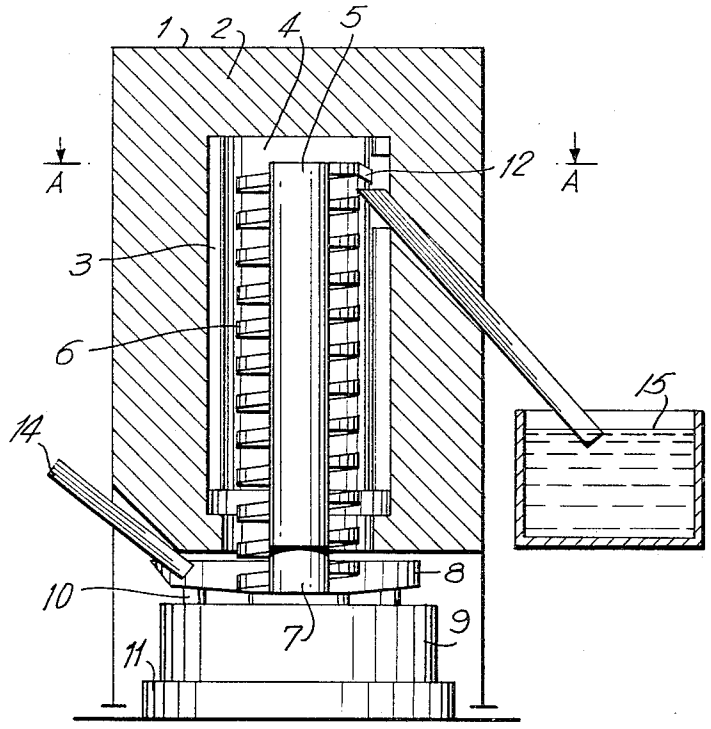


FIG. 1

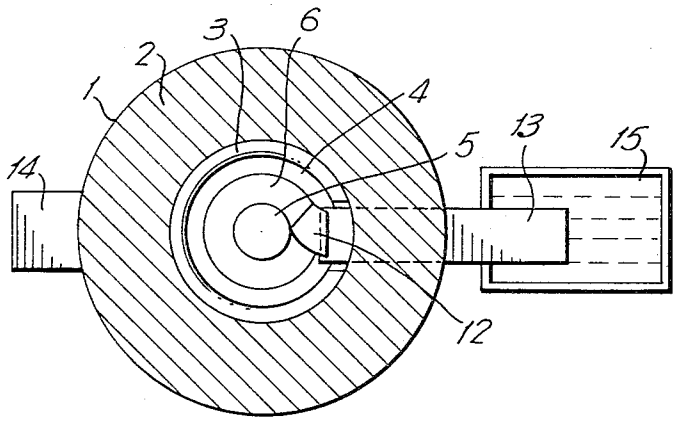


FIG. 2

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3,380,721

CONVEYOR FURNACE FOR HEAT-TREATMENT OF PARTS

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ABSTRACT OF THE DISCLOSURE

A heat-treatment furnace comprising a chamber containing heating means and a vertical guide carrying an external screw trough, the guide being secured to a bunker below the chamber which receives the parts to be treated and in turn is connected by means of spring supports to a fixed plate which supports an electromagnetic vibrator constituted by armatures mounted on the bunker or support plate and cores on the other one thereof, the interpolar gap between the armature and cores being adjustable to vary the amplitude and frequency of oscillation of the vibrator.

The present invention relates to furnaces for heat-treatment of parts.

I am aware that prior to my invention there were known furnaces for the heat-treatment of parts, having a body with a lining and heating elements, and a bunker complete with a screw trough on its internal side surface accommodated in the working chamber of the body.

Parts are loaded into the bunker by means of a charging trough, running through the roof of the furnace. By means of a shaft the bunker is connected with a vibrator, mounted on the external side of the furnace. Such an arrangement of the vibrator, bunker, and charging trough in the existing furnaces increases the dimensions and heat losses of the furnace, and complicates the transmissions of oscillations from the vibrator to the bunker. Besides, a disadvantage of the existing furnaces for the heat-treatment of parts is the increased time of heating the parts, because the screw trough is mounted inside the bunker itself and therefore the parts are heated mainly by heat conduction and radiation of walls of the bunker.

Attempts to overcome the above difficulties and disadvantages have not given any positive results, but I have successfully solved this problem and brought it to practical realization.

The present invention aims at the heat-treatment of parts in the furnace during their passing through its working chamber. In accordance with a preferred embodiment, the furnace has a body with a lining, a bunker, a screw trough for passing the delivering parts, and a vibrator designed to impart oscillations to the bunker and screw trough. The bunker is mounted outside the working chamber of the furnace directly on the vibrator, and is provided with a guide rigidly secured in the center of said bunker in the direction of its vertical axis, on the external surface of which guide the screws trough is mounted, said guide being a hollow cylinder.

An object of the present invention is the provision of a high-productivity, compact furnace for heat-treating of parts, simple in its design.

The present invention also increases the speed of heating the parts.

A further object of the present invention is to decrease the consumption of gas when the furnace operates with a protective gas atmosphere.

According to these and other objects of the invention, there is provided a new device and combination of parts and elements thereof, as described here and below and claimed in the appended claims. It is also understood that

the modifications in the essence of the invention disclosed herein may be made without departing from the true spirit and scope of the present invention, as defined by its claims.

Other objects and advantages of the invention will become more fully apparent from a consideration of the following description of a preferred embodiment, taken in conjunction with the appended drawings, in which:

FIG. 1 is a side elevation of the furnace according to the present invention;

FIG. 2 is a section of the furnace taken on A—A (FIG. 1).

The furnace for the heat-treatment of parts comprises a body 1 with lining 2 and heating elements 3 that are mounted in the working chamber 4 of said furnace. The furnace can be also heated with all kinds of electric heaters, as well as with radiation pipes, gas burners, etc. In the working chamber 4 there is provided a guide 5, made as a hollow cylinder, on the outer surface of which a screw trough 6 is arranged. The screw trough 6 is manufactured as an integral part with the guide 5; however, it can be also manufactured and assembled of separate parts. The lower end of the guide 5 emerges from the working chamber 4, being rigidly secured by means of a tong device 7 in the center of a bunker 8 along its vertical axis, with the screw trough 6 being smoothly joined to the bottom of the bunker 8. The bunker 8 is mounted outside the working chamber 4 on vibrator 9 by means of three spring supports 10 that are uniformly arranged over the circumference. The upper ends of the spring supports 10 are secured in the bottom of the bunker 8, while their lower ends are secured on plate 11. The spring supports 10 are inclined in one direction in relation to the vertical axis. The optimum angle of inclination is about 15 to 20°. The vibrator 9 is mounted on the foundation independently of the furnace body. The known vibrators are of varied design, such as mechanical, electromagnetic, pneumatic, etc.

According to the present invention, an electromagnetic vibrator is used, the cores of which are mounted on the side of the bunker. The armatures are mounted on brackets that are secured on the plate 11 in such a manner as to allow controlling the interpolar gap between the armatures and cores of the electromagnets.

To the upper part of the guide 5 is secured a dumping trough 12, one end of which is smoothly joined to the screw trough 6, which facilitates the unloading of parts from the working chamber of the furnace. On the body 1 of the furnace, directly under the dumping trough 12, an inclined unloading trough 13 is mounted.

Parts to be heat-treated, such as nuts, bolts, rivets, etc., are loaded into the bunker 8 through a charging trough 14. The loading of parts may be effected either directly in an automatic continuous line after the last preceding operation has been completed or from an accumulating bunker.

After the vibrator has been put in action, the bunker and screw trough are imparted with oscillations, under the action of which, due to the forces of inertia and friction, the parts will gradually move from the bunker 8 through the screw trough 6 upwards. During the passing through a length of the screw trough 6, which is located in the working chamber 4 of the furnace, the parts are heated, thereby acquiring desired properties according to the kind of the heat-treatment applied. Upon completion of this operation, the parts are directed through the dumping trough 12 into the unloading trough 13, being then discharged by gravity from the furnace into a quenching bath 15, for example.

The speed of movement of the parts through the screw trough, and hence the time of their remaining in the working chamber of the furnace mainly depends on the

angle of pitch of the screw line of the trough and on the material, of which the trough is manufactured, material and shape of the parts being treated, the angle of inclination of the spring supports, and the amplitude and frequency of oscillations of the vibrator. In a preferred embodiment disclosed here the time the parts are remaining in the furnace, that is, the speed of movement of parts, is easily controlled by changing the interpolar gap between the cores and armatures of the electromagnets, and varying the voltage applied to the electromagnets.

The furnace, as disclosed in the present invention, may be employed for effecting various types of heat-treatment, such as bright hardening, tempering, carburizing, etc., as applied to parts of various shapes when the furnace is operated under a protective gas atmosphere. The present invention is disclosed in connection with a preferred embodiment. However, there may be allowed such modifications and alterations that do not depart from the true idea and scope of the invention, which will be readily understood by those skilled in the art.

What is claimed is:

1. A furnace for the heat treatment of parts, said furnace comprising a body, a lining within said body defining a chamber, heating means in said chamber, a bunker outside said lining and below said chamber for receiving parts to be treated, a vertical guide rigidly secured to said bunker and extending into said chamber, a screw trough externally mounted on said guide and extending upwardly from said bunker, vibration means coupled to said bunker for imparting oscillations thereto and thereby to said trough whereby parts to be treated are advanced upwardly on said trough through the heated chamber, means for the removal of treated parts from the top of said trough, a fixed support plate for said vibration means, the latter comprising an electromagnetic vibrator including armature mounted on one of said bunker and support plate and cores on the other of said bunker and support plate, spring supports between the bunker and the fixed support plate inclined in one direction in relation to the vertical axis, and means for controlling the interpolar gap between the armatures and cores to adjust the amplitude and frequency of oscillation of the vibrator.

2. A furnace as claimed in claim **1**, wherein said heating means comprises axial heat distribution elements extending in the chamber for substantially the entire length thereof.

3. A furnace as claimed in claim **1**, wherein said guide is a hollow cylinder.

4. A furnace as claimed in claim **1** comprising means located externally of the lining for the supply of parts to be treated to the bunker.

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