United States Patent [19]

Rogalsky et al.

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[54] **APPARATUS FOR HEATING AND COOLING LONG CYLINDRICAL PARTS**

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[52] **U.S. Cl.** ..... **165/120,** 432/128, 214/339, 198/127 R

[51] **Int. Cl.** **F28g 7/00**

[58] **Field of Search** 165/120; 214/338, 339; 198/127; 432/128

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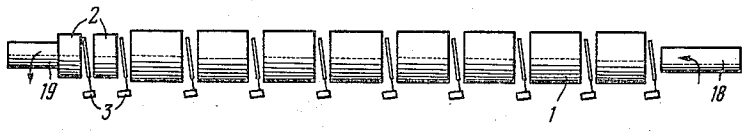
[57] **ABSTRACT**

An apparatus having at least two mechanisms for rotary conveyance of treated cylindrical articles through a multisectional furnace and a multisectional cooler. The mechanisms are mounted on frames between sections of the furnace and cooler.

Each mechanism has a ring mounted rotatable with respect to its longitudinal axis on two rolls mounted in the frame. The ring longitudinal axis is angularly misaligned with respect to the apparatus longitudinal axis. The article being treated rests on the inner surface of the ring and is rotatively moved forward during rotation of the ring.

The mechanisms are provided with means for fixing the ring in the axial direction.

2 Claims, 6 Drawing Figures



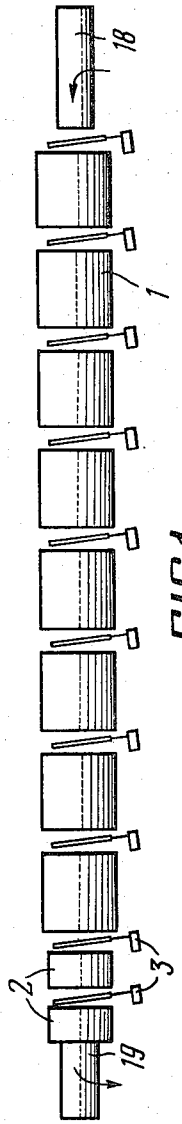


FIG.1

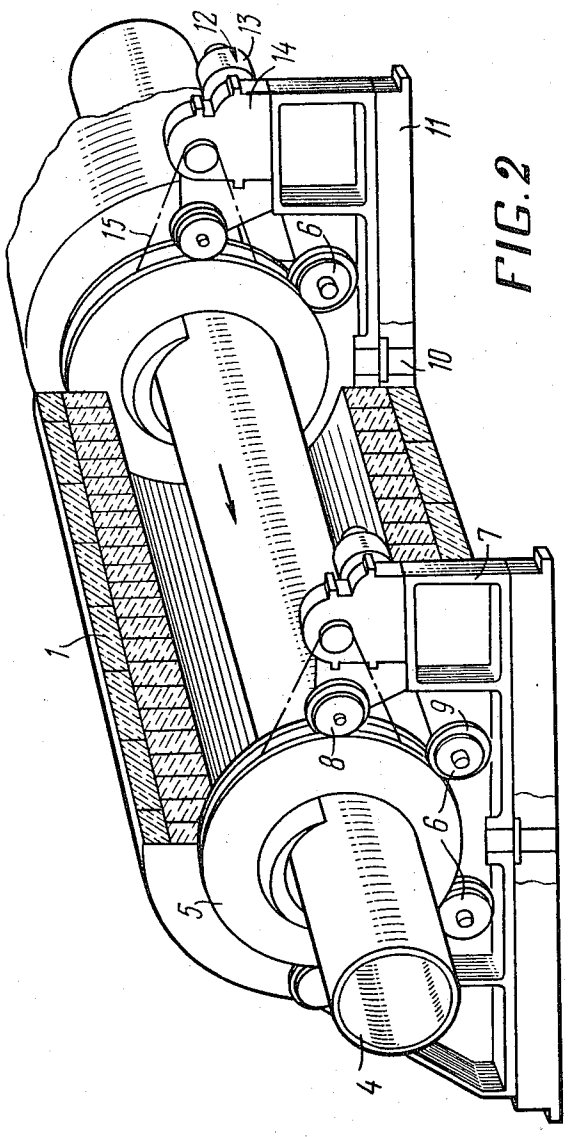


FIG. 2

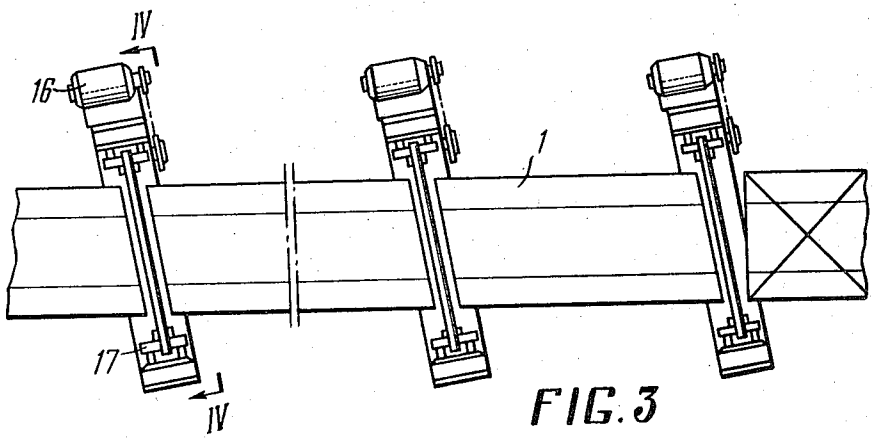


FIG. 3

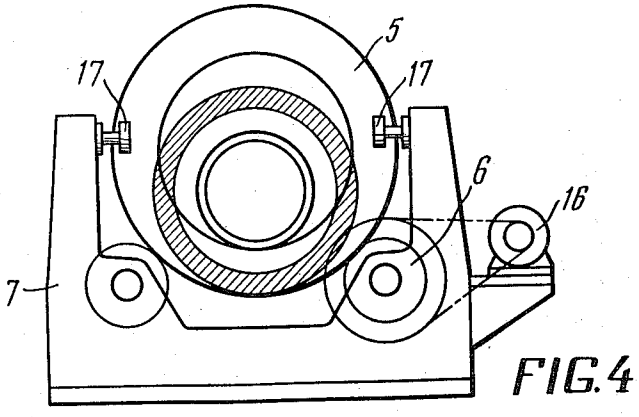


FIG. 4

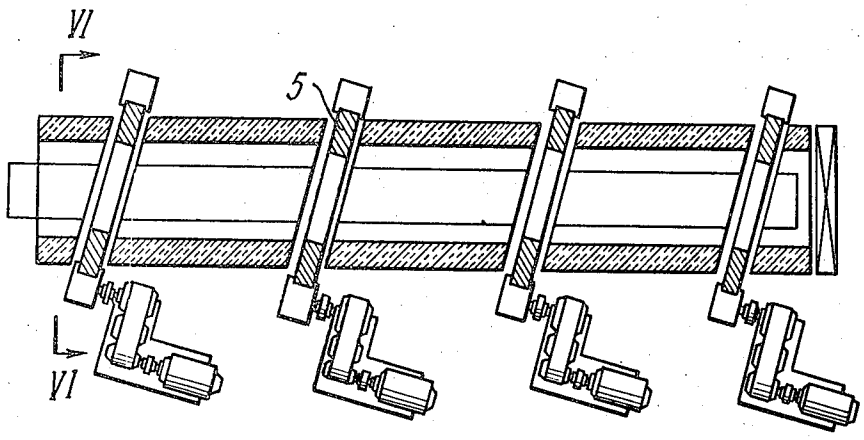


FIG. 5

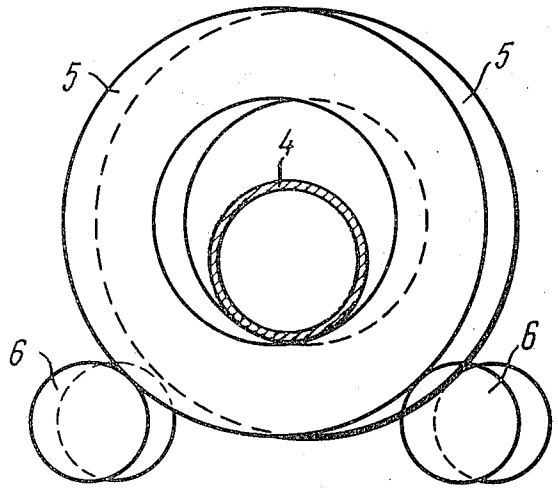


FIG. 6

APPARATUS FOR HEATING AND COOLING LONG CYLINDRICAL PARTS

The invention relates to the production of pipes and tubes, and more particularly to the construction of an apparatus for heat treatment of pipes and tubes.

Well known in the art are various constructions of conveyor type apparatus in which the part under treatment is rotably conveyed.

One commonly known apparatus comprises a multisectional furnace, a cooling means or sprayer arranged directly behind the furnace and coaxially with it, and a conveying mechanism installed between the furnace and cooling means sections (on platforms).

In this apparatus the conveying mechanism is made in the form of wheel pairs mounted at an angle to the pipe or tube longitudinal axis.

Conventionally, the pipe or tube is positioned in the trough of the wheel pair.

Wheels of each pair are set on shafts of gearboxes or other means driven by electric motors.

Due to the angle between the axes of wheels and part or tube being conveyed the latter is rotatively moved forward as a result of the rotation of wheels while being heated and cooled.

The prior art apparatus for heat treatment of pipes and tubes having a conveying mechanism of the type described above has a number of disadvantages.

The apparatus for heat treatment of tubes, as a rule, is designed for effecting the treatment of pipes and tubes widely ranging in diameter. For example, it may be designed for treating electrically welded gas pipes with a diameter of 530 to 1,420 mm.

During rotary conveyance of pipes and tubes on pairs of wheels the movement stability of pipes or tubes is determined by the depth to which the pipes are laid down in the wheel trough.

The pipes of smaller and larger diameter seat in the trough of wheel pairs at different height, i.e., with different angle of laying down. As a result, the pipe of a larger diameter is positioned too high on the wheels, and the rotary conveyance becomes unreliable, since during rotation the pipe may fall out of the wheels.

The realization of wheel mechanisms with the intercentre distance adjustable at the furnace intersection platform in order to obtain a suitable trough for each particular pipe diameter is not easily feasible and brings about many problems which make doubtful its purpose. Therefore, the conveyance of pipes and tubes having a wide range of diameters by means of wheel roller bed is difficult from the technical point of view.

The arrangement of reducing gears and other mechanisms imparting rotation to wheels at the high temperature area deteriorates their operating efficiency, requires the provision of a special water system for cooling reducing gear cases, as well as of a circulating liquid lubrication system.

The cumbersome construction of wheel pairs necessitates longer furnace intersectional distances or platforms, thus decreasing the furnace efficiency and increasing the apparatus length.

It is an object of the invention to provide an apparatus for heating and cooling of long-sized cylindrical parts having a wide range of diameters.

Another object of the invention is to reduce the overall length of such apparatus.

Still another object of the invention is to provide an apparatus wherein the drives of mechanism for conveying parts are removed outside the high temperature zone of the multisectional furnace.

These and other objects are attained in an apparatus for heating and cooling long-sized cylindrical parts comprising a conveyer barrel-type multisectional furnace, a multisectional cooling means mounted coaxially with said furnace, and at least two mechanisms for rotary conveyance of parts under treatment through said furnace and said cooling means, said mechanisms being mounted on frames between sections of said furnace and said cooling means, wherein, according to the invention, each of said mechanisms for rotary conveyance of parts under treatment comprises a ring mounted rotatable with respect to its longitudinal axis on at least two rollers mounted in said frame, the longitudinal axis of said ring being angularly misaligned with respect to the apparatus longitudinal axis, said parts under treatment resting on the inner surface of said ring and being moved rotatably forward during rotation of said ring, each of said mechanisms having means for fixing said ring in the axial direction.

Such construction of apparatus will ensure reliable conveyance of parts under treatment with rapid rotation, reduce the length of furnace insectional platforms and permit the removal of the drives of conveying mechanisms outside the high temperature zone of the apparatus multisectional furnace.

In the apparatus according to the invention, mechanisms for rotary conveyance may be arranged so that alternate centres of their rings may be displaced in the horizontal plane to opposite directions with respect to the apparatus longitudinal axis, when viewed along the forward travel of parts under treatment.

Owing to this arrangement of conveying mechanisms their rings form a groove that prevents lateral swing of conveyed parts.

The present invention will now be explained in greater detail with reference to a particular embodiment thereof which is represented in the accompanying drawings, wherein:

FIG. 1 shows a top view of the apparatus according to the invention;

FIG. 2 shows a general view of one furnace section with two mechanisms for rotary conveyance of parts under treatment made in accordance with the invention;

FIG. 3 shows a top view of a portion of the apparatus according to the invention;

FIG. 4 shows a sectional view taken along IV—IV of FIG. 3;

FIG. 5 shows a top view of the apparatus with mechanisms for rotary conveyance of parts under treatment illustrating the displacement of ring centres with respect to the apparatus longitudinal axis made in accordance with the present invention;

FIG. 6 shows a sectional view taken along VI—VI of FIG. 5.

Now referring to the figures, the apparatus comprises a conveyer barrel-type multisectional furnace 1 (FIG. 1) and a multisectional cooling means 2 which may be of a sprayer type. Mechanisms 3 for rotary conveyance of cylindrical parts 4 being treated are arranged between sections of furnace 1 and cooling means 2.

Each mechanism 3 comprises a multiple-piece ring 5 (FIG. 2) resting on rolls 6 whose shafts are fixed in

frame 7. Rollers 8 are mounted on frame 7. Rolls 6 and rollers 8 have central collar rims 9 which extend into the annular recess of ring 5 and serve for axial fixing of ring 5.

To make possible adjustment of angular position of ring 5 with respect to the apparatus longitudinal axis, frame 7 is provided with a rod 10 around which it can revolve supported by fixed plate 11. Drive 12 mounted on frame 7 is used to rotate ring 5 and comprises electric motor 13, gear box 14 and chain transmission 15.

It should be understood that other drives differing from the one described above may be used for imparting rotation to ring 5. For example, ring 5 can be rotably driven by support rolls 6 coupled with rotary drive 16 (FIG. 3).

It should be also noted that rollers 17 (FIGS. 3, 4) mounted on frame 7 diametrically at two opposite sides of ring 5 may be used for fixing ring 5 in the axial direction instead of collar rims 9 (FIG. 2).

Mechanisms 3 for rotary conveyance of parts 4 under treatment may be installed in the apparatus so that centers of rings 5 (FIGS. 5, 6) are alternatively displaced in the horizontal plane to opposite directions with respect to the apparatus longitudinal axis along the forward travel of treated part 4.

When such arrangement of mechanisms 3 is employed, rings 5 form a groove which prevents lateral swing of parts 4 going therethrough.

The operation of the apparatus according to the invention is as follows.

At the initial stage, prior to feeding parts 4 to be treated into the apparatus, multisectional furnace 1 (FIG. 1) is heated to the desired temperature, and cooling means 2 is supplied with cooling agent. Drives 12 for rotating rings 5 of mechanisms 3 are started.

Parts 4 to be treated, such as electrically welded gas pipes having large diameter, one by one are fed to charging roller conveyer 18 which handles parts 4 while imparting rotation thereto into multisectional furnace 1.

Parts 4 resting on the inner surface of rotary rings 5 whose longitudinal axes are angularly disposed with respect to the apparatus longitudinal axis are rotatively moved forward thus going through furnace 1 where they are uniformly heated to the temperature required by the heat treatment technology.

In operation of the apparatus, rotating ring 5 which encompasses part 4 under treatment is supported by rolls 6 whose shafts are fixed in frame 7. The axial fixing of rotary ring 5 is ensured either by collar rims 9 of rolls 6 extending into the annular recess of ring 5 or by rolls 17.

The heated pipe continuing rotation around its axis enters cooling means 2 which, for example, may be used for hardening purposes. Between the sections of this cooling means mechanisms 3 are also mounted whereby the treated part 4 is still rotatively conveyed through the cooling means.

After cooling under the pre-set conditions in cooling means 2, parts 4 leave the apparatus and are fed by discharging roller conveyer 19 for further technological steps.

It should be mentioned that when mechanisms 3 are installed in the apparatus so that the centres of their rings 5 (FIGS. 5, 6) are angularly displaced in the horizontal plane to opposite directions with respect to the apparatus longitudinal axis in an alternate manner along the forward travel of treated parts 4, the heat treatment technological steps are carried out in the same sequence as described above.

The use of the apparatus for heating and cooling long-size cylindrical parts of the construction described above and made in accordance with the invention will provide for:

Higher reliability of conveyance with rapid rotation of long-sized cylindrical parts widely ranging in diameter and uniform heating and cooling these parts in the apparatus.

Shorter length of unheated portions of multisectional furnace or platforms where conveying mechanisms are installed whereby partial cooling of parts under treatment can be reduced and an increase in the apparatus production capacity may be achieved.

Longer service life of drive mechanisms due their removal outside the high temperature zone of the apparatus multisectional furnace.

We claim:

1. An apparatus for heating and cooling long-sized cylindrical parts including a conveyer barrel-type multisectional furnace; a multisectional cooling means mounted coaxially with the longitudinal axis of said multisectional furnace; at least two frames, being installed between a section of said furnace and said cooling means; at least two rolls mounted in each of said frames, at least two mechanisms for rotary conveyance of parts under treatment through said furnace and said cooling means, said mechanisms being mounted on said frames, each of said mechanisms comprising a ring mounted rotatable with respect to its longitudinal axis on said rolls; the longitudinal axis of said ring being angularly misaligned with respect to the apparatus longitudinal axis, said parts under treatment resting on the inner surface of said ring and being rotatively moved forward during rotation of said ring; and means for axial fixing of said ring, said means being provided in each of said mechanisms for rotary conveyance of parts under treatment.

2. An apparatus as in claim 1 wherein said mechanisms for rotary conveyance of parts under treatment through the apparatus are mounted so that the geometrical centers of said rings are alternatively displaced in the horizontal plane in opposite directions from said apparatus longitudinal axis along the forward travel of treated parts.

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