Aug. 5, 1969 E. C. UBAN 3,459,410

MOVABLE-CHAMBER HEATING APPARATUS WITH SEAL

Filed Oct. 25, 1967 2 Sheets-Sheet 1

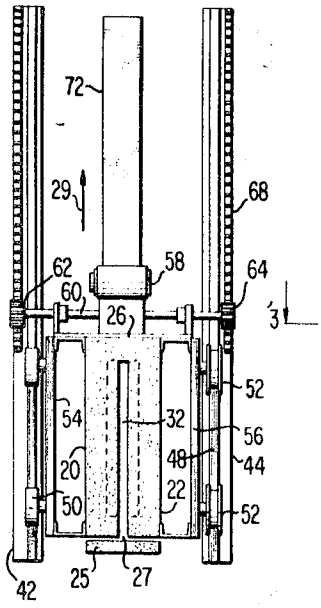


FIG. 3

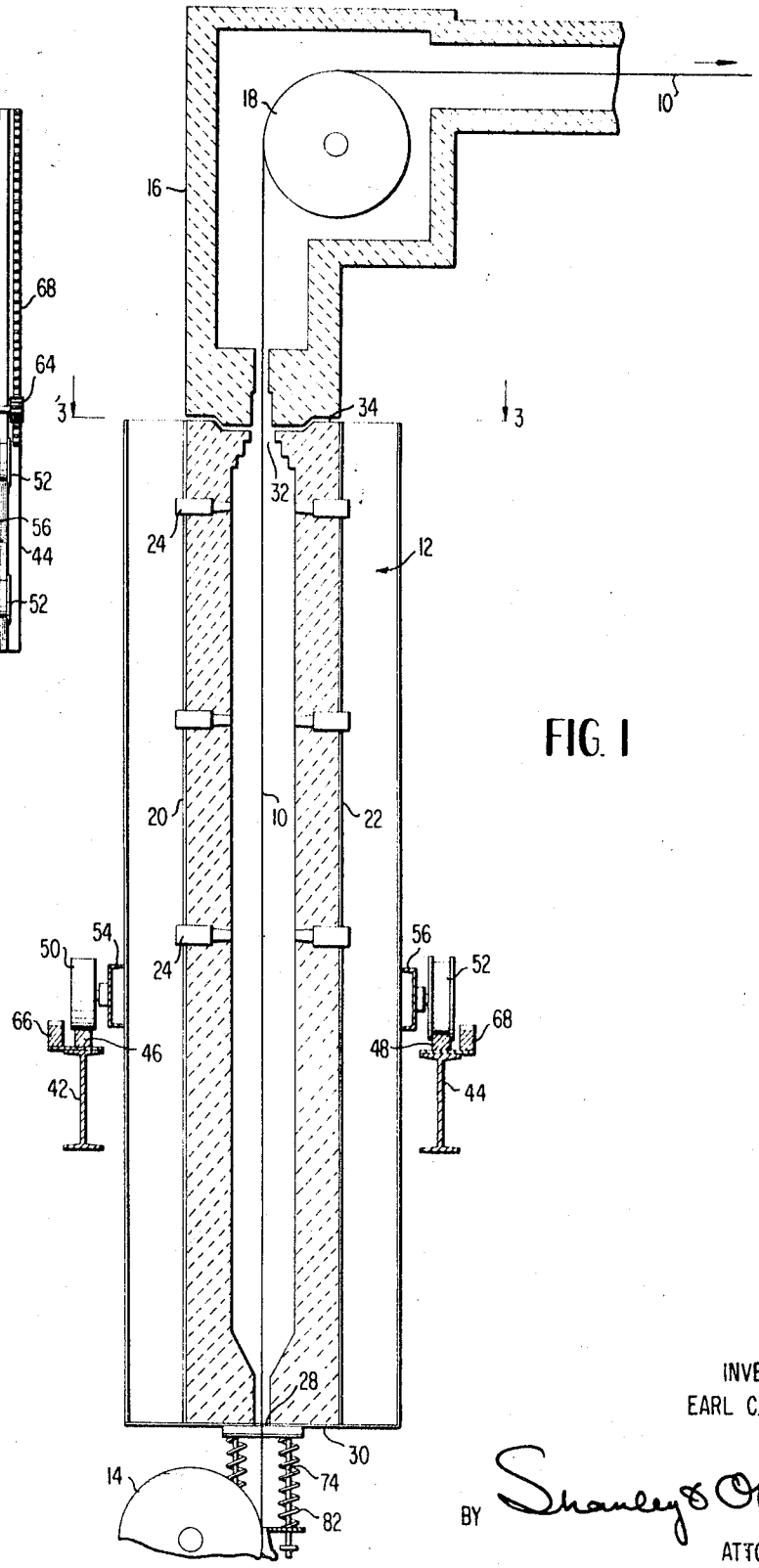


FIG. 1

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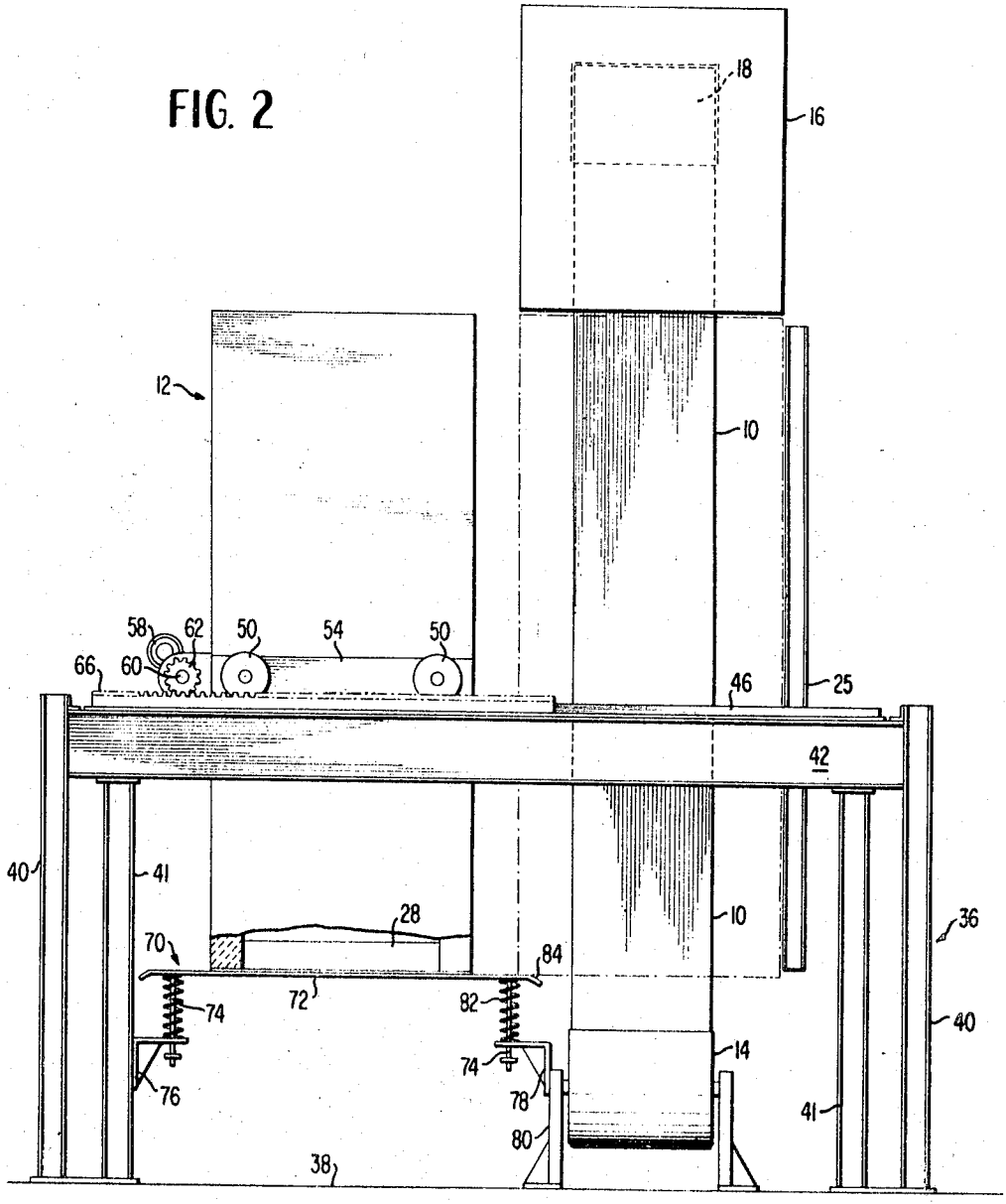
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FIG. 2



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MOVABLE-CHAMBER HEATING APPARATUS WITH SEAL

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Int. Cl. F27b 9/28
U.S. Cl. 263—3 5 Claims

ABSTRACT OF THE DISCLOSURE

Heating apparatus includes a heating chamber having openings for the passage of work through the chamber. The chamber is movable to an operative position surrounding the path of the work, and to an inoperative position spaced from the work path. A sealing device seals the lower work-passage opening when the heating chamber is in the inoperative position to minimize chilling of the heating chamber by a natural draft through the work-passage openings.

Background of the invention

This invention relates to heating apparatus of the type including a movable heating chamber. In its more particular aspects, the invention pertains to apparatus for heating running-length work.

Continuous lengths of work, such as strips or filaments of metal or other material, are often heated in a heating chamber which can be moved to an inoperative position away from the pass line of the work. The heating chamber is mounted for such movement to prevent overheating of the work whenever movement of the work through the furnace is interrupted for any reason. Such furnaces and their advantages are well known. However, furnaces of this type which are constructed to heat a continuous length of work running in a generally vertical direction are disadvantageous in that, when the heating chamber is in inoperative position, a stack effect tends to chill the chamber. Since one opening for the passage of work is at the upper portion of the furnace and the other work-passage opening is at the lower portion of the furnace, convection creates a flow pattern in which not gases pass out of the chamber through the upper opening and relatively cool, ambient air passes through the lower opening into the heating chamber and chills the chamber. This presents difficulty in restoring proper operating conditions upon restarting the line, subjects the refractory lining of the heating chamber to thermal shock, and wastes energy.

Accordingly, a main object of the invention is the provision of improved, retractable-chamber heating apparatus in which chilling of a heating chamber in retracted position by a stack effect is minimized.

Other objects of the invention, its features and advantages, will appear from the following detailed description which, when considered in connection with the accompanying drawings, discloses a preferred embodiment of the invention for purposes of illustration only and not for determination of the limits of the invention. For defining the scope of the invention, reference will be made to the appended claims.

Brief description of the drawings

In the drawings, wherein similar reference characters denote similar elements throughout the several views:

FIGURE 1 is a vertical cross-sectional view of heating apparatus forming a preferred embodiment of the invention;

FIGURE 2 is an elevational view of the apparatus of FIGURE 1, showing the heating chamber in inoperative position; and

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 1.

Description of the preferred embodiment

In FIGURE 1, steel strip 10 travels along its pass line through a heating chamber generally indicated at 12 in a heating section of a continuous processing line. Strip 10 passes from a next preceding processing station (not shown) around guide roll 14, in a generally vertical direction through heating chamber 12, and into insulated strip guide chamber 16. Strip 10 then passes around guide roll 18 and to a next succeeding station.

Heating chamber 12 is of conventional construction and includes refractory-lined front and back walls 20, 22 forming opposing heating panels. A plurality of heating units 24, which may be of any suitable type of conventional design, are mounted in walls 20, 22. Heating chamber 12 includes a side wall 26 (FIGURE 3), which is opposite a slot 27. Slot 27 is provided so that heating chamber 12 can be moved in the direction of arrow 29 out of strip-heating position without disturbing strip 10. Stationary abutment 25 closes slot 27 when chamber 12 is in its operative, strip-heating position.

A strip entrance opening 28 is formed in bottom wall 30 of heating chamber 12, and a strip exit opening 32 is formed in top wall 34 of the chamber. Thus, with chamber 12 in the operative position of FIGURES 1 and 3, strip 10 enters chamber 12 through lower opening 28, passes the length of the elongated chamber 12 and is heated, then passes out of the chamber through upper opening 32.

Heating chamber 12 is mounted for movement from its operative position to an inoperative position in which it is spaced from the pass line of strip 10. In FIGURE 2, chamber 12 is shown in inoperative position, with its operative position outlined in dotted lines. The chamber is mounted on an upstanding framework which is generally indicated at 36 and anchored on base 38. Framework 36 includes a plurality of upstanding columns 40, 41 which support horizontally extending, parallel beams 42, 44 (see also FIGURE 1). The upper flanges of the beams carry parallel tracks 46, 48 upon which travel roller assemblies 50, 52. Roller assemblies 50, 52 are mounted on crossbars 54, 56 on heating chamber 12. Motor 58 is mounted on heating chamber 12 and, operating through a speed reducer, rotates a shaft 60 which is carried in bearing mounts on chamber 12. Spur gears 62, 64 are secured to shaft 60, and mesh with racks 66, 68 which are mounted on beams 42, 44, parallel to tracks 46, 48. Rotation of gears 62, 64 moves the heating chamber 12 along tracks 46, 48 to operative or inoperative position as desired.

A sealing device, generally indicated at 70, is provided to seal lower strip-passage opening 28 whenever heating chamber 12 is in the inoperative position. Sealing device 70 includes a closure plate 72. The sealing device is mounted in fixed position on base 38 at a location adjacent the inoperative position of the heating chamber so that when chamber 12 is moved to inoperative position, plate 72 closes lower strip-passage opening 28. Plate 72 is carried by four support rods 74, which are slidably received in apertures in brackets 76, 78. Bracket 76 is secured to one of the columns 41, and bracket 78 is secured to standard 80. Each rod 74 is surrounded by a coil spring 82. Springs 82 bias plate 72 away from the brackets and resiliently press the plate against bottom wall 30 of heating chamber 12 to form a tight closure over opening 28. Downturned lip 84 on plate 72 facilitates sliding of chamber 12 over the plate.

In use, the heating chamber **12** is maintained in the operative, strip-heating position of FIGURES 1 and 3 until strip movement is interrupted. When this occurs, motor **58** is operated to move chamber **12** to the inoperative position of FIGURE 2. As the chamber moves to its inoperative position, plate **72** progressively covers lower opening **28** and finally completely covers the opening, being resiliently pressed against the bottom wall of the chamber to form a tight seal over opening **28**. In this fashion, a stack effect tending to draw cool ambient air into and chill the chamber is minimized so that proper operating conditions are more easily obtained when the line is restarted, thermal shock to the furnace lining is reduced, and power and fuel losses are minimized.

Although the invention has been described in connection with a preferred embodiment, modifications of the embodiment illustrated can be made without departing from the invention. Such modifications are within the scope of the invention.

I claim:

1. Heating apparatus, comprising:

a base,

means including walls defining a heating chamber,

means forming upper and lower openings in the walls of the heating chamber,

mounting means mounting the heating chamber on the base for movement to a work-heating, operative position and to an inoperative position,

means for selectively moving the heating chamber to the operative and inoperative positions,

sealing means for sealing the lower opening when the heating chamber is in the inoperative position, and

second mounting means mounting the sealing means

on the base at a location adjacent the inoperative position of the heating chamber,

the sealing means including:

closure plate means for closing the lower opening, and

resilient means for resiliently pressing the closure plate means against the wall of the heating chamber in which the lower opening is formed.

2. The heating apparatus of claim **1**,

the second mounting means including bracket means spaced away from the closure plate means, and

the resilient means including spring means biasing the closure plate means away from the bracket means.

3. The heating apparatus of claim **2**,

the sealing means including a plurality of rod members associated with the closure plate means and extending in a direction toward the bracket means,

each rod member being slidably received in the bracket means.

4. The heating apparatus of claim **3**,

the spring means including a coil spring surrounding each rod member.

5. The heating apparataus of claim **1**,

the closure plate means including means forming a lip extending in a direction away from the heating chamber, for easing sliding movement of the heating chamber over the closure plate means.

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JOHN J. CAMBY, Primary Examiner