May 21, 1968 K. W. FLEISCHER 3,384,053

TUBE SUPPORT

Filed June 17, 1966

FIG. 3

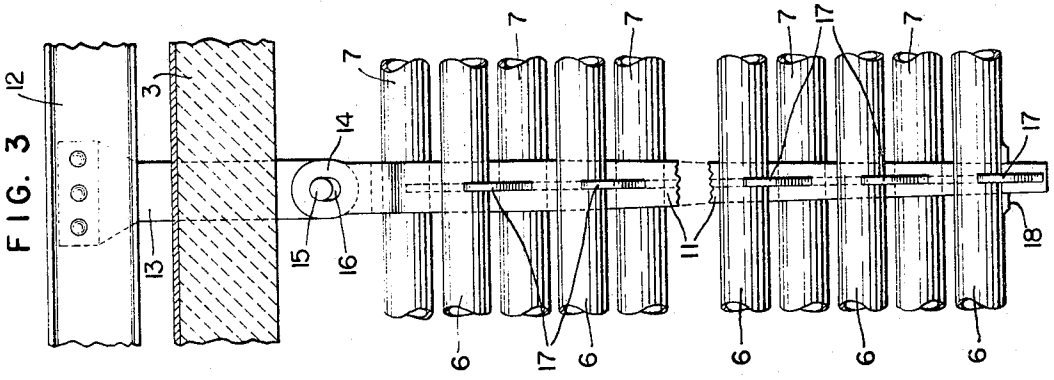


FIG. 2

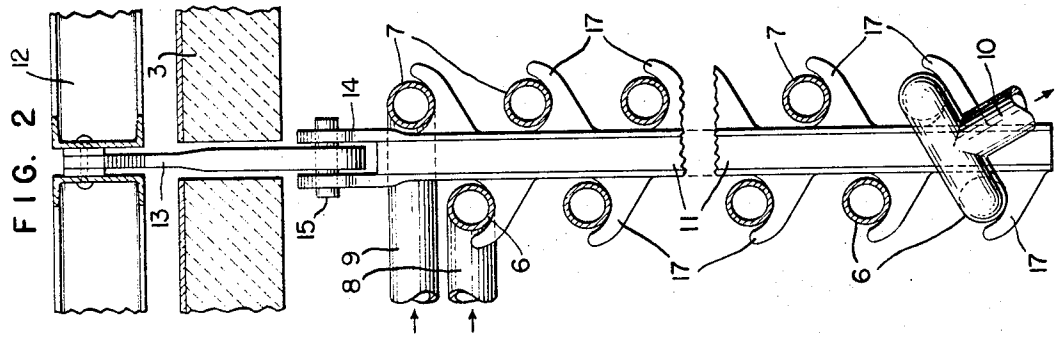
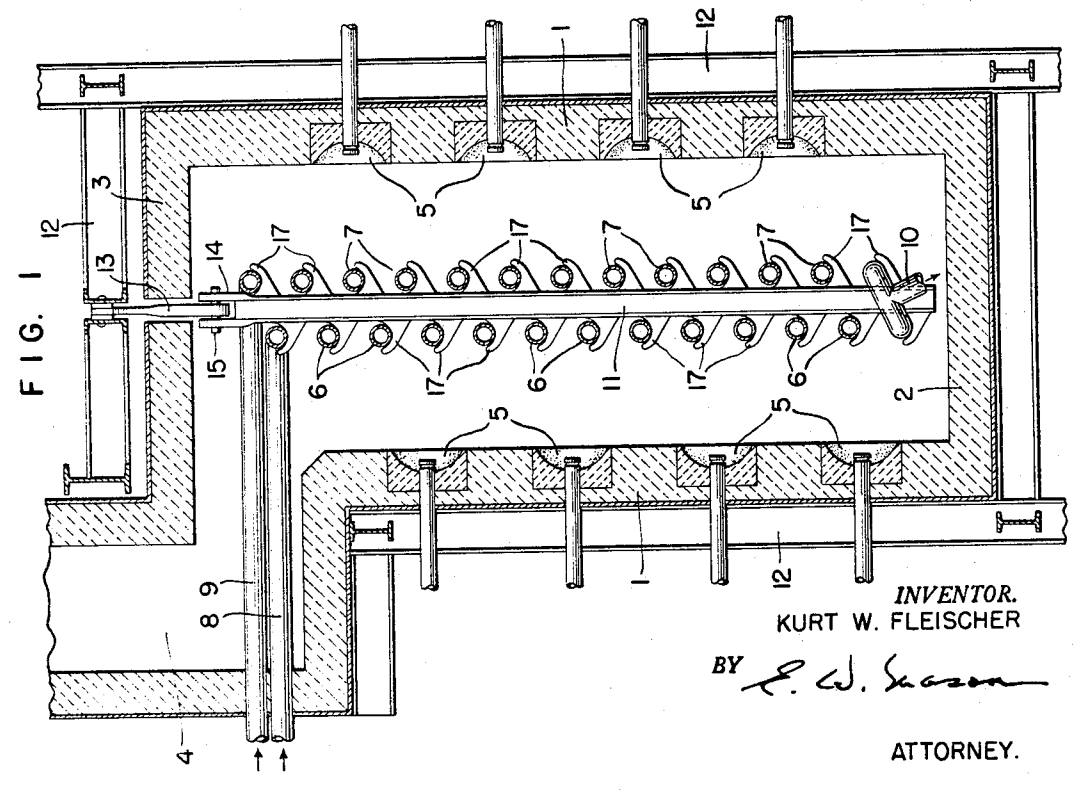


FIG. 1



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TUBE SUPPORT

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The present invention relates to tube heaters, and more particularly to supports for holding the passes of a tube coil in position in a tube heating furnace.

In many furnaces, or tube heaters, that are used in the petrochemical industry, for example, the fluid to be heated flows back and forth through the passes of a horizontally disposed, serpentine tube coil or bank. The various passes of the coil must be supported as they are being heated. The supports heretofore used are structures rigidly attached to the furnace, and are strong enough to withstand the lateral thrust created as the various passes expand and contract due to temperature changes in the furnace. With a coil having each pass fifty feet long, the expansion could be eight or nine inches.

It is an object of this invention to provide a tube support that will swing with the coil as it expands and contracts. It is a further object of the invention to provide tube supports of relativley light weight.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a sectional view through the furnace chamber,

FIG. 2 is an enlarged view of the upper portion of the tube support, and

FIG. 3 is a view taken from the right of FIG. 2 showing an entire support.

As shown in FIG. 1, there is a section through a furnace which has a chamber surrounded by side walls **1**, floor **2** and a roof **3**. The chamber is elongated in a direction perpendicular to the drawing and is heated by horizontal, parallel rows of burners **5** which are shown herein as being of the radiant cup type. The products of combustion from the burners are exhausted through a stack **4** to one side of the roof of the chamber.

The furnace is used to heat a pair of vertically disposed tube coils, each of which consists of a plurality of horizontal disposed passes that are connected in the usual fashion by return bends. The passes of one coil are indicated by the numeral **6**, while the passes of the other coil are indicated by the numeral **7**. These coils are supplied respectively with fluid to be heated by pipes **8** and **9**. The arrangement of the coils and of the flow of the material through the coils depends upon the type of pyrolysis that is being practiced in a particular furnace. As shown herein, the coils are joined at their lower ends by a common discharge through pipe **10**.

The coils are supported in the furnace by means of tube supports **11**, a number of which are spaced along the length of the furnace. Usually these supports will be from 6 to 8 feet apart. The tube supports are suspended from a portion of the structural steel work **12** of the

furnace. As shown herein, there is provided a plate or hanger **13** which is rigidly bolted to the structural steel and which extends through a small opening in roof **3**. The space between the sides of the opening and the plate are preferably closed with cement. Tube support **11** has on its upper end a fork or yoke **14**, the fingers of which receive between them the lower end of plate **13**. The plate and yoke arms are provided with openings through which pin **15** extends. It is noted that the openings **16** in the yoke fingers are larger than the pin so that the support can swing freely around the pin in a direction parallel to the direction in which the tube passes extend while plate **13** prevents the support from swinging sideways. Each support is provided with a plurality of oppositely extending arms **17** on which the passes of the respective tube coils rest. In some cases it may be desirable to weld small knobs **18** to the bottom of the lowermost tube pass, as shown in FIG. 3 of the drawing, for a purpose which will be described below.

Modern tube heaters are being operated at temperatures close to the limits of the steels that are available. While heat is carried from the tubes by the material flowing through them, the tube supports must withstand continuously the furnace temperature. In addition to the weight of the tube, a great strain is placed on the support by the transverse force created by the horizontal movement of the tubes as they expand and contract due to temperature changes. In addition, as the hot tubes slide along the supporting arms, abrasion of the tubes sets up strains in them. With the tube supports of the present invention these disadvantages are substantially eliminated.

In this case the tube supports **11** can pivot around pins **15** as the tubes expand, so that the bending force of the tubes on the supports, as well as slipping of the tubes on arms **17**, is materially reduced. The upper tube passes where the fluid being heated is coolest will expand less than the lower passes where the tube is hottest. Since, however, the pivot **15** is closest to the cooler tubes, the greater expansion of the lower tubes is automatically compensated for. The knobs **18**, which may be welded to the bottom tube pass on opposite sides of an arm **17**, will engage the arm and move it around pivot **15** as the tube expands. This will prevent any binding of the pivot. In addition, the knobs will only permit the tube to slide on the arm, in any event, an amount determined by their spacing.

Since the forces acting on the tube supports are reduced substantially due to their ability to pivot as the tube passes change in length, they can be made of lighter material than would otherwise be possible.

While in accordance with the provisions of the Statutes I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. A furnace, said furnace being adopted to heat serpentine tube having horizontally disposed passes one above the other, said furnace having a chamber in which the tube is disposed and a roof over the chamber, supporting structure above the roof, a plate attached to said

structure and extending through the roof into the chamber, an elongated support member, a plurality of tube supporting arms projecting at different levels from opposite sides of said member for supporting the horizontal passes of the tube, and means mounting said member from one end on the portion of said plate in said chamber, said mounting means being operative to permit pivotal movement of said member on said plate only in a direction perpendicular to the direction in which said arms extend and parallel to said tube passes.

2. The combination of claim 1 in which said mounting means comprising a pair of parallel fingers extending from an end of said member to receive said plate between them and a pin extending through said fingers and said plate, said pin extending in a direction parallel to said arms.

3. The combination of claim 1 in which the tube pass resting on the lowest arm of said member, is provided with a pair of knobs, one on each side of said arm to engage said arm as said tube moves.

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