

- [54] **TUBE SUPPORT SYSTEM FOR HEAT EXCHANGER**
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- [52] U.S. Cl..... **165/69, 165/162, 165/172**
- [51] Int. Cl..... **F28f 1/00**
- [58] Field of Search **165/69, 172, 67, 162; 176/76, 78**

[57] **ABSTRACT**

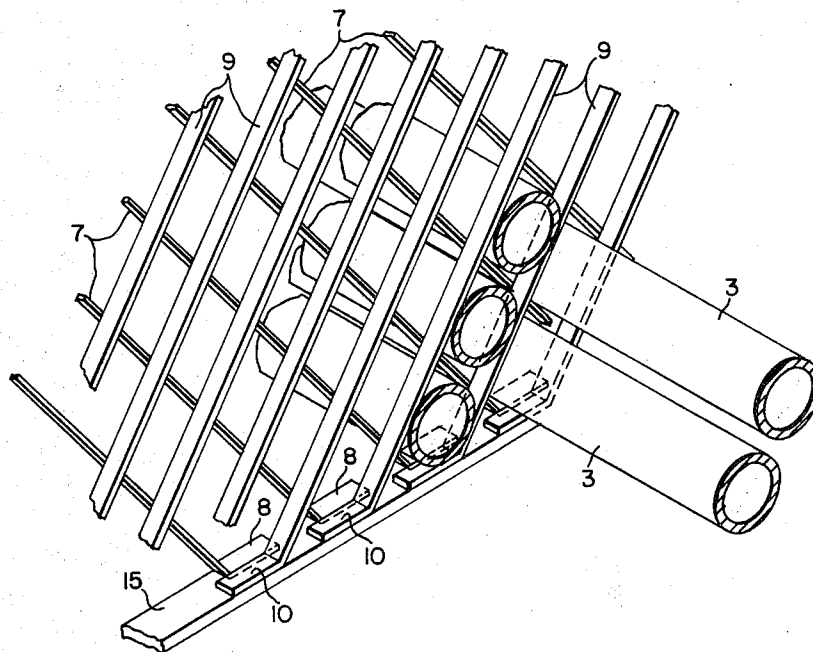
Two groups of parallel flat bars disposed on an angle with respect to each other form a lattice which engages four sides of each tube to reduce the vibrations; the ends of the flat bars are bent and fastened to end bars which provide rigidity necessary to produce an economical vibration dampening support system which can be easily installed in an assembled heat exchanger.

[56] **References Cited**

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4 Claims, 2 Drawing Figures



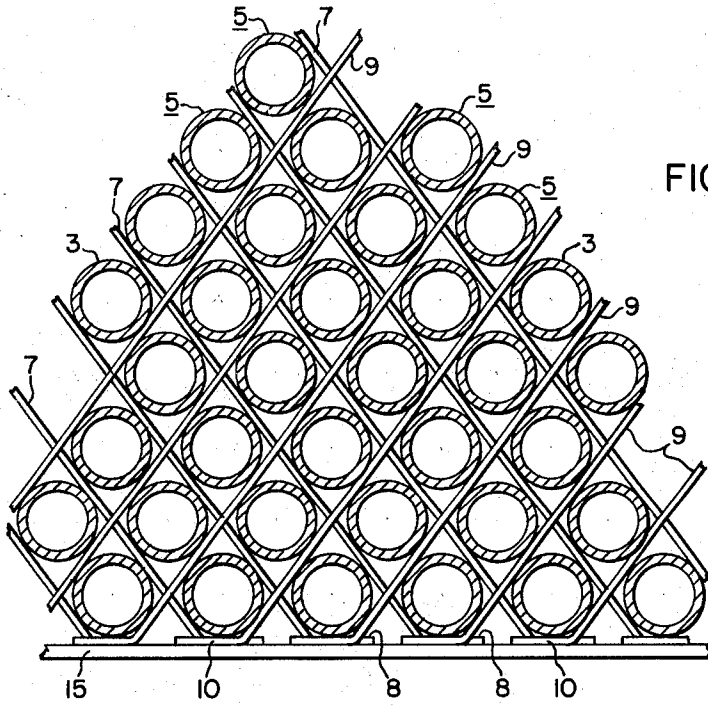


FIG. 1.

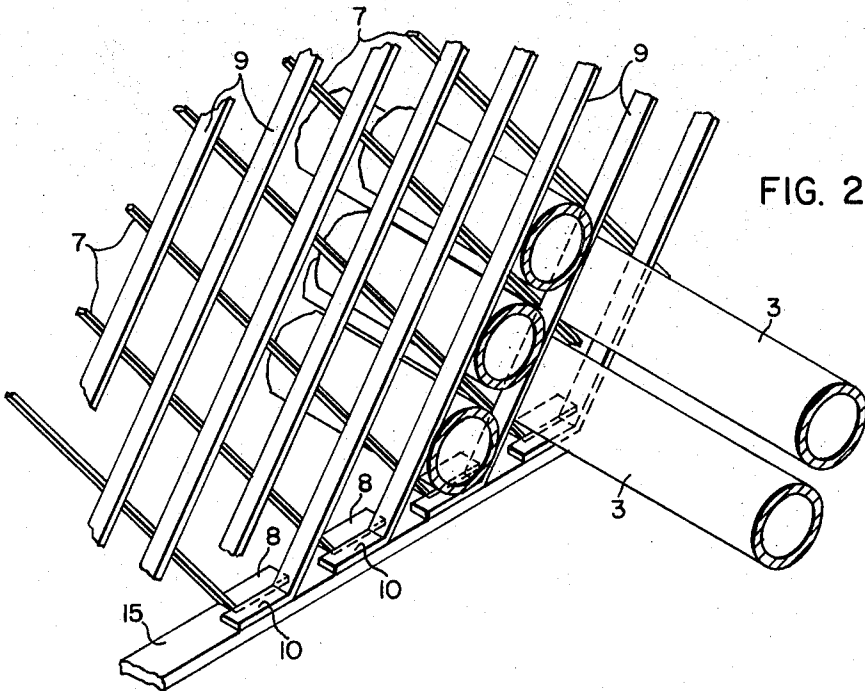


FIG. 2.

TUBE SUPPORT SYSTEM FOR HEAT EXCHANGER

BACKGROUND OF THE INVENTION

This invention relates to heat exchangers, and more particularly, to a tube support system which can be easily installed in an assembled heat exchanger to reduce vibration in the tubes.

As fluid flows over heat exchanger tubes it produces dynamic forces which act upon the tubes causing the tubes to vibrate. The amplitude and frequency of the vibrations are affected by such facts as the span between the tube supports, the stiffness of the tubes and the velocity and density of the fluid. Reducing the length of the span between supports in the most expedient method of reducing vibration of the tubes, however, if the heat exchanger is assembled, it is impossible to utilize additional conventional tube support plates, which consist of plates having a plurality of holes through which the tubes pass. Therefore, an economical support system is needed to facilitate field installation of an additional support to reduce vibrations which were not apparent until the heat exchanger has been in service.

SUMMARY OF THE INVENTION

In general, a tube support system for a heat exchanger having a plurality of rows of tubes forming a tube bundle, when made in accordance with this invention, comprises a first group of strips disposed generally parallel to each other and between adjacent rows of tubes, and a second group of strips disposed generally parallel to each other and between adjacent rows of tubes. The first group of strips is disposed at an angle with respect to the second group of strips forming a lattice which generally surrounds the tubes. The strips have terminal ends which are generally disposed at the periphery of the tube bundles and a bar for interconnecting the strips to add rigidity to the lattice, to reduce vibration and to prevent the strips from sliding through the tube bundles.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects and advantages of this invention will become more apparent from reading the following detailed description in connection with the accompanying drawings, in which:

FIG. 1 is a partial sectional view of a heat exchanger with a tube support system made in accordance with this invention; and

FIG. 2 is a perspective view description the heat exchanger and tube support system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, FIGS. 1 and 2 show a support system for a tube bundle 1 of a heat exchanger, such as a moisture separator reheater, in which a plurality of tubes 3 are disposed on a triangular pitch to form a plurality of rows 5 of tubes. While the tubes 3 are shown disposed on a triangular pitch, the tube support system can be applied to generally any layout wherein the tubes are disposed in rows.

The tube support system comprises a first group of

strips 7 disposed generally parallel to each other between adjacent rows 5 of tubes 3. The strips 7 have ends 8 which are bent to form an obtuse angle with respect to the strips 7 and terminate adjacent the periphery of the tube bundle.

A second group of strips 9 disposed generally parallel to each other and between adjacent rows of tubes 3 are also disposed at an angle with respect to the first group of strips 7, forming a lattice which generally surrounds the tubes 3 so that each tube is engaged on four sides by the strips 7 and 9. The strips 9 have ends 10 which are bent to form an obtuse angle with respect to the strips 9 and terminate at the periphery of the tube bundle.

The bent portions 8 and 10 of the strips 7 and 9 engage a flat bar 15 and are fastened thereto by tack welding or other means.

The group of strips 7 and 9 being disposed at an angle with respect to each other form a lattice which surrounds the tubes and engages four sides thereof. Since the ends of the strips are fastened to the flat bars 15, the lattice has sufficient rigidity to reduce vibration of the tubes 3. The strips 7 and 9 are generally the thickness of the spacing between rows of tubes so that the strips can be slipped between the rows of tubes. The ends of the strips 7 and 9 are then bent to retain the strips within the row of tubes thus facilitating fabrication of this tube support system in an assembled heat exchanger to provide an economical tube support system, which can be installed in an assembled heat exchanger to reduce the vibration of the tubes and to prevent their premature failure.

What is claimed is:

1. A tube support system for a heat exchanger having a plurality of rows of tubes forming a tube bundle, said tube support system comprising a first group of strips disposed generally parallel to each other and between adjacent rows of tubes, a second group of strips disposed generally parallel to each other and between adjacent rows of tubes, said first group of strips being disposed at an angle with respect to said second group of strips and arranged to cooperate with each other to exclusively form a lattice which generally surrounds the tubes, said strips having terminal ends which are bent at an oblique angle with respect to the strip, and are generally disposed at the periphery of the tube bundle, the ends of the first group of strips being bent in one direction and the ends of the second group of strips being bent in the opposite direction, said bent ends of said second group of strips overlapping with said bent ends of said first group of strips, and a flat bar fastened to the overlapping bent ends of the strips to add rigidity to the lattice, to reduce vibration between the tubes, and to prevent the strips from sliding through the rows of tubes.

2. A tube support system as set forth in claim 1, wherein the bent portion of the strips are fastened to the bar by tack welding.

3. A tube support system as set forth in claim 1, wherein the thickness of the strip is such that the strips engage the tubes in adjacent rows.

4. A tube support system as set forth in claim 3, wherein the tubes are disposed on a triangular pitch.

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