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A. R. BANTA

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METHOD AND ARTICLE FOR PROTECTING CONDENSER TUBES

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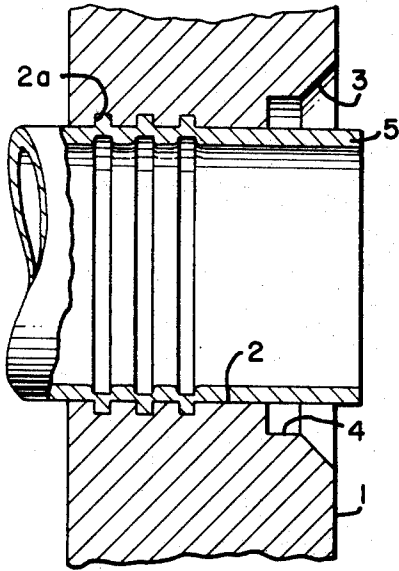


FIG. 1

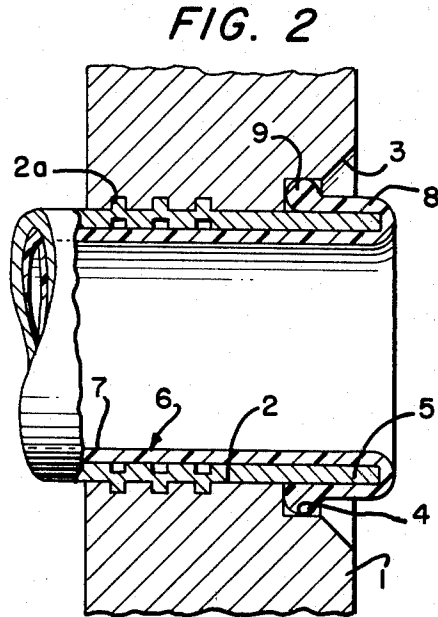


FIG. 2

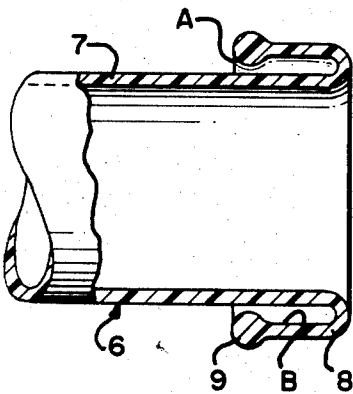


FIG. 3

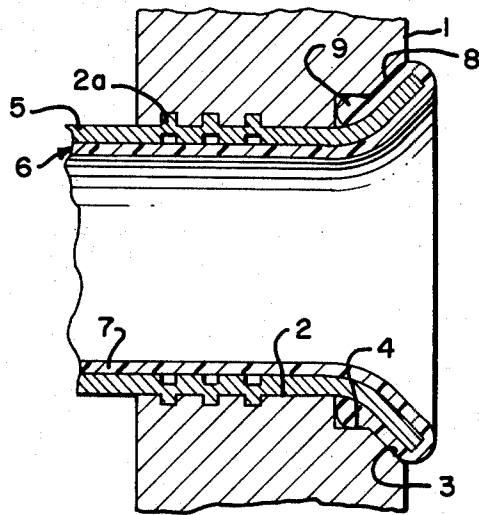


FIG. 4

INVENTOR.
ANDREW R. BANTA
BY
Bernard J. Murphy
AGENT

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METHOD AND ARTICLE FOR PROTECTING CONDENSER TUBES

Andrew R. Banta, Bethlehem, Pa., assignor to Ingersoll-Rand Company, New York, N.Y., a corporation of New Jersey

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ABSTRACT OF THE DISCLOSURE

This disclosure describes a method of protecting tubes of steam surface condensers or the like from corrosion and deterioration, and sets forth an improved plastic sleeve insert for use with the method.

In steam surface condensers where tube entrance erosion is a problem, such as in marine uses or in any circumstances where power plants employ sea water for cooling, plastic tube inserts, about six inches long, are often used at the tube entrance to help minimize this problem.

Also it is known in prior art to use O-rings as means for sealing condenser tubes in the tube sheets.

The plastic tube inserts which are currently used tend to slide out of the condenser tubes, during start-up of the equipment in a syphonic circuit when the water circuit goes from atmospheric pressure to a vacuum. This occurs because air at atmospheric pressure becomes trapped between the plastic insert and the inner wall of condenser tube, and when the water box pressure drops, this relatively pressured and entrapped air pushes the plastic insert out of the tube.

The limitations of having a separate O-ring seal arise from the fact that it incorporates a second additional step increasing the cost of preparing the unit. Further, there is little cooperation between the deep-seated O-ring and the separate plastic tube insert toward fluid sealing. Arrangements taught in prior art prescribe rather complex assemblies of packing, O-rings, grommets, seals, and displaceable bonnets to present a cohesive sealing and protective unit. However, these are expensive in time and cost to install and maintain.

Accordingly, it is an object of the present invention to provide a method for protecting condenser tubes and the like from corrosion or deterioration with an improved plastic sleeve of simplified design; another object of the present invention is to provide an improved method of both protecting condenser tubes and sealing them in the tube sheet; it is another object of this invention to provide a protective sleeve having means for claspings over and onto the end of the condenser tube to frustrate forces which would tend to displace it therefrom; a further object of the present invention is to provide a protective sleeve having sealing means integral therewith for sealing the tube in the tube sheet.

A feature of this invention comprises the use of a cylindrical plastic sleeve having an excursive portion with an O-ring on the end thereof for disposition on the end of a condenser tube.

The above-mentioned and other features and objects of this invention will become more apparent by reference

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to the following description taken in conjunction with the accompanying figures in which:

FIGURE 1 is a cross-sectional view in elevation of a tube sheet that has been drilled and counterbored, having a condenser tube inserted and expanded therein;

FIGURE 2 is a cross-sectional view in elevation showing the protecting sleeve inserted over the end of the condenser tube, according to the invention;

FIGURE 3 is a cross-sectional view of the protecting sleeve of the invention;

FIGURE 4 is a cross-sectional view in elevation showing the tube and sleeve flared into the counterbore, further according to the invention.

In FIGURE 1 there is shown a tube sheet 1. According to the invention, the tube sheet 1 is drilled to form a drill hole 2 which is then counterbored with a chamfer 3 and a recess 4 such as would be provided for an O-ring. Additionally, internal serrations 2a, into which the condenser tube 5 can be expanded, may be formed in drill hole 2. Following this, condenser tube 5 is inserted and expanded in the drill hole. Next, as shown in FIGURE 2 the plastic sleeve 6 of the invention is inserted into and over the end of the condenser tube 5 for the protection thereof. Plastic sleeve 6, as can be seen in FIGURE 3, comprises a cylindrical shank 7, an outer lip 8, and an O-ring-type seal 9 integrally formed on, or bonded to the end. The outside diameter of the O-ring-type seal 9 is greater than that of the outer lip 8, and corresponds with the inside diameter of the recess 4 wherein it is nested. Further, the inside diameter A of the seal 9 is slightly less than the inside diameter B of the outer lip 8, the latter dimension corresponding to the outside diameter of tube 5. Thus, the sleeve 6 is forceably fitted onto and over the end of the condenser tube 5 and insures a firm claspings thereof on the tube to prevent its displacement therefrom.

As described thus far, this invention teaches an improved method of protecting the ends of tubes subject to corrosion and deterioration, such as condenser tubes, from such harmful effects.

FIGURE 4 shows the sleeve 6 and condenser tube 5 flared into the counterbore for the sealing of the tube. In executing this step of the invention, the seal 9 of the sleeve 6 is fixed in the recess 4. Both the end of the tube 5 and the outer lip 8 confine the seal 9, compressively, against the outer wall of the tube 5 and the inner wall of the drill hole 2. In this the tube 5 is sealed internally within the tube sheet 1, and the seal 9 is yet integral and continuous with the protective portions of the sleeve 6 (lip 8 and shank 7).

My invention provides a method for protecting the ends of condenser tubes, and the like, and a method of both sealing and protecting such tubes, and teaches an improved sleeve for protecting such tubes.

While I have described above the principles of my invention in connection with specific methods and apparatus it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the accompanying claims.

I claim:

1. A method for protecting condenser tubes from corrosion and deterioration and for internal sealing of said tubes within a tube sheet, comprising the steps of drilling and counterboring holes in a tube sheet; inserting con-

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denser tubes in the holes; expanding said tubes in said holes; placing a protective sleeve both in the inner surface and disposing a sheathing portion of said sleeve over and above the outer surface of the ends of said tubes; and flaring the ends of said tubes and said sleeves to fix said sheathing portions of said sleeves in, and said tube ends against, said counterbores.

2. A sleeve, for protecting a tube which is subject to corrosion and deterioration, having at one end thereof an annular lip to accommodate therein the end of said tube, said sleeve having a uniform material thickness save for a terminal portion at the end of said lip which has a greater cross-sectional dimension, which said greater dimension causes said portion firmly to clasp said tube.

3. A sleeve, according to claim 2, wherein:
said terminal portion comprises an O-ring-type seal.

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4. A sleeve, according to claim 2, formed of plastic.

5. A sleeve, according to claim 2, formed of polytetrafluoroethylene.

6. A sleeve, according to claim 2, formed of polyamide.

7. A sleeve, according to claim 2, wherein the inside diameter of said terminal portion is less than the inside diameter of said lip and less than the outside diameter of said tube.

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C. SUKALO, *Assistant Examiner*.