July 1, 1969 L. A. MALEWICZ 3,452,814

BELL-END CONDENSER TUBES

Filed Feb. 24, 1967

FIG.1
(PRIOR ART)

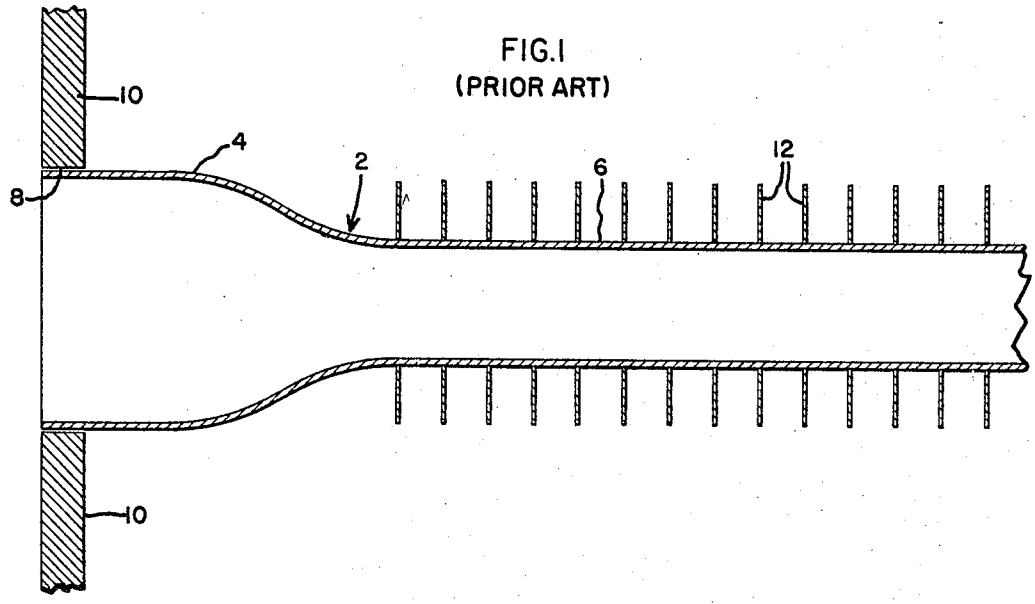
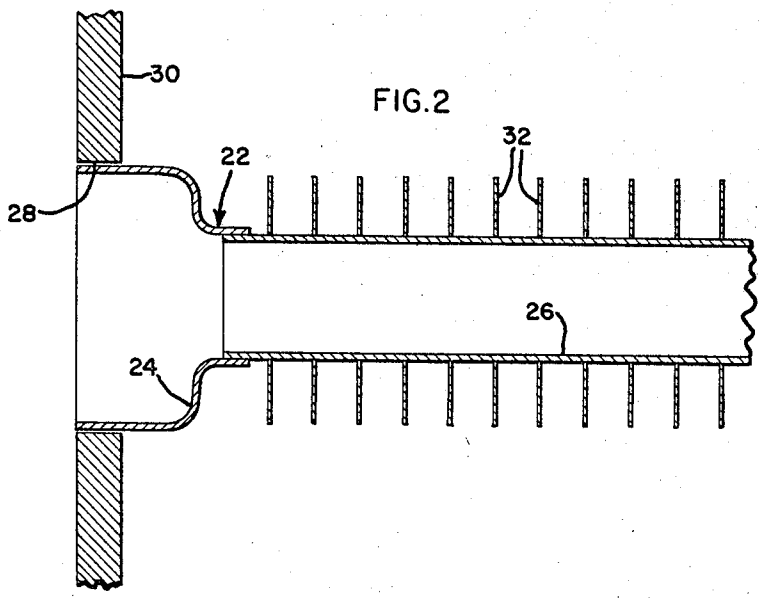


FIG.2



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BELL-END CONDENSER TUBES

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U.S. Cl. 165—178 1 Claim

ABSTRACT OF THE DISCLOSURE

A bell-end heat exchanger tube fabricated from a straight cylindrical tube portion and a bell-end stamping. The bell-end stamping has a transition surface extending between a major diameter and a minor diameter thereof, a tangent to said surface lying in a plane substantially perpendicular to the axis of said bell-end stamping. The small end of the bell-end stamping overlaps the straight cylindrical tube portion.

Background of the invention

The present invention relates to heat exchanger tubes. More particularly, the invention relates to heat exchanger tubes having bell-end portions of greater diameter than their finned tube members.

In heat exchangers known to the prior art, it is common to have the heat exchanger tubes extending within the heat exchanger body from one tube sheet to another. It is desirable to have tubes removable from the tube sheet for servicing and replacement. If the tubes are of the type having a fin member extending radially therefrom, the hole in the tube sheet through which the tube is to be removed must necessarily be larger than the tube and fin diameter. For this purpose, heat exchanger tubes are often made with bell ends which have a diameter slightly larger than that of the tube fin. These bell ends are pressed into a tube sheet having similarly enlarged holes so that the finned tube member is removable from the heat exchanger. These prior art bell-end heat exchanger tubes are typically made by a process of deep drawing or expanding the ends of a tube member to the desired major diameter. Due to the nature of the drawing process, the transition from the minor to the major diameter is relatively gradual at a sacrifice to the "working length" of the heat exchanger tube. Furthermore, this prior art process of drawing heat exchanger tubes with an integral bell is relatively expensive.

Accordingly, it is an object of the present invention to provide a heat exchanger tube and a method of making the same having an improved proportion of working length to total length.

Another object of the present invention is to provide a relatively economical method of producing bell-end heat exchanger tubes.

Other objects, advantages and features of the present invention will become apparent from the following description when taken in connection with the accompanying drawing.

Summary of the invention

Briefly, the present invention is practiced in one form by a heat exchanger tube having a bell end to which it is joined as by welding or other means. The initial separation of the tube and the bell end permits the bell end pieces to be economically produced as by stamping. The stamped bell end members have a short transition from their major to their minor diameter so that the finished heat exchanger tube has an improved proportion of working length to total length.

Drawing

In the drawing:

FIG. 1 is a longitudinal section of a bell-end heat exchanger tube according to the prior art,

FIG. 2 is a longitudinal section of a bell-end heat exchanger tube according to the present invention.

Description

In FIG. 1, a typical bell-end heat exchanger tube of the prior art is shown. The tube is generally indicated at **2** and has an expanded or bell-end portion **4** having a major diameter and a "working length" **6** having a smaller minor diameter. The bell-end portion **4** of the tube is tightly fit within a hole **8** through a supporting tube sheet **10**. The "working length" **6** of the heat exchanger tube **2** is that portion of minor diameter and is surrounded by radial heat exchanger fins **12**.

Bell-end portion **4** and working length **6** of the tube **2** are a single piece. That is, the bell-end **4** was formed by a process of deep drawing or expanding from a tube which was initially of a uniform minor diameter along its length. This deep drawing method of producing a bell-end tube necessitates the gradual transition from the minor to the major diameter as shown in the FIG. 1 tube. The axial length of the transition in tube **2** is effectively lost as a heat exchanger surface since the heat exchanger fins **12** are only added to the tube at its portion of uniform minor diameter, that is, along working length **6**.

Referring now to FIG. 2, a heat exchanger tube is generally indicated at **22** and comprises a bell-end portion **24** and a working length of minor diameter **26**. Bell-end member **24** is fit within hole **28** through tube sheet **30**. The working length **26** of the heat exchanger tube **22** is surrounded by heat exchanger fins **32** having an outside diameter slightly less than diameter of hole **28** to permit removal of tube **22** therethrough.

Tube portion **26** is a member separate from bell-end portion **24**. Members **24** and **26** are lap-joined as by welding or brazing to form the integral heat exchanger tube **22**. The fact that bell-end portion **24** is a separate piece enables it to be produced by a stamping process from sheet stock and also permits it to be made with a relatively short transition length from its major to its minor diameter. That is, the bell-end portion **24** being separately made can be stamped out with a very abrupt transition from major to minor diameter. The plane of the transition surface is substantially normal to the tube axis. The effect of this is that, having a shorter transition length, there is more working length in the heat exchanger tube **22**. That is, fins **32** surround the working length **26** along a greater proportion of the total tube length. The distance from the tube sheet **30** to the nearest fin **32** is kept to a minimum because the axial length of member **24** is kept to a minimum.

The production process or method by which the heat exchanger tube of FIG. 2 is made, that is, the stamping of part **24** and joining to part **22**, is less expensive than the deep drawing or expanding operation of the prior art.

It will be apparent that a bell-end heat exchanger tube has been herein described which improves on certain aspects of the prior art. The process by which it is produced is economical relative to that of the prior art, and the resulting heat exchanger tube has a greater proportion of working length to total length than such a tube from the prior art. It will also be appreciated that because of the standardized parts, such as tubing and sheet stock that need be stocked, procurement and inventory of bell-end heat exchanger tubes is facilitated. That is, the product of this invention is made from fabricating stand-

ard uniform tubing to mass-produced stampings. This compares favorably with the considerably longer delivery generally required for integrally expanded bell-end tubes of the prior art.

It may occur to others of ordinary skill in the art to make modifications of the present invention which will remain within the concept and scope thereof and not constitute a departure therefrom. Accordingly, it is intended that the invention be not limited by the details in which it has been described but that it encompass all within the purview of the following claim.

What is claimed is:

1. A heat exchanger tube in combination with a tube sheet, said tube having a separate bell-end member of uniform wall thickness substantially the same as the tube wall thickness and a fin member joined thereto, said bell-end member having a greater major diameter than said fin member, said bell-end member having a transition surface extending between the major and minor diameters

thereof, a tangent to said surface lying in a plane substantially perpendicular to the axis of said bell-end member, the smaller end of the bell-end member being lap-joined to said tube, the larger end of the bell-end member being disposed in a circular hole defined by said tube sheet for withdrawal of the tube and fins therefrom.

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