

[54] **METHOD OF MANUFACTURING A FINNED-TUBE HEAT EXCHANGER**

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[58] Field of Search..... 29/157.3 A, 157.3 V, 458, 29/157.3 B, 523

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ABSTRACT

A method for manufacturing a finned tube as a heat exchanger. A thin-walled pipe of aluminum is used to cover the tube proper and cold working is employed instead of conventional shrink fitting of the tube to a cylindrical member on which fins are arranged. The method makes it possible to reduce the size and weight of fins, makes the fitting closer and prevents the generation of oxide layers inside the cylindrical member.

2 Claims, 2 Drawing Figures

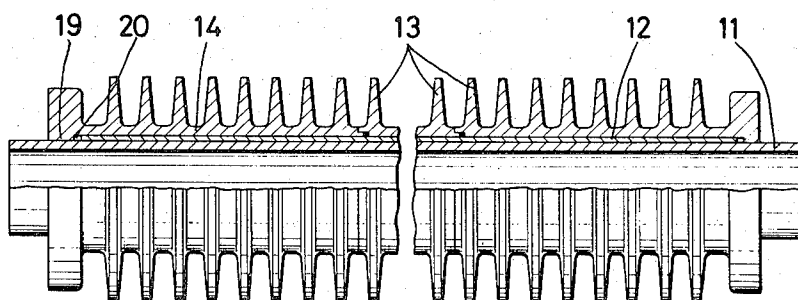


FIG. 1

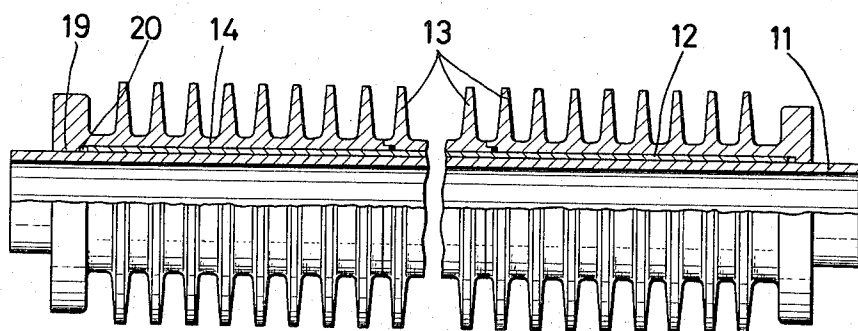
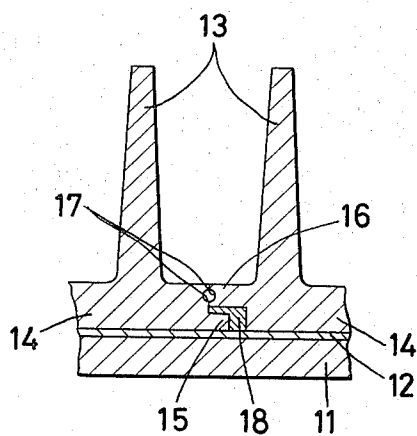


FIG. 2



METHOD OF MANUFACTURING A FINNED-TUBE HEAT EXCHANGER

The present invention relates to a method of manufacturing a finned tube for use as a heat exchanger and more particularly to the manufacturing of a finned tube having a thin-walled pipe made of aluminium covering the tube proper.

The finned tube, conventionally used for recovering thermal energy from a high temperature waste gas prior to its discharge from boilers, heating furnaces and the like, usually comprises a tube made of steel and fins arranged on a cylindrical member which covers the tube proper, both the cylindrical member and the fins being made of cast iron, said metals being resistant against high temperature and the corrosive effect of SO₂ gas and the like. In the case of the conventional finned tube, however, fins have to be as large as possible to enlarge the thermal area therewith because of a shrink fitting method which is used for the fitting of the cylindrical member to the tube proper, in this method the cylindrical member together with the fins are heated prior to fitting to the exterior periphery of the tube proper. The cylindrical member then shrinks as it cools off after fitting to the exterior periphery of the tube proper, the contact between the cylindrical member and the tube gets closer as the result. Also, this shrink fitting method is liable to cause the generation of oxide layers inside the cylindrical member which results in the increase of heat resistance at the contact region between the tube proper and the cylindrical member leading to a decrease in the heat transmitting efficiency of the finned tube.

The main object of the present invention is to correct the defects of conventional finned tubes as described by providing a method for manufacturing a finned tube which is highly effective for thermal transmitting, said method comprising covering a steel tube with a thin-walled pipe made of aluminium, said metal being characterized by softness, high thermal expansion coefficient and good heat conductivity. Fitting thereon a cylindrical member on which fins are arranged, both the cylindrical member and the fins being made of cast iron, allowing a thorough adhesion of the thin-wall pipe covering the tube proper to the inside surface of the cylindrical member by way of cold working which expands the tube proper beginning with the expansion of diameter therein, so as to obtain perfect contact between the thin-wall tube covering the tube proper and the cylindrical member thus giving an excellent heat conductivity or heat exchanging capacity to the produced finned tube.

A preferred embodiment for the invention is described herein taken together with the annexed drawing in which:

FIG. 1 shows a partially-cutaway elevational view of the finned tube in the present invention.

FIG. 2 shows a partially magnified sectional view of the finned tube in the present invention.

In FIGS. 1 and 2, numeral 11 designates the tube proper made of steel, outer periphery which is covered with a thin-wall pipe 12 made of aluminium having high thermal expansion coefficient, good heat conductivity and softness.

Numeral 13 designates a number of fins side by side at a fixed interval on the outer periphery of the cylindrical member 14, the cylindrical member 14 being

fixed on the afore-mentioned thin-wall pipe 12 which covers the tube proper 11.

When the tube proper 11 is lengthy enough for the cylindrical member 14 to be divided into several partitions, all the partitions are connected with each other by means of a projecting annulus 15 inside one partition on one side thereof and an annular recess 16 inside the other partition also on one side thereof so that the projecting annulus 15 may be inserted fittingly into the annular recess 16 so as to firmly connect the two partitions with each other, a similar method being applied to each succeeding portion one by one to bring the rest of the partitions together as with said two partitions into perfect unity. In this case, an annular packing 18 made of aluminium, lead and the like having softness, and heat resistability is provided in the annular recess 16 to prevent possible infiltration of gas and the like through the joint of partitions. An annular groove 17 is also formed on the sides of partitions so that one groove of one partition may contact with the other groove of the adjoining partition as in the case of said projecting annulus 15 and annular recess 16, said grooves playing the role of adding closeness to the connection of said partitions with each other.

In FIG. 1, numeral 19 designates another annular projection formed inside the cylindrical member 14 at one end thereof and numeral 20 designates a space provided between said annular projection 19 and one end of the thin-wall pipe 12.

A space is provided between the outer periphery of the thin-wall pipe 12 covering the tube proper 11 and the interior periphery of the cylindrical member 14 to allow for the expansion of the tube proper.

The finned tube of the present invention is assembled as follows:

Cover the tube proper 11 with the thin-wall pipe 12 on which the cylindrical member 14 as the base of said fins is fitted, thence expand the tube proper 11 internally by way of letting a die therethrough thereby letting the tube proper 11 press upon the interior surface of the thin-wall pipe 12. The thin-wall pipe 12 expanding as the result makes a forced contact with the interior surface of the cylindrical member 14 at the base of the fins.

In this process, the character of the thin-wall pipe 12 made of soft metal as afore-mentioned is advantageous for making the contact closer. Another character of the thin-wall pipe 12 is that it is high in heating expansion coefficient which also adds to the adhesiveness of the thin-wall pipe 12 in contacting with the tube proper 11 and also with the cylindrical member 14.

The generation of oxide layers as in case of shrink fitting as mentioned hereinbefore will be prevented in the cold working method adopted in the present invention.

The finned tube-manufacturing method in the present invention also is advantageous because there are no problem for the size of fins except that the size of fins is to be decided only in relation with the mechanical durability of the fins. The shrink fitting in the conventional method needs a larger thermal area and accordingly it is necessary to make fins as large as possible.

What is claimed is:

1. A method for manufacturing a finned tube as a heat exchanger comprising the steps of: providing as an inner tube a tube which is made of steel; covering said inner tube with a thin-walled pipe made of aluminum having the properties of softness, high heating expansion

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sion coefficient and good thermal conductivity; fitting thereonto a cylindrical outer tube on which fins are arranged, both the cylindrical outer tube and the fins being made of cast iron; and internally expanding the inner tube by cold working so as to adhesively contact the thin-walled pipe with the inner tube which in turn then contacts the outer cylindrical member.

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2. The method as claimed in claim 1 including disposing a plurality of outer cylindrical tubes in side by side relationship each member having formed therein an annular projection on one side and a space to receive said projection on the other side, the projections being fitted into the corresponding spaces.

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