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REFRIGERANT HEAT TRANSFER ELEMENT

Filed Feb. 19, 1957

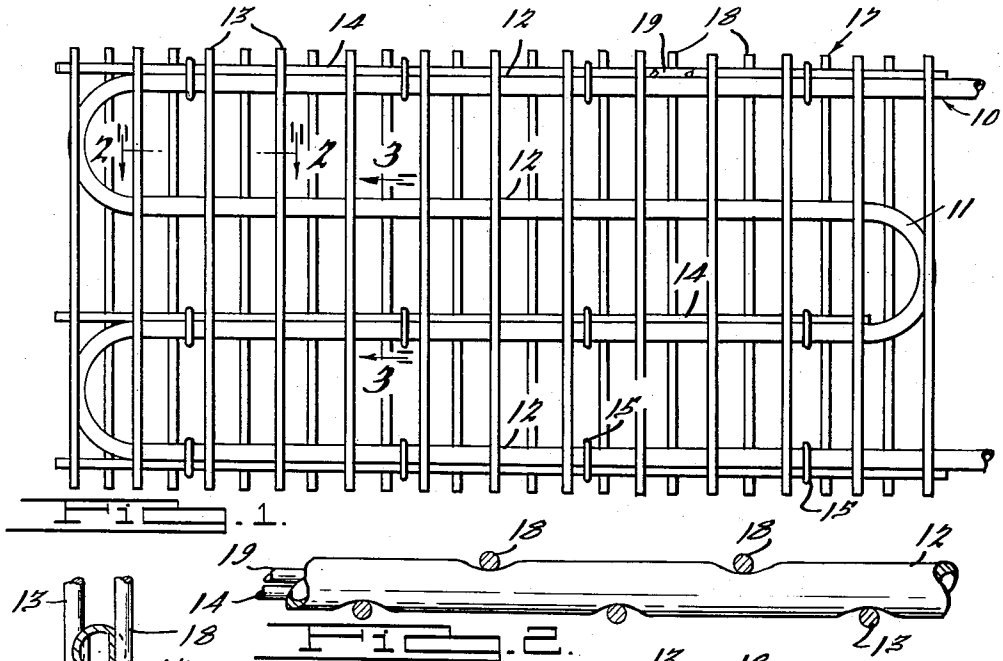


Fig. 1.

Fig. 2.

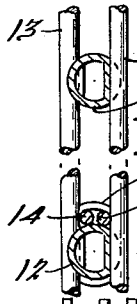


Fig. 3.

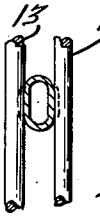


Fig. 4.

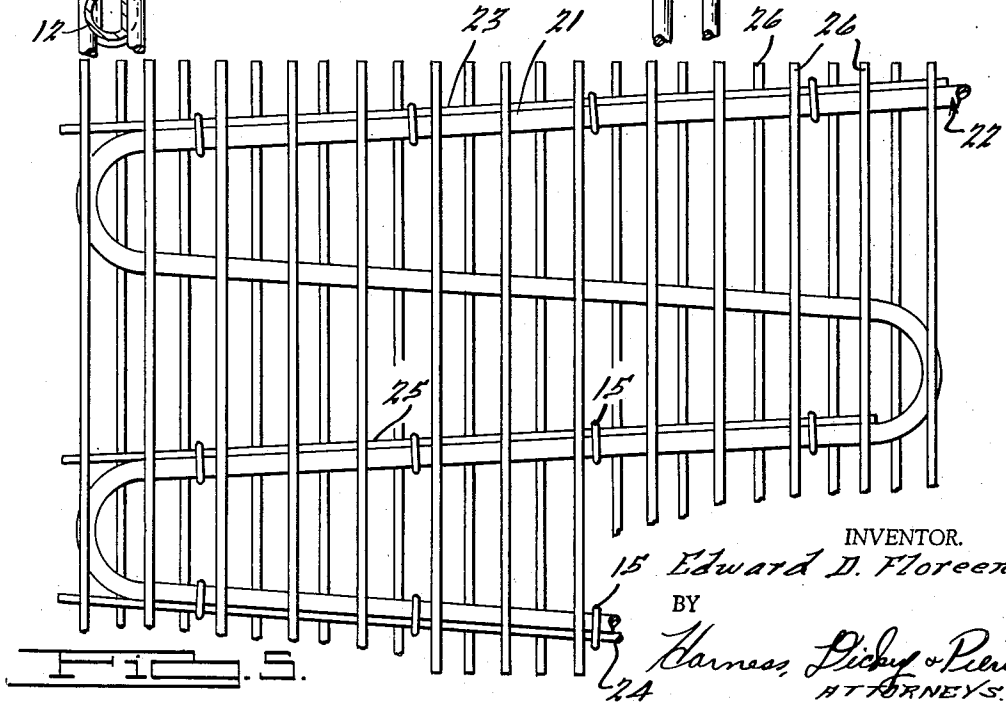


Fig. 5.

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REFRIGERANT HEAT TRANSFER ELEMENT

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2 Claims. (Cl. 257—262.11)

This invention relates to heat exchanging devices, and particularly to a heat exchanging device for a refrigerant and the method of construction embodied therein.

While wires have been employed heretofore in the manufacture of condensers, shelves, evaporators and the like for a refrigeration mechanism, secured to a sinuously formed tubing through which refrigerant passes, the device of the present invention is unique in assembling the wires as a unit frame and applying one or more frames to the sinuously formed tube.

It is, therefore, one object of the invention to form a heat exchanger from a length of sinuously formed tube and a frame made of wires spaced a predetermined distance apart and welded to crossed wires which are spaced to engage certain of the straight lengths of the tube.

It is another object of the invention to have the straight portions of the tube disposed at an angle to the horizon when disposed in a vertical plane and the transverse connecting wires for the spaced wires disposed at the same angle to engage the straight length of the tube.

It is another object of the invention to secure the straight length of wires that maintain the spaced wires in fixed relation in position on the sinuous tube by copper hog rings which braze the crossed wires to the tube when the assembly is heated.

A still further object of the invention is to assemble wire frames on both sides of the sinuously formed tube and press the wires to indent the tube and to reduce the overall thickness of the assembly which is secured as a unit by copper hog rings which bond certain portions of the frames to the sinuous tube.

It is a still further object of the invention to provide a method of forming heat exchangers in the nature of shelves, condensers, evaporators and the like from sinuously formed tubing on which wire frames are bonded, which is simple in construction and economical of manufacture.

Other objects and features of novelty of the invention will be specifically pointed out or will become apparent when referring, for a better understanding of the invention, to the following description taken in conjunction with the accompanying drawing, wherein:

Figure 1 is a plan view of a heat exchanger embodying features of the present invention;

Fig. 2 is an enlarged sectional view of the structure illustrated in Fig. 1, taken on the line 2—2 thereof;

Fig. 3 is a sectional view of the structure illustrated in Fig. 1, taken on the line 3—3 thereof;

Fig. 4 is a view of structure, similar to that illustrated in Fig. 3, showing another form which the invention may assume, and

Fig. 5 is a view of structure, similar to that illustrated in Fig. 1, showing still another form which the invention may assume.

Referring to Figs. 1, 2 and 3, a heat exchanger for a refrigerating device is illustrated employing a tube 10 of sinuous form, having reversely bent loop portions 11 joined by straight portions 12 which are disposed in

parallel relation. A plurality of spaced parallel wires 13 are disposed transverse of the straight portions 12 of the tube 10 which are first secured together in predetermined relation to each other by crossed wires 14 which are welded thereto. The wires 14 engage the outer sides of the top and bottom straight portion 12 and are temporarily secured thereto by hog rings 15 which are made of copper wire. Additional crossed wires 14 may be employed which are spaced to engage a straight portion 12 of the tube 10 at different points in the assembly.

In the view illustrated, a second frame 17 is placed on the opposite side of the sinuous tube 10 which is similar to the first frame and having a plurality of spaced parallel wires 18 extending transversely of the straight portion 12 of the tube interconnected by crossed wires 19 which are aligned with the wires 14 of the first said frame. Whether one or two frames are applied to the continuous tube and whether the parallel wires 13 and 18 are spaced closer or farther apart, and whether in offset or aligned relation on opposite sides of the tube, pressure may be applied to the assembly to force the wires of the frame into the sinuous tube to reduce the overall height of the assembly by the indenting of the tube at the straight portion thereof, as illustrated in Figs. 2 and 3. The hog rings 15 engage both sets of the transverse wires 14 and 19, and when heated the wires 14 and 19 are brazed to the straight lengths of the tubing 12 and the wires 13 are brazed to the tube 10 at the engaged points thereof by the copper coating on the tube which is applied thereto. The entire assembly is maintained together by brazing material which, in case a wire should tear from the tube, will rupture rather than the material of the tube 10, which would occur if a weld were employed. The indentations formed in the tube by the wires have a decided beneficial effect in causing turbulence and ebullition of the liquid passing through the sinuously formed tube 10 which thereby produces a better transfer of the heat from the tube wall and wires 13 and 18 to the refrigerant passing through the tube.

In Fig. 4, an oval-shaped tube is illustrated as having the transverse wires 14 and 19 brazed therein, with the spaced parallel wires indented into the tube on opposite sides of the tube a slight amount which increases the area of engagement between the wires and the tube to produce a better flow of heat therethrough, aided by the turbulence and ebullition of the refrigerant passing through the tube.

In Fig. 5 a construction is illustrated, similar to that illustrated in Fig. 1 with the exception that the straight portions 21 of a sinuous tube 22 are disposed at an angle from the loops therebetween so that when the exchanger is disposed in a vertical plane the fluid will flow by gravity through the tube to the bottom thereof when the refrigeration apparatus is shut down. Otherwise, the formation of one or both of the wire frames and the application thereof to the tube will be the same as the assembly of Fig. 1. In the present instance, crossed wires 23, 24 and 25 are disposed at an angle to the wires 26 so as to extend along the straight portions 21 of the tube, as clearly illustrated in Fig. 5. In a similar manner, hog rings 15 are employed for securing one or both of the frames, whichever number is employed, to the sinuous tube before heat is applied thereto to produce the bonding of the wire frames thereto.

The frames may be of a width to extend only over the straight portions of the tube, and pressure may be applied to the assembly to sink the wires into the tube whether it is round or oval, which produces a restriction in the passage of the tube to produce turbulence to the refrigerant passing therethrough and a greater area of contact between the surface of the tube and the

wires so that a greater amount of brazing material will be employed therebetween to increase the heat conductivity between the points of engagement between the wires and the tube.

What is claimed is:

1. In a heat exchanger, a sinuously formed tube having straight portions and oppositely presenting end loop portions therebetween, a frame made of spaced wires joined by transverse wires welded thereto, and hog rings of brazing material securing said transverse wires to straight portions of said tube to retain said frame and tube in assembled relation before the assembly is heated to melt the rings.

2. In a heat exchanger, a sinuously formed tube having straight portions and oppositely presenting end loop portions therebetween, a frame made of spaced wires joined by transverse wires welded thereto, hog rings of brazing material securing said transverse wires to straight portions of said tube to retain said frame and tube in assembled relation, and a second frame on the opposite

side of the tube similar to said first frame and retained therewith in assembled relation on said tube by said hog rings, said hog rings retaining said frames assembled on said tube until said assembly is heated to melt the rings.

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