Dec. 23, 1941. R. M. STIKELEATHER 2,267,315

METHOD OF MAKING HEAT EXCHANGE UNITS

Original Filed Feb. 15, 1939

Fig. 1.

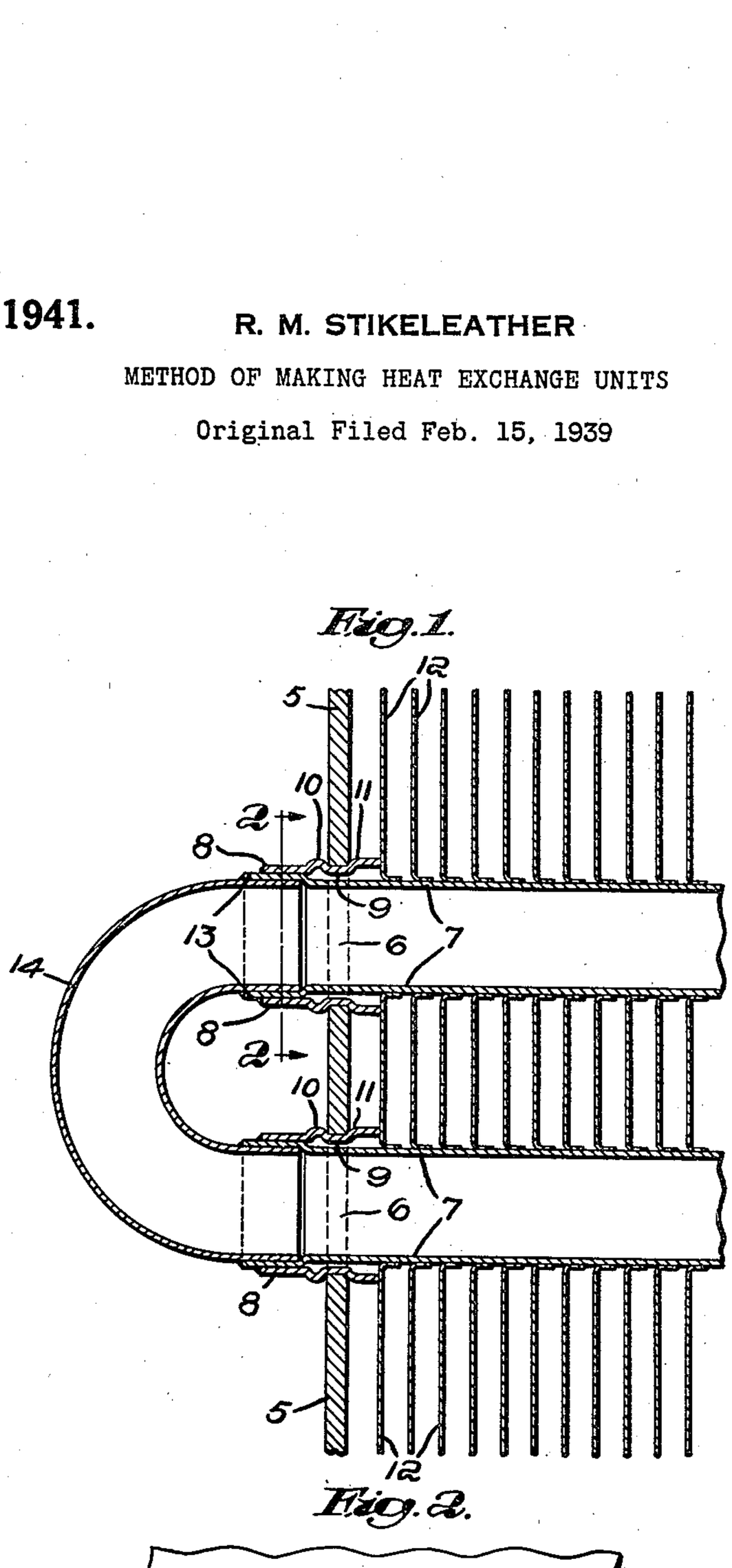
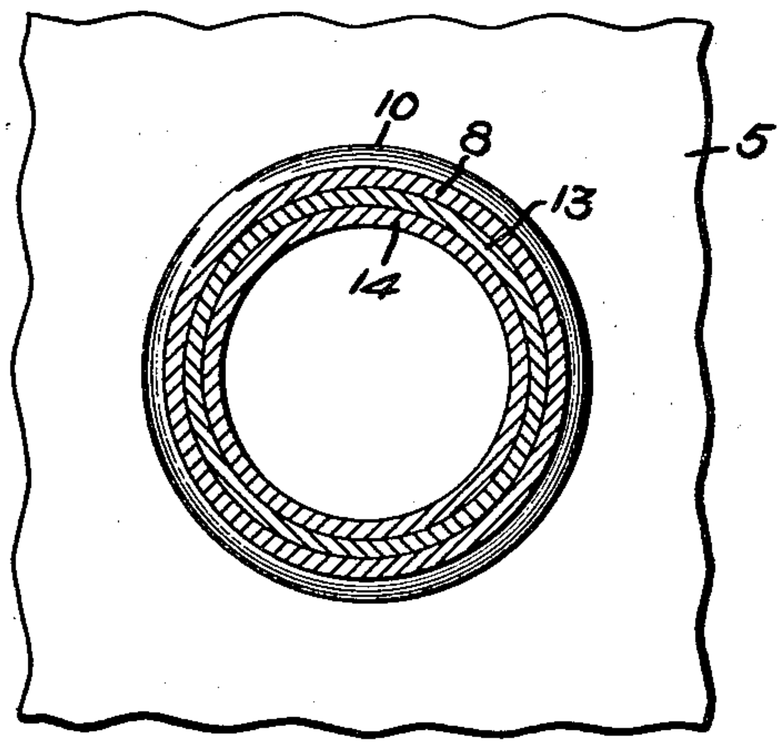



Fig. 2.

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## METHOD OF MAKING HEAT EXCHANGE UNITS

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Original application February 15, 1939, Serial No. 256,475. Divided and this application July 15, 1940, Serial No. 345,475

2 Claims. (Cl. 29—157.3)

This invention relates to heat exchange tubes and relates more particularly to methods and apparatus for anchoring heat exchange tubes in end plates extending transversely of the tubes.

This application is a division of my copending application Serial No. 256,475, filed Feb. 15, 1939.

For the conditioning of air it is convenient to provide heat exchange tubes such, for example, as refrigerant condensers and air cooling refrigerant evaporators in units including several horizontal rows of tubes, each row containing several tubes. The tubes are usually connected in a series-parallel circuit with respect to interior fluid flow, by return bends at the ends of adjacent tubes. It is also usual to provide vertically extending end plates at the ends of the tubes, the end plates containing circular openings through which the tubes extend, with the end plates between the ends of the tubes and the return bends. The end plates serve as air guiding passages and to support and align the tubes.

Heretofore it has been the practice to either solder or braze the end plates directly to the tubes. Neither practice has proved satisfactory. For duties such as for railroad cars where considerable motion and vibration is present, the end plates move relative the tubes and loosen the soldered joints. To braze the end plates to the tubes requires that the end plate and tubes be raised to the brazing temperature. Such high temperatures result in the relatively thin fins adjacent the end walls, always used on this type of tube, being burned and weakened.

According to this invention tubular bushings are expanded into the circular openings in the end walls and the outer ends of the bushings are brazed to the ends of the tubes while simultaneously the ends of the tubes are brazed to the return bends. The end walls and the bushings protect the extended surface fins from the high brazing temperatures.

An object of the invention is to improve the method of securing end plates to heat exchange tubes.

Another object of the invention is to anchor end plates more securely to heat exchange tubes without damaging the tubes.

Other objects of the invention will be apparent from the drawing and the following description.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a side elevation in section of a heat exchange tube assembly embodying the invention, and

Fig. 2 is a sectional view along the line 2—2 of Fig. 1.

Each end plate 5 is first provided with circular apertures at 6, each aperture being substantially greater in diameter than the copper tube 7 it is to receive. The plates 5 are then tinned in the circular apertures with solder. Tubular copper bushings 8 have portions adapted to fit into the apertures 6 correspondingly tinned and the bushings are then placed within the apertures and are expanded into the end plate by a suitable tool to take the shape chosen by Fig. 1 of the drawing. The expanded bushings have recessed portions 9 which fit into the circular apertures 6 and have the raised shoulder portions 10 and 11 on each side of each recessed portion 9.

The plate 5 is then placed on the tubes and its position is regulated by the shoulders 11 contacting at their inner edges the outer edges of the innermost fins 12 which thus space properly the position of the tube ends with respect to the outer ends of the bushings 8. The outer ends 13 of the tubes are then flared as illustrated by Fig. 1 with the outer ends of the bushings 8 so as to tightly contact same. The return bend 14 is then placed in position as shown by Fig. 1 with its two ends within the flared portions 13 of the tubes.

After the above described assembly operations have taken place, heat is applied to the outer portions of the bushings 8 and the flared portions 14 of the tubes, brazing compound is flowed in between the bushings 8 and the flared portions 13 of the tubes and between the ends of the return bend and the flared portions 13, and the bushings are brazed to the flared portions of the tubes and the flared portions of the tubes are brazed to the ends of the return bend. Sufficient heat is also transmitted through the bushings 8 to cause their tinned portions to become sweated to the correspondingly tinned apertured interiors of the walls 5.

The end wall 5 protects the fins 12 from the brazing heat. It is to be observed further that the end wall is not attached directly to the tubes as in the past but is attached to expanded bushings which are spaced from the tubes where attached to the end walls, thus providing flexibility and a more rugged assembly.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not

limited to the exact apparatus and arrangements of apparatus shown as modifications may suggest themselves to those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. The method of attaching an end plate and a return bend to a tube which comprises aperturing the plate, expanding one end of a tubular bushing into the aperture, placing the plate on the tube with the other end of said bushing around one end of the tube, flaring said one end of the tube into said other end of said bushing, placing one end of said bend within the flared portion of said tube, and simultaneously brazing said bushing to said tube and said tube to said return bend.

2. The method of attaching an end plate to a tube which comprises aperturing the plate, tinning the periphery of the aperture with solder, tinning an intermediate exterior portion of a tubular bushing with solder, placing the tinned portion of the bushing within the aperture, expanding the bushing into the aperture, placing the plate over the tube with the outer end of the bushing around one end of the tube, and brazing the bushing to the tube while simultaneously through the conduction of heat through the bushing, sweating the tinned areas of the bushing and the plate together.

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