

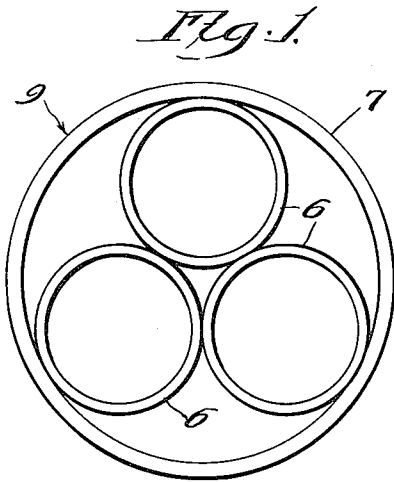
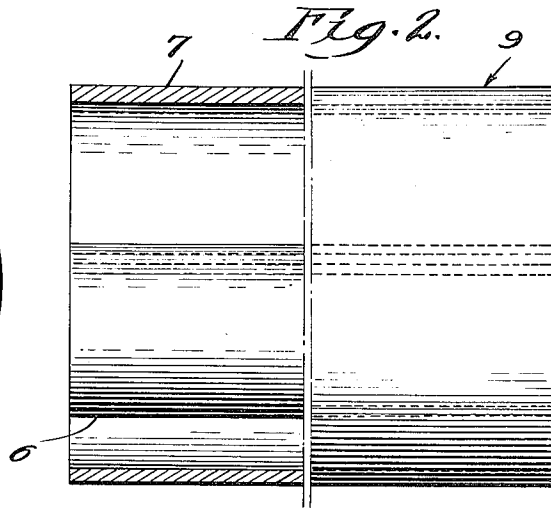
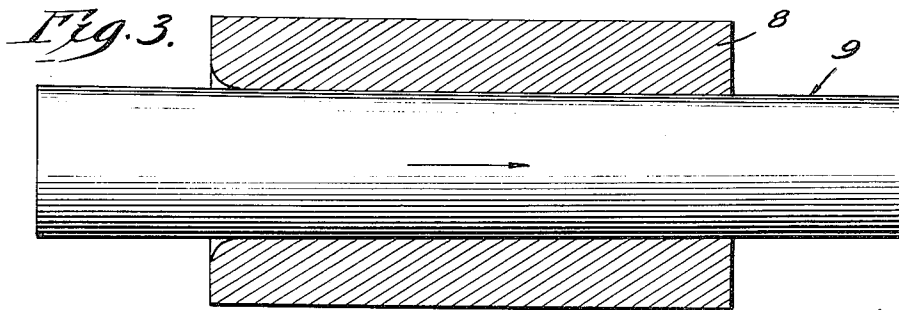
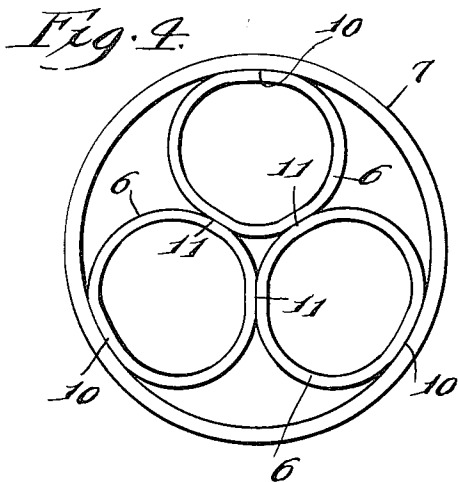
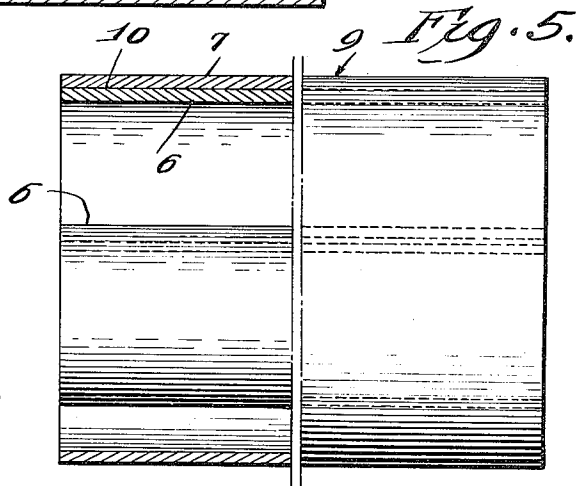
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METHOD OF MAKING HEAT EXCHANGER TUBE

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2,722,733

METHOD OF MAKING HEAT EXCHANGER TUBE

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1 Claim. (Cl. 29—157.3)

This invention relates to a heat exchanger tube and more particularly to a new tube and the method in which it is made.

Space may be saved in heat exchangers, by providing an increase in heat exchange area within each tube to decrease the number of tubes necessary to effect a given quantity of heat exchange. This may be accomplished by utilizing a tube having internal fins.

It is the principal object of this invention to provide a new and improved heat exchanger tube, made by a new and improved method.

Another object is to provide a new and improved method for manufacturing an internally finned heat exchanger tube of commercially available material without the aid of bonding agents between the tube and the internal fins.

Another object is to provide a method of securing smaller tubes in side by side relation within a larger tube to make an internally finned heat exchanger tube without the aid of bonding agents, and so that the larger tube will have a positive sealed wide line of contact with each of the smaller tubes through all operating temperatures to which the heat exchanger tube may be subjected.

Other objects and advantages will be apparent from the description of a particular embodiment illustrated in the accompanying drawings in which:

Fig. 1 is an end view of an assembly of small tubes placed inside a single larger tube with the inner tubes loosely in place; Fig. 2 is a broken side view, partly in section, of the tubes shown in Fig. 1; Fig. 3 is a diagrammatic side view of a die through which the assembly of Figs. 1 and 2 may be passed; Fig. 4 is an end view of the assembly after it has passed through the die; Fig. 5 is a broken side view, partly in section, of the assembly shown in Fig. 4.

While we have shown and shall hereafter describe a certain embodiment of our invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claim.

Many heat exchangers employ a tube bundle within a shell arranged to have a hot fluid pass around and between the tubes to heat a relatively cooler fluid passed through the tubes between headers on the shell. The heat exchange is thus affected by conduction through the walls of the tubes and it logically follows that, other things being the same, with greater area available for conduction of heat will come greater heat exchange. Where, due to the nature of the fluids or other materials on the two sides of the heat exchanger, it is desirable to increase the exposed area on the inside of a tube, this has sometimes been accomplished by employing internally finned tubes. This invention is concerned with a new and improved tube of the internally finned type.

As shown in Figs. 1 and 2, three relatively small tubes 6 are placed in side by side relation so that their axes

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are mutually parallel. These tubes 6 are then placed within a single larger tube 7 so that all the axes of the tubes are then parallel. The sizes of the respective tubes 6 and 7 are so chosen that the smaller tubes may be easily inserted or withdrawn from the larger, yet substantially fill the larger without room for an additional tube 6 of the same size. Generally, the tubes 6 are slightly shorter than the tube 7 so as to facilitate the necessary operations for installing and connecting the tubes. It is contemplated that all of the space within the tube 7, both inside and around tubes 6, will contain the same fluid or other material, the tubes 6 through their contact with the tube 7 acting as internal fins thereon.

In the embodiment shown, three small tubes have been placed within a single larger tube. This number may vary according to the area of fins desired within the larger tube 7.

After the tubes have been assembled as illustrated in Figs. 1 and 2, the assembly 9 may be passed through one or more dies 8 (Fig. 3). Each die is tapered in the direction of the arrow to draw the outer tube 7 to a smaller diameter throughout its entire length. By contracting or reducing the diameter of the outer tube 7, the smaller tubes and outer tube are drawn together along longitudinal lines of contact between their walls. The assembly is reduced in diameter a sufficient amount to cause the inner tubes 6 to flatten along areas 10 along the line of contact of the tubes 6 and the outer tube 7, and along contacting lines 11 between adjacent pairs of tubes 6. This flattening serves several purposes, in that it increases the area of intimately contacting metal between the tubes, thus increasing available surface between tubes for heat transfer by conduction, insures that an intimate contact is made between the tubes along the entire length of the tubes and that such contact is maintained during any expansion or contraction of the tubes due to temperature changes. The tubes may have some resiliency imparted to their walls when the assembly is passed through the dies, thus making the inner tubes press against the outer tube to maintain intimate contact.

It is important that the best possible heat transfer between the walls of the outer tubes 7 and the fins formed by the inner tubes 6, be accomplished. The tube of this invention is advantageous in this regard. The assembly 9 may be reduced in diameter uniformly along its entire length, thus insuring intimate contact between all the tubes. The difficulty of brazing or soldering the tubes together is eliminated as well as the uncertainty in making a good heat conductive union between the tubes.

If it is desired that the outer diameter of the assembly remain the same as the original size of the tube 7, one or more of the smaller tubes may be expanded instead of reducing the diameter of the larger tube 7. This method accomplishes the same result and the same resiliency may be imparted to the walls of the tubes to maintain the intimate contact between them.

As an example of the use of a tube made in accordance with this invention, a heat exchanger was equipped with 80, 1 3/4" tubes each having three internal smaller tubes and provided the same amount of available heat transfer area as a much larger heat exchanger having 400, 1" tubes. The same size heat exchanger as the one containing 1" tubes would be large enough to contain approximately 300, 1 3/4" tubes. A great savings in space was thus effected.

We claim:

The method of making a heat exchanger tube comprising, placing three round cross section tubes of the same diameter within a single larger tube so that the axes of all the tubes are parallel and each tube is in contact

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with all the others, then reducing the diameter of the larger tube to force all the tubes into heat conductive contact through intimately contacting wall surfaces and then stopping the reduction of the larger tube after the contacting portions of the tubes have flattened to provide said contacting walls and before materially changing the size of the passages through the tubes.

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