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TURBULENCE MEANS FOR RADIATOR TUBES

Filed July 15, 1935

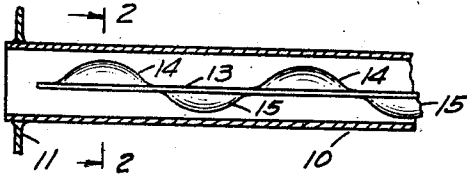


FIG. 1

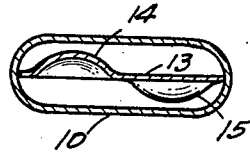


FIG. 2

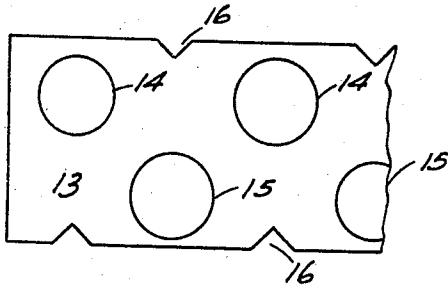


FIG. 3

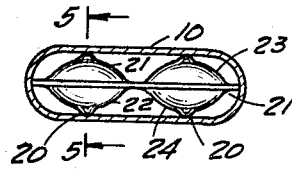


FIG. 4

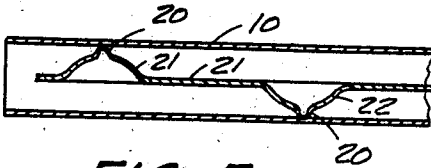


FIG. 5

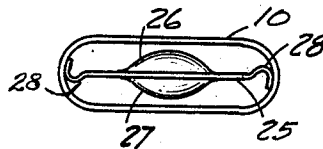


FIG. 6

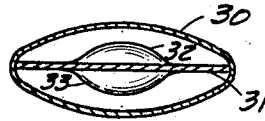


FIG. 7

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TURBULENCE MEANS FOR RADIATOR
TUBESFred M. Young, Racine, Wis., assignor to Young
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6 Claims. (Cl. 138—38)

In conventional radiators or heat transfer devices, for various reasons, flattened or oval tubes have been found more desirable than round tubes. With either it is customary to supply closely spaced fins through which the tubes extend and are intimately associated, thus to increase the air contact surface.

Means on the tube fins are frequently provided to cause air turbulence. The present invention provides means for causing turbulence of the liquid as it passes through the tubes.

Low heat transfer efficiency is caused by skin friction which causes a very slow movement of the thin layer of liquid that is in direct contact with the inner walls of the tubes. The liquid in the center of the tubes may travel rapidly through the tube; however heat transfer must necessarily be through this slowly moving film of liquid to the tube surface.

I provide means whereby all of the liquid is caused to closely wipe the tube surface at frequent intervals, thus to break up the surface film and more readily transfer temperature from the main body of the liquid to the tube.

I accomplish these results by means of a centrally positioned thin metal strip having edges which contact the walls of the tubes and having suitably positioned embossments or projections thereon, whereby the liquid will be diverted in spots and crowded against the walls of the tubes, thus to break up the flow and mix the liquid and cause it to closely wipe the tube surface at frequent intervals.

It will be understood that some temperature transfer will also take place through the central strip to the walls of the tubes, at its contact therewith.

To these and other useful ends this invention consists of matter hereinafter set forth and claimed and shown in the accompanying drawing in which:

Figure 1 is a longitudinal transverse sectional view of a flat radiator tube showing a fraction of the usual tube header, illustrating one form of my tube strip in position.

Figure 2 is a transverse sectional view of the device shown in Figure 1, taken on line 2 of Figure 1.

Figure 3 is a side view of a fraction of my metal strip as shown in Figures 1 and 2.

Figure 4 is a sectional view of a tube and metal strip illustrating a means to more closely center the strip in the tube.

Figure 5 is a longitudinal transverse fractional

view of the device shown in Figure 4, taken on line 5 of Figure 4.

Figure 6 illustrates a modification.

Figure 7 is a transverse sectional view of an elliptical tube equipped with one form of my invention.

As thus illustrated in Figures 1, 2 and 3 the radiator tube is designated by reference numeral 10 and a fraction of a tube plate by numeral 11. My improved tube strip in its entirety, is designated by numeral 13. I provide embossments 14 and 15, each being of a suitable height so as to nearly contact the tube walls at the apex of the embossments. These embossments are preferably alternately positioned and in rows on the opposite sides of the strip. For example, embossments 14 form a row on one side of the strip and embossments 15 are positioned in a row on the other side of strip 13, embossment 15 projecting in the opposite direction to embossment 14 and alternately spaced.

I may however, elect to position embossments 15 directly opposite embossments 14; or the embossments on one side of the strip may be directed oppositely or alternately so that adjacent embossments are directed oppositely. Thus when the liquid is diverted and displaced by embossment 14, embossment 15 will tend to displace an equal quantity of liquid and re-divert the cross flow of liquid in the opposite direction. Clearly it will be seen that while the liquid will, at intervals, be crowded against the walls of the tubes, it will also be split or spread transversely, only to be again diverted, split and spread oppositely; thus turbulence will be set up which will not only cause the liquid to closely wipe the tube walls at frequent intervals as it passes through the tube, but it will also be diverted and divided at frequent intervals, whereby it will be thoroughly mixed so as to present the maximum and uniform temperature for wall contact.

Clearly the strip 13 and its embossments are at all times in intimate contact with the passing liquid and since the strip edges contact with the tube walls, some temperature change takes place between the liquid and tubes through the strips.

It will be understood that the embossments may be variously positioned and shaped or the diverting means may be other than circular in shape.

In Figures 4 and 5 I illustrate the embossments as having very small supplemental embossments or projections 20, adapted to contact the tube wall whereby the strip 21 will be held in a central position and another heat transfer means pro-

vided between the strip and the tube. In this design embossments 21 and 22 are alternately positioned on one side of the strip and embossments 23 and 24 are similarly positioned on the other side of the strip.

In Figure 6 I illustrate a modification wherein the strip 25 is provided with a single row of centrally positioned embossments 26 and 27. These embossments may be somewhat larger in diameter than those shown in Figures 1 to 5, or they can be made oblong in a transverse direction or otherwise shaped for the purpose herebefore outlined. I provide curved portions 28 on both edges of strip 25 whereby the strip will be caused to yieldingly contact the tube and form a larger contact surface for reasons which will be apparent.

In Figure 7 I illustrate my improvement adapted to serve preferably, an oval tube 30 having a strip 31 as in the other designs. In this design the projections 32 and 33 are formed as illustrated and positioned in the center of the strip or otherwise and alternately on opposite sides thereof. These projections will cause the liquid to impinge the walls of the tube alternately.

Clearly applicant's device may be used to advantage on any kind of heat transfer cores and for this reason it has not been shown as associated with any particular design of core. It will be understood that the embossments may be variously shaped and positioned, therefore many minor changes may be made without departing from the spirit and scope of this invention.

Having thus shown and described my invention, I claim:

1. A radiator tube of the class described, having means to cause turbulence in the liquid passing therethrough, said tube having a flattened shape in cross section, said means comprising a metal strip adapted to be held midway between the side walls of said tube and having a number of spaced spherically shaped embossments positioned alternately on opposite sides thereof.

2. A radiator tube of the class described, having means to cause turbulence in the liquid passing

therethrough, said tube having an elliptical shape in cross section, said means comprising a metal strip adapted to be held midway between the side walls of said tube and having a number of spaced spherically shaped embossments positioned alternately on opposite sides thereof.

3. A radiator tube of the class described, having means to cause turbulence in the liquid passing therethrough, said tube being elongated in cross section, said means comprising a metal strip adapted to be held midway the side walls of said tube and having a number of spaced spherically shaped embossments whereby the passing fluid will be directed at intervals against the side walls of said tube, said embossments being positioned alternately on opposite sides of said strip.

4. A tube of the class described, having means therein to cause turbulence in the liquid or gas passing therethrough, said means comprising a metal strip adapted to be held midway in said tube and having a number of spaced apart bulging embossments each adapted to force the passing liquid or gas to impinge the wall of said tube, said embossments positioned alternately on opposite sides of said strip.

5. A heat transfer tube of the class described, comprising means therein to cause turbulence of the gas or liquid passing therethrough, said means comprising a metal strip having a number of spaced apart embossments formed therein alternately on opposite sides and edges and adapted to cause the passing liquid or gas to closely impinge the walls of the tube at spaced intervals, said embossments being formed by pressing the material into bulged raises.

6. A radiator tube of the class described, said tube having a flattened shape in cross section and a metal strip positioned therein, said strip having alternately positioned spaced apart embossments on opposite sides thereof, relatively small projections formed on the apex of said embossments which are adapted to contact the walls of said tube and hold said strip in a central position therebetween.

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