HEAT INTERCHANGE APPARATUS

Fig. 1

Fig. 2

Fig. 3

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Patent Drawing
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This invention relates to heat interchange apparatus of the type comprising a system of thin-walled metal tubes each of which is of elongated or flattened form in cross section, that is to say the width of each tube in one direction is very considerably greater than its width in a direction at right angles, and in each of which tubes a thin sheet metal web is arranged to serve both for strengthening the tube and increasing the rate of heat conduction from fluid flowing through the tube. In particular the invention relates to apparatus of this type used as oil, water, or other liquid coolers in association with internal combustion engines for aircraft, road vehicles and other purposes.

The object of the present invention is to provide an improved tube of the above described form for the purpose of further enhancing the rate of heat transfer.

In the accompanying sheet of explanatory drawings—

Figures 1 and 2 are respectively a part sectional side elevation and a sectional end elevation of a tube embodying the invention.

Figure 3 is a fragmentary sectional view illustrating the manner in which a plurality of tubes as shown in Figures 1 and 2 are employed in a liquid cooler.

In carrying the invention into effect as shown in Figures 1 and 2, we construct in any convenient manner from thin sheet metal a tube a of flattened or elongated form in cross section. For convenience of illustration the tube a is shown as seamless, but actually it is provided with a seam along one edge or side. Within the tube a is inserted a thin sheet metal web b of corrugated form, the width of the web being equal to or slightly smaller than the major width of the tube, and the corrugations being of rectangular or other form. Along each of the corrugations in the web b we stab a row of holes c, the holes in each row being preferably staggered. The metal displaced at each hole c by the stabbing operation is not severed as in a clean punching operation, but is caused to project from the inner surface of the corresponding corrugation of the web b in the form of an annular flange d around the hole. Moreover, we preferably so carry out the stabbing operation that the outer edge of each flange d is

of jagged form as shown. The length of each flange d may be such that it extends almost into contact with the adjacent inner surface of the tube a.

The web b serves not only to strengthen the tube b, but also (by contact with the inner surfaces of the tube) to promote heat flow to the tube from liquid flowing through the tube.

It will be seen from the drawing that in a tube constructed as above described, the parallel channels e formed along the interior of the tube (by the corrugations of the web b and the inner surfaces of the tube) are each partially obstructed by a row of staggered projections in the form of jagged flanges d. These do not detrimentally retard the flow of liquid along the tube over the web but do exert on such liquid an advantageous scrubbing action which enables a greater rate of heat transfer to be obtained from the liquid than a webbed tube of ordinary form.

In employing a plurality of tubes a as above described to form the liquid cooler illustrated in Figure 3, the tubes are inserted through perforated gill plates f, and secured at their ends to supporting plates as g which form parts of or are secured to headers (not shown) in the usual manner.

Whilst the invention is especially intended for use in oil coolers, it may be employed in water coolers, for internal combustion engines, and for other analogous purposes.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. For use in heat interchange apparatus of the kind specified, a tube having within it a corrugated sheet metal web which forms within the tube a plurality of parallel fluid-flow channels and which is provided along the bases of the channels with lateral projections in the form of flanges surrounding holes in the web.

2. A tube as and for the purpose claimed in claim 1, in which the flanges forming the lateral projections have jagged outer edges.

3. A tube as claimed in claim 1, in which the corrugations in the web are of rectangular form.

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