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HEAT EXCHANGE APPARATUS FOR FLUIDS

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FIG. 1.

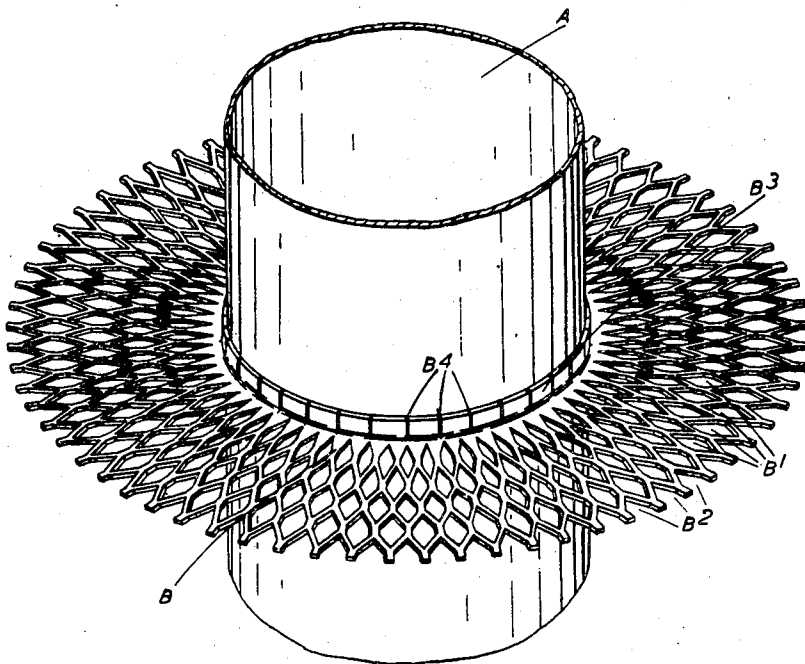
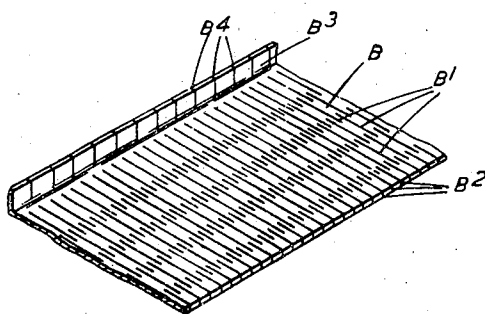


FIG. 2.



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HEAT EXCHANGE APPARATUS FOR FLUIDS

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2 Claims. (Cl. 257-262.16)

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This invention relates to heat exchange apparatus of the kind in which a fluid is passed through a tube or other hollow body the outer wall of which is curved and provided with metal fins extending away from the surface, and is particularly but not exclusively applicable to tubes having a series of separate annular radially extending gills or fins or a continuous radially extending helical gill.

Hitherto when such fins are formed from strip metal it has been the practice to crimp the edge of the strip which is applied to the wall of the tube. It has also been proposed to employ fins formed from expanded metal by which term is to be understood sheet metal which has been provided with a series of slits arranged in staggered relationship and then expanded so that the slits open to provide a trellis like structure.

In such expanded metal the metal strips which form the boundaries between the holes are distorted by the expanding process so that they are not plane surfaces while moreover it is difficult to secure a satisfactory heat conducting connection between the edge of a strip of such expanded metal and the curved surface of a tube or the like, especially as it is necessary to distort the strip still further by compressing the expanded portions of the metal adjacent to the tube.

The present invention aims at reducing or eliminating the difficulties presented by the present practice and at providing a generally improved construction of heat transfer apparatus of the kind referred to.

To this end according to the present invention a secondary heat transfer surface is applied to the curved surface of a heating or cooling element by slitting the sheet metal strip in readiness for expanding into expanded metal and expanding the strip during the application of the appropriate edge thereof to the curved surface of the heating or cooling element or to a "former" surface having the same curvature as the heating or cooling element to which the expanded material is to be applied, the "former" surface being used as a ready means of ensuring the correct shaping of the expanded metal prior to its application to the surface of the heating or cooling element.

Thus, a heat transfer tube or other element having a convex curved surface according to the present invention has connected to it the substantially unexpanded edge of a strip of metal which projects from the curved surface and has been slit and expanded over the various parts of its area to the degree called for by the applica-

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tion of the unexpanded edge to the curved surface.

Preferably the edge of the strip which is connected to the curved surface is substantially continuous and further is bent with respect to the rest of the strip so as to provide a flange having a substantial area in contact with the curved surface for heat transfer. Thus in one preferred form a heat transfer tube according to the invention has applied to its outer surface a series of radial fins or a continuous helical fin formed from metal strip the inner edge of which is bent up approximately at right angles to the plane of the rest of the strip, and is substantially continuous and unexpanded where it is connected to the tube while the remainder of the strip is slit and expanded to the degree called for by the application of the inner edge to the tube without appreciable distortion.

The invention may be carried into practice in various ways but one construction according to the invention is illustrated in perspective in the accompanying drawings, in which

Figure 1 is a perspective view of a tube having a heat transfer fin applied to it according to the present invention, and

Figure 2 is a perspective view of a part of a strip of metal suitable for forming a heat transfer fin according to the present invention.

In the construction illustrated a heat transfer tube A has applied to its outer surface a heat transfer fin formed from a strip of metal which in its initial state before application to the tube is formed as shown at B in Figure 2 with a series of slits B¹ arranged in staggered relationship the outer row of which extend as shown at B² through one edge of the strip while the other edge B³ of the strip is substantially continuous and is bent at right angles to the remainder of the strip, the part bent at right angles being if desired provided with a series of slits B⁴ to increase its flexibility.

The strip formed as shown in Figure 2 is applied to the tube A so that its inner edge B³ is substantially unexpanded while the remainder of the surface of the strip expands to the varying degree called for by the bending of the inner edge round the tube as shown. The inner edge is conveniently soldered or otherwise connected to the tube in a manner ensuring good heat transfer between the tube and the fin.

In the construction illustrated the fin is shown as lying in one plane and in practice a series of such fins would be applied to the tube one above the other in a manner useful for sheet metal cooling fins.

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Alternatively a continuous helical fin formed from strip metal as shown in Figure 2 may be applied to the tube A. In either case it will be seen that the union between the inner edge of the fin and the tube can be such as to provide for good heat transfer since this inner edge is substantially undistorted by the expansion of the rest of the strip while the expanded metal provides a large superficial area for heat transfer.

What I claim as my invention and desire to secure by Letters Patent is:

1. A heat conducting device, comprising a sheet metal strip having spaced first and second longitudinal edges and having spaced first and second groups of transverse slits therein to permit expansion thereof, each of said groups of slits including a plurality of transversely aligned slits and the slits of said first groups being staggered with respect to the slits of said second groups, the slits of said groups which are nearest said first longitudinal edge terminating at points spaced therefrom so as to render said first longitudinal edge continuous, the slits of said groups which are nearest said second longitudinal edge extending through said longitudinal edge to render the same discontinuous, said strip being bent along a line parallel to and spaced from said first longitudinal edge to provide a flange for attachment to a convex surface, the transverse slits nearest the said first longitudinal edge extending substantially to the line of bend, said strips being unexpandable at said first longitudinal edge and being expandable to a progressively increasing extent throughout its width from said first longitudinal edge to said second longitudinal edge.

2. In a heat conducting device, the combination of: a heat conducting member having a convex surface; and a strip of metal having spaced first and second longitudinal edges and having alternating first and second groups of transverse slits therein to permit expansion thereof, each of said groups of slits including a plurality of transverse-

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ly aligned slits and the slits of said first groups being staggered with respect to the slits of said second groups, the slits of said groups which are nearest said first longitudinal edge terminating at points spaced therefrom so as to render said first longitudinal edge continuous, the slits of said groups which are nearest said second longitudinal edge extending through said second longitudinal edge to render same discontinuous, said strip being arcuated substantially in its own plane to provide said first longitudinal edge with a curvature conforming to that of said convex surface and to expand said strip in directions substantially parallel to said first longitudinal edge, said strip being bent along a line parallel to and spaced from said first longitudinal edge to provide a flange for attachment to the convex surface of said heat conducting member, the transverse slits nearest the said first longitudinal edge extending substantially to the line of bend, said strip being substantially unexpanded at said first longitudinal edge and being expanded to a progressively increasing extent throughout its width from said first longitudinal edge to said second longitudinal edge, said first longitudinal edge being secured to said convex surface.

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