Sept. 28, 1948. D. E. MORGAN 2,450,203

RADIATOR FIN CONSTRUCTION

Filed Dec. 29, 1945

Fig. 1

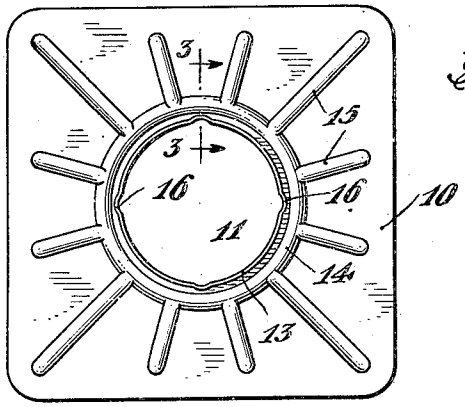


Fig. 2

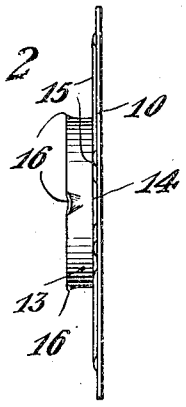


Fig. 3

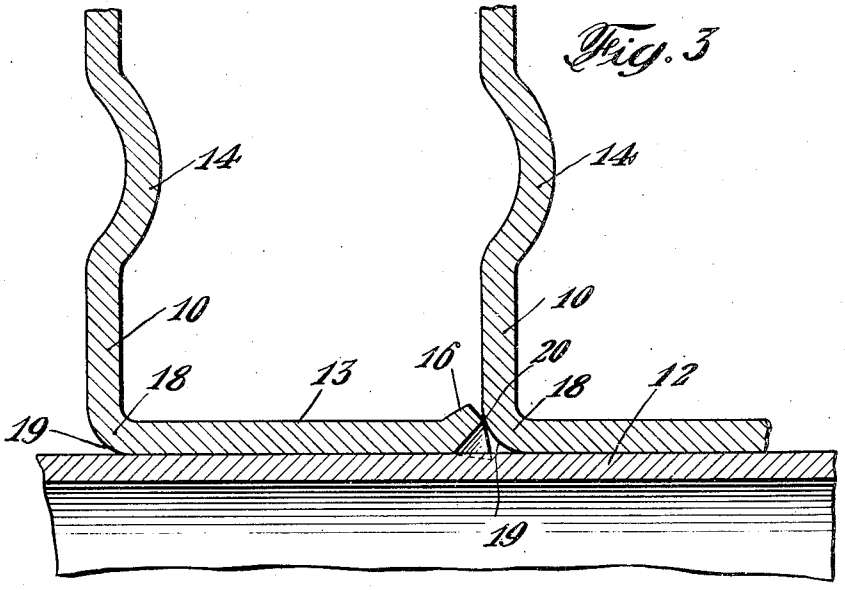
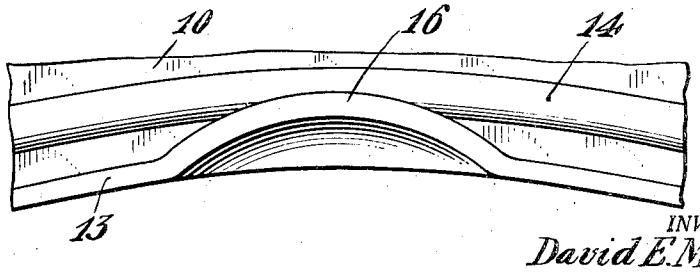


Fig. 4



INVENTOR.
David E. Morgan
BY
ward, Crosby & neal
ATTORNEYS

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RADIATOR FIN CONSTRUCTION

David E. Morgan, Philadelphia, Pa., assignor to Warren Webster & Company, Camden, N. J., a corporation of New Jersey

Application December 29, 1945, Serial No. 638,333

1 Claim. (Cl. 257—262.16)

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This invention relates to heat exchanging apparatus such as radiator constructions wherein heating fluid conduits are provided, having a multiplicity of spaced apart radiating fins.

In constructions of the class indicated it is common practice to use radiating fins which comprise thin flexible sheet metal plate-like portions which extend out transversely of the heating fluid conduit or conduits, an aperture or apertures being formed therethrough for the conduits, and each aperture being accompanied by an integrally formed flange for embracing the conduit to retain the plate-like portions in position, and also to act as spacing means between adjacent fins. In the usual case, such flanges comprise metal which has been struck out of the apertures, and in forming the flange the sheet metal is somewhat rounded in cross section at the junction of the flange with the plate-like portion. Because of this rounded formation, a narrow annular space or crevice occurs between the external surface of the conduit and the surrounding fin at the region of the line of juncture between the flange and fin. Consequently, there will be a tendency for the outer annular edge of the flange on the next adjacent fin to telescope into such crevice with the result that the fins will be irregularly spaced unless some stop means is provided. Also such telescoping may tend to expand portions of some of the fins which embrace the conduit and thereby tend to loosen the same. With constructions wherein the fins are secured to the conduits by expanding the conduits to cause the same to be firmly embraced by the fin flanges, the above noted difficulties may become particularly serious; that is, before the conduit or tube is expanded, the loosely surrounding fin flanges will have a greater tendency to more or less telescope irregularly.

It has heretofore been proposed to bend outwardly the outer annular edges of the fin flanges to thereby provide on each, a rim of greater diameter than the above-mentioned annular crevice under the next fin, such rim thus acting as stop means for maintaining the desired uniform spacing of the fins. In some cases, however, such constructions have certain disadvantages in that it may be difficult to form such rims uniformly and inexpensively since they have to be shaped of the metal which has been struck out of the fin apertures and greatly expanded. It is desirable to use, for example, very thin sheet aluminum in forming the fins, which adds to the difficulties of forming such spacer rims with

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the necessary accuracy and rigidity at the outer edges of the flanges.

According to the present invention an improved simple type of stop means is provided for the above indicated purposes in the form of a plurality of struck out portions located at spaced points around the edge of the fin flange. These struck out portions or detents may, in the usual case be rather widely spaced, although if preferred in some cases, they may be so closely spaced as to give the edge of the flange a substantially corrugated formation. The detents are such that they may be inexpensively, accurately and quickly formed with simple forms of dies.

If a continuous rim is provided around the edge of the fin flange to prevent the above-mentioned telescoping action, then when the conduit or tube carrying the fins is expanded for purposes of securing the fins in place, there may be a tendency for such continuous rims to be pressed out against the next adjacent fin with sufficient force to expand or warp portions of the latter out of their intended position. On the other hand, with the use of spaced detents according to the present invention instead of a continuous rim, the expansion of the tube does not tend to expand or loosen the adjacent fin since the detents will yield or somewhat indent the adjacent fin without tending to stretch or expand it out of proper contact with the tubing.

In accordance with the preferred form of the invention, each of the fins is also formed with a continuous annular corrugation surrounding and in closely spaced relation to the tube, there being spaced radial corrugations starting at such annular corrugation and extending outwardly therefrom. This arrangement of corrugations or strengthening ribs gives the greater part of the fin area a relatively uniform degree of rigidity, while leaving a narrow and relatively flexible area adjacent the tube so that if a series of the fins are pressed or jammed firmly together, and if the detents deflect the metal of the adjacent fins, the deflection will be confined to such narrow flexible area without warping the main areas of the fin, and also as the tube is expanded this narrow flexible annular area will limit any resulting tendency of the fin to warp, to the area within the annular corrugation.

Various further and more specific objects, features and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification and illus-

trate merely by way of example, a preferred form of the invention.

In the drawings:

Figure 1 is a face view of one form of fin construction embodying the invention;

Figure 2 is an edge view of same;

Figure 3 is an enlarged detailed sectional view showing portions of a conduit and portions of two adjacent fins thereon, and formed in accordance with a preferred example of the invention; and

Figure 4 is an enlarged face view of one of the detent portions, several of which are shown in smaller scale in Figure 1.

The fin 10 as shown in Figure 1 is formed with a central aperture as at 11 for receiving the heating fluid conduit, such aperture being accompanied or surrounded by an integral flange 13. If desired one or more annular corrugations or like formations as at 14 may be provided to extend around in spaced relation to the apertures to increase the rigidity of the construction. Also, if desired, such corrugations may be supplemented by a plurality of radially extending corrugations as indicated at 15. The particular arrangement of corrugations shown is highly effective for maintaining the rigidity to the whole surface area of the fin, thereby preventing transverse bending thereof, while at the same time leaving the central portions surrounding the aperture and flange in a relatively more resilient condition such that when the tube is expanded into position within the flange the fin will not tend to be warped out of shape.

As shown in Figures 1 and 2 the outer edge of the flange 13 is formed at spaced points with struck out portions or detents as at 16, the form of these detents being more clearly shown in the enlarged views of Figures 3 and 4. In Figure 3 portions of two of the adjacent fins 10 are shown as embracing a conduit or tube 12. It will be noted that at the region of juncture between the main fin surfaces and the flanges 13, the cross section of the metal is somewhat curved as at 18 so that annular cavities or crevices as at 19 occur, and within which, in the absence of the detents 16 the edges of the flange on the adjacent fin would tend to telescope. However, as shown in Figure 3, because of the somewhat rounded detents 16, there will be substantially a point contact as at 20, between the edge of the flange at the location of the detent and the metal of the fin, substantially at or just above the area where the curved portion 18 merges into the flat area of the fin. Consequently, when the fins are loosely placed on the tube 12 and prior to expansion of the tube, the detents will effectively prevent any tendency of each fin and the flange of the adjacent fin from telescoping. Then when the tube is expanded, as by suitable application of internal pressure, in order to bring the fin flanges into firm embracing engagement with the tube, the detents 16 will continue to prevent such telescoping action. If during the step of expanding the tube, the fin flanges should be expanded somewhat so as to force the detents radially outwardly as compared with the position of the adjacent fin, there will still be no tendency for the detents to expand the adjacent fin or bend it out of shape. Instead, the detents being in contact with the fin only at spaced points will readily yield, slide up on the fin surface, or perhaps slightly indent the fin without danger of warping same.

Since the detents 16 involve only a limited small area of metal they may be readily and accurately shaped with simple forms of dies without undue stretching of the relatively thin metal at the outer edge of the flange, even though such metal has been expanded considerably in the operation of striking up the flange from the metal of the aperture 11. The protuberances or detents being in the form of smoothly arched corrugation-like areas are not likely to bend out of place or to catch on other articles and be distorted when the fins are being handled prior to assembly on the tube or conduit.

Although the invention has been more particularly described in reference to its use on radiator constructions adapted for heating purposes, it will be understood that the constructions herein claimed may be used for other forms of heat exchanging apparatus, including refrigeration or cooling apparatus.

Preferably the heating fluid conduit or tube may be expanded within the fin flanges by the use of the method and apparatus for freezing a liquid within the tube as disclosed and claimed in my co-pending application, Serial No. 605,698, filed July 18, 1945, and reference to which is hereby made.

While the invention has been described in detail with respect to a particular preferred example, it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claim to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

Heat exchanging apparatus comprising a metal tube, a plurality of closely spaced flexible thin sheet metal fins, each fin being provided with an aperture for receiving the tube, an annular integral spacing flange on each fin and surrounding the tube at the aperture, the tube being of such diameter that it presses radially outwardly against the inside surfaces of said flanges, and whereby the flanges securely embrace the tube, each fin being formed with a continuous annular corrugation surrounding and in spaced relation to the aperture thereof, the area of the fin within such corrugation being a narrow flat annular portion in a plane perpendicular to the axis of the tube, and a plurality of spaced corrugations being formed on each fin and extending respectively radially outward from the annular corrugation.

DAVID E. MORGAN.

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