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F. M. YOUNG

1,992,646

HEAT TRANSFER DEVICE

Filed April 20, 1934

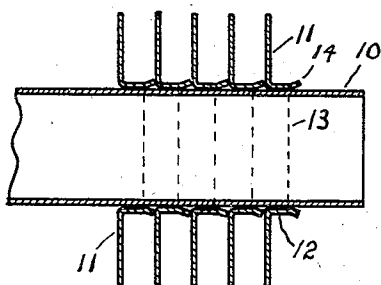


Fig. 1

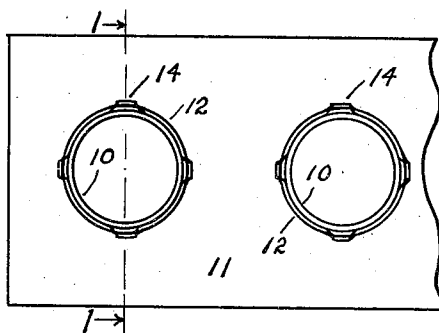


Fig. 2

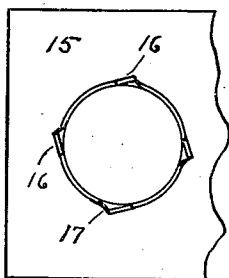


Fig. 3

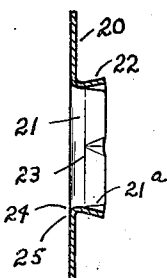


Fig. 4

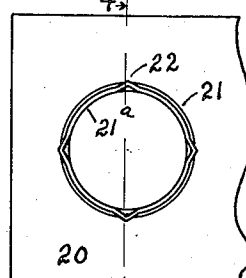


Fig. 5

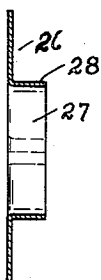


Fig 6

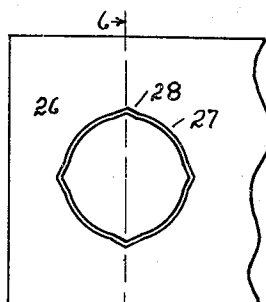


Fig 7

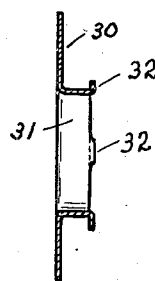


Fig 8

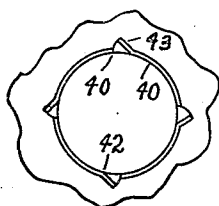


Fig 9

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UNITED STATES PATENT OFFICE

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HEAT TRANSFER DEVICE

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4 Claims. (Cl. 257-263)

My invention relates to the class of device commonly called radiator cores, wherein a multiplicity of fins are closely spaced on circulating tubes, to thereby greatly increase the area of the radiating surface. It will be understood that applicant's device may be used for heating or cooling air, liquid, or gas, and that a coolant or heating liquid or gas may be circulated through the tubes or otherwise.

My device applies particularly to the manner of holding the fins in spaced relation, particularly so during the assembling and bonding operations. It also applies to means for supporting or stiffening the fins, and further it applies to a manner of providing a fin sleeve which will yieldingly embrace the tube; it further applies to integral sleeves and spacers without the necessity of making the sleeve the length of the space between fins to thereby simplify the drawing operation and prevent splitting.

To the foregoing and other useful ends my invention consists in matter hereinafter set forth and claimed and shown in the accompanying drawing in which:

Figure 1 is a sectional view taken on line 1 of Figure 2, showing a fraction of a circulating tube and a number of fins thereon.

Figure 2 is a fractional end or top view of a radiator core, having a single row of tubes.

Figure 3 is a fractional top view of a fin similar to that shown in Figures 1 and 2, except that the projections on the ends of the sleeves are twisted or bent outwardly at one side only.

Figures 4 and 5 illustrate a modification wherein the end of the sleeve is uniform and wherein V-shaped projections provide a rest for the adjacent fin, Figure 4 being a section taken on line 4 of Figure 5.

Figures 6 and 7 illustrate a further modification, Figure 6 being a section taken on line 6 of Figure 7.

Figure 8 illustrates sectionally a sleeve structure similar to that shown in Figures 1 and 2 except the sleeve projection is bent outward at right angle to the tubes.

Figure 9 illustrates a fractional top view of a modification.

One of the difficulties of using fin sleeves as spacers is that they frequently telescope each other, because the material is very thin, the sleeve does not always closely embrace the tube during the assembling operations, and there is a fillet at the point where one sleeve contacts the adjacent sleeve, into which the sleeve end may easily enter, and further when the sleeves

are long enough to act as spacers they are frequently split badly during the drawing operations. In applicant's preferred design, the sleeves may be conventional in length, because narrow projections are provided on the end of the sleeves which are suitably formed to thereby answer as spacers.

Figures 1, 2, 3 and 8 illustrate one form of applicant's invention. The numeral 10 designates the circulating tubes. In Figures 1 and 2, 11 designates the fin strips. In Figure 2 a fraction of a core is shown having a single row of tubes and fin strips suitable therefor. Cores of the type frequently comprise two, three or more rows of tubes, with individual fins or fin strips of a suitable width therefor, forming cores, frequently of considerable width and 10 feet or more in length. Obviously the assembling operation of the larger sizes is no simple matter. The sleeves for convenience in assembling must not fit very close on the tubes, therefore it is customary to expand the tubes after assembling the fins thereon and before the bonding operation. My improved sleeve spacer acts to hold the fins in a definite spaced relation until after the tubes have been expanded and the bonding is completed.

To form my improved sleeve, holes are first punched in the fins from which to draw the sleeves 12 (see Figures 1 and 2) the punch having a shape whereby a suitable number of narrow projections 14 are provided on the end of the sleeve. During the drawing operation or afterward, these projections 14 are bent outward slightly as clearly indicated in Figure 1. Thus they will not slip between the adjacent sleeve and the tube, and will, to some extent provide a stiffening means for the adjacent fin after the bonding operation, as well as a definite spacing means for the fins before the tubes have been expanded. The sleeve 12 is considerably shorter than the space between fins, the end terminating as at 13 as shown in dotted lines in Figure 1.

In Figures 1 and 2, I indicate the projections 14 as having been bent slightly outward. In the design shown in Figure 3 the projection 16 is similar to projection 12 of Figure 1. However the punch may be shaped to thereby twist the projections, whereby they will, after the drawing operation, be left in the form shown, one edge only being bent outwardly as at 17, thus forming a seat upon which the adjacent fin may rest as in Figures 1 and 2.

In Figures 4 and 5 I illustrate a further modification wherein the fin 20 is provided with sleeves 21. These sleeves are made the same length as

the desired distance between fins. A suitable number of preferably V-shaped projections 22, are formed in the ends of the sleeves. These projections are preferably more than one half the length of the sleeve terminating as at 23 and the sleeve is preferably formed slightly tapering toward the tube as indicated so as to yieldingly embrace the tube, the projection 22 acting to permit the sleeve to yieldingly expand over the tube. The end of the sleeve will not touch the adjacent fin because of the fillet at 24, however the point where the fillet joins the fin, as at 25, will rest on the ends of projections 22 and form a definite spacer, as in Figures 1, 2 and 3.

A further modification is shown in Figures 6 and 7 wherein the fin 26 is provided with sleeve 27 and a suitable number of projections 28 are formed which extend the full length of the sleeve. Thus the sleeve for its entire length will be slightly resilient and will yieldingly embrace the tube. In the event the projections 28 are similarly positioned on the fin strips they would intersect adjacent projections, in which case they would not easily telescope. However they may be positioned whereby if the fin strips are reversed alternately they will not register or intersect.

In Figure 8, I illustrate a fin 30 having a sleeve 31 formed exactly similar to sleeves 12 of Figures 1 and 2. The projections 32 however, are bent so as to extend outwardly at right angle to the tube, thus the sleeve proper will necessarily be about the same length as the space between fins, but the projections form a longer surface as a rest for the adjacent fin than shown in Figures 1 and 2.

One of the advantages of applicant's various designs is that the sleeves proper, in no case, need be longer than the distance between fins, particularly so in the design shown in Figures 1, 2 and 3, the advantages of which have hereinbefore been referred to.

In Figure 9, I illustrate a fin having a sleeve 40 of equal length to the distance between fins, the end of the sleeve is slit for a short distance as at 41 and one edge or both edges are then bent outwardly as at 42. Thus the narrow pro-

jecting strips 43 will answer as a rest for the adjacent fin.

Obviously in the design shown in Figures 4 and 5, various numbers of projections may be used, they may be spaced close enough to form a corrugation, the projections may obviously be very narrow and short. The principle object being to prevent telescoping, these projections may therefore be variously shaped.

Applicant's device is particularly suited for a heat transfer device wherein the tubes are supplied with individual fins.

Thus it will be seen that I have provided simple integral means on the sleeves for spacing the fins and a support for the fins without adding to the cost of the core and that my device will act to simplify the assembling operation, prevent telescoping and accomplish the objects as hereinbefore stated.

Having thus shown and described my invention I claim:

1. A heat transfer device, comprising a tube, a multiplicity of closely spaced fins having sleeves through which said tube extends, said sleeves having irregular ends, the high points of which are bent outwardly to thereby form stops for the adjacent fins.

2. A heat transfer device, comprising tubes, a multiplicity of closely spaced fins having sleeves through which said tubes extend, said sleeves at their free ends having a number of relatively narrow and short outwardly projecting V-shaped offsets, to thereby form rests for the adjacent fins and cause said free sleeve ends to yieldingly embrace said tubes.

3. A heat transfer device of the class, comprising a tube, a multiplicity of closely spaced fins having sleeves through which said tube extends, spaced apart outwardly projecting means on the free end of said sleeves forming rests for the adjacent fins.

4. A heat transfer device, comprising a tube, a multiplicity of closely spaced fins having flanges through which said tube extends, the free ends of said sleeves having slits, one edge of which is bent outwardly to thereby form rests for the adjacent fins.

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