

May 24, 1938.

R. H. STONE ET AL

2,118,060

FINNED TUBE

Original Filed July 26, 1930

FIG. 1

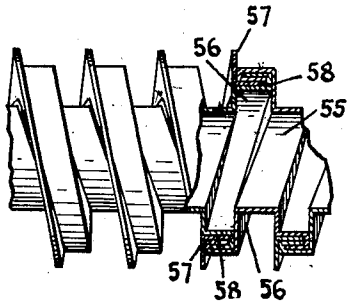


FIG. 2

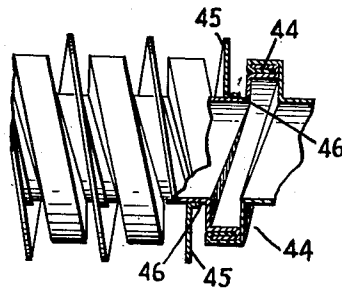


FIG. 3.

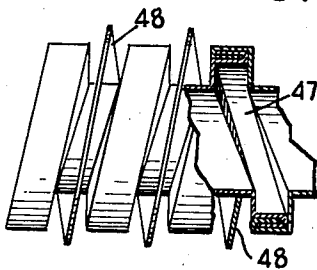


FIG. 5.

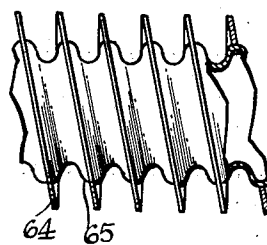
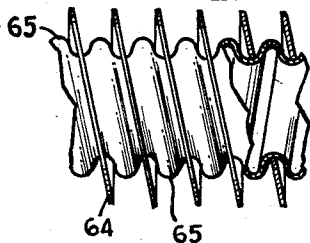


FIG. 4.



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UNITED STATES PATENT OFFICE

2,118,060

FINNED TUBE

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Original application July 26, 1930, Serial No. 471,034. Divided and this application October 4, 1933, Serial No. 692,088. Renewed August 24, 1937

8 Claims. (Cl. 257-262)

This invention relates to tubes and has special reference to the transfer of heat to or from the same.

The present application is a division of our application Serial Number 471,034, filed July 26, 1930 which has since matured into Patent No. 1,941,587 dated January 2, 1934.

The main object of the invention is to provide improved means for effecting transfer of heat to or from the tube—from the tube when it is desired to dissipate heat from the contents of the tube as is the case with radiators, heaters and the like, and from the surrounding medium to the contents of the tube when it is desired to absorb heat into the contents of the tube as is the case in refrigerating or cooling apparatus.

It is a further and ancillary object of the invention to provide the improved heat exchanging means in connection with a corrugated tube.

It is a further and ancillary object of the invention to provide a heat transferring fin in connection with a corrugated tube.

It is a further object of the invention to provide a heat transferring fin in connection with a corrugated tube formed from a grooved strip helically disposed and having the edges of adjacent convolutions secured together whereby the construction and processes of manufacture are greatly improved.

A further and ancillary object of the invention is to provide an improved construction of finned tube.

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawing which illustrates the invention—

Fig. 1 is a view, partly in side elevation and partly in section, of a structure of corrugated tube embodying the invention;

Fig. 2 is a view, partly in elevation and partly in section, of a modified form of tube embodying the invention;

Fig. 3 is a view, partly in side elevation and partly in section, of a still further modified structure of tube embodying the invention;

Fig. 4 is a view, partly in side elevation and partly in section, of a still further modified structure of tube embodying the invention; and

Fig. 5 is a view, partly in side elevation and partly in section, of a still further modified structure of tube embodying the invention.

Referring to the drawing, and first to Fig. 1, there is therein shown a corrugated tube with the heat exchange fin mounted upon the outer side of the corrugation. The efficiency of the tube as a

heat exchanger may be very greatly increased by combining the corrugation with a fin upon the outside thereof over what could be accomplished with either the corrugation or the fin alone. The corrugation increases the radiating surface of the tube exposed to the air and so increases its radiation. Upon making the corrugations too high, however, the pocketing of air between the corrugations is very largely increased so that there is more efficient radiation if the corrugations are made of moderate depth and a fin of heat-conducting material is supplied on the outside of the corrugation. Also the use of the corrugation in combination with the fin on its outside is more efficient than depending upon the height of the corrugation to give the desired heat exchange, for the reason that if the corrugation is made too high the heated fluid in passing through the tube is apt to not penetrate into the extreme recesses of the corrugations so that radiation from the outer surface of the corrugation is impaired, whereas if the corrugation is made low the heated fluid within it penetrates fully throughout the corrugation and delivers its heat thereto, the fin at the outside of the corrugation acting to conduct away such heat and dissipate it into the surrounding atmosphere. Also it is desired to limit the height of the corrugation and combine it with a fin as described, because a corrugation of too great height, under some circumstances, too greatly retards the flow of heated fluid through the tube.

In Fig. 1 the structure includes a tube formed from a helically disposed strip of metal having the edges of adjacent convolutions interfolded as in the patent of the United States of America to Louis H. Brinkman No. 1,198,392, patented September 12, 1916, and having the corrugations 56, the fin being provided by a helically disposed metal strip having a right-angled section comprising the radial portion 57 and the foot portion 58 which is inserted in the seam of the tube as shown in Fig. 1. The fin strip may be secured in the seam by soldering, brazing, welding or in any suitable way, or may be simply inserted within the joint without other securing means.

While corrugated tubes are good radiators of heat and thus form good radiating elements for the heat of the fluid passing through them, it is a fact that the heated air lying between the corrugations on the exterior of the tube is pocketed in the groove between the corrugations and does not flow freely away so that the radiation or dissipation of the heat from the tube is impaired. This condition may be greatly improved and the

corrugated tube as a radiator of heat may be improved, by placing a metal or other heat conducting fin within the space between the corrugations. This conducts the heat away from its confined space and largely increases the heat radiating capacity of the tube by relieving the congestion of heat which occurs in the space between the corrugations.

A device embodying this conception is shown in Fig. 2 of the drawing, wherein the corrugated tube 43 is formed by helically disposing a metal strip having a longitudinal groove and inter-folding the edges of adjacent convolutions as described in the Brinkman patent hereinbefore referred to. This tube has the corrugations 44. Between the corrugations is a helically wound strip of metal having a cross section comprising the radially extending fin 45 and foot 46 at right angles thereto. The strip last referred to is wound helically within the groove of the tube 43 between the corrugations 44, and the foot 46 rests upon the tube 43 between the corrugations. The strip comprising the fin 45 and foot 46 may be secured to the tube 43 by soldering, welding or in other suitable ways, or it may be unsecured to the tube 43 merely resting against it.

It will be seen that the fin 45 of the strip conducts the heat of the pocketed air between the corrugations outwardly and dissipates it; also, the strip, including the fin 45 and the foot 46, being in contact with the tube 43, will act to directly conduct the heat from the tube outwardly, which further fact improves the radiation because heated air being pocketed between the corrugations, the tube between the corrugations does not so readily radiate its heat.

In Fig. 3 is shown a modified construction of tube having a radiating fin between its corrugations, the corrugated tube being shown, like that in Fig. 2, as being the same as shown in the Brinkman patent hereinbefore referred to. The fin 48, however, instead of being formed of a helical strip of angular cross section, is formed of a flat strip helically wound in the groove between the corrugations of the tube 47. The fin or strip 48 facilitates the dissipation of heat from between the corrugations as already explained in connection with the device of Fig. 2 and may be soldered, welded, or otherwise secured to the tube or may simply lie upon it as it is wound thereon.

In Fig. 4 is shown, partly in side elevation and partly in section, a corrugated tube which is integrally formed instead of being formed of a strip as hereinbefore referred to. This integrally formed corrugated tube has a fin 64 located between the corrugations 65. This fin is formed of a helical strip of metal or other suitable heat-conducting material. This strip may be welded, brazed, soldered or otherwise suitably secured to the tube, or it may simply lie in contact therewith.

In Fig. 5 is shown an integrally formed corrugated tube having a helical strip of metal or other suitable heat-conducting material secured to the outer side of the corrugation by soldering, brazing, welding or in any other suitable way, this strip forming a heat radiating fin in conjunction with the corrugation.

While the invention has been illustrated in what are considered its best applications, it may have other embodiments without departing from its spirit and is not therefore limited to the structures shown in the drawing.

What we claim is:

1. The combination with a helically corrugated tube, of a separate strip helically disposed about said tube and secured thereto at its inner edge, said strip comprising flat portions of different cross sectional dimensions at right angles to each other, the greater of said dimensions extending radially of the axis of the tube.
2. The combination with a helically corrugated tube, of a separate strip helically disposed about said tube and secured thereto at its inner edge, said strip being between the corrugations of said tube and comprising flat portions of different cross sectional dimensions at right angles to each other, the greater of said dimensions extending radially of the axis of the tube.
3. The combination with a corrugated tube, of a separate strip helically disposed with relation to the axis of said tube and secured thereto, said strip being mounted at the outer end of the corrugation.
4. The combination with a tube formed of a helically disposed strip having the edges of adjacent convolutions secured together in a fixed joint and a heat-conducting fin secured in said joint and extending outwardly therefrom.
5. The combination with a corrugated tube comprising a helically disposed strip having a longitudinally extending groove forming a corrugation in the completed tube, the edges of adjacent convolutions being secured together in a fixed joint, of a helically disposed heat-conducting fin entering in said joint and projecting outwardly, said joint being at the outer surface of the corrugation.
6. The combination with a corrugated tube, of a helically disposed strip having an angled section, one of the legs of said section being secured to said tube and the other leg projecting outwardly.
7. The combination with a corrugated tube comprising a helically disposed strip having a longitudinal groove forming a corrugation in the completed tube, and the edges of adjacent convolutions of the strip being interfolded to form a joint between the convolutions, of a helically disposed strip having a right-angled section, one of the legs of the angle being inserted in said joint and the other leg of said angle projecting outwardly.
8. The combination with a corrugated tube comprising a helically disposed strip having a longitudinal groove forming a corrugation in the completed tube, and the edges of adjacent convolutions of the strip being interfolded to form a joint between the convolutions, of a helically disposed strip having a right-angled section, one of the legs of the angle being inserted in said joint and the other leg of said angle projecting outwardly, said joint being at the outer end of the corrugation.

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