

June 18, 1946.

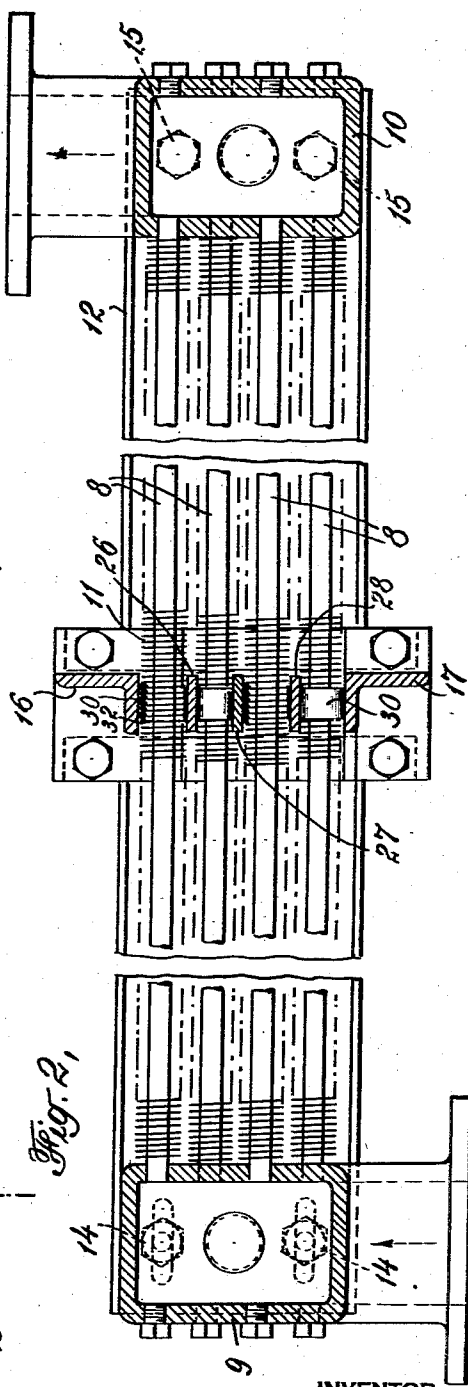
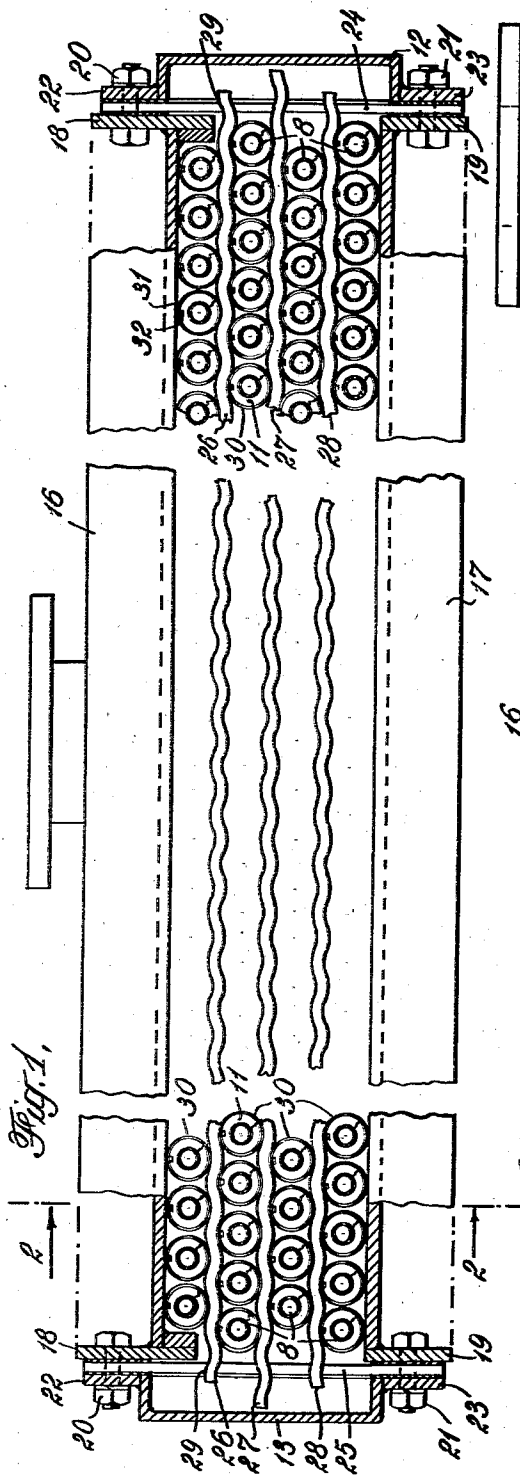
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2,402,209

SUPPORT FOR FINNED TUBES

Filed June 29, 1944

2 Sheets-Sheet 1



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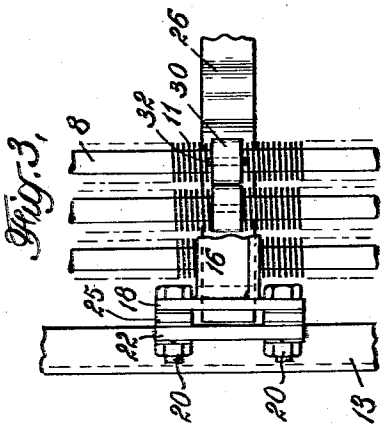
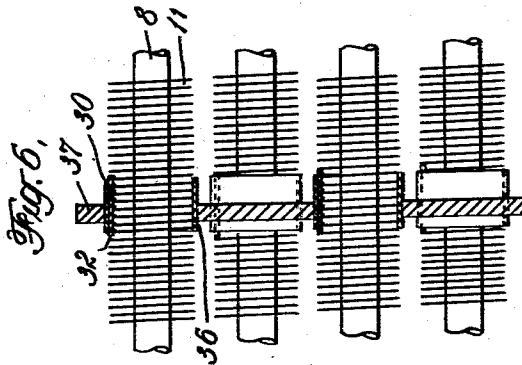
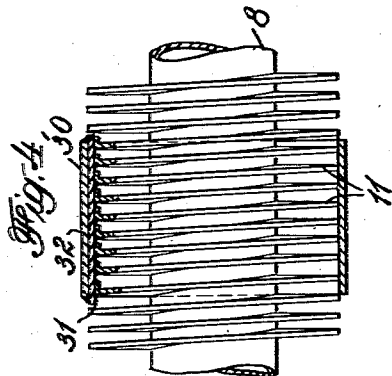
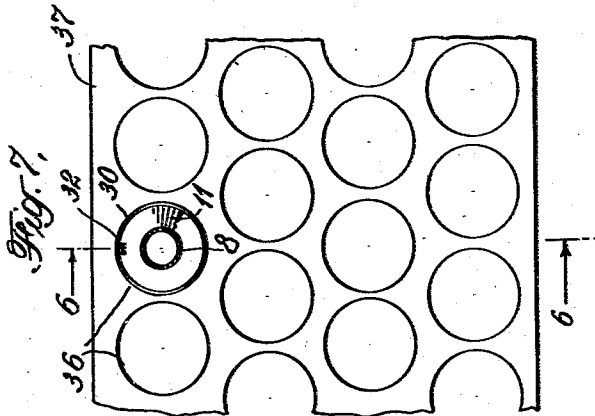
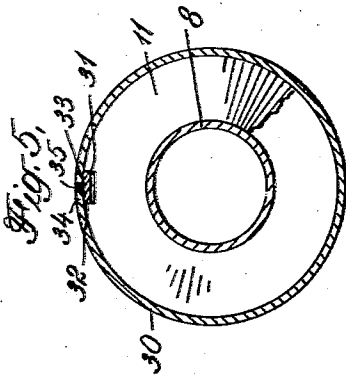
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SUPPORT FOR FINNED TUBES

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2 Sheets-Sheet 2



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SUPPORT FOR FINNED TUBES

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5 Claims. (Cl. 257—262)

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This invention relates to supports for finned tubes and more particularly concerns improved means for forming a support for tubes having circumferentially extending fins on the surfaces thereof.

Many heat exchangers and related apparatus in which heat is transferred between substances employ tubes with fins on their external cylindrical surfaces. Such fins accelerate the rate of heat transfer to or from the material in or flowing through the tube. One widely used form of finned tube employs fins extending circumferentially around the surface thereof, the fins comprising either separately spaced discs or the adjacent turns of a continuous flat helical coil. Finned tubes of this type are frequently disposed horizontally in heat exchanger structures with their opposite ends connected to headers or other ducts or parts, and due to the length of the tubes, they require mechanical support intermediate their ends. The fins on many of such tubes are formed of non-ferrous metals such as copper and are of comparatively thin gauge. The individual fins do not have sufficient strength or rigidity to permit direct attachment of a supporting element thereto.

Finned tubes of the type described have been supported by removing the fin structure from a section thereof and clamping the bare tube length thus exposed directly to a supporting element. This is unsatisfactory in that the removal of some fins usually damages adjacent fins, and where the fins comprise turns of a continuous helically wound strip, removal of a section thereof leaves loose or inadequately secured ends which must be fixed to the tube by special means to prevent unwinding of the remaining fin turns. The positioning of a supporting band around the peripheries of a plurality of fins has heretofore been considered impractical because welding or like joining operations which appeared essential to provide a sufficiently rigid attachment heats the non-ferrous metal forming the fins to a temperature at which it is undesirably weakened.

With the above and other considerations in mind, it is proposed in accordance with the present invention to provide an improved finned tube structure incorporating a support engaging element which is rigidly secured to the finned tube without removal of fins therefrom and without weakening the fin structure. More specifically, the invention contemplates the provision of a support incorporating a band surrounding and contacting the peripheries of a plurality of adjacent circumferentially extending fins, and an element in the nature of a key fixed to the band and extending through notches or openings in the adjacent fins whereby the band is rigidly locked to the fins. In a preferred embodiment of the invention, the band is formed of a piece of metal

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bent around the fin edges with its ends in substantial engagement, the juncture of the ends of the band is disposed over the key element, and a welded joint unites the ends of the band and secures the band to the key element.

In describing the invention in detail, reference will be made to the accompanying drawings in which an embodiment thereof has been illustrated. In the drawings:

Fig. 1 is a sectional view of a finned tube heat exchanger unit employing tube supporting means embodying the invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1 and viewed in the direction of the

arrows;

Fig. 3 is a plan view of a portion of the tube supporting structure of the unit shown in Figs. 1 and 2;

Fig. 4 is an elevation, on an enlarged scale, showing a portion of a finned tube with the support engaging band of the invention thereon;

Fig. 5 is a end view of the structure shown in Fig. 4;

Fig. 6 is a sectional elevation of a modified form of tube supporting means embodying the invention, taken along the line 6—6 of Fig. 7 and viewed in the direction of the arrows; and

Fig. 7 is an end elevation of the structure illustrated in Fig. 6.

In Figs. 1, 2 and 3 of the drawings, there is illustrated a known form of heat exchanger unit comprising a plurality of elongated tubes 8 suitably connected at their opposite ends to an inlet header 9 and an outlet header 10. The tubes 8 carry circumferentially extending radially projecting fins 11 on their outer surfaces. In the illustrated embodiment, the fins 11 are of the type formed of a flat strip or ribbon helically wound edgewise about the tubes. Other known forms of circumferentially extending radially projecting fins may be used. In accordance with known practice, the fins 11 are preferably formed of copper, an alloy containing copper or some other non-ferrous heat conducting metal.

The headers 9 and 10 of the unit are connected by side channel members 12 and 13, the opposite ends of which are respectively bolted to the opposite side faces of the headers 9 and 10 as illustrated at 14 and 15. A transverse support is provided substantially midway between the headers 9 and 10. In the illustrated embodiment, this structure comprises an upper angle bar 16 and a lower angle bar 17. The bars 16 and 17 are secured respectively between the upper and lower edges of the channel members 12 and 13.

As shown in Fig. 1, plates 18 and 19 are respectively welded or otherwise secured to the opposite ends of the bars 16 and 17, and bolts 20 and 21 connect these plates to the plates 22 and 23 welded to the upper and lower edges

of the channel members 12 and 13. Vertically extending plates 24 and 25 are respectively secured to extend between the adjacent ends of the angle bars 16 and 17, and to this end, the vertical plates are clamped between the plates 18 and 22 and 19 and 23 by the bolts 20 and 21 as shown in Fig. 1. A plurality of corrugated strips 26, 27 and 28 extend transversely between the rows of finned tubes 8 and the opposite ends of each of these strips pass through slots 29 in the plates 24 and 25. The tubes 8 of successive horizontal rows are disposed in staggered relation and the corrugations of the strips 26, 27 and 28 are similarly staggered to conform to the circular shape of the finned tubes, as clearly shown in Fig. 1.

It should be understood that the unit described is enclosed in a suitable shell or equivalent chamber or passage and that a fluid is passed through the shell over the finned tubes 8 for heat exchange with the fluid passing through the tubes.

Referring now more particularly to the support engaging structure, each of the finned tubes 8 is surrounded by a band 30 extending around and contacting the peripheries of a plurality of adjacent fin turns 11. One or more of such bands 30 may be provided on each tube 8, and in the disclosed embodiment the bands 30 on the several tubes 8 are all disposed substantially midway between the tube ends and in line with the bars 16 and 17 and the corrugated strips 26, 27 and 28 of the supporting structure. The bands 30 are thus disposed between the peripheral edges of the tube fins 11 and the supporting elements for these tubes. Each band 30 is formed of metal and preferably of ferrous metal. Each of the fin turns 11 contacted by the band 30 has a notch 31 formed in its periphery.

As shown in Fig. 4, the notches 31 may be formed by bending a short section of the fin metal laterally to a position substantially at right angles to the fin. The notches 31 in the adjacent fin turns 11 are preferably aligned longitudinally of the tube.

A metallic strip 32, preferably formed of ferrous metal, is disposed in the aligned notches 31 of the adjacent fin turns 11 engaged by the band 30. The strip 32 preferably has such cross sectional dimensions as to closely fit the notches 31 with its outer surface substantially flush with the peripheries of the fin turns and so substantially engaging the inner surface of the band 30, as shown in Fig. 5. The band 30 is formed of a piece of metal bent to circular form with its opposite ends 33 and 34 substantially in engagement but slightly spaced apart. The juncture between the ends 33 and 34 of the band 30 is disposed to overlap the strip 32.

The band 30 is secured to the strip 32 by suitable means. In the disclosed embodiment, a welded joint 35 is formed which both unites the ends 33 and 34 of the band 30 and secures the band to the strip 32.

With the arrangement described, the band 30 is firmly secured to the finned tube 8 in such a manner that the weight of the tube carried by the supporting structure is distributed over a plurality of fin turns 11. Relative turning movement between the band 30 and the finned tube is prevented by the strip 32 engaging the aligned notches 31 in the peripheries of the fin turns 11. When the band 30 and

the strip 32 are formed of ferrous metal, the welded joint 35 may be formed without heating the non-ferrous metal of the fins 11 to a temperature high enough to weaken the fins. This results from the improved arrangement described in which the strip 32 lies between the welded joint 35 and the fins 11. The bands may engage various forms of supporting structures other than that illustrated in Figs. 1, 2 and 3. For example, as illustrated in Figs. 6 and 7, the bands 30 may be disposed in circular openings 36 in a transverse plate 37 through which the tubes 8 pass.

I claim:

1. In a device of the character described, in combination, a tube having circumferentially extending spaced fins thereon, a band surrounding said finned tube in engagement with the peripheries of a plurality of the fins, said fins having openings therein, an element disposed in said fin openings and secured to said band and a tube support engaging the outer surface of said band.

2. In a device of the character described, in combination, a tube having circumferentially extending spaced fins thereon, a band surrounding said finned tube in engagement with the peripheries of a plurality of the fins, said fins having notches in their peripheral edges substantially aligned longitudinally of said tube, an element disposed in said notches and secured to the inner surface of said band and a tube support engaging the outer surface of said band.

3. In a device of the character described, in combination, a tube having a plurality of circumferentially extending spaced fins thereon, a band comprising a piece of metal bent around said tube with its ends in substantial engagement and its inner surface engaging the peripheries of a plurality of adjacent fins, said fins having aligned notches in their peripheral edges, a strip of metal disposed in said aligned notches and engaging the inner surface of said band at the juncture of the ends of the metal piece forming said band, a welded joint uniting the ends of said band and securing said strip to the said band and a tube support engaging the outer surface of said band.

4. In a device of the character described, in combination, an elongated tube having circumferentially extending radially projecting fins on its outer surface, a band surrounding said tube with its inner surface engaging the peripheries of a plurality of said fins, said fins having notches in their peripheries, a strip disposed in said notches adjacent the inner surface of said band, means securing said strip to said band and a tube support engaging the outer surface of said band.

5. In a device of the character described, in combination, an elongated tube having circumferentially extending radially projecting fins on its outer surface, a metallic band surrounding said tube with its inner surface engaging the peripheries of a plurality of said fins, said fins having notches in their peripheries, a strip of metal disposed in said notches with its outer surface adjacent the inner surface of said band, a welded joint between said strip and said band and a tube support extending transversely of said tube and engaging the outer surface of said band.