

UNITED STATES PATENT OFFICE

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FINNED TUBE

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This invention relates to a finned tube, and it has to do more especially with a tube which is made up of a tubular body formed without fins and with the fins applied to this tubular body. The invention contemplates a tube wherein strength is added to the tube by the stock which forms the fins. Accordingly, the tube to which the fin is applied can be made of relatively light stock, and the fin stock is such as to form a spiral reinforcing band. The convolutions of this spiral band are preferably disposed in close proximity to each other so that the reinforcement exists over the length of the tube.

In describing this invention it is thought that it would be well to briefly set forth the manner in which the tube is made although the method by which it is made will not be gone into in detail as this is fully described and claimed in my Patent No. 1,685,270, dated Sept. 25, 1928.

In the accompanying drawings:

Fig. 1 is an assembly view showing somewhat diagrammatically how the tube of the present invention is made.

Fig. 2 is an enlarged section in detail which shows a step in the forming of the tube.

Fig. 3 is a longitudinal sectional view of the completed tube.

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

The tube consists of an inner core 1 which is a tube in itself. Around this tube is spirally wound fin stock having an upright portion 2 and a horizontal portion 3. This stock is wound tightly around the tube and preferably the adjacent convolutions are in substantially abutting relation so that the outer edge of one convolution is in close proximity or in abutting relation to the point of juncture between the upright and the horizontal portions of the next adjacent convolution, as shown at 5. The spirally wound stock can be secured to the tubular core in any desired

manner; as for instance, the stock can be tinned before it is wound upon the tube and after it is wound on the tube the whole can be subjected to a sweating or heating operation which melts the coating of tin and causes the stock to adhere to the tube. On the other hand, after the stock is wound on the tube, the whole can be subjected to a solder bath. Also, both of these ways can be used simultaneously so that the horizontal convolutions are securely fixed to the tube by the sweating of the tin originally applied to the stock, and so that the solder from the solder bath covers the entire tube and seals the adjacent convolutions together where they meet or substantially meet at the point 5.

In the making of the tube, the core 1 is rotated and for this purpose a pair of rollers 10 and 11 may be used. These rollers are driven and engage opposite sides of the tube to cause a resultant rotation of the tube. Preferably they are disposed at an angle to each other to effect a line contact with the tube. The strip stock 12 is drawn from a supply which may be a spool or a roll (not shown). If the strip stock is not tinned previous to being put in the supply it may be drawn through an acid bath, a solder bath and a cooling bath progressively, as shown in Fig. 1. From here the stock is drawn over a guide roller 13 and then through suitable rollers 14 which are such as to give the stock a longitudinal bend so that it is angular in cross section to provide an upright portion 2 and horizontal portion 3.

This angular stock is then wound upon the tube. For this purpose it may first be drawn through a guide die 15. To nicely wind the stock on the tube it is necessary to either draw the metal of the upright portion, or corrugate the same, and I have shown a pair of corrugating rollers 16 and 17 which are positively driven and which engage opposite sides of the upright portion to corrugate the same, as at 18, (Fig. 4). From the corrugat-

ing rollers the strip stock is fed to the rotating tube and wound thereon. The stock is then compressed against the tube, and for this purpose a battery of rolls may be provided. These rolls are in the form of worms and have portions which project in between the upright spiral fin and compress the horizontal portions of the stock tightly against the tube. As above stated, the tube can be heated, and due to the fact that the fin stock is tinned, the tube and the stock will adhere together, on the other hand, in addition to securing the stock and tube together, in this manner, the whole may be subjected to a solder bath.

This, I have shown in the drawings. A suitable acid is applied to the tubing by means of a nozzle 21 and then the tube passes through a solder bath. Molten solder is maintained in a tank 22, the solder being kept hot by the burners 23. A solder lifting device is represented at 24. This device may be one of several types which are well known by those skilled in the art. As shown, the device is a rotary affair carried by bearings 25, and may be provided inside by suitable buckets which dip down into the molten solder, raise the same and pour the solder over the tube. Excess solder is blown off the tube by a jet of air which is directed onto the tube through a nozzle 26. The tube may then be cooled by a water bath 27. Finally the tube may pass through another set of rollers 28 which are similar to the rollers 20. The rollers 20 and 28 may be driven or they may be held stationary. If driven, the speed is coordinated with the rotative movement of the tube so that the tube is advanced longitudinally. If held stationary, the tube worms its way through the rollers. However, any suitable arrangement may be utilized for advancing the tube longitudinally.

It will be noted that the tube is reinforced by the spiral band formed by the horizontal portion of the fin stock, and that the adjacent convolutions of this band are securely fixed together by the solder bath. I use the word "solder" in speaking of the bath in a generic manner, intending to cover any metal which may be made molten and poured over the tube to finish the same and seal the parts together. Not only is the tubing reinforced but the fin stock is applied simultaneously, and formed by the same metal which provides the reinforcement of the tube. Such tube, of course, is useful for the transference of heat. The present tube is efficient for this purpose inasmuch as the spiral fin is integral with the spiral reinforcing band, and this band has a large contact with the body of the tube, in fact, in contact with the entire body of the tube. This makes for an efficient transference of heat from the tube to the fins or vice versa.

The use of the terms "upright" and "horizontal"

as defining the portion of the stock which is wound upon the tube, has been made for the purpose of convenience. It is not meant, however, by these terms to limit the invention to stock wherein the portion forming the fin is perpendicular to the portion which flatly abuts against the tube. It is so shown in the drawing and this is thought to be preferable in ordinary tube construction, but it is entirely within the invention to have the leg of the stock which forms the fin disposed at an angle to the horizontal portion which is other than an angle of 90°.

Not only is the tube reinforced by the spiral fin stock but it in reality forms a complete outer sheathing for the inner tube when the convolutions are wound in substantially abutting relation. Moreover, the fin stock has a large area of contact with the inner tube so that an efficient transference of heat is had from the tube to the spiral fin, or vice versa, and inasmuch as the spiral fin is integral with the reinforcing band the tube made by this method is efficient for heat transferring purposes.

Claims:

1. A finned tube comprising a tubular body, spiral convolutions of stock on the tube which stock is angular in cross section, one leg of the angle forming a spiral fin, and the other leg of the angle flatly abutting the tube wound in coils having a heat-conducting relation with one another, said leg secured to the tube by solder and secured to each other by solder.

2. A finned tube comprising a tubular core, spiral convolutions of stock on the tubular core, said stock being angular in cross section, one leg of the angle forming a spiral fin, and the other leg of the angle forming a spiral reinforcing band for the tubular core, the spiral convolutions being in direct abutting relation whereby the spiral band forms a continuous tube-like reinforcement for the tube.

3. A finned tube comprising a tubular core, spiral convolutions of stock on the tubular core, said stock being angular in cross section, one leg of the angle forming a spiral fin, and the other leg of the angle forming a spiral reinforcing band for the tubular core, the spiral convolutions of the re-inforcing band being in direct abutting relation whereby the spiral band forms a continuous tube-like reinforcement for the tube, the convolutions being secured together by solder.

4. A finned tube comprising a tubular core, spiral convolutions of stock on said tubular core, said stock being angular in cross section, one leg of the angle forming a spiral fin, and the other leg of the angle forming a spiral reinforcing band for the tubular core, the spiral convolutions being in abutting relation whereby the spiral band forms a continuous tube like reinforcement for the tube,

and a coating of sealing metal covering the tube and the spiral stock and securing the adjacent convolutions of the stock together.

5 A finned tube comprising a tubular body, spiral convolutions of stock on the tube, said stock being L-shaped in cross section, one leg of the L forming spiral fin and the other leg of the L flatly abutting the tube, the free edge of the last mentioned leg of the L in each convolution being in substantial contact
10 with the outside part of the bend in the L of the next adjacent convolution.

In testimony whereof I affix my signature.

HARRY W. BUNDY.

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