Nov. 23, 1948. M. G. BOERGER 2,454,624

METHOD OF PRODUCING RADIATOR TUBES

Original Filed Jan. 21, 1944

Fig. 1.

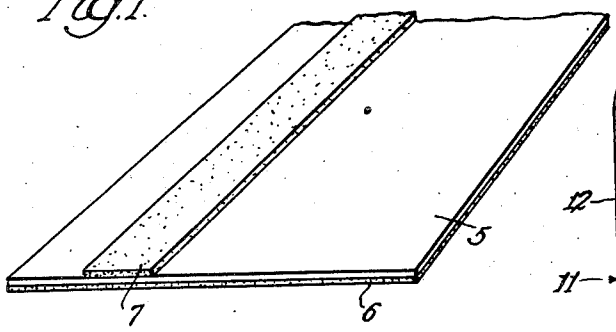


Fig. 2.

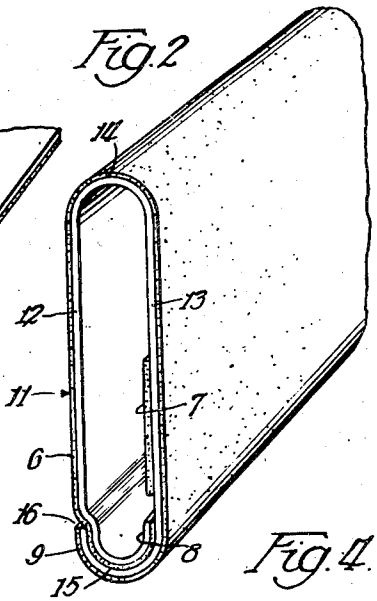


Fig. 3.

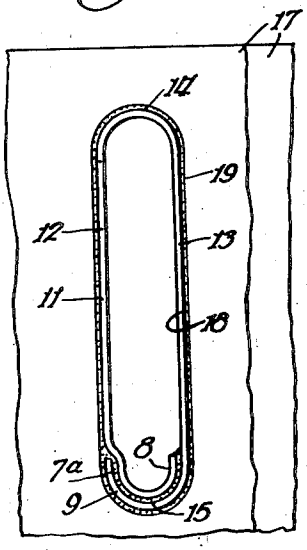


Fig. 4.

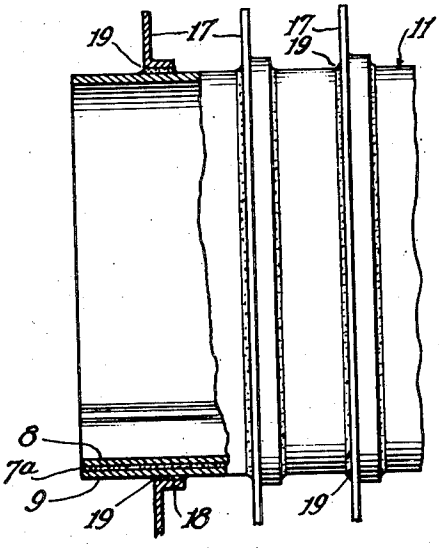
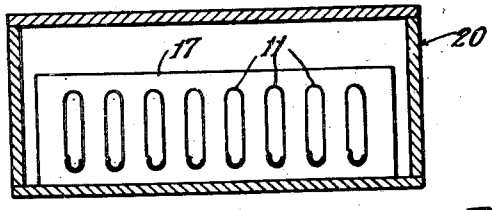


Fig. 5.



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METHOD OF PRODUCING RADIATOR TUBES

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6 Claims. (Cl. 113—118)

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This invention relates to a method of producing radiator tubes, and the subject matter hereof has been divided out from my co-pending application for Letters Patent on Solder coating tube stock, Serial No. 519,139, filed January 21, 1944. Among its objects are to simplify the method of producing radiator tubes and to minimize the cost of production thereof. Another object is to minimize the time element and labor required to produce radiator tubes. Another object is the provision of a prepared metal strip having a fusible metal ribbon fused or otherwise secured on one side thereof, which strip may be rolled into tube form, with its edge portions overlapped and thereafter heated to a fusing temperature whereby the fusible ribbon melts and unites the overlapping edge portions of the strip. Another object is the provision of a metal strip having a fusible ribbon on one side thereof, and having its other side coated with a fusible bonding material, which strip may be rolled into tube form having overlapping edges, assembled with apertured fin members, and the assembled members heated to a fusing temperature whereby the overlapping edges of the tube are united and the fins are bonded to the tube in one heating operation.

With these and other objects and advantages in view this invention consists in the herein described method of producing radiator tubes from flat tube stock. It further consists in the hereinafter described method of producing radiator tubes from flat stock with fins bonded to the tubes.

The invention further consists in the several novel features hereinafter fully set forth.

The invention is clearly illustrated in the accompanying drawing, in which:

Fig. 1 is a perspective view of a prepared metal strip from which a radiator tube is formed and embodying one form of the present invention.

Fig. 2 is a fragmental perspective view showing the prepared metal strip of Fig. 1 rolled into tubular form preparatory to the heating process.

Fig. 3 is an end view of the finished tube bonded to a fin.

Fig. 4 is a fragmental side elevation partly broken away, illustrating the finished tube with several fins bonded thereto; and

Fig. 5 is a sectional view through a furnace or oven showing a heat exchange core therein.

Referring to said drawing which is merely illustrative of one embodiment of the invention, and referring first to Fig. 1, the reference character 5 designates a fragment of a metal strip of indefinite length which may be cut up into tube lengths. Fused or otherwise secured to one side of the metal strip is a ribbon 7, composed of solder or other suitable fusible bonding material which extends throughout the length of the metal strip. The ribbon may be in the form of a separate length of fusible metal, spot welded to the metal strip or it may be flowed thereon or it may be fastened thereto in any other desirable manner. The fusible ribbon may be disposed at one side edge portion of the metal strip or it may be disposed at some distance from said edge for the purpose hereinafter explained. For certain purposes the side of the metal strip opposite the one containing the fusible ribbon is coated with solder or other suitable bonding material 6.

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In constructing a radiator tube in accordance with the present invention, a tube length of the prepared metal strip is rolled by suitable rolls (not shown) into the form of a tube 11 (see Fig. 2), with the fusible ribbon disposed on the inner side of the tube. As a preference the metal strip is rolled into a tube of flat form, having straight sides, 12, 13, connected by rounded edges, 14, 15. The side edge portions 8, 9, of the metal strip are rolled to overlap each other with the edge portion 8 of the metal strip overlapped by the edge portion 9 thereof. In order that the edge portion 9 of the metal strip may be flush with the outer side of the tube, the metal strip is offset lengthwise of the strip substantially along the line where the flat side of the tube merges into the overlapped edge portion 8, as is seen at 16 in Fig. 2, the offset being inwardly a distance substantially equal to the thickness of the strip. When rolled into the tube form illustrated, the fusible ribbon 7 occupies a place adjacent and directly above the side edge of the inner edge portion 8 of the metal strip. This permits the overlapped edges to be rolled together tighter, requires less solder to unite them and provides a tube of more uniform shape.

Radiator cores are usually composed of tubes and fins bonded thereto. In Figs. 3 and 4 several fins 17 are shown in connection with a radiator tube constructed in accordance with the present invention. The fins are provided with holes 18 whose configuration corresponds in size and shape to the external configuration of the tubes. As is well understood, a multiplicity of tubes with fins strung along the length thereof are employed in the manufacture of radiator cores or similar heat exchange elements, and in accordance with the present invention, when fins are provided,

they are strung upon the tubes after the latter have been rolled into shape.

In order to unite the overlapping edge portions of the tubes and to bond the fins to the tubes after assemblage therewith, the entire assembly is heated to the fusing point of the fusible bonding material. This may be done in accordance with many of the well known processes, one of which is to place the assembly in a furnace 20 (see Fig. 5) with the lap joints of the tubes disposed at the bottom of the assembly, with the ribbon of solder located above the overlapped edges of the joints, and heat the assembly to the fusing point of the bonding material. During the heating process the fusible ribbon melts and flows down the inner side of the tube wall to which it was fastened and flows into the crevice between the overlapping edge portions of the tube as at 7*a*, and by capillary attraction flows to the extreme edge of the overlapping portion 9. When cooled the film of bonding material between the overlapping edge portions unites them.

Simultaneously during the heating process the fusible bonding material on the outer sides of the tube walls melts and flows down the outer sides in contact with the fins and bonds the edges of the holes of the fins to the tubes as at 19, any surplus bonding material dripping from the lower edges of the tubes.

From the above it is apparent that I have provided a prepared metal strip capable of being readily rolled into tubular form and having self-contained fusible bonding material which, when heated to the fusing point, unites the overlapping edges of the tube and furthermore that I have provided a prepared metal strip which is capable of being bonded to fins merely by the application of heat thereto of sufficient temperature to fuse the bonding material.

Having thus described the invention, it is obvious that various immaterial modifications may be made in the same without departing from the general scope and field of this invention; hence, it is not to be understood that the present device is to be limited to the exact form, construction, arrangement and combination of parts herein shown and described or to the uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. The method of producing a radiator tube which consists in applying a ribbon of solder to one side of a metal strip throughout its length, rolling the prepared strip into a flat tube with the side edges of the strip overlapping each other along an arc of a circle at one edge of the tube to form a lap joint with the inner overlapped portion offset inwardly a distance substantially equal to the thickness of the metal strip, with the outer edge of the outer overlapping part disposed in alignment with the outer face of the flat tube, setting the tube in a position with its overlapped joint at the lowermost point, and heating the rolled tube to the fusing point of the solder, causing the melted solder, when set, to unite the overlapping edge portions of the rolled strip.

2. The method of producing a heat exchange unit comprising tubes with fins bonded thereon, which consists in applying a ribbon of fusible bonding material to one side of a metal strip throughout its length, applying a coating of fusible bonding material to the other side of the strip, rolling the prepared strip into a flat tube with the side edges of the strip overlapping each other at one edge of the tube to form a lap joint with a coating of solder between the overlapped parts and with the outer edge of the outer overlapping part disposed in alignment with the outer face of the flat tube, with the ribbon of fusible material disposed on the inner face of the tube and disposed above the edge of the overlapped member of the joint, stringing fins upon the rolled tube and heating the assembled parts to the fusing point of the bonding material.

3. The method of producing a radiator tube which consists in applying a ribbon of solder to one side of a metal strip adjacent one edge thereof throughout its length, rolling the prepared strip into a flat tube with the side edges thereof overlapping each other at one edge of the tube to form a lap joint with the inner overlapped portion offset inwardly a distance substantially equal to the thickness of the metal strip, with the outer edge of the outer overlapping part disposed in alignment with the outer face of the flat tube, with the solder strip disposed on the inside face of one straight wall of the tube above the overlapped edge of the other straight wall, and heating the rolled tube to the fusing point of the solder, causing the melted solder to flow between the overlapping edges of the tube.

4. The method of producing a heat exchange unit comprising tubes with fins bonded thereon, which consists in applying a ribbon of solder to one side of a metal strip adjacent one edge thereof throughout its length, applying a coating of fusible bonding material to the other side of the strip, rolling the prepared strip into a flat tube with the edges thereof overlapping each other at one edge of the tube to form a lap joint with the inner overlapped portion offset inwardly a distance substantially equal to the thickness of the metal strip, with the outer edge of the outer overlapping part disposed in alignment with the outer face of the flat tube, with the solder strip disposed on the inside face of one straight wall of the tube above the overlapped edge of the other straight wall, stringing apertured fins upon the rolled tube and heating the assembled parts to the fusing point of the bonding material, causing the melted solder strip to flow between the overlapping edges of the tube and the coating of fusible bonding material on the outside of the tube to flow along the edges of the apertures in the fins and thereby bond the fins to the tube.

5. The method of producing a heat exchange unit comprising tubes with fins mounted thereon, which consists in applying a ribbon of solder to one side of a metal strip adjacent one edge thereof throughout its length, applying a coating of fusible bonding material to the other side of the strip, rolling the prepared strip into a flat tube with the edges thereof overlapping each other at one edge of the tube to form a lapped joint with fusible bonding material disposed between the overlapped parts and with the outer edge of the outer overlapping part disposed in alignment with the outer face of the flat tube, with the solder strip disposed on the inside face of one straight wall of the tube above the overlapped edge of the other straight wall, stringing apertured fins upon the rolled tube, setting the assembled parts in position with the lapped joint at the bottom of the assembly and heating the assembled parts to the fusing point of the bonding material, causing the solder strip to melt and flow between the overlapping edges of the tube and causing the coating of fusible

bonding material on the outside of the tube to flow along the edges of the apertures in the fins and thereby bond the fins to the tube.

6. The method of producing a heat exchange unit comprising tubes with fins mounted thereon, which consists in applying a ribbon of solder to one side of a metal strip adjacent one edge thereof throughout its length, applying a coating of fusible bonding material to the outer side of the strip, rolling the prepared strip into a flat tube with the edges thereof overlapping each other at one edge of the tube to form a lapped joint with the inner lap offset inwardly a distance substantially equal to the thickness of the metal strip and with the outer edge of the outer overlapping part disposed in alignment with the outer face of the flat tube, with the solder strip disposed on the inside face of the straight wall of the tube above the overlapped edge of the other straight wall, stringing apertured fins upon the rolled tube, setting the assembled parts in position with the lapped joint at the bottom of the assembly and heating the

assembled parts to the fusing point of the bonding material, causing the solder strip to melt and flow between the overlapping edges of the tube and causing the coating of fusible bonding material on the outside of the tube to flow along the edges of the apertures in the fins and thereby bond the fins to the tube.

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