Oct. 8, 1940. E. J. HOUDRY 2,216,778

HEAT EXCHANGE MEMBER AND METHOD OF MAKING

Filed July 23, 1937

Fig. 1.

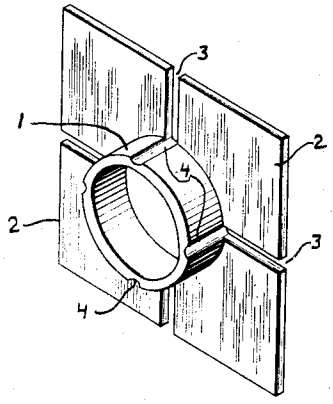
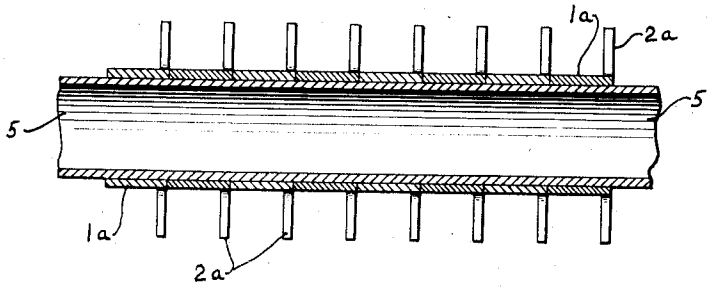


Fig. 3.



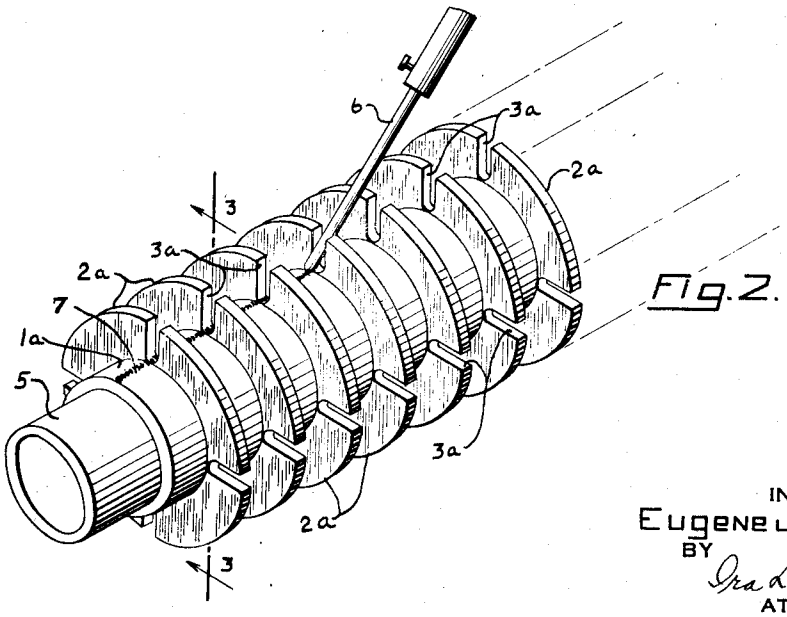


Fig. 2.

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HEAT EXCHANGE MEMBER AND METHOD OF MAKING

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5 Claims. (Cl. 29—157.3)

The present invention relates to finned tubes or conduits and to a method of making or constructing the same. More particularly the invention concerns the use of fins on tubes or conduits, as hereinafter illustrated and described, and to a method of assembling the fins on and attaching them to tubes. The fins primarily contemplated may be referred to as transverse fins.

It is an object of this invention to provide a method for rapidly making or fabricating conduits with transverse or similar fins attached thereto. A further object is to employ fin members which are of such structure that they are particularly adaptable for use in my method of assembly. One aspect of my invention involves shaping the fins so that portions or flanges thereof provide for uniform or any desired spacing of fins. These and other objects and advantages will be apparent from the description taken as a whole.

The problem of making tubes having transverse fins attached thereto, and doing so rapidly and cheaply, is one of considerable commercial importance. The simplification of this problem provided by the present invention can be most quickly understood in connection with the illustrative apparatus shown in the accompanying drawing, in which:

Fig. 1 shows in perspective one form of fin member ready for mounting upon a conduit;

Fig. 2 is a perspective view of a tube or conduit having a series of fins of different shape thereon and in the course of being attached thereto; and

Fig. 3 is a longitudinal sectional view taken on line 3—3 of Fig. 2.

The fins, such as fin 2 shown in Fig. 1 or fins 2*a* shown in Figs. 2 and 3, may be formed from plates of any desired thickness cut in desired shapes (e. g., square or round) which are centrally punched and then drawn, expanded or otherwise processed to provide a flange (continuous or broken) which will fit the tube to which the fins are to be attached. The plates may be slotted from the periphery of each to points adjacent the central opening to produce fins which are generally segmental in character. This may be done at the time of punching and drawing the center, or subsequently thereto, including after the fins have been mounted on the tube.

In assembling transverse fins on a tube or conduit, fin members of square, round or other desired peripheral contour are forced over or slid onto the tube and positioned with the slots in the several fins in straight or curved alignment. (In the event that the fins are slotted after being mounted on the tube, the slots will be made in alignment.) As illustrated in Fig. 2, a plurality of rows of slots 3*a* may be provided, four rows being indicated. The fins may be held in desired spaced relation by flanges, such as upturned flange 1 on fin member 2 or flanges 1*a* shown in Figs. 2 and 3, or they may be spaced by collars of suitable length which surround the tube and are disconnected from the fin members. Notches or the like may be provided on successive fins, if desired, to insure the maintenance of proper alignment of slots 3*a* during welding, although this is generally unnecessary. Welding electrode 6 (Fig. 2), shown in broken away view, is in the course of being moved lengthwise of the tube through one row of slots, thus simply and quickly to weld the fins 2*a* to the tube 5; note the welding bead 7. In place of the welding electrode shown, any other desired type of welding tool may be employed. It is optional whether the welding head is maintained stationary and the tube is moved therealong so that the welding tool passes through the aligned slots, or vice versa, whether the tube is maintained stationary and the welding tool is moved. Also, welding tools may be passed through any plurality or all of slots simultaneously, if desired, and this is sometimes advantageous in the production of a finished finned tube which is free from warpage.

The plates or fins are preferably slotted deeply enough so that the fin metal will be fluxed with the metal of the tube during the welding operation. Where the flange 1 of the fin is sufficiently thin no slotting at all of the flange will be necessary in order to weld the flange to the tube but, when it is thicker, the flange may be partially slotted, as illustrated in Fig. 1 by the partial slots 4 which begin where the full slots 3 end. The radial slots may be cut entirely through the plate, including the flange, in which case the sections of the plates or fins will be held in place by a press or other suitable means while being welded to the tube. However, when cutting the radial slots (such as slots 3 in Fig. 1 or 3*a* in Fig. 2), it is preferable to make the cut only part-way through the flange, so that the flange will hold the fin plate in place and the fin metal at this point will be fluxed with the metal of the tube during the welding operation. Inasmuch as the flange on each plate, when employed, provides a good bearing surface on the tube and may grip the same with a light press fit, tack or spot welding of flanges is sufficient for many uses. On the other hand, the flanges may be used only as spacer members, not welded to the tube, conduc-

tion between the tube and fin being established by welding the fin to the tube at the inner ends of the slots, such as of slots 3 and 3a shown in the drawing.

Where desired, the flanges of the fins may be welded to the tube at points intermediate the slots by making a step rotation of either the welding head or the tube assembly as the welding head advances in relation to the tube. The step rotation may, for example, be of 30, 45 or 60 degrees, more or less.

In addition to fins of the particular types illustrated in the drawing, it will be understood that my invention is applicable in the case of other fins which extend around or substantially around a tube or conduit whether they are rectangular, round or of other peripheral contour and whether, in a plane perpendicular to the length of the tube, they are generally flat, curved, etc., so long as my above-described method of joining fins to a tube is applicable.

The uses for which finned tubes as described may be employed are many and varied. They may be used where there is a fluid inside the tube and a solid material surrounding the tube, or vice versa, or where there are fluids both within and around the tube, or where there are solids both within and around the tube, where it is desired to effect the exchange of heat between points within the tube and points exterior thereto. For example, by way of specific illustration, finned tubes or conduits constructed as herein illustrated may be employed in controlling the temperatures of catalytic beds or masses, e. g., in apparatus such as shown in Patent. No. 2,078,947, issued to myself on May 4, 1937 or in my copending application Serial No. 84,787, filed June 12, 1936 which issued on June 27, 1939, as Patent No. 2,163,599. Again, my invention may be employed in constructing tubular finned members for various other particular uses involving heat exchange, for example those illustrated in Patents Nos. 855,239, issued to J. F. Faries on May 28, 1907, 1,920,800, issued to J. W. McCausland on August 1, 1933, or 1,838,105 issued to T. E. Murray on December 29, 1931.

The tubes or conduits on which the fins are attached obviously are not limited to single-walled tubes but include other types of conduits, e. g., double or nested conduit assemblies such as shown in Patent No. 1,987,903, issued to myself on January 15, 1935, or conduits of the type illustrated in my aforementioned Patent No. 2,078,947 or my aforementioned copending application.

What I claim is:

1. In the construction of a tube with a series of transverse fins attached thereto, the steps which comprise sliding centrally punched fins onto said tube with spacer members between adjacent fins to maintain them in desired spaced relationship, said fins having slots extending from the peripheries of the fins to points adjacent their central openings but not completely severing the fins into sections, positioning said fins with their slots in alignment along the length of the tube, and passing a welding tool through the aligned slots so as to join said series of fins to said tube.

2. In a method of providing a tube with transverse fins, the steps of forming flanged apertures in metal plates, providing slots in each plate from the periphery to points adjacent the aperture and grooves in the outer wall of each flange in line with the slots, positioning the plates on the tube through the apertures and spacing the plates by means of the aperture flanges, aligning the slots of each plate and joining the plates to the tube by fusing the grooved areas of the flanges to the tube.

3. In a method of providing a metal tube with transverse fins, the steps of forming a flanged aperture in metal plates, slotting each plate inwardly from the outer edge to provide a plurality of interconnected segments, positioning the segmented plates on the tube in spaced relation and aligning the slots, joining the tube and segmented plates by passing a welding tool through the aligned slots between adjacent segments of each plate and fusing the tube and segments at the joining line.

4. In the construction of a metallic core with transverse fins, the steps of forming an aperture in a plurality of plates, slotting each plate from its periphery to points adjacent the aperture presenting segments interconnected by a continuous web portion, positioning the plates on the core in spaced relation and aligning the slots of the plates, and securing the plates by fusing the web portion with the core.

5. A finned heat exchange device adapted for efficient heat transfer comprising a conduit for conveying fluid, apertured plates extending transversely of the conduit, each plate having the apertures provided with spacing flanges and slots outwardly thereof, said slots extending from the outer edge of the plate to said flange forming segments of extensive heat exchange surface, and a welded joint between the segments for securing each plate integrally to the conduit with the slots in alignment.

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