May 6, 1941. F. M. YOUNG 2,240,537

COMPOSITION HEADER AND TUBE PLATE FOR RADIATORS

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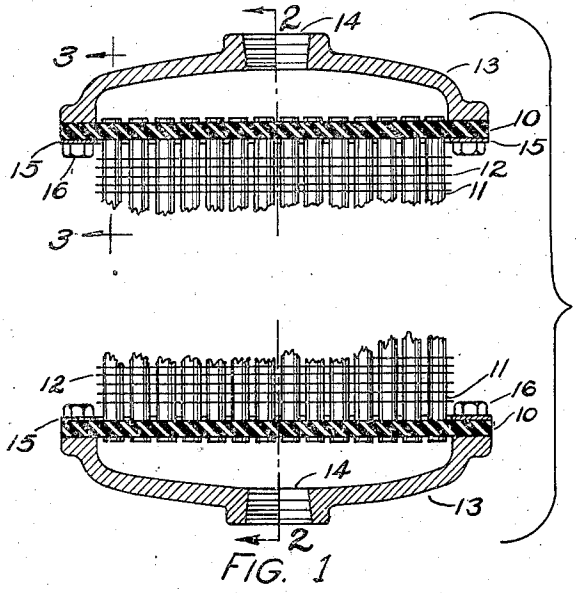


FIG. 1

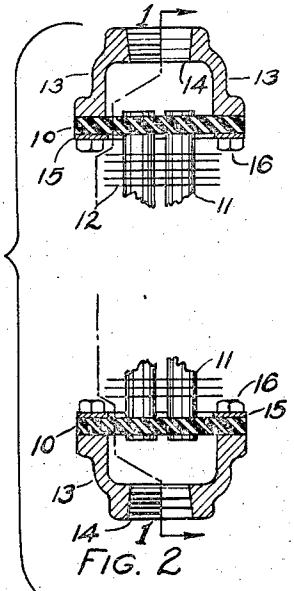


FIG. 2

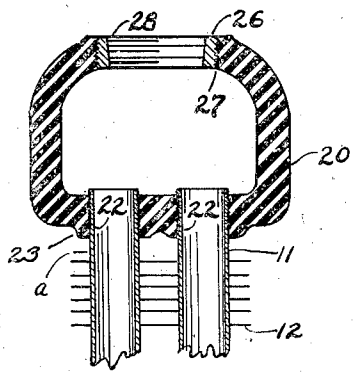
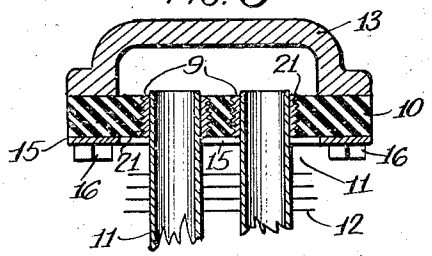


FIG. 4.

FIG. 3



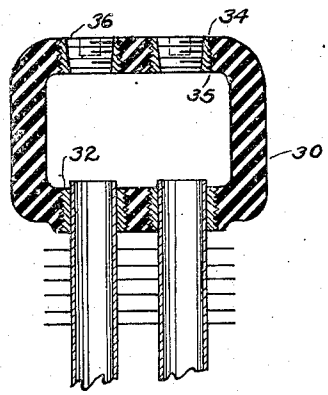


FIG. 5

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COMPOSITION HEADER AND TUBE PLATE FOR RADIATORS

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2 Claims. (Cl. 257—154)

The present invention relates to means for permitting free and individual expansion and contraction of the tubes.

Radiator tubes are generally made from copper or a composition comprising a large percentage of copper. The walls are thin and fragile and tend to fracture at the point where they enter the metal tube plates because of vibration and unequal expansion and contraction.

I provide tube plates of a rubber composition or an equivalent and vulcanize the tube ends in the composition plates or I provide suitable metal sleeves which are vulcanized to the composition into which the tube ends may be expanded; and when the headers and the tube plates are made integral of composition material, I provide screw threaded sleeves for the reception of the tubes and screw plugs.

The art of producing mechanical rubber products or equivalents and of vulcanizing the same to metals, particularly brass and copper, has advanced to a point where the product is impervious to heat and other destructive agents.

In radiators having cast iron headers and metal tube plates and copper tubes, a destructive electrochemical action takes place because of dissimilar metals. My invention is designed to prevent electrolysis and provide tube plates or headers wherein the tubes are left free to expand and contract individually and wherein tube vibrations pass into the composition tube plates and are absorbed thereby.

To these and other useful ends the present invention resides in parts and combinations thereof or their equivalents, and mode of operation, as will be understood from the following description, reference being had to the accompanying drawing in which:

Fig. 1 is a fractional sectional view of my preferred form of invention taken on line 1—1 of Figure 2.

Fig. 2 is a fractional section taken on line 2—2 of Figure 1.

Fig. 3 is a transverse sectional view taken on line 3—3 of Figure 1.

Fig. 4 is a transverse sectional view of a modification.

Fig. 5 is a transverse sectional view of a further modification.

As thus illustrated in Figures 1, 2 and 3 I provide composition tube plates 10—10 having a number of tubes 11, the ends being secured to the tube plates as will hereinafter appear and the tubes having thereon a multiplicity of closely spaced fins 12 through which the tubes extend.

I preferably secure the tubes in the header plates as follows: Metal sleeves 9 have openings adapted to snugly receive the tube ends and are grooved on the outer surfaces as at 21 and suitably treated forming a surface suitable for being vulcanized into member 10, at the manufacturing plant. After the fins 12 have been positioned over the tubes, and bonded thereto, the tube ends are moved into the openings in sleeves 9 and then expanded in the openings forming a complete core, after which header caps 13 are placed into the position shown, and secured by means of metal straps 15 and bolts 16. It will be understood that openings in member 10 for bolts 16 are moulded into this member. Clearly, because of the nature of synthetic rubber, no gaskets will be needed. Header caps 13 are provided with screw threaded openings 14 with which to make inlet and outlet pipe connections.

Thus clearly in view of the flexible characteristics of composition rubber or its equivalents, the tubes may expand and contract individually or in groups without injury and without injuring the tube plates.

In Figure 4, I illustrate a header 20 which is cast integral of synthetic rubber and wherein tubes 11 are cast and vulcanized into the header as at 22. When metal sleeves are not used for attaching the tubes to the headers, I preferably provide extensions 23 so as to provide a longer surface for contact with the tubes. As illustrated in this figure, I provide a metal sleeve 26 in each header which is roughened on its outer surface, as at 27 so as to form a suitable surface for contact with the rubber, the sleeve being pipe threaded as at 28. However this member may be supplied with a flat outer surface suitable for a gasketed joint.

In Figure 5, I illustrate a header somewhat similar to the header illustrated in Figure 4. The tubes in this design are secured to the tube plates, as in Figure 3. In this design, it is necessary to provide screw threaded openings in the outer surface of the header whereby a tool may be inserted for expanding the tubes in sleeves 32.

I provide sleeves 34 which are roughened on their outer surfaces as at 35 with which to supply a suitable vulcanizing contact with the rubber and a pipe thread 36. These sleeves are positioned in axial alignment with the tubes. A screw plug is used for closing the openings in the sleeves. Thus it will be seen that I have provided means whereby the tubes may be suitably secured to the tube plates; that the tubes

may expand and contract individually; and that after the tube plates or headers are completed, the tubes may be inserted into the metal sleeves and expanded in the usual manner. It will be seen in the design shown in Figures 1, 2, 3 and 5, that the tube plates or the unitary headers may be manufactured at a rubber plant and the rest of the assembly completed at a heat exchanger manufacturing plant.

It will be understood that the material described as "rubber composition or an equivalent" includes synthetic rubber and the like or any composition suitable as a substitute so long as the material is sufficiently elastic to permit unequal expansion or contraction of the individual tubes or rows of tubes without injury.

Clearly other header designs may be employed without departing from the spirit and scope of the present invention as recited in the appended claims.

Having thus shown and described my invention I claim:

1. A device of the class described, comprising spaced headers and a number of tubes forming an operating connection therebetween, a multiplicity of closely spaced fins through which said tubes extend forming a heat exchange core, said headers being formed integrally of synthetic rubber, metal sleeves cast in and vulcanized to the tube plate of said headers and being adapted to receive the ends of said tubes, inlet or outlet sleeves in said headers being cast in and vulcanized thereto, sleeves cast in and vulcanized to the outside edge of said headers each having removable closures and being in alignment with a tube.

2. A heat exchanger of the class described, comprising spaced headers having relatively thick detachably secured tube plates made of synthetic rubber, a number of tubes forming an operating connection between said tube plates and a multiplicity of closely spaced fins through which said tubes extend, said tube plates having sleeves vulcanized therein and being adapted to embrace the ends of said tubes, whereby said tubes may be inserted and expanded into their sleeves to thereby form liquid and gas tight metal joints.

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