

United States Patent

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[54] TUBE AND HEADER CONSTRUCTION
7 Claims, 5 Drawing Figs.

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[51] **Int. Cl.**..... **F28f 9/04**

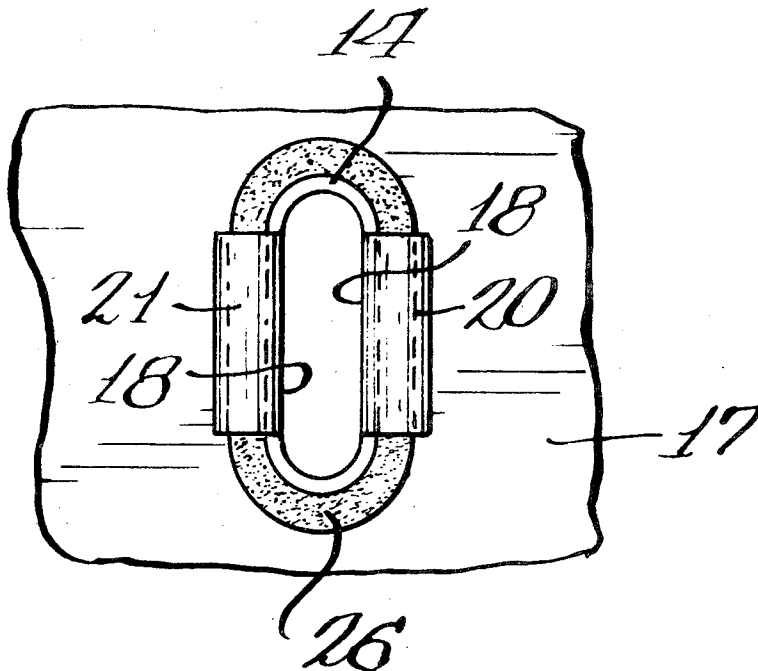
[50] **Field of Search**..... 165/153,
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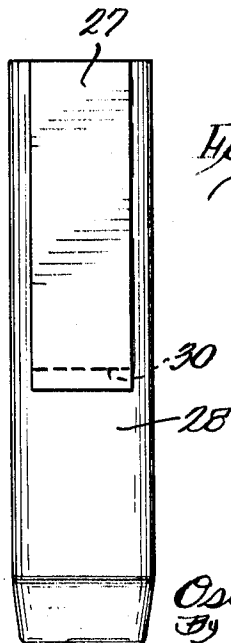
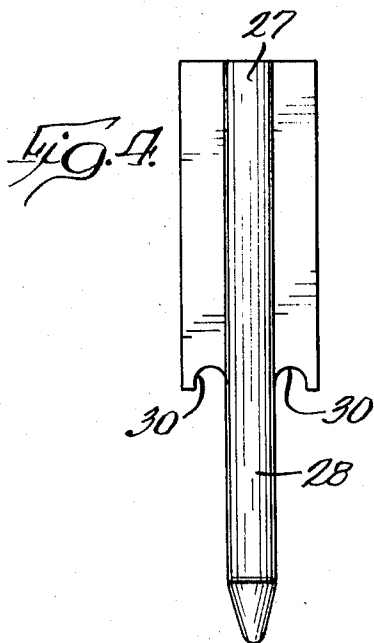
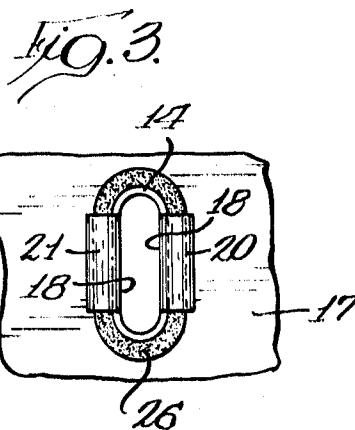
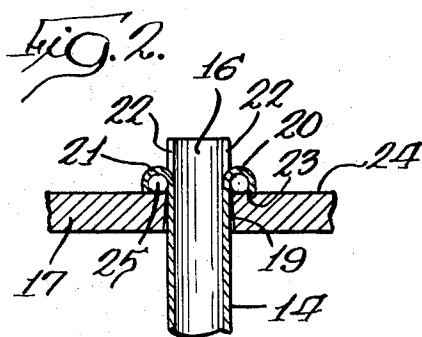
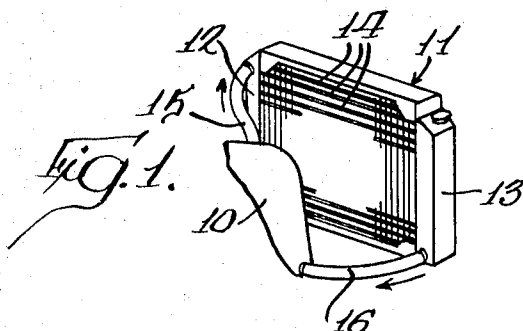
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ABSTRACT: A tube and header construction which may be used in a cooling radiator for an internal combustion engine in which one end of each tube extends into the header through an opening in a wall member forming a liquid-confining part of the header and with spaced end portions of the tube end within the header being separate from the remainder of the tube and distorted to extend away from this remainder thereby to secure the tube end to the header wall member. In one embodiment of the invention these spaced end portions of the tube within the header are curved over until their extreme ends are in contact with the inner surfaces of the wall member. In another embodiment the tube end portions are used to secure a solid joining material such as a brazing material in position to be activated as by melting in a subsequent joining operation where it is in position to bond the tube to the header.





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TUBE AND HEADER CONSTRUCTION

One of the features of this invention is to provide a tube and header construction wherein a tube end extends into the header and is provided with spaced separate end portions shaped to extend away from the remainder of the tube end and thereby secure the tube end to the header especially preparatory to permanent joining.

Other features and advantages of the invention will be apparent from the following description of one embodiment thereof taken in conjunction with the accompanying drawings. Of the drawings:

FIG. 1 is a fragmentary perspective view of a portion of an internal combustion engine and a cooling radiator therefor including the invention.

FIG. 2 is a fragmentary enlarged sectional view through a tube end and the adjacent portion of the header wall illustrating the invention.

FIG. 3 is a fragmentary plan view of the structure of FIG. 2 shown in conjunction with a ring of brazing alloy preparatory to joining the tube to the header.

FIGS. 4 and 5 are side elevational views of a tool that may be used to produce the tube arrangement of FIGS. 2 and 3.

In FIG. 1 there is shown an internal combustion engine 10 with a cooling radiator 11 having an inlet header 12 and spaced outlet header 13 for the coolant liquid with the two headers being connected by parallel spaced horizontal coolant tubes 14. The liquid coolant flows in the customary manner from the engine 10 to the inlet header 12 by way of a conduit 15 and after flowing in parallel through the coolant tubes 14 into the outlet header 13 then flows from this header back to the engine 10 by way of the radiator 11.

The radiator 11 includes the tube and header construction of this invention as illustrated in enlarged detail in FIGS. 2 and 3. As is illustrated there, each tube 14 has an end 16 extending into each header 12 and 13 through a wall member 17 that forms a liquid confining part of the respective header. Thus the wall member 17 in this embodiment will be the inner wall of each of the opposite headers 12 and 13.

In the illustrated embodiment the tube 14 is of elongated cross section as shown most clearly in FIG. 3 with substantially parallel sides 18. The tube 14 extends through a similarly shaped opening 19 in the wall 17. The tube end portion 16 within the header wall 17 is provided with a pair of oppositely located spaced end portions 20 and 21 each in the form of a tongue separated from the remainder of the tube end 16 by parallel slits 22.

Each of the end portions 20 and 21 extends away from the remainder of the tube end 16 within its header thereby securing the tube end to the header wall member 17. In the illustrated embodiment each end portion 20 and 21 has a terminal edge 23 that is in contact with the inner liquid-contacting surface 24 of the header wall 17. As illustrated in FIG. 2, each end portion 20 and 21 is curved arcuately so as to provide a space between the end portion and the adjacent surface 24 of the header wall 17.

In the embodiment of FIG. 3 this space is utilized to retain a solid joining material such as the illustrated ring 26 of brazing metal alloy in position around the joint between the tube 14 and the header wall 17. When so retained and the assembly heated to brazing temperature in the usual and ordinary brazing operation the engagement of the ring 26 by the curved end

portion 20 and 21 prevents or materially retards the flowing away of the melted alloy from the joint where the alloy is intended to be applied. This of course is the joint between the opening 19 and the adjacent surfaces of the tube 14.

By using the tube and header construction of this invention it is now possible to eliminate the usual deforming of the tube which is the customary way of fixing a tube end to a header wall preparatory to permanent joining. This deforming frequently caused the tube to split and also resulted in uneven spacing of the tube end from the header wall opening through which it extended. The structure of this invention also prevents the tube end becoming filled with brazing metal or solder during the melting joining step.

Thus this invention of tube and header construction forms a more secure bonding of the tube to the header both before and after permanent bonding, can be used to hold the bonding metal, either solder or brazing metal, exactly in position where it is needed to form a secure joint and greatly improves the efficiency of mechanical production as it materially reduces and even eliminates failures in the bond which would cause the unit to be rejected.

FIGS. 4 and 5 illustrate a tool that may be used to shape the tube end 16. This tool 27 comprises a body 28 with a tapered lower end 29 adapted to fit snugly within the tube end 16. It also has opposite shoulders 30 arcuately curved to engage and bend over the end portions 20 and 21 to the same curvature of the shoulders 30.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the appended claims.

I claim:

1. A tube and header construction, comprising: a wall member forming a liquid confining part of said header having an opening; a tube end extending into said header through said opening; and means forming spaced end portions of said tube end within the header extending away from the remainder of said tube end within said header and thereby securing said tube end to said header wall member.

2. The structure of claim 1 wherein said tube end is substantially the same size and shape as said opening to fit snugly therein.

3. The structure of claim 1 wherein said end portions have terminal edges in contact with said wall member on the interior of said header.

4. The structure of claim 1 wherein said tube end is of elongated cross section with substantially parallel opposite sides in each of which is located a said end portion.

5. The structure of claim 4 wherein said tube end is substantially the same size and shape as said opening to fit snugly therein, and said end portions have terminal edges in contact with said wall member on the interior of said header.

6. The structure of claim 1 wherein said end portions are spaced from said wall member to retain a solid joining material between the wall member and end portions.

7. The structure of claim 6 wherein said tube end is substantially the same size and shape as said opening to fit snugly therein, and said end portions have terminal edges in contact with said wall member on the interior of said header.