HEAT EXCHANGER
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The present invention relates to heat exchangers and more particularly to a heat exchanger for cooling the liquid coolant of an internal combustion engine.

The present automobile radiator uses a two part tank or header on each end of a radiator core. The two parts of the header are usually joined by some type of soldered seam. The tubes of the radiator core are connected and soldered individually to the headers. The fabrication of this multitude of soldered joints is expensive and provides many opportunities for coolant leaks, both in manufacture and service.

The primary object of the present invention, therefore, is to provide a radiator which is easily and inexpensively fabricated and wherein the possibility of leakage is reduced considerably.

The present invention contemplates the use of extruded or roll-formed sections in making the headers, and the utilization of a particuliar tube end and header construction to provide a substantially continuous opening between the headers and the tubes. It is further contemplated that mounting flanges for the radiator; the oil cooler; and support means for the radiator fins be formed as an integral extrusion or roll-formed section.

While the primary object of the present invention relates to the reduction of expense of fabrication and the reduction of leakage in service of a heat exchanger, other objects and advantages will be apparent from the following detailed description taken in conjunction with the appended drawings wherein:

FIGURE 1 is an exploded, perspective view of a heat exchanger made in accordance with the present invention;

FIGURE 2 is an enlarged fragmentary perspective view, partially in section, of the header and tube construction of the heat exchanger of FIGURE 1; and

FIGURE 3 is a cross-sectional view of the heat exchanger.

Referring to the drawings, there is disclosed in FIGURE 1 a heat exchanger in accordance with the present invention which comprises, in general, a pair of parallel, elongated tanks or headers 10, 11 and a plurality of spaced tubes 12 extending between and in fluid communication with the tanks 10, 11. A plurality of convoluted fins 13 are provided in the spaces between the tubes 12.

An important aspect of the present invention is the use of extrusions, preferably formed of aluminum, for the tanks 10 and 11. The tank 10 is a modified rectangular extrusion comprising a top wall 14, side walls 15 and 16, and a bottom wall 17. The top wall 14 has a projecting flange 18 thereon which, as extruded, is a continuous flange, but a portion thereof is removed as shown in FIGURE 1 and apertured at 19 to provide a mounting flange for the heat exchanger. The bottom wall 17 of the extruded tank 10 has a pair of downwardly extending projections 20, 21 thereon, as shown in FIGURE 2, which direct the air flow away from space between the top of fins 13 and the bottom wall 17, and into the fin and tube area of the heat exchanger. The projections 20, 21 thus prevent the short circuiting of air through the space. The bottom wall 17 has a pair of spaced, upwardly extending members 17a and 17b thereon which form a longitudinally extending channel 22 for receiving the ends of the tubes 12. An aperture 23 is provided in the top wall 14 for a coolant supply and overflow fitting 24, and an aperture 25 is provided for the coolant inlet tube fitting 26.

pair of caps 27, 28 are welded or otherwise suitably secured to the ends of the tank 10.

The bottom tank 11 is in an extension of substantially the same configuration as tank 10. As seen in FIGURE 3, the tank 11 has a bottom wall 30, side walls 31 and 32, and a top wall 33. The bottom wall 30 has a projecting flange 34 thereon which, like the flange 18 of tank 10, has a portion thereof removed and apertures 35 formed therein to provide a mounting flange. The top wall 33 has a pair of upwardly extending projections 36, 37 thereon which serve to retain the bottom ends of the fins 13. The top wall 33 also has a pair of spaced, downwardly extending members 33a and 33b which form a longitudinally extending channel 38 for receiving the bottom end of the tubes 12. The bottom wall 30 of the tank 11 has an aperture 40 therein which receives a fitting 42 for an oil cooler 44. An oil cooler fitting 43 is also provided in the wall 30. An aperture 45 is provided in the wall 32 for receiving a coolant outlet fitting 46. A drain boss 47 and valve 48 are provided in the wall 32. A pair of caps 50, 51 are welded or otherwise suitably secured to the ends of the tank 11.

Another important aspect of the present invention is the formation of the oil cooler 44 as an integral part of the bottom tank 11. The oil cooler 44 is formed by an extruded partition 52; bottom ends 31a, 32a of the side walls 31, 32; and the bottom wall 30. Heat exchange fins 53 are formed on the partition 52. By forming the partition 52 with its fins 53 by extrusion to provide the oil cooler 44, the costs and problems of assembling a separate oil cooler in the bottom tank are substantially eliminated, as well as the possibility of leakage and contamination of the coolant and/or the oil.

Another important aspect of the present invention relates to the construction of the ends of the tubes 12 and their relationship to the channels 22 and 38 of the tanks 10 and 11, respectively. The tubes 12, which are relatively flat to provide space therebetween for the heat exchange fins 13, are expanded at both ends thereof to provide rectangular-shaped openings 54, 55. The opening 54 is defined by side walls 54a, 54b and end walls 54c, 54d. When the heat exchanger is assembled, the end walls 54c are placed in contact with the end walls 54d of the adjacent tube 12 and the side walls 54a, 54b are placed in contact with the upwardly extending members 17a, 17b, respectively. The areas of contact of the tubes with each other and with members 17a, 17b are provided with a weld or other suitable sealant. The bottom ends of the tube 12 are assembled in the channel 38 in the same manner. The aforesaid flared tube and channel construction eliminates the need of a separate multiple apered wall in the headers of a heat exchanger.

A pair of plates 56, 57 are welded or otherwise suitably secured to the projections 20, 21—36, 37, respectively, to support the outermost fin 13 of the heat exchanger.

While the description of the present heat exchanger has been more or less limited to a radiator for an internal combustion engine, it will be understood by those skilled in the art that this is only one of many embodiments of the invention, which invention obviously has many other applications in the heat exchange art.

1. A heat exchanger adapted to be mounted on a structure comprising a pair of spaced, elongated tanks, each tank comprising a substantially rectangular member having top, side and bottom walls, one wall of each of said tanks having a relatively narrow channel therein defined by inwardly extending members and outwardly extending projections in said wall, the plurality of spaced tubes extending between said tanks, the ends of said tubes having end and side walls, the side walls being sealably connected to the projections defining the channels and the end walls
of each adjacent tube being connected together in sealed relationship to provide a substantially continuous opening between said tanks and said tubes, at least one of said tanks having a mounted flange integral with said tank and extending from one of said walls for securing the heat exchanger to a structure said inwardly extending members provide substantial extending projections providing means to deflect the flow of air away from said tube ends.

2. A heat exchanger as defined in claim 1 wherein at least one tank member is provided with a partition therein dividing said tank member into two compartments, and inlet and outlet passages in each of said compartments.

3. A heat exchanger in accordance with claim 2 wherein the partition has a plurality of spaced fins thereon.

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