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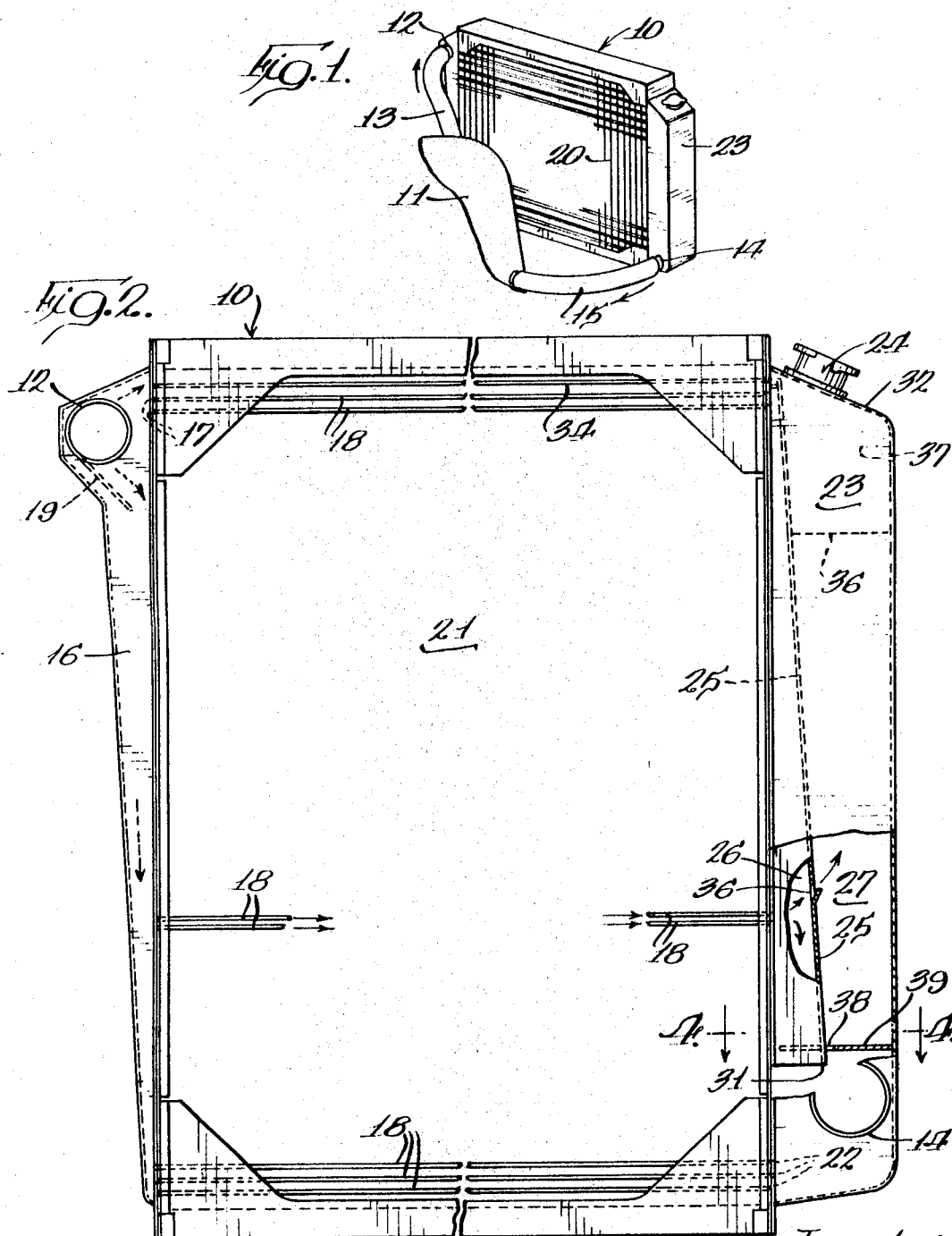
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LIQUID COOLANT RADIATOR WITH AIR SEPARATING MEANS

Filed Aug. 23, 1967

2 Sheets-Sheet 1



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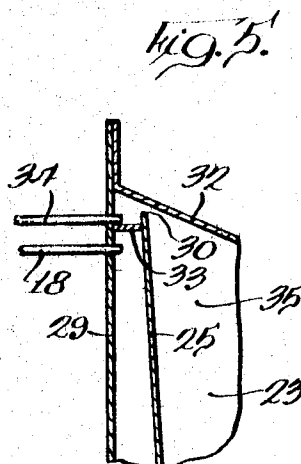
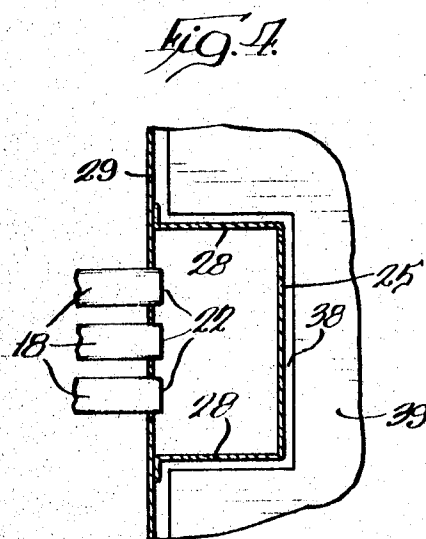
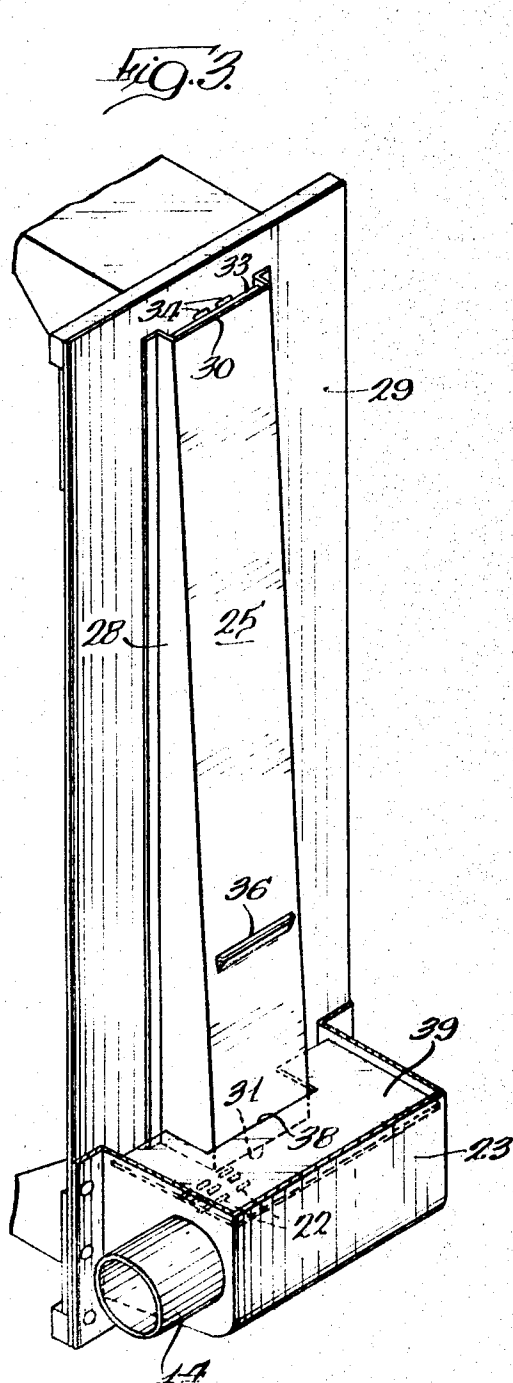
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LIQUID COOLANT RADIATOR WITH AIR SEPARATING MEANS

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2 Claims

ABSTRACT OF THE DISCLOSURE

A radiator for cooling the liquid coolant of a combustion engine utilizing a core having spaced tubes through which coolant flows during the cooling and a coolant header at one side of the core with which the tubes communicate, the header having upright baffle means dividing the header into a liquid chamber adjacent the tubes and an air-liquid chamber on the side of the baffle away from the tubes and a restricted flow air-liquid vent means in the baffle below the top thereof connecting the liquid and air-liquid chambers so that air and liquid passing through the vent into the air containing chamber causes air to collect at the top of the chamber above the vent means.

In radiators of the above type, there is often air trapped in the liquid coolant and if not removed this air tends to reduce the efficiency of the cooling system. The radiator of this invention provides a header structure which permits removal of this air automatically from the main coolant passage of the engine and the radiator. In the preferred construction it also provides fluid passage means at the top of the baffle means interconnecting the upper tubes of the radiator core and the top of the air space in the air-liquid chamber together with barrier means including the baffle means isolating this upper tube from the liquid chamber that is on the side of the baffle means adjacent the core tubes.

One embodiment of the invention is illustrated in the accompanying drawings in which:

FIGURE 1 is a fragmentary perspective view of a portion of a combustion engine block and a radiator embodying the invention.

FIGURE 2 is a rear elevational view partially broken away and partially in section for clarity of illustration of the radiator of FIGURE 1.

FIGURE 3 is an enlarged fragmentary perspective view partially in section of the right end of the radiator of FIGURE 2.

FIGURE 4 is a fragmentary horizontal sectional view taken along line 4-4 of FIGURE 2.

FIGURE 5 is an enlarged fragmentary vertical sectional view of the upper right-hand corner of FIGURE 2 but omitting the filler tube and cap for clarity of illustration.

As shown in the drawings, the radiator 10 is employed in front of a combustion engine block 11, such as for an automotive vehicle, and the radiator has an inlet 12 communicating with the block 11 by a hose 13 for flow of liquid coolant from the block 11 into the radiator 10 and an outlet 14 on the other side of the radiator for returning cooled coolant to the block 11 by means of a similar hose 15.

As can be seen in FIGURE 2, the inlet 12 empties into the top of a header 16 at one side of the radiator 10 and the coolant on entering the header 16 is directed downwardly and toward the entrance ends 17 of the parallel coolant tubes 18 by a downwardly and inwardly inclined baffle 19 adjacent the inlet 12. The baffle 19 directs flow toward the top tubes 18 in low flow and level operations. It also helps control after boil losses.

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The coolant tubes 18 and customary interconnecting vertical fins 20 comprise the radiator core 21 in which the coolant is cooled by heat exchange with air flowing through the fins and over the tubes in the customary manner propelled as by a fan (not shown).

As shown in FIGURE 4, the coolant tubes are in horizontal sets, here shown as sets of three. The entrance ends 17 of all the tubes communicate with the inlet header 16 to receive liquid coolant therefrom. The opposite outlet ends 22 of the tubes 18 communicate with a vertical header 23 located on the opposite side of the core 21. The top of this outlet header 23 is provided with a filling tube and cap combination 24 of the customary type.

Located within the outlet header 23 is an upright baffle means 25 dividing the header 23 into a liquid chamber 26 adjacent the outlet ends 22 of the coolant tubes 18 and an air-liquid chamber 27 on the side of the baffle means more remote from the tubes 18. As shown most clearly in FIGURES 3-5, the baffle 25 is of generally U-shaped cross section having sides 28 attached to the adjacent end plate 29 of the radiator to provide an upright conduit. The baffle slopes from a top end 30 that is adjacent the plate 29 to a bottom end 31 (FIGURE 2) relatively spaced from the end plate 29. This baffle 25 encloses the inner or outlet ends 22 except for those beneath the bottom end 31.

As shown most clearly in FIGURE 5, the top end 30 of the baffle 25 is spaced below the sloped top 32 of the header 23 that carries the filling tube 24 which is not shown in FIGURE 5 for clarity of illustration. Immediately beneath this top end 30 of the baffle 25 there is provided a barrier means 33 in the form of a generally horizontal shelf extending from the baffle 25 to the end plate 29. Thus the combination of the baffle 25 and barrier plate 33 encloses all of the tube 18 outlet ends 22 except for the topmost horizontal row of three coolant tubes 34 and of course those tubes that are beneath the bottom end 31 of the barrier plate 33. This topmost row 34 of tubes empties into the header 23 at an area above the barrier plate 33 and thereby communicate with the air space 35 that is above the liquid level shown at 36 in FIGURE 2 on the air-liquid chamber 27 side of the baffle 25.

The outlet 14 from the header 23 is located adjacent the bottom thereof and in the vicinity of the bottom end 31 of the baffle 25. Thus the bottom of the baffle is open to the outlet 14 so that liquid flowing from left to right, as viewed in FIGURE 2, through the tubes 18 empties into the liquid chamber 26 within the baffle 25 and then flows downwardly through the bottom end 31 and into the outlet 14 for return to the block 11 by way of the hose 15.

The baffle 25 is provided below its top, and preferably nearer to the bottom 31 than the top 30, with a restricted flow air-liquid vent means 36 in the form of a transverse generally horizontal slot in the baffle. This vent interconnects the two chambers 26 and 27 previously described that are located on opposite sides of the baffle. Because the liquid chamber side 26 of the baffle is under higher pressure than the air-liquid chamber 27 side, mixed air and liquid is projected through the vent 36 under pressure so that the air readily separates from the liquid in the chamber 27 and rises to the top or into the air space 37 above the illustrated liquid level 36. As the air-liquid chamber 27 is isolated from the main liquid flow path, which as previously described is into the liquid chamber 26, down through the open bottom end 31 of the baffle and through the outlet 14, the chamber 27 is a quiet chamber in which there is relatively little liquid flow. However, the bottom liquid containing portion of the chamber 27 communicates with the bottom of the header 23, which functions as a liquid exit chamber, through a

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restricted flow opening 38 provided by a transverse bottom baffle 39 which as illustrated most clearly in FIGURE 4 is separated from the baffle 25 and the adjacent portions of the end plate 29 by the small liquid flow space 38. With this construction as more liquid is needed in the coolant passages caused by the normal coolant losses it is easily drawn from the liquid supply in the chamber 27. In one embodiment of the invention the width of the restricted flow opening or space 38 was $\frac{1}{16}$ inch and the dimensions of the vent 36 were about $\frac{1}{4}$ inch by $2\frac{1}{4}$ inches long.

As stated earlier, the top row 34 of coolant tubes is not contained within the baffle 25 but empties into the air space 35 on the outside of the baffle 25 as shown in FIGURE 5. This structure permits venting of the engine block 11 while the radiator is being filled through the fill tube 23 as an aid in removing air from the coolant passages. Furthermore, during a steam boil-off it permits steam to escape at the top of the core without permitting the steam to blow all of the coolant from the core.

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 accompanying claims.

I claim:

1. A radiator for cooling the liquid coolant of a liquid cooled engine, comprising: a core having spaced tubes through which said coolant flows during said cooling; a coolant header at one side of the core with which said tubes communicate; upright baffle means in said header substantially enclosing the header ends of said tubes, the baffle means having an open lower end above the bottom of said header for dividing said header into a liquid chamber adjacent said tubes, an air-liquid chamber on the side of the baffle means more remote from said tubes, and a liquid exit chamber beneath said liquid chamber and air-liquid chamber and baffle; a coolant outlet from said liquid exit chamber; a restricted flow air-liquid vent means in said baffle means below the top thereof connecting said liquid and air-liquid chambers, air and liquid thereby passing through said vent means to collect air at the top

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of said air-liquid chamber and above said vent means; restricted flow means between said air-liquid chamber and said liquid exit chamber for directing liquid substantially free of air from said air-liquid chamber to said exit chamber and said outlet; fluid passage means at the top of said baffle means interconnecting an upper tube and the top of said air-liquid chamber; and barrier means including said baffle means isolating said upper tube from said liquid chamber.

2. A radiator for cooling the liquid coolant of a liquid cooled engine, comprising: a core having spaced transverse tubes through which said coolant flows during said cooling; a coolant header at one side of the core receiving liquid from said tubes; baffle means in said header defining a liquid chamber adjacent said tubes and an air-liquid chamber on the side of the baffle means more remote from said tubes; restricted flow air-liquid vent means in said baffle means below the top thereof connecting said liquid and air-liquid chambers, air and liquid thereby passing through said vent means to collect air at the top of said air-liquid chamber and above said vent means; fluid passage means at the top of said baffle means interconnecting an upper tube and the top of said air-liquid chamber; and barrier means including said baffle means isolating said upper tube from said liquid chamber.

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123—41.54; 165—107, 138, 148, 174