

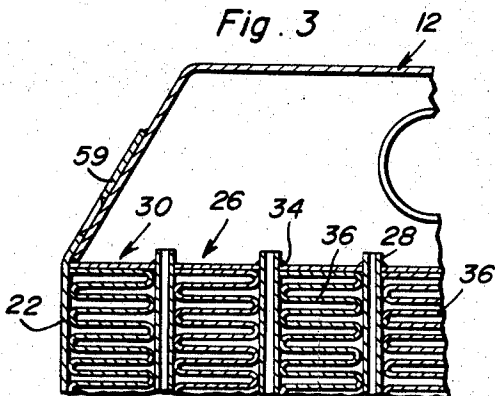
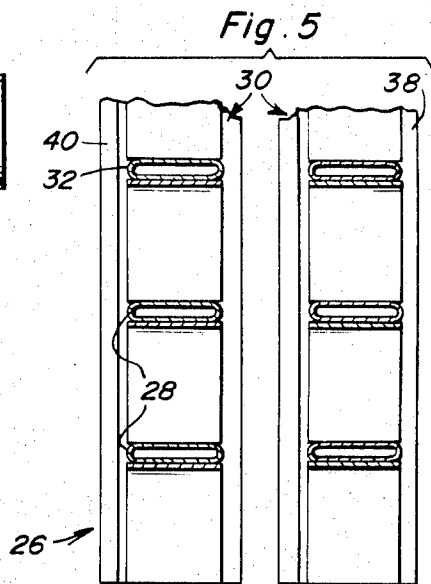
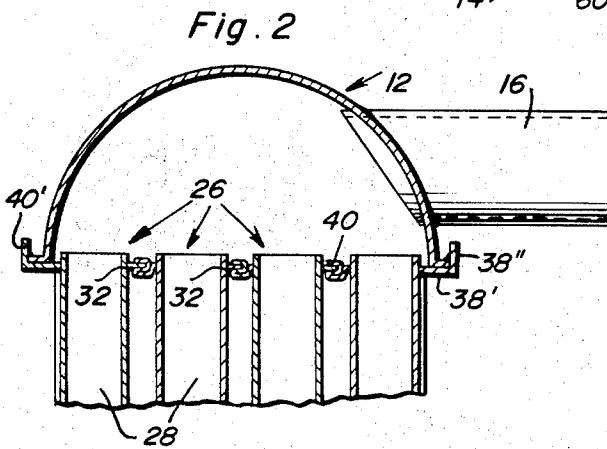
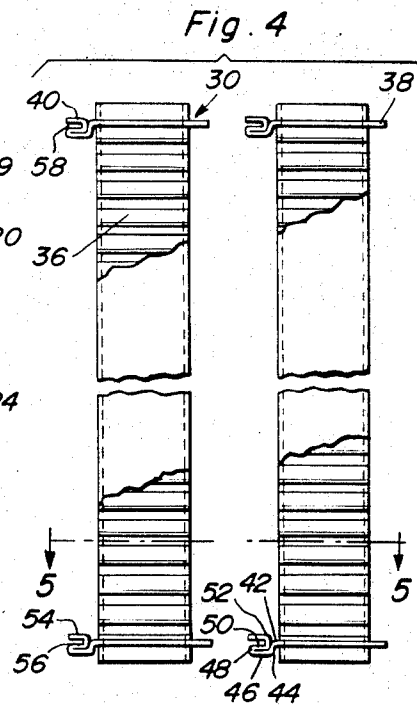
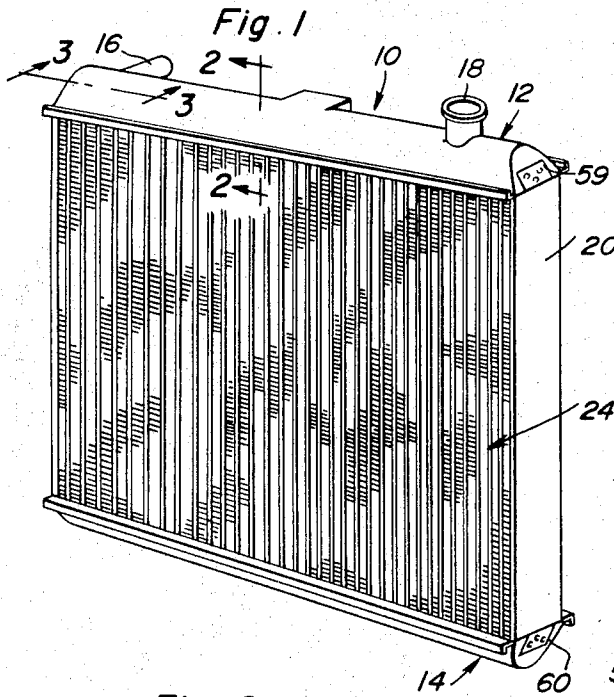
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3,472,316

LAYERED HEAT EXCHANGER WITH INTERLOCKING HEADER PLATES

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3,472,316

## LAYERED HEAT EXCHANGER WITH INTER-LOCKING HEADER PLATES

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7 Claims

### ABSTRACT OF THE DISCLOSURE

A heat exchanger core including a plurality of side-by-side rows of generally parallel coolant tubes, the corresponding ends of each row of tubes opening through a header plate section and the adjacent edge portions of adjacent header plate sections including interlocking portions sealingly secured together.

The layered heat exchanger of the instant invention has been designed to provide a means by which the coolant tubes of all industrial and automotive radiators may be standardized in transverse dimension. The layered heat exchanger is able to provide the necessary cooling capacity with standard size coolant tubes inasmuch as it may be readily constructed of any plan area and thickness to afford the coolant capacity desired within a reasonable cross-sectional area.

Further, the layered heat exchanger of the instant invention enables damaged or inoperative sections of the heat exchanger to be readily replaced or repaired inasmuch as the heat exchanger may be readily disassembled thus affording low cost repair and maintenance.

The main object of this invention is to provide a layered heat exchanger utilizing standardized components and which may be readily constructed to provide the necessary cooling capacity utilizing only basic standardized components.

Another object of this invention is to provide a heat exchanger which may be readily disassembled and whose component parts may therefore be readily repaired or replaced.

Yet another object of this invention is to provide a heat exchanger in accordance with the preceding objects and which will lend itself to being manufactured from basic standardized components.

A final object of this invention is to be specifically enumerated herein is to provide a heat exchanger which will conform to conventional forms of manufacture, be of simple construction and easy to service so as to provide a device that will be economically feasible, long lasting and relatively trouble-free from a maintenance standpoint.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of a heat exchanger constructed in accordance with the present invention;

FIGURE 2 is an enlarged fragmentary vertical sectional view taken substantially upon the plane indicated by the section line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged fragmentary vertical sectional view taken substantially upon the plane indicated by the section line 3—3 of FIGURE 1;

FIGURE 4 is a side elevational view of a pair of adjacent standardized components of the heat exchanger; and

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FIGURE 5 is a fragmentary sectional view taken substantially upon the plane indicated by the section line 5—5 of FIGURE 4.

Referring now more specifically to the drawings, the numeral 10 generally designates a heat exchanger constructed in accordance with the present invention and which is in the form of an automotive radiator or the like. The heat exchanger 10 includes somewhat conventional upper and lower end tanks generally referred to by the reference numerals 12 and 14 and it may be seen that the upper tank 12 includes a coolant outlet neck 16 and a filler neck 18. Of course, the lower end tank 14 includes an inlet neck (not shown) of conventional design. Further, the heat exchanger 10 includes a pair of opposite side mounting straps 20 and 22.

The core of the heat exchanger 10 is referred to in general by the reference numeral 24 and includes a plurality of side-by-side core sections referred to in general by the reference numeral 26. Each of the core sections 26 includes a row of generally parallel coolant tubes 28 of standardized size and similar upper and lower end plate sections generally referred to by the reference numerals 30. The end plate sections are generally in the form of elongated strips and each is provided with a plurality of longitudinally spaced and transversely elongated openings 32 for receiving the corresponding ends of the coolant tubes 28 therethrough. The ends of the coolant tubes 28 are sealingly secured through the openings 32 in any convenient manner such as by soldering 34. The core sections 26 are arranged in side-by-side relation and any suitable type of cooling fins 36 may be utilized and disposed between adjacent cooling tubes 28.

From FIGURES 2 and 4 of the drawings it may be seen that the opposite longitudinal edge portions of the end plate sections 30 include a tongue defining edge portion 38 and a groove defining edge portion 40. The tongue defining edge portions 38 are substantially planar and are merely defined by the corresponding edge portion of the end plate section 30 projecting outwardly beyond the ends of the tubes 28 secured therethrough. On the other hand, the groove defining edge portions 40 each includes a pair of bends 42 and 44 defining a laterally offset portion 46 and the latter is bent back upon itself as at 48 and has a pair of right angle bends 50 and 52 formed therein defining a second back-turned portion 54. The second back-turned portion 54 and the portion 56 coact with the portion disposed between the right angle bends 50 and 52 to define a groove 58 in which either of the tongue defining edge portions 38 are snugly receivable. Accordingly, each layer of the heat exchanger 10 is defined by a plurality of the tubes 28 secured through a corresponding pair of end plate sections 30. The layers of the heat exchanger 10 may be readily secured together by tightly wedging the tongue defining edge portions 38 in the opposing grooves 58 and subsequently securing the tongue defining edge portions 38 in the groove 58 by soldering. Of course, the outside layers of the core 24 may include extended tongue defining edge portions 38' and be devoid of the groove defining edge portions 40 so as to include upturned flange portions 38'' and 40' between which to receive the opposite side edge portions of the upper and lower end tanks 12 and 14. The edges of the upper and lower end tanks 12 and 14 may be secured to the end plate sections 30 in any convenient manner such as by soldering and the mounting straps 20 include the conventional apertured tabs 59 and 60 by which the mounting straps 20 may be secured to the inclined end faces of the upper and lower end tanks 12 and 14 by soldering.

It may thus be seen that the heat exchanger 10 may be readily varied in height merely by varying the length of the tubes 28, may be varied in width extending between

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the mounting straps 20 by increasing the length of the end plate sections 30 and may be increased in thickness by using additional layers or core sections 26.

Inasmuch as the core 24 may be readily constructed of any size to provide the desired cooling capacity it may be readily constructed from standardized components and components which may therefore be readily repaired or replaced.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. A radiator construction defining a thick panel-like structure for disposition transversely in an air flow path, said radiator construction including an elongated header plate assembly extending along one marginal edge of the structure and disposed generally normal to the medial plane of the structure, said header plate assembly including a plurality of generally coplanar elongated plate sections disposed in side-by-side relation, said plate sections each having coolant tube receiving openings formed therein at points spaced longitudinally therealong adapted to have corresponding ends of a plurality of side-by-side coolant tubes secured therein, said plate sections including pairs of adjacent marginal portions provided with first and second coating components extending therealong and sealingly secured together, said first and second components comprising tongue and groove defining free edge portions of said marginal portions with the tongue defining free edge portions snugly received and secured in the grooves defined by the adjacent groove defining free edge portions.

2. The combination of claim 1 wherein each tongue defining edge portion is defined by adjacent spaced apart and generally parallel reversing bends formed in and ex-

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tending along the tongue defining free edge portion, the reversing bend adjacent the edge face of said free edge portion being spaced therefrom.

3. The combination of claim 2 wherein the portions of said edge portion free immediately adjacent and disposed on opposite sides of the last-mentioned bend are generally parallel and snugly receive therebetween the tongue portion of the adjacent plate section.

4. The combination of claim 1 including a plurality of generally parallel coolant tubes, said tubes being arranged in side-by-side rows of tubes and having one set of corresponding end portions secured through said openings.

5. The combination of claim 4 including cooling fins disposed between adjacent tubes in each row of tubes.

6. The combination of claim 1 including an open-sided end tank secured to one side of said header plate assembly and enclosing at least all but the marginal edge portions of one side of said plate assembly within said end tank.

7. The combination of claim 1 wherein said tongue defining free edge portions and the grooves by said groove defining edge portions are disposed generally normal to said medial plane.

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29—157.3, 157.4; 113—118, 149; 165—175