

[54] **RADIATOR ASSEMBLY**[75] Inventor: **Vernon N. Tramontini**, Indianapolis, Ind.[73] Assignee: **Stewart-Warner Corporation**, Chicago, Ill.[22] Filed: **Feb. 25, 1974**[21] Appl. No.: **445,085**[52] U.S. Cl. **165/126**[51] Int. Cl. **F28f 13/12**[58] Field of Search **165/121-127**[56] **References Cited****UNITED STATES PATENTS**

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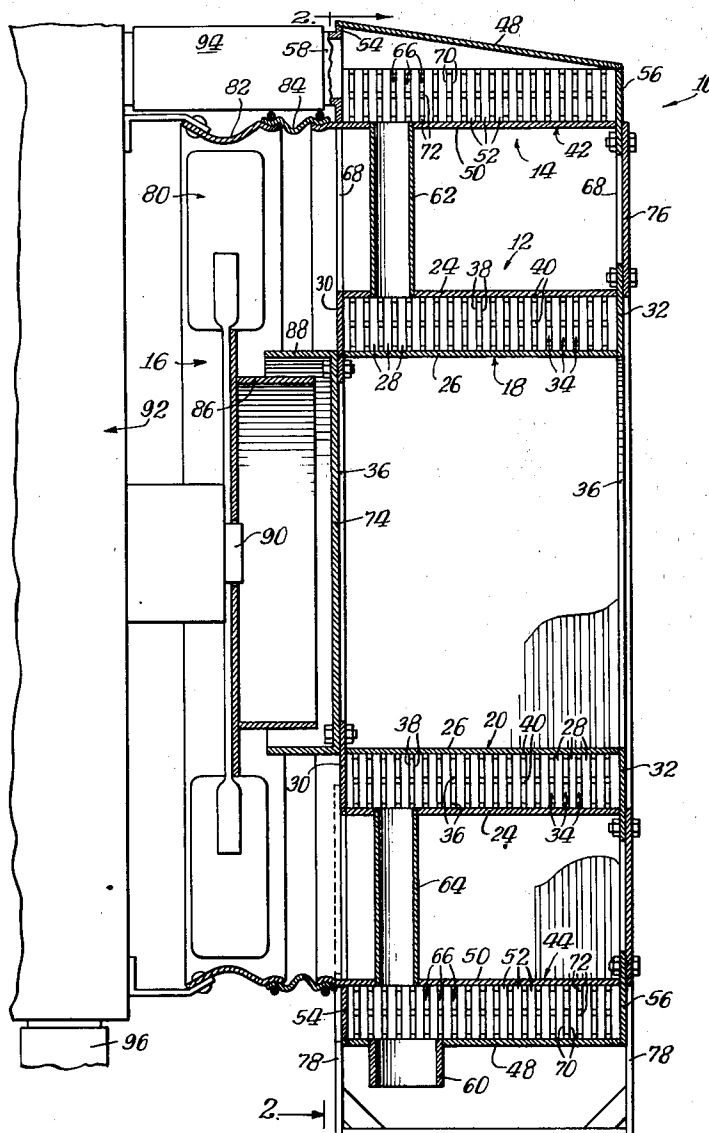
Primary Examiner—Charles J. Myhre

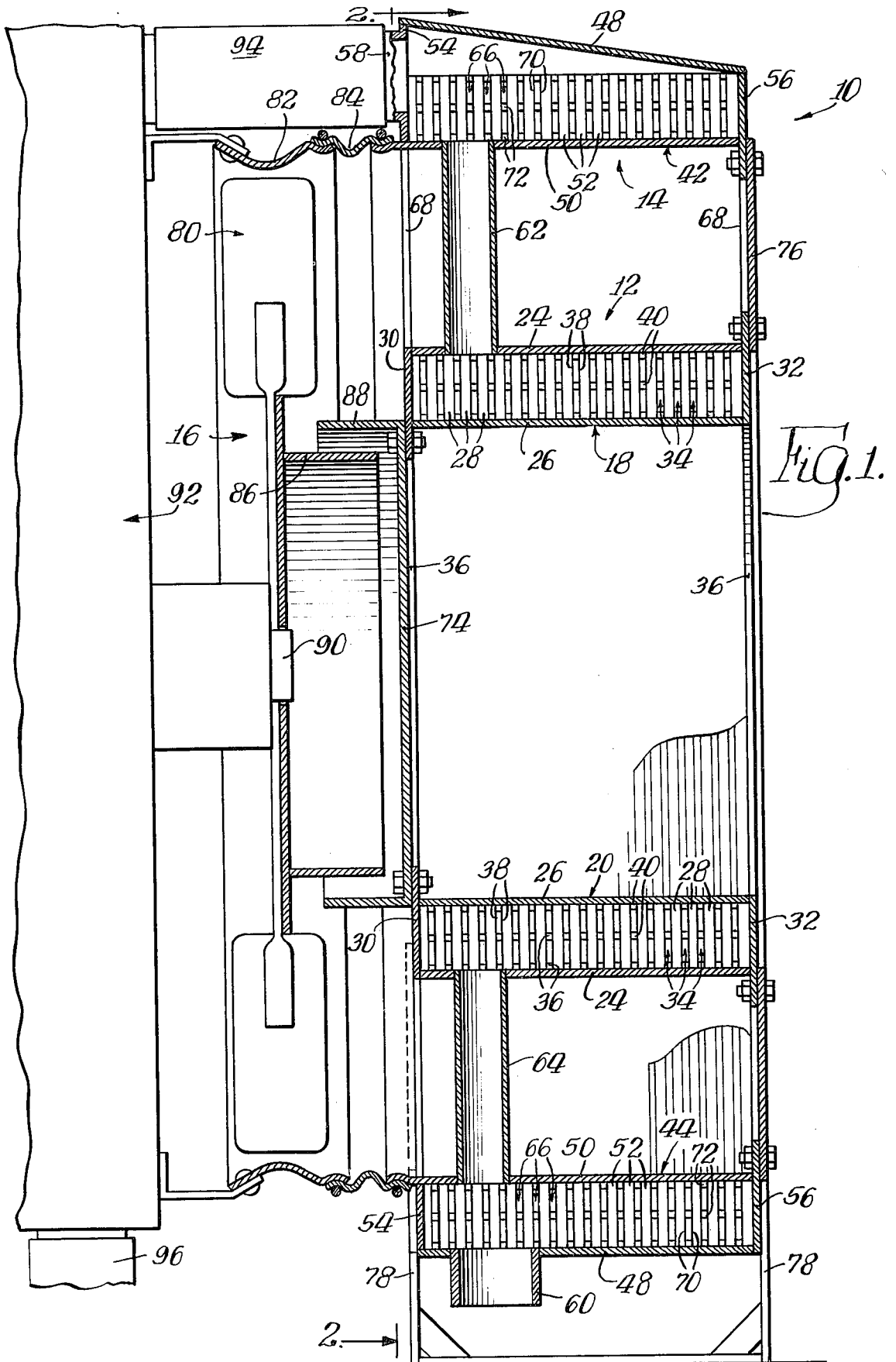
Assistant Examiner—Theophil W. Streule

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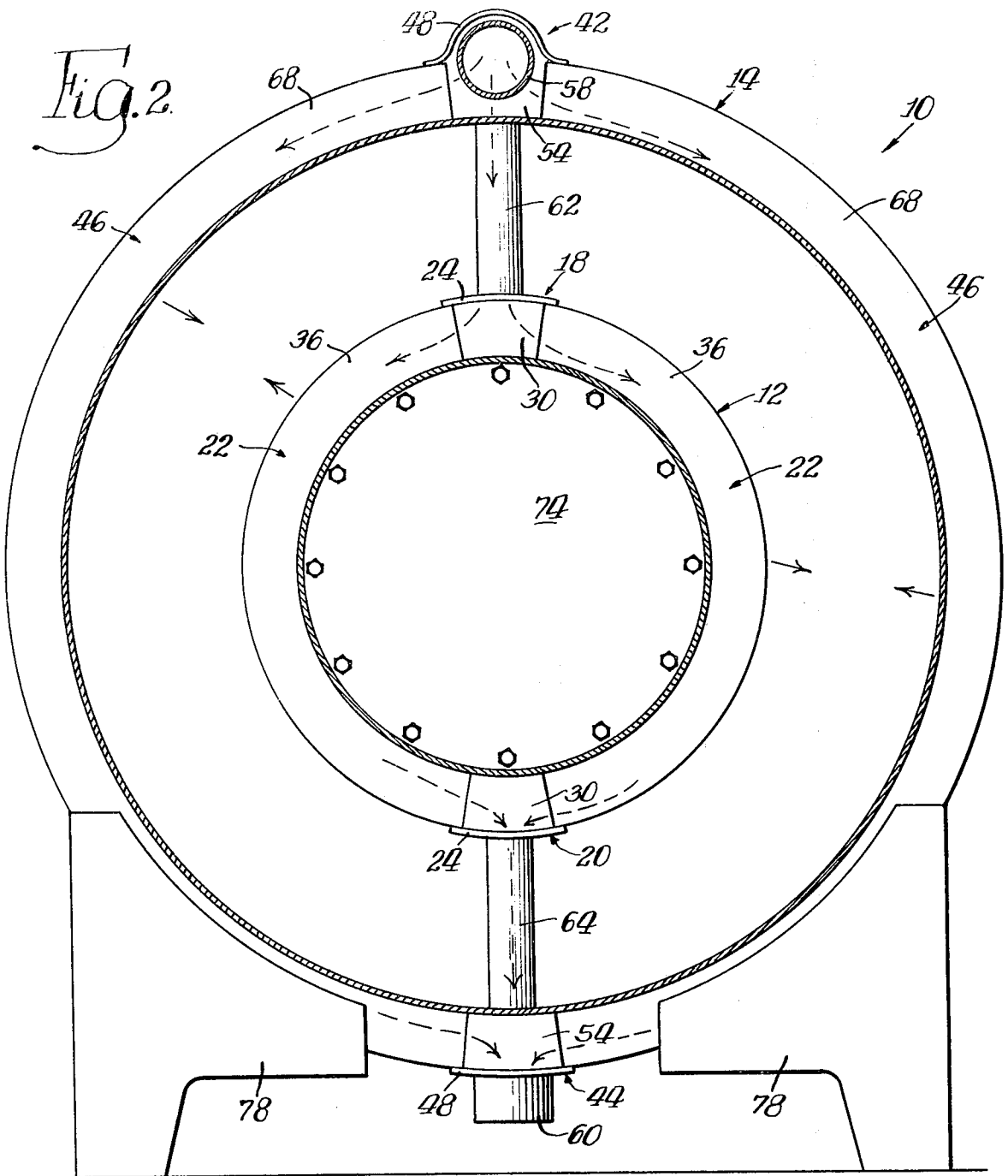
ABSTRACT

An inner annular radiator has fluid passageway means and radial air passageway means. An outer annular radiator is radially spaced from the inner annular radiator and has fluid passageway means and radial air passageway means. Air propelling means includes a fan located at one side of the inner and outer annular radiators for moving air through the air passageway means thereof in opposite directions.

4 Claims, 2 Drawing Figures



SHEET 2 OF 2



RADIATOR ASSEMBLY

FIELD OF THE INVENTION

The present invention pertains to a radiator assembly comprising a pair of radially spaced annular radiators for use in the cooling system of a truck, off-road vehicle, or the like.

SUMMARY OF THE INVENTION

The radiator assembly of the present invention comprises a pair of radially spaced annular radiators each having fluid passageway means and radial air passageway means, and air propelling means for moving air through the air passageway means. In particular, the fan of the air propelling means is located at one side of the annular radiators spaced therefrom.

With this arrangement, excessive air turbulence and reverse-of-normal air flow at the sections of the radiators adjacent the fan are minimized if not completely eliminated. As a result, better distribution of air across all cooling surfaces, and more uniform air flow and heat transfer, are attained than heretofore. Hence, the present radiator assembly performs its cooling function with greater efficiency than prior art radiator assemblies.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical axial median sectional view of a radiator assembly incorporating the principles of the present invention; and

FIG. 2 is a transverse sectional view taken substantially along the line 2—2 in FIG. 1 looking in the direction indicated by the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is indicated generally by the reference numeral 10 a radiator assembly incorporating the principles of the present invention. The radiator assembly 10 comprises an inner annular radiator 12, an outer annular radiator 14 radially spaced from the inner radiator 12, and air propelling means 16 located coaxially thereof.

The inner annular radiator 12 includes diametrically opposed first and second tank portions 18 and 20, and a pair of substantially semi-circular core portions 22. The tank portions 18 and 20 are each comprised of a radially outer wall 24, a radially inner wall 26, two sets or series of axially spaced side bars 28, and end walls 30 and 32. The two core portions 22 are each comprised of a plurality of radially extending core elements 34 and axially outer plates 36. Each core element 34 includes a pair of semi-circular side plates 38 and two or more intermediate semi-circular spacer rods 40. The core elements 34 are suitably secured at their open ends between the side bars 28 of the tank portions 18 and 20, and define a plurality of arcuate fluid passageways communicating at their ends with the tank portions 18 and 20. Also, the core elements 34 are axially spaced to define intermediate radial air passageways in the general planes of the side bars 28.

The outer annular radiator 14 includes diametrically opposed third and fourth tank portions 42 and 44, and a pair of substantially semi-circular core portions 46. The tank portions 42 and 44 are each comprised of a radially outer wall 48, a radially inner wall 50, two sets

or series of axially spaced side bars 52, and end walls 54 and 56. A fluid inlet tube 58 is secured in the end wall 54 of the third tank portion 42; a fluid outlet tube 60 is secured in the outer wall 48 of the fourth tank portion 44; a first fluid conduit tube 62 is connected between the third and first tank portions 42 and 18; and a second fluid conduit tube 64 is connected between the second and fourth tank portions 20 and 44. The two core portions 46 are each comprised of a plurality of radially extending core elements 66 and axially outer plates 68. Each core element 66 includes a pair of semi-circular side plates 70 and two or more intermediate semi-circular spacer rods 72. The core elements 66 are suitably secured at their open ends between the side bars 52 of the tank portions 42 and 44, and define a plurality of arcuate fluid passageways communicating at their ends with the tank portions 42 and 44. Also, the core elements 66 are axially spaced to define intermediate radial air passageways in the general planes of the side bars 52 and the core elements 34.

To establish the proper path of air flow, a circular closure plate 74 is secured radially across the inner annular radiator 12 at one side thereof, and an annular closure plate 76 is secured radially between the inner and outer annular radiators 12 and 14 at the other side thereof. The annular radiators 12 and 14 are typically mounted to a vehicle frame, and, to accommodate such mounting, support flanges 78 are suitably secured to the outer plates 68 of the core portion 46.

The air propelling means 16 includes a fan 80 which is located at one side of the inner and outer annular radiators 12 and 14 axially spaced therefrom. Extending about the fan 80 concentrically thereof is an annular shroud 82 secured along one edge by an annular flexible connector 84 to the outer annular radiator 14. To prevent recirculation of air in the vicinity of the fan 80, an axial ring 86 is secured to the central portion of the fan 80 and an overlapping axial ring 86 is secured to the circular closure plate 74.

When the radiator assembly 10 is installed in a vehicle, the support flanges 78 are secured to the vehicle frame (not shown); the fan 80 is secured to a shaft 90 driven by the vehicle engine 92; the shroud 82 opposite the flexible connector 84 is connected to the engine 92; and the inlet and outlet tubes 58 and 60 are connected to the engine water jacket and water pump (not shown) through inlet and outlet radiator hoses 94 and 96. The vehicle engine 92, the vehicle components referred to but not shown, and the connections thereto, are conventional and well known.

When the engine 92 is operating, water or other coolant heated in the engine 92 is directed therefrom through the inlet radiator hose 94 and the fluid inlet tube 58 to the third tank portion 42 of the outer annular radiator 14. One portion of the coolant received in the third tank portion 42 bifurcates and flows in parallel down through the core elements 66 of the core portions 46 at each side of the radiator 14. The remaining portion of the coolant received in the third tank portion 42 flows down through the first fluid conduit tube 62 to the first tank portion 18 of the inner annular radiator 12. The coolant received in the first tank portion 18 bifurcates and flows in parallel down through the core elements 34 of the core portions 22 at each side of the radiator 12. The coolant flowing from the core elements 34 is collected in the second tank portion 20 of the radiator 12 and is transmitted downwardly through

the second fluid conduit tube 64. The coolant flowing from the conduit tube 64 and from the core elements 66 is collected in the fourth tank portion 44 of the outer annular radiator 14 and returned through the fluid outlet tube 60 and the outlet radiator hose 96 to the engine 92.

To cool the liquid flowing through the radiators 12 and 14, the fan 80 draws air first radially outwardly through the air passageways of the inner radiator 12 and radially inwardly through the air passageways of the outer radiator 14 and then axially in the direction of the fan 80. By arranging the fan 80 in the manner described, excessive air turbulence and reverse-of-normal air flow at the sections of the radiators 12 and 14 nearest the fan 80 are substantially eliminated, distribution of air through all air passageways and uniformity of air flow and heat transfer are optimized, and cooling is attained with maximum efficiency.

If desired, the direction of air flow through the radiators 12 and 14 could be reversed; in such case, the fan 80 would force air axially inwardly between the radiators 12 and 14 and direct the same radially inwardly through the air passageways of the inner radiator 12 and radially outwardly through the air passageways of the outer radiator 14. Also, if desired, the radiators 12 and 14 could be divided axially into two or more parts or sections for cooling transmission oil, hydraulic fluid and the like in addition to engine coolant.

While there has been shown and described a preferred embodiment of the present invention it will be understood by those skilled in the art that various rearrangements and modifications may be made therein without departing from the spirit and scope of the invention.

The invention claimed is:

1. A radiator assembly, comprising; an inner annular radiator having a plurality of axially spaced generally arcuate fluid carrying core elements, arcuate radial flow air passageway means between said core elements, an outer annular radiator surrounding said inner radiator and having a plurality of axially spaced arcuate fluid carrying core elements, arcuate radial flow air passageway means between said outer radiator core elements, an axially extending substantially unobstructed annular space between the inner and outer radiators, fan means

positioned to convey air axially through said annular space, and means for directing the conveyed air simultaneously radially in one direction through the air passageway means in said inner annular radiator and in the opposite direction through the air passageways means in the outer annular radiator.

2. The radiator assembly of claim 1 wherein said inner annular radiator comprises diametrically opposed first and second tank portions, and a pair of substantially semi-circular core portions including said core elements connected at their ends to said first and second tank portions and with said plurality of core elements being parallel and defining a plurality of fluid passageways axially spaced to define intermediate air passageways, said outer annular radiator including diametrically opposed third and fourth tank portions, a pair of substantially semi-circular core portions including said core elements connected at their ends to said third and fourth tank portions and with said plurality of core elements being parallel and defining a plurality of fluid passageways axially spaced to define intermediate air passageways, fluid inlet means connected to said third tank portion, fluid outlet means connected to said fourth tank portion, first fluid conduit means between said first and third tank portions, and second fluid conduit means between said second and fourth tank portions.

3. The radiator assembly of claim 2 wherein said means for directing conveyed air includes a circular closure extending radially across said inner annular radiator at said one side thereof, an annular closure extending radially between said inner and outer annular radiators at the other side thereof, and an annular shroud concentric of said fan and secured to said outer annular radiator.

4. The radiator assembly of claim 1 wherein said means for directing conveyed air includes a circular closure extending radially across said inner annular radiator at said one side thereof, an annular closure extending radially between said inner and outer annular radiators at the other side thereof, and an annular shroud concentric of said fan and secured to said outer annular radiator.

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