May 15, 1962 F. A. HIERSCH 3,034,770

HEAT EXCHANGER

Filed Sept. 16, 1959 2 Sheets-Sheet 1

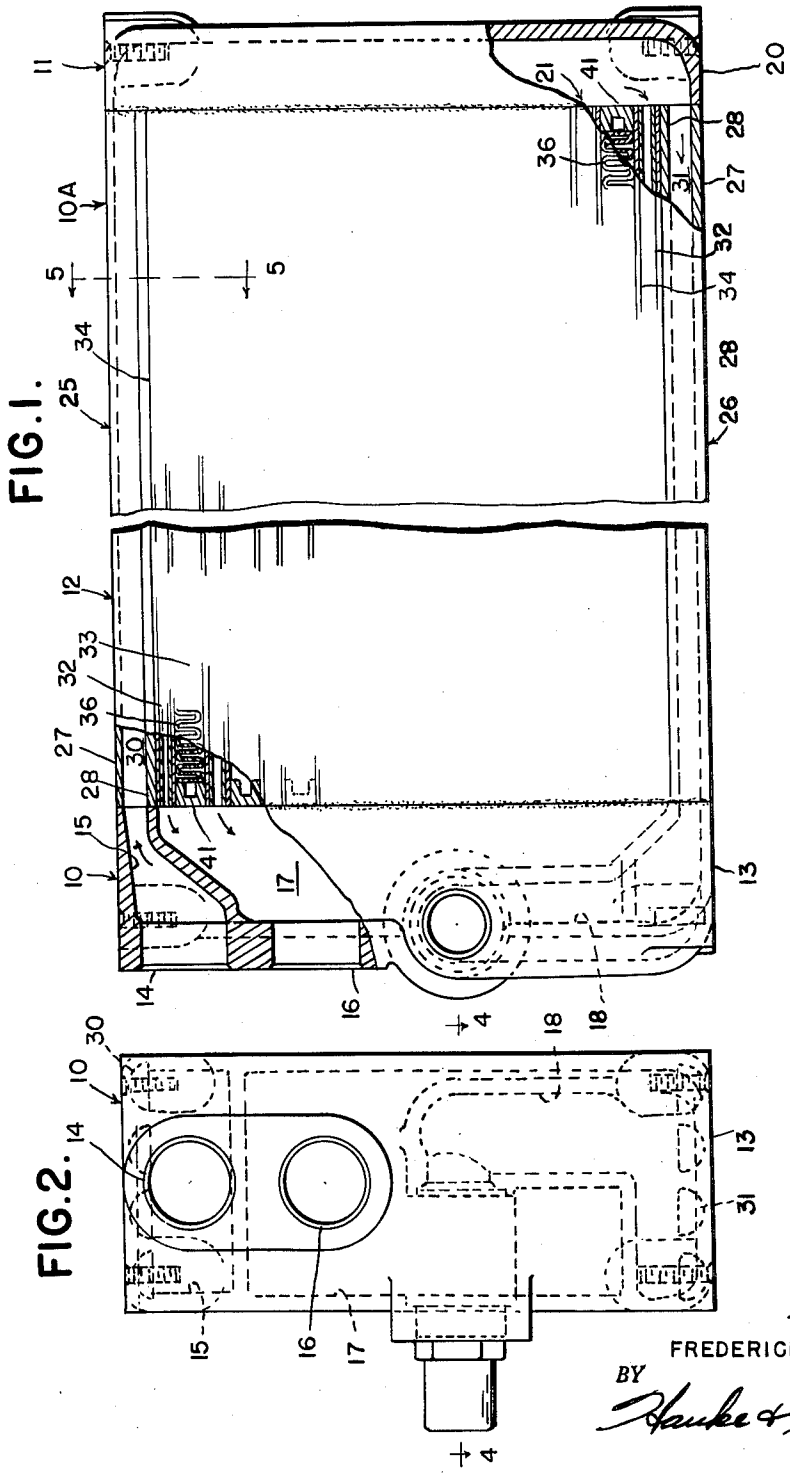


FIG. 1.

FIG. 2.

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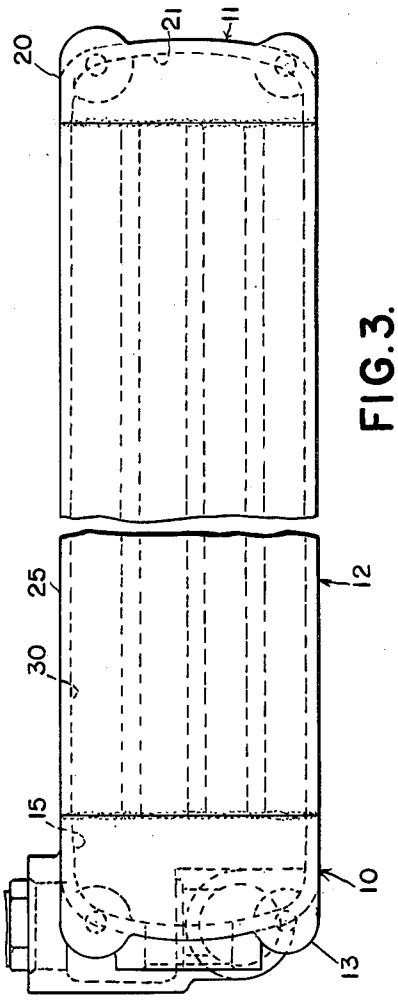


FIG. 3.

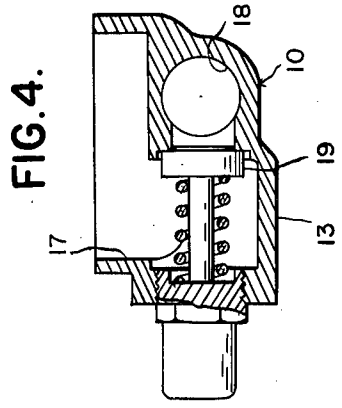


FIG. 4.

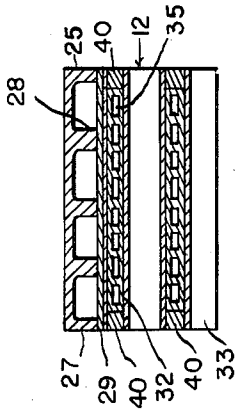


FIG. 5.

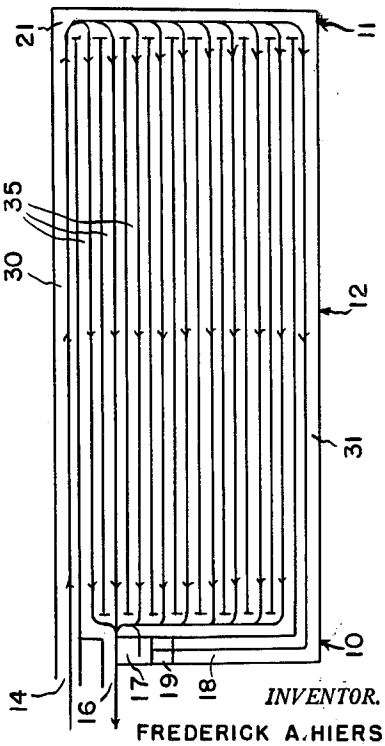


FIG. 6.

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HEAT EXCHANGER

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4 Claims. (Cl. 257—245)

My invention relates to heat exchangers and more particularly to heat exchangers of the type having a core provided with passages for one fluid being disposed normal to the passages for another fluid, such as is used in heat exchangers commonly called radiators.

The manufacture of such heat exchangers generally involves tedious and expensive hand assembly and welding operations, and quality control is very difficult to achieve. Moreover, such heat exchangers are quite prone to leakage and blowout, particularly where one of the fluids is under pressure and/or subject to pressure pulsing which readily produces structural failure and blowout even when static pressure tests have been passed satisfactorily.

An object of the present invention is to decrease failure of heat exchangers by providing an improved construction having overall reinforcements against blowout from normal operation and from excessive fluid pressure.

Another object of the invention is to facilitate quality control by providing a heat exchanger structure adaptable to automatic assembly and welding operations.

A further object of the invention is to improve heat exchanger construction by providing fluid warmup and bypass return tubes which are the full width of the core plates and in combination with a tank and header provide overall reinforcement for the core.

For a more complete understanding of the invention, reference may be had to the accompanying drawings illustrating a preferred embodiment of the invention in which like reference characters refer to like parts throughout the several views and in which

FIG. 1 is a side elevational view of a heat exchanger constructed in accordance with the present invention.

FIG. 2 is an end elevational view of the tank structure side of the heat exchanger of FIG. 1.

FIG. 3 is a top view of the heat exchanger of FIG. 1.

FIG. 4 is a cross sectional view of the tank structure taken substantially on the line 4—4 of FIG. 2.

FIG. 5 is a fragmentary cross-sectional view taken substantially on the line 5—5 of FIG. 1, and

FIG. 6 is a flow diagram of the heat exchanger.

The heat exchanger is illustrated as comprising a tank structure 10, a header structure 11, and a core structure 12 sandwiched between the tank and header structures 10 and 11.

The tank structure 10 comprises a housing 13 having an inlet passage 15, an outlet port 16 opening to an outlet chamber 17 as shown in FIG. 1, and a bypass passage 18 connected with the outlet chamber and controlled by a thermostatic bypass valve 19 as illustrated in FIG. 4.

The header structure comprises a housing 20 having a manifold chamber 21.

The core structure comprises a pair of substantially similar parallel rigid wall structures 25 and 26 connecting opposite sides of the tank structure 10 with opposite sides of the header structure 11 preferably by brazing or welding to form a rigid substantially parallelepiped-shaped casing 10. Each wall structure preferably comprises an outer member 27 having ribs 28 as shown in FIG. 5, and an inner flat plate 29 abutting the ribs 28 to form a plurality of longitudinal inlet warm-up passages 30 in the wall structure 25 and a plurality of bypass passages 31 in the wall structure 26. If desired,

the outer member 27, ribs 28 and plate 29 could be formed as a single piece extrusion. The warm up passages 30 openly connect the tank inlet passage 15 with the header manifold chamber 21. The bypass passages 31 openly connect the header manifold chamber 21 with the tank bypass passage 18.

Sandwiched between the wall structures 25 and 26 in the casing 10A, or more particularly between the plates 28, are parallel alternately stacked core elements 32 and 33 separated by flat plates 34. Each of the core elements 32 has a plurality of longitudinal passages 35 openly connecting the tank outlet chamber 17 with the header manifold chamber 21. Each of the core elements 33 is corrugated as shown to provide a plurality of lateral passages 36 disposed normal to the passages 35 and open from opposite sides of the core structure 12.

Substantially rigid longitudinal bar elements 40 are secured along the sides of each core element 32 parallel with the passages 35, and substantially rigid lateral bar elements 41 are secured along the sides of each core element 33 parallel with the passages 36.

The various components of the heat exchanger are preferably welded or brazed together, and it will be seen that the wall structures 25 and 26 having passages 30 and 31 and the tank and header structures 10 and 11 form a full width casing which provides overall reinforcement and effectively contain the core elements 32 and 33 against blow out from excessive or pulsating pressures.

The intake and outlet ports 14 and 16 are preferably adapted for connection to an oil or other fluid system (not shown) under pressure. The core element passages 36 are preferably adapted to conduct cooling air flow. The oil or other fluid entering the port 14 passes through the intake passage 15 and the warmup passages 30 to the header manifold chamber 21. When the oil is cold, the thermostatic valve 19 is adapted to open the bypass passage 18 to the outlet chamber 17, so that the passages 31 will pass at least part of the oil flow from the header manifold chamber 21 direct to the tank outlet chamber 17. When the oil is warm, the thermostatic valve 19 is adapted to close the bypass passage 18, so that oil flow passes from the header manifold chamber 21 through the passages 32, in heat exchange relation with the cooling air passages 36, to the tank outlet chamber 17.

Although I have described only one preferred embodiment of my invention, it will be apparent to one skilled in the art to which the invention pertains that various changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A fluid to fluid heat exchanger comprising a tank structure having an inlet passage and an outlet chamber, a header structure spaced from the tank structure and having a manifold compartment, and a core structure sandwiched intermediate said tank structure and said header structure, said core structure comprising a pair of spaced rigid parallel walls connecting opposite sides of said tank structure with opposite sides of said header structure, said header structure, tank structure and connecting walls forming a substantially parallelepiped-shaped casing assembly, said walls each extending the full width of said tank structure and said header structure, one of said walls having at least one longitudinal warm-up passage openly connecting said tank inlet passage with said header manifold compartment, a plurality of parallel stacked core elements sandwiched intermediate and parallel with said walls, alternate core elements having longitudinal passages openly connecting said header manifold compartment with said tank outlet chamber, the

other core elements having lateral passages disposed substantially normal to the first core element passages and opening at opposite sides of said heat exchanger.

2. The heat exchanger as defined in claim 1 and in which said tank structure has a bypass passage communicating with said outlet chamber, a valve in said bypass passage, and the other of said walls having at least one longitudinal passage openly connecting said header manifold compartment with said bypass passage.

3. The heat exchanger as defined in claim 2 and in which said walls each comprise an outer plate member having a plurality of spaced longitudinal ribs forming

parallel channels and an inner flat plate member covering said ribs and channels.

4. The heat exchanger as defined in claim 1 and in which flat plates separate adjacent core elements and in which a substantially rigid bar element is secured along each side of each core element and extends parallel to the passages therein, said bar elements being sandwiched between and spacing apart the edges of said flat plates.

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