Sept. 3, 1963 G. H. DIEHL 3,102,530

HEAT EXCHANGER ASSEMBLIES FOR FORCED AIR FURNACES

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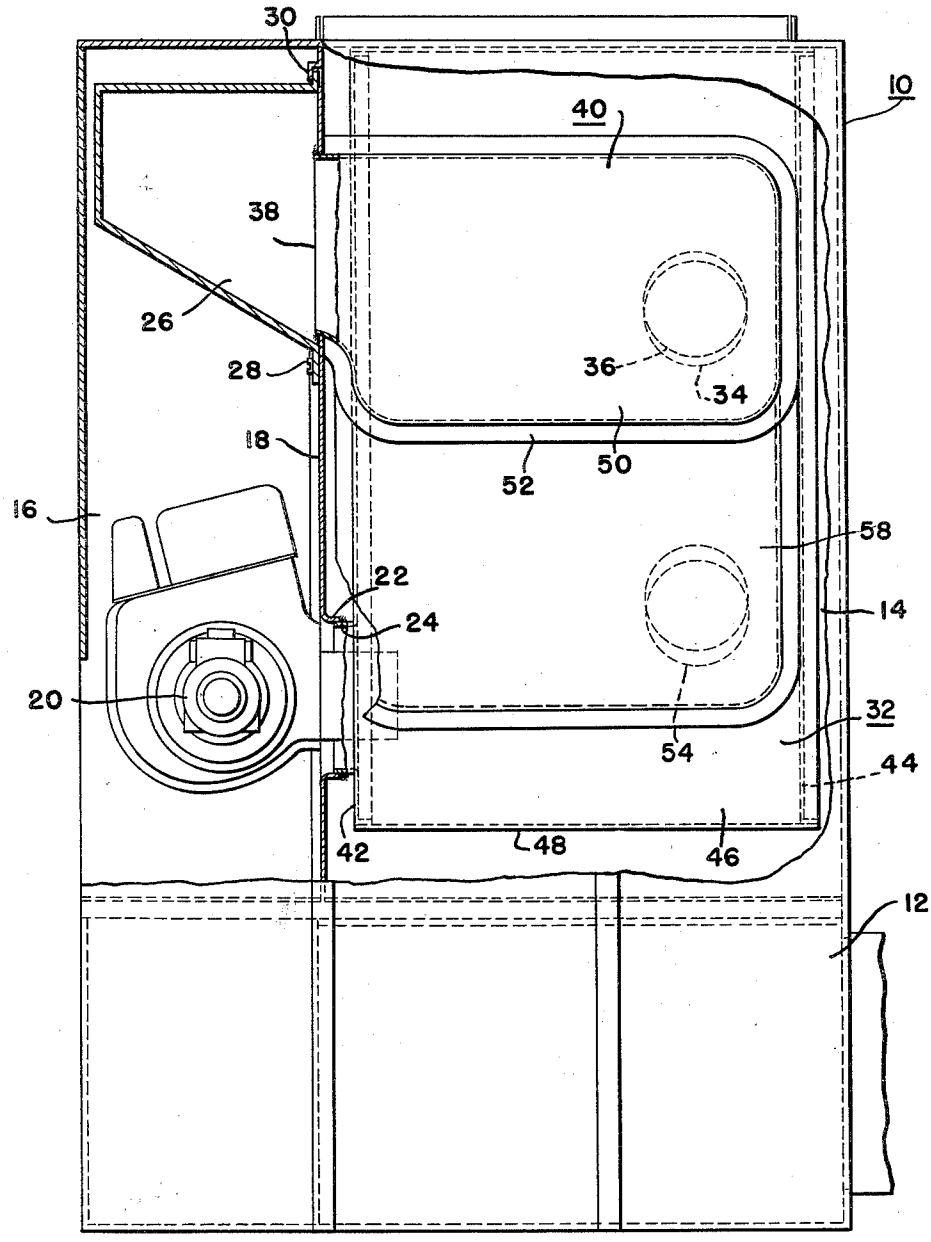


Fig. 1

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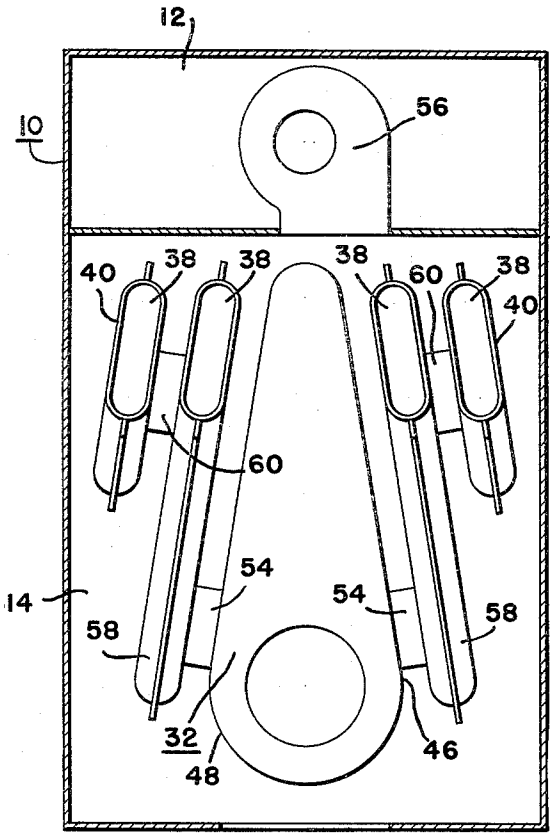


Fig. 2

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HEAT EXCHANGER ASSEMBLIES FOR FORCED AIR FURNACES

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This invention pertains to heat exchanger assemblies for forced warm air furnaces, and particularly to heat exchanger assemblies readily adapted for add-on air cooling which offer a minimum resistance to air flow.

One of the principal difficulties with presently designed heat exchanger assemblies used on forced warm air furnaces is the rather substantial resistance to air flow through the unit which seriously impairs the operating efficiency when a cooling coil is placed in the plenum chamber for summer cooling. It is well recognized that greater volumes of air are required for cooling than for heating, and consequently it is of utmost importance to minimize the resistance to air flow, or pressure drop, through the heat exchangers in installations designed for year round conditioning of the air.

The present invention relates to heat exchanger assemblies having a minimum resistance to air flow, which heat exchanger assemblies utilize common parts and can be readily fabricated to form units having different heating capacities. Accordingly, among my objects are the provision of an improved heat exchanger assembly which offers a minimum resistance to air flow thereacross; the further provision of a heat exchanger assembly embodying a combustion shell having a substantially airfoil configuration with relatively thin radiators supported by a partition panel to form an integral subassembly; and the still further provision of a heat exchanger assembly including a combustion shell and a plurality of radiators which can be readily combined to form units of different heat capacities.

The aforementioned and other objects are accomplished in the present invention by utilizing a common combustion shell of airfoil vertical cross-section in heating units of different capacities. Specifically, the improved heat exchanger assemblies are designed for use with conventional oil burners and can be used interchangeably in up-flow or counter-flow arrangements. The combustion shell comprises front and back panels and side walls which are seam welded together to form a unit which is airfoil or "tear drop" in vertical cross-section so as to offer minimum resistance to air flow thereacross. Each side wall of the combustion shell has an opening for the attachment of a radiator, the radiators being used to increase the area of the heat exchange surface. Each radiator comprises a pair of cup-shaped sheet metal members having seam welded edges, the side walls of which are located generally parallel to the side walls of the combustion shell.

In furnaces of small capacity two small radiators are employed, one on each side of the combustion shell. The largest capacity furnace embodies two large radiators and two small radiators, two one each side of the combustion shell. In a furnace of intermediate capacity two large radiators are emloyed, one on each side of the combustion shell.

The front wall of the combustion shell has an opening for mounting a conventional gun-type oil burner therein. Each radiator has a flue gas outlet communicating with a flue gas collector likewise located at the front of the unit, the collector being connected to a vertical stack in a conventional manner. The blowers for the units can be located beneath the heat exchanger assembly for an up-flow unit and above the heat exchanger assembly in a

counter-flow unit. In both embodiments the entire heat exchanger assembly is attached to a partition panel which can be mounted in a furnace casing either above or beneath the blower compartment. The flue gas collector is detachably connected to the partition panel to facilitate easy cleaning of the radiators.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown, and wherein similar numerals denote similar parts throughout the several views.

In the drawings:

FIGURE 1 is a side view, partly in section and partly in elevation, of an up-flow forced warm air furnace embodying a heat exchanger assembly having two large and two small radiators constructed according to the present invention.

FIGURE 2 is a schematic view of a counter-flow furnace having two large and two small radiators.

With reference to FIGURE 1, one embodiment of the improved heat exchanger assembly is exemplified in connection with an up-flow oil-fired furnace enclosed by a casing 10 which is divided into a lower blower compartment 12, a heat exchanger compartment 14 and a burner and control compartment 16. The heat exchanger compartment 14 is separated from the burner and control compartment 16 by a partition panel 18 which supports the heat exchanger assembly. A conventional oil burner assembly 20 is suitably attached to the partition panel 18, the blast tube thereof extending through a pair of telescopically arranged metal rings, or annuli, 22 and 24. A flue gas collector 26 is detachably connected to the partition panel 18 by a plurality of screw devices 28 along its lower edge, the upper edge being retained between a plurality of hooks 30 and the partition panel 18. The flue gas collector is adapted for communication with a conventional stack, not shown.

In the up-flow furnace shown in FIGURE 1, the upper end of the heat exchanger compartment 14 is open to facilitate connection to a plenum chamber, not shown, when the furnace is installed. The heat exchanger assembly is supported by the partition panel 18 and comprises a combustion shell 32 having an inlet opening on its front wall adjacent the bottom thereof constituted by the ring 24, and a pair of rearwardly located side wall openings communicating with ducts 54 adjacent its lower end as seen in FIG. 1. The ducts 54 in turn communicate with large radiators 58 having duct-connected side wall outlet openings 34. The side wall outlet openings 34 communicate with inlet openings 36 in radiators 40 which are mounted in parallel relationship to the side walls of the combustion shell 32. The radiators 40 in turn have outlet openings 38 communicating with the flue gas collector 26, the openings 38 being in the edges thereof remote from the side wall inlet openings 36.

It will be appreciated that by supporting the combustion shell and radiators, which together constitute the heat exchanger, on the partition panel 18, the heat exchanger can readily be used in both furnaces of the up-flow and counter-flow type, by merely placing the blower compartment either below, as shown in FIGURE 1, or above, for a counter-flow furnace unit. The radiators 40 can be readily cleaned by removing the flue gas collector 26 from the partition panel 18 thereby exposing the large outlet openings 38.

The combustion shell 32 comprises a front wall 42, a rear wall 44 and a pair of side walls 46 and 48 which are seam welded together along their margins to form a gas tight unit. The ring 24 surrounds a circular opening in the front wall 42 and is likewise welded thereto. Each radiator 40 is constructed similarly to the large radiators

58 and comprises a pair of dished, or cup-shaped, sheet metal members 50 and 52 which are seam welded along three peripheral edges to form a gas tight unit. The peripheral walls of the openings 38 for the radiators 40 extend through openings in the partition panel 18 and are rigidly attached thereto by welds. Similarly, the duct, or ring, 24 of the combustion shell 32 is welded to the ring 22 carried by the partition panel 18. Thus, the combustion shell, radiators and partition panel constitute an integral subassembly which can be mounted in a suitable furnace casing either above or below the blower compartment and thus can be used interchangeably in counter-flow and up-flow furnaces.

In FIGURE 2 a counter-flow furnace is shown utilizing the combustion shell 32 with both large radiators 58 and small radiators 40. The large radiators 58 are connected with the combustion shell 32 by ducts 54, and the small radiators are connected to the large radiators by ducts 60. Thus, it is apparent that furnaces of different capacities can be manufactured utilizing common parts, namely the combustion shell 32 and either small radiators 40 or large radiators 58 alone, or in combination. Irrespective of whether the furnaces are of the up-flow or the counter-flow type, the configuration of the combustion shell and the radiators results in a maximum air wiping action with a minimum pressure drop through the heat exchanger. By utilizing common heat exchanger and panel subassemblies, the exterior heights of the several furnaces of different capacities are the same, and all the furnaces are readily adapted for add-on air conditioning by inserting cooling coils in the plenum chambers, not shown.

While the embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

A heat exchanger assembly for a forced air furnace including in combination, a vertical panel having four openings in the upper portion thereof and a single opening in the lower portion thereof, a ring attached to the edge of the lower opening in said panel and extending rearwardly therefrom, a combustion shell comprising a front wall, a rear wall and a pair of side walls secured together, said front wall having an opening with a ring secured to the edge thereof and extending forwardly therefrom for telescopic engagement with the rearwardly extending ring attached to said panel, means securing said rings together to support the combustion shell on said vertical panel, each side wall of said combustion shell having an opening in the lower portion thereof adjacent the rear wall for the egress of hot flue gases therefrom, a first pair of radiators, one radiator being disposed on each side of said combustion shell and having a side wall inlet opening connected to one of said side wall outlet openings of said combustion shell, each radiator having an outlet wall portion in an edge thereof remote from its inlet opening and projecting through one of said openings in the upper portion of said panel, each of said first pair of radiators having a side wall outlet opening in the side wall opposite the inlet opening and remotely located from the outlet wall portion thereof, a second pair of radiators of a different size and capacity than said first pair of radiators and having side wall inlet openings connected with the side wall outlet openings of said first pair of radiators and outlet wall portions in the edges thereof remote from the inlet openings and projecting through openings in the upper portion of said panel, and means securing said first and second pair of radiators to said panel for support thereby.

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