July 4, 1961 C. RABIN 2,991,048

HEAT EXCHANGE UNIT

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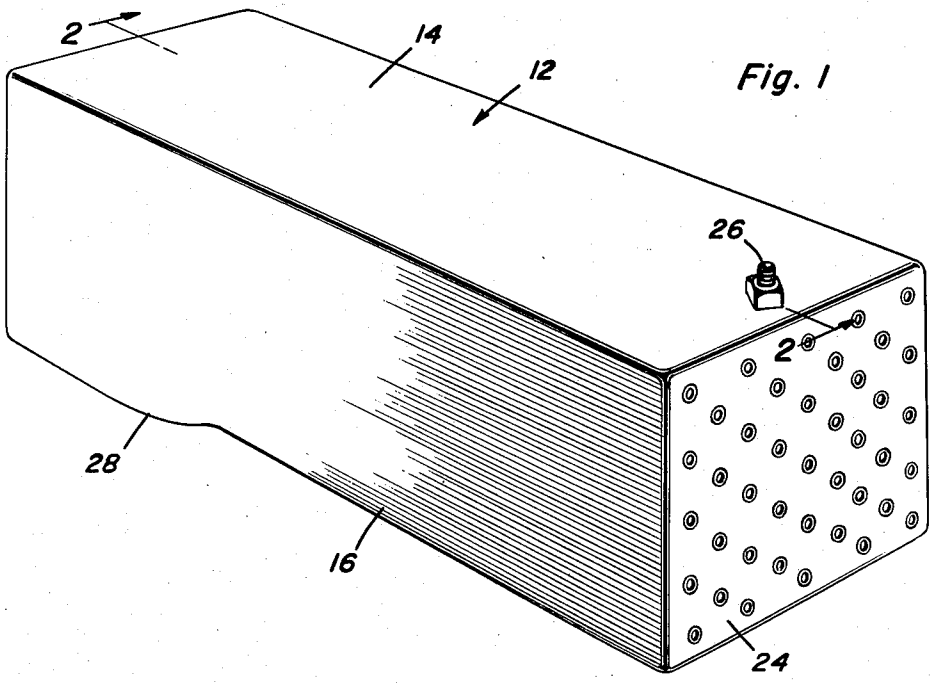


Fig. 1

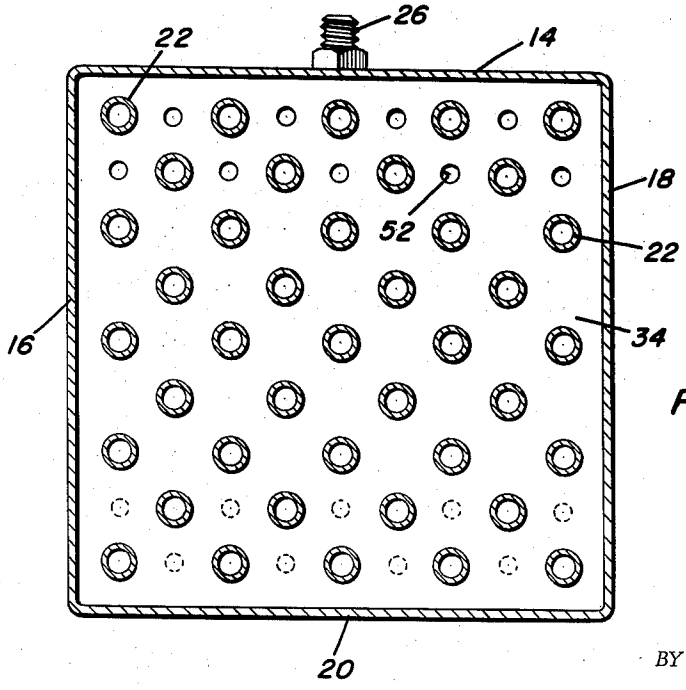


Fig. 4

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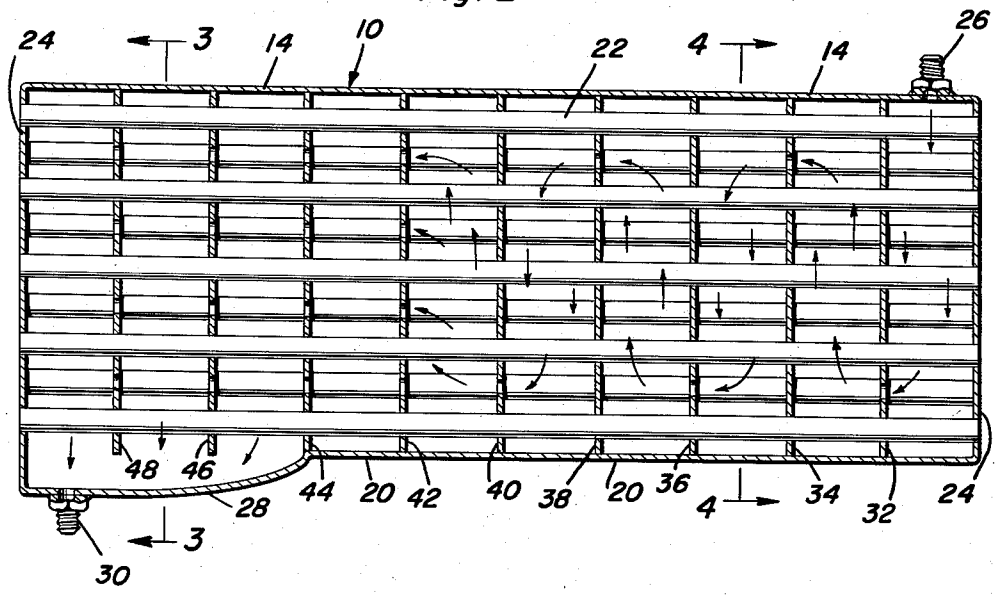
Attorneys

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Fig. 2



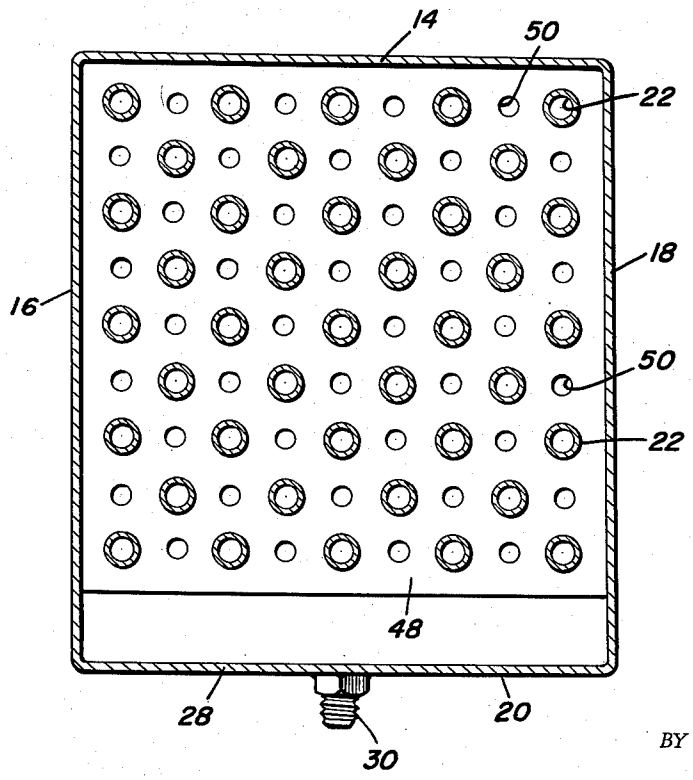


Fig. 3

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HEAT EXCHANGE UNIT

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3 Claims. (Cl. 257—236)

The present invention generally relates to a heat exchange unit and more particularly to such a unit particularly adapted for use in an air conditioning unit or refrigeration system and may be used as either an evaporator or a condenser in such a system.

The primary object of the present invention is to provide a heat exchange unit in which a baffle arrangement is provided for controlling the direction of flow of the material being treated for increasing the efficiency of the heat exchange unit.

Another object of the present invention is to provide a heat exchange unit which may be used as an evaporator or condenser and which includes adjacent one end thereof, a sump which acts as a receiver for condensed refrigerant liquid or as a receiver for expanding refrigerant liquid whereby heat will be absorbed or given off depending upon the direction of flow of the refrigerant through the heat exchange unit.

Yet another object of the present invention is to provide a heat exchange unit which is simple in construction, easy to use, effective in operation and generally inexpensive to manufacture.

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 drawing forming a part hereof wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of the heat exchange unit of the present invention;

FIGURE 2 is a longitudinal, vertical sectional view taken substantially upon a plane passing along section line 2—2 of FIGURE 1 illustrating the details of construction of the heat exchange unit and the baffle arrangement therein;

FIGURE 3 is a transverse sectional view taken substantially upon a plane passing along section line 3—3 of FIGURE 2 illustrating the construction of one type of baffle; and

FIGURE 4 is a transverse, sectional view taken substantially upon a plane passing along section line 4—4 of FIGURE 2 illustrating the construction of another type of baffle unit.

Referring now specifically to the drawings, the numeral 10 generally designates the heat exchange unit of the present invention which includes a generally elongated casing designated by the numeral 12 and including a top wall 14, side walls 16 and 18 and a bottom wall 20, which cooperate to define a generally elongated hollow parallelepiped casing.

Extending longitudinally through the casing 12 is a plurality of elongated tubes 22 which receive air or other cooling medium. Any type of fan or other air induction means may be employed for moving air through the tubes 22. If other cooling medium or heat exchange means are employed, other means may be provided for propelling the fluid through the tubes 22. For instance, if water is used in the tubes 22, then a circulating pump would be used for circulating the water therethrough. The casing 12 is also provided with closed end walls 24 through which the tubes 22 project but which are sealed thereto for forming a closure for the casing. Adjacent one end of the casing 12 there is provided an adapter fitting 26 in the top wall 14. In the bottom wall 20 adjacent the end of the casing 12 remote from the adapter 26, there is provided a depressed portion or sump 28 having an adapter fitting 30 connected thereto.

Intermediate the adapter fittings 26 and 30 is a plurality of transverse baffle plates designated by the numerals 32, 34, 36, 38, 40, 42, 44, 46, and 48. Baffles 32, 34, 36, 38 and 40 are of one type of construction and the baffles 42, 44, 46 and 48 are of another type of construction.

FIGURE 3 illustrates the baffle 48 which of course receives the tubes 22 and which also is provided with a plurality of openings or holes 50 therein which are arranged throughout the area of the baffle 48 and generally disposed alternately with the tubes 22 which are staggered in relation to each other. Thus, the flow of material through the baffle plate 48 will be over substantially the entire area thereof so that material may pass from one side or the other of the plate 48 without considerable hindrance.

FIGURE 4 illustrates baffle 34 and the baffle 34 includes apertures 52 arranged only adjacent the upper end of the baffle 34 so that a fluid can only flow through the baffle plate 34 at or adjacent to the upper end thereof. The baffles 32–40 inclusive are identical but the openings 52 therein are in staggered relation. That is, the openings 52 in the baffles 32, 36 and 40 are located adjacent the lower edge thereof while the apertures in baffles 34 and 38 are located adjacent the upper edge thereof whereby the fluid passing through the baffles will move in a zig-zag course until such time as they reach the baffle 42 at which time they may assume a more nearly straight course. The sump 28 underlies three of the baffles 44–48 and will generally collect any condensation from this area of the heat exchange unit or evaporate from a liquid surface if the device is used as an evaporator in a refrigeration cycle.

When the device acts as a condenser, air or other cooling medium will be passed through the tubes with the inlet side being the side adjacent the adapter fitting 26 which is also the inlet for the hot refrigerant gas received from the compressor or an equivalent. The construction of the initial baffle is such that the hot refrigerant gas will pass in a zig-zag path as illustrated in FIGURE 2. The alternation of the baffle plate provides the zig-zag path and the hot refrigerant gases will give up heat in each compartment to the tubes passing therethrough. As the gas flows up and down through each separate compartment and condenser to a liquid it will be collected in the end compartments and drained into the sump. When using the device as an evaporator, the operation will be just the reverse. Liquid would then enter the adapter fitting 30 into the sump and then expand to a gas and continue through each compartment taking up heat as it expands.

The particular arrangement of the baffles wherein certain of the baffles have apertures only at one edge thereof and arranged alternately and wherein the other remaining baffles have apertures throughout the area thereof provides an effective heat transfer between the material being treated such as refrigerant gas and also the heat exchange medium such as air or other fluid.

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 as claimed.

What is claimed as new is as follows:

1. A heat exchange unit comprising a generally elongated hollow closed casing, a plurality of longitudinally extending tubes extending through said casing in spaced parallel relation for heat exchange fluid flow, an inlet adapter adjacent one end of the casing, an outlet adapter

adjacent the other end of the casing and on the opposite side thereof in relation to the inlet adapter, and a plurality of transversely extending and longitudinally spaced baffle plates disposed intermediate the inlet and outlet adapters, said casing having a sump adjacent one end thereof with the outlet adapter being connected to the sump, said baffle plates extending throughout the transverse area of the casing, said sump extending longitudinally and bridging a plurality of baffle plates, the baffle plates disposed adjacent the inlet adapter each being provided with apertures adjacent one edge with the baffle plates being arranged alternately with the apertures disposed adjacent opposite sides of the casing thereby providing a zig-zag path for flow of fluid therethrough for passage of such fluid in heat exchange relation to said tubes.

2. The heat exchange unit defined in claim 1 wherein the baffle plates adjacent the end of the casing having the outlet adapter are each provided with a plurality of apertures distributed throughout the area of the baffle plate for discharging liquid condensate into the sump or for providing initial evaporation of liquid in the sump, the lower edges of the baffle plates adjacent the outlet adapter being spaced above the bottom of the sump thereby providing communication between the sump and the space between the baffle plates overlying the sump.

3. A heat exchange unit comprising an elongated hollow casing, a plurality of transversely extending and longitudinally spaced plates, said plates extending throughout the transverse area of the casing, a plurality of longitudinally extending tubes in said casing and receiving a heat exchange fluid, said tubes extending through said plates, an inlet fitting adjacent one end and at the top of the casing, an outlet fitting adjacent the other end and at the bottom of the casing, and a sump at the end of said casing and forming a liquid receiver with the outlet fitting being disposed in the sump, said sump bridging a plurality of plates, said plates including apertures therein for restricting and guiding flow of fluid over the outer surface of the tubes, said plates adjacent the inlet fitting having the apertures arranged alternately adjacent the top and bottom edges for zig-zag flow of the material to be treated by the heat exchange medium, said plates adjacent the sump and outlet fitting having the apertures arranged throughout the area thereof.

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