March 28, 1944. C. R. KEEP 2,345,537

HEAT EXCHANGE UNIT

Original Filed May 16, 1942

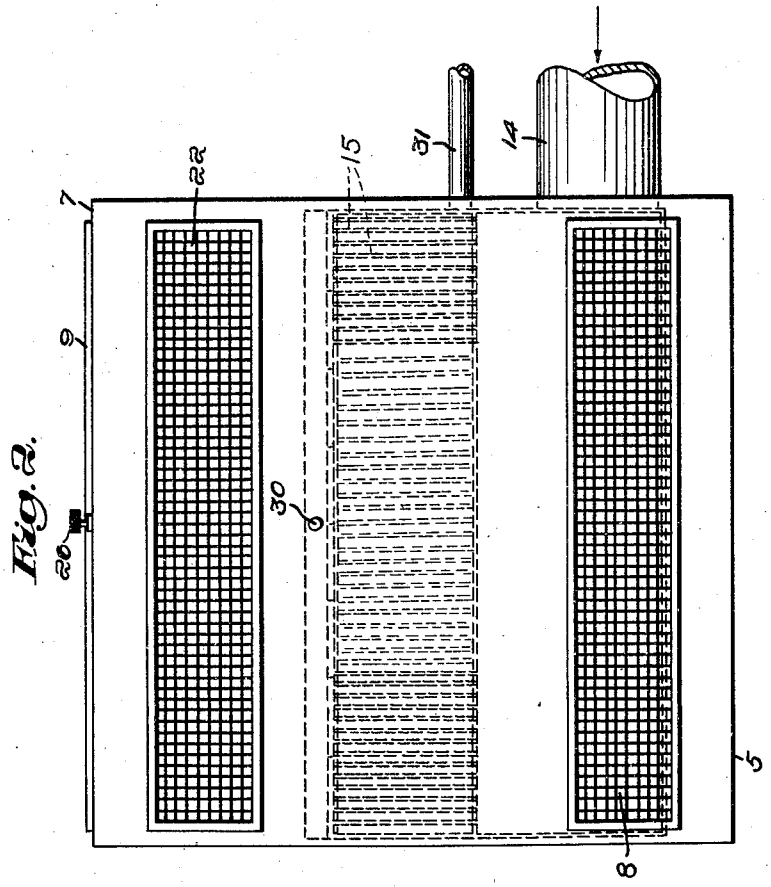


Fig. 2.

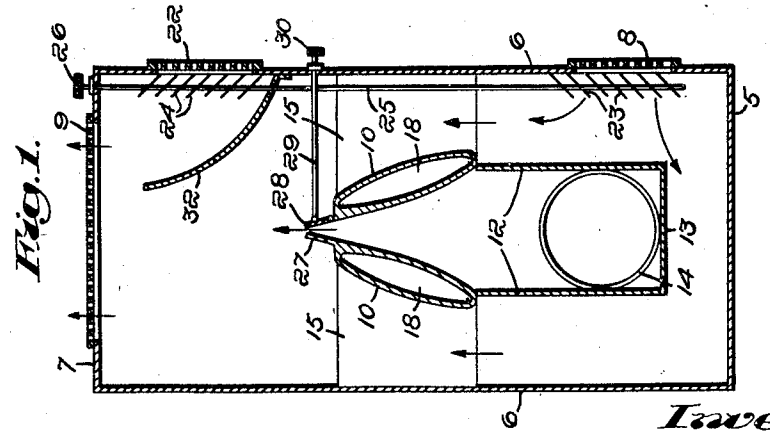


Fig. 1.

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HEAT EXCHANGE UNIT

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Original application May 16, 1942, Serial No. 443,203. Divided and this application January 1, 1943, Serial No. 471,048

3 Claims. (Cl. 257—137)

This invention relates to heat exchange units of the type which contain air ejector nozzles through which primary air from a central source is supplied for inducing the flow into the units, of recirculated air.

This application is a division of my copending application, Serial No. 443,203, filed May 16, 1942.

The Palmer Patent No. 2,287,267 discloses such a unit in which the external surfaces of the heat exchange tubes are shaped and arranged to form the ejectors for inducing the flow of recirculated air. The present invention provides improvements over the features disclosed in said patent and which modify same for overcoming difficulties of commercial operation.

A feature of this invention resides in providing for varying the induction effect of ejector nozzles utilizing surfaces of heat exchange tubes. In one embodiment of the invention, the opposite walls of the ejector nozzle are formed by elongated heat exchange tubes, one or both of the tubes having extensions at the tips thereof and one of the extensions being pivoted for varying the spacing between the nozzle tips and thus varying the ejector effect.

Another feature of the invention resides in providing an air by-pass around an ejector nozzle which includes one or more heat exchange tubes as an element or elements thereof. In the embodiment of the invention utilizing heat exchange tubes as opposite walls of an ejector nozzle, an air by-pass is provided by utilizing two recirculated air inlets, one below and the other above the ejector.

Objects of the invention are to improve the efficiency of and to reduce the cost of, heat exchange units of the type which include ejector nozzles for inducing the flow of recirculated air.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a cross sectional view through one embodiment of a heat exchange unit incorporating features of this invention, and

Fig. 2 is a side elevation of the unit of Fig. 2.

Two heat exchange tubes 10 provide the opposite converging walls of an ejector nozzle as disclosed in said patent. The tubes are provided with the fins 15 which extend from the outer surfaces of the tubes to the walls 6. All of the recirculated air from the inlet 8 passes in contact with the fins 15.

A bypass around the heat exchange surfaces for recirculated air is provided by another recirculated air inlet 22 placed between the tubes 10 and the air outlet 9. The inlet 8 contains the shutter type dampers 23 and the inlet 22 contains the similar dampers 24. The dampers 23 and 24 are interconnected by the rod 25 and are simultaneously adjusted by the knob 26. The dampers 23 are opened when the dampers 24 are closed and vice versa so that as the volume of bypass air through the inlet 22 is increased, the volume of recirculated air trhough the inlet 23 is decreased. The deflector 32 prevents the outward flow of air through the inlet 22.

The ejector nozzle adjustment is taken care of by attaching the stationary plate extension 27 to the upper end of one of the tubes 10 and by pivoting the plate extension 28 to the upper end of the other of the tubes. The rod 29 is attached to the plate 28 and is moved by the knob 30 for varying the space between the plates 27 and 28 and accordingly the air inducing effect of the nozzle.

The pipe 31 illustrated by Fig. 2 may be one of two pipes for conveying heat exchange fluid to the tubes 10. The tubes have internal openings 18 for the passage of a heat exchange fluid therethrough for tempering the primary and recirculated air. In hot weather, a chilled brine or other suitable fluid may be used. In cold weather steam or hot water may be used.

The duct 14 is adapted to be connected to a central source of primary, conditioned air under sufficient pressure for the ejector nozzle to induce the desired volumes of recirculated air and for the mixed primary and recirculated air to be discharged at sufficient velocity and under sufficient pressure to convey the discharged air to remote points in the space served.

Advantages of utilizing the surface of an elongated tube 10 as an ejector wall are that saving in material results; that improved heat transfer is obtained due to the absence of the turbulence and the shadow effect of round tubes; the operation is quieter, the efficiency is greater and the elongated tubes and their fins may be cast iron, a material more easy to obtain than copper under emergency conditions.

While an embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangements of apparatus illustrated, as modifications therefrom may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. A substantially rectangular heat exchange

unit having substantially vertically extending walls, a discharge outlet in its upper wall, a recirculated air inlet in the lower portion of one of said vertically extending walls, and a primary air inlet, comprising a pair of elongated heat exchange tubes arranged to form between adjacent external surfaces, an upwardly extending ejector nozzle, said tubes having internal openings for the passage of a heat exchange fluid and having extended surface fins extending from one tube to said one of said walls and extending from the other tube to the wall of said unit opposite said wall, means forming a passage conducting air from said primary air inlet into said nozzle and forming walls isolating the air from said primary inlet from the air from said recirculated air inlet, means forming another recirculated air inlet in said one wall between said nozzle and said outlet, dampers in said recirculated air inlets, and means at the upper ends of said tubes for varying the induction effect of said nozzle for varying the volume of air drawn in through said recirculated air inlets.

2. A substantially rectangular heat exchange unit having substantially vertically extending walls, a discharge outlet in its upper wall, a recirculated air inlet in the lower portion of one of said vertically extending walls, and a primary air inlet, comprising a pair of elongated heat exchange tubes arranged to form between adjacent external surfaces, an upwardly extending ejector nozzle, said tubes having internal openings for the passage of a heat exchange fluid and having extended surface fins extending from one tube to said one of said walls and extending from the other tube to the wall of said unit opposite said wall, means forming a passage conducting air from said primary air inlet into said nozzle and forming walls isolating the air from said primary inlet from the air from said recirculated air inlet, and means at the upper ends of said tubes for varying the induction effect of said nozzle for varying the volume of air drawn in through said recirculated air inlet.

3. A substantially rectangular heat exchange unit having substantially vertically extending walls, a discharge outlet in its upper wall, a recirculated air inlet in the lower portion of one of said vertically extending walls, and a primary air inlet, comprising a pair of elongated heat exchange tubes arranged to form between adjacent external surfaces, an upwardly extending ejector nozzle, said tubes having internal openings for the passage of a heat exchange fluid and having extended surface fins extending from one tube to said one of said walls and extending from the other tube to the wall of said unit opposite said wall, means forming a passage conducting air from said primary air inlet into said nozzle and forming walls isolating the air from said primary inlet from the air from said recirculated air inlet, and means including a pivoted extension of one of said tubes at the upper ends of said tubes for varying the induction effect of said nozzle for varying the volume of air drawn in through said recirculated air inlet.

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