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THROUGH-PIPING ARRANGEMENT FOR AIR CONDITIONING UNIT

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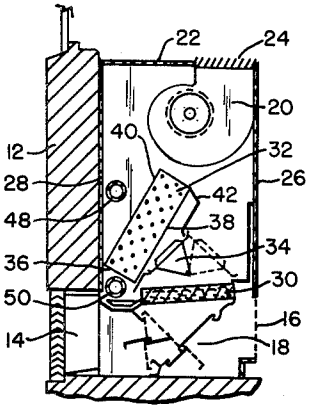


FIG. 1

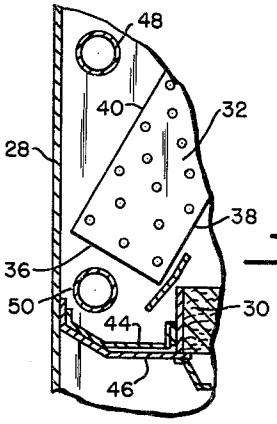


FIG. 2

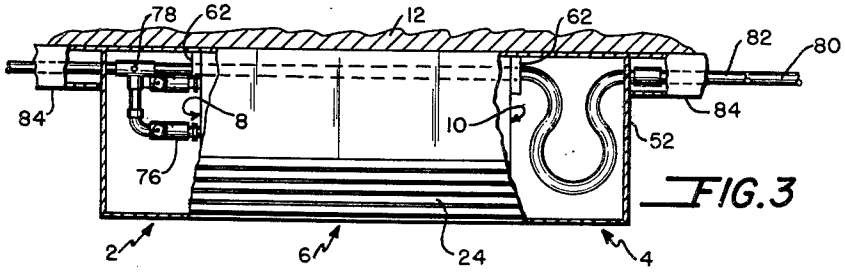


FIG. 3

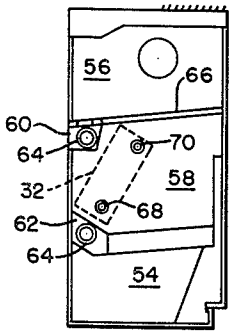


FIG. 4

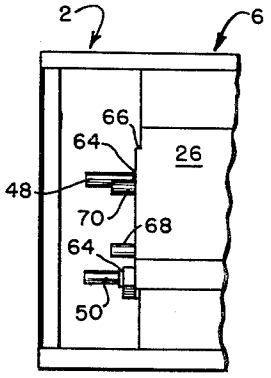


FIG. 5

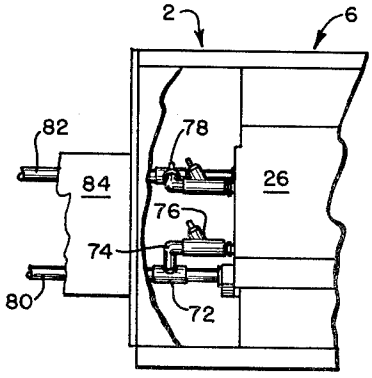


FIG. 6

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THROUGH-PIPING ARRANGEMENT FOR AIR CONDITIONING UNIT

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6 Claims. (Cl. 62—285)

This invention relates generally to air conditioning apparatus and relates particularly to an improved through-piping arrangement for a remote air conditioning unit. While the invention is suitable for embodiment in various kinds of remote air conditioning units, it will be primarily described in connection with an air conditioning unit ventilator.

A through-piping arrangement, as that term is used herein, means that forced water supply and return piping for a series of remote air conditioning units in one water circuit passes through, rather than around, the cabinet of the unit. This arrangement is frequently provided when the piping between units in adjacent rooms is mounted on the wall with pipe covers or other structure hiding the pipes between the units.

One object of the present invention is the provision of a relatively simple through-piping arrangement for an air conditioning unit ventilator (i.e., one that is adapted to selectively utilize forced hot or chilled water as the tempering medium).

Another object is the provision of a through-piping arrangement wherein it is not necessary to insulate all of the supply and return piping within the unit ventilator; thus providing not only a saving in insulation but also a saving in space required to accommodate the piping.

These and other objects of the invention are attained by providing a construction wherein the heat exchanger of the unit ventilator is so disposed as to permit installation of the through supply and return piping closely adjacent the heat exchanger and in a position so that the condensate drip pan for the heat exchanger also serves to collect condensate dripping from the supply and return piping.

More specifically, in accordance with the invention, I provide, in an air conditioning unit ventilator of the face and bypass damper type, a heat exchanger or coil having its bottom adjacent the rear wall of the cabinet and being tilted forwardly, a condensate drip pan underlying the bottom edge of the heat exchanger and spaced therebelow, a water supply pipe extending through the space between the drip pan and the bottom edge of the coil, and a water return pipe above the supply pipe and extending through the space between the downstream face of the coil and the rear wall of the cabinet. With this through-piping arrangement, those lengths of the supply and return pipe overlying the drip pan need not be insulated, thus saving insulation and requiring less space for the through piping. Further, a savings is effected of the pipe and pipe fittings such as would be required if the piping were to loop around the central part of the unit ventilator, and the piping does not contribute significantly to the space problem frequently encountered in attempting to get everything needed into a unit ventilator having a limited size cabinet.

The invention will be further described in connection with the accompanying drawing illustrating one embodiment incorporating the principles of the invention by way of example, and wherein:

FIGURE 1 is a somewhat diagrammatic vertical sectional view of a unit ventilator having the through-piping arrangement of the invention;

FIGURE 2 is a fragmentary vertical sectional view showing the relationship, in somewhat more detail than

in FIGURE 1, between the coil, through-piping arrangement, and the drip pan of the unit ventilator;

FIGURE 3 is a broken top view of a unit ventilator incorporating the through-piping arrangement, this view showing the piping connections made and the piping extending beyond the ends of the unit ventilator through pipe covers;

FIGURE 4 is an end view of a unit ventilator adapted to incorporate the through-piping arrangement, the connections between the through-piping and the coil not being shown in this view;

FIGURE 5 is a fragmentary front view of the end compartment of the unit ventilator of FIGURE 4; and

FIGURE 6 is a fragmentary front view of the left end portion of the unit ventilator and the piping and cover extending beyond the unit ventilator, this view showing the connections between the piping and coil.

The unit ventilator illustrated in the drawing is similar, in respect to the general arrangement of major parts, to the unit ventilator described and claimed in Baker et al. U.S. Patent 2,909,043. As is conventional, the interior of the unit ventilator is vertically divided into three portions (FIGURE 3) including a left-end compartment generally designated 2, a right-end compartment generally designated 4, and a central portion 6; the divisions being made by the left and right vertical partitions 8 and 10. The interior components illustrated in FIGURES 1 and 2 are within this central portion 6 which serves as a central passageway for the air between the air inlets and the air outlets of the unit ventilator.

The unit is typically mounted with its rear side against an exterior building wall 12 containing an outdoor air inlet 14 for admitting fresh air to the lower part of the central portion. Recirculation air is admitted through a room air inlet 16, the proportions of fresh and recirculated air admitted being controlled through operation of the primary dampers generally designated 18 and operable between alternate extreme positions shown by the solid and dotted line positions. The air drawn into the unit through the inlets is drawn upwardly and through the central portion of the unit ventilator by a series of fans 20 positioned below the top wall 22 which contains air outlet openings 24 through which air is discharged into the room.

In passing upwardly through the central passageway, also designated 6, and which is defined on opposite ends by the opposite vertical partitions 8 and 10, and at the front and rear by the respective front and rear walls 26 and 28, the air passes through a filter 30 and is then directed through or around the heat exchanger or coil 32 in accordance with the position of the bypass damper 34 operable between the opposite extreme positions illustrated by the solid and dotted line positions of the damper.

The coil 32 is positioned with its bottom edge 36 adjacent the rear wall 28 of the central passageway, and is tilted forwardly so that its upstream and downstream faces 38 and 40 respectively are inclined with respect to a vertical plane. The bypass air passageway, through which air directed around the coil passes, is forwardly of the coil and is defined along its rear by a baffle 42 depending from the top edge of the coil and cooperating with frame structure in which the bypass damper 34 is supported, a preferred bypass damper and frame structure being disclosed in copending Selhost U.S. patent application Serial No. 94,744, filed March 10, 1961.

A drip pan 44 substantially underlies the bottom edge of the coil to catch condensate dripping from the coil when chilled water is being circulated. This pan may conveniently be attached along its forward edge to the rear edge of the auxiliary frame in which the air filter 30 is placed. This permits the pan to be withdrawn forwardly through the same access opening through which the air filter is withdrawn. The pan is supported on an

underlying plate 46 extending between the opposite vertical partitions and having a forward edge generally delineating the rear edge of the opening above which the filter is situated.

It will be observed in FIGURES 1 and 2 that the inclination of the coil 32 relative to the rear wall 28 results in a generally V-shaped space between the rear wall and the downstream face 40 of the coil, and the spacing of the drip pan 44 below the coil leaves a space therebetween. In accordance with the invention, the V-shaped space accommodates the return water pipe 48 of the through-piping, and the space between the coil and the drip pan accommodates the supply water pipe 50 of the through-piping.

Turning now to FIGURE 3, both the supply and return pipe extend through the central air passageway, slightly forward of the rear wall 28, with respective opposite ends projecting through the vertical partitions 8 and 10. Since the supply and return pipes are vertically aligned, only the return pipe 48 is visible in FIGURE 3. Each pipe comprises a straight portion which extends from the one end compartment through the central air passageway 6 to the opposite end compartment, and an expansion-loop portion 52 in the opposite end compartment. The outer end of the expansion-loop extends slightly beyond the opposite end compartment to permit a connection to be made with the piping which extends to unit ventilators in adjacent rooms. In the drawing, the expansion-loop portion is shown in the right-end compartment 4, with the left-end compartment 2 providing space for making the connections between the through-piping and the coil 32.

Each vertical partition 8 and 10 is made up of a number of separate panels which in assembled form make up what is herein called the vertical partitions. The parts which comprise the vertical partitions are generally delineated in FIGURES 4 and 5 and include three main parts, a lower panel 54 corresponding to the end of the primary damper portion of the central passageway, an upper panel 56 generally corresponding to the end of the fan section of the central passageway, and an intermediate panel 58 generally corresponding to the end of the coil and bypass section of the central passageway. Since the provision of through-piping for any particular arrangement is optional with the customer, those parts of the vertical partitions through which the through-piping passes and which support the piping when it is to be used are characterized as adapter pieces. The upper adapters 60 are flat, plate-like members secured along their upper edges to a depending flange of ledge 66 formed along the lower edge of the upper panel 56, with the front and bottom marginal edges of the pieces being lapped by the edges of the cut-out of the intermediate panel 58. The lower adapters 62 are inwardly open shell-like pieces secured in the illustrated position adjacent the rear wall 28. Each adapter has a hole in which a grommet 64 is mounted and through which the piping passes.

In the factory installation of the through-piping, the through-piping is mounted in place before the coil 32, the bypass damper 34 and the intermediate panels 58 of the vertical partition are installed. The adapters 60 and 62 are first secured in place to the upper and lower panels 56 and 54 with the through-piping mounted to extend through the central passageway. The coil and intermediate panels are then added and the bypass damper section may then be installed. It will be observed in FIGURES 4 and 5 that the supply and return tappings 68 and 70 respectively of the coil project through one of the intermediate panels 58. The relationship between the through-piping location and the coil tappings in the left end compartment is shown in FIGURES 4 and 5 before the connections between through-piping and the coil are made.

The fittings used to connect each through-pipe with its respective coil tapping is shown in FIGURES 3 and 6. The fittings include a T 72, an elbow 74 and a combination balancing and shut-off valve 76. The shut-off

valves may be closed tightly to permit removal of an individual unit coil without draining the water from the circuit in which the individual unit is installed. An air vent 78 is preferably provided in the return T 72 in accordance with conventional practice.

As will be appreciated, the through-piping arrangement described is intended for a wall mounted piping circuit serving a number of unit ventilators. Thus, the supply and return piping which connects the unit ventilators in adjacent rooms is shown in FIGURES 3 and 6 extending beyond the ends of the unit ventilator. Both the supply pipe extension 80 and the return pipe extension 82 are usually hung from the wall and a pipe cover 84 or similar structure is used to cover the pipe. Insulating the piping extending through the central passageway 6 is not required. However all piping and fittings in the end compartments and between unit ventilators must be insulated.

In the typical operation of a bypass damper type unit ventilator served by a forced water system, the water will normally be continuously circulated to and through all of the coils. The degree to which the air passing through the unit ventilator is heated or cooled is dependent upon the position of the bypass damper since so-called valve control of water flow to each coil is normally not used. If chilled water is being circulated, condensate forming on the coil and the through-piping within the central passageway falls into the common drip pan. If hot water is being circulated, the problem of condensate collection does not exist of course. However, in either case, the through-piping within the central passageway does serve as a miniature heat exchanger in itself when air is passing around it, and does not act as an uncontrolled heat source as would be the case where only hot water was to be used and uninsulated through-piping looped around the central passageway within the cabinet.

Any given piping circuit containing a number of unit ventilators may be arranged for either direct or reverse return, and the mains for the particular circuit may be arranged for up-feed or down-feed with due consideration being given to the proper air venting and draining practices.

It will be appreciated that while the invention has been described in connection with a unit ventilator, the principles thereof are equally applicable to an air conditioning unit which does not have provision for varying the quantity of outdoor air in the manner of a unit ventilator. Thus, for example, the invention could also be embodied in a remote fan-coil unit adapted to utilize hot and chilled water as the tempering medium.

The invention claimed is:

1. In a through-piping arrangement for a remote air conditioning unit having a cabinet enclosing a pair of opposite end compartments and a central air passageway with a forwardly inclined coil in said central air passageway of the type adapted to selectively receive hot and chilled water: drip pan means generally underlying the bottom side of said coil and of a sufficiently limited width that it does not extend forwardly to any substantial degree below the front face of said coil; a pair of pipes extending from one end compartment through said central passageway into the other end compartment for conveying said water therethrough, said pipes being generally aligned with each other in vertically spaced relation and collectively overlying said drip pan means in aligned relation within said central passageway so that condensate forming on and dropping from said pipes during a period of chilled water circulation will be received by said drip pan means which also serves said coil.

2. The through-piping arrangement specified in claim 1 wherein: said pair of pipes are uninsulated in said central passageway.

3. The through-piping arrangement specified in claim 1 wherein: said drip pan means is spaced sufficiently below the bottom side of said coil to accommodate one of said pair of pipes in the space between said coil and said drip

pan; and the other of said pair of pipes extends through said central passageway adjacent the downstream face of said coil.

4. In a remote air conditioning unit including a cabinet having an air inlet and air outlet and blower means for inducing the flow of air through a central air passageway defined by a front wall and a rear wall and opposite end walls: a heat exchanger, adapted to selectively receive a tempering medium of one temperature character and another, disposed within said passageway between said opposite end walls and extending forwardly and upwardly with its rear bottom corner adjacent said rear wall; a condensate pan spaced below and underlying the bottom edge of said heat exchanger to define a space therebetween, said pan being of a sufficiently limited width that it does not extend forwardly to any substantial degree below the front face of said heat exchanger; a supply pipe for carrying a supply of said tempering medium through said passageway, extending through said space and having opposite ends projecting through the respective opposite end walls; and a return pipe for returning said tempering medium through said passageway, extending through another space defined by the rear face of said heat exchanger and the rear wall, and having opposite ends projecting through the respectively opposite end walls.

5. In a unit ventilator including a cabinet having an air inlet and air outlet and blower means for inducing the flow of air into said air inlet, through a central air passageway defined by a front and rear wall and opposite end walls, and out of said air outlet: a heat exchanger, adapted to selectively receive a tempering medium of one temperature character and another, extending forwardly across a portion of said central air passageway in inclined relation to the vertical front and rear walls of said central air passageway; a partition underlying the lower edge of said heat exchanger, said partition being of a sufficiently limited width that it does not extend forwardly to any substantial degree below the front face of said heat exchanger; a condensate drip pan of a width generally co-extensive with said partition width overlying said partition and spaced below the lower edge of said heat exchanger to receive condensate therefrom; a pair of pipes for carrying said tempering medium passing through said opposite end walls in an aligned disposition above said condensate drip pan so that condensate dropping from said pipes will be received by said pan.

6. In air conditioning apparatus of the unit ventilator type having a cabinet enclosing opposite end compartments and a central air passageway separated from said end compartments by correspondingly opposite vertical partitions: a heat exchanger adapted to selectively receive a heating or a cooling medium disposed to extend across a portion of said central air passageway in inclined relationship to the rear wall of said cabinet, the rear bottom corner of said heat exchanger being adjacent said rear wall so that a lower, downwardly-open V-shaped space is formed between the bottom edge of said heat exchanger and said rear wall, and an upper, upwardly-open V-shaped space is formed between the rear face of said heat exchanger and said rear wall; a condensate drip pan spaced below the bottom edge of said heat exchanger in a position to receive condensate dripping from said heat exchanger, said pan being of a sufficiently limited width that it does not extend forwardly to any substantial degree below the front face of said heat exchanger; a return water pipe extending from one end compartment to the other through said upper space in said central passageway, said return pipe being vertically aligned with said pan; and a supply water pipe extending from one end compartment to the other through said lower space in said central passageway, said supply pipe also being vertically aligned with said pan.

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