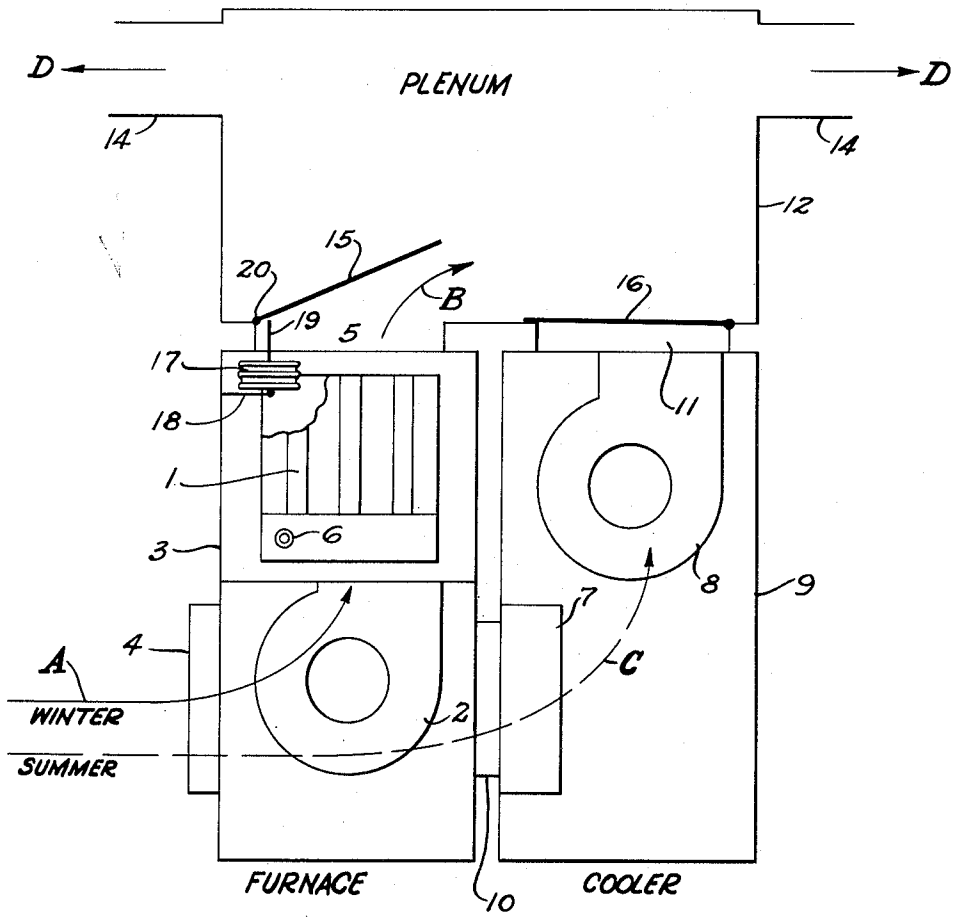
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GRAVITY FLOW MEANS FOR SUMMER-WINTER AIR CONDITIONER

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GRAVITY FLOW MEANS FOR SUMMER-WINTER AIR CONDITIONER

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This invention relates to so-called year around or summer-winter air conditioning plant of the type wherein a furnace is employed for heating operation in the winter and a cooler unit is employed for cooling operation in the summer, each unit having its own air circulating blower, and both arranged to discharge into a common plenum chamber from which ducts lead to various locations in the building to which the conditioned air is to be discharged.

Such a plant includes a pair of check valves located at the two inlets to the plenum chamber, each to be opened automatically by air pressure upon operation of the blower of its unit, and each to otherwise remain closed so as to prevent reverse flow from the plenum chamber upon operation of the blower of the other unit.

The furnace unit includes a heating element such as the usual heat exchanger, with combustion chamber and burner.

Its blower is motor driven, and electrically controlled devices and connections are provided for suitable operation of the various elements, particularly of the burner and blower.

Occasionally it is desirable or necessary to operate the furnace heating element without operation of its blower, as in a new installation where fuel is available but before electricity is available, so that heat may be provided by manual operation of the controls although the motor cannot drive its blower. Electric power failure after complete installation, presents a similar situation.

In either event, the furnace itself may be operated to heat air by natural gravity flow thereof instead of by flow at the normal much higher rate produced by the blower.

A principal object of this invention is to provide that the furnace check valve be opened to permit such gravity flow from the furnace unit into the plenum chamber, when the heating element is in operation but the blower is not.

Another object is to provide that such opening of the valve takes place automatically responsive to operation of the heating element so that dangerously high temperatures cannot arise within the furnace unit, and heat may be delivered from the plenum chamber, as for example, at least sufficient to prevent freezing within the building.

More specifically and as further objects, the invention provides such opening of the valve responsive to the temperature of the heating element, and by simple and inexpensive thermally responsive means dependably arranged.

Further objects and advantages will be apparent from the following description, taken in connection with the accompanying drawing, which is a conventionalized and somewhat diagrammatic view, generally as in sectional elevation, and showing principal elements of a plant embodying the invention.

With reference now to the drawing, the furnace unit includes a heating element 1 and blower 2, both located

within a jacket 3 having a low lateral inlet opening 4 leading to the blower and a top outlet opening 5 leading from the heating element.

As is usual and well understood in the art, the furnace may include a burner serving the heat exchange part of the heating element 1, the blower is electrically driven, and suitable controls are provided for normal operation subject to thermostatic demand but not here illustrated; it being sufficient to here state that normal operation of the furnace includes operation of the blower to cause forced air flow into the furnace by way of its inlet opening 4, as indicated by the arrow A, through the blower 2, past the heating element 1 and upward discharge of the heated air by way of the outlet 5, as indicated by the arrow B.

Also, and as is usual in the art, the furnace may be provided with a manual device for emergency operation of its burner in the absence of electricity; as here conventionally indicated by the knob 6.

The cooler unit includes, so far as is here pertinent, a cooling element 7 and blower 8 located within a jacket 9, having a side inlet connection 10 leading from the furnace jacket 3 and a top outlet opening 11; so that upon operation of the cooler unit, as in summer, air flow will be had as indicated by the arrow C, through the lower portion of the furnace, connection 10, the cooling element 7, and through the blower 8 with upward discharge through the outlet 11.

As will be well understood in the art, the cooling element 7 is served by means not illustrated such as compressor and condenser and the blower 8 driven by electric motor, and suitable controls are provided for operation of the cooler unit as subject to thermostatic demand.

A plenum enclosure 12 is provided above the furnace and cooler units to receive discharge therefrom and in turn discharge to suitable ducts 14 which lead the conditioned air to suitable locations in the building served by the conditioning plant, as indicated by arrows D.

At each inlet to the plenum enclosure 12 a hinged valve is provided, as at 15 for the outlet 5 of the furnace and at 16 for the outlet 11 of the cooler. These valves are gravity urged to closed position and sufficiently light in weight that either will automatically open by air pressure produced by operation of the blower of its unit.

In the drawing, the furnace valve 15 is indicated as partially open and the cooler valve 16 as closed.

It being appreciated that never will both blowers be in operation simultaneously, upon operation of either blower, its valve will be opened and consequent pressure within the plenum chamber will secure the other valve in its already closed position. Thus, the two valves act as automatic check valves, each for preventing reverse flow of air into its unit when conditioned air is being discharged by the other unit.

What has thus far been described is known in the art.

According to my invention means are provided for opening the valve 15 of the furnace unit when the heating element 1 is being operated, as by suitable manipulation of the manual control 6, in the absence of operation of the furnace blower 2.

For the purpose, I provide a thermally responsive device, suitably located to be subject to the temperature of the heating element 1, and arrange the same to be effective upon the valve 15 to open the same upon heating operation of the element, but otherwise permitting operation of the valve 15 responsive to blower operation as above described.

As here conventionally indicated, the thermally responsive device is in the form of a bellows 17, mounted as by a bracket 18 in the warm air passageway adjacent

the heating element 1 and also the outlet 5, and provided with a push rod 19 operable through the outlet 5 against the valve 15 adjacent its hinge 20.

It will be apparent that the arrangement is such that when the heating element 1 is in operation but the blower 2 is not, the thermal element 17 will expand, raise the push rod 19 and open the valve 15, thus permitting gravity flow of air by thermosiphonic action from the furnace into the plenum chamber, as indicated by the arrow B.

Thus automatically, excessive temperatures are prevented within the furnace, and the ducts 14 may be served warm air from the plenum chamber even though the blower 2 be out of operation for any reason.

Occasionally a cooler unit is added to a previously existent heating system, and it may be observed that the thermally responsive valve opening device herein disclosed, may be easily added to the furnace of such system, and is equally applicable regardless of the type of fuel used by the furnace.

I claim:

1. In an air conditioning plant having a plenum enclosure, a furnace unit including a heating element and blower means, a cooler unit including blower means, both said blower means being arranged to provide discharge into said plenum enclosure by way of separate openings, and each of said openings having a check valve associated therewith to automatically permit said discharge and prevent reverse flow; means associated with the check valve of said furnace unit to cause opening thereof automatically upon operation of said heating element without operation of its said blower means.

2. In an air conditioning plant having a plenum enclosure and cooler and furnace units arranged for separate discharge thereinto, each of said units having blower means providing for its said discharge, and check valve means arranged to automatically permit such discharge and prevent reverse flow in either unit upon discharge by the other; means associated with the check valve of said furnace unit to cause opening thereof responsive to operating temperature within said furnace unit and independent of operation of its said blower means.

3. In an air conditioning plant having a plenum enclosure, a furnace unit including a heating element and blower means, a cooler unit including a cooling element and blower means, said blower means being arranged to provide discharge into said plenum enclosure by way of separate openings, each of said openings having a check valve associated therewith to automatically permit said discharge and prevent reverse flow; means associated with the check valve of said furnace unit to cause opening thereof responsive to operating temperature of said heating element, without preventing opening thereof responsive to said furnace blower means whereby said furnace unit may serve said plenum enclosure by gravity or forced air operation without affecting said cooler unit.

4. In an air conditioning plant having cooler and furnace units arranged in side by side relation for upward discharge, a plenum enclosure arranged above said units to receive said discharge, check valve means for each said unit arranged to automatically permit said discharge therefrom and prevent reverse flow, from said enclosure, said cooler unit including blower means arranged to open its said check valve means and provide its said discharge, said furnace unit including blower means arranged to open its said check valve means and provide its said discharge and a heating element served by said blower means; means thermally responsive to said heating element and associated with said furnace unit check valve means to open the same upon operation of said element without operation of its blower means.

5. In an air conditioning plant having a plenum enclosure, a furnace unit including blower means and a heating element operable without said blower means, a cooler unit including blower means, both said blower means being arranged to provide discharge into said plenum chamber by way of separate openings, and each of said openings having a check valve associated therewith to automatically permit said discharge and prevent reverse flow; means associated with the check valve of said furnace unit to cause opening thereof automatically responsive to operation of said heating element without operation of its said blower means.

6. In an air conditioning plant having a plenum enclosure, a furnace unit including a heating element and blower means, a cooler unit including blower means, both said blower means being arranged to provide discharge into said plenum chamber by way of separate openings; valve means associated with said openings to automatically permit said discharge through either, subject to operation of its blower means, and coincidently prevent flow from said plenum enclosure through the other opening, and means associated with said valve means to provide passageway from said furnace unit to said plenum enclosure, automatically upon operation of said heating element and independent of operation of its said blower means.

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