

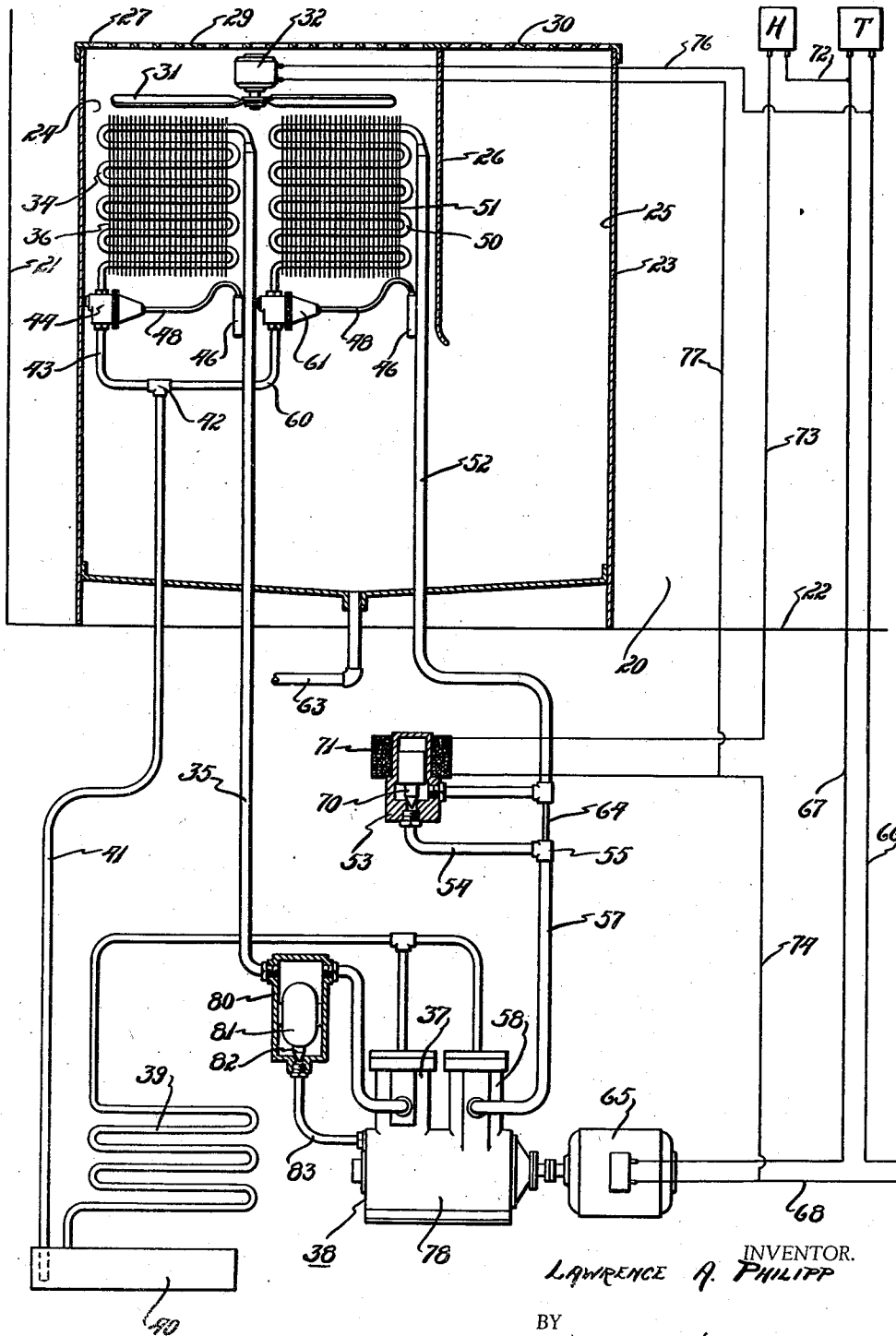
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AIR CONDITIONING SYSTEM

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AIR CONDITIONING SYSTEM

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The present invention relates to air condition-
ing systems and particularly to systems for cool-
ing and dehumidifying air, and is based upon the
subject matter disclosed and claimed in my co-
pending applications, Serial Nos. 697,169, 697,170,
697,171 and 697,172 filed respectively on November
8, 1933.

One of the objects of the present invention is
to provide a heat absorber over or about which
air is circulated which heat absorber, at times,
is maintained at such low temperature as to cool
the air to considerably below the dew point there-
of for the purpose of removing moisture from
the air, to provide another heat absorber which,
whenever it is in operation, operates constantly
independently of the first heat absorber and which
is utilized for removing principally sensible heat
from air flowing over or about the same, and to
provide for controlling the amount of heat re-
moved by the heat absorbers in accordance with
the condition of the air; in carrying out the
foregoing object, it is a further object to control
the system in accordance with the relative hu-
midity and the temperature of the air.

Further objects and advantages will be appar-
ent from the following description, reference
being had to the accompanying drawing wherein
a preferred form of embodiment of the present
invention is clearly shown.

The figure in the drawing represents diagram-
matically an air conditioning system.

The air conditioning system is herein shown,
for illustrative purposes, for cooling a room such
as a living room or an office and the room 20,
and the room is diagrammatically illustrated by a
side wall 21 and a floor 22. Within this room
there is disposed a cabinet 23 having compart-
ments 24 and 25. A partition 26 depends from
the top wall 27 of the cabinet and extends from
the front to the rear thereof to divide said cabinet
23 into the compartments 24 and 25. Air enters
the compartment 24 and is expelled from com-
partment 25 through openings 29 and 30 respec-
tively in the top 27. Air is forced through the
cabinet by the fan 31 which is driven by a con-
stantly operating motor 32.

A heat absorber 34, having fins 36 thereon for
increasing the heat absorbing area thereof, is
disposed within compartment 24 and is herein
shown, for the purpose of illustrating one form
of the invention, as an evaporator. Gaseous re-
frigerant is withdrawn from the evaporator 34
through a pipe 35 by the cylinder 37 of a com-
pressor 38. The compressed refrigerant is deliv-
ered to a condenser 39 wherein it is cooled and

liquefied and then flows to a receiver 40. From
the receiver 40 the liquid refrigerant flows by
way of pipe 41, coupling 42 and branch pipe 43
to an expansion valve 44. Any suitable type of
expansion valve may be employed and in the
present illustration I have shown an expansion
valve of the type that is responsive to the pressure
in the evaporator and to the temperature of the
outlet of the evaporator. This type of valve is
known in the art as a "thermostatically con-
trolled expansion valve" and such valve is shown
in the Marshall Patent No. 630,617 and is em-
ployed as shown in the Marshall Patent No.
1,003,283. For the purpose of subjecting the
expansion valve to the temperature at the outlet
of the evaporator, a bulb 46 is intimately con-
nected to the suction pipe 35 and is connected
by a pipe 48 to the back side of the flexible wall
of the valve 44. The bulb 46 and the pipe 48
contain a volatile fluid to affect the operation of
the valve 44 so that it will operate also in accord-
ance with changes in temperature of the outlet
of the evaporator.

The operation of the compressor 38 will cause
a lowering of the pressure and likewise a lower-
ing of the temperature of the evaporator 34 and
air flowing over evaporator 34 will be cooled. The
size of the compressor is computed relative to
the size of the evaporator so that during normal
operation, only or principally sensible heat will
be removed from the air as it flows over evap-
orator 34.

A second heat absorber 50 is also disposed
within compartment 24 and is shown as an evap-
orator having fins 51 for increasing the heat
absorbing surface thereof. Gaseous refrigerant
is withdrawn from evaporator 50 by a pipe 52
which pipe is connected through a valve 53, cou-
pling 55 and pipe 57 to the low pressure side of
a cylinder 58 of compressor 38. The condensed
refrigerant is cooled by the condenser 39 and
the liquid refrigerant is conducted from the re-
ceiver 40 through the pipe 41 coupling 42 and a
branch pipe 60 to an expansion valve 61. This
expansion valve may be of the same type as
valve 44 and is responsive to the pressure within
the evaporator 50 and the temperature at the
outlet of the evaporator, it also being provided
with a bulb 46 and a connecting pipe 48. The
capacity of the cylinder 58 is computed relative
to the size of evaporator 50 so that when the
valve 53 is open, the pressure within the evap-
orator 50 is decreased to such an extent that the
evaporator will cool the air flowing thereover to
considerably below the dew point thereof, caus-

ing the precipitation of moisture from the air to reduce the relative humidity thereof. The water will drip from the evaporator to the bottom of the cabinet 23 and will be drained therefrom through the drain pipe 63.

A restriction bypasses the valve 53 and is herein shown as a restricting pipe 64 which is connected between pipe 52 and coupling 55. When the valve 53 is closed, the restriction 64 permits a restricted flow of gaseous refrigerant from the evaporator 50 to the compressor 38 and the arrangement is such that when valve 53 is closed, the quantity of gaseous refrigerant withdrawn from evaporator 50 is sufficient only to cause the evaporator 50 to be lowered in temperature to remove only or principally sensible heat from the air.

The desired temperature of the air is maintained by causing the compressor 38 to operate intermittently. The compressor is driven by a motor 65 and the starting and stopping of the motor is controlled by a thermostat T. This thermostat may be placed at any desired place in the room and when the temperature of the air is above a predetermined desired maximum, it closes the motor circuit including wire 66, thermostat T, wire 67, motor 65 and wire 68. The refrigerating apparatus will then operate to reduce the temperature of the air flowing over the evaporators 34 and 51 and when the temperature of the air is decreased to a predetermined relatively lower temperature, the thermostat T will interrupt the motor circuit.

It is also desirable to control the relative humidity of the air and for this purpose there is provided a humidostat H for controlling the valve 53. The valve 53 is magnetically operated and includes a solenoid core 70 which functions as a valve and is lifted from its seat when the magnet coil 71 is energized. The valve 71 is energized when the relative humidity of the air in the room is high and this valve is maintained open until the relative humidity is decreased to a desired minimum at which time humidostat H will interrupt the circuit to the coil 71 and will maintain same interrupted until the relative humidity increases to a certain higher value. The circuit for the coil includes wire 66, thermostat T, wire 72, humidostat H, wire 73, coil 71 and wires 74 and 68. When the relative humidity of the air is higher than that desired, the flow of gaseous refrigerant from the evaporator 50 is unrestricted and therefore the temperature of the evaporator will be decreased to below the dew point of the air causing a precipitation of moisture and a consequent dehumidification of the same. After the relative humidity of the air has been decreased to a desired lower value, the valve 53 will close and the flow of gaseous refrigerant from evaporator 50 will be restricted to that which can flow through the restricting pipe 64. The evaporator 50 will then increase in temperature and only or principally sensible heat will be removed from the air.

The air after passing over evaporators 34 and 50 will thoroughly mix in the bottom of the cabinet 23 and in the compartment 25. Therefore the relatively cold air from evaporator 50 will be tempered by the relatively warm air from evaporator 34.

It is desirable to cause a continuous circulation of air in the room 20 and therefore the fan motor 32 operates continuously, it being connected as follows, wires 66 and 76, motor 32 and wires 77, 74, and 68.

Although I have shown the heat absorber 34 as comprising an evaporator of a mechanical refrigerator, it is to be understood that any suitable type of heat absorber may be employed. When the heat absorber 34 is in the form of an evaporator and as herein shown operatively connected with the compressor 38, it is desirable that the low pressure side of the refrigerating system be maintained independent of one another so that when the compressor cylinder 58 is operating to produce a relatively low pressure, gaseous refrigerant from evaporator 34 will not flow to the low pressure side of the refrigerator system including evaporator 50 and cylinder 58. Gaseous refrigerant from pipe 57 is connected to the crank case 78 of compressor 38 as is well known in the art while the pipe 35 does not enter the crank case and therefore the low pressure sides of both systems are maintained entirely independent of one another. The oil which is usually contained in the crank case 78 for lubricating the working parts of the compressor 38 is usually miscible with the refrigerant employed and consequently some of the oil flows through the condenser 39, receiver 40 and into the evaporators 34 and 50. The oil from evaporator 50 can return directly to the crank case 78 because the pipe 57 is connected with the crank case. In order to return oil from evaporator 34 to the crank case without subjecting the crank to the relatively higher pressure in pipe 35, the pipe 35 extends through a float chamber 80 which incloses a float 81, which float actuates a needle valve 82. The bottom of the chamber 80 is connected with a pipe 83, the inlet of which is controlled by the valve 82. After a predetermined quantity of oil is returned to the chamber 80, the float 81 will rise to lift the needle valve 82 and permit the oil to flow into pipe 83 and be returned to the compressor crank case 78 by said pipe.

Under certain conditions it will be desirable to cause some precipitation of moisture at the absorbers 34 and 50 when these absorbers are operating at substantially the same temperature, and it is to be understood that when the absorber 34 is referred to as functioning to remove only or principally sensible heat, such term is used merely to define the main functional purpose of said absorber 34 as distinguished from the main functional purpose of absorber 50 when absorber 50 is operating at a relatively lower temperature than absorber 34.

While the form of embodiment of the present invention as herein described constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

I claim:

1. An air conditioning system comprising in combination, a heat absorber about which air to be conditioned is circulated; a second heat absorber operating constantly independently of the first heat absorber and about which air to be conditioned is circulated, two independent refrigerant withdrawing means for maintaining said constant independent operation between said two heat absorbers, and means responsive to the relative humidity of air for varying the cooling effect of one of said heat absorbers relative to the other.

2. An air conditioning system comprising in combination, a heat absorber about which air to be conditioned is circulated; a second heat absorber operating constantly independently of the first heat absorber and about which air

to be conditioned is circulated, two independent refrigerant withdrawing means for maintaining said constant independent operation between said two heat absorbers, means responsive to the temperature of the air for controlling the amount of heat absorbed by the specific heat absorbers; and means responsive to the relative humidity of such air for varying the cooling effect of one of said heat absorbers relative to the other.

3. An air conditioning system comprising in combination, a heat absorber about which air to be conditioned is circulated; a second heat absorber operating constantly independently of the first heat absorber and about which air to be conditioned is circulated, two independent refrigerant withdrawing means for maintaining said constant independent operation between said two heat absorbers, means responsive to the temperature of the air for controlling the amount of refrigerating mediums flowing through said heat absorbers; means responsive to the relative humidity of the air for varying the amount of refrigerant flowing through one of said heat absorbers relative to the other.

4. An air conditioning system comprising in combination, a plurality of evaporators about which air to be conditioned is circulated, separate and independent sources of low pressure withdrawing means, means connecting said sources to the respective evaporators for constant independent operation of the evaporators, and means responsive to the temperature and humidity conditions of the air for controlling the amount of heat absorbed by the evaporators.

5. An air conditioning system comprising in combination, a plurality of evaporators about which air to be conditioned is circulated, separate and independent sources of low pressure withdrawing means, means connecting said sources to the respective evaporators for constant independent operation of the evaporators, and means responsive to the relative humidity of the air for controlling the operation of one of said evaporators.

6. An air conditioning system comprising in combination, a plurality of evaporators about which air to be conditioned is circulated, separate and independent sources of low pressure withdrawing means, means connecting said sources to the respective evaporators for constant independent operation of the evaporators, a

valve for controlling the flow of refrigerating medium through one of said evaporators, and means responsive to the relative humidity of the air for controlling said valve.

7. An air conditioning system comprising in combination, a pair of heat absorbers operating constantly independently of one another, and about which air to be conditioned is circulated, two independent refrigerant withdrawing means for maintaining said constant independent operation between said two heat absorbers, and means responsive to a change in the relative humidity of the air for changing the temperature of one of said absorbers relative to one another.

8. An air conditioning system comprising in combination, a pair of heat absorbers operating constantly independently of one another, and about which air to be conditioned is circulated, two independent refrigerant withdrawing means for maintaining said constant independent operation between said two heat absorbers, and means responsive to the temperature of the air for controlling the heat exchange between the air and the heat absorbers, and means responsive to a change in the relative humidity of the air for changing the temperature of one of said absorbers relative to one another.

9. An air conditioning system comprising in combination, a pair of heat absorbers for cooling air, heat dissipating means having two inlets, said heat absorbers being connected with the heat dissipator, one to each inlet, so that the temperatures of the heat absorbers are maintained constantly independent of one another, and means responsive to the relative humidity of the air for varying the cooling effect of one of the heat absorbers relative to the other.

10. An air conditioning system comprising in combination, a pair of heat absorbers for cooling air, heat dissipating means having two inlets, said heat absorbers being connected with the heat dissipator, one to each inlet, so that the temperatures of the heat absorbers are maintained constantly independent of one another, means responsive to the temperature of the air for controlling the amount of heat absorbed by the absorbers, and means responsive to the relative humidity of the air for varying the cooling effects of one of the heat absorbers relative to the other.

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