Nov. 9, 1937. B. R. VANCOTT 2,098,443

AIR CONDITIONING APPARATUS

Filed Feb. 20, 1936 2 Sheets-Sheet 1

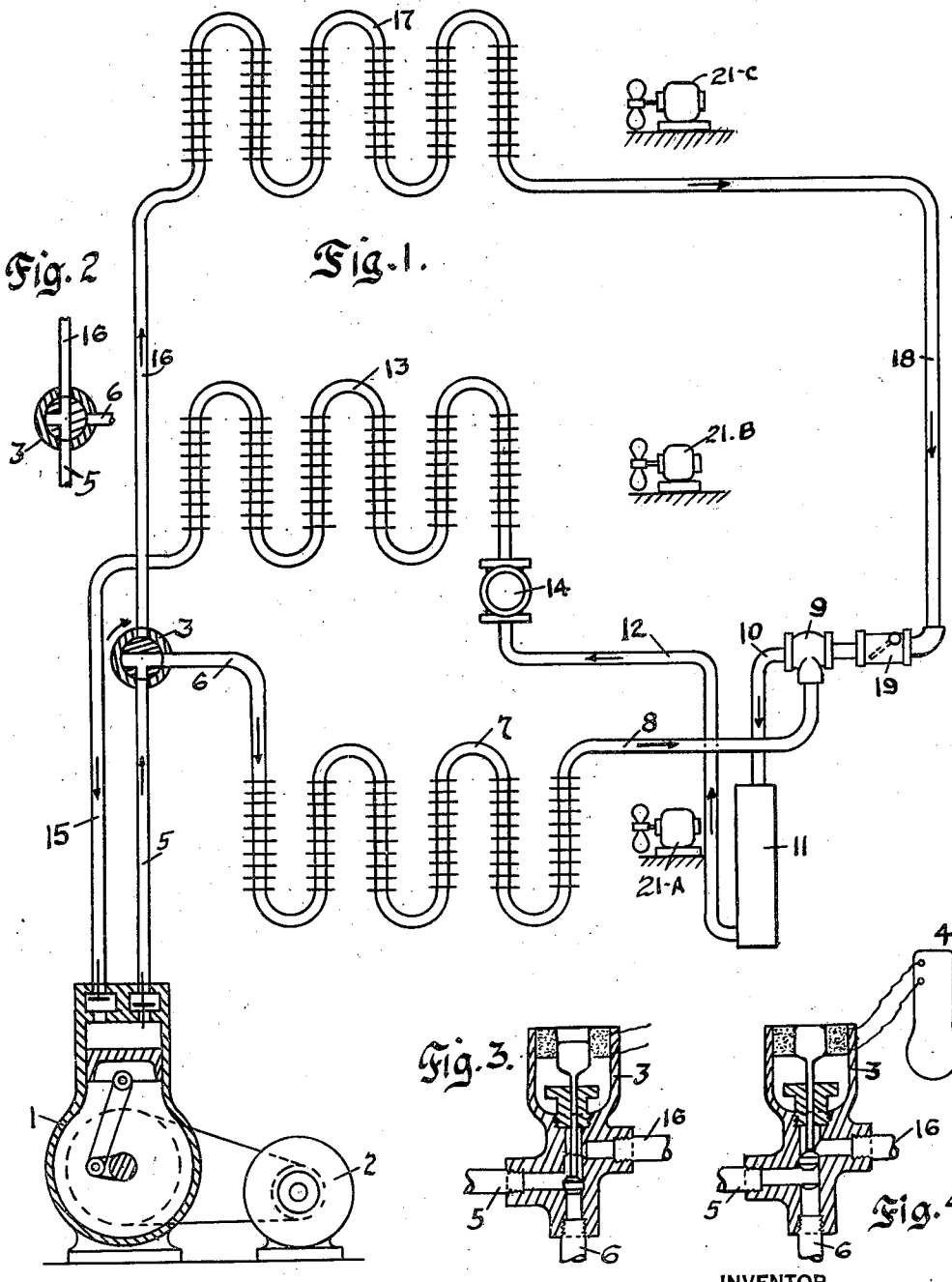

Fig. 2

Fig. 1.

Fig. 3.

Fig. 4.

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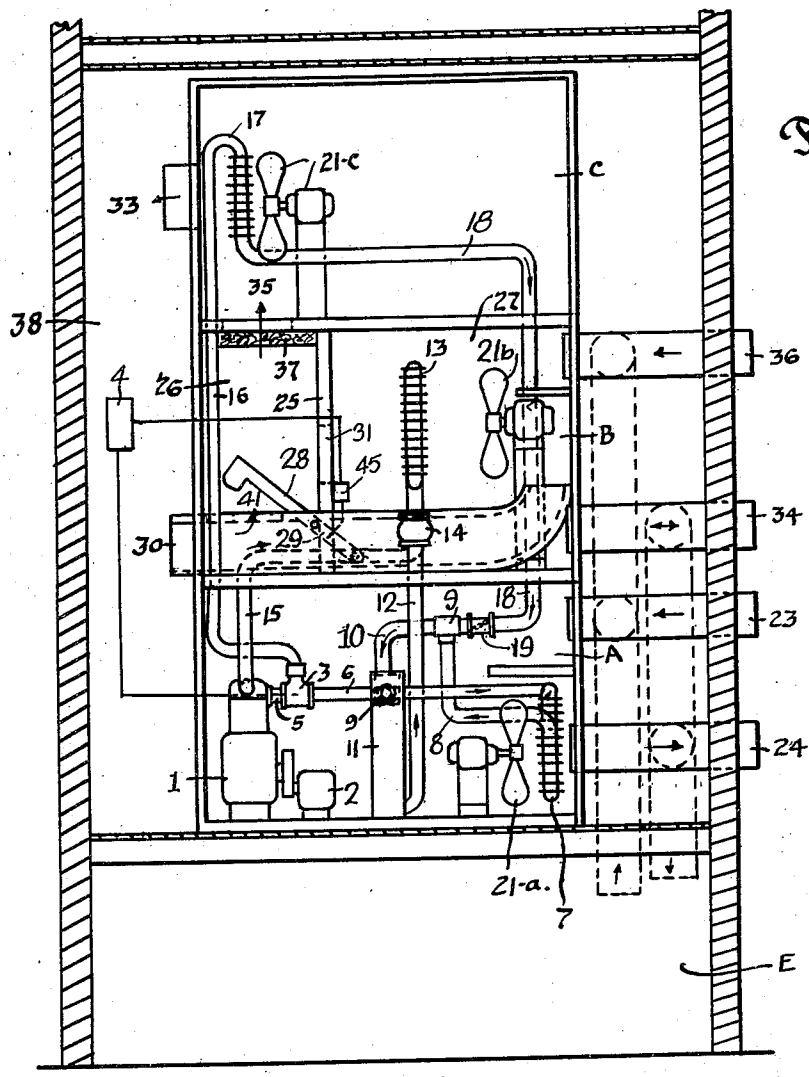

Fig.5

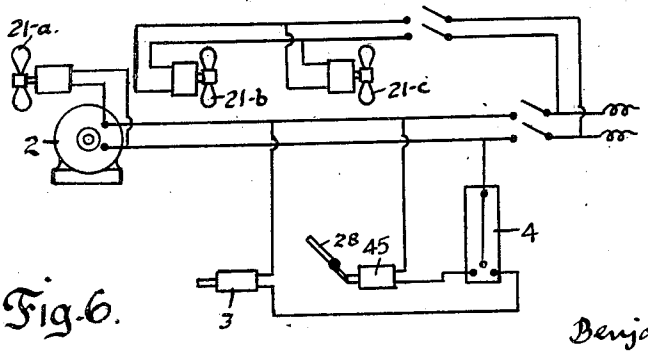

Fig.6.

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AIR CONDITIONING APPARATUS

Benjamin R. Vancott, Los Angeles, Calif.

Application February 20, 1936, Serial No. 64,842

3 Claims. (Cl. 62—129)

The essence of the invention lies in the disclosure of cooperable elements of the organization whereby air and refrigerant fluid may be diverted and circulated through alternate chambers to heat or cool the atmosphere of an enclosure or room wherein the air is to be conditioned and temperature controlled.

The primary purpose is to provide an apparatus with several chambers or compartments containing means to divert and circulate the air and alternate the flow of refrigerating fluid through coils in said compartments.

Another object is to provide means to utilize the heat radiated as a result of compressing a refrigerating fluid to heat an enclosure wherein the air is to be conditioned.

A further object is to alternate the air to and from an enclosure wherein the air is to be conditioned by providing means for diverting the flow of air from one chamber to another wherein said air is to be heated or cooled to a greater or less degree, and means for circulating air to and from and into a room or enclosure to be air-conditioned.

The foregoing and other objects will appear during the disclosure of the invention by the specification, as is illustrated by the drawings, which are for the purpose of illustration only, being a schematic showing accomplished by diagrammatic drawings sufficient to enable those versed in the art to design and build the apparatus; it being specifically understood that any other means within the realm of mechanical skill and expediency may be used to build the apparatus within the scope of the claims.

Of the drawings:

Fig. 1 is a diagram illustrating the relationship of various mechanical elements as involved in the scheme of the organization.

Fig. 2 is a diagram of a rotary valve to illustrate a three-way valve as of Fig. 1 in another position for the diversion of refrigerant to another coil.

Fig. 3 represents an alternative type of three-way valve, including a solenoid actuated plunger in down position.

Fig. 4 is the same as Fig. 3, with the plunger in up position, including a diagram 4 representing any conventional thermatically-controlled switch ordinarily obtainable on the open market and commonly used.

Fig. 5 is a diagram of an enclosure or room and of a three-compartment cabinet with a side removed to show the conduits, evaporator and condensers in end elevation, together with the relative position of other essential elements.

Fig. 6 is a wiring diagram showing a plan for the electrical control and actuating layout of the invention.

The form of the invention shown consists of a cabinet divided into chambers A, B and C. The air-conditioning apparatus consists of a compressor having an inlet valve and an outlet valve, a primary condenser 17 and a secondary condenser 7 connected with said outlet valves of said compressor by a conduit 5 leading to a three-way valve 3, said three-way valve 3 automatically controlled by a thermostat 4 to provide intercommunication between said primary condenser 17 and the compressor 1 or between said secondary condenser 7 and the compressor 1. The said primary condenser 17 is enclosed in a chamber C as of Fig. 5, having an inlet opening 35 communicating from another chamber B enclosing an evaporator 13. The chamber C enclosing said primary condenser 17 has an outlet port 33 communicating with an enclosure or room 38 in which the air is to be conditioned. The chamber B, enclosing said evaporator 13, has an air duct 30 communicating between said enclosure 38, in which the air is to be conditioned, and said chamber B. Openings 34 and 36 are provided to communicate between the outside atmosphere and said chamber B. A partition 25 divides chamber B into two compartments 26 and 27. A port 31 in said partition 25 communicates between compartments 26 and 27. A shutter 28 is disposed within the compartment 26, one end 29 of said shutter 28 extends within the duct 30 and forms a valve therefor. A thermostat 4 may be used to actuate a solenoid 45 to operate said shutter 28 to simultaneously close duct 30 and port 31 and open a port 41 in the top of said duct 30. Fans 21A, 21B and 21C are located within the chambers A, B and C, respectively, to circulate air at all times. The port 41 in said duct 30 is disposed oppositely toward the inlet 35 of said primary condenser chamber C. Means are provided by a suitable thermostatically-controlled solenoid and a shutter 28, 29, whereby the closing of said duct 30 and said port 31, in said partition 25, will allow air to be circulated from said room 38, wherein the air is to be conditioned, by circulating the air through said duct 30, chamber B, and said inlet 35 to said primary condenser chamber C, thence back into said room 38. The third chamber A contains compressor 1, motor 2, receiver 11, and secondary condenser 7. Said chamber A has ports 23 and 24 com-

municating with the outside atmosphere to provide fresh air for circulation through said chamber A to cool said secondary condenser 7, when the three-way valve is turned to communicate between the compressor 1 and said secondary condenser 7.

Means to direct the movement of air in the evaporator chamber B are provided by the duct 30 and fan 21B, which direct the circulation of air into the chamber B from room 38, where it is deflected by either the side wall of chamber B and/or by a curved end which may be provided for the duct 30, or a baffle may be used. The air is propelled by fan 21B through port 31 and is deflected upwardly through compartment 26 when the port 41 is closed and port 31 is open. A filter 37 is disposed, in compartment 26, across inlet opening 35 of compartment C. This filters the air passing into enclosure 38 during both the heating and cooling cycles of the apparatus.

The shutter 28 may act as a counterweight to the movable core of a solenoid 45. The opposite end 29 of the shutter 28 being contacted by the movable solenoid core. Energization of the solenoid 45 may move the shutter 28 against its counterweight action to close the port 31 and duct 30. When the solenoid 45 is de-energized the weight of the shutter 28 moves it to its normal position, closing the port 41.

Fig. 6 shows the arrangement of electrical connections which may be used if the apparatus is to operate automatically.

Figs. 1 and 2 for the purpose of expedience in illustration suggest a rotary type of three-way valve, while Fig. 3 shows a plunger type three-way valve operated by a thermostatically-controlled solenoid closing the port to conduit 6 and allowing intercommunication between conduits 5 and 16. Fig. 4 shows the plunger covering the port leading to conduit 16 and opening the conduits 5 and 6 for intercommunication. The thermostat 4 in Fig. 4 constitutes a means of electrical control to provide current to actuate said solenoid valve 3 as of Figs. 3 and 4. Various types of solenoids and thermostats which are adaptable to the described structure are regularly manufactured and available on the open market.

The heating cycle

When heating is necessary one end of the shutter 28 is disposed across duct 30 and the other end closes port 31. At the same time the three-way valve 3 is set to intercommunicate between conduits 5 and 16, the refrigerant is circulated through primary condenser 17, and air is circulated at the same time, by fan 21C, from enclosure 38 through the proximal end of duct 30 and port 41, thence through port 35, chamber C, back to enclosure 38. The refrigerant is heated on being compressed, and is sent to the primary condenser 17, where the heat is taken up by the air returning to the enclosure 38. During this cycle the air is being circulated in through port 36 against evaporator 13 and out port 34. This air adds heat to the system.

The cooling cycle

When cooling is necessary duct 30 and port 31 are opened, port 41 is closed by shutter 28, and simultaneously the three-way valve is positioned to provide communication between compressor 1 and condenser 7. Air is circulated from the outside atmosphere through inlet ports 34 and 36, and mixes with air from the enclosure 38 drawn through duct 30. The mixture then passes through chamber B, around evaporator 13, and through ports 31 and 35 into chamber C, around the primary condenser coil 17, which has now become an inactive coil, and then through port 33 into enclosure 38. The refrigerant passing through the expansion valve 14 on this setting is prevented from circulating through the primary condenser 17 by a check valve 19 placed in the return line 10, 18 from the condenser 17. The mixture of air from the enclosure and outside air is chilled by passing over the evaporator 13, and the chilled air is sent into the enclosure 38. Thus the cooling cycle is completed. During this cooling cycle refrigerant is condensed in the condenser 7 by the cooling effect of the stream of outside air circulating in through port 23, through chamber A and out through port 24 by means of fan 21A.

It will be noted that during the alternate cycles of heating, cooling and circulating air and refrigerant, the evaporator is in operation at all times.

What I claim as my invention, and desire to secure by Letters Patent is:

1. An air-conditioning apparatus comprising a compressor having an inlet valve and an outlet valve, a primary condenser and a secondary condenser connected with the outlet valve of said compressor by conduit means including a three-way valve, said three-way valve adapted to be actuated to provide alternate intercommunication between said compressor and said primary condenser and between said compressor and said secondary condenser, said primary condenser being enclosed in a chamber having an inlet opening communicating with another chamber enclosing an evaporator, the chamber enclosing said primary condenser having an outlet port communicating with a room in which the air is to be conditioned, said chamber enclosing said evaporator having an air duct communicating between said room in which the air is to be conditioned and said chamber enclosing said evaporator, inlet means communicating with said chamber enclosing said evaporator, a partition in said last-named chamber, a port in said partition, a shutter disposed within a compartment formed by said partition, said shutter extended within said duct, means to operate said shutter to simultaneously close said port in said partition and said duct, means within the primary condenser chamber and the evaporator chamber to circulate air, a port in said duct disposed oppositely toward the inlet of said primary condenser chamber, the closing of said duct and said port in said partition permitting air to be circulated in said room wherein the air is to be conditioned by circulating the air through said duct and said inlet to said primary condenser chamber, back into said room; a third chamber enclosing a secondary condenser, ports communicating with the outside atmosphere and the secondary condenser chamber, said secondary condenser acting to cool and condense a refrigerant when said three-way valve is turned to communicate between the compressor and said secondary condenser, together with means to individually operate the above-described valve and shutter to control the operation of said apparatus.

2. An air-conditioning apparatus for a room or the like comprising an evaporator enclosed in a chamber, a primary condenser enclosed in a chamber, a secondary condenser enclosed in a chamber, together with means to circulate air

from said room through said evaporator chamber and said primary condenser chamber and return said air to said room; additional means to circulate air from the outside atmosphere through the evaporator chamber and said primary condenser chamber, means to circulate air through the secondary condenser chamber, and means to alternately circulate a refrigerant through said primary condenser and said evaporator, or through said secondary condenser and said evaporator.

3. An air-conditioning apparatus comprising a plurality of chambers for air-conditioning an enclosure, fluid refrigerant condenser elements in some of the chambers, a fluid refrigerant evaporator element in another of the chambers, combined with a compressor, conduit means connecting said compressor to said condenser elements, means to provide for the flow of fluid refrigerant from one condenser element to the evaporator element or from another of said condenser elements to said evaporator element, said chambers containing means capable of being actuated to circulate and direct an air stream between and through said evaporator chamber and one of said condenser chambers, or through said condenser chamber only, and thence to said enclosure.

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