

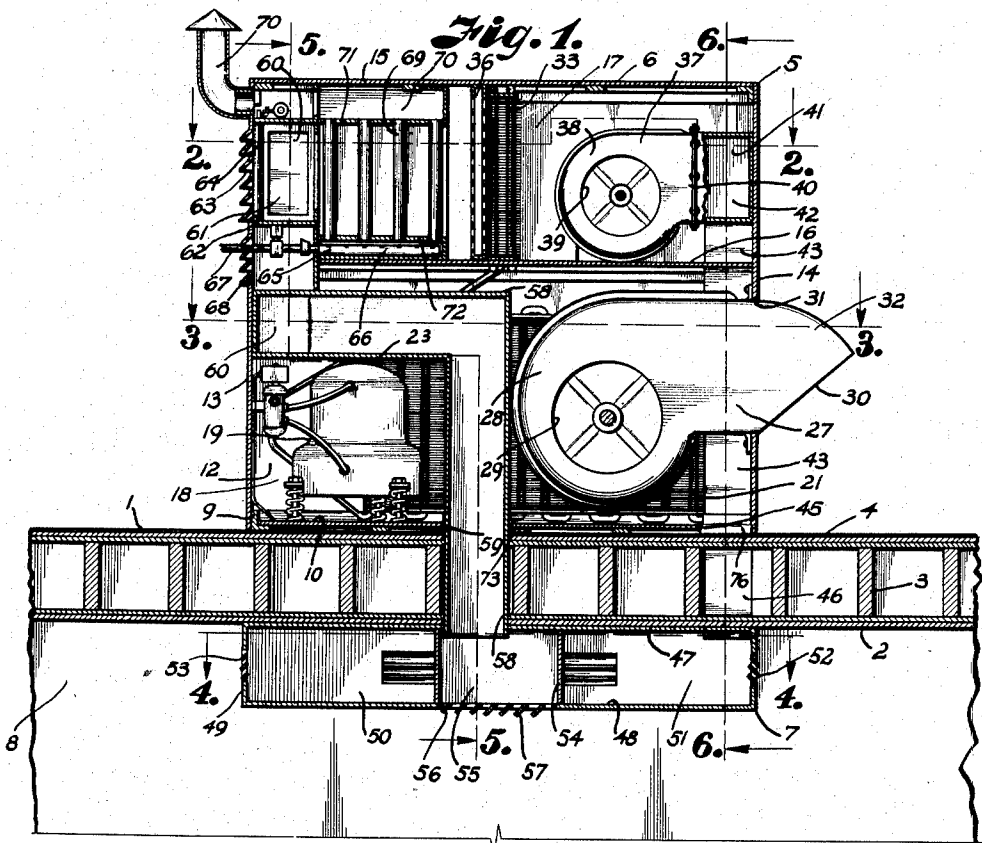
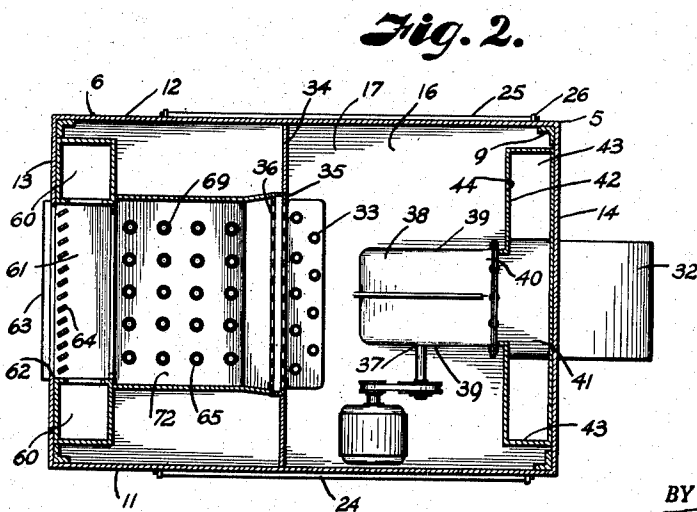
May 19, 1959

C. S. BAUMAN
AIR CONDITIONING SYSTEM

2,886,955

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3 Sheets-Sheet 1



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Fig. 3.

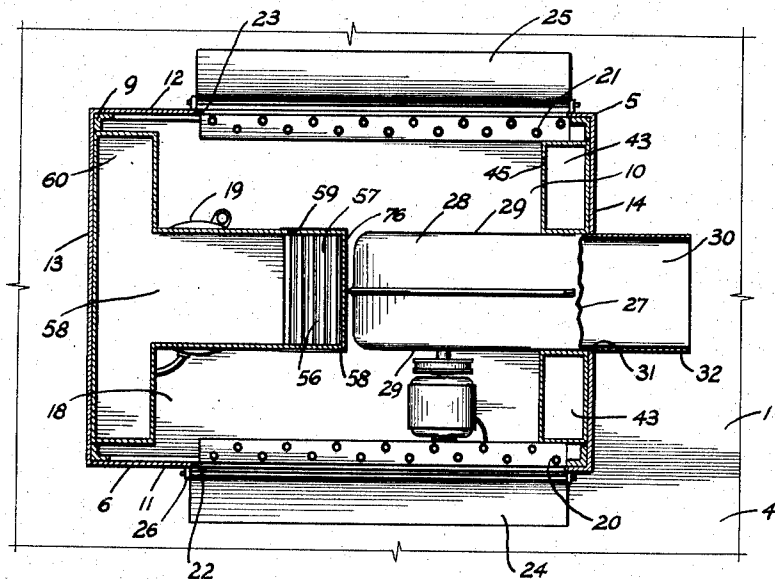
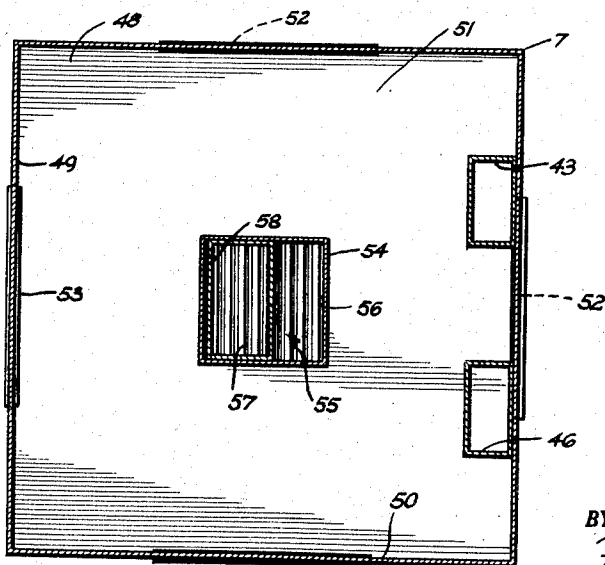


Fig. 4.



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Fig. 5.

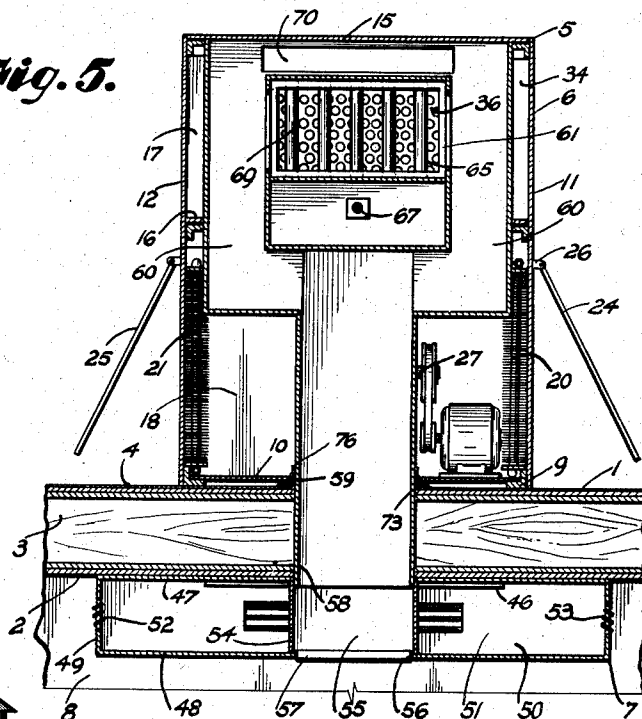


Fig. 6.

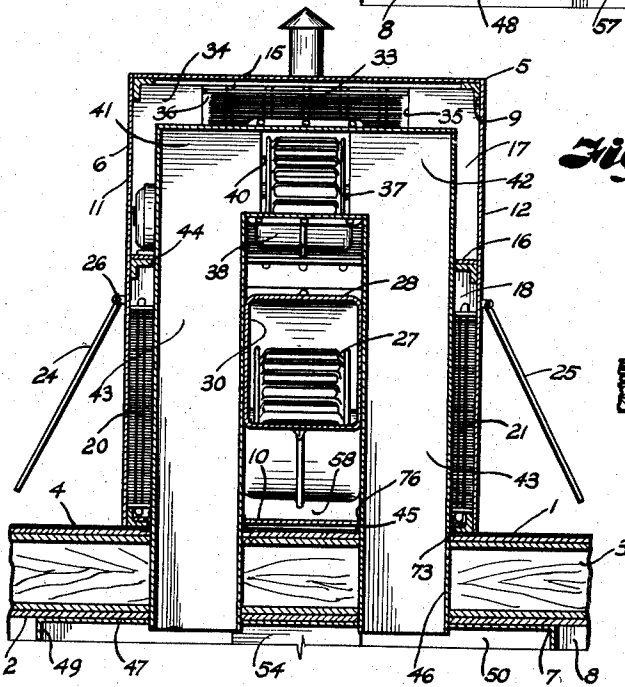
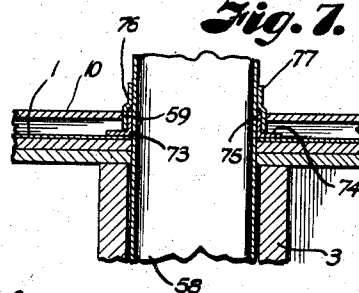


Fig. 7.



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2,886,955

AIR CONDITIONING SYSTEM

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3 Claims. (Cl. 62—259)

This invention relates to air conditioning systems, and more particularly, to a prefabricated air conditioning system for economical installation on a building for circulating air in areas of a space to be cooled or heated.

In large buildings of one-story construction, such as store buildings having large areas substantially unobstructed by partitions or walls extending substantially from the floor to the ceiling, it is conventional practice to install the cooling and heating equipment in a room or basement and provide extensive duct systems to deliver conditioning air throughout the space and other ducts for returning air to the cooling or heating equipment. Such large cooling equipment requires cooling towers for water used to cool the compressor and condensers which together with the extensive duct system cause the installations to be very expensive and often many times the cost of the necessary refrigeration and/or heating equipment.

The objects of the present invention are to provide a prefabricated air conditioning system which eliminates the extensive ducts normally used; to provide such an air conditioning system adapted to be mounted on a roof of a building and one or more arranged for each to cool or heat air in a certain portion of the room space under said roof; to provide such an air conditioning system with a housing or casing in the room space to be conditioned and forming supply and return air chambers having communication through the ceiling or roof to the air conditioning equipment; to provide such an air conditioning system with the refrigeration system and air circulating means so located that a minimum of operating noise is projected into the room being conditioned; to provide an outside permanently mounted air conditioning system for year around operation; and to provide an air conditioning system which is adapted to be prefabricated, that is economical to manufacture and install wherein each will efficiently condition air in its respective room area.

In accomplishing these and other objects of the present invention, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view through the air conditioning system arranged on the roof of a building.

Fig. 2 is a horizontal sectional view through the air conditioning system on the line 2—2, Fig. 1.

Fig. 3 is a horizontal sectional view through the air conditioning system on the line 3—3, Fig. 1.

Fig. 4 is a horizontal sectional view through the air supply and return chambers on the line 4—4, Fig. 1.

Fig. 5 is a vertical sectional view through the air conditioning system on the line 5—5, Fig. 1.

Fig. 6 is a vertical sectional view through the air conditioning system on the line 6—6, Fig. 1.

Fig. 7 is an enlarged section through the flashing around the ducts which extend through the roof of the building.

Referring more in detail to the drawing:

1 designates the roof of a building preferably of a single story type which may be of any suitable structure with a ceiling 2 supported on roof beams 3 with suitable roofing material 4 supported by the beams to provide a substantially flat roof.

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5 designates an air conditioning system one or more of which are supported on the roof structure of the building. Each system 5 includes a housing 6 arranged on the exterior of the roof structure and a casing 7 supported on the ceiling 2 inside a room space 8 wherein the air is to be conditioned. The housing 6 preferably includes a frame 9 of connected structural members to which is suitably attached a bottom wall 10, side walls 11 and 12, end walls 13 and 14, and a top wall 15. The housing is divided into two compartments by a partition 16 suitably supported therein. In the illustrated structure, the partition 16 is horizontal and divides the housing into a high side compartment 17 and a low side compartment 18.

A motor compressor unit 19 is arranged in the low side compartment 18 preferably adjacent the end wall 13. The motor compressor unit is energized by a suitable power supply (not shown) and operates to compress a suitable refrigerant when energized. The compressed refrigerant is conveyed through suitable conduits to condensers 20 and 21 which are preferably arranged in the housing 6 and positioned across openings 22 and 23 respectively in the side walls 11 and 12 respectively whereby air may draw through the openings 22 and 23 through or over the condensers to cool and condense the refrigerant therein.

Doors 24 and 25 are arranged on the exterior of the housing 6 and have their upper edges connected to hinge members 26 carried by the housing whereby the doors may be swung downwardly to close the openings 22 and 23 to prevent air flow therethrough when operation of the compressor is not desirable, for example, in the winter time. In the summer time when it is usually desirable to cool air supplied to the room space 8, the doors 24 and 25 are swung upwardly to open the openings 22 and 23 for air flow through the condensers. Also, when the doors 24 and 25 are swung upwardly sufficiently for suitable air flow through the condensers, said doors act as awnings providing the condensers with solar protection.

A suitable motor driven blower 27 is mounted in the compartment 18 adjacent the end wall 14 and substantially centrally between the condensers 20 and 21. The blower includes a casing 28 having inlet openings 29 and an outlet connection 30 arranged in registering relation with an opening 31 in the end wall 14. A hood 32 is preferably mounted on the exterior of the wall 14 to deflect the air discharge downwardly whereby the hood forms a rain guard for the opening in the outlet connection of the blower.

When the motor compressor 19 is operating, the blower 27 is also operated to draw air through the condensers 20 and 21 into the compartment 18 through the inlet openings 29 to the blower casing 28 and the air discharged through the outlet connection 30 to the exterior of the housing 6 thereby providing an air circulation for cooling of the condensers whereby the refrigerant flowing therethrough is cooled and condensed, after which it is metered into an evaporator coil 33 arranged in the high side compartment 17 where the refrigerant is heated and vaporized and then returned to the intake of the motor compressor unit 19 in a substantially conventional refrigerant circuit for recompression by the motor compressor unit 19 and recirculation through the refrigeration system.

A vertical partition 34 divides the high side compartment 17, said partition extending from the side wall 11 to the side wall 12 and from the partition 16 to the top wall 15 and is preferably substantially midway between the end walls 13 and 14. The partition 34 has an opening 35 therein with a filter 36 covering the opening on the side of the partition adjacent the end wall 13 and the evaporator 33 covering the opening 35 on the side of the

partition adjacent the end wall 14 which is the blower side of the high side compartment.

A motor driven blower 37 is arranged in the blower portion of the compartment 17 and includes a casing 38 having inlet openings 39 and an outlet connection 40 which is connected to a plenum chamber 41 adjacent the end wall 14 and preferably centrally located relative to the side walls 11 and 12.

The plenum chamber 41 has lateral extensions 42 communicating with spaced air supply ducts 43 which extend through openings 44 in the partition 16 downwardly through the low side compartment on opposite sides of the blower 27 through an opening 45 in the bottom 10 and has extensions 46 of suitable length to extend through the roof structure of the building whereby the lower end of the extension 46 may be connected with the supply chamber in the casing 7 supported under the ceiling of the room space to be conditioned.

The casing 7 is preferably arranged substantially under the housing 6. It has a top wall 47, bottom wall 48, side walls 49, and end walls 50, which are suitably connected together to form a chamber 51 that is substantially square in horizontal cross section. Each of the side walls 49 and end walls 50 have openings 52 covered with a grille or register 53 having suitable baffles or deflectors for directing the air outwardly and downwardly away from the casing 7. The casing includes inner walls 54 extending from the bottom wall 48 to the top wall 47 to define a return air chamber 55 which is preferably substantially square in horizontal cross section with the walls thereof substantially equally spaced from the side and end walls of the casing 7. The bottom wall 48 has an opening 56 that is covered by a grille or register 57 for entry of air from the room space 8 to the return air chamber 55. Each of the walls of the casing are preferably covered or lined with acoustical material to eliminate projection of noise into the room space 8.

The return air chamber has communication with a return air duct 58 that is connected to the top wall 47, extends through the roof structure, through an opening 59 in the bottom wall 10 of the housing 6 and upwardly in the low side compartment 18, preferably substantially centrally of the side walls and between the motor compressor 19 and blower 27. The upper portion of the return duct 58 in the low side compartment 18 extends substantially to the end wall 13 and adjacent said end wall has lateral branches 60 that extend to the side walls 11 and 12 and then upwardly through the partition 16 with the upper portions communicating with a plenum or mixing chamber 61 that extends transversely of the high side compartment approximately midway the height thereof. The end wall 13 has an opening 62 communicating with the plenum chamber 61 and preferably has louvers 63 arranged over the opening to provide weather protection thereto.

A damper 64 is arranged on the inside of the plenum chamber 61 for selective movement across the opening 62 to adjust the effective opening and the entry of outside air into the plenum chamber 61 for mixing with the return air entering same. A suitable heater 65 is arranged in the high side compartment 17 between the plenum chamber and the filter 36 and may be gas or oil fired and suitably controlled by thermostat as in conventional practice. In the form illustrated, the heater 65 includes a gas burner 66 having a supply pipe 67 which extends through the end wall 13. Also, a louvered opening 68 is arranged in said end wall for supply of combustion air therethrough and through the space between the upper end of the return air duct 58 and the bottom of the plenum chamber 61. The products of combustion from the burner 66 pass through tubes 69 to a flue connection 70.

The tubes 69 are spaced and connect with upper and lower walls 71 and 72 whereby air from the plenum chamber 61 is drawn through the heat exchanger around the tubes 69 and then through the filters 36 and evapora-

tor 33 to the blower 37. With this arrangement, air supplied to the room space 8 may be heated with the heating member 65 or cooled by refrigerant in the evaporator 33 as is desired.

In installing an air conditioning system constructed as described, a large room space 8 to be conditioned is divided into substantially square or geometric shaped areas of floor space corresponding to the shape of the casing 7 wherein the volume in the respective room space areas is slightly below the heating or cooling capacity of the individual systems. Then an area marked on the ceiling substantially centrally relative to the respective floor space areas and openings 45 and 59 cut through the roof structure for the air supply and return air ducts. Then flashing 73 of angular cross section is applied on the roof with each having a flange 74 extending outwardly from the respective opening and overlying the roof material and the flange 75 upstanding therefrom and defining an opening through which the respective duct may be sleeved. The ducts 42 and 58 are then provided with a flashing 76 having the upper portion 77 suitably secured to the respective duct and the flashing extending outwardly and then downwardly therefrom to engage over the exterior of the flashing flange 75. The housing 6 with the air conditioning equipment therein is then moved into position with the ducts 43 and 58 in alignment with the openings through the roof and is then lowered whereby said ducts extend through said openings and the flashing engaged to form a seal therearound. The housing 6 is then suitably secured to the roof structure. The casing 7 is then suitably mounted on the ceiling and supported from the roof structure, and also connected to the ducts 43 and 58 whereby the supply duct communicates with the supply chamber 51 and the return air duct communicates with the return chamber 55. Then a fuel supply is connected to the heating device 65, electric current connected to the motors, and suitable controls arranged in the room space 8 and connected to the refrigeration system and heating system for selective controlling thereof.

In cooling the room space, the doors 24 and 25 are swung upwardly and outwardly and secured for entry of air through the condensers 20 and 21. Then upon operation of the motor compressor unit and the blowers, the compressed refrigerant flows through the condensers 20 and 21, then to the evaporator 33, air being drawn by the blower 27 through the condensers 20 and 21 and discharged through the outlet connection thereof to cool the condensers. The blower 37 operates to draw air through the opening 57, return chamber 55, return air duct 58, and extension 60 to the plenum chamber 61 where the air is mixed with outside air entering the opening 62 under control of the damper 64. The air passes through the heat exchanger 69, filter 36, evaporator 33, into the blower 37 and is then discharged outwardly and downwardly through the grille covered openings 52 for return through the return air duct, thereby cooling the air in the respective space of the room to be conditioned. When it is desired to heat the room space, the doors 24 and 25 are swung downwardly to close the openings 22 and 23. The motor compressor 19 and blower 27 are not operated. Fuel is then supplied to the heater 65 and the blower 37 operated to draw air through the return duct, plenum chamber 61, through the heat exchanger and filter 36, evaporator 33, to the blower which then discharges the heated air through the duct 43 to the supply chamber 51 for delivery to the room, each air conditioning system operating to condition the portion of the air in the large space for which it is designed to accommodate, the blower 37 and the ducts and openings being such that the air velocity through the openings 52 will move the air outwardly from the casing 7 sufficiently to circulate the air through the area to be conditioned.

It is to be understood that while I have illustrated

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and described one form of my invention, it is not to be limited to the specific form or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What I claim and desire to secure by Letters Patent is:

1. An air conditioning system comprising, a housing having means for securing it to a roof structure of a room space to be conditioned, said housing having top, bottom, side and end walls, a partition in the housing dividing it into two compartments, one of said compartments having openings in the side wall portions thereof, refrigerant condensers disposed in said one compartment in overlying relation to said side openings, cover means movably mounted on the housing to cover said side openings and movable to open said openings, said cover means in open position providing a protector eave shading said condensers, air circulating means in said one compartment for moving air through said side openings and over the condensers and discharging said air outside of the housing remotely of said side openings, a refrigerant compressor in said one compartment, a refrigerant evaporator in said other compartment, means connecting the refrigerant compressor and refrigerant condensers and refrigerant evaporator to complete a refrigeration circuit therethrough, a casing having top, bottom, side and end walls with means for securing it to the ceiling of a room space to be conditioned substantially under the housing with the top wall of said casing adjacent the ceiling, partitions in said casing spaced from the side and end walls thereof forming a return air chamber substantially centrally of the casing and an air supply chamber surrounding the return air chamber, said casing having a central opening in the bottom thereof communicating the room space to be conditioned with the return air chamber, said casing having openings in the sides and ends thereof communicating the air supply chamber with the room space to be conditioned, an inlet passageway and an outlet passageway communicating with the portions of said other compartment on opposite sides of the evaporator, means extending through the roof structure communicating the return air chamber and air supply chamber with the inlet passageway and outlet passageway respectively, a damper in the housing adapted to open and close an opening provided in said housing between the inlet passageway and the outside atmosphere, and a blower means for circulating air over said evaporator by way of the inlet and outlet passageways and delivering said air through the air supply chamber to the room space to be conditioned.

2. An air conditioning system comprising, a housing having means for securing it to a roof structure of a room space to be conditioned, said housing having top, bottom, side and end walls, a partition in the housing dividing it into two compartments, one of said compartments having openings in the side wall portions thereof, refrigerant condensers disposed in said one compartment in overlying relation to said side openings, cover members on the exterior of the housing to cover the side openings to said one compartment, means hingedly connecting the upper portions of said cover members to the housing above said side openings whereby said cover members may be swung outwardly and upwardly to open the side openings in the side walls and yet shade the condensers, air circulating means in said one compartment for moving air through said side openings and over the condensers and discharging said air outside of the housing remotely of said side openings, a refrigerant compressor in said one compartment, a refrigerant evaporator in said other compartment, means connecting the refrigerant compressor and refrigerant condensers and refrigerant evaporator to complete a refrigeration circuit therethrough, a casing having top, bottom, side and end walls with means for securing it to the ceiling of a room

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space to be conditioned substantially under the housing with the top wall of said casing adjacent the ceiling, means in said casing and forming a return air chamber and an air supply chamber therein, said casing having opening therein communicating the room space to be conditioned with the return air chamber and the air supply chamber, an inlet passageway and an outlet passageway communicating with the portions of said other compartment on opposite sides of the evaporator, means extending through the roof structure communicating the return air chamber and air supply chamber with the inlet passageway and outlet passageway respectively, a damper in the housing adapted to open and close an opening provided in said housing between the inlet passageway and the outside atmosphere, and a blower means for circulating air over said evaporator by way of the inlet and outlet passageways and delivering said air through the air supply chamber to the room space to be conditioned.

3. An air conditioning system comprising, a housing having means for securing it to a roof structure of a room space to be conditioned, said housing having top, bottom, side and end walls, a partition in the housing dividing it into two compartments, one of said compartments having openings in the side wall portions thereof, refrigerant condensers disposed in said one compartment in overlying relation to said side openings, cover panel members on the exterior of the housing to cover the side openings to said one compartment, means hingedly connecting the upper portions of said cover panel members to the housing above said side openings whereby said cover panel members may be swung outwardly and upwardly to open the openings in the side walls, air circulating means in said one compartment for moving air through said side openings and over the condensers and discharging said air outside of the housing remotely of said side openings, a refrigerant compressor in said one compartment, a refrigerant evaporator in said other compartment, means connecting the refrigerant compressor and refrigerant condensers and refrigerant evaporator to complete a refrigeration circuit therethrough, a casing having top, bottom, side and end walls with means for securing it to the ceiling of a room space to be conditioned substantially under the housing with the top wall of said casing adjacent the ceiling, partitions in said casing spaced from the side and end walls thereof forming a return air chamber substantially centrally of the casing and an air supply chamber surrounding the return air chamber, said casing having a central opening in the bottom thereof communicating the room space to be conditioned with the return air chamber, said casing having openings in the sides and ends thereof communicating the air supply chamber with the room space to be conditioned, an inlet passageway and an outlet passageway communicating with the portions of said other compartment on opposite sides of the evaporator, means extending through the roof structure communicating the return air chamber and air supply chamber with the inlet passageway and outlet passageway respectively, a damper in the housing adapted to open and close an opening provided in said housing between the inlet passageway and the outside atmosphere, and a blower means for circulating air over said evaporator by way of the inlet and outlet passageways and delivering said air through the air supply chamber to the room space to be conditioned.

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