July 6, 1954 W. F. BORGERD 2,682,757

ATTIC MOUNTED AIR CONDITIONING UNIT

Filed June 13, 1951 2 Sheets-Sheet 1

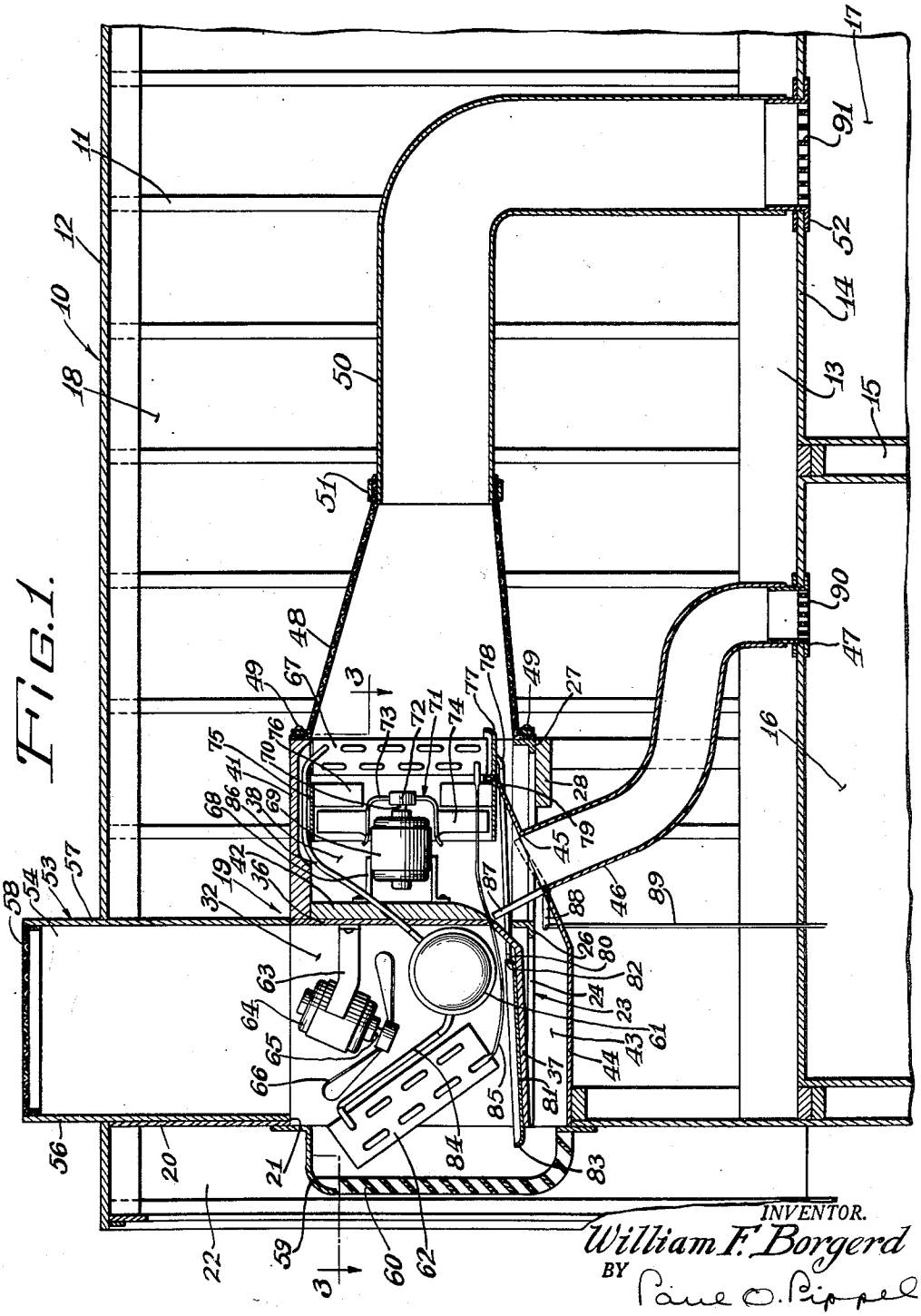


FIG. 1.

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FIG. 2.

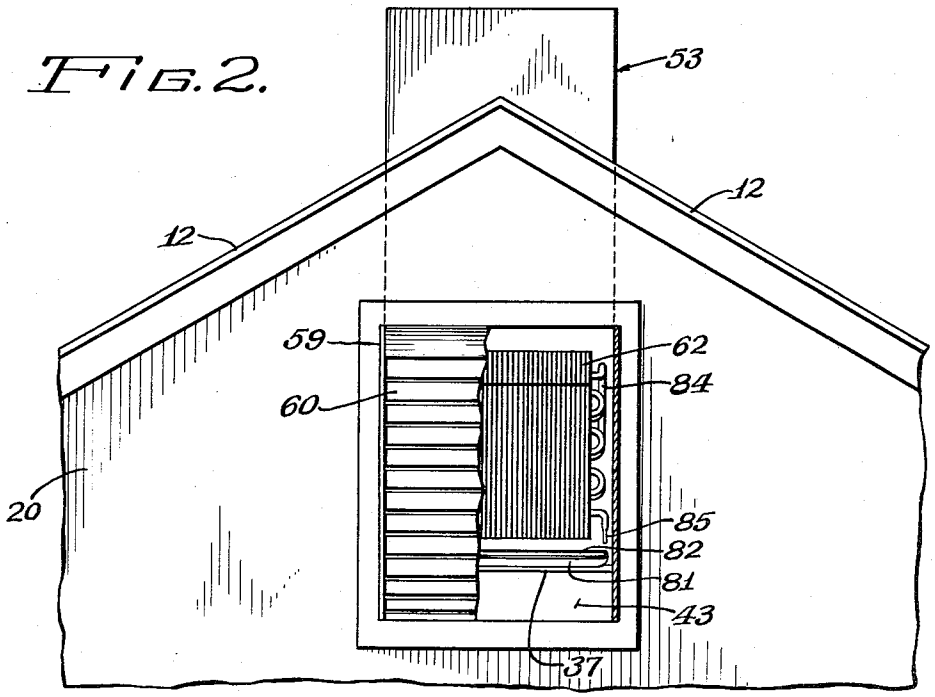
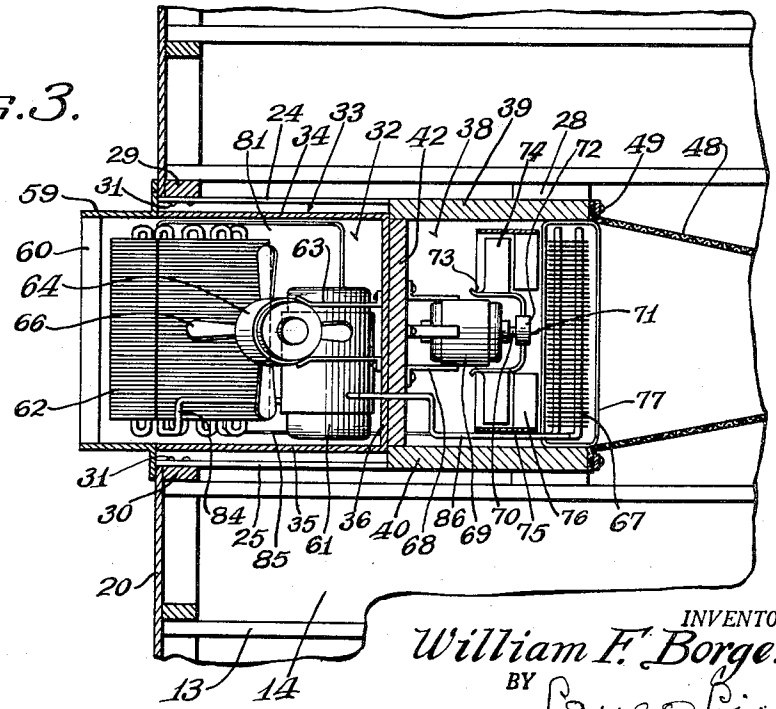


FIG. 3.



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ATTIC MOUNTED AIR CONDITIONING UNIT

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5 Claims. (Cl. 62—129)

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This invention relates generally to an air conditioning unit and more particularly to a unit mounted in the attic of a building.

To install an air conditioning system in a building having no duct system between the rooms, it is necessary to install supply and return air ducts between the rooms and the cooling unit. The cost of installing such ducts often represents a high percentage of the entire cost of the system. For this reason, many home owners have resorted to installing a package unit in a room of their home. Such a unit is usually housed in a cabinet which is not particularly attractive and which is of a size to require considerable floor space. If the unit is large enough to cool several rooms, air circulation between the rooms is usually inadequate to properly move the warm air from all parts of the rooms, and objectionable drafts are experienced by occupants of the rooms. If ducts are provided between the cooling unit and the various rooms, the unit is usually placed in a utility room or a basement so that valuable floor space is used. The present invention provides an air conditioning unit which has none of the above mentioned disadvantages.

One object of the present invention is to provide an air conditioning unit which is adaptable for mounting in the attic space of a building.

Another object of the invention is to provide an air conditioning unit with a simple and inexpensive duct system for circulating air to several rooms of a building.

Another object of the invention is to provide an air conditioning unit so constructed that the machinery therein will be properly cooled by outside air without the necessity of a water cooling system.

Another object of the invention is to provide an air conditioning unit which can be completely assembled at the factory and shipped to the place of installation as a package unit.

Another object of the invention is to provide an air conditioning unit for a building which can be slid into place from the outside of the building.

Another object of the invention is to provide an air conditioning unit with means for effectively removing water that condenses on the cooling element thereof.

Another object of the invention is to provide an air conditioning unit with means for adjustably proportioning the amounts of outside air and inside air being circulated therethrough.

Another object is to provide an air conditioning unit so constructed and mounted that the

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noise of the machinery and air being circulated therethrough will not be projected into the building being cooled or to neighboring buildings.

Another object of the invention is to provide an attic mounted air conditioning unit which can be installed in a building with a minimum amount of construction work.

Another object of the invention is to provide an attic mounted air conditioning unit having the high side machinery secured within a short chimney through which natural air currents will flow and cool the machinery.

Other objects, advantages and novel details of construction of the invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a longitudinal sectional view of an air conditioning unit, embodying the invention, mounted in an attic of a building.

Figure 2 is a front elevational view of a top portion of the building of Figure 1 with part of the louvers broken away to better show parts of the air conditioning unit.

Fig. 3 is a sectional view of the air conditioning unit taken along line 3—3 of Figure 1.

As seen in the drawings, a portion of a building 10 is illustrated having rafters 11 supporting a roof 12 and longitudinally extending beams 13 supporting a ceiling 14. The space below the ceiling 14 is divided into rooms by walls 15, a portion of two rooms 16 and 17 being shown in Figure 1. The space between roof 12 and ceiling 14 is the attic 18 of the building and this is the space of a building which is usually considered useless. The present invention provides an air conditioning unit 19 which is located in the attic 18 so that the attic space is put to use. The outer wall 20 of the building 10 is provided with a window 21 which opens into the attic 18. This window provides access into the attic 18 so that the air conditioning unit 19 can be mounted therein. The roof 12 projects outwardly over outer wall 20 to form eaves 22 which protect window 21 from the weather.

The air conditioning unit 19 is mounted upon a frame 23 comprising channel shaped side members 24 and 25 and cross members 26 and 27. The inner end of the frame 23 rests upon a transverse beam 28 whereas the other end is secured to vertical beams 29 and 30 by bolts 31 adjacent window 21. A high side compartment 32 is enclosed by a casing 33 comprising side walls 34 and 35, end wall 36 and bottom wall 37. The casing 33 is secured to frame 23 with an open end

located adjacent window 21. A low side compartment 38 is formed by side walls 39 and 40, top wall 41 and end wall 42. These walls are constructed from heat insulating material and may be secured to the frame 23 or casing 33.

Positioned below frame 23 is a passageway or tunnel 43 enclosed by wall member 44 with an open end communicating with window 21 and the other end connecting to the bottom of low side compartment 38. It is contemplated that wall member 44 be secured to outer wall 20, but it could also be secured to frame 23. An opening 45 is provided in wall member 44 to which an intake duct 46 is connected. The other end of the duct 46 is connected to a grille 47 which is positioned in ceiling 14 and opens into room 16. The open end of low side compartment 38 is enclosed by a short duct 48 made from sound deadening material such as canvas. Bolts 49 secure one end of the duct 48 to the unit 19 and clamp 51 secures the other end of the duct to outlet duct 50. Outlet duct 50 is connected to a grille 52 which is positioned in ceiling 14 in communication with room 17.

Positioned above high side compartment 32 is a short chimney 53 comprising side walls 54, front wall 56 and rear wall 57 which extend upwardly through roof 12. It is contemplated that this chimney be secured to outer wall 20 with the lower edge of the walls mating with the upper edge of the walls of high side compartment 32. Removably secured to the upper edges of the chimney walls is a screen 58 which will prevent foreign matter from falling into the chimney. Removably secured around the window 21 is a frame 59 to which horizontally extending louvers 60 are secured. The frame 59 and louvers 60 will protect the high side compartment 32 and tunnel 43 from the weather and will direct air currents thereinto.

Mounted in the high side compartment 32 is a combination motor-compressor unit 61 of a generally cylindrical shape. A finned tube type condenser 62 is secured in front of the motor-compressor unit 61 adjacent window 21 in a slightly tilted position with the upper portion extending through the window into the space enclosed by frame 59. Secured above the condenser 62 and motor-compressor unit 61 by brackets 63 is an electric motor 64 having an armature shaft 65 to which a propeller type fan 66 is secured. The blades of the fan 66 are offset toward the motor 64 in order to allow placement of the motor 64 closely adjacent to the condenser 62 and motor-compressor unit 61. As best seen in Figure 1, the aforementioned machinery is arranged compactly within the high side compartment 32 so that the height of the compartment can be maintained at a minimum. When motor 64 is running, fan 66 will pull air through louvers 60 over the condenser 62 and motor-compressor unit 61 and discharge it upwardly through chimney 53 so that the machinery will be effectively cooled and maintained at proper operating temperatures. The chimney 53 will induce a draft therethrough which will assist in the movement of air while the fan 66 is operating. Convectional air currents will also move through the chimney when fan 66 is not operating so that the machinery within compartment 32 will be cooled even when the refrigeration system is on the off cycle. Louvers 60 are pitched downwardly so that they offer practically no frictional resistance to the air. Chimney 53 is large in cross section and relatively short so that it offers very little resistance to air flow therethrough.

Secured within low side compartment 38 adjacent the open end thereof is a finned tube evaporator 67. Brackets 68 are secured to end wall 42 and carry an electric motor 69 having an armature shaft 70 to which a fan 71 is fastened. The fan 71 comprises a collar 72 to which an inturned spider cup 73 is secured with the fan blades 74 mounted thereon. Surrounding the fan 71 is a circular shaped shroud 75 having stationary vanes 76 extending inwardly toward the center thereof. With motor 69 operating, fan 71 will pull air through the bottom of compartment 38 and pass it through the evaporator 67 into duct 48. The stationary vanes 76 will prevent rotation of the air columns as they enter the duct 48. Spaced slightly below the evaporator 67 is a drip tray 77 having an outlet 78 to which a tube 79 is connected. The opposite end of the tube 79 extends into high side compartment 32 and is connected to an inlet 80 provided in a flat pan 81. The pan 81 has short upstanding walls 82 and is secured to bottom wall 37 with the outer edge 83 extending slightly outside window 21. The pan is tilted slightly downwardly toward outer edge 83 so that any water which collects therein will drain out over edge 83 and drip to the ground below or into a gutter (not shown) positioned therebelow. As warm air is circulated over the cold surfaces of the evaporator 67, it will usually be lowered to its dew point and some moisture will condense on the evaporator. In the illustrated embodiment, the condensate will drip from the evaporator 67 into tray 77 from where it will gravitate through tube 79 into pan 81. The outside air being circulated through high side compartment 32 will pass over the pan 81 and will pick up water therefrom and carry it upwardly through chimney 53 into the atmosphere. If conditions should be such that all the water in pan 81 is not picked up by the air, the excess will be drained over edge 83 and disposed of as mentioned above.

The refrigeration system is charged with a suitable refrigerant and since operation thereof is well known in the art, only a short description is deemed necessary. After being compressed by the motor-compressor unit 61, the refrigerant is conveyed by conduit 84 to condenser 62 where it is cooled by the air circulating thereover. From the condenser 62 the refrigerant passes through a capillary restrictor tube 85 into evaporator 67 where it absorbs heat from the air circulated by fan 71. The refrigerant is then returned by conduit 86 to the motor-compressor unit 61 to complete the refrigeration system. Suitable controls for automatically controlling the machinery may be provided but are not shown since such controls are well known in the art and are not important to the present invention.

The air conditioning unit 19 can be completely assembled at the factory and then shipped to the building in which it is to be installed. After the window 21 into the attic is provided for and chimney 53 and tunnel wall 44 are installed, the unit 19 can be easily slid through the window and secured in place. After the ducts 46 and 50 are secured thereto, the unit is ready for operation. A damper 87 is pivotally secured to tunnel wall 44 and is provided with a fixed lever 88 to which rod 89 is pivotally secured. The rod 89 extends into room 16 and may be moved by an operator or automatic controls for changing the position of

damper 87. When the lever 89 is pulled downwardly, damper 87 will be moved to the position shown by solid lines in Fig. 1 so that tunnel 43 is closed and duct 46 opened. If lever 89 is then pushed upwardly, damper 87 will be moved to the position shown by dotted lines in Figure 1 so that tunnel 43 is opened and duct 46 is closed. By varying the position of the damper, the proportion of outside air and room air circulated over the evaporator 67 can be controlled.

The air conditioning unit 19 will operate to cool all the rooms of the building by proper location of the outlet duct 50 and inlet duct 46. The grilles 47 and 52 may be provided with adjustable louvers 90 and 91 respectively for controlling the flow of air therethrough. Duct 46 could be omitted, if desired, with only outside air being circulated through tunnel 43 over evaporator 67. In the illustrated embodiment the air to be cooled is circulated by fan 71 over the evaporator 67 and then passed into room 17 by duct 50. A door (not shown) between the rooms will be open, and the cool air will move through the rooms 17 and 16 and be returned by duct 46. Damper 87 will be set to give the desired mixture of return room air and outside air to be cooled. Any condensate formed on evaporator 67 will be collected by tray 77 and drained into pan 81 by tube 79. Fan 66 will pull outside air through window 21 and discharge it through chimney 53 so that the machinery in the high side compartment 32 will be properly cooled. The water in pan 81 will be picked up by the air circulating through the compartment and then vaporized as it contacts the hot surface of condenser 62 with a resultant cooling of the condenser. Canvas duct 48 will absorb any noise being projected thereinto from the machinery and will prevent air circulation noises from entering the room 17. It is contemplated that the motor-compressor unit 61, electric motor 64 and electric motor 69 be mounted on resilient supports (not shown) in order to isolate sound and vibration.

It is apparent from the foregoing that an air conditioning unit is provided which will cool rooms within a building with a very simplified duct system therebetween. The unit is adaptable for installation in the attic space so that floor space within the rooms is not required. The unit is very compact so that it can be easily slid into position in the attic. Since the length of the unit is relatively small with most of the heavy machinery secured in the high side compartment adjacent the window, most of the weight can be carried by the outer wall of the building. Effective means is provided for the removal of condensate and the natural air movement through the high side compartment will aid in the cooling of the machinery therein. The circulation of cooled air through the rooms will maintain comfortable temperatures therein and the proportion of outside air and recirculated room air can be selectively controlled.

Although the invention has been described with considerable particularity in connection with the illustrated embodiment, it is to be understood that the invention is not limited to the details of construction or to the specific relations of parts described, as many modifications will readily occur to those skilled in the art, and all such modifications as come within the scope of the appended claims and their equivalents are to be considered as being within the invention.

What is claimed is:

1. In an air conditioning system for installation in an attic having an opening therein, an air conditioning unit comprising a high side compartment and a low side compartment, said unit of a size sufficient to permit insertion of said unit into said attic through said opening in said attic, a condenser and a blower therefor mounted in said high side compartment so that convection air currents and air currents produced by the condenser blower enter one side of said high side compartment and pass through said condenser and out another side of said high side compartment, an evaporator and a blower therefor mounted in said low side compartment so that air currents produced by the evaporator blower enter one side of said low side compartment and pass through said evaporator and out another side of said low side compartment, mounting means for substantially supporting said unit to one wall of said attic so that said one side of said high side compartment extends into said opening, a chimney positionable through the roof of said attic, means for mounting said chimney to be substantially supported by said one wall of said attic, said chimney connected to said another side of said high side compartment whereby convection air currents are produced which enter said one side of said high side compartment and pass from the top of said chimney, a duct mounted so that one end thereof is connected to said opening, the other end of said duct connected to said one side of said low side compartment, a second duct mounted so that one end thereof is connected to any rooms below said attic, the other end of said second duct connected to said one side of said low side compartment, a damper mounted to cooperate with said first and second ducts and operable to proportion the amount of air entering said one side of said low side compartment from said first and second ducts, a third duct mounted so that one end thereof is connected to any rooms below said attic, the other end of said third duct connected to said another side of said low side compartment.

2. In an air conditioning system for installation in an attic having an opening in one wall thereof, an air conditioning unit comprising a casing of such size as to be readily insertable into said attic through said opening in one wall thereof, said casing comprising a high side compartment and a low side compartment, said high side compartment being provided with a vertical inlet opening on one side thereof and a horizontal outlet opening on the top thereof, means for mounting said casing to said wall of said attic with said vertical inlet opening in alignment with said opening in said attic wall, whereby said wall substantially supports the weight of said unit, a refrigerant condenser mounted in said high side compartment between said inlet and outlet openings, a chimney positionable through the roof of said attic, and means for mounting said chimney to be substantially supported by said one wall of said attic, said chimney positionable in said attic roof directly above said horizontal outlet opening and connected thereto, whereby convectional air currents are produced which enter said opening in said one wall of said attic, enter said vertical inlet opening on one side of said casing, flow through said condenser, through said horizontal outlet opening and upward through and out of said chimney.

3. In an air conditioning system as claimed in claim 2, fan means mounted within said high side compartment between said refrigerant condenser and said horizontal outlet opening, said fan oper-

able to draw air into said opening in said one wall of said attic, through said vertical inlet opening, through said condenser, and through said horizontal outlet opening and upward through and out of said chimney.

4. In an air conditioning system for installation in an attic having an opening in one wall thereof, an air conditioning unit comprising a casing of such size as to be readily insertable into said attic through said opening in one wall thereof, said casing comprising a high side compartment and a low side compartment, said high side compartment being provided with a vertical inlet opening on one side thereof and a horizontal outlet opening on the top thereof, said low side compartment being provided with inlet and outlet openings through different walls thereof, means for mounting said casing to said wall of said attic with said vertical inlet opening in alignment with said opening in said attic wall, whereby said wall substantially supports the weight of said unit, a refrigerant condenser mounted in said high side compartment between said inlet and outlet openings thereof, a refrigerant evaporator mounted in said low side compartment between said inlet and outlet openings thereof, a chimney mounted through the roof of said attic and mounted to be substantially supported by said one wall of said attic, said chimney positioned in said attic roof directly above said horizontal outlet opening of said high side compartment and connected thereto, whereby convectional air currents are produced which enter said opening in said one wall of said attic, enter said vertical inlet opening on one side of said casing

flow through said condenser, through said horizontal outlet opening and upward through and out of said chimney, and means associated with said inlet and outlet openings of said low side compartment for causing air to flow into the inlet opening of said high side compartment, through said refrigerant evaporator, through said outlet opening of said low side compartment, and through any space below said attic and back to said inlet opening of said low side compartment.

5. In an air conditioning system as claimed in claim 4, said last mentioned means comprising a pair of ducts, one of said ducts connected to said inlet opening of said low side compartment and any space below said attic, the other of said ducts connected to said outlet opening of said low side compartment and another portion of any space below said attic, and a fan mounted within said low side compartment between said inlet opening thereof and said refrigerant evaporator, said fan operating to move air through said evaporator, through said two ducts, and through any space below said attic.

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