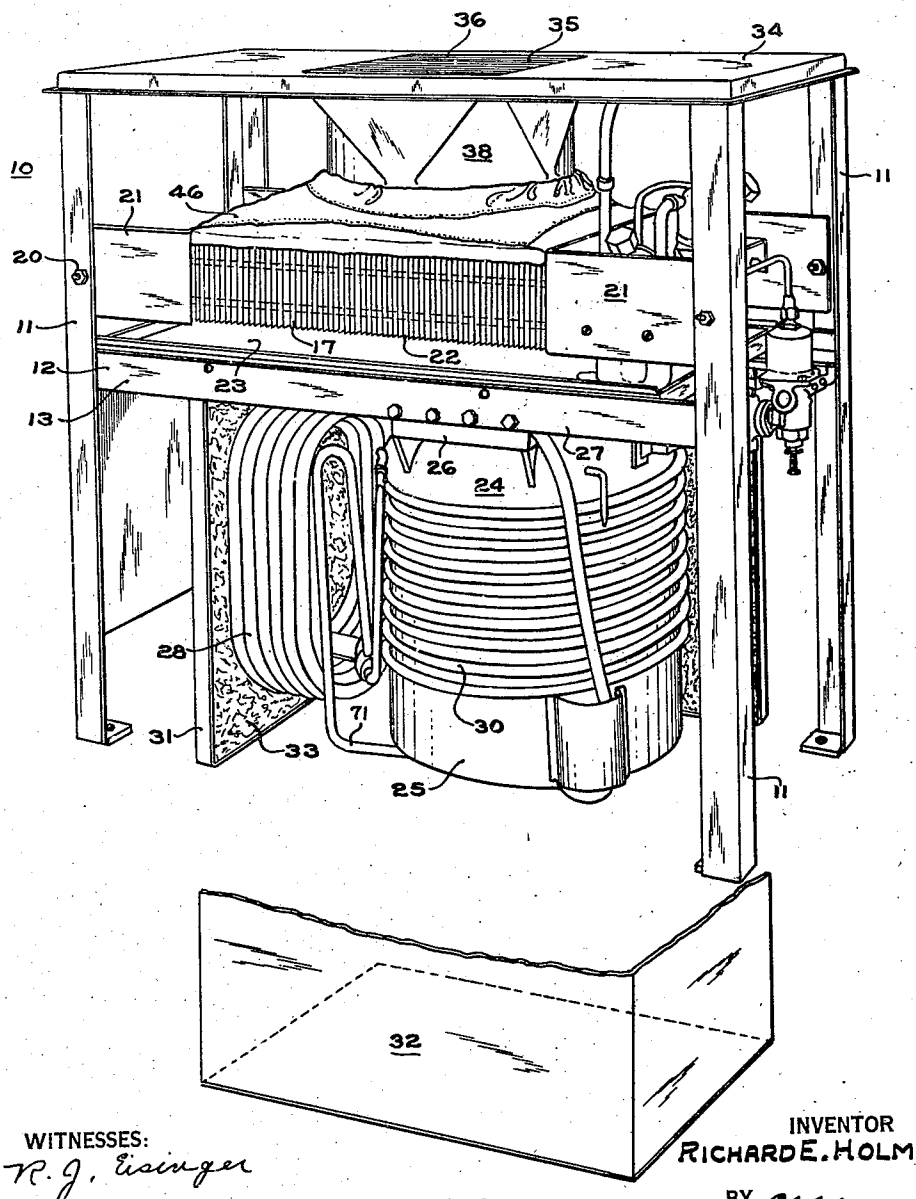
Sept. 2, 1941. R. E. HOLMES 2,254,654

AIR CONDITIONING APPARATUS

Filed Dec. 1, 1936 3 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

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Sept. 2, 1941. R. E. HOLMES 2,254,654

AIR CONDITIONING APPARATUS

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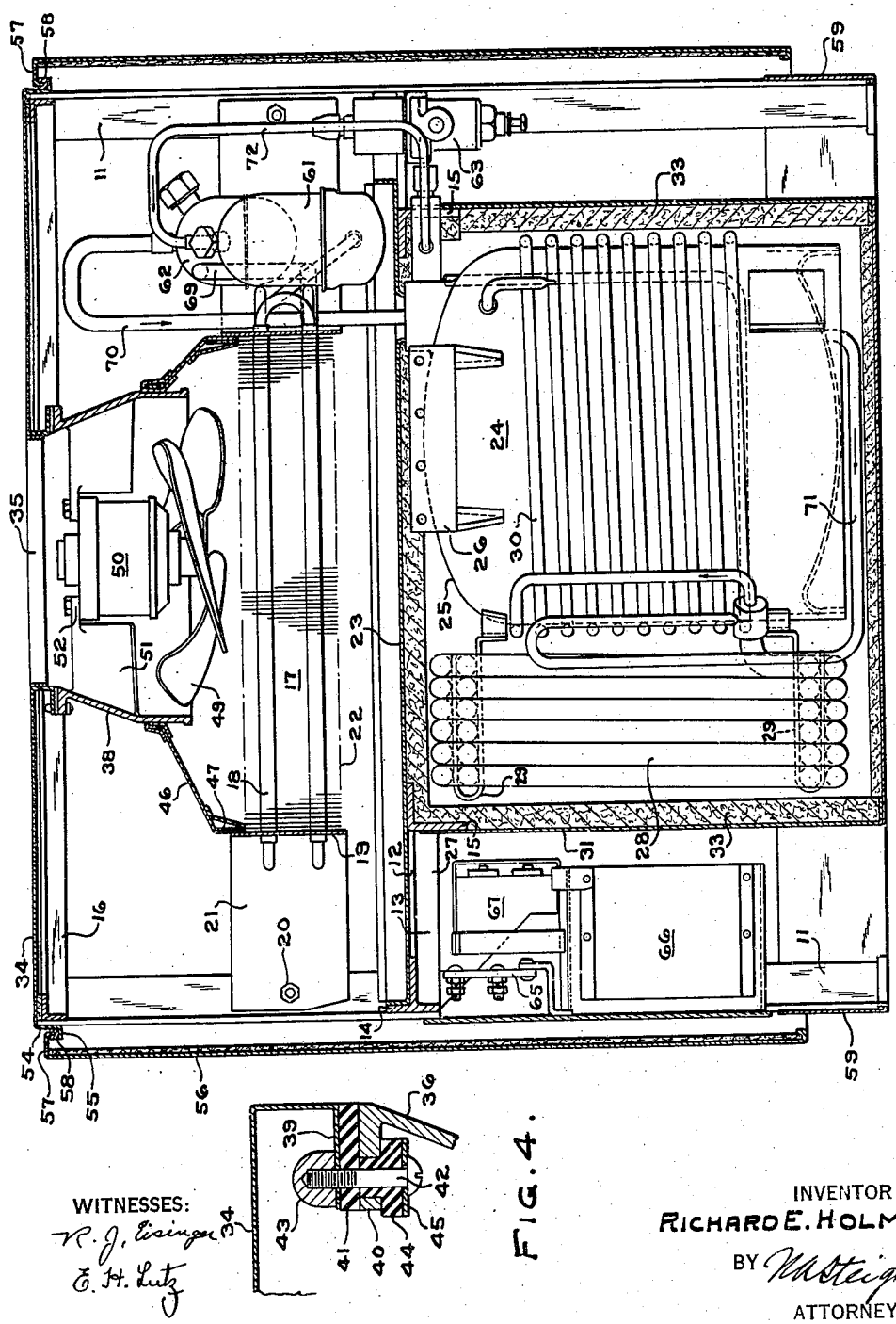


FIG. 3.

FIG. 4.

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Sept. 2, 1941. R. E. HOLMES 2,254,654

AIR CONDITIONING APPARATUS

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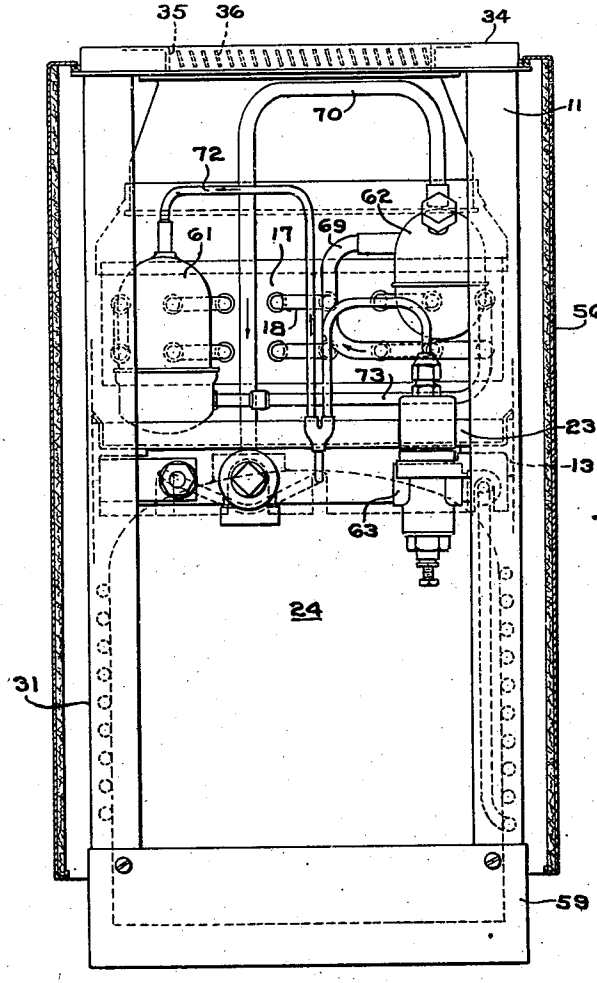


FIG. 5.

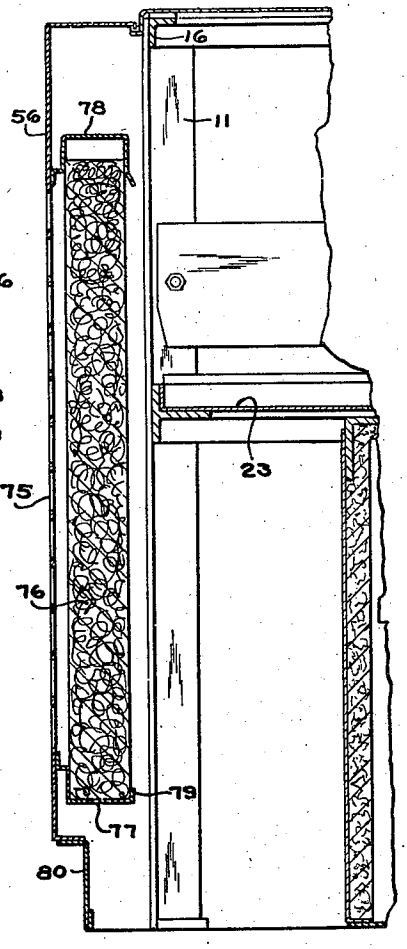


FIG. 6.

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Patented Sept. 2, 1941

2,254,654

UNITED STATES PATENT OFFICE

2,254,654

AIR CONDITIONING APPARATUS

Richard E. Holmes, Springfield, Mass., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application December 1, 1936, Serial No. 113,557

8 Claims. (Cl. 62—140)

My invention relates to a unit air conditioner, more particularly to a supporting structure and cabinet therefor, and it has for an object to provide improved apparatus.

A more particular object is to provide a cabinet of reduced cost.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings forming a part of this application, in which:

Fig. 1 is a perspective view of the unit air conditioner, with parts removed to show the interior construction thereof;

Fig. 2 is a broken perspective view of a cover member removed from the conditioner of Fig. 1;

Fig. 3 is a vertical longitudinal section;

Fig. 4 is a sectional view of a rubber insulated connection;

Fig. 5 is a vertical transverse section; and,

Fig. 6 is a vertical longitudinal partial section of a second form, which is slightly modified to include air filters at the air inlets.

Referring to the drawings in detail, the unit air conditioner includes a frame or chassis indicated generally by the numeral 10. The frame includes vertical members 11, such as angle irons, which are connected to each other by a horizontal connection 12 disposed intermediate the top and the bottom of the vertical members 11. In the illustrated embodiment, the connection 12 comprises two longitudinal T-bars 13 connecting the two front and the two rear vertical members, respectively, a transverse T-bar 14 connecting the vertical members on the left, and transverse angle irons 15 connecting the longitudinal T-bars 13 at points adjacent but spaced from the respective ends thereof. The upper ends of the vertical members may also be connected, as by four angle irons 16, to provide further rigidity. The connections between the parts of the frame may be of any suitable form, such as bolting or welding, the latter being preferred. There is thus provided a rigid unitary frame for supporting the operating and the casing or enclosing parts of the unit air conditioner.

An evaporator 17 is mounted on the frame and spaced above the connection 12 a sufficient distance to permit passage of air therebetween. It includes horizontal tubes 18 mounted in end plates 19, the latter having flanges 21 connected to the vertical members 11, as by rubber insulated bolt connections 20, similar to the connection shown in Fig. 4, described below. The tubes 18 are provided with transverse, vertical plates or fins 22 for increasing the air cooling surface.

The T-bars and angle irons of the horizontal connection 12 have horizontal flanges disposed in a common horizontal plane, as best shown in Fig. 3, and have resting thereon a drip pan 23 disposed beneath the evaporator 17 for receiving the condensate falling therefrom.

The unit air conditioner comprises a hermetically sealed motor compressor unit 24, comprising a motor and a compressor enclosed in a casing 25. The latter is provided with brackets 26 adjacent the top, which brackets are adapted to be bolted to the downwardly-extending flanges 27 of the longitudinal T-bars 13 for suspending the motor-compressor unit therefrom. The condenser 28 of the illustrated embodiment, is water cooled, and comprises a double tube coil. It is also disposed beneath the connection 12 and may desirably be carried by the casing 25, being mounted on brackets 29 attached to the casing. The motor compressor unit is preferably cooled by the condenser cooling water after the latter is discharged from the condenser. For this purpose, a coil 30 is wrapped around the casing 25 and connected to the outlet from the condenser.

A housing 31 for the condenser and the motor compressor unit is preferably provided, being attached to the downwardly-extending flanges 27 of the longitudinal T-bars 13 and the angle irons 15. The front wall, one end wall and the bottom wall of the housing 31 are preferably formed as a cover member 32, shown in Fig. 2, which is removable to provide access to the interior of the housing. The walls of the housing 31 are preferably lined with any suitable form of heat and sound-insulating material 33.

A top wall 34 for the unit air conditioner is mounted on top of the frame 10, and may rest on the horizontal flanges of the angle irons 16 with a strip of sound deadening felt interposed therebetween. The top wall 34 contains an outlet opening 35 and a grill 36 is preferably disposed within the outlet opening. A shroud member 38 depends from the top wall 34 in registry with the outlet opening 35. The top wall and the shroud member have flanges 39 and 40, respectively, which are secured together with a rubber gasket 41 inserted therebetween, by means of bolts 42 and nuts 43, as shown in Fig. 4. The bolts extend through rubber grommets 44 where they extend through the flange 40 so that metal-to-metal contact between the top wall and the shroud member is avoided. A metal washer 45 may be inserted between the rubber grommet and the head of the bolt.

A flexible connection 46, made of any suitable material such as rubberized cloth, is provided for conveying air from the evaporator to the shroud 38. The lower edges of the flexible connection may be fastened to a metal strip 47 carried by the evaporator, and the upper edges may be fastened around the shroud by means of a draw string. A fan 49, overhung on the shaft of its driving motor 50, is mounted within the shroud member 38 for effecting upward flow of air therethrough. The shroud 38 is formed with straightening vanes 51 cooperating with the blades of the fan 49. These vanes are formed with projections 52 to which the motor 41 is attached by means of rubber insulated bolt connections similar to that shown in Fig. 4.

The edges of the top wall 34 are first bent downwardly, as shown at 54, and then outwardly as shown at 55 to provide horizontal flanges. The casing of the unit air conditioner comprises, in addition to the top wall 34, a skirt or tubular member 56 comprising four vertical walls for closing the four sides of the air conditioner. The skirt member 56 is preferably made of sheet metal and comprises inwardly-extending flanges 57 at its upper edges, which flanges are adapted to rest on the horizontal flanges 55 of the top wall for supporting the skirt member from said top wall. Preferably, the inner edges of the flanges 57 are bent downwardly to extend into the grooves of U-shaped rubber gaskets 58, which are glued to said edges and rest dirctly on the flanges 55. The walls of the skirt member are of greater horizontal dimensions than the frame 10, thereby providing vertical passages for air between the walls of the skirt member and the frame. The lower edges of the skirt member are spaced above the bottom of the frame, to permit air to pass around said edges into said passages. Relatively narrow strips of sheet metal 59 are preferably applied to the lower ends of the vertical members 11 to close off from view the portion of the interior not covered by the skirt member 56.

The right-hand end of the evaporator 17 is spaced from the right-hand end of the frame 10 to provide space for other parts of the refrigerating system, including a float valve 61 and a centrifugal separator 62. A water regulating valve 63 is disposed between the right-hand transverse angle iron 15 and the right hand end of the frame. Electrical equipment including a panel board 65, a relay 66 for starting the compressor motor, and a capacitor and transformer 67 is mounted on the frame 10 at the left as shown in Fig. 3.

The refrigerating system operates in the usual manner of such a system. Refrigerant vapor formed in the evaporator is conveyed through a conduit 69 to the separator 62, in which unvaporized liquid refrigerant is trapped, then through a conduit 70 to the motor compressor unit 24 in which it is compressed. The compressed refrigerant is conveyed through a conduit 71 to the condenser 28 wherein it is condensed by the cooling action of the water flowing through the inner tube. The condensed refrigerant passes through a conduit 72 to the float valve 61, which reduces the pressure and controls the flow thereof. The refrigerant is then conveyed through a conduit 73 to the evaporator 17, wherein it absorbs heat from the air passing thereover and the liquid portion of the refrigerant is vaporized. Cooling water, supplied from any suitable source flows first through the condenser 28 to effect the condensation of refrigerant therein and then flows through the coil 30 to cool the motor compressor unit 24.

Air from the room passes under the lower edges of the skirt member 56, through the passages between the walls of the skirt member and the frame and parts carried thereby, then flows through the space provided between the evaporator and the horizontal connection 12, over the surfaces of the evaporator, then through the flexible connection 46, past the fan 49, through the shroud 38 and the grill 36 upwardly into the enclosure in which the unit air conditioner is disposed.

The skirt member 56 is readily removable from the unit air conditioner, it being necessary merely to lift the same therefrom. The frame 10 and the parts carried thereby are then readily accessible from all sides thereof, thereby greatly facilitating servicing of the apparatus. It will also be apparent that a very simple and inexpensive form of frame is provided. The suspension of the condenser and the motor compressor unit from the connection 12 provides a very simple and inexpensive method of attaching these parts.

In Fig. 4, I show a modified form of my invention which may be used when it is desired to provide air filters. In this case, the end walls of the skirt member 56 are provided with air inlet openings 75 and are spaced from the frame 10 a distance somewhat greater than in the first embodiment. An air filter 76 is disposed on the inner side of the end wall and extends over the area of the inlet opening 75. It is preferably retained in position by means of a lower channel member 77 and an upper channel member 78. As will be seen from Fig. 4, the bottom of the channel 78 is spaced upwardly a short distance from the top of the air filter 76, and the flange 79 of the lower channel member 77 has a vertical extent slightly less than this distance. This arrangement permits the air filter to be inserted by first inserting the upper edge into the channel member 78, passing the lower edge over the flange 79 and then lowering the same into the channel member 77. The air filter is inserted while the skirt member 56 is removed from the frame 10. In this embodiment, the wall of the skirt member 56 extends down to the floor, the lower portion thereof being set inwardly as shown at 80 to conform to the design of the first embodiment.

In the embodiment of Fig. 4, the air from the room enters through the inlet openings 75, passes through the filters 76, through the spaces between the filters and the frame 10 and then into the space below the evaporator. The construction and operation of this embodiment is otherwise the same as that of the first embodiment.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a unit air conditioner, the combination of a frame including vertical members, a horizontal connection between said members intermediate the upper and lower ends thereof, an evaporator

carried by said frame above said connection, a drip pan below said evaporator carried by said connection, a motor-compressor unit disposed beneath said connection and suspended therefrom, a condenser disposed beneath said connection and carried by said frame, a top wall mounted on the top of said frame, and a removable tubular or skirt casing member providing vertical walls supported by said frame, said casing member being adapted to be telescoped over the top of the frame.

2. A unit air conditioner as defined in claim 1 wherein some walls of the casing member are spaced from the frame and the parts carried thereby and the lower edges of said walls are spaced above the bottom of the frame to provide passage for air from the exterior of the cabinet to said evaporator.

3. In a unit air conditioner, the combination of a frame comprising four corner posts, a top wall mounted on the top of said frame, a horizontal partition carried by the frame between the top and the bottom thereof, an evaporator mounted on the frame above said partition, a motor-compressor unit and a condenser suspended from said partition, an inner casing for said motor-compressor and said condenser, and an outer casing comprising vertical walls disposed in spaced relation to said inner casing to provide passages therebetween leading to said evaporator, the lower edges of said vertical walls being disposed above the bottom of the frame to provide communication between said passages and the exterior of the air conditioner, and said casing member being removably supported by said frame.

4. In a unit air conditioner, the combination of a skeleton frame, an evaporator mounted on said frame below the top thereof, a top wall mounted on top of said frame and having an outlet opening therein, a fan carried by said top wall and arranged to induce flow of air over said evaporator and discharge the same through said outlet opening in the top wall, and a unitary casing member comprising at least three adjacent vertical walls for closing at least three of the sides of the conditioner, said casing member being suspended from the top wall and being removable while said top wall remains in place.

5. In a unit air conditioner, the combination of a stationary structure including a wall having an opening therein, an evaporator mounted on part of said stationary structure other than said wall, means forming a passage for air between said opening and said evaporator and including a duct member of a flexible material that is resistant to transmission of vibration, said flexible duct member being secured around the side of the evaporator facing said openings and providing reduction in flow area of the air passage from said side of the evaporator to a materially reduced flow area, and a fan supported by said wall and disposed to effect flow of air through said passage.

6. In a unit air conditioner, the combination of a stationary structure including a top wall having an outlet opening therein, a member providing an air passage suspended from said top wall and having the outlet end of its passage communicating with the outlet opening in the top wall, a fan and motor unit carried by said member with the fan disposed in said passage, cooling means mounted on said stationary structure below said top wall, and a duct member, made of flexible material that is resistant to transmission of vibration, for conveying air from said cooling means to the inlet end of said air passage in said first mentioned member, said cooling means having a flow area for air that is materially greater than that of the inlet end of said air passage and said duct member of flexible material providing reduction in flow area from the former to the latter, whereby said fan induces flow of air from said cooling means, through said duct member to the fan and discharges the same through said air passage and outlet opening in the top wall.

7. In a unit air conditioner, the combination of a stationary structure including a top wall having an outlet opening, a fan shroud suspended from said top wall in registry with said outlet opening, a propeller fan and motor unit disposed in said shroud and mounted thereon, an evaporator mounted on said stationary structure below said top wall, and a cloth duct member connecting said shroud and said evaporator, the lower edges of said cloth duct member being secured around the top of said evaporator and the upper edges thereof being secured to said shroud, whereby said fan induces flow of air over said evaporator and through said duct member and discharges the same upwardly through said shroud and said outlet opening.

8. A unit air conditioner adapted to be disposed within a room to be air conditioned and comprising the combination of a frame, air-treating elements carried by the frame, a top wall carried by the frame and having an outlet opening formed therein, a fan carried by said top wall and adapted to discharge air through said outlet opening, said top wall having a horizontally-projecting flange or shoulder whose upper surface is disposed below the upper surface of the top wall, and a skirt or side wall member comprising at least three vertical walls and having an inwardly-extending flange at the top thereof resting on said flange or shoulder of the top wall for supporting the side wall member thereon, the upper surface of said inwardly-extending flange being at least as low as the upper surface of said top wall.

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