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Berger

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[54] **AIR CONDITIONING UNIT**

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[52] **U.S. Cl.** **62/419**, 62/427, 62/263, 62/298, 62/302, 165/48, 165/76

[51] **Int. Cl.** **F25d 17/06**

[58] **Field of Search** 62/97, 317, 427, 62/419, 263, 77, 298, 302, 326; 165/48, 76, 63

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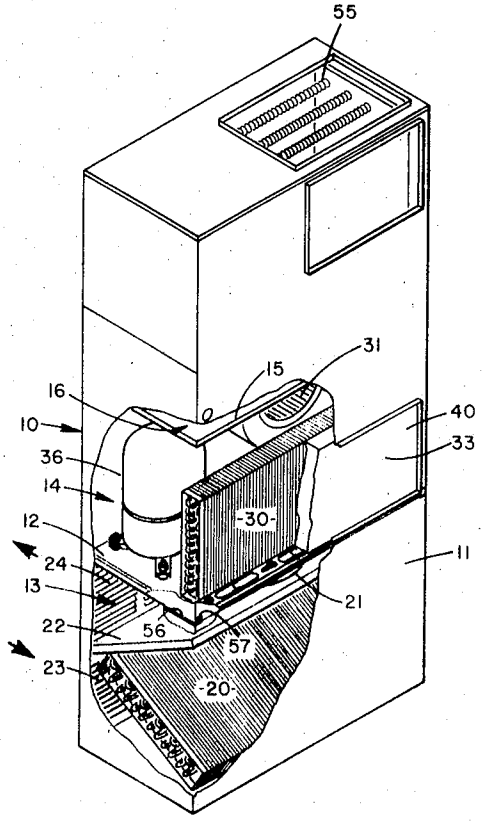
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[57] **ABSTRACT**

A relatively thin air conditioning unit for modular buildings is provided with a housing having a lower partition and an upper partition which divides the housing into a lower compartment containing a condenser and a condenser fan; a middle compartment containing an evaporator, an evaporator fan and a compressor; and an upper compartment containing a gas or an electric furnace. The lower compartment, including the lower part of the housing, lower partition, the condenser, the condenser fan motor, the evaporator and the compressor are formed as an integral subassembly and mounted to the remainder of the housing by means of interfitting channel shaped side tracks which facilitate disassembly and servicing of the refrigeration section of the unit from the exterior of the building to which the unit is attached.

3 Claims, 3 Drawing Figures



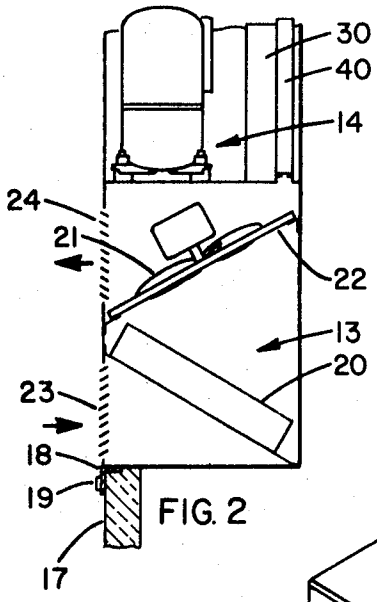


FIG. 2

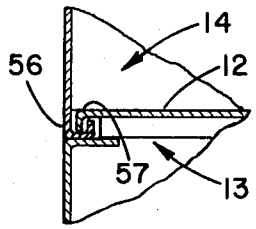


FIG. 3

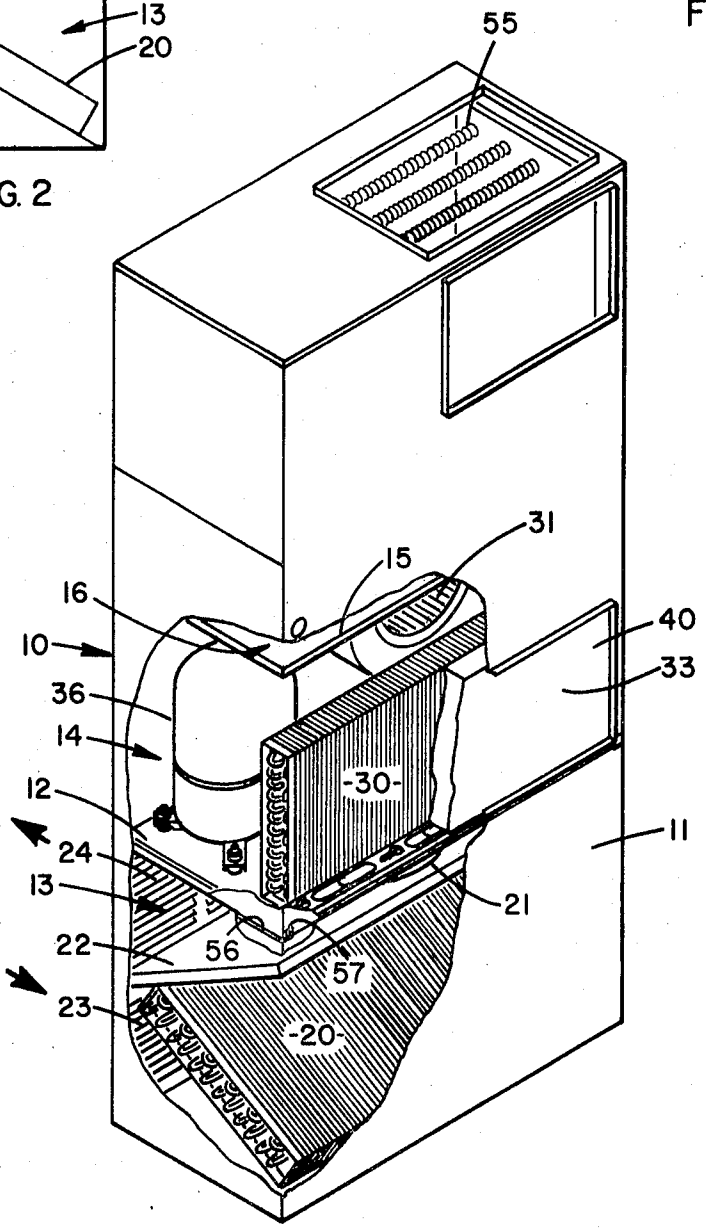


FIG. 1

AIR CONDITIONING UNIT

BACKGROUND OF THE INVENTION

This invention relates to air conditioning units and, more particularly, to air conditioning units which are especially designed for use with modular building construction.

An air conditioning unit for a modular building is usually required to be assembled adjacent an exterior face of the building at an above ground location. Consequently, the unit by its nature occupies valuable interior space. It is desirable that the unit be capable of being mounted with little or no overhang on the exterior of the building since an overhang could create problems in transporting the modular building, especially if it is a mobile home. However, it is also desirable that the modular unit occupy as little interior building depth as possible and preferably it should fit within the confines of a utility closet without unduly restricting the space therein which must be occupied by other equipment such as water heaters. The unit should be completely factory assembled and available with or without add-on cooling. Finally, such units must be made easily serviceable, preferably from the exterior of the building to which they are attached.

These desirable features present a unique design problem in satisfactorily combining the necessary components of a heating and cooling air conditioning unit to provide conditioned air to the modular building. It is a principal object of this invention to provide an improved air conditioning unit which suits the special requirements imposed by modular building construction.

SUMMARY OF THE INVENTION

An air conditioning unit having a casing which is divided by a lower partition and an upper partition into a lower compartment, a middle compartment and an upper compartment has a refrigerant condenser and a condenser fan disposed within the lower compartment. A refrigerant evaporator, a refrigerant compressor and an evaporator fan are disposed within the middle compartment and an electric or gas furnace is located within the upper compartment. The lower compartment including the lower partition, the compressor, the evaporator, the condenser and the fan are all formed as an integral subassembly which is secured to the middle and upper compartment by removable means such as an interfitting channel construction so that the subassembly can be removed from the housing as an integral section. The evaporator fan is secured to the upper partition so that the furnace section can be operated without the refrigeration section in place.

This arrangement provides an easily serviceable, extremely thin construction which does not excessively intrude into the closet space provided for utilities in the building and at the same time avoids the necessity of any exterior overhang.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of an air conditioning unit in accordance with this invention;

FIG. 2 is a fragmentary cross sectional view of the lower sections of the unit shown in FIG. 1; and

FIG. 3 is a fragmentary cross section illustrating the sliding flanges.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An air conditioning unit **10** is illustrated in FIG. **1** having an outer housing **11** forming a six sided rectangular enclosure for heating and cooling air conditioning units. A lower partition **12** and an upper partition **15** spaced from each other are secured within the housing to divide it into a lower compartment **13**, a middle compartment **14**, and an upper compartment **16**. A refrigerant condenser **20** and a condenser fan **21** mounted on condenser fan baffle **22** are secured in the interior lower compartment **13**. A condenser air inlet **23** and a condenser air outlet **24** disposed on opposite sides of baffle **22** are formed in the rear wall portion of casing **11**. Condenser fan **21** draws air into lower compartment **13** through condenser air inlet **23**, draws the air across refrigerant condenser **20**, and discharges the air from lower compartment **13** through condenser air outlet **24**. The condenser air inlet **23** and the condenser air outlet **24** are both formed on the rear side of casing **11** so that the rear wall of the casing can be mounted flush with wall **17** of a modular building to which the unit is attached by means of flanges **18** and screws **19**.

Refrigerant evaporator **30**, refrigerant compressor **36** and evaporator fan **31** are disposed within the middle compartment **14** of housing **11**. The evaporator, condenser and compressor are connected with a suitable expansion device in a refrigeration circuit to cool air passing over evaporator **30**. A filter **40** is interposed between evaporator air inlet **33** formed in housing **11** and evaporator **30**. Evaporator air inlet **33** is formed on the opposite side of housing **11** from that in which the condenser air inlet **23** and condenser air outlet **24** are formed. This construction enables air to be drawn directly into the front side of housing **11** facing the interior of the building being conditioned, thereby making the entire width of the unit available for evaporator surface.

Compressor **36** and evaporator **30** are mounted on the top surface of lower partition **12**. Partition **12** is secured with the separable bottom portion of the walls of housing **11** which form lower compartment **13** in which are secured condenser **20**, condenser fan **21** and condenser fan baffle **22**, so that the entire refrigeration system forms an integral subassembly. As best shown in FIGS. **2** and **3**, the sides of the refrigeration subassembly are secured to the upper portion of the sides of housing **11** by means of oppositely facing interfitting sheet metal channels **56, 57** integrally formed with the walls of the upper and lower sections respectively of the side walls of housing **11**. This arrangement enables the entire lower compartment and the refrigeration system components in the middle compartment to be slid outwardly toward the back of housing **11** as a unit for servicing. Evaporator fan **31** is secured to upper partition **15** and in the event that the evaporator fan extends below the top of the refrigerant evaporator, it is necessary to remove the evaporator fan to withdraw the refrigeration subassembly from the housing. Thereafter, the evaporator fan can be reattached to partition **15** so that the upper section **16** containing furnace heating means **55**, such as electric heaters, can be operated without the refrigeration subassembly being in place. An additional advantage of this arrangement is that the customer may install only the furnace section together with the evaporator fan and subsequently add a refrig-

eration system with a minimum of installation effort being required.

While for purposes of simplicity a furnace has been illustrated having an electric furnace **55** disposed in upper compartment **16**, this compartment may alternatively contain a gas fired furnace heat exchanger of relatively conventional configuration. The construction of the air conditioning unit of this invention is readily adapted to the installation of either a gas or electric furnace within the same enclosure to satisfy the customer's preference and to take advantage of either desired heat source.

An air conditioning unit arranged in accordance with this invention lends itself to a relatively narrow depth while making maximum utilization of the available height of the utility closet in which it is installed. The unit may be mounted with the back side flush with the building exterior or with the front side flush with the building interior and in either event the overhang is small due to the vertical configuration of components. It will also be apparent that the air conditioning section can be completely serviced from the exterior of the building so that it is unnecessary to make provisions for access to the units through the utility closet and other items such as a water heater may be placed directly in front of the unit. The component layout is also advantageous because it allows great flexibility in manufacturing either an electric or gas fired furnace with or without air conditioning within the confines of the same basic upper enclosure and enables the unit to be sold and installed as either a heating only or a heating and cooling unit. Furthermore, the refrigeration section can be removed for servicing during cold weather without impairing the operation of the furnace. The unit is further uniquely adapted to the requirements of modular building construction by employing a simple flange mount for either interior or exterior overhang. The vertical configuration of components take the best advantage of the available interior space by minimizing the depth and making use of otherwise wasted vertical room, compared with units having the condenser and evaporator mounted side by side.

A preferred embodiment of this invention has been described for purposes of illustration, but it will be appreciated that the invention may be otherwise embodied within the scope of the following claims.

I claim

1. An air conditioning unit comprising:

A. a housing, said housing having upper and lower spaced, horizontally extending partitions dividing said housing into a lower compartment, a middle compartment and an upper compartment;

B. said lower compartment having a refrigerant condenser disposed therein, a condenser air inlet opening to said lower compartment formed in one side of said lower compartment, a condenser air outlet opening from said lower compartment also formed in said one side of said lower compartment, a condenser fan mounted in said lower compartment for drawing air in said inlet opening, passing the air over the refrigerant condenser and discharging it from the outlet opening to condense refrigerant in said refrigerant condenser;

C. said middle compartment having a refrigerant evaporator, a refrigerant compressor and a conditioned air fan mounted therein, said refrigerant evaporator and said refrigerant compressor being mounted adjacent the upper side of said lower partition separating said lower and middle compartments and said conditioned air fan being detachably mounted adjacent the lower side of said upper partition separating said middle and upper compartments, an evaporator air inlet opening to said middle compartment formed in the side of said middle compartment opposite the side of the housing having the condenser air inlet and outlet openings therein, an evaporator air outlet opening formed in the upper partition, said conditioned air fan being disposed to draw air to be conditioned in said evaporator air inlet opening and pass the air across said refrigerant evaporator and to discharge the air into said upper compartment through said evaporator outlet opening in the upper partition; and

D. said upper compartment comprising a furnace section having air heating means therein for heating air discharged into the upper compartment by said conditioned air fan, an air outlet opening formed in a wall of the upper compartment to a desired location.

2. An air conditioning unit as defined in claim **1** wherein the lower portion of the housing, the lower partition, the refrigerant condenser, the condenser fan, the refrigerant evaporator and the refrigerant compressor are secured together as a subassembly and the subassembly is secured to the remainder of the unit by relatively slidable means to facilitate installation and removal thereof from the remainder of the unit.

3. An air conditioning unit comprising:

A. a housing, said housing having upper and lower spaced, horizontally extending partitions dividing said housing into a lower compartment, a middle compartment and an upper compartment;

B. said lower compartment having a refrigerant condenser disposed therein, a condenser air inlet opening to said lower compartment formed in a side of said lower compartment, a condenser air outlet opening from said lower compartment formed in a side of said lower compartment, a condenser fan mounted in said lower compartment for drawing air in said inlet opening, passing the air over the refrigerant condenser and discharging it from the outlet opening to condense refrigerant in said refrigerant condenser;

C. said middle compartment having a refrigerant evaporator, a refrigerant compressor and a conditioned air fan mounted therein, said refrigerant evaporator and said refrigerant compressor being mounted on the upper side of said lower partition separating said lower and middle compartments and said conditioned air fan being detachably mounted on the lower side of said upper partition separating said middle and upper compartments, an evaporator air inlet opening to said middle compartment formed in a side of said middle compartment, an evaporator air outlet opening formed in said upper partition, said conditioned air fan being disposed to draw air to be conditioned in said evaporator air inlet opening and pass the air across said refrigerant evaporator and to discharge the air into said upper compartment through said evaporator outlet opening in the upper partition;

D. said upper compartment comprising a furnace section having air heating means therein for heat-

ing air discharged into the upper compartment by said conditioned air fan, an air outlet opening formed in a wall of the upper compartment for discharging conditioned air from the upper compartment to a desired location; and

E. the lower portion of the housing, lower partition, the refrigerant condenser, the condenser fan, the refrigerant evaporator and the refrigerant compressor being secured together as a subassembly and the subassembly being secured with the remainder of the unit by relatively slidable means to facilitate removal of the subassembly from the remainder of the unit.

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