Feb. 13, 1962 H. H. HOPKINSON ET AL 3,020,820

SELF-CONTAINED AIR CONDITIONING UNITS

Original Filed Dec. 16, 1955 3 Sheets-Sheet 1

FIG. 2

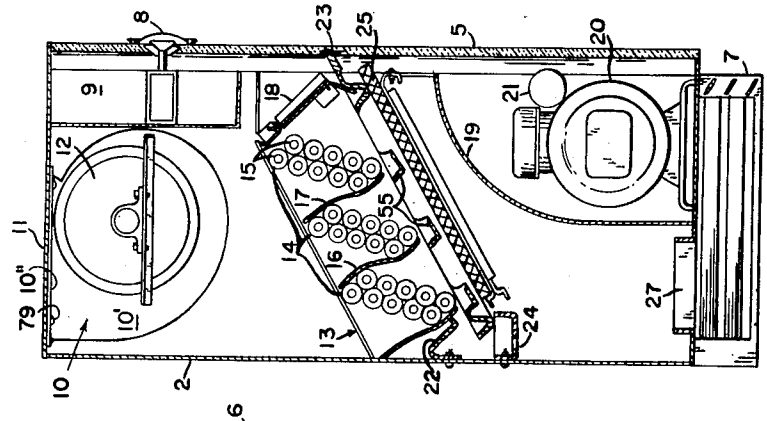


FIG. 1

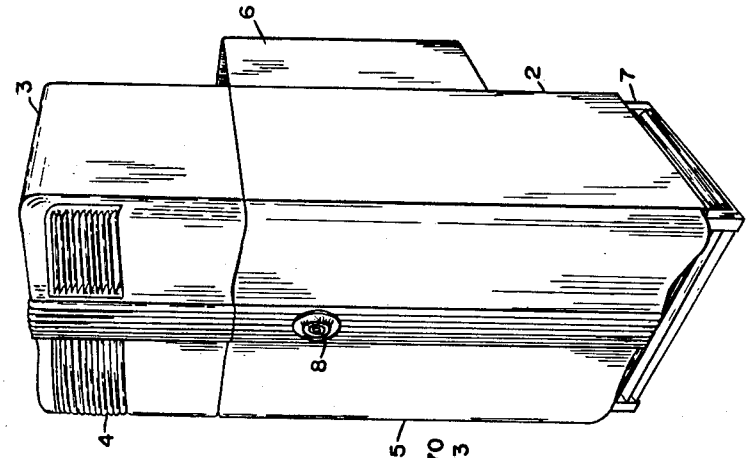


FIG. 4

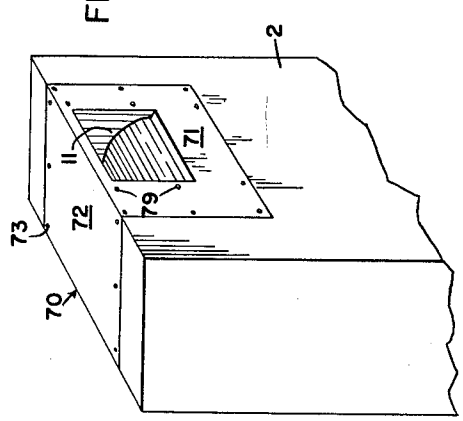
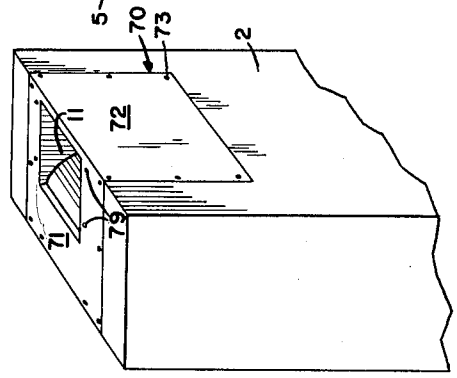


FIG. 5



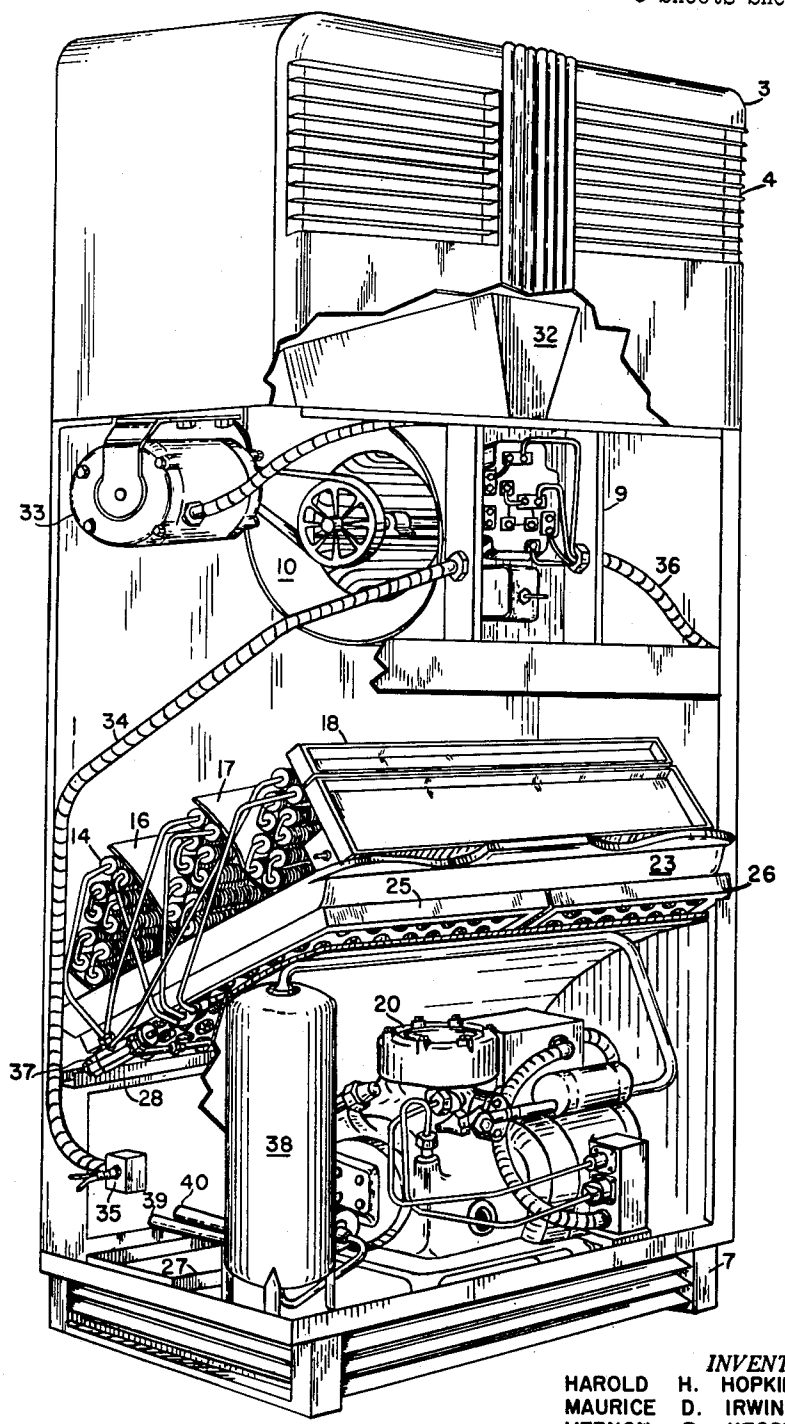
INVENTORS.
HAROLD H. HOPKINSON.
MAURICE D. IRWIN.
VERNON R. KESSLER.
BY Herman Seid
ATTORNEY.

Feb. 13, 1962 H. H. HOPKINSON ET AL 3,020,820

SELF-CONTAINED AIR CONDITIONING UNITS

Original Filed Dec. 16, 1955 3 Sheets-Sheet 2

FIG. 3



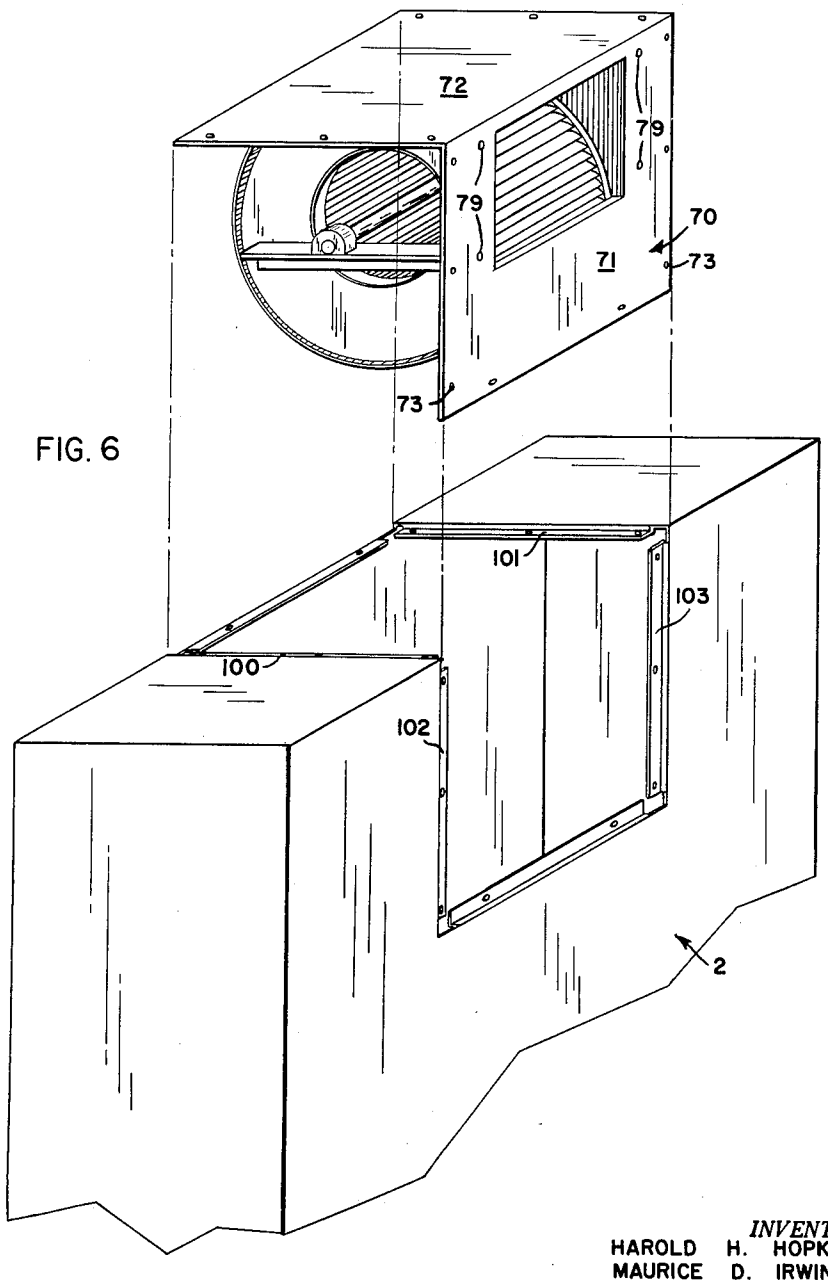
INVENTORS.
HAROLD H. HOPKINSON.
MAURICE D. IRWIN.
VERNON R. KESSLER.
BY
Herman Seid
ATTORNEY.

Feb. 13, 1962 H. H. HOPKINSON ET AL 3,020,820

SELF-CONTAINED AIR CONDITIONING UNITS

Original Filed Dec. 16, 1955 3 Sheets-Sheet 3

FIG. 6



INVENTORS
HAROLD H. HOPKINSON.
MAURICE D. IRWIN.
VERNON R. KESSLER.

BY Herman Seid
ATTORNEY.

United States Patent Office 3,020,820
Patented Feb. 13, 1962

3,020,820

SELF-CONTAINED AIR CONDITIONING UNITS

Harold H. Hopkinson, Manlius, Maurice D. Irwin, De Witt, and Vernon R. Kessler, Fayetteville, N.Y., assignors to Carrier Corporation, Syracuse, N.Y., a corporation of Delaware

Original application Dec. 16, 1955, Ser. No. 553,501, now Patent No. 2,959,031, dated Nov. 8, 1960. Divided and this application Nov. 9, 1959, Ser. No. 851,655
5 Claims. (Cl. 98—40)

This application is a division of our copending application, Serial No. 553,501, filed December 16, 1955, entitled Self-Contained Air Conditioning Units, now Patent No. 2,959,031, granted November 8, 1960 and relates to air conditioning units and more particularly to self-contained air conditioning units in which the air handling equipment and the refrigeration system are enclosed in a common housing.

The use of self-contained air conditioning units in homes, stores, factories and offices, is very often restricted by the inflexible character of these machines. Air in such machines is customarily introduced through an intake grille in the front of the machine and is discharged from a grille spaced above the intake grille. The lower portion of the casing of such a machine is commonly monopolized by the refrigeration equipment. The orientation of components within the machine is normally dictated by the type of evaporator coil used; this in turn controls the method of condensate removal from the coils and the orientation of the filter element. Since banks of fin coils are commonly used in such units the orientation of such components has become very conventional.

The chief object of the present invention is to provide a self-contained air conditioning unit of extreme versatility which will permit application in a wide variety of situations.

A further object is to provide a novel fan mounting which permits changing the disposition of the fan discharge. Other objects of my invention will be readily perceived from the following description.

This invention relates to a self-contained air conditioning unit comprising a casing and a multi-directional air intake which also serves as a supporting base for the casing. This casing has a first compartment in communication with the air intake and a fan therein secured to an adjustable fan mounting, said fan mounting being of such a nature that air being discharged from the casing may be directed in an upward or backward direction from the machine. A refrigeration system is located within a second compartment within the casing; the evaporator of this refrigeration system is disposed in the air stream induced through the first compartment of the casing. This evaporator comprises a plurality of heat exchange and baffle members which cooperate in pairs so that air impinging upon the baffles will be directed toward the heat exchange members and be in heat exchange relation therewith. These heat exchange members comprise a plurality of parallel serpentine fin coils so arranged that condensate forming thereon will flow in a converging pattern toward the lowermost tube of each heat exchange member. Cooperating with the evaporator is a plastic drip pan adapted to collect condensate which drips from the lowermost tube of each heat exchange member. Disposed below this drip pan is a filter element through which the air passes coming from the air intake. The drip pan is made of a plastic or an insulating material and is so constructed that it does not substantially impede air flow therethrough nor does it permit the formation of condensate on the lower extremities thereof which might moisten the filter element.

The attached drawings illustrate a preferred embodiment of the invention, in which

FIGURE 1 is a perspective view of the present invention showing an external air cooled condenser and a plenum for the air discharged from the unit;

FIGURE 2 is a sectional view of the unit employing a water cooled condenser;

FIGURE 3 is a perspective view of the unit shown in FIGURE 2 in which a large portion of the casing is removed to indicate the orientation of the components therein;

FIGURES 4 and 5 are partial right rear perspective views showing the alternate orientations of the fan mounting; and

FIGURE 6 is an exploded view illustrating the mounting of the fan assembly in the casing.

Referring to the drawings there is shown in FIGURE 1 a self-contained air conditioning unit embodying the present invention. The unit comprises a casing **2** having a front removable panel **5** giving the unit the general shape of a rectangular parallelepiped. Mounted above the unit is a plenum **3** having louvers **4** in the front thereof through which conditioned air is discharged from the unit into the space to be conditioned. An air cooled condenser **6** is secured to the rear of the unit and is operatively connected to the refrigeration system employed by the unit. This type of air cooled condenser may be suitably attached in any desired manner to the machine and put in communication with a supply of cooling air or it may be spaced remote from the unit and be operatively connected to the machine by suitable conduits for the refrigerant to be cooled.

This type unit may employ a water cooled condenser as shown in FIGURES 2 and 3 instead of this external air cooled condenser. Located centrally in the front panel of the unit is a control center **8** which may be of the type illustrated in the copending patent application of V. Kessler and W. A. La Grange, Serial No. 553,502, filed December 16, 1955, now Patent No. 2,959,031, granted November 8, 1960.

Referring to FIGURES 2 and 3 there are indicated a sectional view of the machine and a perspective view of the machine with a major portion of the front cover panel and a side panel removed from the unit. FIGURE 2 indicates the control center being connected to a suitable control box **9** wherein are situated the controls for the refrigeration system and blower fan of the unit. Behind the control box is located a suitable fan adapted to induce an air stream through the casing. In the present embodiment there is shown a centrifugal fan **10** having its discharge opening in the upper wall of the unit.

It will be noted that FIGURES 2, 4 and 5 do not indicate the plenum **3** shown in FIGURE 1. It will be readily appreciated that suitable duct work may be attached to this fan discharge opening for discharging the conditioned air in a space remote from the machine. This fan may be mounted in an alternate position which will be described hereinafter. During operation of this fan, air is taken in through the inlet **12** in the scroll **10'** and discharged through the discharge outlet **11** in the scroll.

An evaporator **13** is disposed below the fan. This evaporator comprises a plurality of heat exchange members having a plurality of baffles wherein each baffle is located adjacent a heat exchange member and cooperates therewith to form an alternate arrangement of heat exchange members and baffles. In the present embodiment there is indicated a unit employing three heat exchange members **14**, each heat exchange member comprising a pair of parallel serpentine fin coils. It will be readily apparent to one skilled in the art that a greater number of serpentine coils may be employed without departing from the spirit of the present invention. Dis-

posed between these heat exchange members are the baffles **16**, **17** and **18**. It will be noted at this point that baffle **18** is pivoted in a manner and for a purpose to be described hereinafter.

Disposed below the evaporator and occupying the forward portion of the casing is a compartment defined by the partition **19** and the front cover panel **5**. Within this compartment is located components of the refrigeration system. Appearing in FIGURE 2 is a compressor **20** having a muffler **21**. The partition **19** extends upwardly and curves under the evaporator. Generally the distance between the partition and the evaporator decreases in proximity of the cover panel **5**. The purposes of this construction is to maintain a constant velocity beneath the evaporator by decreasing the cross section of the air stream as it passes each heat exchange member of the evaporator and thereby compensate for the air that has passed through the heat exchange member.

Adjacent the evaporator and attached to the rear wall of the casing is a partition **22** which extends laterally across the machine and is adapted to prevent the bypass of air about the evaporator without being in heat exchange relation therewith. A drip pan **23** having a plurality of channels is located beneath the evaporator. The purpose of this drip pan is to prevent condensate formed on the evaporator from dripping onto and moistening the filter elements **25** and **26**. Condensate that falls into the drip pan **23** flows therefrom into a trough **24** which is connected to a suitable drainage system (not shown). Located in the bottom wall of the casing is an opening **27**. The entire unit may be mounted upon a base member having suitable louvered openings around the periphery thereof, the base member acting as an air inlet and being in communication with the opening **27**.

It will be appreciated at this point that fan **10** serves to draw air through the louvered openings of the base member **7** through the opening **27**, through the filter elements **25** and **26**, and through openings in the drip pan and the evaporator **13**. In the evaporator **13**, the air will either directly impinge upon the heat exchange members **14** and be in heat exchange relation therewith or will come into contact with the baffles **16**, **17** and **18**. These baffles deflect these air currents towards the heat exchange members. The air is chilled as it passes through the evaporator. Condensate may be formed which subsequently flows into the drip pan **23** and then into the trough **24** and from the unit. The air having been in heat exchange relation with the evaporator is then discharged by fan **10** into the space to be conditioned.

Referring to FIGURE 3, the unit is indicated with the plenum **3** having the louvered openings **4**. In this particular application the unit is located within the space to be air conditioned. Extending into the plenum is an air diffuser **32** which may be of the type shown in the patent to F. D. Stevens, Patent No. 2,704,971, issued March 29, 1955. This diffuser is directly mounted upon the unit and is in communication with the discharge **11** of the fan **10**. In this view there is also shown the drive means employed to operate the fan **10**. In the present embodiment a motor **33** is attached to the rotor of the fan by means of a belt and pulley drive. This motor is operatively connected to the control box **9**. Also extending from this control box are the cables **34** and **36**, cable **34** being a power cable which is connected to the power supply at the junction box **35** which is wired to a suitable source of electricity. The cable **36** is operatively connected to the refrigerant compressor in the unit.

Disposed beneath the control box and the fan, there are shown the serpentine coils which comprise the evaporator and the means of supplying refrigerant to the individual serpentine coils from the expansion valve **37**. It will be readily seen from this view that the baffle **18** is of a different construction than baffles **16** and **17**.

Located beneath the filter elements **25** and **26** is shown the refrigeration system which is of a conventional type and employs a compressor **20** which is of the reciprocating semi-hermetic type. Adjacent this compressor is a water cooled condenser **38** which is connected to a supply of water by line **39** and discharges through a drain line **40**.

In FIGURE 3, the opening **27** is indicated and also an opening **28** which extends through the back wall of the unit. These openings are provided to increase the range of application of the machine. Air can be taken in from the sides and front of the machine and if desired, outside air may be employed with the present machine wherein a suitable duct may be attached to either opening **27** or **28**.

In the present unit, a by-pass is provided within the evaporator by providing a baffle which may be movable so that its deflecting action may be discontinued and air permitted to pass about the heat exchange member without coming into heat exchange relation therewith. This principle of operation is carried out in the present invention by the baffle **18**. It will be readily appreciated that a plurality of baffles may be provided to accomplish this function without departing from the spirit of the invention. The baffle is more fully described in Patent No. 2,959,031, granted November 8, 1960.

Each coil **15** (FIGURE 2) comprises a parallel row of horizontal tubes **53**. These horizontal tubes are finned to increase their heat exchange area. The serpentine coils are placed in parallel relation with the plane of each serpentine coil being askew to a vertical plane. Referring to the drawing the tubes are placed in a staggered relation with the fins slightly overlapping. In this construction, as condensate is formed on the surface of the heat exchange member, the condensate will flow downwardly from tube to tube in a converging path to the lowermost tube of each heat exchange member. Should any of the condensate be entrained in the air stream it will fall upon an adjacent baffle and flow downwardly until it comes into contact with the lowermost tube of a heat exchange member. As the condensate collects on this lowermost tube it begins to drip downwardly into a channel of the drip pan **23**.

Drip pan **23** comprises a structure fabricated of polystyrene having a generally rectangular shape. Longitudinally across the rectangular shape are channels **55** which have a general L-shape. These channels are disposed under the individual heat exchange members and are adapted to collect condensate falling from the lowermost tube of each heat exchange member. The structure and function of the drip pan are more fully set forth in Patent No. 2,959,031.

It will be noted this drip pan is fabricated of polystyrene for the specific purpose of preventing formation of condensate on the underside of the structure. The temperature of condensate formed on the evaporator is relatively low and as the condensate falls into the drip pan should this drip pan be of a heat conductive material the underside of the drip pan would be chilled whereby air coming into contact with the underside would have moisture condensed therefrom. A build-up of moisture would subsequently drip on to the filter elements **25** and **26**. It will be doubtlessly appreciated that after a short interval of operation under such conditions the filter would turn into a soggy mass which would impede the passage of air therethrough and subsequently make the unit totally inoperative.

FIGURES 4, 5 and 6 illustrate the novel fan mounting employed in the present invention. There is indicated the fan mounting **70** which comprises a first section **71** and a second section **72**. Both sections are of a general planar nature being set at right angles to each other to complete the parallelepiped shape of the casing. These sections have identical external physical dimensions and have identically situated bolt connecting means **73**. The manner of connecting the fan assembly to

casing 2 is shown in FIGURE 6. Flanges 100 and 101 extend from the top of casing 2 and flanges 102 and 103 extend from the side of casing 2. Mounting 70 rests on the flanges and is secured thereto by means 73. Through the first section 71 extends an opening for the fan discharge 11. This fan with its motor in the present invention is secured to the fan mounting 70. Scroll 10' of fan 10 includes a flange 10'' at each side thereof. Each flange is secured to fan mounting 70 by suitable fastening means, for example, screws 79. Because of the identical shape of the first and second sections, plus the existence of identical bolt connecting means, a versatile fan mounting is provided in which the fan discharge may be oriented so that it directs air in an upward direction or in a backward direction from the machine.

In reviewing this machine it is perceived that there is presented a unit having great versatility.

A versatile fan mounting is provided which permits the fan to discharge air from the machine in an upward or backward direction. Ducts may be connected to the machine if desired to direct the air to a space remote from the machine location. A plenum may be used when the machine is placed in the space to be air conditioned.

While we have described a preferred embodiment of the invention it will be understood the invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

We claim:

1. In a self-contained air conditioning unit, the combination of a casing and a fan discharge mounting, said casing comprising a top and side wall members, said casing having an opening extending into the top and one side wall member, said fan discharge mounting including an L-shaped member having equal leg portions, one leg portion having an opening therein, the other leg portion being imperforate, a fan secured to said fan discharge mounting and discharging through the opening in said one leg portion thereof, said fan discharge mounting being complementary to the opening in the casing, and connecting means for mounting the L-shaped member into the casing so as to permit orientation of the leg portion having the fan discharge opening in either the top or side wall member of the casing, said fan and said fan discharge mounting being movable as an assembly.

2. In a self-contained air conditioning unit, the combination of a casing and a fan mounting, said casing comprising a top and side wall members, said top and one of said side wall members having an opening therein, said fan mounting including a first section and a second section secured at a right angle to said first section, said first section having an opening therein, a fan secured to said fan mounting and discharging through said opening in said first section, said fan mounting being complementary to said opening in the top and one of said side wall members, and connecting means for securing the fan mounting into the casing so as to permit orientation of the first section in either said top or in said one of the side wall members.

3. In a self-contained air conditioning unit, the combination of a casing and a fan mounting, said casing comprising a box-like structure including a top and a side wall, said casing having an inlet opening and an outlet opening therein, said outlet opening defined in the top and side wall, said fan mounting including a first section and a second section at right angles to each other, a fan secured to said fan mounting and discharging through an opening in said first section, said fan mounting being complementary to said outlet opening, and means for connecting said fan mounting to said casing so as to selectively mount said first section in said top or in said side wall.

4. A blower for a self-contained air conditioning unit comprising a casing having a top and side walls, said casing having an opening extending into the top and one side wall, a fan mounting adapted to close said opening including first and second identical members secured at an angle to each other, said first member having an opening therein, a fan secured to said fan mounting for discharging air through said opening in said first member, said fan mounting being complementary to the opening in said casing, and connecting means for securing the fan mounting to the casing whereby the first section is oriented in either said top or said one side wall of the casing to discharge air through said top or said one side wall.

5. A blower for a self-contained air conditioning unit comprising a casing having a top and side walls, said casing having an opening extending into the top and one side wall, and a fan mounting including an angle member having equal leg portions, a fan secured to said fan mounting and discharging through an opening in one leg portion thereof, said fan mounting being complementary to the opening in the casing so as to permit orientation of the leg portion having the fan discharge opening in either the top or side wall of the casing, said fan and said fan mounting being movable as an assembly.

References Cited in the file of this patent

UNITED STATES PATENTS

2,310,843	Ditzler	Feb. 9, 1943
2,710,573	Marker	June 13, 1955
2,786,407	Sarles	Mar. 26, 1957