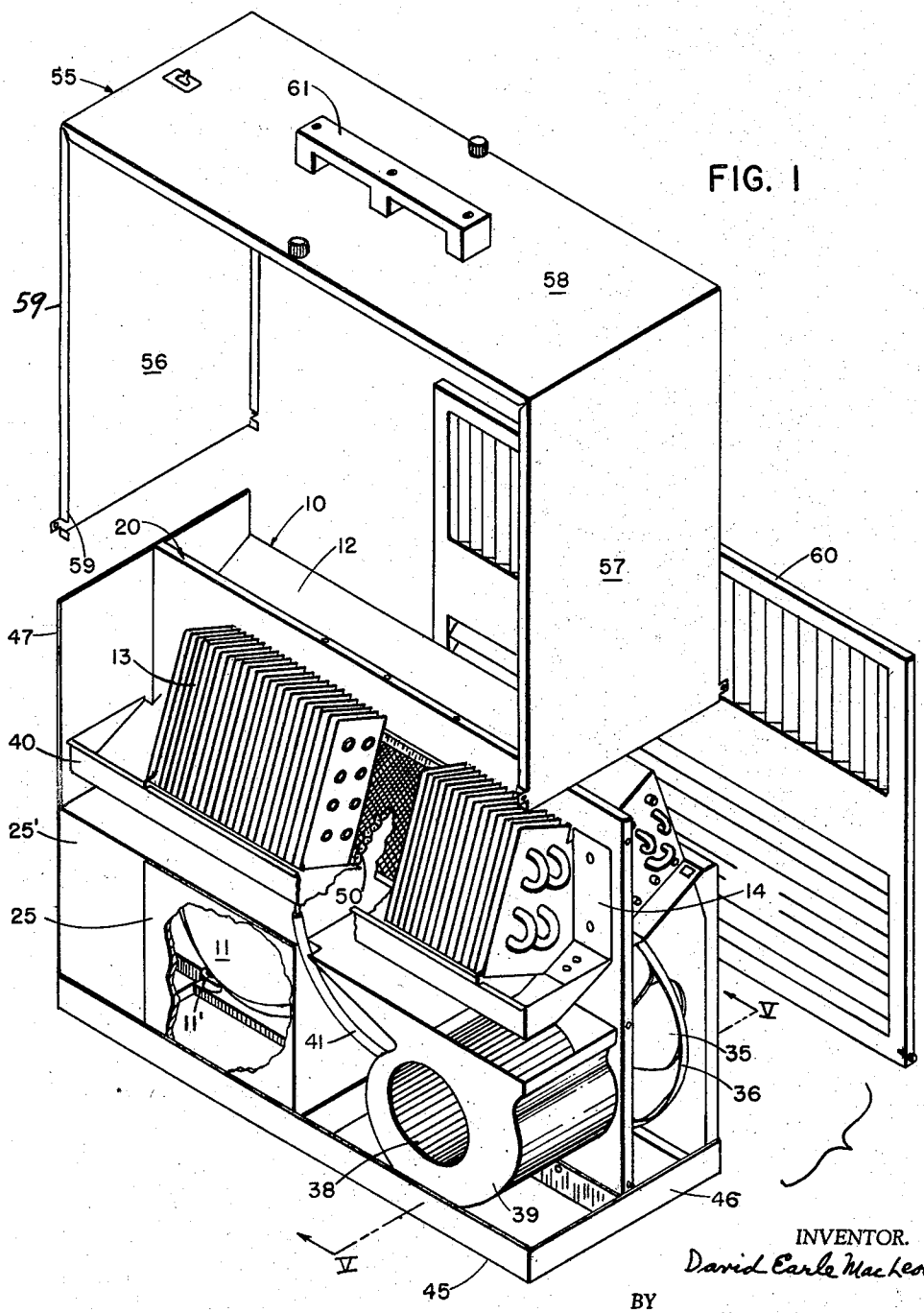
July 19, 1960 D. E. MacLEOD 2,945,359

SELF-CONTAINED AIR CONDITIONING UNITS

Filed Sept. 22, 1958 4 Sheets-Sheet 1

FIG. 1



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SELF-CONTAINED AIR CONDITIONING UNITS

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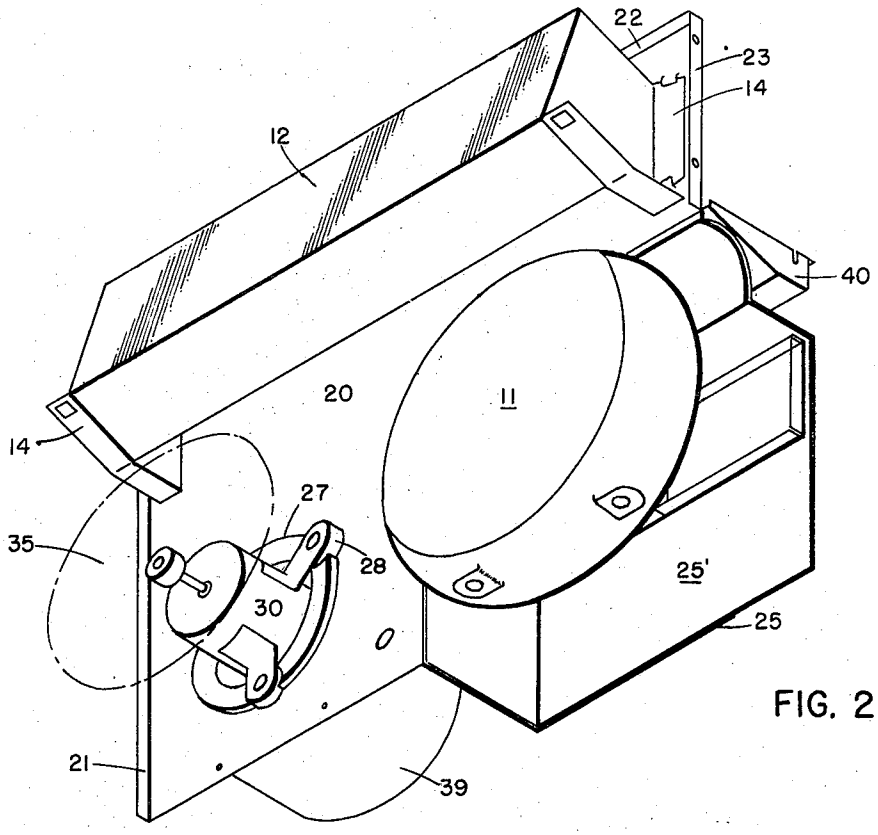


FIG. 2

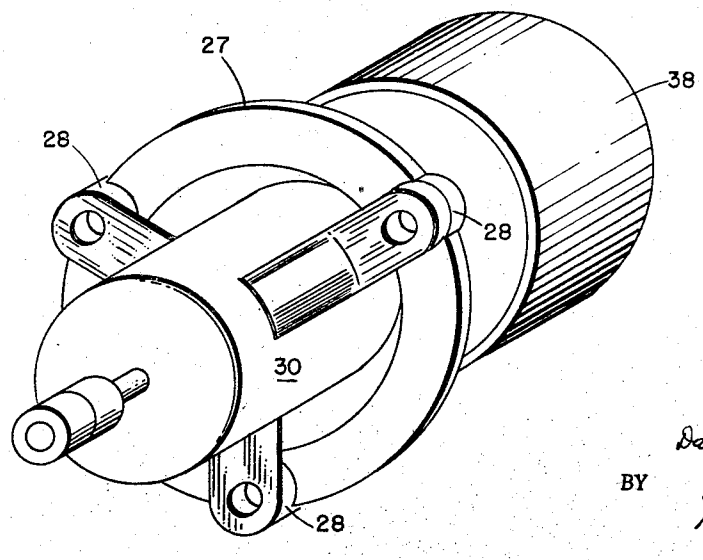


FIG. 3

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SELF-CONTAINED AIR CONDITIONING UNITS

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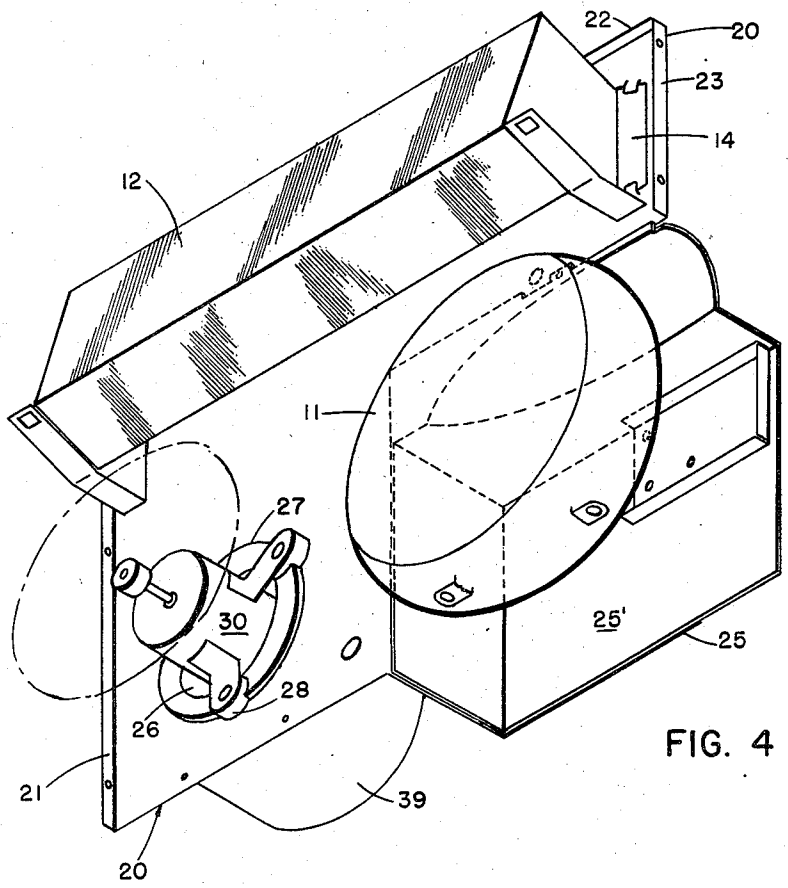


FIG. 4

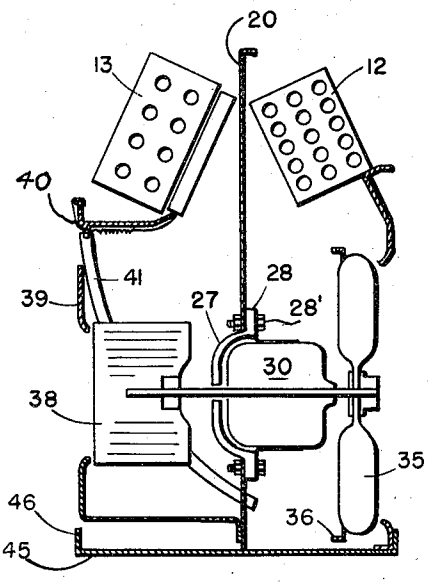


FIG. 5

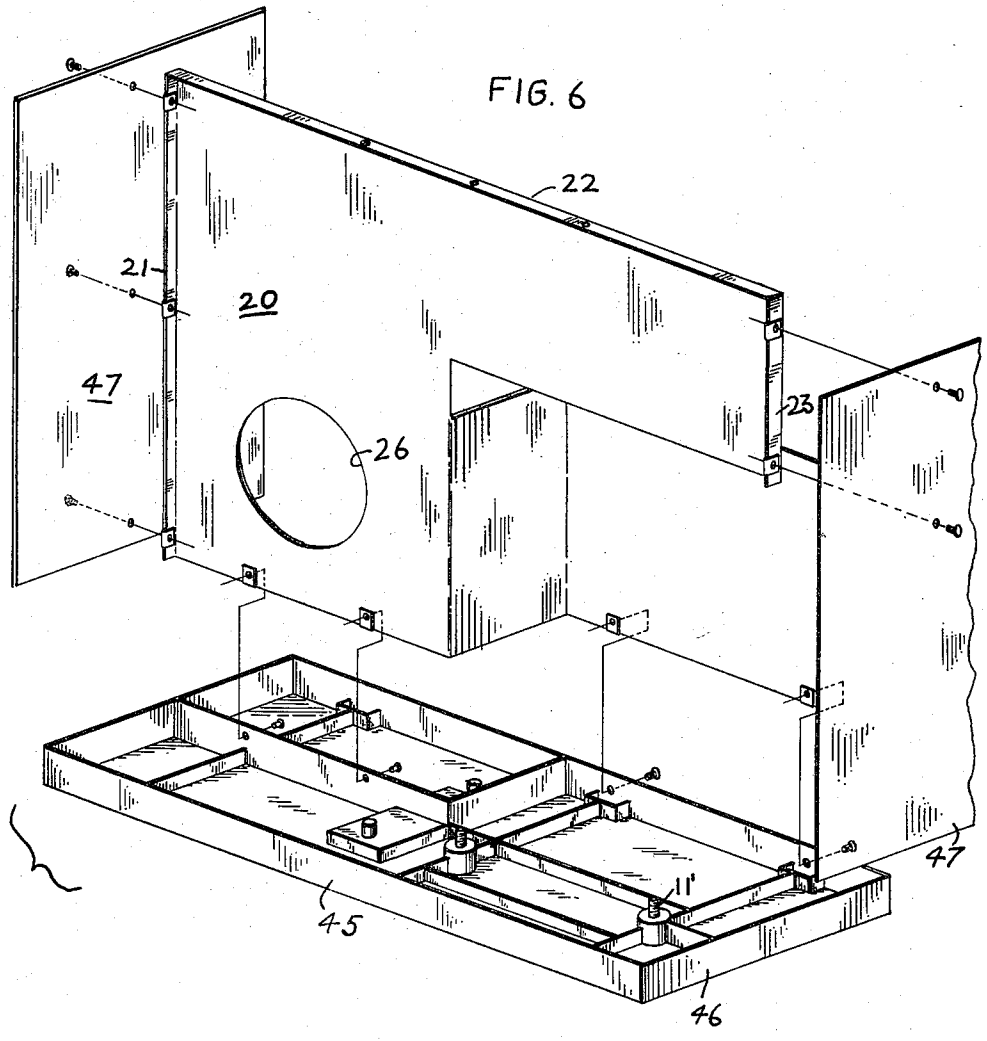
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FIG. 6



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SELF-CONTAINED AIR CONDITIONING UNITS

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5 Claims. (Cl. 62—280)

This invention relates to air conditioning, more particularly, to novel means for the construction of unit air conditioners whereby said air conditioners may be made more compact, lighter in weight, and weight balanced to permit portability of said units.

Unit air conditioners have been evolved for use in relatively small areas merely requiring a connection to a current source and an access opening to the ambient surroundings outside of the conditioned area for operation. In home installations, a variety of situations arise wherein it would be highly desirable to be able to readily move a single air conditioning unit from place to place. Thus a single unit might readily be employed in a variety of rooms depending on the use to which the room is being put, so that if the unit were truly portable, a single unit could be employed in living areas of the home during the day, and in sleeping areas of the home during the night. This has heretofore been a substantially unobtainable desideratum arising from the fact that in order to attain suitable cooling capacities, components of a volume and weight were required which precluded portability. Conventional air conditioning units employ a compression refrigeration system comprising a compressor, condenser, expansion means, and an evaporator, all of said elements arranged in a closed fluid circuit through which refrigerant is directed. A condenser fan and an evaporator fan may be mounted on a single motor shaft and employed for directing air into heat exchange relationship with the evaporator and condenser. Previous attempts at miniaturization have been relatively unsuccessful due to the inadequacies of air flow resulting from mere repositioning of the components into a more compact volume. Additional difficulties have arisen due to the fact that the continuously operating motors of the compressor and fan, require relatively substantial mountings so as to insure noise free operation and a reasonable operating life in the mechanism. Other problems arise in connection with the noise level resulting from air flow, and motor operation. In connection with attempts at attaining portability the relatively heavy compressor and fan motor produce an unbalanced mass which is difficult to carry, and difficult to install.

It is with the above problems in mind that the present means have been evolved, means providing a novel arrangement for the components of an air conditioning unit whereby said unit may be substantially reduced in volume, whereby a weight balanced unit is provided and whereby assembly and maintenance of the unit are substantially facilitated.

It is accordingly a primary object of this invention to provide an improved construction for an air conditioning unit.

Another object of this invention is to provide an improved air conditioning unit which is readily portable so as to permit ready installation and use in a variety of areas as desired by the user.

A still further object of the invention is to provide an

air conditioning unit of relatively light weight for the cooling capacity provided.

A further object of the invention is to provide an air conditioning unit occupying relatively little volume for the cooling capacity provided and at the same time permitting ready flow of air into heat exchange relationship with the heat dissipating condenser, and heat absorbing evaporator thereof.

Another object of the invention is to provide novel noise and heat insulating means for use in an air conditioner.

A still further object of the invention is to provide a novel air conditioning unit construction facilitating assembling of said units.

It is also an object of this invention to provide a novel air conditioning unit structure which facilitates maintenance of said unit.

Another object is to provide an air conditioning unit of balanced weight to facilitate carrying of same.

These, and other objects of the invention which will become apparent from the following disclosure and claims, are achieved by provision of a novel component supporting partition panel employed in a unit housing to separate the heat dissipating condenser from the heat absorbing evaporator and the ambient atmosphere from the conditioned area, when said unit is arranged in a window, or other opening from the conditioned area to the ambient. The novel partition panel member is so designed as to support thereon the other components of the air conditioning unit such as the condenser, compressor, evaporator, and fan motor. Additionally, the novel arrangement of the components attains a compactness heretofore unobtainable, and facilitates manufacture and maintenance by permitting assembly on a single supporting panel which serves the multiple function of separating the ambient from the conditioned area, and as a component support. The noise and heat producing motors for the fan and compressor are mounted in a novel fashion whereby the heat and noise are isolated.

A primary feature of the invention resides in the fact that all components are arranged on a single support, with the support functioning as a partition wall.

An additional feature of the invention is the novel positioning of the evaporator and condenser with respect to their respective fans whereby air flow is aided.

Another feature of the invention is a novel fan motor mounting which serves to thermally insulate the ambient from the conditioned area, the motor from the evaporator, and further provides sound insulation for the fan motor.

A further feature resides in the novel weight balanced arrangement of the components.

The novel features of the invention, and their mode of functioning will be made most manifest and particularly pointed out in conjunction with the accompanying drawings wherein:

Figure 1 represents a perspective exploded view of a novel air conditioning unit constructed in accordance with the principles of this invention, with parts broken away to reveal the details of this invention;

Figure 2 is a perspective view of the interior components of the air conditioning unit of Figure 1, as seen from the opposite side of the unit;

Figure 3 is a perspective detail view of the fan motor and its novel mounting;

Figure 4 is a perspective view of the partition panel with the condenser and fan motor shown in phantom, as mounted thereon;

Figure 5 is a cross-sectional view on line V—V of Figure 1, and

Figure 6 is an exploded view illustrating the manner in which the partition, base pan and shroud plates are assembled as a unit.

As best seen in Figure 1, the novel unit **10** comprises

a refrigeration system including a compressor 11, a heat dissipating condenser 12, and a heat absorbing evaporator 13, all arranged in a closed fluid circuit through which refrigerant may be passed. Compressor 11 is of the type having a motor sealed integrally therewith within a housing; and condenser 12 and evaporator 13 are of the reverse bend coil, fin plate type having a flanged mounting bracket 14 at each end thereof (only one of which is seen in Figure 1 in connection with evaporator 13).

A partition panel 20 is formed in the shape of a rectangular plate having flange 21 along one side thereof, flange 22 along the upper edge thereof, and flange 23 extending downwardly along a part of the other edge thereof. An offset compressor supporting portion 25 sets back approximately one quarter of the area of panel 20. Panel 20 is formed of a sheet material having structural rigidity such as steel, plastic or the like. Compressor 11 is securely attached to panel 20 beneath condenser 12. Preferably, a moldable plastic cover 25' having sound and heat insulating properties such as expanded polystyrene is placed about the compressor after it is secured in place.

At the lower half of panel 20 adjacent offset 25 a fan motor aperture 26 is arranged.

Within fan motor aperture 26, a dished fan motor mounting 27, as best seen in Figures 2, 3 and 4 is provided. This fan motor mounting 27 is formed of expanded polystyrene plastic, or the like. Bushings 28 are arranged at spaced intervals about the periphery of mounting 27.

In assembled position, motor mounting 27 is arranged within aperture 26, and motor 30 is secured to bushings 28 on the condenser side of the panel by means of bolts 28' which also secure the mounting 27 to partition 20. Motor 30 has a drive shaft extending therethrough. Condenser fan 35 having slinger ring 36 thereon is secured to one end of the shaft of motor 30; and centrifugal evaporator fan 38 is secured to the opposite end of the shaft of motor 30. A scroll 39 is arranged about the evaporator fan 38.

As best seen in Figure 5, the evaporator 13, and condenser 14 are arranged on opposite sides of panel 20, with said evaporator and condenser oriented in an inverted V position, for a purpose to become hereinafter more apparent. Arranged beneath evaporator 13, is condensate drip trough 40 secured to panel 20, but at a spaced distance therefrom. Drip trough 40 is provided with a drain tube 41 leading from a lowermost part of said trough. As shown in Figure 1, condensate drain tube 41 leads from drip pan 40 through panel 20 to the condenser fan compartment.

Compressor 11 is suitably secured to panel 20, beneath condenser 12.

A base pan 45 having upstanding flanges 46 is provided, flanges 46 being secured to the base of partition wall 20. It will be understood the partition thus supports the base pan when the unit is carried. Shroud plates 47 may be provided, one on each side, fitting in pan 45 and being attached to partition 20. Plates 47 serve the dual function of supporting partition wall 20 and heat insulating the components of the unit, and aid in retaining the condensate in the condenser compartment. The compressor is anchored in position on the unit by conventional fastening means 11'.

Air filter 50 is arranged between the discharge of centrifugal evaporator fan 38 and the evaporator 13.

As best seen in Figure 1, a wraparound housing 55 formed of a sheet material bent into a three sided configuration having side panels 56 and 57 and an upper panel 58 is provided for enclosing the assembled components, all secured to panel 20, which is in turn mounted on base pan 45. Flange 59 is provided about the edges of the housing panels, to which suitable facade

grills 60 may be attached. A handle 61 is substantially centrally positioned on top panel 58 permitting portability of the unit. As readily comprehended wraparound housing 55 is mounted over shroud plates 47 (only one of which is shown) and secured to base pan 45 by means of suitable detachable fastenings.

The refrigerant conduits interconnecting the compressor, evaporator, and condenser, and the specific expansion valving employed have not been shown; nor have the electrical connections between fan motor and compressor motor since these are conventional.

Where it is desired to attain the novel results heretofore described in connection with the objects and features of the invention, the aforedescribed components are assembled by mounting the evaporator 13 and condenser 12 on opposite sides of a partition panel 20, along the upper edge thereof. A condensate drip trough 40 is arranged beneath evaporator 13 and secured thereto for support from partition wall 20 at a spaced distance therefrom. The fan motor 30 is mounted by dished motor mounting 27 whereby the center of gravity of motor 30 and its associated fans 35 and 38 will be substantially coplanar with that of partition panel 20. Compressor 11 is similarly secured to partition wall 20 within offset portion 25, whereby the center of gravity of the compressor will be substantially coplanar with that of the partition wall.

It will thus be observed that a novel assembly, and mode of attaining same has been provided for an air conditioning unit whereby all of the components of the unit are supported from a single partition wall extending through the center of gravity of said components. The result of this novel arrangement is that all of the components are confined in a relatively small volume, are readily accessible for assembly and maintenance, and additionally a weight balanced unit has been provided which may readily be carried or moved as desired.

The use of dished fan motor mounting 27, the offset compressor supporting portion and the surrounding insulating member of an expanded polystyrene serves the threefold purpose of: orienting the motors with their center of gravity coplanar with the partition panel, thereby providing weight balance; heat insulating the motors from the evaporator cooling coil; and dampening the motor vibration.

The ready portability permits use of a single air conditioning unit for either heating, cooling, or dehumidifying purposes, without requiring complex refrigeration or air handling control means. Thus the unit may be installed in any given area with either the heat dissipating condenser, or the heat absorbing evaporator facing the area so as to either heat or cool the area. Additionally, the entire unit may be positioned within the area with both evaporator and condenser in heat exchange relationship with the air in the area to thereby provide dehumidification effects.

Where the unit 10 is installed for use as a room cooler, it is contemplated that installation will be made in a window, or the like wall aperture, with the condenser in heat exchange relationship with the ambient atmosphere, and the evaporator in heat exchange relationship with the air in the conditioned area. This is most readily accomplished by positioning the unit on a window stool with the evaporator facing into the room. Where so operated, evaporator fan 38 draws air into scroll 39 which directs an air stream upwardly between panel 20 and evaporator 13. The angle between evaporator 13 and partition panel 20 serves to confine the air flow into an area of progressively decreasing cross section as the air stream moves from the fan, the result being an increase in air velocity producing a relatively uniform volume of air moving into contact with the evaporator surface. Similarly, the angled positioning of condenser 12 with respect to panel 20 serves to provide a relatively uniform volume of air flow from condenser fan 35 over the condenser surface.

Any condensate forming as a result of contact of the relatively warm conditioned air with the evaporator coil is collected in condensate trough 40, whence it is drained through drain tube 41 over to the condenser side of panel 20 where slinger ring 36 will throw the condensate against the condenser for evaporation into the ambient.

When it is desired to employ the novel unit 10 for heating purposes, it is merely necessary to reverse the position of the unit with respect to its mounting, that is on the window stool, so that the condenser faces the conditioned area, and the evaporator the exterior of the building. In this orientation, air flow will take place as above described for cooling operation save that the conditioned air will now be in heat exchange relationship with the heat dissipating condenser.

The novel construction features here disclosed which have served to substantially lighten the required weight of the unit for any given cooling capacity, and permit a reduction in required volume, have also produced a relatively weight balanced unit readily movable by the average user. This portability permits use of the unit as a dehumidifier by positioning of the unit completely within the conditioned area. In this position, the condenser serves to raise the temperature of the air in the conditioned area. The evaporator serves to reduce the temperature and to condense out moisture from the air coming into contact therewith serving to decrease the relative humidity. The net effect is a slight heating of the air and a substantial decrease in moisture content of the air. Where the unit is employed as a dehumidifier, drain hose 41 is removed from its aperture in panel 20, and any condensate collecting in trough 40 is directed to some other suitable collection point away from the condenser.

When maintenance of the unit is required, it is merely necessary to remove the casing, which will thus expose the components of the unit which may thence be oriented as desired merely by moving partition panel 20.

It will thus be observed that a novel air conditioning unit, and mode of constructing same has been provided which produces a relatively compact unit, occupying a minimal volume, having a centrally positioned center of gravity, and being of relatively light weight, whereby portability of the unit is facilitated. Additionally, novel means have been provided for aiding air flow through the unit, as well as for sound dampening of the drive motors of the unit, and for heat insulating the heat dissipating elements from the heat absorbing elements.

The center of gravity of the unit is on the window stool so that the unit may be mounted in such a manner that it does not extend an undesirable distance in the room being conditioned and doesn't extend beyond the screen line so that the screen may be retained in place. The unit may be readily employed in casement windows with slight adaptation.

The above disclosure has been given by way of illustration and elucidation and not by way of limitation and it is desired to protect all embodiments of the hereindisclosed inventive concept within the scope of the appended claims.

I claim:

1. In an air conditioning unit, means for facilitating assembly and maintenance of the components of said unit, said means comprising a partition panel functioning to separate the conditioned atmosphere from the ambient atmosphere; a compressor secured to said partition panel; an evaporator coil mounted on said partition panel above said compressor; a condensate collection trough secured to said partition panel beneath said evaporator; a condenser secured to said panel on a face thereof opposite to that upon which said evaporator is mounted; a fan motor mounted on said panel; an evaporator fan driven by said fan motor; a condenser fan driven by said fan motor, said fans being on opposite sides of said panel; a base pan forming a sump and extending beneath said panel and supporting said panel in a vertical plane, whereby all of said units are integrally secured one to the other in a compact manner.

2. Apparatus as in claim 1 in which said panel has an opening therein and said fan motor is supported on said panel and in said opening by a dished supporting element of heat insulating, sound dampening material, whereby heat transfer between opposite sides of said panel, as well as sound transmission from said motor will be minimized

3. Apparatus as in claim 2 in which the heat insulating, sound dampening material is expanded polystyrene.

4. In an air conditioning unit the combination of a casing, a base pan mounted on said casing, combined partition and supporting means in said casing functioning to separate the conditioned atmosphere from the ambient atmosphere, a compressor, means securing the compressor to said base pan, an evaporator coil, means mounting the evaporator coil on said partition and supporting means above said compressor, a condenser, means securing said condenser to said partition and supporting means on a face thereof opposite to that upon which said evaporator coil is mounted, said condenser being secured to said partition and supporting means above the compressor, a fan motor, means mounting said fan motor on said partition and supporting means, an evaporator fan driven by said fan motor, a condenser fan driven by said fan motor, said fans being on opposite sides of said partition and supporting means whereby all of the aforementioned components may be handled as a unit.

5. In an air conditioning unit, including a compressor, a condenser, an evaporator and a fan driving motor, means for facilitating assembly and maintenance of the components of said unit, said means comprising: combined partition and supporting means arranged between the condenser and evaporator to prevent the passage of air therebetween, means securing the compressor to said supporting means, means securing the condenser to said supporting means, means securing the evaporator to said supporting means, and means securing the fan motor to said supporting means, said latter means comprising a dish shaped mount arranged in an aperture in said supporting means.

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