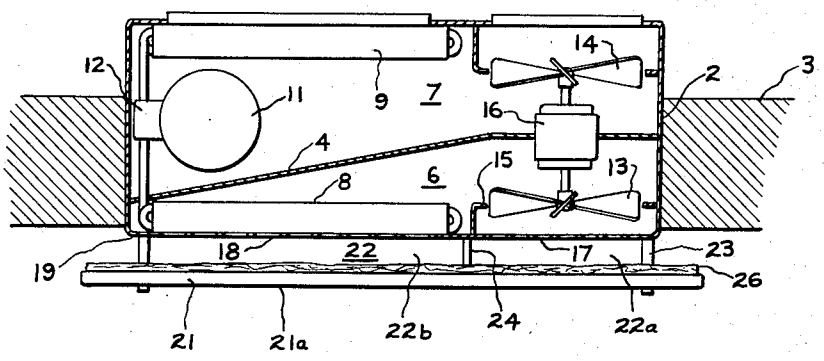
Jan. 12, 1960 L. W. ATCHISON 2,920,460

SELF CONTAINED AIR CONDITIONER HAVING NOISE ATTENUATING MEANS

Filed Oct. 24, 1957

FIG. 1



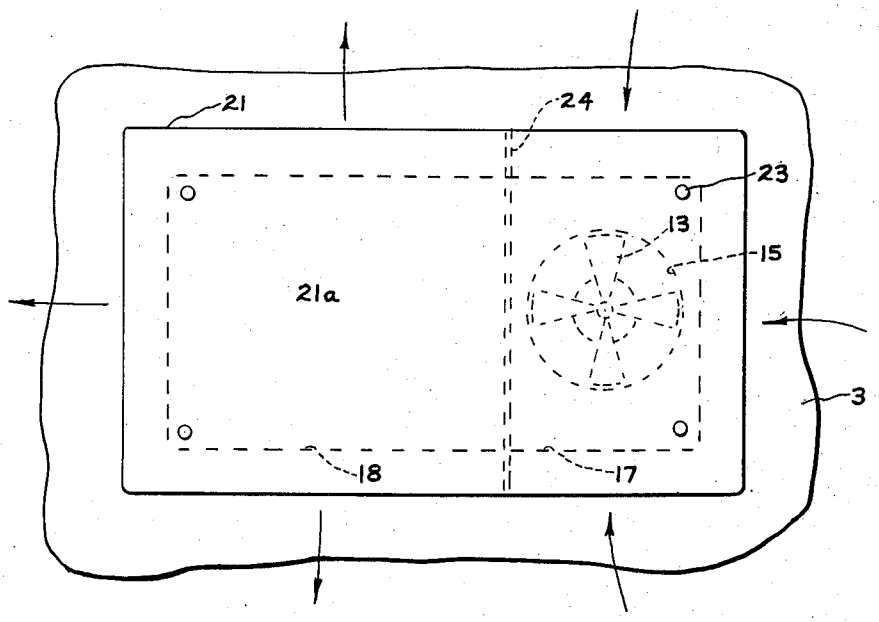


FIG. 2

INVENTOR.
LEONARD W. ATCHISON

BY Fred L. Mellhoff

HIS ATTORNEY

United States Patent Office 2,920,460
Patented Jan. 12, 1960

2,920,460

SELF CONTAINED AIR CONDITIONER HAVING NOISE ATTENUATING MEANS

Leonard W. Atchison, Louisville, Ky., assignor to General Electric Company, a corporation of New York

Application October 24, 1957, Serial No. 692,150

4 Claims. (Cl. 62—296)

The present invention relates to a self-contained air conditioning unit of the type adapted for mounting in an aperture in an outer wall of an enclosure and more particularly to an arrangement in a unit of this type whereby the noise produced by such an air conditioner is attenuated or muffled.

One of the main objections to self-contained air conditioning units of the type normally mounted within a window or an aperture in an outer wall of an enclosure is the noise associated with the operation of such a unit, due to the close proximity of the working components of the unit to the enclosure. While improvements in the compressor and fan operation as well as in the respective mounting arrangements for these components have tended to reduce the noise of the operation of these components, there is still a great deal of objectionable noise.

Another objectionable characteristic of some of these units is that they tend to direct a cold stream of air into the central portion of the enclosure for a considerable distance making it very uncomfortable for anyone positioned close to or in the air stream. Also, when these units are of the type that can be used to warm an enclosure during the winter, the fact that the warm air stream is directed into the center or into the inner portions of the enclosure in a direction away from the outer wall causes a certain amount of draftiness in other portions of the enclosure, particularly in the areas close to the outer walls.

It is an object of the present invention to provide a self-contained air conditioner having an arrangement for attenuating the noise produced by the working components of the conditioner.

More specifically, it is an object of the present invention to provide a self-contained air conditioner having an arrangement whereby the sound waves produced by the working components within the air conditioner are forced to take a circuitous path in reaching the enclosure.

Another object of the present invention is to provide, in a self-contained air conditioner, an arrangement whereby the air discharging from the conditioner is prevented from entering the central portions of the enclosure prior to being mixed with the air within the enclosure.

A further object of the present invention is to provide a simple and improved arrangement for a self-contained air conditioner which causes the discharge air to flow directly over the outer wall of the enclosure on which the conditioner is mounted thereby forming a blanket or layer of air on this wall.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In carrying out the objects of the present invention there is provided a self-contained air conditioning unit of the type mounted in an outer wall of an enclosure and having inlet and outlet openings arranged on the front

or face of the unit directed into the enclosure. Supported directly in front of the unit but slightly spaced therefrom is provided a noise attenuating panel being at least coextensive with and having an area equal to at least the area of the inlet and outlet openings on the front of the air conditioner. The space between the front of the conditioner and the panel provides room for ingress and egress of air circulated through the unit from the enclosure. This space is separated by a divider which abuts the conditioner between the inlet and outlet openings in the front of the conditioner and prevents direct circulation of air from the outlet opening to the inlet opening without the air first passing around the panel. Air discharging from the outlet opening of the conditioner is forced by the panel to flow directly along the wall of the enclosure whereupon it mixes with room air before spreading into the room. Sound waves emanating from various components within the conditioner are prevented from passing directly from these components into the enclosure, but must first reverberate between the panel and the conditioner before passing around the panel into the enclosure, thereby effectively attenuating or muffling the sound before it reaches the enclosure.

As a further aspect of the present invention, the noise attenuation panel is provided with a noise and heat insulating material to further muffle the noises emanating from the components within the conditioner and to prevent the panel from becoming so cooled by the discharge air from the conditioner that moisture condenses on the panel surface exposed to the relatively warmer room air.

For a better understanding of the invention reference may be had to the accompanying drawing in which:

Fig. 1 is a schematic elevation view of a self-contained air conditioner having the noise attenuating panel of the present invention; and

Fig. 2 is a front view of the arrangement looking from the room side directly toward the conditioner with arrows showing the direction of air flow as it discharges from and enters the conditioner through the space beneath the panel.

Referring now to Fig. 1, there is shown in schematic form an air conditioner within a casing or housing **2** mounted in an aperture of an outer wall **3** of an enclosure. In the illustrated embodiment of the invention, the casing is divided by a barrier **4** into a pair of separate compartments hereinafter referred to as the inner compartment **6** and the outer compartment **7**, according to their relative positions in relation to the enclosure. The unit is provided with a pair of heat exchangers **8** and **9** mounted respectively within the inner and outer compartments **6** and **7**. Connecting the heat exchangers **8** and **9** in reversible refrigerant flow relationship with a compressor **11** is a reversing valve **12** which permits the refrigerant flow through the system to be selectively reversed thereby permitting the heat exchangers **7** and **8** to be operated interchangeably either as a condenser or as an evaporator according to the air conditioning requirements of the enclosure. For example, the heat exchanger **9** can be operated as a condenser while the heat exchanger **8** is operated as an evaporator to provide cooling of the air within the enclosure. Or, the heat exchanger **9** can be operated as an evaporator while the heat exchanger **8** is operated as a condenser thereby utilizing the heat exchanger **8** as a source of heat to warm the air within the enclosure.

The unit is provided with means for circulating outside air through the outer compartment and for circulating air from the enclosure through the inner compartment. More specifically, there are provided a pair of fans **13** and **14** mounted respectively within the inner and outer com-

partments 6 and 7 and arranged to be driven by a motor 16 mounted in the barrier 4. In order to circulate air from within the enclosure through the inner compartment 6, the front face or end 19 of the conditioner facing into the enclosure is divided into a pair of openings designated the inlet opening 17 and the outlet opening 18. Air from within the enclosure is drawn by the fan 13 into the inner compartment 6 through the inlet opening 17 and the fan scroll 15 whereupon it flows against the barrier 4 and is directed through the heat exchanger 8 to be discharged back into the enclosure through the outlet opening 18.

As thus far described, this air conditioner with its reversible heat exchanger units forms no part of the present invention, but is intended only to be illustrative of one type of air conditioner to which the invention is particularly well adapted. It is not intended to limit the invention only to air conditioners of the reversible type, as the invention is also very useful in the ordinary type air conditioner which may be mounted in an outer wall of an enclosure and used only for cooling the enclosure. As will now be described, the invention is concerned with an arrangement for attenuating or muffling the noises produced within the unit by the operating components therein and to a new and improved arrangement for directing the discharged air outwardly along the outer wall of the enclosure such that it mixes with the warm air within the enclosure prior to flowing into the central portions of the enclosure.

As may be seen in Fig. 1, the air conditioning unit in the illustrated embodiment of the invention is mounted such that the front 19 or side of the air conditioner directed toward the enclosure is flush with the wall 3. This, of course, is not an absolute necessity, however, from an appearance standpoint, it is desirable to mount the conditioner so that there is as little overhang into the room as is possible. Mounted directly in front of the air conditioner in a plane parallel to the front 19 of the air conditioner but spaced a slight distance therefrom, is a noise attenuating panel 21 which provides the dual functions of attenuating or muffling the noises issuing from the air conditioner and directing the air discharged from the conditioner along the walls of the enclosure. Means are provided for supporting the panel 21 in spaced relation with the front face 19 of the air conditioner. More specifically, the panel is supported by four studs or spaced elements 23 which extend into the enclosure from the four corners of the conditioner.

Within the space 22 between the panel and the front face 19 of the air conditioner, there is provided a divider 24 which is arranged approximately normal to both the front face 19 of the conditioner and the panel 21 and positioned such that it separates the inlet opening 17 and outlet opening 18 of the air conditioner. Thus, as can be seen in Fig. 1, all of the space 22*a* directly in front of the inlet opening 17 is separated from the space 22*b* in front of the discharge opening 18. By means of the divider 24, air discharging through the outlet opening 18 into the space 22*b* is prevented from passing directly into the space 22*a* and thereupon recirculating through the conditioner via the inlet opening 17. In other words, none of the discharge air can recirculate through the inlet opening 17 without first passing out from under the panel 21. In operation, the air from the enclosure, as indicated by the arrows directed toward the conditioner in Fig. 2, enters the space 22*a* behind the panel and is drawn through the inlet opening 17. Air discharged from the conditioner flows directly against the panel and is dispersed outwardly around three sides of the panel along the inner surface of the wall 3 as is indicated by the arrows directed away from the conditioner in Fig. 2.

As may be seen in Fig. 2, the area of the panel 21 is somewhat greater than the area of the front face 19 of the conditioner. In the illustrated embodiment of the invention, the discharge opening 18 of the conditioner comprises the entire area to the left of the divider 24 and the inlet opening 17 comprises the entire area to the right of the divider 24. Obviously, if the inlet opening and the outlet opening did not include the entire front of the conditioner, then the size of the panel need only be slightly greater than the combined areas of the inlet and outlet openings plus the area between the openings. Sound waves issuing from the conditioner radiate outwardly toward the enclosure through the inlet and outlet openings 17 and 18. These sound waves encounter the panel 21 and are prevented from passing directly out into the enclosure without first "bouncing" back and forth between the panel and the air conditioner until they eventually pass around the outer periphery of the panel. In other words, by means of the panel 21 an object of some mass is interposed between the source of the noise and the persons in the enclosure thereby attenuating or muffling the sound waves created within the conditioner.

It is desirable to attach a noise deadening or insulating material 26 to the back of the panel to further deaden the sound waves created within the conditioner. A further function of the insulating material is to prevent the panel 21 from getting too cold due to the flow of the cold air over the panel on the discharge side or inner surface of the panel. If the panel is permitted to reach a temperature close to that of the discharge air there is great likelihood of condensate forming on the outer surface 21*a* thereof which is in contact with the relatively warm air of the enclosure. Of course, the panel can always be made of a material having a very low thermal conductivity thereby preventing the flow of heat or cold from the inner surface of the panel to its exposed outer surface.

During the heating season, the heat exchanger 8 is opearted as a condenser and the heat exchanger 9 is operated as an evaporator and warm air is discharged from the outlet opening 18. By means of the panel 21, the air discharging from the outlet opening 18 is forced to flow outwardly from underneath the panel in at least three directions along the wall of the enclosure. This has the effect, during the heating season, of spreading a layer of warm air on at least a portion of the outer wall 3 and is very effective in reducing drafts which normally rise in this portion of the enclosure. Furthermore, cold air on the outer wall of the inlet opening side of the conditioner, or on the wall to the right of the conditioner as viewed in Fig. 2, is drawn directly from the area adjacent the wall into the conditioner whereupon it is heated before it flows into the inward portion of the enclosure. Thus, by means of the panel, the wall is blanketed with a layer of warm air and the cold air which does form on the wall is quickly circulated through the conditioner thereby reducing the possibility of this air reaching the central portions of the enclosure.

Another advantage of the use of this panel is the fact that it hides the conditioner from view thereby creating a very pleasant appearance within the enclosure. The panel can be decorated according to the desires of the occupants or may even take the form of a picture, thereby completely camouflaging the conditioner lying directly behind the panel.

By the present invention there has been provided a simple arrangement for attenuating or muffling the noises emanating from the operating components of an air conditioner. Moreover, by means of this arrangement for attenuating the noises of the conditioner the circulation of the discharged air from the conditioner is enhanced thereby preventing cold drafts and greatly adding to the comfort conditions within the enclosure when such a conditioner is used to heat or cool an enclosure.

While in accordance with the patent statutes there has been described what at present is considered to be the preferred embodiment of the invention, it will be obvious

to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An air conditioning arrangement for an enclosure comprising a self-contained air conditioning unit mounted in an outer wall of said enclosure, said air conditioning unit having inlet and outlet openings in the front thereof, a substantially planar panel arranged directly in front of said air conditioner but spaced a short distance therefrom to permit air to flow through the space between said front of said air conditioner and said panel, said panel being at least coextensive with and having an area equal to at least the area of said inlet and outlet openings in said front of said air conditioner, means for supporting said panel in spaced relation with said front of said air conditioner, and a divider extending between said panel and said front of said air conditioner, said divider abutting said front of said air conditioner between said inlet and outlet openings whereby air discharged through said outlet opening is prevented from flowing into said inlet opening through said space between said panel and said front of said air conditioner and whereby sound waves emanating from components within said air conditioner are forced to pass around said panel before being radiated into said room thereby attenuating the sound reaching said room.

2. An air conditioner arrangement for an enclosure comprising a self-contained air conditioning unit mounted within an outer wall of said enclosure, said front of said air conditioner arranged substantially flush with said wall, inlet and outlet openings in said front of said air conditioner for circulating air from within said enclosure through said air conditioner, a substantially planar panel mounted directly in front of said air conditioner in a plane parallel to said front of said air conditioner but spaced a short distance therefrom, said panel being at least coextensive with and having an area greater than the area of said front of said air conditioner, means for supporting said panel in spaced relation with said front of said air conditioner, and a divider in said space between said panel and said front of said air conditioner, said divider abutting said air conditioner between said inlet and said outlet openings thereof whereby air discharging through said outlet opening is forced to flow outwardly along said wall and prevented from circulating directly between said panel and said air conditioner into said inlet opening.

3. An air conditioning arrangement for an enclosure comprising a self-contained air conditioning unit including a casing mounted in an aperture in an outer wall of said enclosure, inlet and outlet openings in the front of said casing through which air from the enclosure is circulated within the unit, a substantially planar panel arranged directly in front of said front wall of said casing but spaced a short distance therefrom to permit air to flow between said front of said air conditioner and said

panel around substantially the entire periphery of the space between said panel and the front of said casing, said panel being at least coextensive with and having an area greater than the area of said front wall of said casing, means for supporting said panel in spaced relation with the front wall of said air conditioner, and a divider extending between said panel and said front wall of said casing, said divider abutting said front wall of said casing between said inlet and said outlet openings whereby air discharging through said outlet opening is prevented from flowing into said inlet opening through said space between said panel and said front wall of said air conditioner and whereby sound waves emanating from components within said air conditioner are forced to pass around said panel before being radiated into said enclosure thereby attenuating the sound reaching said enclosure.

4. An air conditioning arrangement for an enclosure comprising a casing, said casing mounted in an aperture in an outer wall of said enclosure, a refrigeration system including a pair of heat exchangers mounted in said casing, inlet and outlet openings in the front wall of said casing through which air from the enclosure is circulated, a substantially planar panel mounted directly in front of said air conditioner in a plane parallel to said front wall of said air conditioner but spaced a short distance therefrom, said panel being coextensive with and having an area equal to at least the combined projected area of said inlet opening and said outlet opening whereby air discharging through said outlet opening is deflected along said wall of said enclosure, heat insulating and sound deadening material on the surface of said panel facing said air conditioner whereby sound waves emanating from components within said air conditioner are attenuated and forced to pass around said panel before being radiated into said enclosure, means for supporting said panel in spaced relationship with said front wall of said air conditioner, and a divider in said space between said panel and said front of said air conditioner, said divider abutting said air conditioner between said inlet and said outlet openings thereof whereby air discharging through said outlet opening is forced to flow outwardly along said wall and prevented from flowing directly from said outlet opening into said inlet opening in the space between said panel and said front of said air conditioner.

References Cited in the file of this patent

UNITED STATES PATENTS

1,900,644	Haimbaugh	Mar. 7, 1933
2,009,246	Ashbaugh	July 23, 1935
2,162,152	Wulle	June 13, 1939
2,355,289	Gibson	Aug. 8, 1944
2,644,389	Dauphinee	July 7, 1953
2,654,227	Muffly	Oct. 6, 1953
2,791,169	Daninhirsch	May 7, 1957
2,858,760	Lathrop	Nov. 4, 1958

FOREIGN PATENTS

117,399	Australia	Aug. 17, 1943