

May 24, 1938.

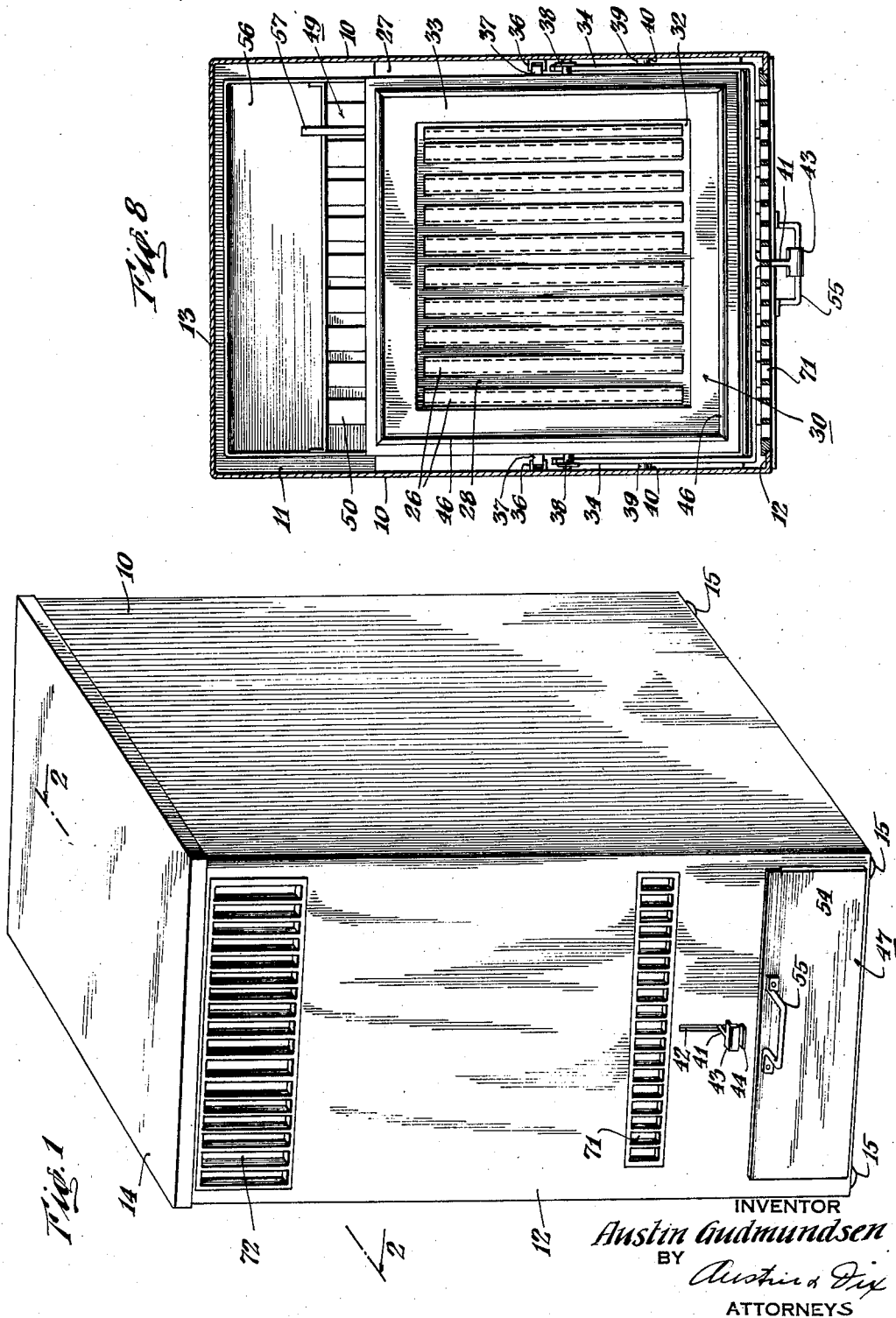
A. GUDMUNDSEN

2,118,044

UNIT AIR CONDITIONER

Filed July 27, 1933

3 Sheets-Sheet 1



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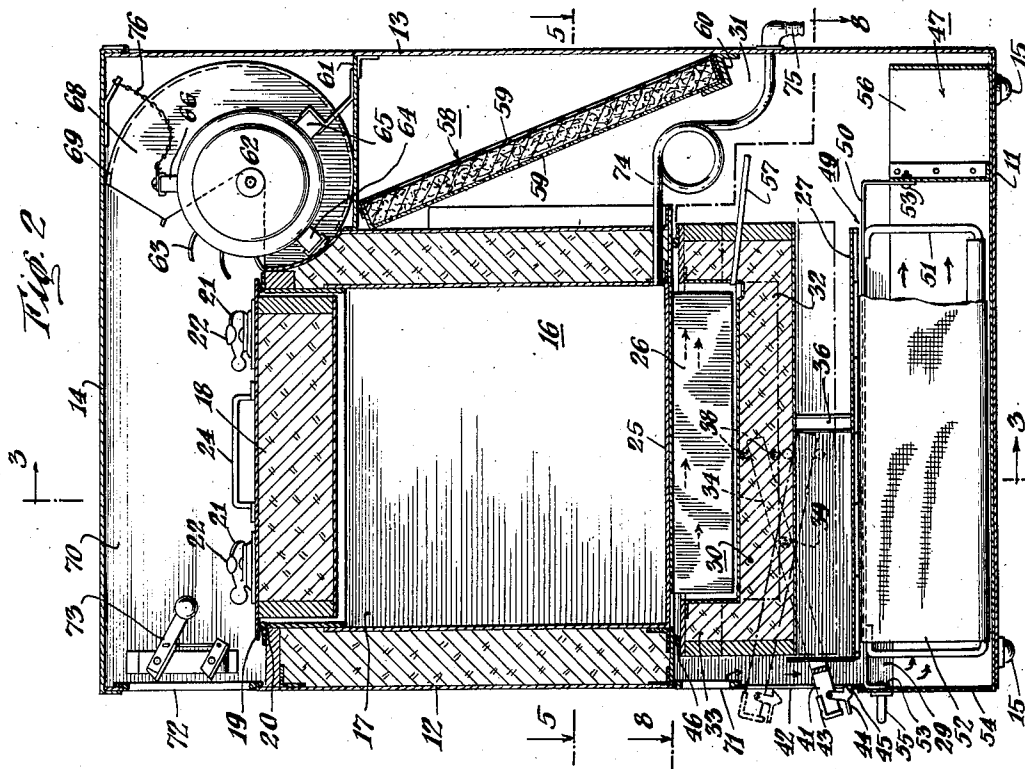
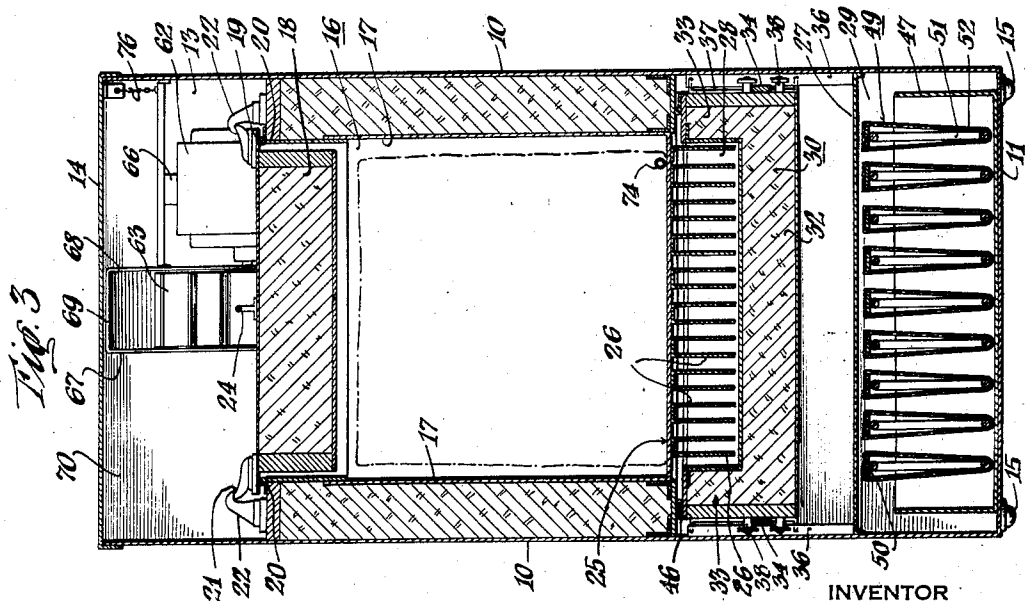
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3 Sheets-Sheet 2



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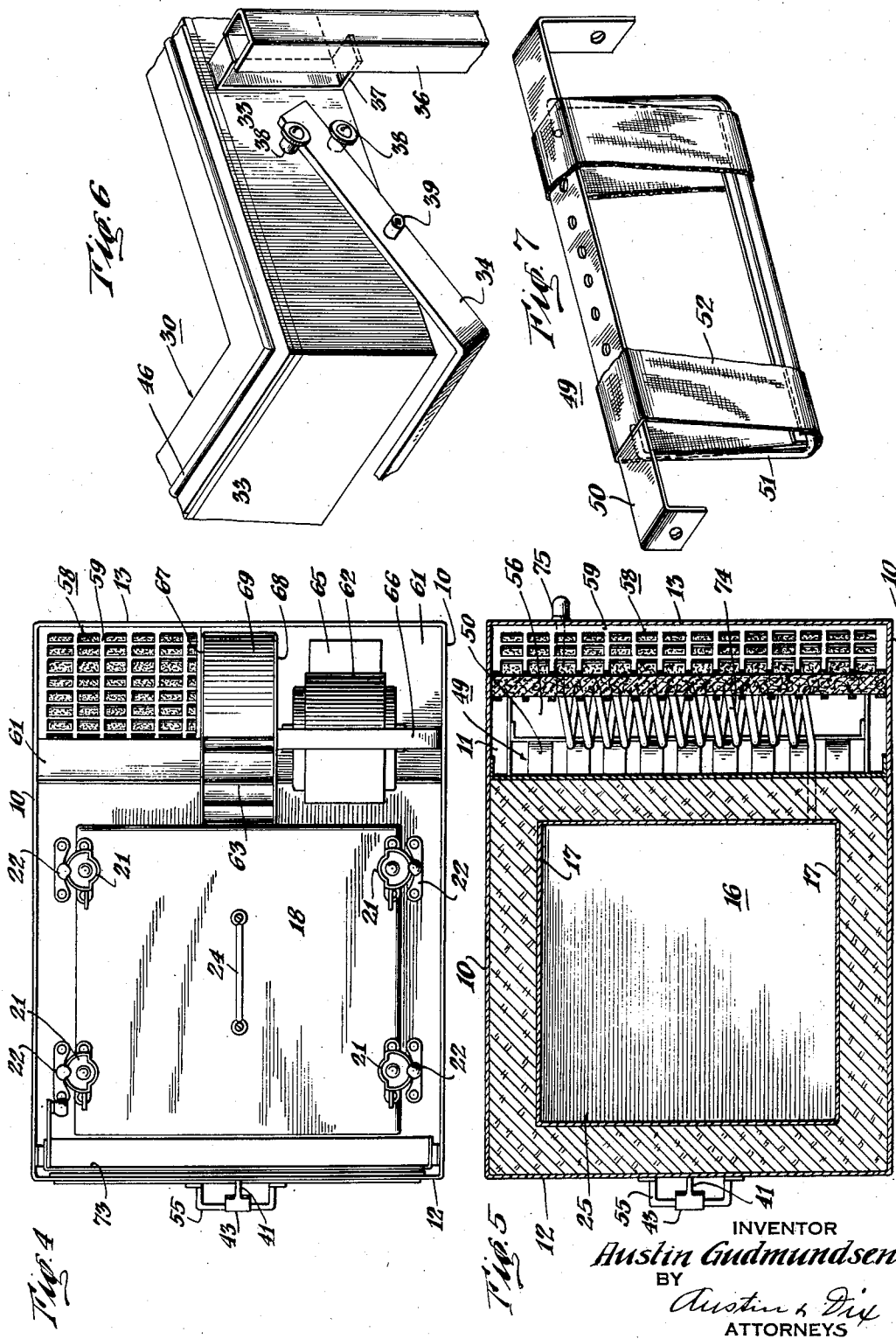
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UNITED STATES PATENT OFFICE

2,118,044

UNIT AIR CONDITIONER

Austin Gudmundsen, Wauwatosa, Wis.

Application July 27, 1933, Serial No. 682,422

5 Claims. (Cl. 62-91.5)

This invention relates to air conditioners and more particularly to a portable type for year-round use.

According to one form which the invention may assume, the air conditioner is contained in a portable cabinet in which is constructed a refrigerant chamber adapted to use solid carbon dioxide as a refrigerant. Adjacent the refrigerant chamber is an air-cooling conduit which may be used when it is desired to cool and dehumidify air. Another conduit is constructed in the cabinet in which water may be maintained. This may be used when it is desired to humidify air.

The bottom wall of the refrigerant chamber is constructed of a good heat-conducting material such as metal, and has dependent therefrom fins extending into the cooling conduit for more efficient transfer of heat.

A special fin cover or hood is provided which may serve to close the cooling conduit and to insulate the heat-transfer fins, and, in addition, may form a partition between the humidifying conduit and the cooling conduit. Suitable means are provided for draining such moisture as may be precipitated from the cooled air.

Frame elements carrying a suitable wicking are provided for insertion in the water chamber in the humidifying conduit for increasing the effective wetted surface exposed to the air passing through the humidifying conduit.

An economizer coil is connected to the refrigerant chamber through which may pass cold gaseous carbon dioxide obtained from the subliming of carbon dioxide.

A filter is provided for cleaning the air and a fan or blower, for circulating air through the conditioner and discharging it therefrom.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which—

Figure 1 is a view in perspective of the air conditioner;

Figure 2 is a section on line 2-2 of Figure 1;

Figure 3 is a section on line 3-3 of Figure 2;

Figure 4 is a view of the air conditioner looking down with the top removed;

Figure 5 is a section on line 5-5 of Figure 2;

Figure 6 is a fragmentary perspective of the fin cover;

Figure 7 is a perspective of a wick-frame element with the wick partially cut away; and

Figure 8 is a view on line 8-8 of Figure 2.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims, various details will be identified by specific names for convenience but they are intended to be as generic in their application as the art will permit.

Referring now to the drawings, the conditioner comprises a metal casing made up of side walls 10, bottom 11, front 12, back 13 and hinged top 14; mounted on casters 15.

A refrigerant chamber 16 is constructed in the casing and comprises side walls 17. The side walls 17 of the refrigerant chamber are insulated. A refrigerant chamber cover 18 is provided, which comprises an insulated metal casing shaped to fit into the refrigerant chamber. Shoulder projections 19 on the top of the cover rest upon shoulders 20 formed by the upper inside edge of the refrigerant chamber side walls. Mounted on the top of the refrigerant chamber cover are a plurality of pivoted cam lever hasps 21 adapted to register with catches 22 attached to the upper edge of the refrigerant chamber side walls. Between shoulders 19 and 20 is mounted a soft rubber gasket to form a tight fit between the cover and chamber when the hasps are in locked position. Ordinary window sash fasteners may be used for this purpose. A handle 24 is mounted on the top of the refrigerant chamber cover to facilitate lifting when it is desired to remove the cover.

The bottom plate 25 of the refrigerant chamber is constructed of a good heat-transferring material, such as metal, and has dependent therefrom fins 26 to be described more in detail hereinafter.

A baffle plate 27 extending the full width of the casing is mounted between the bottom of the refrigerant chamber and the bottom of the casing to form cooling conduit 28 and humidifying conduit 29.

A fin cover or hood 30 which comprises an insulated metal box with bottom 32 and side walls 33, is mounted between baffle 27 and refrigerant chamber bottom 25. This fin hood is vertically adjustable and is adapted to enclose and insulate the heat-transferring fins when it is in its uppermost position. Brackets 37 mounted on the side walls of the fin cover register with channel-shaped guides 36 fixed to the side walls 10 and prevent lateral movement of the fin hood. The fin hood is mounted on lever 34, which comprises a bar bent in the shape of a right-angled U, the

right-angled U fitting around the front and side walls of the fin hood. The free ends of the lever extend between rollers 38 fixed to the side walls of the fin hood. Pivots 39 mounted on the lever register with journals 40 in the side walls 10 and carry the fin hood.

An arm 41 is attached to the lever 34 and extends through an opening 42 in the front wall of the casing. Mounted on the free end of arm 41 is a foot pedal 43. A catch 44, attached also to the free end of arm 41, is adapted to register with an opening 45, which is at right angles with opening 42 and serves to hold the arm 41 and the lever in its lowermost position, which, in turn, by reason of the pivoted lever 34, maintains the fin hood in its uppermost position. A soft rubber gasket 46 mounted on top of the side walls of the fin cover insures a tight fit between the insulated side walls of the refrigerant chamber, and the fin hood when catch 44 is in locked position as shown in Fig. 2.

Located in the humidifying conduit 29 is a shallow tray or pan 47 in which water may be placed. Affixed to the pan are a plurality of wick-carrying elements 49 placed in parallel. A wick-carrying element comprises metal bar 50, to which is fastened a metal rod 51, bent to form a frame. A cloth wicking, such as turkish toweling, 52, is placed about this frame. The wick elements are affixed to the pan by riveting their ends to the end walls of the humidifying tray, as shown at 53, Fig. 2. The bent metal rod 51 is of such length that the wicking extends well down into the tray. The tray may be placed into the humidifying conduit through an opening in the front wall of the casing, the front side wall 54 of the pan covering said opening. A handle 55 attached to the tray facilitates removal of the tray when its removal is desired. A drip pan 56 constructed integral with humidifying pan 47 serves to catch condensate which may be drained through pipe 57 connected with the inside of the fin hood 30.

A filtering chamber 31, connected to cooling conduit 28 and to humidifying conduit 29, is located behind the refrigerant chamber. Mounted in the filter chamber 31 is an air filter 58, which comprises two screens or grids 59 in parallel-spaced relation, between which is placed a filtering material pervious to air, such as cotton or wool. Filter 58 is mounted in the filter chamber on brackets 60 fastened to the back wall 13 of the cabinet.

A baffle 61 extends over approximately half the cross-sectional area of the top of the filtering chamber. Mounted above baffle 61 on brackets 64, 65, 66, is a motor 62 which may be connected to a suitable source of current. Rubber cushions in the aforesaid brackets minimize vibration while the motor is operating. Connected to the motor 62 is a fan or blower 63. A housing comprising baffles 67, 68, and 69 is located about the blower and this housing is constructed to direct the air current from the blower through the conditioned air conduit 70.

A plurality of apertures 71 in the front wall of the cabinet allow air to enter the cooling conduit, when the hood cover is down, or to enter the humidifying conduit when the fin hood is in its upper position. A plurality of apertures 72 in the front wall permit air to be discharged from the conditioned air conduit 70. Shutters 73 permit of adjusted directional flow of the air being discharged from the cabinet.

An economizer coil 74 placed in the filtering

chamber 31 and connected at one end with the inside of refrigerant chamber 16, allows cold gaseous carbon dioxide, after the solid carbon dioxide has sublimed, to be removed from the refrigerant chamber. The economizer coil also serves to cool the air passing over it. The other end of the economizer coil extends through the back wall 13 of the cabinet. A street elbow 75, attached to this end permits a rubber hose to be attached to lead the spent CO₂ outside, if desired. It is seen that the air conditioner herein described has year-round utility.

In the summertime, when the air is uncomfortably warm and humid, and it is desired to cool and reduce the relative humidity of air in a room or other confined space, the device may be operated as follows: solid carbon dioxide is charged into the refrigerant chamber 16 by removing the refrigerant chamber top 18; the hinged cover 14 lifts up out of the way for charging and is conveniently checked by chain 76, one end of which is attached to the top and the other to bracket 66. After the solid carbon dioxide is placed in the chamber, cover 18 is replaced and locked with fasteners 21 and the hinged top let down. The fin cover 30 is placed in its down position shown in dot and dash lines, by releasing catch 44, the blower is put in operation and air is drawn through apertures 71 and through conduit 28 over the fins as indicated by dotted arrows. The air is cooled from passing over the fins, which are in turn cooled by heat conduction up the fins and to the dry ice. The metal fins 26 are so proportioned as to thickness and length that, with the air flowing over them the temperature of the fin surface is above 32°. Thus, moisture from the cooled air condenses on the cold, fin surfaces and drips off as condensate into the fin cover 30. The condensate thus formed drains from the fin cover through pipe 57 into drip pan 56, from which it may be removed when desired.

The cool, dry air passing through the cooling conduit 28 then passes over the economizer coil 74, which cools it still further. The cooled air then passes through the air filter 58, where it is cleared of suspended particles, thence up to the blower 63 through the blower housing formed by baffles 67, 68, 69, thence through conditioned air conduit 70, and is finally discharged from the conditioner through apertures 72.

When it is desired to stop the operation of the conditioner while there is solid carbon dioxide in the refrigerant chamber, the motor is shut off and the fin cover is raised to its uppermost position by pressing down on foot pedal 43 and locking the lever down by means of catch 44. Thus, the unused solid carbon dioxide is well insulated and will not be inefficiently spent. Furthermore, an excess of air can not then circulate about the heat transfer fins and form an undesirable coating of frost thereon.

In the colder seasons, when the atmosphere in a room is too dry and it is desired to humidify it, the fin cover 30 is placed in its uppermost position by pressing down on foot pedal 43 and locking the lever by means of the catch 44, as hereinbefore described. Water is placed in the pan 47 so that a part of the wicking is below the surface. When the blower is operated, air is drawn through apertures 71, passes downward in the direction of the full line arrows, follows along the damp wicking where it absorbs moisture; thence up and through the filter 58 into the fan 63, and is discharged from the conditioner, as before described.

It is obvious that when the conditioner is operated to humidify air there should be no solid carbon dioxide placed in the refrigerant chamber. It is also obvious that water ice may be used as the refrigerant as well as solid carbon dioxide when the conditioner is operated as an air cooler.

While certain novel features of the invention have been disclosed and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a unit air conditioner for both summer and winter use, a casing, a refrigerant chamber therein for solid carbon dioxide having four insulated side walls and an insulated removable top, a heat transfer plate forming the bottom wall of said refrigerant chamber, said transfer plate having heat transfer fins dependent therefrom, a cooling conduit passing under said refrigerant chamber, said fins extending into said cooling conduit, an air humidifying conduit in the bottom of said casing having a water tray with wicking inserted therein to increase the effective wetted surface, a vertically adjustable insulated fin cover adapted to open and close said cooling conduit and to cover said fins, a filtering chamber in said casing connected with said cooling conduit and humidifying conduit, a filter pervious to air in said filtering chamber, an economizer coil to carry sublimed carbon dioxide from the refrigerant chamber, a conditioned air conduit in the top of said casing, and a blower mounted in the casing to circulate air through the conditioner.

2. In a unit air conditioner, a refrigerant chamber, an air cooling conduit, a heat transfer plate between said chamber and said conduit, fins attached to said plate extending into said conduit,

and a vertically adjustable insulated fin cover adapted to cover said fins and prevent heat losses from said fins and frost accumulation thereon when air is not passing through said air cooling conduit.

3. In a portable unit air conditioner, a cabinet, a solid carbon dioxide container within said cabinet and having heat-insulated walls and a heat-conducting wall, said cabinet having an air passage contacting said heat-conducting wall, a fan in said air passage, and a removable heat-insulating cover for said heat-conducting wall.

4. In a portable unit air conditioner, a cabinet, a solid carbon dioxide container within said cabinet and having its top wall and all of its side walls heat-insulated, said container having a heat-conducting bottom wall, said cabinet having an air passage contacting said heat-conducting bottom wall, a fan in said air passage, and a removable insulating cover for said bottom wall to insulate said bottom wall from said air conduit to conserve refrigerant when its cooling effect is not desired.

5. In a portable unit air conditioner for both summer and winter use, a cabinet, a solid carbon dioxide container within said cabinet and having its top wall and all of its side walls heat-insulated, said container having a heat-conducting bottom wall, said container being spaced from the top of the cabinet and the bottom of the cabinet and from at least one side wall of the cabinet to define a tortuous air passage having an upper horizontal conduit, a vertical conduit and a lower horizontal conduit, said casing having an air outlet for said upper conduit and an air inlet for said lower conduit, a fan in said air passage, an insulating cover for said heat-conducting bottom wall, said lower conduit also having humidifying devices.

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