June 29, 1954 A. TRASK 2,682,159

WINDOW AIR CONDITIONER

Filed Jan. 2, 1951 5 Sheets-Sheet 1

FIG. 1

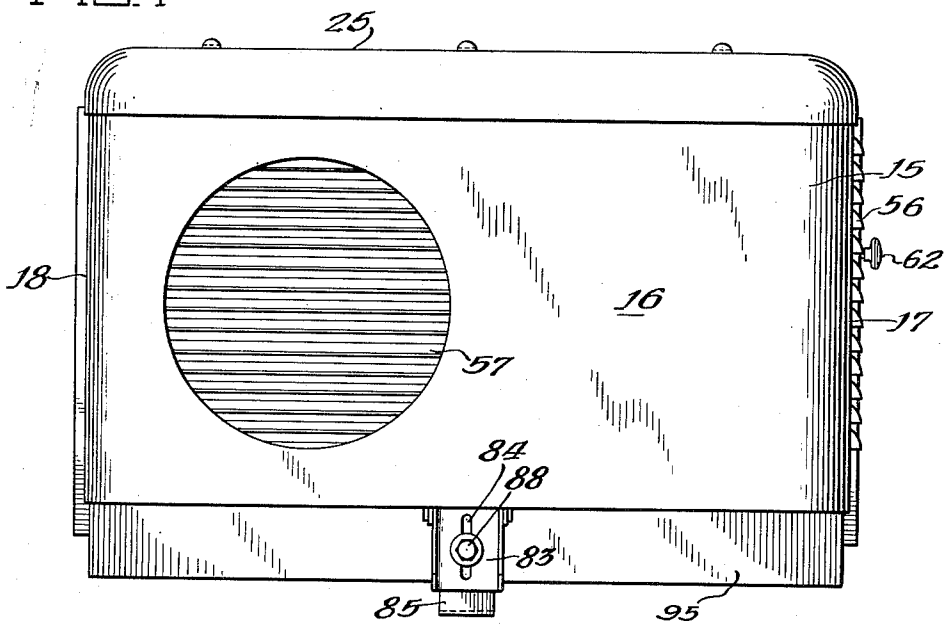
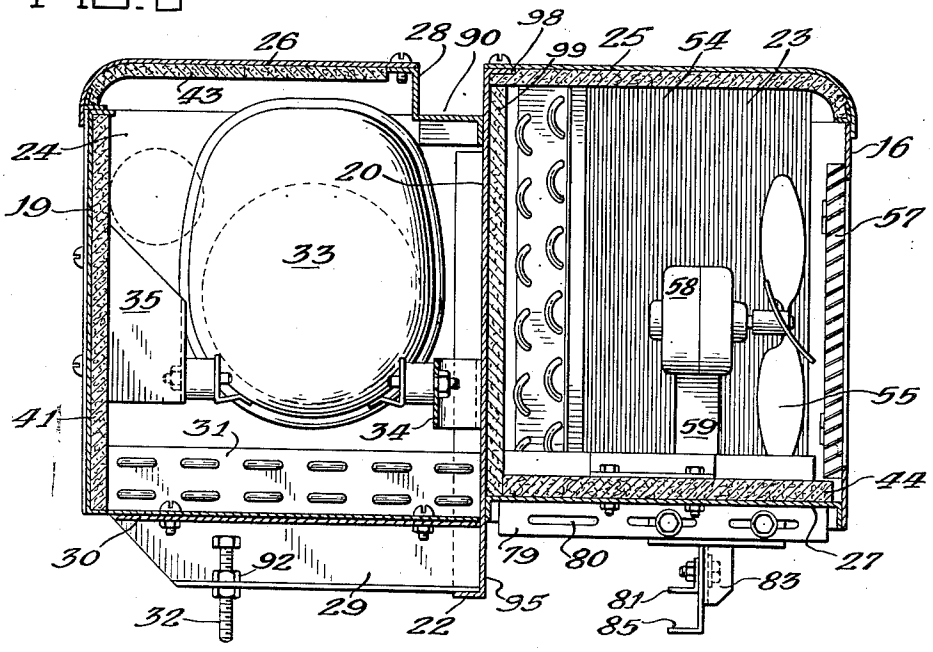


FIG. 6



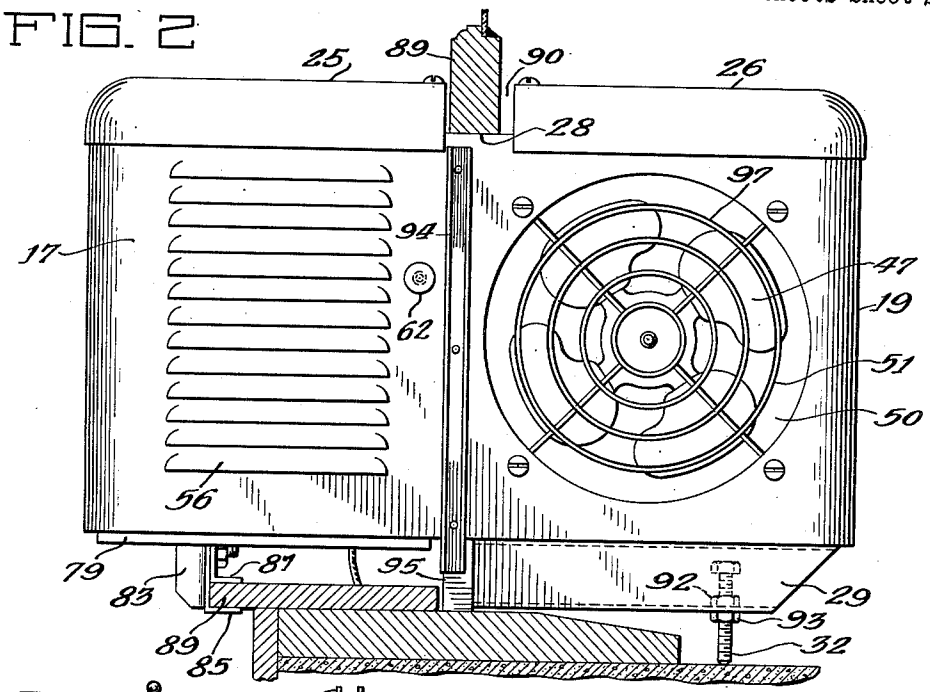
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WINDOW AIR CONDITIONER

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FIG. 2



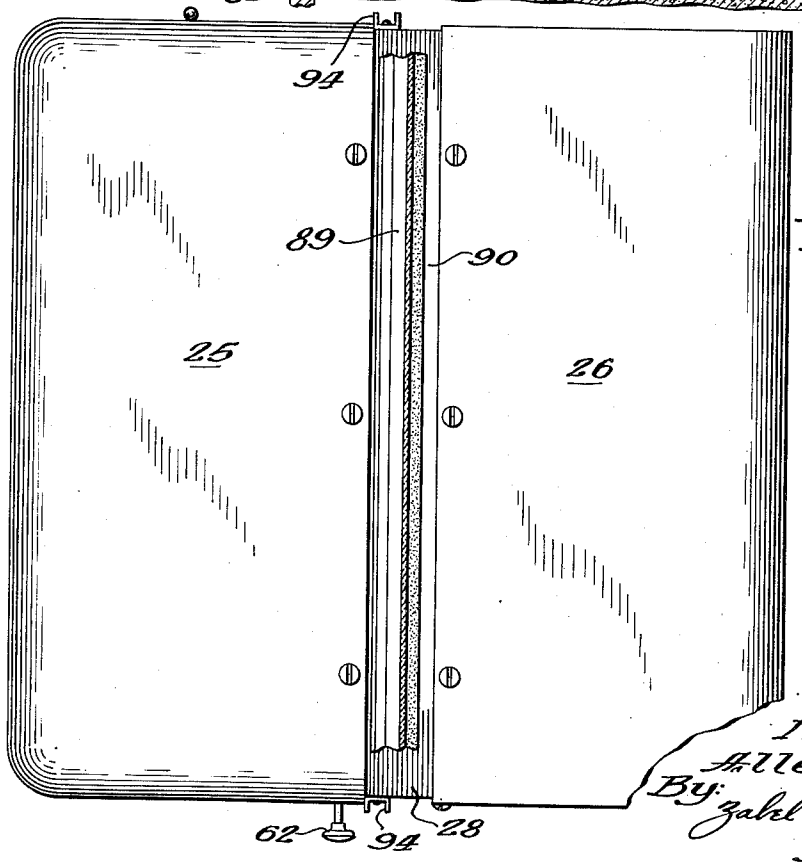


FIG. 3

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WINDOW AIR CONDITIONER

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FIG. 11

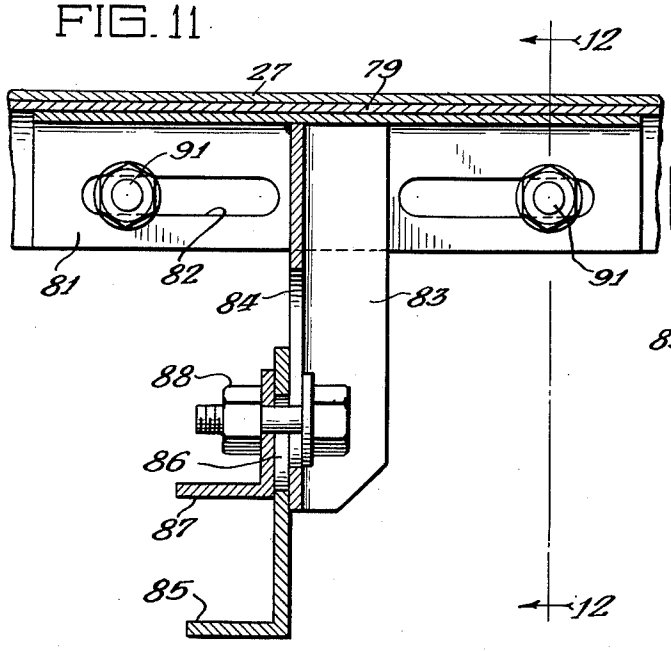


FIG. 12

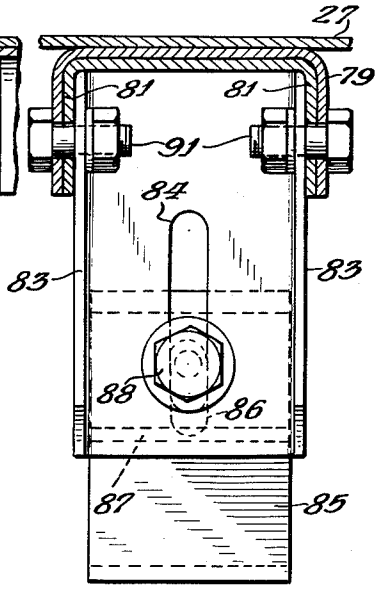
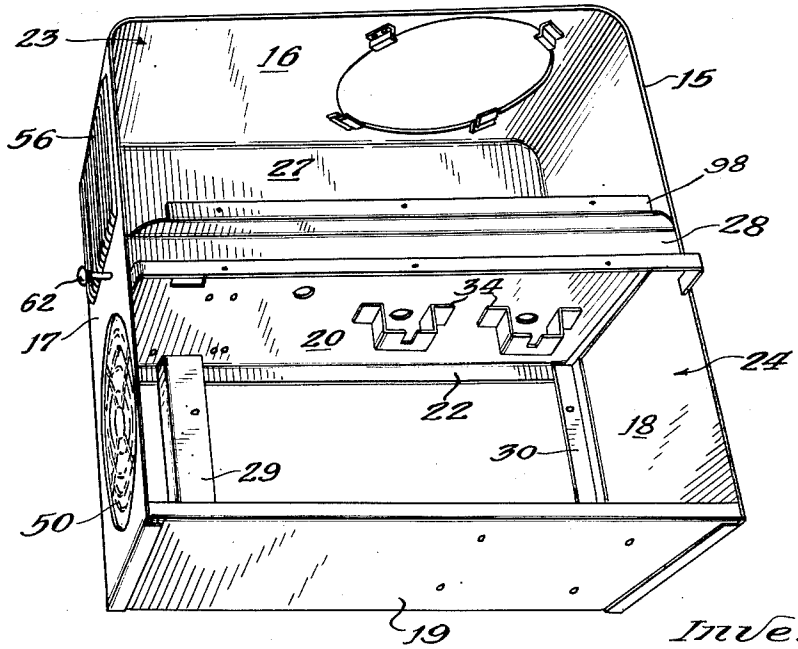


FIG. 4



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FIG. 5

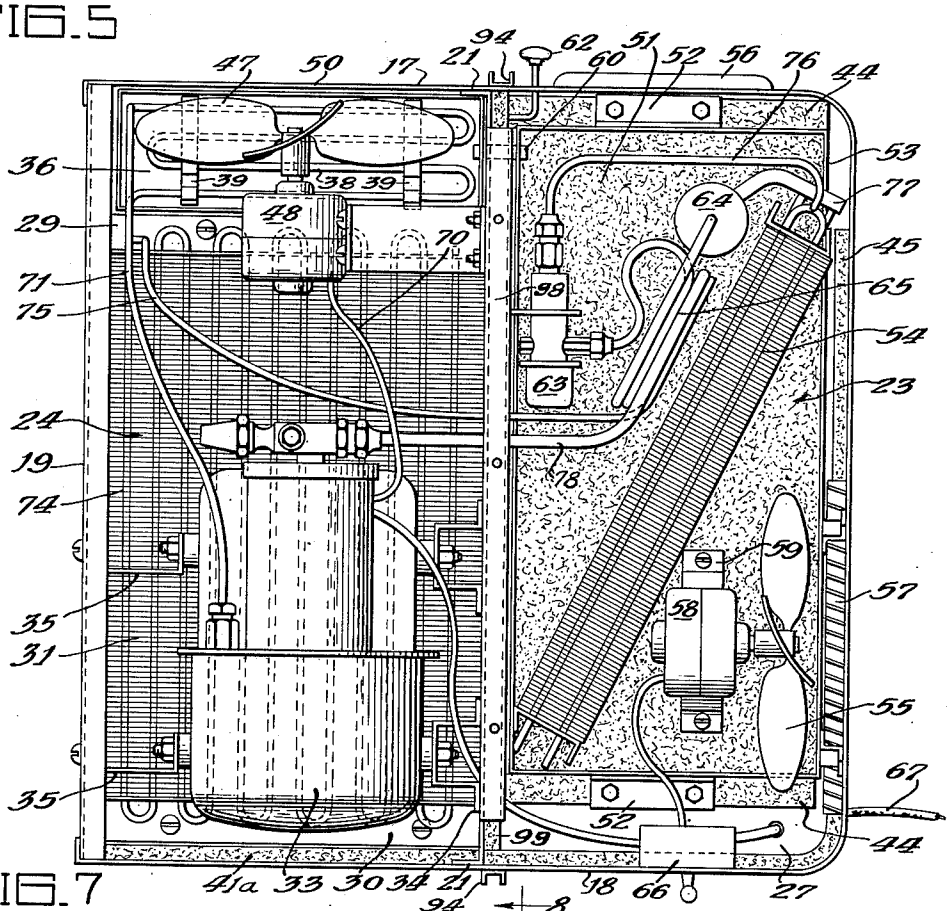


FIG. 7

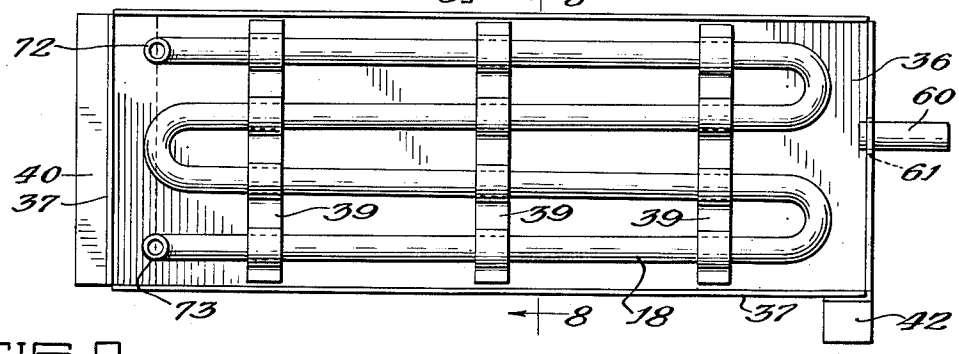
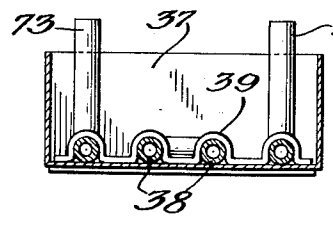


FIG. 8



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WINDOW AIR CONDITIONER

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FIG. 9

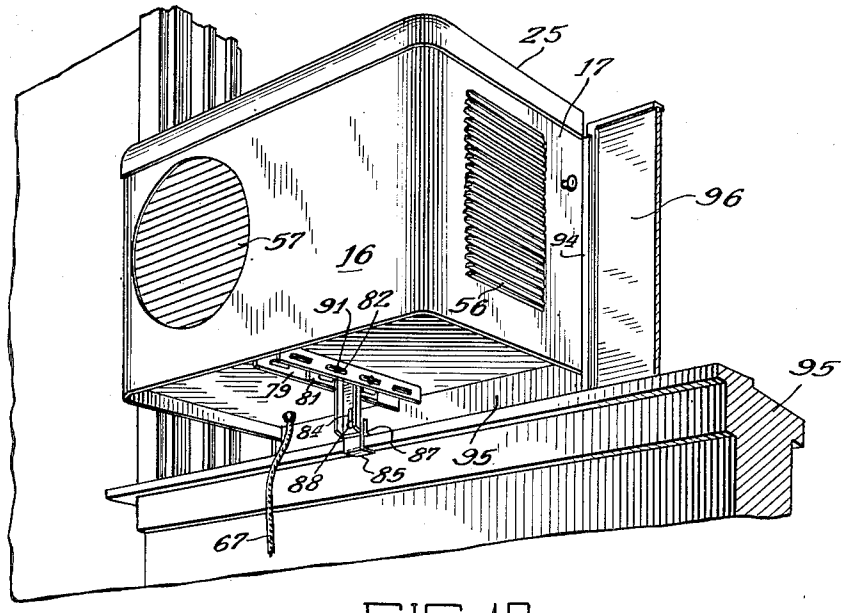
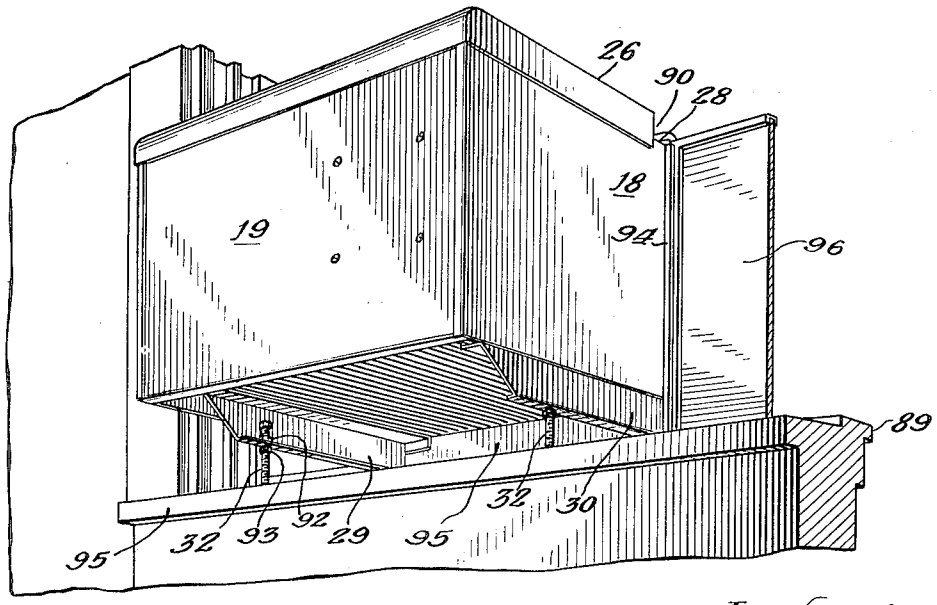


FIG. 10



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Patented June 29, 1954

2,682,159

UNITED STATES PATENT OFFICE

2,682,159

WINDOW AIR CONDITIONER

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Application January 2, 1951, Serial No. 203,971

2 Claims. (Cl. 62—140)

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This invention relates to window mounted air conditioners, and more particularly to the cabinet structure of small unitary air conditioners adapted for mounting on the window sill of double hung sash type windows.

A principal object of this invention is a cabinet constructed as a cantilever structure having a central pier arranged to support the air conditioner within the opening of a window at the bottom closing point of a vertically sliding sash.

Another object is a cabinet adapted to fit within, and be secured to, a window opening without the need for separate mounting frames or separate parts and devices for effecting secure installation.

A window air conditioner adapted for using the structural strength of a window sash as a means of support, is another objective.

Still another object is a cabinet for window air conditioners having a channel recessed into its top cabinet surface adapted to receive the bottom portion of a vertically sliding window sash in a weather sealing contact, and as a retainer for the air conditioner.

Almost all of the window type air conditioners on the market today are constructed with a bottom plate of heavy gage sheet metal of approximately 10 gage or 12 gage steel, in the shape of a rectangular tray having flanged edges like a shallow pan having a rim approximately one and one-half inches in height for retaining condensed water vapor and for imparting structural strength to the tray and the complete unit. The component parts of the air conditioners are assembled upon the tray and then enclosed by cabinet portions being assembled to the tray. In this type of structure it is the tray alone which provides the only integrating structural strength for holding the units into unitary structures.

This invention discloses a novel structure of air conditioner cabinet wherein a centrally disposed vertical partition within the cabinet is the basic structural member of the cabinet to which the cabinet parts are assembled and supported in cantilever fashion on either side thereof. The upper portion of the partition is adapted to engage the lower portion of a window sash so that the window sash becomes a supporting member for the air conditioner in its installed position. The bottom portion of the partition extends below the cabinet in the manner of a pier supporting the cabinet centrally and near its center of gravity.

The above enumerated objects and other objects and advantages of this invention will more fully appear from the following description made

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in connection with the accompanying drawings, wherein like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a front elevation view of a window air conditioner embodying this invention;

Fig. 2 is an elevation view of the right side of the air conditioner showing it mounted in a window. The window sash and sill portions are shown sectionally;

Fig. 3 is a top view of Fig. 1 showing a portion of the window sash of Fig. 2;

Fig. 4 is a perspective view looking into the one piece welded sheet metal air conditioner cabinet of Figs. 1, 2, and 3, with its two top covers removed;

Fig. 5 is a top view of Fig. 3 with the two cabinet top covers removed, and a portion of the window sash groove removed to show the internal mechanism of the air conditioner;

Fig. 6 is a left side elevation view of Fig. 1 with the left side panels removed to show an elevation view of the internal mechanism shown from the top in Fig 5;

Fig. 7 is a top view of the evaporative condenser shown in Fig. 5 underneath the condenser fan;

Fig. 8 is a vertical sectional view of the evaporative condenser of Fig. 7 at section 8—8;

Fig. 9 is an upward perspective view of the air conditioner of Fig. 1 installed in a window. This view is from the room side of the window and it shows the clamping means for securing the machine to the inside edge of a standard type window sill;

Fig. 10 is an upward perspective view of the air conditioner of Fig. 1 mounted in a window. This view is from the outside of the window and shows the window sill jack screws for supporting the air conditioner upon the outside window sill;

Fig. 11 is a vertical sectional view of the window sill clamp of Fig. 9, and

Fig. 12 is a cross sectional view of Fig. 11 taken at section 12—12.

In the drawings a cabinet for an air conditioner of this invention may be constructed of a cabinet wrapper 15 of one piece of sheet metal formed to produce the cabinet front panel 16, right hand side panel 17, and left hand side panel 18. The two ends of cabinet wrapper 15 are flanged and spot welded to back panel 19. A vertical sheet metal partition 20 with side flanges 21, is arranged to divide the interior of the air conditioner cabinet into an evaporator chamber 23 and a condensing unit chamber 24. Partition 20 is attached to side panels 15, and 17 of the cabinet by spot welding its flanges 21 to the side panels.

Partition 20 extends below the cabinet in such manner that its lower extended portion 95 becomes a supporting pier, or leg, for the cabinet. Flange 22 at the bottom portion of partition 20 is a foot for pier 95, upon which the machine is suported.

Partition 20 and pier 95 is located between front panel 16 and back panel 19 of the cabinet in such manner that the cabinet extending to each side of pier 95 is supported in cantilever fashion by pier 95. While the weight of the machine on each side of pier 95 may not be equal to produce a balanced cantilever support at pier 95, the unbalanced weight of one side will in most structures be a small fraction of the total weight of the air conditioner. Thus pier 95, located in substantially a central position under the cabinet supports substantially the entire weight of the unit in cantilever fashion.

The cabinet is provided with front cover 25 over the evaporator compartment 23, and cover 25 is attached with screws to upper flange 98 of the partition 20. Rear cover 26 covers the condensing unit compartment 24. Bottom panel 27 is flanged on its four sides and spot welded at the flanges to side panel 15, front panel 16, side panel 17, and partition 20, at the bottom of evaporator chamber 23 to provide a bottom panel to the chamber for supporting the evaporator and cooling mechanism of the air conditioner.

At the upper part of partition 20 a sash channel member 28 having a W-shaped cross section is spot welded to the partition 20 to form a rectangular sash channel 90 of which the top portion of partition 20 forms one side, and the channel member 28 forms the opposite side and bottom. The rear cover 26 is secured by screws to the top flange of channel member 28 located in a horizontal plane with flange 98 of partition 20.

At the bottom portion of condensing unit chamber 24 is a bracket 29 and a bracket 30, arranged for supporting fin tube condenser 31, within the condensing unit chamber, and for supporting the air conditioner cabinet on an outside window sill by means of jack screws 32 inserted through the lower flanges thereof as hereinafter explained. Bracket 29 is welded at one end to partition 20, and at the other end to the back panel 19. Bracket 30 is welded at one end to partition 20, at the opposite end to back panel 19, and it is welded also to the bottom portion of side panel 15.

A hermetic type electric refrigeration compressor 33 is assembled within condensing unit chamber 24, and is secured to partition 20 by means of two brackets 34 which are welded to the partition 20 and bolted to the compressor, and is secured to back panel 19 by means of two brackets 35 which are bolted to both the compressor and to the back panel 19.

An evaporative condenser assembly 36, shown in Fig. 7, is assembled within the condensing unit chamber 24 between bracket 29 and side panel 17 of the cabinet, substantially in a horizontal plane with fin tube condenser 31, in such a manner that fin tube condenser 31 and evaporative condenser cover the bottom of the condensing unit chamber 24. Evaporative condenser 36 comprises a rectangular pan 37, a serpentine tube 38 secured to the inside bottom of pan 37 by the dual means of clamp members 39 spot welded to the bottom of the pan, and metallic fusion obtained by dipping the said spot welded assembly into a container of molten solder. Substantially

the full length of the serpentine tube 38, which is parallel with the bottom of pan 37, is bonded to pan 37 by metallic fusion for heat exchange. Evaporative condenser 36 is secured within the condensing unit chamber 24 by means of its end flange 40 being assembled between the bottom flange of back panel 19, and insulating fiber board 41 secured to the inside of back panel 19. Bracket 42 welded to pan 37 is arranged to be secured between cabinet bracket 29 and the end portion of fin tube condenser which is attached to bracket 29.

The condensing unit chamber 24 is insulated against the radiant heat of the sun entering the chamber and the sound of the internal operating mechanism leaving the chamber, by fiber board insulation 41 attached inside back panel 19 as described above, and by fiber board insulation 41*a* inside side panel 18, and also by fiber board insulation 43 attached to the inside of cabinet cover 26. The evaporator chamber 23 is insulated against heat and sound transfer between the inside of the chamber and the outside, by fiber board insulation 44 assembled upon bottom panel 27; by fiber board insulation 45 inside cabinet front panel 16; and by glass wool insulation 46 attached by adhesive to the inside of cabinet cover 25. The partition 20 is insulated with fiber board 99.

Condenser fan 47 is a four bladed propeller type fan which draws air through fin tube condenser 31, through condensing unit chamber 24, and discharges it through circular opening 50 in side panel 17. Fan motor 48 is secured to partition 20 by means of bracket 49 bolted to both the motor and the partition 20. Wire fan guard 97 attached by four screws covers opening 50.

In the evaporator chamber 23, evaporator pan 51 is assembled upon fiber board insulation 44 and is secured by means of its brackets 52 being bolted to bottom panel 27. Evaporator pan 51 is provided with low sides 53 to confine condensate. A fin tube evaporator 54 is assembled within pan 51 and attached at each end to the pan sides 53 by means of bolts not shown in the drawings. Evaporator fan 55 is a four bladed propeller type fan arranged to draw air into the evaporator chamber 23 through louvers 56, and through evaporator 54, and then discharge it through grille 57 mounted in a circular opening in front panel 16. Evaporator fan motor 58 drives the fan 55, and is mounted by means of bracket 59 riveted to the bottom of evaporator pan 51 and bolted to motor 58. A short conduit 60 welded into and extending through the side 53 of evaporator pan 51, is located and arranged to carry condensate from the pan 51 to the evaporative condenser 36. Conduit 60 extends through a registering hole in partition 20 and a hole 61 in the end of evaporative condenser pan 37. Knob 62 is for the manual operation of an air pump-out ventilation device not shown in these drawings.

There is also assembled within the evaporator chamber 23, expansion valve 63, refrigerant accumulator 64, heat exchanger 65, and electrical switch 66. Switch 66 is a conventional three position switch having an "off" position, a position for operating fan motors 48 and 58 only, and a position for operating both the fan motors and the compressor 33. A line conductor 67 provides electrical current to switch 66. A conductor 68 carries current from switch 66 to fan motor 58. A conductor 69 carries current from

switch 66 to compressor 33 and fan motor 48. A conductor 70 carries current from compressor 33 to fan motor 48.

The refrigerant circuit of the air conditioner comprises compressor 33 which compresses refrigerant vapor and discharges it through conduit 71 to the inlet 72 of evaporative condenser 36. The outlet 73 of evaporative condenser 36 is in fluid communication with the inlet of fin tube condenser 31. The conduit between evaporative condenser 36 and fin tube condenser 31 is not shown in the drawings as it is concealed in Fig. 5 by compressor discharge conduit 71 which in this view is superimposed. However, outlet 73 of evaporative condenser 36 is in fluid communication with inlet tube 74 in the top row of tubes in the two row fin tube condenser 31. The outlet of fin tube condenser 31 is at the end of the tube in the bottom row of the coil directly under inlet tube 74, and is connected in fluid communication with conduit 75. This connection is not shown in the drawings but is concealed under conduit 71.

Conduit 75 leads condensed refrigerant from the two condensers out of the condensing unit chamber 24, through partition 20, to heat exchanger 65 with which it is in fluid communication. Heat exchanger 65 comprises one loop of two conduits soldered together in heat exchange relation throughout the length of the loop. One conduit thereof establishes communication for a flow of condensed refrigerant from conduit 75 to expansion valve 63, and the other conduit establishes communication for refrigerant vapor from accumulator 64 to the compressor 33 to be described in the continuation of the refrigerant circuit sequence, following. Conduit 76 provides fluid communication between the outlet of expansion valve 63 and the inlet of the evaporator 54. Conduit 77 provides fluid communication between the outlet of evaporator 54 and the inlet of accumulator 64. Heat exchanger 65 provides fluid communication between the outlet of accumulator 64 and conduit 78. Conduit 78 completes the refrigerant circuit by establishing fluid communication between the refrigerant vapor outlet of heat exchanger 65 and the suction inlet of compressor 33.

Underneath the evaporator compartment 23 attached underneath its bottom panel 27, is a universally adjustable clamping device shown in Figs. 11 and 12, for attaching the air conditioner to an inside window sill without the need for screws inserted into the window sill. A sheet metal channel 79 has a plurality of longitudinal slots 80 in its flanges, and it is spot welded underneath the central portion of bottom panel 27. A second and shorter channel 81 is arranged to nest slidingly within channel 79, and has 4 longitudinal slots 82 in its flanges located for sliding registry with slots 80 in channel 79. A channel 83 is located perpendicularly and centrally between the flanges of channel 81 and welded thereto. There is a longitudinal slot 84 in channel 83. A clamp angle 85 having an adjustment slot 86 in vertically adjustable registry with slot 84 in channel 83, is secured in selective location to channel 83 by means of clamp angle 87 bolted to channel 83 with bolt 88 as shown in Fig. 11.

An air conditioner of this invention may be mounted within the opening of a conventional double hung sash window, and securely held there permanently, in the following manner. The lower sash of the window is raised and the air conditioner is set within the window opening as shown in Figs. 9 and 10. The unit supporting pier 95 is located directly behind the inside window sill in the position from which the lower sash was raised, and the unit is centered laterally within the window opening. The lower portion of the sash, shown in Figs. 2 and 3, as 89, is then lowered into sash channel 90 recessed within the top of the air conditioner cabinet. The window sash then becomes a structural member holding the air conditioner in its final operating position. The condensing unit section of the unit, outside the window, is usually a little heavier, and in this instance is a little heavier than the evaporator section within the room. Therefore the upper end of partition 20 which forms the inside wall of sash channel 90, will be brought to bear against the inside bottom portion of the sash, thus locating and securing the machine in its operating position.

The next step of installation procedure may be to clamp the unit to the inside window sill. Clamp angles 85 and 87 are removed from the unit temporarily. Clamp channel 81 is slidingly adjusted within channel 79, to register perpendicular channel 83 in vertical alignment with the inside window sill edge 89. The slots 80 and 82 in channels 79 and 81 respectively, are arranged so that in any relative position of adjustment underneath the cabinet the slot registry provides openings for four bolts 91 to secure channel 81 in its permanent assembled location within channel 79. The four bolts 91 are assembled and tightened. Clamp angles 85 and 87 are then located above and below window sill edge 89 as shown in Figs. 2 and 9, and bolt 88 is inserted to securely clamp the air conditioner to the front edge 89 of the window sill without the need for screws inserted into the window sill or window frame. It will be understood from the drawings that the securing of this clamping device will secure the air conditioner against rotary, horizontal, or vertical movement in a plane perpendicular to the window.

In the next step of installation the window sash again may be raised to permit access to the outside of the window for the purpose of adjusting the jack screws 32, for auxiliary support of the air conditioner on the outside window sill. The jack screws 32 are assembled through the bottom flanges of brackets 29 and 30 by inserting the screws through the nuts 92 welded to the inside of the flanges. The jack screws are screwed down to contact the outside window sill with a slight pressure that will support a small portion of the weight of the air conditioner. Locknuts 93 are then tightened to complete the assembly and installation of the jack screws.

To each side panel of the air conditioner a small channel 94 is assembled to receive fill-in panels 96 provided to close the aperture that may be left between the sides of the air conditioner cabinet and the sides of the window frame. These panels are usually cut from a standard panel material. For installation of machines embodying this invention, these fill-in panels may be very readily measured, cut, and installed with the sash raised. The sash is then lowered into the sash channel 90 to complete the installation.

The cabinet structure of this invention is easily and quickly made in quantity production by the fabrication of nine (9) parts of flat sheet metal, following: cabinet wrapper 15, back panel 19, partition 20, bottom panel 27, sash channel member 28, two brackets 29 and 30, and two brackets 34. These parts may be quickly assembled as

shown in the drawings, by the process of spot welding. The resulting assembly is ready to receive parts for final assembly on a mass production assembly line. The above listed fabricated parts made of 16 gauge steel will result in a very strong cabinet assembly which is one object of this invention.

This cabinet structure is adapted for fast assembly of the internal mechanism on an assembly line, and it is likewise adapted for easy accessibility, with the removal of the two top covers, for field inspection, adjustment, and/or replacement of internal component parts while the unit remains in the installed operating position.

In operation exceptionally high evaporator efficiency is obtained by the evaporator fan **55** drawing the room air into the evaporator chamber through the louvers **56**, through the evaporator coil **54**, and thence discharging it directly into the room through an outlet grille **57** of very low resistance to high velocity air flow. The distribution of air flow through the evaporator is exceptionally even and thereby the maximum of heat transfer from the air to the coil is obtained. The desired quantity of air flow may be moved with a fan motor of low power to gain the highly desirable advantage of quietness in the operation of the evaporator fan. The diagonally located evaporator accomplishes exceptional compactness and helps to induce evenly distributed air flow over the full face area of the evaporator coil.

In operation of the condensing unit high efficiency is assisted by an exceptionally large volume of cooling air being moved through the condensing unit chamber **24** by the condenser fan **47**, which operates at high efficiency because its high velocity discharge of air through cabinet opening **50** is unrestricted. This fan draws air upwardly through fin tube condenser **31** and thence over evaporative condenser **36** in counterflow sequence to the flow of refrigerant within the two condensers which are connected in series as explained above. The hot refrigerant vapor from the compressor passes first through evaporative condenser **36**, then through the top row of tubes in the fin tube condenser **31**, and last through the bottom row of condenser tubes where it is in heat exchange relation with the incoming and coolest air being drawn through the condenser. The single circuit condenser of this invention may be constructed with any number of fin tube rows desired with the rows connected in counterflow series to the flow of cooling air. The counterflow relationship between the refrigerant within the two condensers and the cooling air flowing over the condenser surfaces as disclosed and constructed in this invention accomplishes high condensing unit efficiency. The distribution of cooling air flow through the fin tube condenser is exceptionally even and it results in high heat exchange efficiency. A greater volume of air flow is obtained from a fan and motor assembly of a given power. High condenser air volume helps high condensing efficiency.

The structure of this invention disclosed in this specification is new to the art. It accomplishes the objectives enumerated herein, and other objectives of value that may be understood from a study of this specification.

It will of course be understood that various modifications or changes may be made in the form, details, arrangement, and proportions of the various parts without departing from the scope of the invention.

What I claim is:

1. In a window mounted air conditioner, a cabinet, a partition within the cabinet dividing it into an evaporator unit compartment and a condensing unit compartment, an evaporator assembly in said evaporator unit compartment and a condensing unit assembly in said condensing unit compartment, said condensing unit compartment arranged for extension outside a window, an air cooled condenser in said condensing unit assembly, said condenser being positioned horizontally within an opening in the bottom portion of said condensing unit compartment and extending substantially the full width of said condensing unit compartment from said partition to the outside wall of said cabinet, means for drawing air upwardly through said condenser, and spacing means underneath said cabinet for supporting said cabinet and condenser in such spaced relation above the sill of a window as to permit substantially uniform air flow through said condenser throughout the entire area thereof.

2. In a window mounted air conditioner, a cabinet, a partition within said cabinet dividing the same into an evaporator unit compartment containing an evaporator assembly and a condensing unit compartment containing a condensing unit assembly, said condensing unit assembly arranged for extension outside a window, an air-cooled condenser in said condensing unit assembly, said condenser being positioned horizontally within an opening in the bottom of said condensing unit compartment and covering substantially the full depth of said condenser unit assembly from said partition to the outside wall of said cabinet, means for moving air through said condenser, a transverse vertical pier means substantially equal in width to the width of said cabinet, said pier means supporting said air conditioner in spaced relation above the sill of a window and preventing the passage of air therethrough, and means including said pier means to minimize the restrictive effect of the outside window sill on the flow of air through said condenser by said air moving means whereby the air flow through said condenser is substantially uniform throughout the entire area thereof.

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