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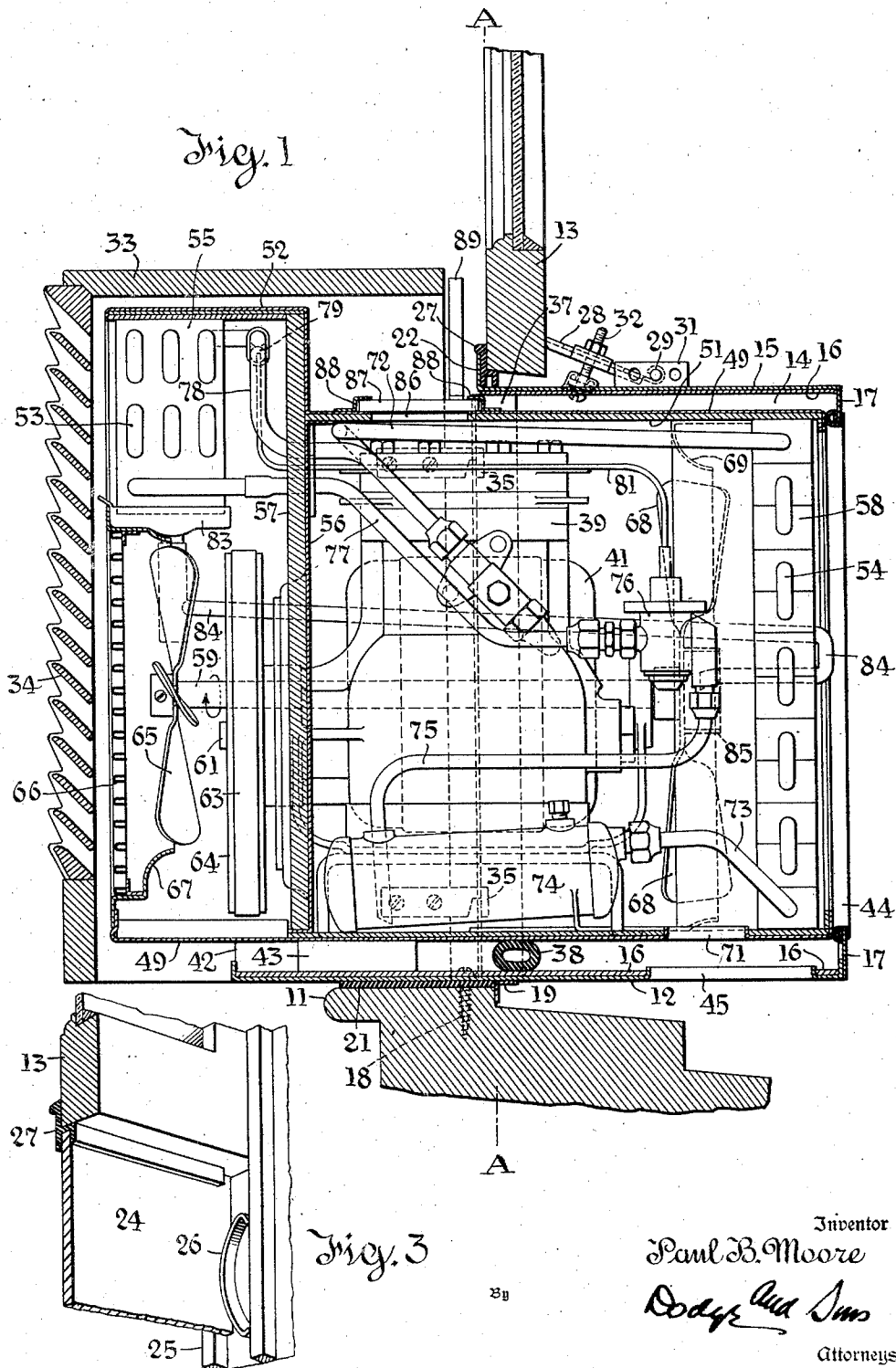
P. B. MOORE

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AIR CONDITIONER

Filed June 24, 1939

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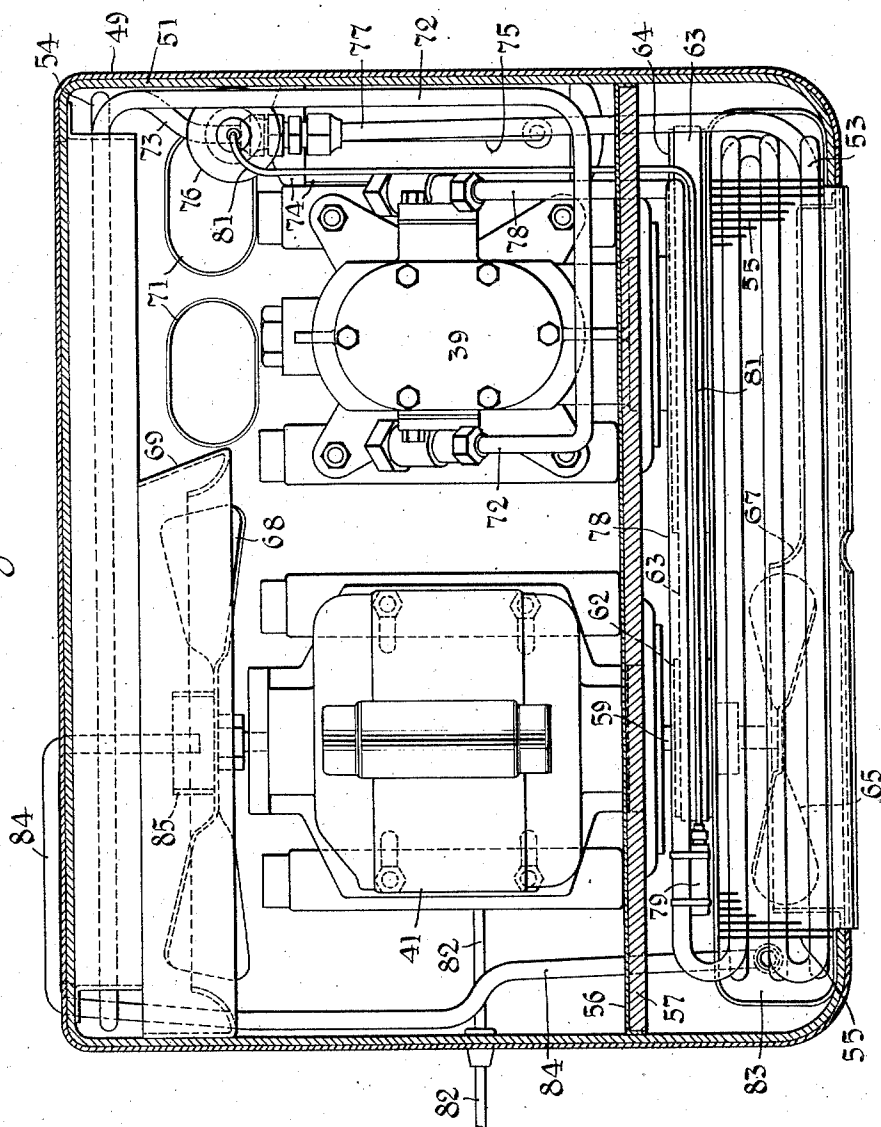
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Fig. 2



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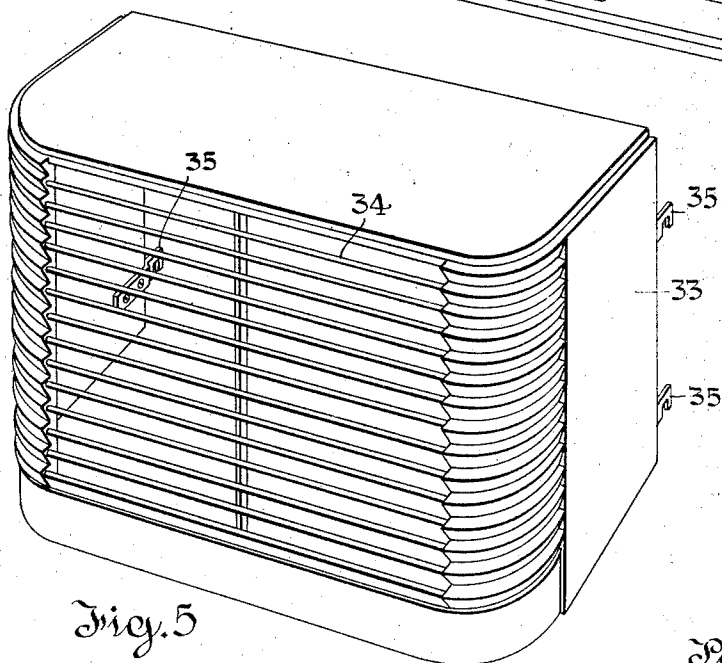
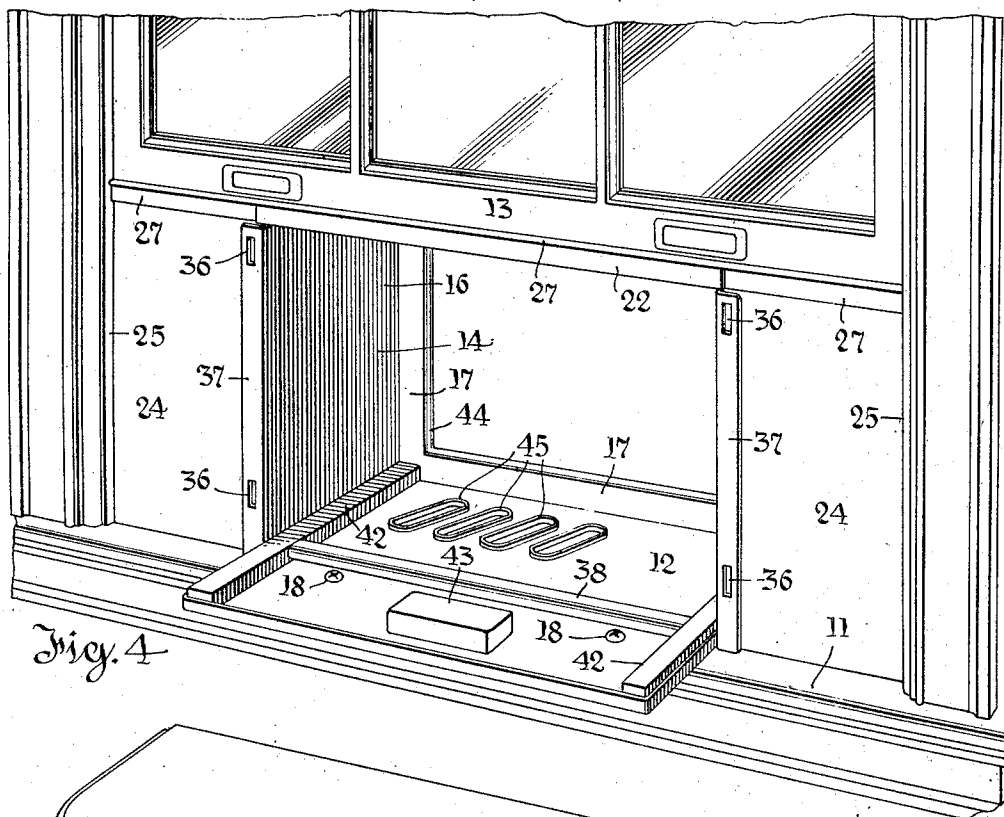
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Fig. 6

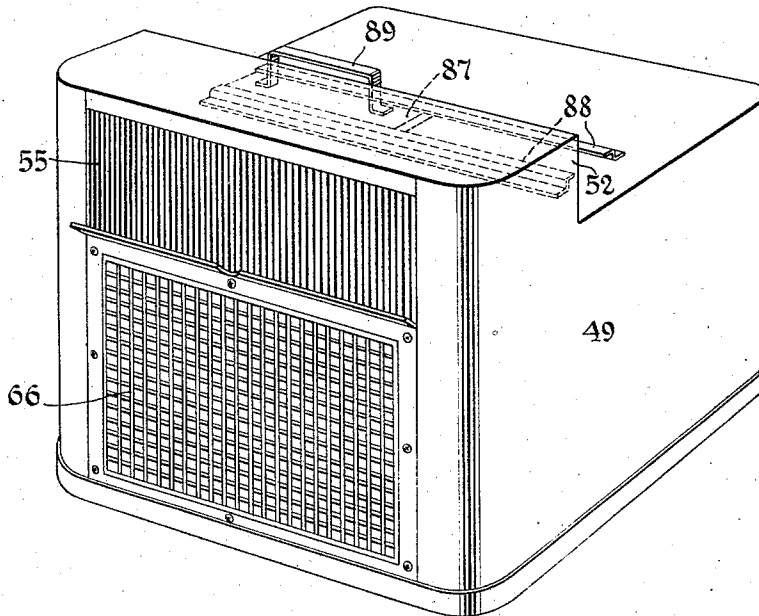
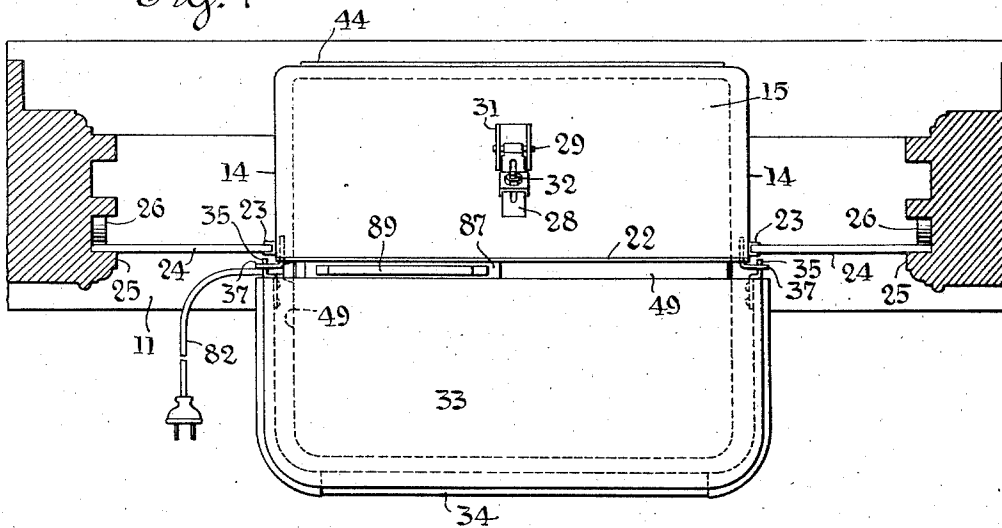


Fig. 7



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## UNITED STATES PATENT OFFICE

2,234,771

## AIR CONDITIONER

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Application June 24, 1939, Serial No. 281,022

18 Claims. (Cl. 62—140)

This invention relates to air conditioning and particularly to a unit intended to be mounted on a window sill under the lower sash of a double-hung window.

In any such unit, space requirements are severe, so that matters of compact arrangement have more than the usual importance. Further, to insure adaptability to even rather narrow windows, there is a practical limit in over-all width. These requirements are met without constructing a unit of undue height by causing the unit to project outward from the plane of the window to an extent not heretofore adopted. This scheme is favorable to efficient grouping of the parts.

Units which are merely mounted on the sill, as heretofore proposed, are dangerous, because they may become dislodged in mounting or during servicing or window-washing operations. An important feature of the present invention is a window board which is semi-permanently mounted on the sill, and which has a seat for a cased self-contained conditioning unit.

This scheme has numerous advantages. A single unit may be readily moved about from one window mount to another. The unit may readily be withdrawn for servicing and another self-contained unit substituted. The unit can be inserted and withdrawn without danger of its falling out the window.

More important still, the window board may include a yielding mount composed of sponge rubber or like pads in which the unit rests. This permits vibration. In such case, the gasket means used to close the interval between the unit and the housing should be yielding in a corresponding degree. Where a reciprocating compressor is used, the use of some means to permit and to absorb the disturbing effects of vibration is quite important.

Other features having particularly to do with construction of the window board and details of arrangement of parts in the self-contained conditioner unit will be explained as the description proceeds.

In the drawings, which show a commercial embodiment—

Fig. 1 is a vertical section through the window board and conditioner unit on a plane at right angles to the plane of the window.

Fig. 2 is a sectional plan view of the conditioner unit, alone.

Fig. 3 is a fragmentary perspective looking from outside the window at one of the fill pieces with its spring clip and gasket.

Fig. 4 is a perspective view from inside the room, showing the window board structure in place, ready to receive the conditioner unit.

Fig. 5 is a perspective view of the louvered cover which is hooked onto the window board structure of Fig. 4, after the conditioner unit has been inserted.

Fig. 6 is a perspective view of the self-contained conditioner unit, the cool end (evaporator end) being toward the observer.

Fig. 7 is a plan of the unit completely mounted and ready to run, except that the gasket against which the sash seals is omitted to avoid obscuring other parts.

The main structural component of the window board is a housing supported directly by the window sill 11 and made up of a base plate 12 which extends both inward and outward from the plane A—A (which indicates in Fig. 1 the position of the inner face of the lower sash 13), and sides 14, and top 15, each of which extends outward beyond plane A—A to the same extent as does base 12, but extends inward beyond plane A—A only very slightly.

The housing is constructed of sheet metal lined at 16 with sound-deadening, heat insulating sheet material, and is open at its back or outer end except for the inturned flange 17, (see Figs. 1 and 4) which completely encircles the outer end opening.

The base 12 is rigidly attached to sill 11 by screws, two of which are indicated at 18. The first step in installation is to mount this housing, its position being accurately defined by flange 19 welded to the lower face of base 12 and engaging the outer face of sill 11 (see Fig. 1). A rubber seat strip 21 is preferably used to ensure a seal.

Across the inner end of top 15 is an upstanding flange 22 and welded to the outer faces of the sides 14 are two vertical channels 23. These extend the full height of the sides and receive fill pieces 24 preferably formed of a brittle heat insulating compo-board. This, when scored, breaks cleanly on the score lines, so that the fill pieces are readily cut to width. The fill pieces 24 lie against the edge of sill 11 and against the corresponding guide strip 25 at the inner side of the lower sash. They are retained on one edge by channel 23 and on the other edge by C-shaped spring clips 26, snapped into the corresponding guideway (see Figs. 3 and 7). Their height is such that they extend slightly above the top 15 to enter the bottom groove in an h-shaped rubber strip 27 that extends the entire width of the

sash 13 and seats against flange 22. This strip ensures a seal the entire width of the sash. The sash holds it down on the tops of the fill pieces and against the top 15, and also seats it against flange 22.

The sash is clamped down (see Fig. 1) by a clip 28 hinged at 29 to a fitting 31 on top 15. A bolt 32 which may be set up from inside the room actuates the clip, and fitting 31 has three holes to serve as fulcrums for the clip, so that adjustment may be made for the thickness of the particular sash.

The construction described above provides a window board which may be adapted quickly to any window and when applied is semi-permanent. Since the window is fastened closed as an incident to setting up the mount, all danger of dropping the unit out of the window is avoided.

Simply for finish, a cabinet 33 with louvers 34 is mounted over the inward projecting portion of base 12 and beyond the same. This is hung by means of hooks 35 (see Fig. 5) which enter slots 36 in angle brackets 37 attached to side plates 14 (see Figs. 4 and 7). The device is operative without this cabinet, and omission of the cabinet and its mounting connection is within the purview of the invention, but in such case the conditioner unit would be exposed and should be finished to present a better appearance than the rather utilitarian embodiment shown in Fig. 6.

While the unit may be mounted in various ways, the use of a reciprocating compressor renders a yielding mount desirable. This permits the entire unit to vibrate slightly so that the vibrations are absorbed and exert no troublesome effect. This is an important feature of the invention, for the mass of the condenser, receiver, evaporator and motor as well as the enclosing casing are effective to lower the period and assist in inhibiting excessive motion.

An important supporting element is a rubber tube 38 located on base 12 near the plane A—A. This, as indicated in Fig. 1, is directly under the compressor 39 and motor 41. Strips 42 of sponge rubber engage the end of tube 38 and extend along the sides of base 12. These, with pad 43, act both to support the unit and damp vibration. A tubular gasket 44 carried by flange 17 seals the end of the case of the unit to the window board and yields to permit vibration while maintaining the seal.

In this sealing action, the members 38 and 42 also take part because the slots 45, provided for supplying additional air to the condenser by-pass the lower portion of gasket 44. Hence, the tube 38 and strips 42 serve as auxiliary gaskets and by sealing with the casing of the conditioning unit prevent any communication around the unit between the room and out-of-doors. This expedient permits additional air circulation over the condenser.

As suggested, the conditioning unit is completely self-contained and its form is best shown in Figs. 1, 2 and 6. A sheet metal case 49 lined with insulating material 51 is closed at top, bottom and both sides, but is open at its front (inner end) and at its rear (outer end). An offset 52 near the inner end permits the evaporator coil 53 to be mounted at a somewhat higher level than the condenser coil 54.

The evaporator coil 53 has closely spaced fins 55 which are exposed at the forward end of case 49 (see Fig. 5). Slightly to the rear of evaporator coil 53 and at the offset 52, a vertical partition

56 of metal, with heat insulator 57, subdivides the interior of case 49.

The evaporator coil 53 occupies only the upper portions of the inner end of case 49, but the condenser coil 54 zig-zags over the entire rear open end of case 49 and has fins 58 to increase its heat transfer capacity.

The compressor 39 and motor 41 are mounted between partition 56 and condenser coil 54 with their shafts 59 and 61 parallel with each other and extending through partition 56. The drive from the motor shaft 59 is by pulley 62, belt 63, larger pulley 64 to compressor shaft 61, all located forward of partition 56. This not only renders the drive accessible without removing the unit from the window board, but also it assures protection from rain and other out-door conditions.

The belt drive and a fan 65 which circulates room air over the evaporator are enclosed in the forward end of the case 49 beneath the evaporator. A grille 66 with shroud plate 67 for fan 65 are removably mounted as a unit on the lower portion of the front of case 49. The grille and shroud plate do not extend over the evaporator.

The fan 65 draws air in through the grille and forces it up and over the evaporator back to the room. The shroud plate prevents short-circuiting of air, which otherwise would occur because the diameter of the fan is less than the width of the case, the fan being located to one side, as shown.

The motor shaft 59 carries at its rear end a second fan 68 which rotates within a shroud plate 69. As best shown in Figure 2, this shroud plate extends only part-way across the case 49. The fan operates to force air out through that portion of the condenser which is directly to the rear of the fan and consequently serves to draw air in through the remainder of the condenser. In order to supplement this air, because the shroud plate covers more than half of the condenser area, air ports 71 are formed in the bottom of the casing 49. The slots 45 in the window board housing are used to supply air to the ports 71. It follows that the fan 68 draws air partly through the condenser and partly directly from out-of-doors and discharges air from both sources outward through another portion of the condenser.

In this way, adequate air circulation is obtained with a unit which is very compactly arranged and quite small in size. The circuit for refrigerating can be traced as follows:

From the compressor discharge by way of line 72 to the top of the condenser coil 54, thence from the bottom of the condenser by liquid line 73 to receiver 74. From the receiver 74 by pipe 75 to the expansion valve 76 and thence by pipe 77 to the bottom of the evaporator coil 53. The suction line 78 leads from the top of the evaporator to the compressor intake. The expansion valve 76 is of the superheat controlled type and a thermal bulb 79 in contact with the suction line 78 is connected by the capillary tube 81 with the thermal control mechanism of the expansion valve.

The refrigerating circuit is simply a compressor, condenser, evaporator circuit with an automatic expansion valve of the superheat controlled type serving to maintain the evaporator as nearly flooded as practicable without danger of slop-over of liquid to the compressor. Consequently, the compressor runs at a uniform volumetric rate.

To supply electric current to the motor, an electric cable 82 is used. This leads through the left side of the case 49 and passes out through the interval between cabinet 33 and bracket 37 (see Fig. 5).

Fig. 1). This cable has a plug by which it is connected to the usual electric outlet.

To dispose of the water drip from the evaporator, use is made of a water collecting pan 83 to which is connected a pipe 84. The pipe discharges within a small cup 85 carried by the hub of the fan 68. As the drip falls, drop by drop, into the cup, the rapid rotation of the cup causes it to be atomized, and thrown out into the air stream leaving the blades of the fan 68. It is thus blown into the condenser air and is either evaporated by condenser heat or discharged into the open air in a finely atomized form. No novelty is here claimed for the idea of evaporating the drip in the condenser air stream.

However, the form of the conditioning unit here described is useful in connection with drip disposal because it permits the evaporator to be located at a level sufficiently high to insure gravity feed of the drip to the hub of the condenser fan.

In this connection, it may be remarked that the offset at 52 which is provided primarily to permit elevation of the evaporator, is secured without sacrifice of light from the window because this extension lies within the ordinary dimensional limits of the bottom frame of a sash. Consequently, by extending portions of the casing 49 upward, extra volume and extra height for the evaporator are secured without sacrifice of light.

This is important, because units of the sill-mounted type are relatively small and hence they are usually availed of for rooms of small size having a single window. In such a room the sacrifice of light space in the window is a serious consideration.

With a unit of this type, particularly if installed in a room having only one window and under conditions which fasten the lower sash down, it is important to be able to use the unit as a ventilator. To accomplish this, a pump-out port 86 is formed through the top of the casing 49 immediately to the rear of the offset 52. This port is normally closed, by a damper 87 which is slidable in guides 88. The damper may be shifted by an up-standing handle 89 which is immediately between the sash 13 and the rear margin of the cabinet 33 (see Fig. 1 and Fig. 6). When this damper is opened, the condenser fan 68 functions to draw air from the room and discharge it out of doors.

The conditioning unit above described is also available for insertion through openings other than windows and can be used to withdraw heat and moisture from a room and discharge them out of doors or to a ventilating flue. The particular advantages of the structure and particularly the advantages of the window board construction have been set forth and need not be repeated.

While the invention resides in some of its aspects in the particular arrangement described, considerable latitude in embodying the ideas which under-ly the invention is possible. The description is therefore to be taken as illustrative rather than limiting. The scope of the invention is defined in the claims.

What is claimed is:

1. The combination of a window board structure adapted to fill the space between a window sill and a double-hung window, said window board structure having an opening, and a platform approximately coincident with the lower margin of said opening; yielding supports on said platform; a conditioning unit supported on

said supports and extending through said opening, said unit comprising a refrigerating circuit inclusive of a condenser exposed to air circulation at the outer end of the unit, an evaporator exposed to air circulation at the inner end of the unit compressing means and means segregating the circulating paths of air over condenser and evaporator; and yielding gasket means serving to produce a seal between the window board structure and the segregating means of said unit while permitting moderate vibration of the unit.

2. The combination of an open-ended box-like housing; means for fixing said housing on the sill of the window frame of a double-hung window of the type in which the sash runs in guides; related flanges extending across the top and vertically on the sides of said housing approximately in the plane of a sash guide; means for filling each interval between said housing and a side of the window frame, each such means comprising a fill piece engaging a side flange and a guide, said fill piece aligning at its top with said top flange; a retaining means for holding said fill pieces in position; a channelled gasket engaging said top flange and the tops of the fill pieces and serving as a seat for the sash; a portable conditioning unit of the refrigerative type including condenser and evaporator isolated from each other, and compressing means, the unit being removably inserted in said housing with the condenser exposed to outside air and evaporator exposed to inside air; and means for sealing said unit to said housing.

3. The combination with the structure defined in claim 2 and in which the sealing means is a yielding gasket, of rubber-like pads mounted in said housing and supporting said unit, the yielding characteristics of the pads and the gasket being such as to permit vibration of the unit as a whole while the gasket seal is maintained.

4. The combination defined in claim 2 in which the fill pieces are of heat insulating composition board readily frangible when scored, whereby heat transfer is resisted and installation is facilitated.

5. A room conditioning unit intended to be mounted on a window sill beneath the lower sash of a double-hung window in the wall of the room to be conditioned, said unit comprising in combination, a window board structure adapted to fill the space beneath the sash when the latter is partially raised and including a box-like extension projecting outward from the window board, and having ports for external air circulation; means for fixing said window board structure in position; a conditioner unit removably inserted into said extension and including a casing subdivided and ported to provide an external air circuit portion and a room air circuit portion isolated from one another, a refrigerating unit of the compressor condenser evaporator circuit type mounted in said casing with the evaporator thereof in the room air circuit portion and the remainder in the external air circuit portion, motor means in said casing connected to drive said compressor, and fans, one in each portion connected to be driven by said motor means and serving to circulate air drawn from the room and from out-of-doors through respective portions; and sealing means serving with the window board and casing to obstruct direct communication between the room and out-of-doors.

6. A room conditioning unit intended to be mounted on a window sill beneath the lower sash of a double-hung window in the wall of the room

to be conditioned, said unit comprising in combination, a window board structure adapted to fill the space beneath the sash when the latter is partially raised and including a box-like extension projecting outward from the window-board, and having ports for external air circulation; means for fixing said window board structure in position; a conditioner unit removably inserted into said extension and including a casing sub-divided and ported to provide an external air circuit portion and a room air circuit portion isolated from one another, a refrigerating unit of the compressor-condenser-evaporator circuit type mounted in said casing with the evaporator thereof in the room air circuit portion and the remainder in the external air circuit portion, motor means in said casing connected to drive said compressor, and fans, one in each portion connected to be driven by said motor means and serving to circulate air drawn from the room and from out-of-doors through respective portions; sealing means between said window board and said casing, said means serving with the window board and casing to obstruct direct communication between the room and out-of-doors; and a shiftable damper controlling a port in the conditioner casing which when open affords such direct communication.

7. A room conditioning unit intended to be mounted on a window sill beneath the lower sash of a double-hung window in the wall of the room to be conditioned, said unit comprising in combination, a window board structure adapted to fill the space beneath the sash when the latter is partially raised and including a box-like extension projecting outward from the window board, and having ports for external air circulation; means for fixing said window board structure in position; a conditioner unit removably inserted into said extension and including a casing sub-divided and ported to provide an external air circuit portion and a room air circuit portion isolated from one another, a refrigerating unit of the compressor condenser evaporator circuit type mounted in said casing with the evaporator thereof in the room air circuit portion and the remainder in the external air circuit portion, motor means in said casing connected to drive said compressor, and fans, one in each portion connected to be driven by said motor means and serving to circulate air drawn from the room and from out-of-doors through respective portions; yielding sealing means between said window board structure and casing and a yielding support for said conditioner unit arranged to permit vibration thereof, said sealing means being yielding through a sufficient range to permit said vibration while maintaining said seal.

8. The combination defined in claim 5 in which the driving connection between the motor means and the compressor is located in said room air circuit portion.

9. A room conditioning unit for mounting on the sill of a window frame beneath the lower sash of a double-hung window, comprising in combination a window board element made up of a box-like housing projecting outwardly upon and from the window sill and filler pieces releasably connected with said housing and the window frame and dimensioned to fill the space between said housing and the sides of the window frame; means for rigidly connecting said housing to the window sill and to the sash; a conditioner unit removably inserted into said

housing and projecting at its inner end therefrom, said unit including a casing sub-divided and ported to provide an outdoor air circuit path and a room air circuit path, a refrigerating unit of the compressor-condenser-evaporator circuit type mounted in said casing with its evaporator in the room circuit path and the remainder of the unit in the outdoor air circuit path, motor means in said casing connected to drive said compressor and fans connected to be driven by said motor means and serving to circulate air drawn from the room and from out-of-doors through corresponding air paths in the conditioner unit; and yielding means for supporting said unit in said housing and for producing a seal between said unit and said housing.

10. The combination of a casing sub-divided by a partition and ported on opposite sides of said partition to afford a room air circuit path and an external air circuit path; a refrigerating unit of the compressor-condenser-evaporator circuit type mounted in said casing, the evaporator of said unit being mounted in the room air circuit path and substantially the entire remaining portion of said refrigerating unit being mounted in said external air circuit path; fans mounted one in each of said air circuit paths; a motor mounted in said casing and connected to drive said fans and said compressor; an open-ended housing fixed in an opening in a wall or the like; a yielding support carried by said open-ended housing and serving to support said casing; and gasket means sealing between said open-ended housing and said casing.

11. The combination of a window board structure adapted to fill the space between a window sill and a double-hung window, said window board structure having an opening, and a platform approximately coincident with the lower margin of said opening; yielding supports on said platform; a cased conditioning unit supported on said supports and extending through said opening, said unit comprising a refrigerating unit inclusive of a condenser exposed to air circulation at the outer end of the unit, an evaporator exposed to air circulation at the inner end of the unit compressing means, and means segregating the circulating paths of air over condenser and evaporator; yielding gasket means serving to produce a seal between the window board structure and the casing of said unit while permitting moderate vibration of the unit; and a concealed ported housing removably mounted in said window board structure on the room side thereof to enclose and conceal said conditioning unit.

12. The combination of an open-ended box-like housing; means for fixing said housing on the sill of the window frame of a double-hung window of the type in which the sash runs in guides; related flanges extending across the top and vertically on the sides of said housing approximately in the plane of a sash guide; means for filling each interval between said housing and a side of the window frame, each such means comprising a fill piece engaging a side flange and a guide, said fill piece aligning at its top with said top flange; a retaining means for holding said fill piece in position; a channelled gasket engaging said top flange and the tops of the fill pieces and serving as a seat for the sash; a portable conditioning unit of the refrigerative type, including condenser and evaporator isolated from each other, and compressing means, the unit being removably inserted in said housing with the con-

denser exposed to outside air and evaporator exposed to inside air; means for sealing said unit to said housing; and a concealing ported housing removably mounted in said window board structure on the room side thereof to enclose and conceal said conditioning unit.

13. In a window mounted room air conditioner, the combination of a casing subdivided and ported to afford a room air circuit path and an external air circuit path isolated from each other; a refrigerating circuit mounted in said casing and inclusive of condenser and evaporator, one mounted in one, and the other in the other of said air circuit paths; and a window board structure in which said casing is resiliently mounted as a whole with said circuit paths each having its entrance and exit on opposite sides of said window board from the entrance and exit of the other circuit path.

14. In a window mounted room air conditioner, the combination of a casing subdivided and ported to afford a room air circuit path and an external air circuit path isolated from each other; a refrigerating circuit mounted in said casing and inclusive of condenser and evaporator, one mounted in one, and the other in the other of said air circuit paths; a window board structure in which said casing is yieldingly mounted as a whole with said circuit paths each having its entrance and exit on opposite sides of said window board from the entrance and exit of the other circuit path; and a concealing ported housing releasably mounted on the room side of said window board, and enclosing that portion of said casing which would otherwise be exposed within the room.

15. In a window mounted air conditioner, the combination of a window board including means for fixing the same rigidly between the sill and the partially raised sash of a double-hung window, said window board having an opening for the insertion therethrough of a refrigerative air conditioner, and supporting means for the unit when so inserted; a refrigerative unit including a support and a refrigerative circuit inclusive of evaporator, condenser, compressor and at least one motor mounted thereon; yielding means for sustaining the support of said unit by the supporting means of the window board with said condenser exposed to the air at one side of the window board and said evaporator exposed to the air at the other side thereof; and yielding isolating means coacting with said window board and unit to inhibit air flow between the evaporator and condenser while permitting vibratory movement of said unit relatively to said window board.

16. In a window mounted air conditioner, the combination of a window board including means for fixing the same rigidly between the sill and the partially raised sash of a double-hung window, said window board having an opening for the insertion therethrough of a refrigerative air conditioner together with a weather protective hood for the unit projecting from the outdoor side

of the window board, and supporting means for the unit when so inserted; a refrigerative unit including a support and a refrigerative circuit inclusive of evaporator, condenser, compressor and at least one motor mounted thereon; yielding means for sustaining the support of said unit by the supporting means of the window board with said condenser exposed to the air at one side of the window board and said evaporator exposed to the air at the other side thereof; and yielding isolating means coacting with said window board and unit to inhibit air flow between the evaporator and condenser while permitting vibratory movement of said unit relatively to said window board.

17. In a window mounted air conditioner, the combination of a window board including means for fixing the same rigidly between the sill and the partially raised sash of a double-hung window, said window board having an opening for the insertion therethrough of a refrigerative air conditioner and supporting means for the unit when so inserted; a refrigerative unit including a support and a refrigerative circuit inclusive of evaporator, condenser, compressor and at least one motor mounted thereon; yielding means for sustaining the support of said unit by the supporting means of the window board with said condenser exposed to the air at one side of the window board and said evaporator exposed to the air at the other side thereof; yielding isolating means coacting with said window board and unit to inhibit air flow between the evaporator and condenser while permitting vibratory movement of said unit relatively to said window board; and a ported housing removably mounted on said window board on the room side thereof to enclose and conceal said unit.

18. In a window mounted air conditioner, the combination of a window board adapted to fill the space beneath the partially raised sash and the sill and lateral sash guides of a window, said window board having an opening for the insertion therethrough of a refrigerative air conditioner; means for locking said window board rigidly to the frame element of the window; means for locking said window board rigidly to the sash element of the window; a refrigerative unit including a support and a refrigerative circuit inclusive of evaporator, condenser, compressor and at least one motor mounted thereon; means for yieldably sustaining the support of said unit on the window board with the unit extending through the opening in the window board so that the condenser and compressor are exposed to the air on one side of said window board and the evaporator is exposed to the air on the other side of the window board; and yielding isolating means coacting with said window board and unit to inhibit air flow between the evaporator and condenser while permitting vibratory motion of said unit relatively to said fixed window board.

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