

Feb. 13, 1940.

C. H. NEIMAN

2,190,242

AIR CONDITIONER

Filed July 8, 1939

2 Sheets-Sheet 1

Fig. 1

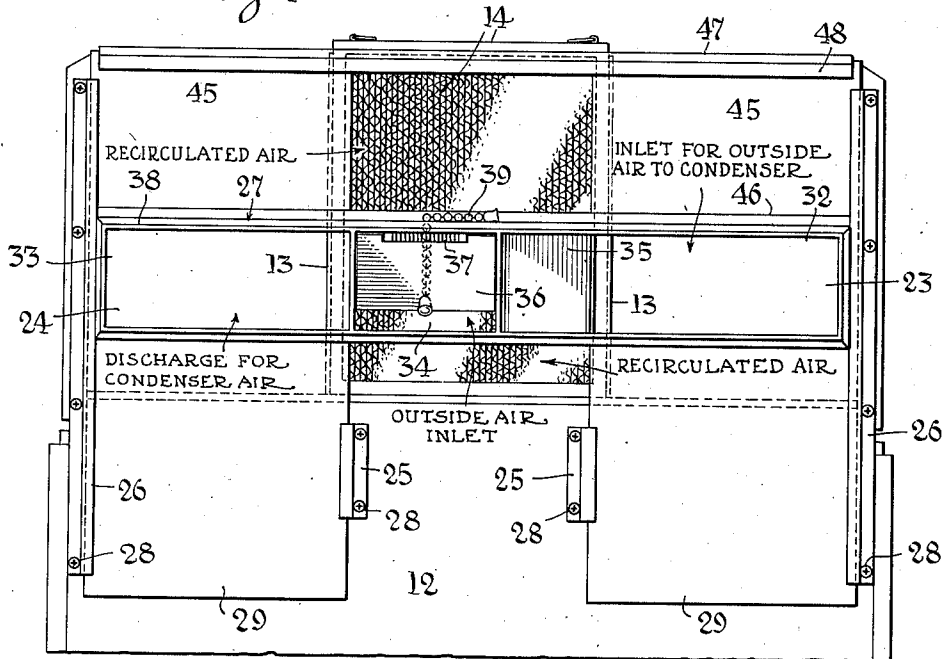
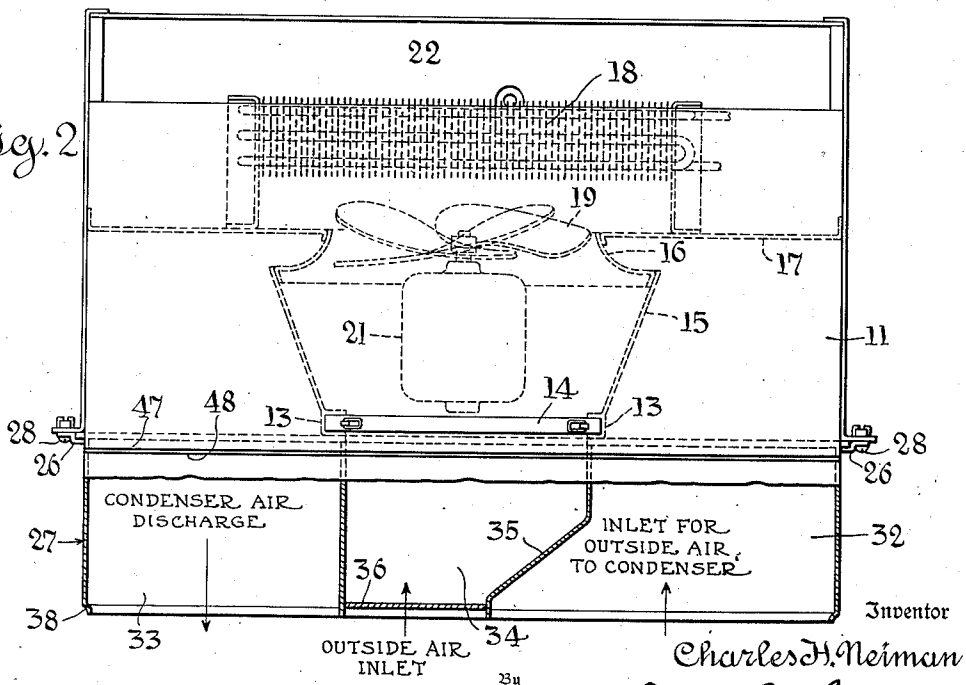


Fig. 2



Inventor
Charles H. Neiman
Dodge and Inn
Attorneys

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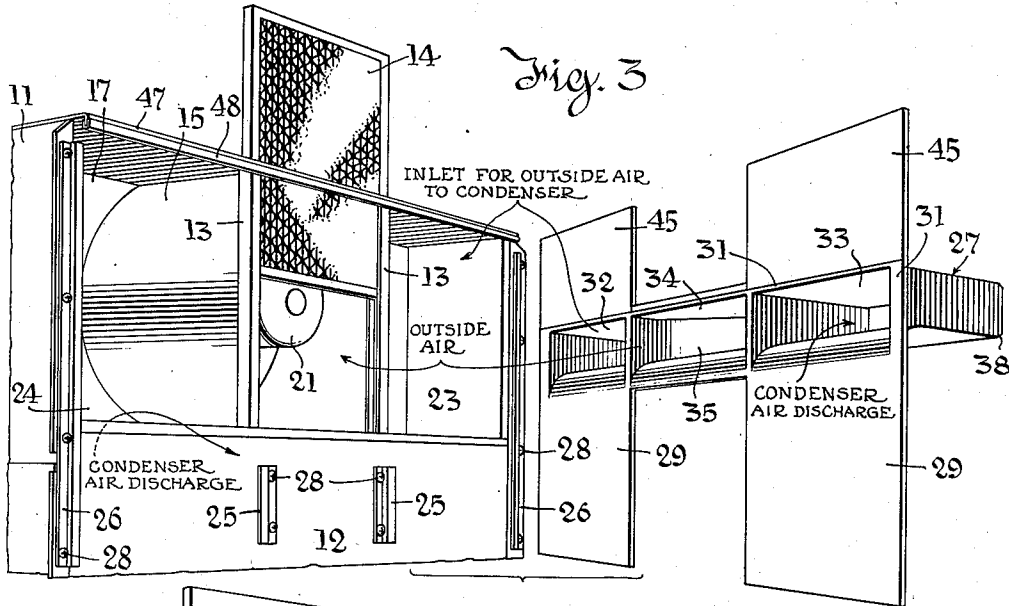
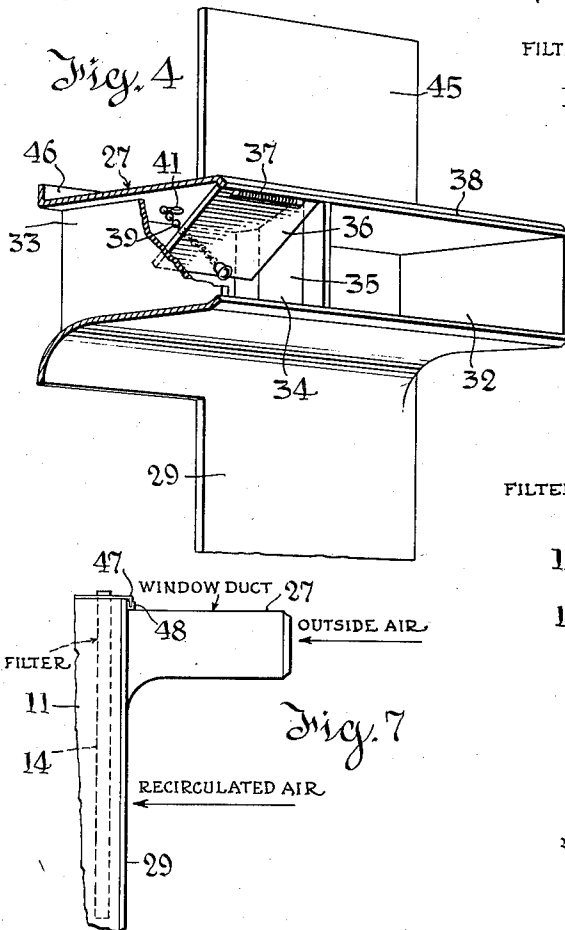
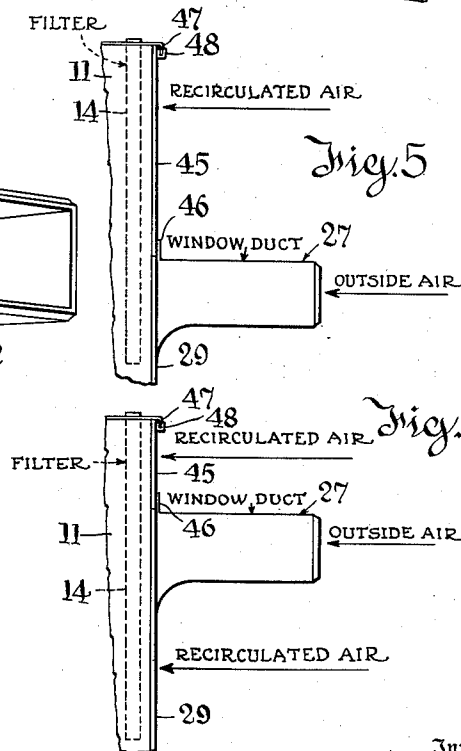
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Inventor
Charles H. Neiman
Dodge and Son.
Attorneys

UNITED STATES PATENT OFFICE

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AIR CONDITIONER

Charles H. Neiman, York, Pa., assignor to York
Ice Machinery Corporation, York, Pa., a cor-
poration of Delaware

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6 Claims. (Cl. 62—129)

This invention relates to air conditioners of the so-called "portable type" in which the condenser is air cooled.

In air conditioners of the portable mechanically refrigerated type, the usual practice is to install the unit in front of a window, the top of the unit being somewhat higher than the window sill. A window board is positioned to close the interval between the sill and the partly raised sash. This window board always has separate ports, one affording a supply connection and the other affording a discharge connection for the condenser air circuit. The air entering the supply connection flows to the lower portion of the conditioner unit, absorbs heat from the compressor and its driving motor and then enters a circulating fan which discharges it in heat exchanging relation with the condenser to the outlet connection. Thus, the condenser air circuit draws air from out of doors, passes it through the lower portion of the conditioner housing and returns it out of doors. There is a wholly separate air circuit which draws some or all of its air from the room, passes it through a filter, then in heat exchanging relation with the evaporator of the refrigerating unit, and delivers the air to the room. It is desirable to deliver to this circuit a regulable amount of fresh air and one of the features of the present invention is a construction such that this air is drawn from out of doors through an independent port in the window board and is caused to pass through the same inlet and through the same air filter as does air drawn from the room.

In installing devices of this sort, it is desirable to use a standardized window board. Since the height of the window sill above the floor is subject to considerable variation, according to the design of the building, some means must be provided to afford a vertically adjustable connection between the window board and the casing of the unit. While this is a relatively simple matter, so far as the condenser air circuit is concerned, the need for providing for fresh air for the room circuit has heretofore introduced considerable complication. Recourse has usually been had to a damper arranged between the condenser air inlet and the room air circuit. It is difficult to find space for such a damper and there are incidental objections involving pressure differentials between the two air circuits which render this scheme undesirable.

The present invention provides a very simple arrangement in which the air connections are vertically adjustable. To produce the desired

result the window duct which connects with the window board is vertically adjustable relatively to the conditioner and so arranged as to deliver fresh air to the same inlet port and to the same air filter which receive re-circulated air from the room.

The construction provides vertical adjustment through a considerable range. In all of its adjusted positions, the window duct exposes the same total area of the room circuit inlet filter to re-circulated air and to fresh air supplied through a portion of the window duct unit.

Because no part of the adjustable inlet connection may project above the top of the unit, recourse is had to small filler pieces of insulating board which are cut to size at the time of installation. These are so dimensioned as to close the interval between the duct and the top of the unit on each side of the room circuit inlet. The intervals between the window duct and the casing on each side of the room air inlet below the window duct are closed by pendant portions of the adjustable window duct member. Consequently, all that is necessary in installing the unit is to set the window duct to the proper height, insert filler pieces of the proper dimension and connect the unit with the window board.

This provides an ideal arrangement as to air circulation, permits the fresh air damper to be mounted in the fresh air passage in the window duct and so directs this air that a single filter is used for both the fresh and the re-circulated air.

A preferred embodiment of the invention will now be described in connection with the accompanying drawings in which:

Figure 1 is a view in elevation of the upper portion of the rear of the unit showing the window duct in an intermediate position a few inches above the lowest position to which it is adjustable.

Figure 2 is a plan view partly broken away to show the interior construction of the window duct.

Figure 3 is a perspective view showing the window duct and the rear of the unit as they would appear if the window duct were swung away from its normal position and the filter partly withdrawn from its guides.

Figure 4 is a fragmentary perspective of the window duct showing the fresh air damper about half-way open.

Figure 5 is a fragmentary side elevation showing the duct in the lowermost position to which it may be adjusted.

Figure 6 is a similar view showing the window duct adjusted to an intermediate position such as that shown in Figure 1.

Figure 7 is a similar view showing the window duct adjusted to the highest position it may assume.

In all the views, the external ornamental casing which covers the front, top and sides of the unit, but not the back, is omitted. This casing merely encloses the insulated metal housing of the unit proper and since it has no function in connection with the present invention, there is no occasion to illustrate it.

Similarly, the window board, which might assume any one of a number of known forms, is omitted from the drawings. Such window boards have long been well-known in the art and any window board which could connect with the window duct here described may be used. All that the window board does is to provide a ported closure beneath the lower sash of the window, and its particular form is immaterial so long as it provides a port or slot whose height and width conform to the corresponding dimensions of the end of the window duct.

Referring first to Figure 3, 11 represents the sheet metal housing of the unit proper and 12 is a removable back plate which gives access to the compressor, the motor which drives the same, the condenser, a condenser fan, and other standard components of units of this general type. Since the form and arrangement of these parts is subject to wide variation, no attempt at illustration is made.

Mounted vertically above the back plate 12 and extending to the top of the unit are two vertical channel guides 13 which terminate in a slot formed in the upper wall of the housing 11. Into these guides is inserted a rectangular filter element 14 which may be of the oil-coated screen type. The space between the guides 13, i. e., the entire area of the filter 14, is the inlet to the room air circuit. This inlet leads to the interior of a conical housing 15 (see Fig. 2) terminating in a shroud ring 16 fixed in the center of a cross-partition 17.

Forward of the partition 17 is the evaporator 18 of the refrigerating circuit. A fan 19 driven by an electric motor 21 is centered within the shroud ring 16 and operates to draw air through the filter 14, force it into contact with the finned evaporator coil 18 and thence into a plenum chamber 22. From the plenum chamber 22, the air which has been cooled and dehumidified by passage over coil 18 is discharged into the room. In the particular machine illustrated in the drawings, the discharge is through the top of the housing 11. So far as the present invention is concerned, the location of the discharge opening is wholly immaterial provided it delivers air to the room.

The condenser cooling air enters through the opening 23 outside the conical housing 15, flows downward over the compressor, thence enters the condenser cooling fan which forces it in heat exchange relation with the condenser, and then flows upward to and discharges through the condenser air discharge opening 24.

Vertically adjustable in guides 25 and 26 is the multiple ported window duct element 27. The guides 25 and 26 are clamped to the housing 11 by screws 28. The guides are so dimensioned that when the screws are set up the guides serve also as clamps and fix the window duct element 27 in its vertically adjusted position. The win-

dow duct element 27 has a flat face which seats against the rear of the conditioner unit and has two pendant portions 29 which overlap the plate 12 and which are sealed thereto by any suitable gasket material such as sponge rubber. To avoid confusion in the drawings, no attempt is made to illustrate the sponge rubber as a separate element but it is to be understood that it is cemented over the rear faces of the members 29 and over rear faces of the marginal frames 31 of the window duct element 27. Thus, when the duct is clamped in position, a reasonably airtight seal is provided between the window duct element 27 and the conditioner unit housing 11.

The window duct element 27 provides three passages, namely, the condenser air inlet passage 32 which leads to the opening 23; a condenser air discharge passage 33 which leads from the opening 24; and a fresh air inlet passage 34 which, at its inner end, is coextensive in width with the guides 13 and seals therewith.

Because the fresh air inlet need not be large, an offset indicated at 35 is provided in the partition between the ducts 32 and 34. This gives a large entrance aperture for outside condenser air and affords a relatively narrow inlet for fresh air to be supplied to the room circuit. This inlet is controlled by a damper 36 which is hinged at its upper edge to a portion of the window duct by means of a spring hinge 37 which urges the damper 36 in a closing direction. The outer end of the duct member 27 is provided with an offset at 38 designed to mate with the aperture in the window board. This offset serves as a flange or jamb against which the lower edge of the damper 36 seats when fully closed.

The damper may be drawn open and latched in any desired open or partially open position by means of a bead chain 39 which passes through a key hole slot 41 in the top of the window duct and may be engaged with the narrow portion of the slot by moving the chain laterally after it has been drawn upward.

Assuming a window having a very low sill, the window duct might be set in its lowermost position as shown in Figure 5. In this position the lower margin of the duct registers approximately with the lower margin of the air ports in the back of the unit. This would leave openings from the room leading above the window duct unit to the condenser inlet opening 23 and the condenser discharge opening 24. These openings are closed by inserts 45 which are engaged at the lower edges behind the flange 46 on the top of the window duct element.

At their tops the inserts enter behind a flange 47 provided with a rubber gasket 48. The gasket is U-shaped in cross section as shown in Figures 5 to 7 inclusive. One side edge of each insert is engaged by a guide 26 and the other overlaps the guideway 13 and seals therewith. These inserts are made of brittle insulating board which may be scored to the desired dimensions and which, when scored, may be broken readily on the score lines.

In the average case, the proper position of the window duct will be an intermediate one as indicated in Figures 1 and 6, in which event the inserts 45 are of somewhat different dimensions but otherwise identical with similar inserts shown in Figure 5.

In Figure 7, the highest position of the window duct is illustrated. In such case, the inserts 45 are not required because the top of the duct seats against the gasket 48.

It will be observed that in all adjusted posi-

tions of the window duct element the pendant portions 29 are effective to close the condenser inlet opening 23 and the condenser discharge opening 24 below the window duct element.

In all positions, the fresh air inlet passage 34 delivers to a portion of the filter 14, the area of which portion is fixed. In the adjustment of Figure 5, all the recirculated air enters the unit above the window duct, whereas in the position of Figure 7 it all enters below the window duct. In the usual case of intermediate adjustment illustrated in Figure 6, a part of the recirculated air enters above and a part below the window duct.

The invention affords a very simple adjustment which will adapt a given unit to windows having different heights of sill. In all of these, the fresh air duct leads directly from out of doors to the filter 14 and the total inlet area to the room air circuit is constant except to the extent that it may be varied by adjusting the fresh air damper 36.

It follows that the unit operates in the same way regardless of the vertical adjustment of the window duct. Since the fresh air is taken directly from out of doors and not from the condenser air circuit, the adjustment of the fresh air damper has no effect on the condenser cooling air flow and possible pressure differentials are not disturbing.

After the window board is in place and the window duct has been adjusted to proper height, the whole conditioner unit may be rolled away from its normal operating position for the purpose of window washing or the like. The unit is customarily mounted on casters for this purpose. The conditioner may be readily reconnected with the window board by rolling the unit back to place.

The filter 14 is accessible for removal and replacement after removing the ornamental housing (not shown) and withdrawing the filter from its guides as indicated in Figure 3.

An important incidental advantage of locating the recirculated air inlet in the rear wall of the unit arises from the fact that heating radiators are usually located under windows. Room coolers in which the present invention is embodied are commonly mounted in front of such radiators, and include means for running the room circuit fan 19 alone. In the winter the unit can be used as a circulating ventilator, drawing room air from a point immediately in front of the heating radiator, together with a regulable percentage of outdoor air, mixing the two and delivering the mixture to the room.

While it is preferable to locate the fresh air inlet opening between the other two openings, because this makes it conveniently possible to locate the room discharge opening at the top or front of the cabinet, other arrangements are possible, and in some instances, it will be found desirable to locate the fresh air inlet opening otherwise. For example, the fresh air opening might be at one end, the condenser discharge at the other, and the condenser inlet between. Such an arrangement would have the advantage of separating the fresh air inlet as widely as possible from the condenser discharge. An important reason for using separate fresh air ducts for the condenser air circuit and the room air circuit is to assure that the large condenser fan cannot draw all the entering fresh air. The separate duct also offers a convenient location for the fresh air damper.

Thus, while one embodiment of the invention

has been described in considerable detail, it should be understood that the particular construction of the window duct is affected to some degree by details of the design of the unit with which it is to be used. Consequently, the description here given should be taken as illustrative and not limiting. The scope of the invention will be defined in the claims.

What is claimed is:

1. The combination of a conditioner having an enclosing wall provided with a room circuit air inlet opening and separate inlet and discharge openings for condenser air; a duct element whose vertical dimension is less than that of said openings, said element being vertically adjustable relatively to said wall and having ducts adapted to afford distinct communications from said discharge opening and to said inlet openings; means for fixing said duct element in adjusted position; and means for closing portions of said condenser air openings both above and below said duct element.

2. The combination of a conditioner having an enclosing wall provided with a room circuit air inlet opening and separate inlet and discharge openings for condenser air; a duct element whose vertical dimension is less than that of said openings, said element being vertically adjustable relatively to said wall and having ducts adapted to afford distinct communications from said discharge opening and to said inlet openings; means for fixing said duct element in adjusted positions; means carried by said duct element for closing such portions of said condenser air openings as are below the lower margin of the duct element proper; and inserts arranged to close portions of the condenser air openings above the upper margin of the duct element.

3. The combination of a conditioner having an enclosing wall provided with a room circuit air inlet opening and separate inlet and discharge openings for condenser air; a duct element whose vertical dimension is less than that of said openings, said element being vertically adjustable relatively to said wall and having three distinct ducts each positioned to align horizontally with a corresponding opening; an adjustable damper in the duct which leads to the room air inlet opening; means for fixing said duct element in adjusted positions; and means for closing the portions of said condenser air openings above and below said duct element.

4. The combination of a conditioner having an enclosing wall provided with three horizontally aligned openings of substantially equal height, one of said openings being an inlet opening for the room air circuit and the other two being respectively inlet and discharge openings for condenser cooling air; a duct element whose horizontal dimension is sufficient to span said three openings, and whose vertical dimension is substantially less than the vertical dimension of said openings, said duct element being vertically adjustable relatively to said wall and having at least two ducts, one of which is a discharge duct for the condenser cooling air and the other of which is a supply duct; means for fixing said duct element in adjusted positions whereby it overlaps chosen portions of said openings; and means for closing the exposed portions of the condenser air circuit openings.

5. The combination defined in claim 4 in which at least a portion of the means for closing the exposed portions of the condenser air openings

is carried by and adjustable with said duct element.

6. The combination of a conditioner having an enclosing wall provided with three horizontally alined openings of approximately equal vertical dimension, one of said openings being a room circuit air inlet and the other two being respectively an inlet and a discharge opening for condenser cooling air; guide ways defining the margin of the first-named opening; a filter removably mounted in said guide way; a duct

element whose vertical dimension is less than that of said openings, said duct element being vertically adjustable relatively to said wall and having three ducts adapted to communicate with said openings; an adjustable damper in the duct which communicates with the room circuit air inlet opening; means for fixing said duct element in adjusted positions; and means for closing those portions of the condenser air circuit openings which are exposed by said duct element.

CHARLES H. NEIMAN.