Jan. 11, 1938. H. K. STEINFELD ET AL 2,105,205

AIR CONDITIONING APPARATUS

Filed Feb. 25, 1933 3 Sheets-Sheet 1

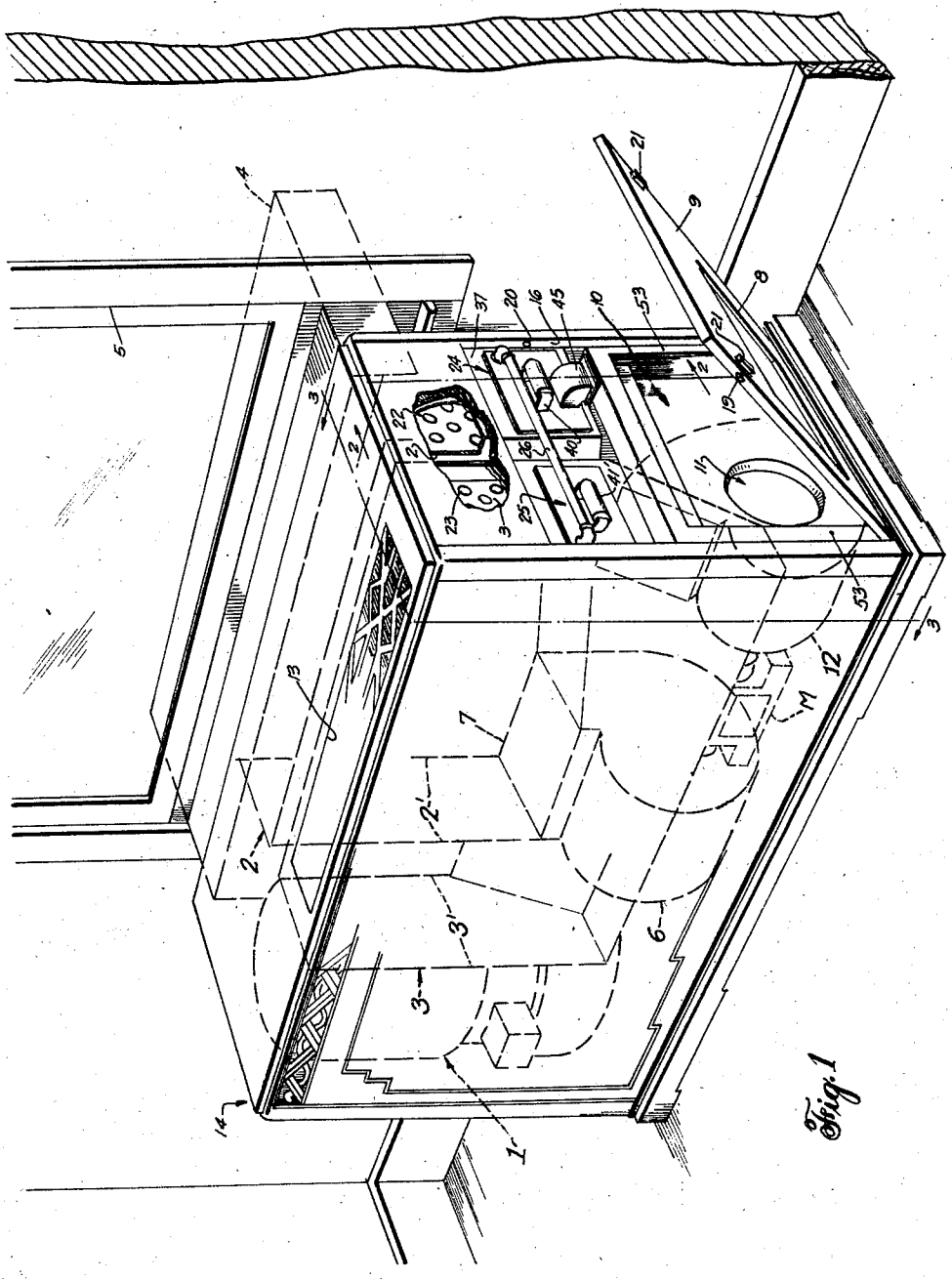


Fig. 1

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Fig. 3

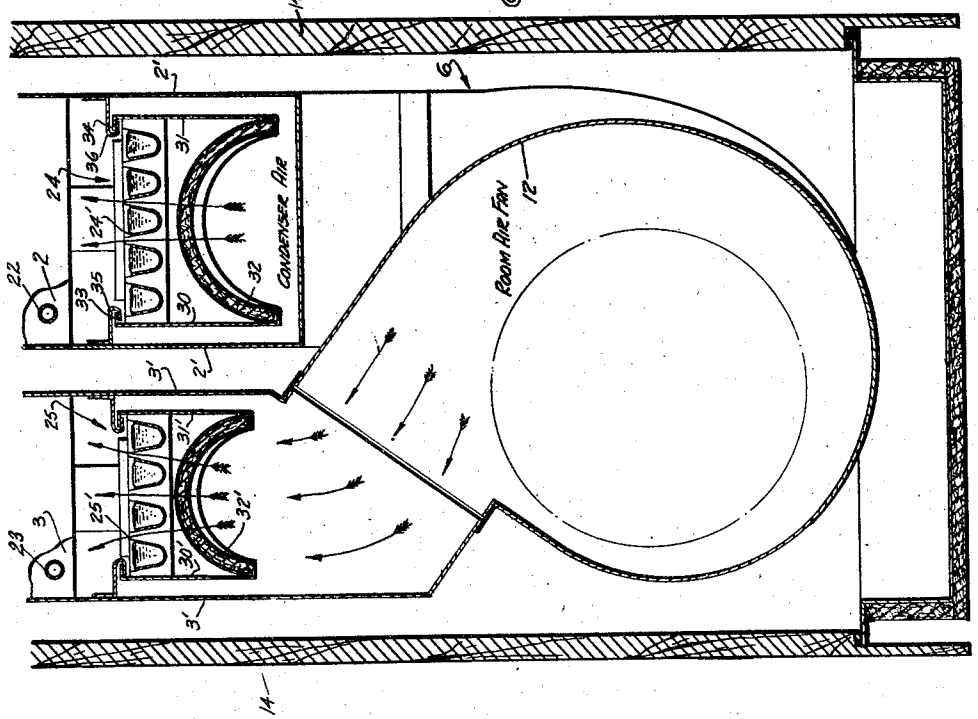
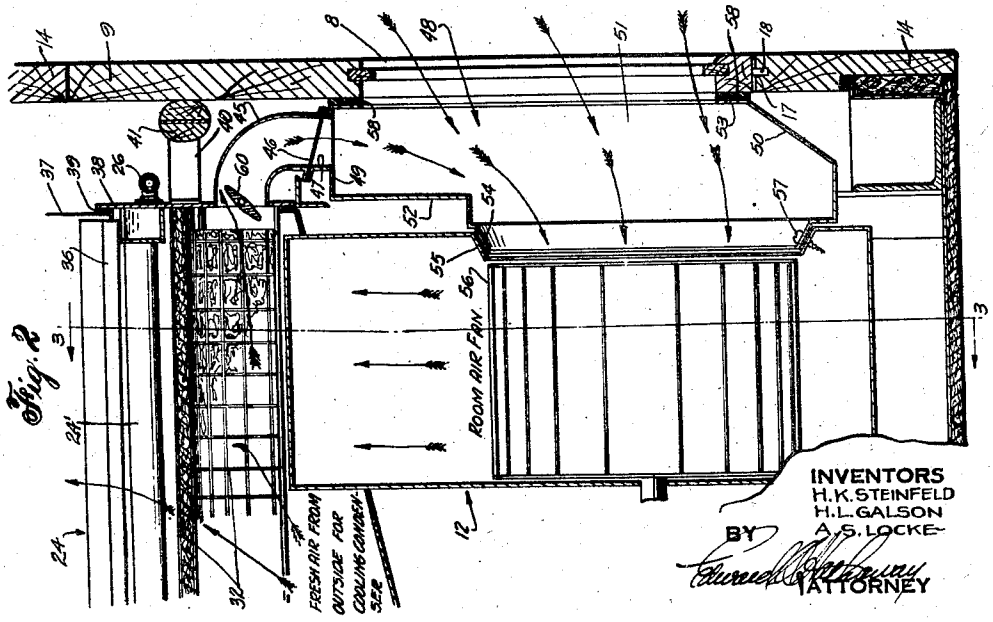


Fig. 2



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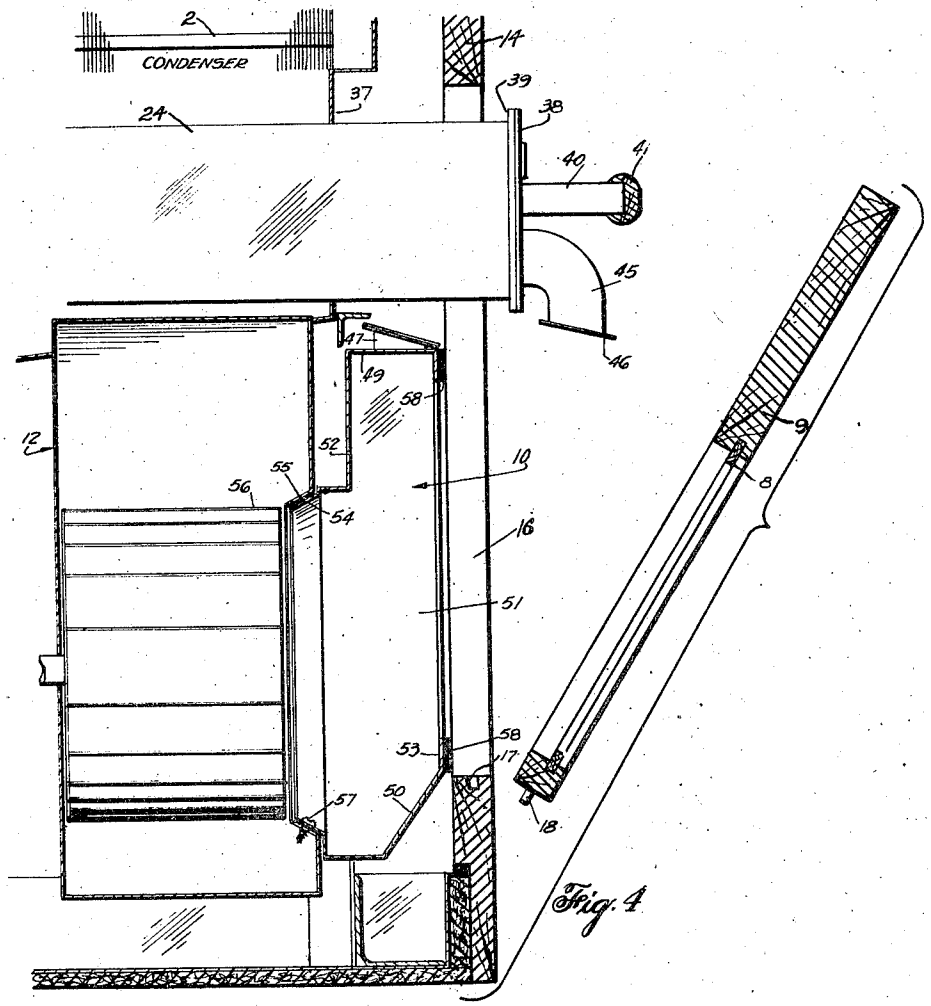


Fig. 4

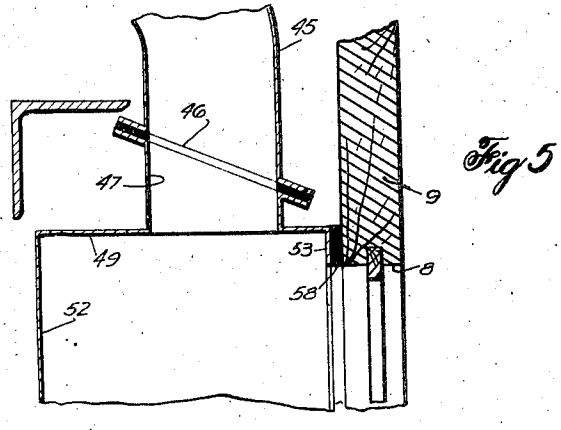


Fig 5

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Patented Jan. 11, 1938 2,105,205

UNITED STATES PATENT OFFICE

2,105,205

AIR CONDITIONING APPARATUS

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Application February 25, 1933, Serial No. 658,610

11 Claims. (Cl. 62—129)

This invention relates generally to air conditioning apparatus preferably of the self-contained room cooler unit type and more particularly to improved ventilating means and means for snugly holding in operative position a removable tray and a normally breakable ventilator joint, thereby to minimize air leakage and to avoid vibration of movable parts while at the same time maintaining convenient and easy removal thereof.

In an air conditioning unit of the type which is herein specifically disclosed for purposes of illustration, a self-contained compression refrigerating system is employed in combination with complementary heat exchange elements specifically a condenser and an evaporator for cooling room air circulated thereover, although it will of course be understood that various other refrigerating systems might be used and also that the unit may be used for heating a room merely by interchanging the condenser and evaporator functions of the heat exchange elements. With any system that might be employed it is preferable to use a condensate tray removably disposed within the unit and also to supply fresh air to the recirculated room air.

One object of our invention is to provide improved means for conducting and directing air through the unit whereby the air may be cooled, dehumidified and filtered before being discharged to the room. Another object in this respect is to provide an improved air chamber for cooperation with the room air circulating means and a further object is to provide improved means for supplying fresh outside air to the room air circulating means while at the same time permitting this fresh air supply connection to be normally readily breakable or separable and yet easily be made tight in its operative position. Another object is to provide an improved ventilating or fresh air arrangement in combination with a removable tray which herein specifically is a combined filter and condensate disposal tray placed in the path of flow of the outside air over the condenser although the tray may be used only for the filter function or the condensate function. Another object is to provide improved means for snugly holding in position said tray and ventilator joint and to similarly hold another tray specifically used for condensate collecting purposes. A further object is to permit said trays to be individually readily removed when the holding means is released although it will be understood that only a single tray for either collecting or disposal or both may be used.

A further and more specific object is to have the condensate disposal tray provided at its end with a short downwardly projecting elbow terminating preferably in a sloping surface which in normal position has a wedging contact with the wall of said end chamber through which the room air passes in flowing to the room air blower.

Another object is to press said trays and wedging contact in a snugly held position by means of a door disposed preferably in one end of the cabinet although it will of course be understood that various other positions or removable side portions of either the cabinet or wall of the unit may be employed to effect this function irrespective of whether the trays are removed longitudinally through the end of the cabinet or from some other position or direction.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings which represent for purposes of illustration one specific embodiment which the invention may take among other possible forms and wherein:

Fig. 1 is a perspective of the room cooler unit placed in a room adjacent a suitable opening therein such as a window to permit communication with the outside atmosphere for purposes of cooling the condenser;

Fig. 2 is a vertical longitudinal section of one end of the room cooler unit showing the condensate disposal tray and breakable ventilating connection held in their normal operative position by the end door of the cabinet, this section being taken on a plane generally indicated by the line 2—2 of Fig. 1;

Fig. 3 is a vertical transverse section taken substantially on the line 3—3 of Figs. 1 and 2 and showing the construction for longitudinally slidably supporting the condensate collecting and disposal trays and for filtering the room air and condenser cooling air;

Fig. 4 is a vertical longitudinal section through the right end of the unit and showing the cabinet and door removed together with partial removal of the condensate tray with its ventilating connection broken, this section being taken generally on the plane indicated by the line 2—2 of Fig. 1;

Fig. 5 is an enlarged vertical section of the breakable ventilating connection and contact between the room air and chamber and cabinet door.

The construction, arrangement of parts and mode of operation of the particular type of room cooler unit herein disclosed is the same as shown in detail in the applications of Henry L. Galson, Serial No. 648,772, filed December 24, 1932, and Charles R. Neeson, Serial No. 656,487, filed February 13, 1933, except for the differences herein set forth. Therefore it will suffice to state for purposes of this application that the unit includes a vertical axis motor-compressor unit generally indicated at 1 adapted to compress a suitable refrigerant which is condensed in a condenser generally indicated at 2 from which liquid re-

frigerant passes through suitable pressure reducing means for evaporation in an evaporator generally indicated at 3. The reference numbers 2' and 3' generally indicate the vertical passages in which the condenser and evaporator per se are disposed. The condenser is cooled by outside air flowing inwardly through one portion of a duct 4 projecting rearwardly through a suitable window or opening 5 of the room and thence flows downwardly over motor-compressor unit 1 and into an outside air blower 6 and thence upwardly from its outlet 7 and over condenser 2 to the outside atmosphere through another passage portion of duct 4. The room air enters a suitable opening 8 in a cabinet door 9 and thence flows through an end air chamber 10 to the inlet 11 of a room air blower 12 from which the air flows upwardly over the evaporator 3 to be cooled thereby and thence through a room outlet 13 formed in the top of the cabinet 14, said outlet 13 and inlet 8 each being provided with a suitable grille or perforated cover. The blowers 6 and 12 are driven from a common motor M.

As generally shown in Fig. 1, one end of the cabinet is provided with a doorway provided as shown in Fig. 4 with a groove 17 to receive a tongue 18 on the lower edge of door 9. Any suitable locking means may be employed to hold the upper end of the door in position in doorway 16, one form of such means herein being shown as spring held balls 19 adapted to be pressed laterally into suitable small recesses 20 in each of the sides of doorway 16. This arrangement permits the door to be easily opened merely by pulling outwardly on handles 21 and then slightly raising the door to free tongue 18 of its groove 17.

Beneath the condenser and evaporator, whose tubes are shown in Fig. 1 at 22 and 23 respectively, are disposed a condensate disposal tray generally indicated at 24 and a condensate collecting tray generally indicated at 25, whereby humidity in the room air which is condensed on the surface of the evaporator will drip down and collect preferably in suitable troughs 25', Fig. 3, of tray 25 and thence be conducted laterally through any suitable removable pipe 26 to suitable troughs 24' in tray 24, thereby to be entrained by the upward flow of outside air between said troughs and be evaporated by contact with the hot condenser surface and thence discharged to the outside air through duct 4.

As shown more clearly in Fig. 3 the trays may be of any suitable construction but herein comprise sides 30 and 31 extending longitudinally for substantially the full length of the condenser. The longitudinally extending laterally spaced troughs 24' are supported by sides 30 and 31 near their upper edges while the lower portion of the sides supports an arched air filter 32 extending for substantially the full length of the tray and removable therewith as disclosed in said Neeson application. As far as the present invention is concerned, it will suffice to state that the tray is longitudinally slidably supported by flanges 33 and 34 formed on the upper edges of sides 30 and 31 and disposed in suitable guideways 35 and 36 carried by the walls 2' of the air passage leading to condenser 2. A suitable opening is formed in the end wall 37 of this passage to receive the tray. The tray carries an end plate 38 which overlaps the edges of said opening thereby to permit a piece of rubber or other suitable yieldable material 39 to be interposed between said cover and end wall 37. A handle projects outwardly from cover 38 and comprises preferably flat spring material 40 having a wood handle grip 41 which may also be made of any suitable yieldable material such as rubber.

As shown in Fig. 3 the condensate collecting tray 25 is identical in construction to the disposal tray 24 except as to being somewhat smaller in overall cross sectional dimensions. A filter 32' is supported between the sides 30' and 31'. In each tray it will be noted that the air may flow upwardly between the open lower sides of the trays to pass through the filters and then between the condensate troughs. Hence it is seen that both the condenser air and room air are filtered and also that the condenser is cooled by fresh air continuously brought in from the outside through duct 4.

To ventilate the room by supplying fresh air thereto, I provide a short elbow duct 45 secured to the end plate 38 of the disposal tray, this elbow duct communicating with the passage in which tray 24 is disposed thereby permitting some of the fresh air supplied to said passage for cooling the condenser to be diverted and supplied to the room air. As shown more particularly in Figs. 2 and 4 elbow 45 has a normally breakable joint comprising specifically a sloping or inclined end 46 adapted to register with a complementary inclined end of a passage 47. This passage 47 projects upwardly from the walls of the end air chamber generally indicated at 10. This chamber is substantially rectangular in front view as seen in Fig. 1 and has an upper horizontal narrow side 49 and a lower transversely disposed partially upwardly inclined narrow side 50 connected at each end by vertical sides 51 and an inner wall 52. The sides 51 and upper and lower sides 49 and 50 have an inturned flange 53 to provide an opening of preferably substantially the same size and shape as the room air inlet opening 8 formed in the cabinet door 9. This chamber is brought into close cooperating relation with the casing of fan 12 preferably by the provision of a conical member 54 projecting inwardly from the rear wall 52. This abutting or conical member 54 is held in substantially nested relation to a complementary conical surface 55 of the casing of fan 12. Suitable yieldable or other insulation is interposed between said conical surfaces 54 and 55, each of which has aligned openings communicating with the fan rotor 56. If desired any suitable screws or other temporary holding means 57 may be used, although it will be understood from the description to be presently given that such screws are not absolutely essential. From Fig. 1 it is seen that the end air chamber 48 extends for the full width of the cabinet, thereby permitting a maximum size inlet air opening 8.

With the various elements in their operative relation as shown in Fig. 2, door 9 sufficiently bears upon handle 41 to appreciably press the tray front plate 38 into snug contact with insulation 39 and end wall 37 of the condenser passage and at the same time press the breakable joint 46 in close operative relation. In addition, suitable insulation 58 makes a close fit between the air chamber flange 53 and the door, thus preventing seepage of room air into improper portions of the cabinet. Also it is seen that fresh air diverted through elbow 45 is directed into chamber 48 and therein mixed with the room air to be circulated by fan 12 upwardly through filter 32', thence between the troughs 25' and upwardly over evaporator 3 to be cooled and

dehumidified before being discharged to the room through outlet 13, Fig. 1.

To remove either one or both of the trays 24 and 25 (the latter also being snugly held in position by contact between its handle 40' and door 9) the door is pulled outwardly by handles 21 to release ball latches 19 and then raised upwardly to clear tongue 18 of its groove 17. The pipe 26 then may be suitably disconnected whereupon by grasping handles 40 or 40' the trays may be individually longitudinally slidably removed. Upon removal of tray 24, joint 46 separates thus permitting complete removal of the tray to clean the same or renew the filter. If desired a suitable adjustable pivot valve 60 may be disposed in elbow 45 thereby to variably control the supply of fresh air.

Hence it is seen that we have provided an extremely simple arrangement for not only snugly holding various elements in position so as to avoid leakage and vibration but have also provided an extremely simple and effective means for insuring proper ventilation and permitting removal of the various parts, this arrangement being applicable whether the cabinet is removable from the unit as shown or constitutes fixed inner walls of the unit placed inside of an outer cabinet.

It will of course be understood that various changes may be made in the details of the various elements and arrangements thereof without departing from the spirit of the invention as set forth in the appended claims.

We claim:

1. An air conditioning unit comprising, in combination, a heat exchange element, means for circulating air thereover, a removable condensate tray disposed in the path of said circulated air, means whereby condensate from said tray is sprayed over said heat exchange element, and means for pressing said tray to its normally operative position.

2. An air conditioning unit comprising, in combination, a heat exchange element, means for circulating air thereover, a condensate tray disposed in the path of said air, means whereby condensate from said tray is sprayed over said heat exchange element, and a door in the side of said unit adapted when in closed position to hold said tray in its normally operative position.

3. An air conditioning unit comprising, in combination, a heat exchange element, means for circulating air thereover, a condensate tray horizontally removably disposed in the path of said air, means whereby condensate from said tray is sprayed over said heat exchange element, a handle secured to an outer portion of said tray, and a door adapted when in closed position to press on said handle and hold said tray snugly in its operative position, whereby upon opening of said door said tray may be removed by pulling on said handle.

4. The combination set forth in claim 3 further characterized in that said handle is yieldable.

5. An air conditioning unit having front and end walls comprising, in combination, a refrigerant heat exchange element, means forming a passage whereby air may be circulated in a vertical direction over said heat exchange element, a condensate tray, means whereby condensate from said tray is sprayed over said heat exchange element, means for horizontally removably inserting said tray in said passage through one of said end walls, and a movable portion of said end wall being adapted when in its closed position to press said tray and firmly hold the same in its operative position.

6. An air conditioning unit comprising, in combination, a refrigerating system including a pair of complementary heat exchange elements, means for circulating outside air over one of said elements and room air over the other of said elements, condensate collecting and disposal means removably disposed in said paths of air over said elements, and means including a movable door for snugly holding said condensate collecting and disposal means in their operative position.

7. An air conditioning unit comprising, in combination, a heat exchange element, means for circulating room air thereover including a blower having an inlet opening disposed in a substantially vertical plane, means forming a chamber with an inner vertical side disposed in substantially close operative relation to said blower inlet to directly cover the same whereby room air first enters said chamber and then flows through said inlet to be circulated over said heat exchange element, and a door adapted to be pressed into engagement with the walls of said chamber-forming means to substantially seal the same.

8. An air conditioning unit comprising, in combination, a refrigerating system having a pair of complementary heat exchange elements, means for circulating room air over one of said elements and outside air over the other of said elements, and means forming a separable passage for diverting a portion of said outside air to the flow of room air.

9. An air conditioning unit comprising, in combination, a refrigerating system including a pair of complementary heat exchange elements, blower means for circulating room air over one of said elements and outside air over the other of said elements, a filter interposed between said outside source of air and the heat exchange element over which the outside air flows, and means for diverting a portion of said outside air before it passes through said filter and supplying said diverted air to the flow of room air.

10. An air conditioning unit comprising, in combination, a refrigerant system including a pair of complementary heat exchange elements, blower means for circulating room air over one of said elements and outside air over the other of said elements, a removable condensate tray disposed in the path of said outside air, and means associated with said tray for diverting a portion of the outside air and supplying said diverted air to said flow of room air thereby to add fresh air to the room.

11. An air conditioning unit comprising, in combination, a refrigerant system having a pair of complementary heat exchange elements, means for circulating room air over one of said elements and outside air over the other of said elements, removable condensate collector and disposal trays respectively disposed in the paths of said room and outside air, filters carried by each of said trays, and means for diverting outside air from beneath one of said filters and supplying said diverted air to the room air beneath the filter therefor.

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