April 23, 1940. A. A. FEINBERG 2,197,974

PORTABLE AIR CONDITIONING APPARATUS

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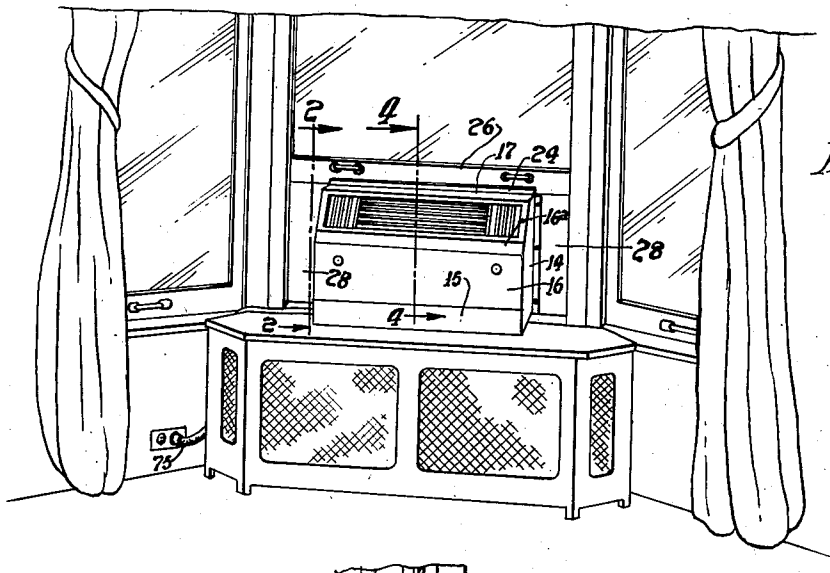


Fig. 1.

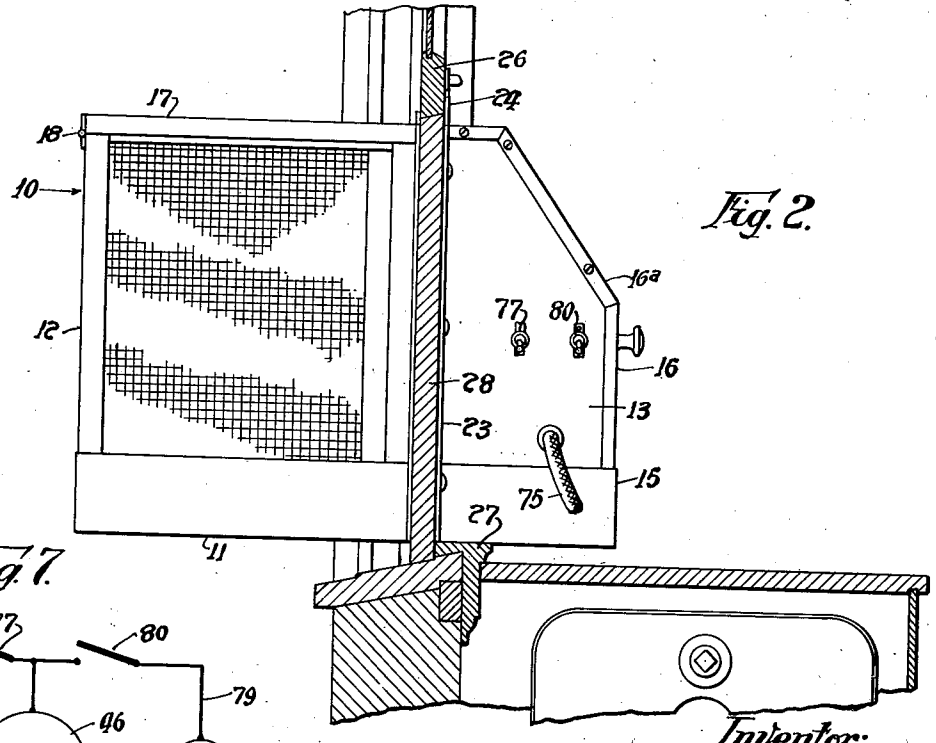
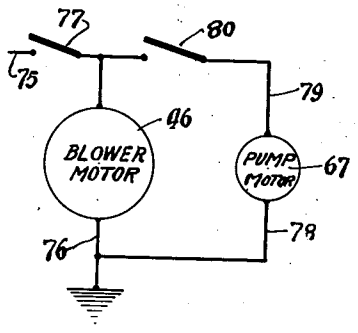


Fig. 2.

Fig. 7.



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PORTABLE AIR CONDITIONING APPARATUS

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Fig. 4.

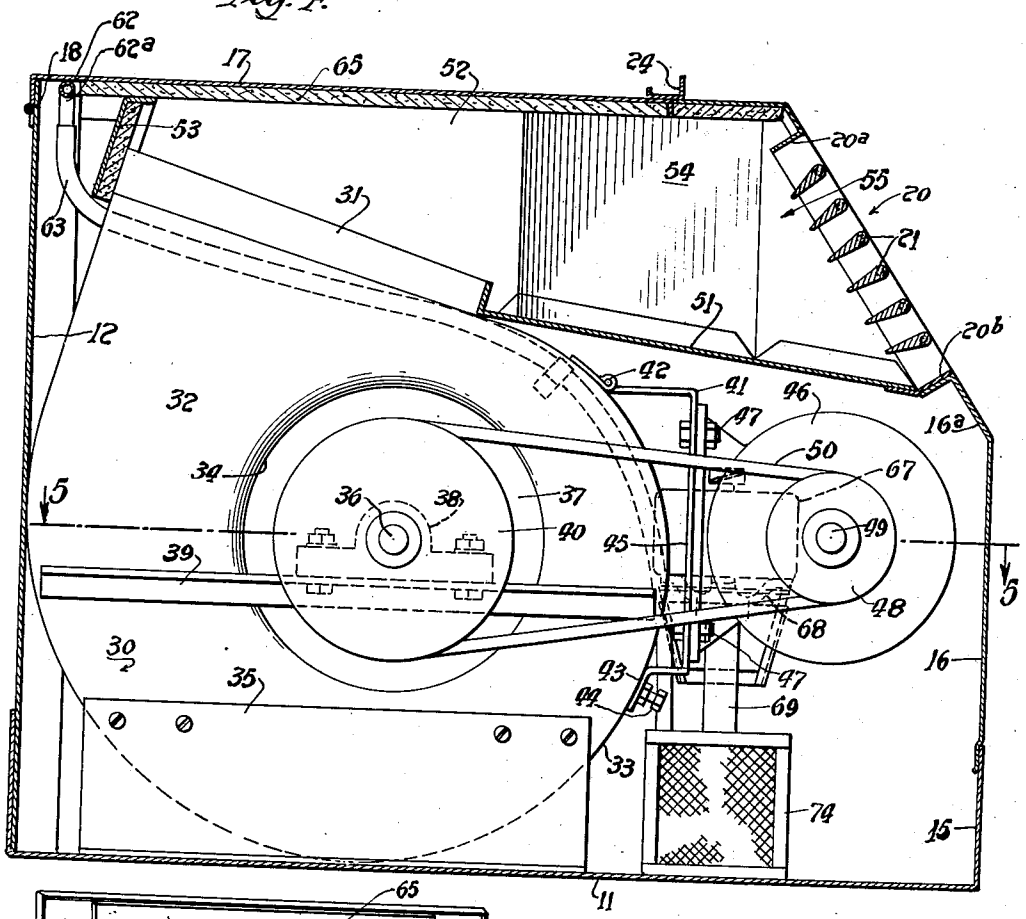
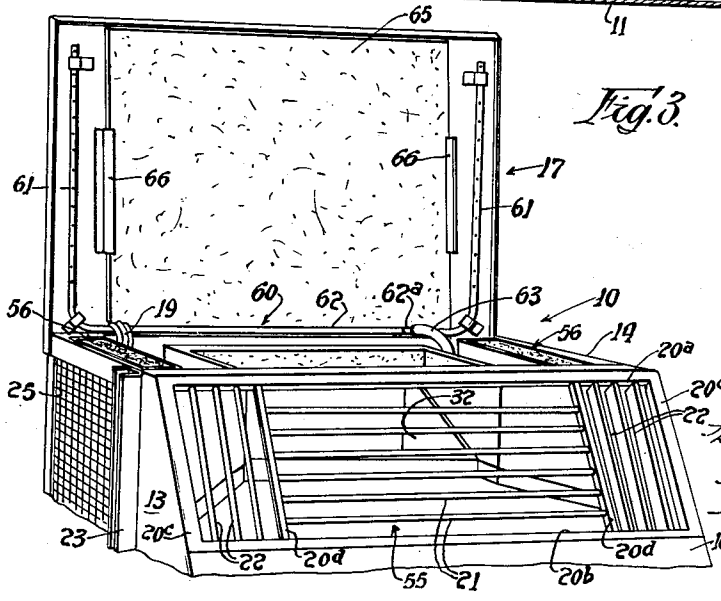


Fig. 3.



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PORTABLE AIR CONDITIONING APPARATUS

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Fig. 5.

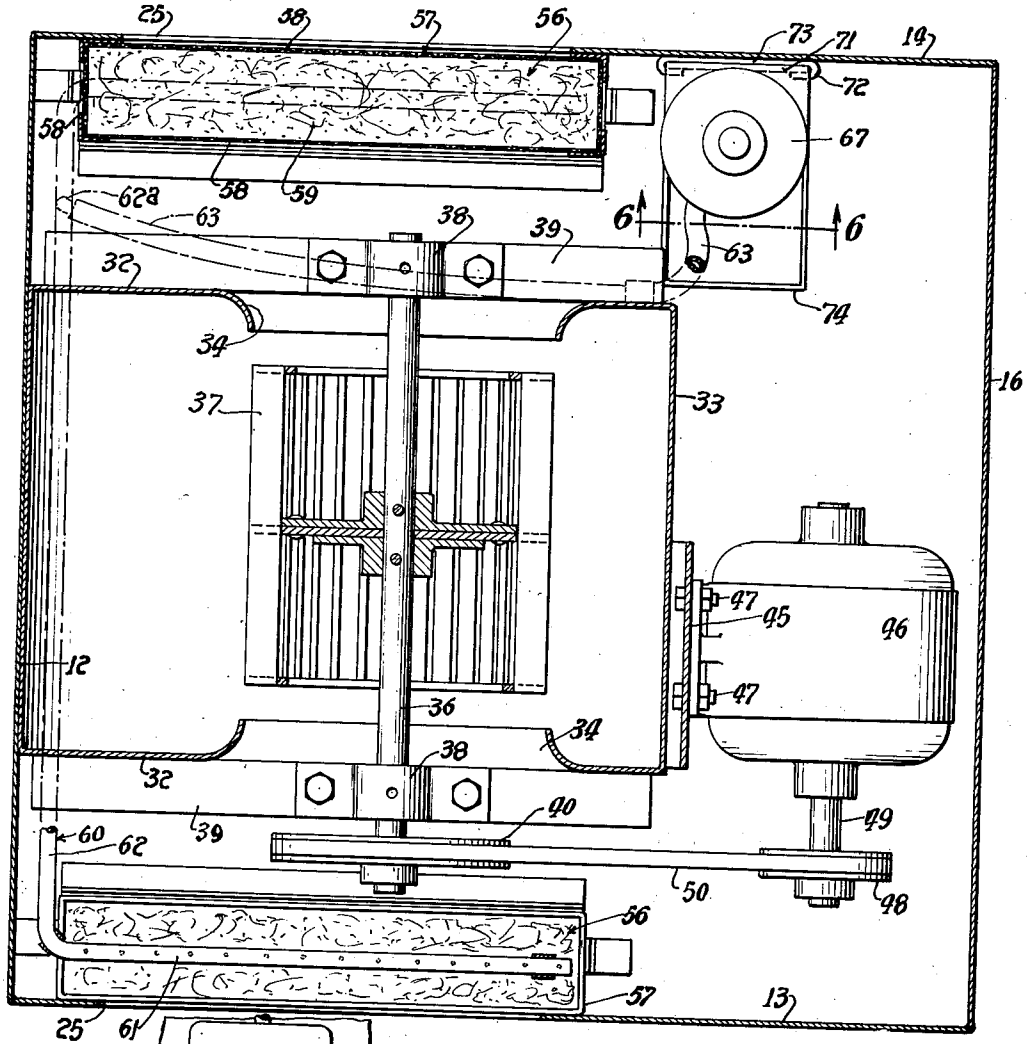
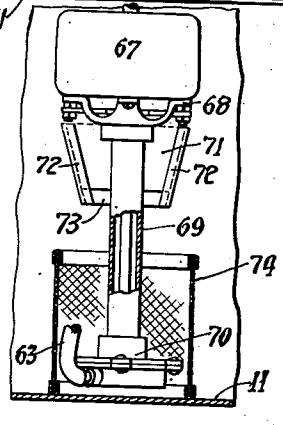


Fig. 6.



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PORTABLE AIR CONDITIONING APPARATUS

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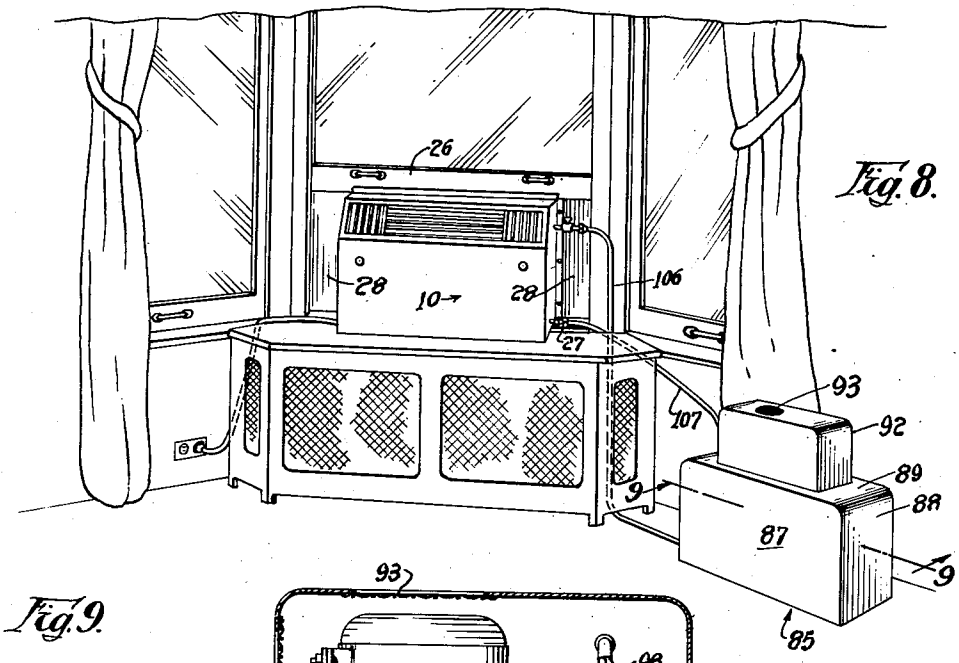


Fig. 8.

Fig. 9.

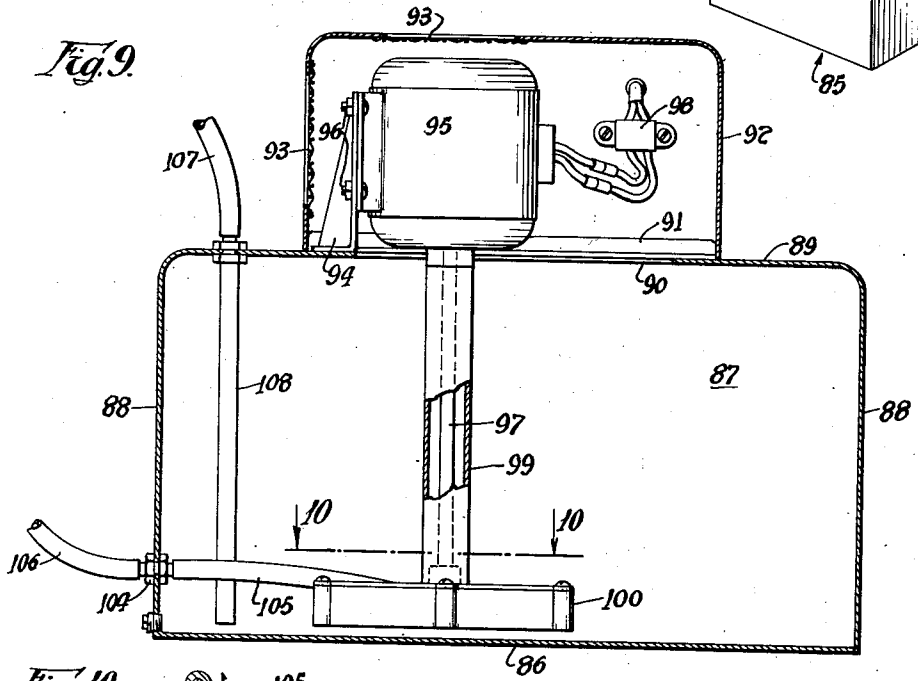
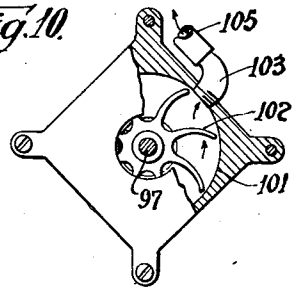


Fig. 10.



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UNITED STATES PATENT OFFICE

2,197,974

PORTABLE AIR CONDITIONING APPARATUS

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Application June 16, 1938, Serial No. 213,997

6 Claims. (Cl. 261—29)

This invention relates to improvements in portable air conditioning apparatus and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The present invention is more particularly concerned with apparatus of this kind in the form of a unit adapted to be positioned in the window opening in a home, small shop, business and professional office, hotel and hospital room and to take in outside atmospheric air and clean, cool, humidify and then diffuse the same through the room or space in which the window opening is located.

One of the objects of the present invention is to provide apparatus of this kind wherein the parts are so formed and correlated as to provide a compact arrangement within a casing of pleasing appearance that may be disposed in an ordinary size of window opening and which apparatus though relatively light in weight for easy handling in placing it in a window opening, is efficient in use for its intended purpose.

Another object of the invention is to provide apparatus of this kind including a casing having an air inlet in which air filtering mats are so arranged as to be easily removed for cleaning purposes and then as easily replaced without requiring the removal of the casing from the window opening for this purpose.

A further object of the invention is to provide improved means whereby the discharged air may be directed for a better diffusion thereof.

The above mentioned objects of the invention, as well as others, together with the advantages thereof will more fully appear as the specification proceeds.

In the drawings:

Fig. 1 is a perspective view of an apparatus embodying one form of the invention, as when positioned in the window opening of a room.

Fig. 2 is a vertical sectional view, on an enlarged scale, through parts shown in Fig. 1, as taken on the line 2—2 of Fig. 1, the apparatus appearing in side elevation.

Fig. 3 is a perspective view of the upper portion of the casing and contained parts of the apparatus appearing in Fig. 1, with the cover or lid in its raised or open position for a better showing of the arrangement of the parts.

Fig. 4 is a longitudinal vertical sectional view, on an enlarged scale, through the apparatus appearing in Fig. 1 as taken on the line 4—4 of Fig. 1.

Fig. 5 is a horizontal sectional view through the apparatus as taken on the line 5—5 of Fig. 4, certain of the parts at one side of the casing being shown in elevation for a better illustration thereof.

Fig. 6 is a detail vertical sectional view as taken on the line 6—6 of Fig. 5 and shows more particularly the removable mounting for the unitary water circulating pump and driving motor arrangement.

Fig. 7 is a diagrammatic view illustrating the circuit for the blower motor and the water pump motor of the apparatus and which will be more fully referred to later.

Fig. 8 is a view similar to Fig. 1 and illustrates a modified form of apparatus wherein the water circulating unit is made separate from and is disposed outside of the casing.

Fig. 9 is a vertical sectional view on an enlarged scale, through the water circulating unit appearing in Fig. 8, the plane of the section being taken on the line 9—9 of Fig. 8.

Fig. 10 is a detail horizontal sectional view as taken on the line 10—10 of Fig. 9 and illustrates more particularly the pump of the water circulating unit appearing in Figs. 8 and 9.

Referring now in detail to that embodiment of the invention illustrated in Figs. 1 to 6 inclusive of the drawings, 10 indicates the casing of the apparatus as a whole. This casing which has an open top, is of a generally rectangular form and includes a bottom wall 11, rear wall 12, side walls 13 and 14 respectively and a front wall 15 which is of a height less than that of the side and rear walls. At the front of the casing, above the wall 15 is an opening in which a cover plate 16 is removably engaged. When said cover is in its closed position, it forms a continuation of the front wall. The open top end of the casing is closable by means of a cover or lid 17 that has a hinged connection 18 with the rear wall 12 and whereby it may be swung from the closed position appearing in Fig. 4 to the open position appearing in Fig. 3.

A stop 19 carried by the cover or lid, is so connected to the rear wall of the casing from the inside thereof as to limit the open position of the lid to the vertical one appearing in Fig. 3. The cover or lid when in its closed position, terminates short of the plane of the front wall 15 and associated cover plate 16 and an inclined grille frame 20 is provided between the top inclined portion 16a of the cover plate 16 and that point at the top of the casing, coincident with the free edge of the cover or lid 17 when the same is in its closed position.

The grille frame includes top and bottom mem-

bers 20a—20b, side members 20c—20c and intermediate members 20d—20d that are spaced inwardly from and are parallel with the members 20c—20c and extend from the top member 20a to the bottom member 20b of the grille frame as best appears in Fig. 3. In the mid portion of the grille frame, between the members 20d—20d thereof, are spaced louver blades 21 that extend parallel with the top and bottom members 20a—20b of the grille frame. In the end portions of the grille frame, between the members 20c and 20d thereof, are spaced louver blades 22 that extend parallel with the side and intermediate frame members 20c and 20d of the grille frame.

It is apparent that while the louvers 21—22 in said frame are all disposed in the same plane across the casing, the louvers 21 extend at a right angle to the length of the louvers 22. These louvers which function to diffuse the air blast discharged from the apparatus, have a pivotal connection at their ends with the associated members of the grille frame and whereby the edgewise plane of the various blades in each group may be set at different edgewise angles for the desired diffusion of air.

As before mentioned, the casing before described is intended to be disposed in the window opening of a room or like space. To make the placing in a window opening, a relatively easy matter and to provide a relatively tight seal between the window opening and the outside of the casing, the following construction is provided: Secured to the outer surface of each side wall 13—14 is a vertically arranged channel 23 with its flanges directed outwardly. Another channel 24, the flanges of which extend upwardly, is fixed to the outer surface of the cover or lid 17 and so extends across the same as to match up at its ends with the top ends of the channels 23. In each side wall 13—14 between the rear wall 12 and the channel 23 is an opening 25, the bottom edge of which is substantially even with the top edge of the front wall 15. The openings 25 constitute the air inlets for the casing 10, one at each side thereof. With the arrangement described, the bottom portion of the casing is water-tight up to the level of the top edge of the front wall 15 and therefore said bottom portion of the casing is employed in this instance as a water reservoir.

When the casing before described is disposed in a window opening, such as the opening of a center window in a bay as appears in Fig. 1, the bottom rail of the sash 26 engages in the channel 24. A portion of the bottom wall 11, forward of the plane of the channels 23—24 rests upon the window sill 27 and filler panels 28 are disposed between the sides of the casing and the sides of the window frame. These panels fit at their lateral upright margins in the channels 23 and in the window sash grooves of the window frame respectively, as best appears in Figs. 1 and 2. It is apparent from Fig. 2 that with the parts arranged and correlated as described, the casing is securely positioned in the window opening.

In the casing on the central median line thereof from front to rear is located a blower casing 30, the axis of the casing being arranged parallel with the front and rear walls of the casing. This casing which has an upwardly and slightly forwardly extending discharge neck 31, includes side walls 32—32 spaced inwardly from the associated sides of the casing and a peripheral wall 33, the bottom portion of which rests upon the bottom wall of the casing. In the side walls of the casings are intake openings 34, the bottom portion of which is disposed above the level of the water contained in the reservoir as provided by the bottom portion of the casing 10 as a whole. The blower casing is held in the desired position in the casing by side plates 35, secured to the side walls of the blower casing and to the bottom wall of the casing 10 as a whole as best appears in Fig. 4.

The intake openings 34 for the blower casing are eccentrically disposed with respect to the axis of the casing and extending axially of said intake openings is a rotor shaft 36. A rotor 37 (see Fig. 5) is fixed to said shaft within the blower casing. The shaft 36 is journalled at its ends in bearing blocks 38 carried by angle bars 39 fixed to the side wall 32 of the blower casing. A pulley 40 is fixed to one end of the shaft.

A motor supporting bracket 41 is disposed to the front of the blower casing. The horizontal top end portion of the bracket is pivoted to the peripheral wall 33 of the casing as indicated at 42. The bottom end portion 43 of the bracket which is unattached with respect to the wall 33, carries adjusting screws 44 only one of which appears in Fig. 4. The vertical part 45 of the bracket has the base of an electric motor 46 attached thereto by means of the bolts 47. A pulley 48 is secured to the armature shaft 49 of said motor and a belt 50 is trained about the pulley 48 and the pulley 40, whereby the rotor of the blower is driven from the motor. By manipulating the screws 44, it is apparent that the bottom end of the bracket 41 may be swung away from the blower casing and whereby the belt 50 may be kept at the desired tension.

51 indicates a substantially horizontally disposed wall that extends from the casing flange 20b before mentioned at a slight upward angle, to the front side of the discharge neck 31 of the blower casing 30. To the rear of said wall 51, there is provided a pair of upright walls 52 that are fixed to and project upwardly from the sides of the blower discharge neck. The rear ends of the walls 52 stop at an inclined wall 53 arranged slightly to the rear of the discharge neck. Upright walls 54 angle outwardly from the front ends of the side walls 52 to terminate at the side walls of the casing 10. Thus a portion of the side walls 13 and 14 of the casing 10 coact with the walls 51, 52, 53 and 54 and a part of the cover 17 when closed, to provide an air outlet chamber 55, with which the discharge neck 31 communicates at one end and with which the grilled air discharge opening 20 communicates at the other end.

Along each side wall 13 and 14 of the casing, in line with each air inlet opening 25 is located an air filtering mat 56, held in an upright frame 57 rising from the bottom wall of the casing and terminating about flush with the top of the casing 10. The mat is of a unitary construction to include foraminous sides and ends 58 and a fibrous filler 59. When water is supplied to the top end of the mat, it substantially saturates the fibers therein so as to envelop them in a water film, the excess water draining back into the water in the reservoir as provided by the bottom of the casing. To supply such water to said mats, the following arrangement is provided.

A U shaped pipe 60 is secured to the underside of the cover 17 and includes perforated side legs 61 and an imperforate connecting leg 62. The latter leg is arranged near the rear hinged portion of the cover and the two side legs are so arranged as to be disposed approximately centrally above the air filter mats 56—56 when the

cover or lid 17 is in its closed position, such as appears in Fig. 4. The connecting leg 62 carries a nipple 62a (see Fig. 3) at one point in its length and which nipple is adapted to have one end of a flexible conduit or hose 63 attached thereto. The other end of said conduit is connected to a pump, as will later appear whereby water is supplied to said U shaped pipe for distribution to the filter mats.

A mat or pad 65 of a compressible material such as felt or soft rubber is secured to the underside of the cover or lid 17 between the side legs 61—61 of the pipe 60, the said mat or pad extending from the free edge to the hinged edge of the cover. This gives the pad such an area that when the cover is in its closed position, said pad rests upon the top edges of the various walls of the casing that coact in forming the air outlet chamber 55 and seals against leakage of air out through the casing at this point and which leakage, of course, will reduce the efficiency of the apparatus. Also fixed to the under side of the cover, along the lateral edge of the pad 65 thereon are cleats 66 which when the lid is closed, engage the lateral inner top and edges of the holders for the filter mats and hold them in position and against rattling when the apparatus is in operation. This arrangement of the filter mat and of said cleats best appears in Fig. 3.

The means for supplying water from the reservoir as provided by the bottom portion of the casing 10 to the filter mats is as follows: Adjacent the right hand side wall 14 of the casing, forwardly of the associated filter mat 56 is provided a motor 67, the armature shaft of which is arranged vertically. This motor carries a spider 68 at its bottom from which depends a tube 69, said tube supporting a pump casing 70 at its bottom end. The spider 68 has an L shaped plate secured thereto and the vertical leg 71 of said plate tapers in width from top to bottom to fit in the flanged sides 72 of a bracket supporting plate 73 fixed to said right hand side wall of the casing. The other end of the conduit or hose 63 before mentioned, is connected to the outlet side of the pump casing 70, the inlet side of the pump being formed by a centrally disposed bottom opening. In the casing is the usual rotor secured to the armature shaft of the motor 67.

The pump casing, which appears best in Fig. 10, is disposed in a strainer basket 74 that rests upon the bottom of the casing 10. When the pump 70 is in operation, it discharges water up through the flexible conduit or hose 63 to the U shaped distributor pipe, the water passing into both legs 61 and out through the openings therein, to discharge onto the top end of both filter mats 56. The water supplied to said mats keeps the fibrous material thereof well saturated and the excess drains back into the reservoir as provided by the bottom end of the casing 10.

It is preferred that the pump motor 67 be so electrically connected with the blower motor 46 as to be energizable only after the motor 46 has been energized. A simple way in which this can be accomplished appears diagrammatically in Fig. 7. In that figure 75 indicates a lead in conductor for current which is connected to one side of the motor 46, the other side of said motor being grounded by a conductor 76. A switch 77 is provided in said conductor 75. When this switch is closed the motor 46 is energized and when said switch is open, said motor is deenergized. A conductor 78 connects one side of the motor 67 with the line 76 and a second conductor 79 connects the other side of said motor with the line 75 at a point between the motor 46 and the switch 77. In the conductor 79 is a switch 80 for controlling the motor 67, the switches 77 and 80 being disposed at a convenient place toward the front of the casing so as to be accessible from within the room having the window opening in which the casing is located. A convenient place for said switches is the side wall 13 of the casing 10 as appears in Fig. 2.

With this arrangement, it is apparent that the blower motor 46 may be energized without energizing the motor 67 and it is also apparent that the motor 67 can only be energized after the motor 46 has been energized. Thus, it is possible to operate the blower without operating the pump or the two may be operated simultaneously but the pump cannot be operated unless the blower is operating. In damp weather, the blower can be operated without adding to the water content of the air discharged from the apparatus.

Should it be desired to clean out the reservoir as afforded by the bottom of the casing and to clean the basket 74, the front cover plate 16 is removed to give access into the casing from the front thereof. The motor 67 and its plate 71 is then lifted upwardly, to disengage the plate from the bracket 73 and to remove the pump 70 from the basket 74, this movement of the motor and pump being possible by reason of the flexibility of the conduit or hose 63. The basket 74 which is loose with respect to the casing, may be removed from the casing 10 for cleaning. After cleaning, the basket is replaced after which the motor 67 and pump 70 may be repositioned as a unit.

Assume that the apparatus is arranged in the window opening of a room in a dwelling as before described and that it is a rather warm dry day. Also assume that a sufficient amount of water is in the reservoir as formed by the bottom of the tank so that the pump 70 is submerged therein.

When the switches 77 and 80 are both closed, the blower 30 and the pump 70 are both placed in operation. The pump then delivers water up through the conduit or hose 63, to the U shaped distributor pipe 60 so that water passes out through the apertures in the legs 61—61 to be discharged upon the top ends of both filter mats. This provides a film of water covering the strands or fibres in both filter mats, the excess water draining back into the reservoir in the bottom of the casing.

With the blower in operation, air is drawn in through both side inlets and the wet filter mats therein and then into both air intakes for the blower. The blower discharges said air into the air outlet chamber 55 and then out through the open spaces between the louvers in the grille frame and into the room. The air discharged through said space creates a turbulence in the upper air strata of the room and the diffusion of such air may be regulated by turning the louvers into the desired edgewise angular positions. As the air passes through the mats 56—56, it will absorb some water content and it is the evaporation of a part of this content that provides the desired cooling effect, the remainder maintaining the room at the desired condition of humidity. Should the outside atmosphere be warm and humid, the switch 80 is opened and the motor 67 is de-energized so that no water is supplied to the filter mats.

In Figs. 8, 9 and 10 I have illustrated a modi-

fied form of the invention in that the water supply and the circulating pump and driving motor therefor are located outside of the casing instead of inside of the casing as before. Under such conditions, the casing 10 may be of the same construction as before but I provide in connection therewith, a rectangular tank-like casing 85 including a bottom wall 86, side walls 87, end walls 88 and a top wall 89 in which is formed an opening 90 bounded by an upright flange 91. An inverted box-like cover 92 rests upon the top wall 89 of the casing 85 being removably held in position by its engagement with the flange 91. In the top and one end of the cover are screened openings 93 for a circulation of air therethrough.

94 indicates an upright bracket fixed to a part of the casing top wall 89 towards one end of the opening 90 therein. A motor 95 is mounted on said bracket by means of bolts 96 within the area of said opening 90 and the armature shaft 97 of said motor is disposed vertically. The switch 98 for controlling said motor is so carried by one of the upright walls of the cover 92 so as to be operable from the outside thereof. A tube 99 is so fixed to the bottom end of the motor 95 as to enclose the shaft 97 and to support a pump casing 100 for a centrifugal pump. This casing has a central bottom inlet that opens into a chamber 101 in which is located a rotor 102 fixed to the bottom end of the shaft 97. At one side of the casing is the discharge outlet 103 for the pump. In one end wall 88 of the casing 85 is located a nipple 104 and one side of this nipple is connected by a flexible conduit or hose 105 to the pump outlet 103. A flexible conduit or hose 106 leads to the upper portion of the casing 10 where it is connected up to the distributor pipe arranged above the filter mats as before. A flexible return conduit 107 connects the bottom of the casing 10 with a pipe 108 carried by the top wall 89 of the casing 85 to deliver excess water back into said casing.

It is apparent that when the motor 95 is energized, a circulation of water is established from the casing 85 to the mats in the casing 10 with the excess water draining back into the casing 85.

Should the filter mats require cleaning, this may be accomplished by raising the window sash 26 so as to permit raising of the cover or lid 17 into open position appearing in Fig. 3 to give access to the mats for removal. After removal, they may be backwashed and then replaced, the window sash again lowered and the apparatus set into operation as before.

The apparatus is simple in construction, is relatively light in weight and it is efficient in operation for its intended purpose.

While in describing the invention I have referred in detail to the form, construction and arrangement of the various parts, the same is to be considered only in the illustrative sense so that I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

I claim as my invention:

1. In an apparatus of the kind described, a casing open at the top, a cover for said top and movable to expose or to close said top, means providing an air inlet and an air outlet for said casing, air filtering means arranged in said air inlet, a blower in said casing having an intake side and a discharge side and which discharge side is in operative communication with said outlet, means carried by said cover and overlying said air filtering means when said cover is in its closed position and for delivering water to said air filtering means, and means for supplying water to said means carried by said cover.

2. In an apparatus of the kind described, a casing open at the top, a cover for said top and movable to expose or to close said open top, means providing an air inlet at each side of the casing, means providing an air outlet for said casing forwardly of said air inlets, air filtering means in each inlet, a blower in said casing and having an intake and a discharge side and which discharge side is in operative communication with said outlet, means carried by said cover and overlying said air filtering means when said cover is in its closed position for delivering water to said air filtering means, and means for supplying water to said means carried by said cover.

3. In an apparatus of the kind described, a casing open at the top, a cover for said top and movable to expose or to close said open top, means providing an air inlet at each side of the casing, means providing an air outlet for said casing forwardly of said air inlets, air filtering means in each inlet, a blower in said casing and having an intake and a discharge side and which discharge side is in operative communication with said outlet, means carried by said cover and overlying said air filtering means when said cover is in its closed position for delivering water to said air filtering means, means providing a water supply, and means including a pump for circulating water from said supply to said means carried by the cover, the excess water from said air filtering means draining back to said water supply.

4. In an apparatus of the kind described, a casing open at the top, a cover movable either to expose or to close said open top, means providing an air inlet opening at each side of the casing, and an air outlet at the front of the casing, means providing an air chamber at the front of the casing and communicating with said outlet, air filtering means associated with each air inlet opening, a blower in said casing having an intake and a discharge side, means in said casing coacting with said cover when closed in providing a duct located between said filtering means and connecting said discharge side of the blower with said chamber, means carried by said cover and overlying said filtering means when said cover is closed for distributing water to said filtering means, and means for supplying water to said means on said cover.

5. In an apparatus of the kind described, a casing open at the top, a cover movable either to expose or to close said open top, means providing an air inlet opening at each side of the casing, and an air outlet at the front of the casing, means providing an air chamber at the front of the casing and communicating with said outlet, air filtering means associated with each air inlet opening, a blower in said casing having an intake and a discharge side, means in said casing coacting with said cover when closed in providing a duct located between said filtering means and connecting said discharge side of the blower with said chamber, a tube carried on the underside of said cover and having perforated end portions arranged to overlie said filtering means when said cover is closed for distributing water to said filtering means, and means for supplying water to said tube.

6. In an apparatus of the kind described, an open top casing having a bottom formed to pro-

vide a reservoir, said casing having an air inlet at each side above said reservoir, air filtering means associated with each air inlet, a cover movable to either expose or to close said open top, a blower in said casing, having an intake and a discharge side and which discharge side is in operative communication with said outlet, means on the underside of said cover and overlying said filtering means when said cover is in its closed position for distributing water over said filtering means, means providing a motor driven pump submerged in the water in said reservoir, and means for connecting said pump with said water distributing means carried by the cover.

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