Jan. 20, 1953 C. KRAUSS 2,626,136

AIR CIRCULATING AND CONDITIONING UNIT

Filed Nov. 6, 1948 3 Sheets-Sheet 1

Fig. 1

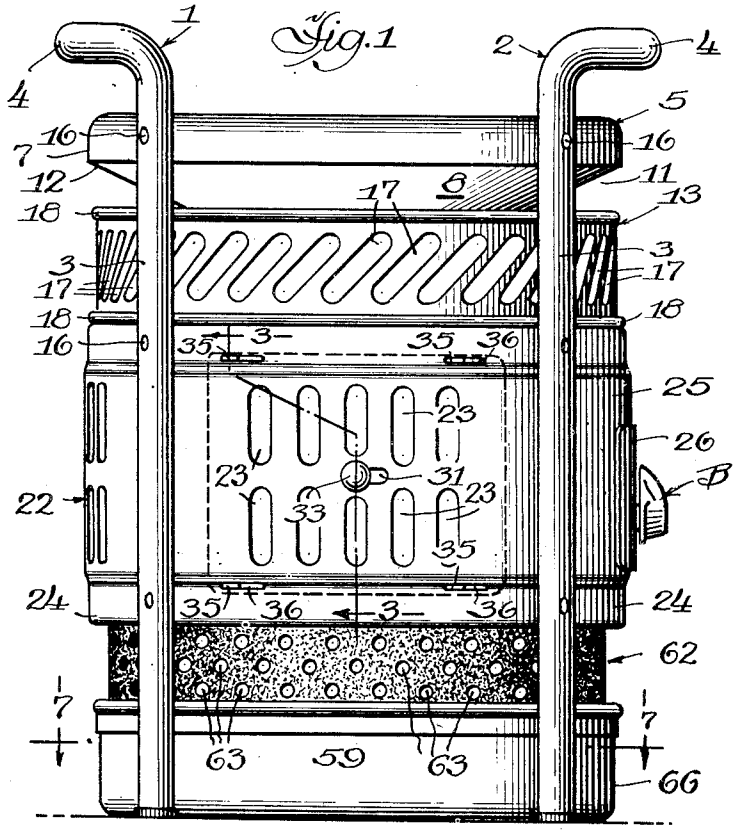
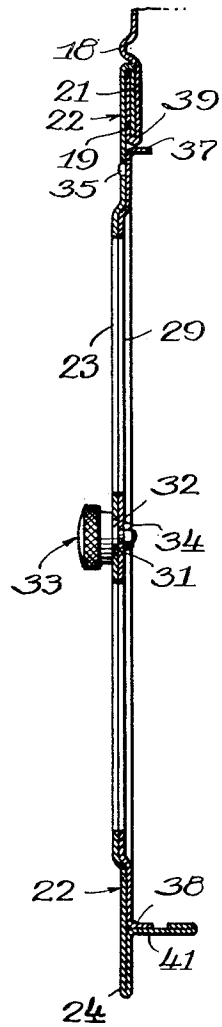


Fig. 3



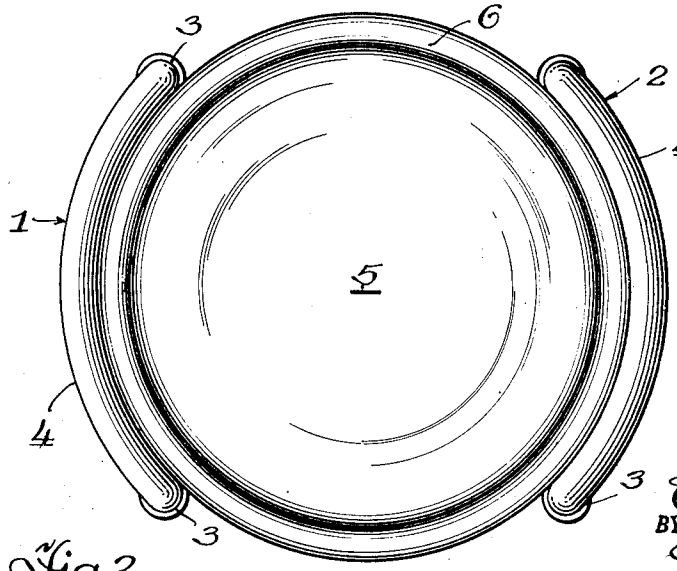


Fig. 2

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AIR CIRCULATING AND CONDITIONING UNIT

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Fig. 4

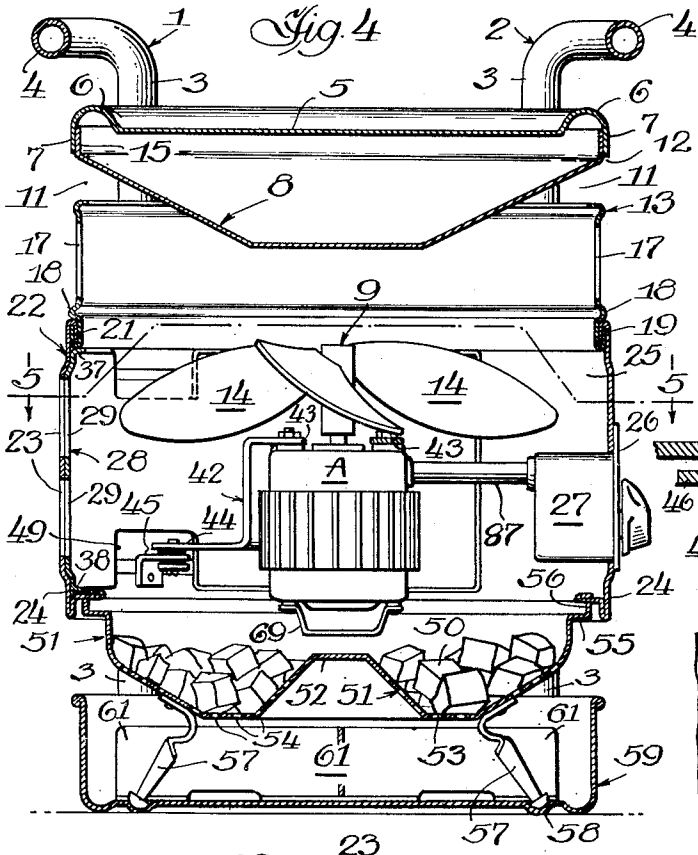


Fig. 6

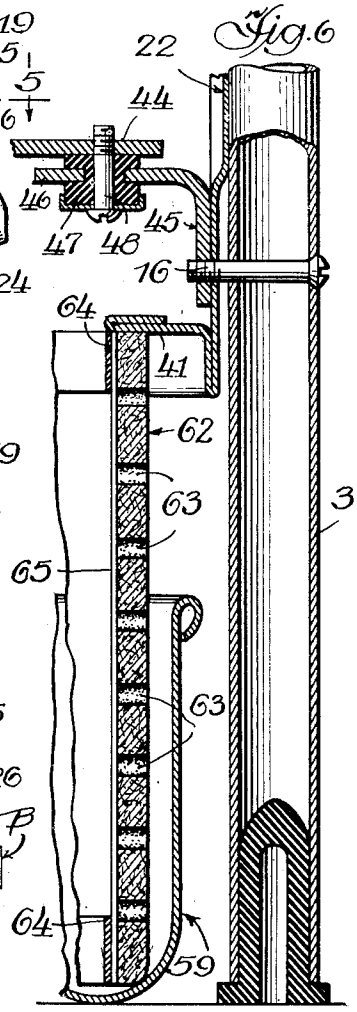
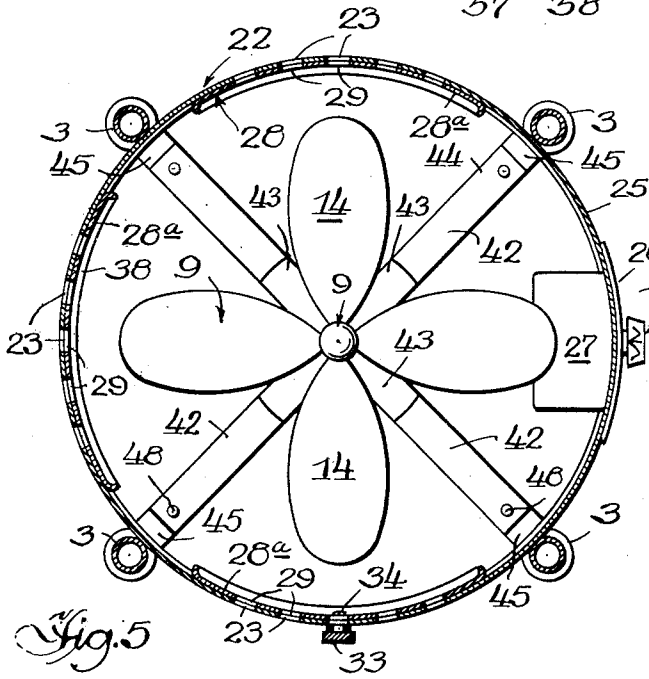


Fig. 5



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AIR CIRCULATING AND CONDITIONING UNIT

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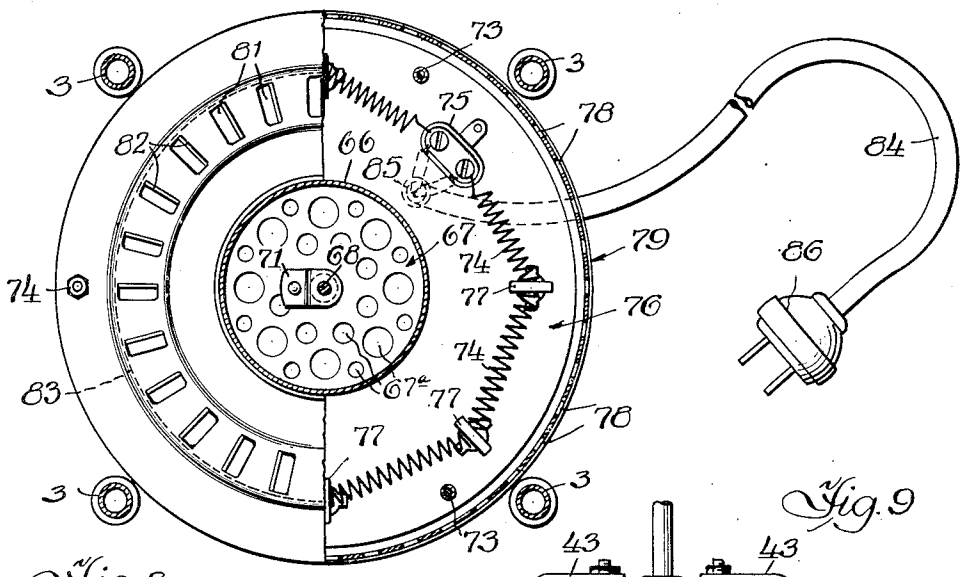


Fig. 8

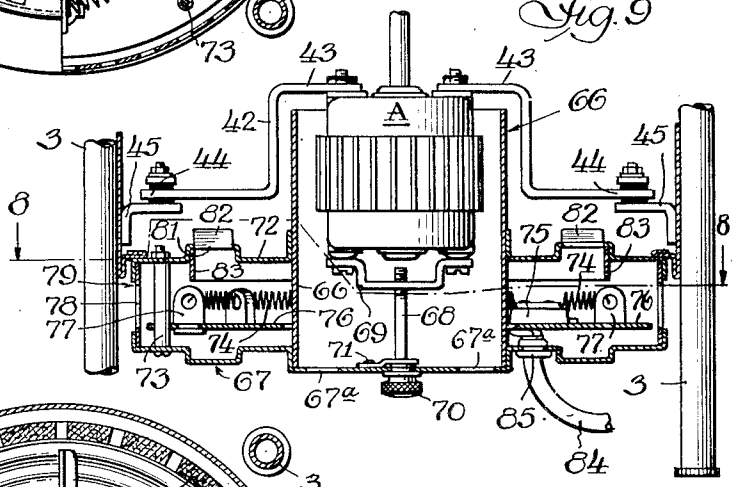


Fig. 9

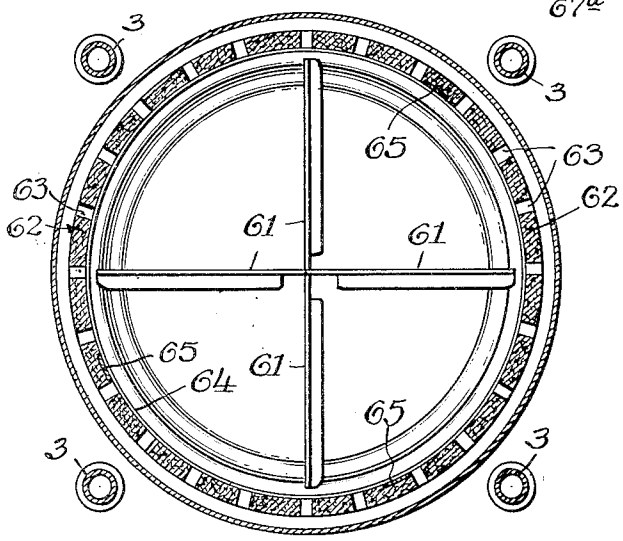


Fig. 7

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2,626,136

UNITED STATES PATENT OFFICE

2,626,136

AIR CIRCULATING AND CONDITIONING UNIT

Carl Krauss, Chicago, Ill.

Application November 6, 1948, Serial No. 58,767

9 Claims. (Cl. 261—30)

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The present invention relates to a novel air circulating and conditioning unit and more particularly to a novel construction and arrangement of fan or air circulating mechanism for humidifying, cooling or heating air to be supplied to and circulated in a room or other enclosure.

Among the objects of the present invention is the provision of a novel air circulating assembly or fan unit provided with novel means and mechanism for cooling, heating or humidifying the discharged air.

The present invention further comprehends the provision of a novel air circulating and conditioning unit so designed and constructed as to regulate the quantity of air being drawn into the unit. This is accomplished by a novel adjustable shutter construction and arrangement in which the shutter or shutter sections may be quickly opened or closed, as desired.

Another important object and advantage of the present invention is the provision of a novel portable air circulating and conditioning unit suitable for use in hot or cold weather, and including a novel fan or air circulator provided with an air conditioning unit that is readily removable from the base of the unit.

A further object of the present invention is the provision of a novel heating unit and including a novel means and manner for detachably mounting the air heating unit in the circulating or fan assembly whereby such heating unit may be removed or replaced, as desired.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the construction, combination and arrangement of parts and manner of assembly illustrated in the accompanying drawings, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

In the drawings:

Figure 1 is a view in side elevation of the novel air circulating and conditioning unit.

Fig. 2 is a top plan view thereof.

Fig. 3 is an enlarged fragmentary view in vertical cross section taken on the irregular line 3—3 of Fig. 1.

Fig. 4 is a view, part in side elevation and part

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in vertical cross section, through the novel assembly of Fig. 1, with the exception that the humidifying means shown in Fig. 1 has been replaced by a novel cooling means.

Fig. 5 is a view in horizontal cross section taken on the irregular line 5—5 of Fig. 4.

Fig. 6 is an enlarged fragmentary view in vertical cross section through a supporting leg and its associated parts as disclosed in Fig. 1, including the floor pan and humidifying means.

Fig. 7 is a view in horizontal cross section taken in a plane represented by the line 7—7 of Fig. 1.

Fig. 8 is a view in horizontal cross section taken in a plane represented by the line 8—8 of Fig. 9, and showing the position and mounting of the heater element.

Fig. 9 is a view in vertical cross section through the heater assembly of Fig. 8.

Referring more particularly to the disclosure in the drawing and to the embodiment therein shown to illustrate the present novel invention, there is provided an air circulating mechanism in which is embodied novel air treating or conditioning means whereby the air may be humidified for conditioning the air of a room or enclosure in a home, office, hospital or other building, or such air may be cooled or heated as desired or required for the comfort of the occupants.

The novel mechanism or assembly comprises a pair of substantially inverted U-shaped supports 1 and 2 each provided with spaced depending supporting legs 3 and an upper part 4 connecting the legs and curved outwardly to conform to the substantially cylindrical contour of the assembled unit. Each such connecting part 4 forms a handle whereby the fan assembly or unit may be readily lifted and moved to various locations for use.

At the upper end of the assembly or unit is provided a plate 5 providing a table top or flat surface (Figs. 1, 2 and 4) suitable for use as a supporting surface and having a peripheral raised edge or head 6 and depending flange 7. Mounted below this plate or top surface 5 is an upwardly inclined or dished deflector 8 against the under surface of which the air from the fan or blower 9 is discharged and directed outwardly and upwardly into the room or chamber through the annular passage or outlet 11. This discharge passage or outlet is defined by the peripheral edge 12 of the deflector and by an annular or cylindrical band 13 disposed below and spaced from this peripheral edge an amount sufficient to permit the discharged air to escape, but insufficient to allow a child or adult to insert his or her fingers or hand to such an extent as to be engaged by

the blades 14 of the fan 9. The upstanding flange 15 at the edge 12 of the deflector 8 is adapted to be received in the depending flange 7 on the plate 5, and these overlapping flanges are attached to the legs by screws, bolts or other securing means 16.

The band 13 is preferably provided with relatively closely spaced openings or slots 17 (Figs. 1 and 4) for the passage therethrough of air, although vertically spaced annular bars or wires may be provided in lieu of such a band. If such bars or wires are employed, they should be spaced apart an amount such as to prevent access to the fan blades. The band 13 is shown as contoured adjacent its lower edge to provide an annular bead 18 and an outwardly and upwardly bent flange 19 forming an interlocking engagement with the downwardly flanged upper edge 21 of an annular housing 22.

The housing 22 although preferably continuous is divided into four sections or segments by the legs 3 of the supports 1 and 2, with three of the segments being slotted or perforated at 23 intermediate its upper edge 21 and its lower edge 24 (Figs. 1, 3, 4 and 5). The other segment 25 which is preferably imperforate, forms the front of the assembly and in a cut-out in the face thereof is mounted a switch plate 26 secured to the wall of the segment 25 about the cut-out, the body of the switch unit 27 projecting through the cut-out in the segment and into the interior of the assembly. A handle or knob B controls the operation of the switch.

Slidably mounted on the interior of the housing or enclosure 22 is a shutter 28 preferably of arcuate shape and closely conforming to the contour of the housing (Figs. 1, 3, 4 and 5). This shutter preferably consists of three sections 28a connected together to move as a unit assembly and thus extend through an arc of such length as to cover the slotted or perforated portion 23 of the housing. Each section of this shutter is provided with slots or perforations 29 similar in size and spacing as those in the housing or enclosure 22 whereby when the slots or perforations 23 to 29 coincide or are in registry, uninterrupted passage of air therethrough is permitted, whereas when these slots or perforations are out of registry passage of air therethrough is prevented. However, it is to be understood that movement or adjustment of the shutter may be made between these two extremes so as to permit accurate adjustment of the air passing therethrough.

To permit adjustment of the shutter, the housing or enclosure 22 is provided with a horizontal slot 31 through which projects the reduced shank 32 of a knob 33 secured by a nut or the like 34 to the shutter (see Figs. 1 and 3). Additional guide means for limiting the adjustment and movement of the shutter other than the slot 31, includes upper and lower spaced projections 35 on the shutter sections 28a extending through horizontal slots 36 in the housing 22, and the upper and lower inturned flanges 37 and 38 on the shutter sections 28a bearing against or guided by the lower edge 39 of the band 13, and the continuous inturned flange 41 of the lower edge 24 of the housing or enclosure 22.

The fan 9 is mounted within the annular housing and enclosure 22 upon a plurality of spaced radially extending hangers or cross bars 42, each attached at its upper and inner end 43 to the motor housing A and at its lower and outer end 44 to an angle lug or bracket 45. Each angle lug or bracket 45 is secured to the interior of the housing or enclosure by a bolt or other securing means 16 mounted in a leg 3. To cushion the motor mounting, the outer end 44 of each hanger or cross bar 42 is secured to a leg 46 of its angle lug or supporting bracket 45 by a rubber or resilient grommet 47 and a screw or bolt 48, or other suitable fastening means as shown in Figs. 4 and 6 or as shown in Fig. 9. To prevent the supporting brackets or angle lugs 45 from interfering with the sliding movement of the shutter 28, the latter is cut away at 49 to such an extent as to permit the desired movement.

Removably mounted beneath the air circulating or fan assembly and within the confines of the legs 3 is provided a novel air conditioning unit (see Fig. 4) consisting of a perforated tray 51 having a raised central imperforate part 52, an annular dished perforated part 53 having suitably spaced openings or slots 54, and a peripheral raised ledge or shoulder 55 having an upstanding flange 56 positioned beneath the continuous flange 41 on the housing 22. In the position shown, the perforated tray is disposed beneath the base of the fan assembly, and when in use the shutters are wholly or partially closed so as to control the air passing through the tray.

Spaced feet 57 depend from the undersurface of the tray and are adapted to seat in an annular recess 58 in the bottom of a floor pan 59. This floor pan is preferably divided by radial partitions 61 projecting upwardly from the base or bottom of the pan, but with the outer ends of these partitions spaced from the interior of the pan. These dividing partitions prevent undue splashing of the liquid but do not prevent the liquid from seeking its level in the adjacent divisions.

The present invention contemplates placing ice cubes or particles 60 in the perforated tray 51 if it is desired to cool and condition the air discharged into the room or enclosure. In such event, any water resulting from the melting of the ice escapes through the openings or perforations 54 of the tray 51 and collects in the floor pan 59.

If it is merely desired to humidify the air, the perforated tray 51 is preferably removed and a cylindrical or annular pad or partition 62 of felt or other suitable absorbent or wicking material provided with spaced openings 63 therethrough for the passage of air is disposed within the pan in the manner shown in Figs. 1 and 6. This felt is shown as of substantial thickness and preferably strengthened or reinforced by an upper and a lower annular band or ring 64 of metal or the like mounted on the interior of the annular pad or partition. It may be further strengthened by suitably spaced vertical reinforcing strips 65 suitably attached to the bands or rings. With the felt or absorbent material mounted within but in spaced relation with the interior or vertical sides of the pan and projecting thereabove, any water or liquid in the pan will be quickly absorbed and wet the entire body of felt due to its wicking action. Thus if water is placed in the pan any air drawn through the openings 63 will be humidified by the evaporating water. Similarly, if any other liquid or fluid such as a deodorizing or air treating composition is placed in the pan, it will be absorbed by the absorbent material and condition the entering air.

The invention further comprehends the use of a novel heating unit for heating the air (see Figs. 8 and 9) when that becomes necessary or desirable. Such heating unit comprises an en-

closure or collar 66 encompassing the motor A and retained in position by a base or bottom plate 67 depending from the motor by means of a mounting bolt 68 threaded into a bracket or motor clip 69 disposed on the lower end of the motor housing, the bolt head 70 being held by a retaining clip 71. The bottom plate 67 is provided with openings 67a for cooling the motor A, and this plate and a top plate or cover 72 disposed in spaced relation by spacers 73, provides an enclosure for a heating element 74 connected to a terminal block 75. The heating element is preferably mounted on a socket plate 76 carrying a plurality of insulators 77 for supporting the heating element.

Air is drawn into the heating unit by the fan 9 through the openings 78 in a perforated grill 79, carried over the heating elements and then drawn upwardly and outwardly through the slots or cut-outs 81 formed in the cover 72 by the upstanding tongues 82. However, to assure heating the air entering the heating chamber before it is discharged through the slots or openings 81, a deflector or baffle ring 83 is provided for directing the air downwardly over the heating elements. A heater cord 84 enters the bottom plate 67 through the bushing 85 and is connected at one end to the terminal block 75 for energizing the heating element 74 from a suitable source of current supply and at the other end is provided a plug 86 for connection to a receptacle provided in the face plate 26 of the switch box 27.

When the conditioning system or removable units have been removed or are not employed and the present novel fan assembly is used for circulating the air, the shutter 28 is moved by the knob or handle 33 to open position in which the slots or perforations 29 in the shutter sections 28a are moved into alignment or registry with the slots or perforations 23 in the housing or enclosure 22. In this position air is drawn through these slots or perforations 23 and 29 by the fan blades 14 and discharged upwardly against the deflector 8 and outwardly therefrom into the room or chamber.

Whenever the air conditioning system is employed, whether it is the humidifying unit of Figs. 1, 6 and 7, the cooling unit of Fig. 4 or the heating unit of Figs. 8 and 9, the shutter 28 is closed so that the air must be drawn from the base of the assembly and through the conditioning unit then employed. In other words, if the assembly of Figs. 1, 6 and 7 is employed, the pan 59 with the cylindrical or annular perforated pad or partition 62 mounted therein is partially or substantially completely filled with water and placed on the floor beneath the motor and fan with the upper edge of the pad or partition seating against the underside of the flange 41 of the housing (see Fig. 6). With the sections 28a of the shutter 28 closed, air drawn into the assembly must pass through the openings or passages 63 and is humidified.

Due to the absorbent or wicking characteristics of the felt or absorbent pad or partition 62, the water quickly wets the entire pad and the evaporating moisture is carried along by the air drawn through the perforations or openings 63. If desired, other liquid or fluid may be added to the pan, such as for deodorizing or otherwise treating the air to be discharged. Also, if desired, the pad may be formed of a porous filtering material whereby the air may be drawn therethrough and filtered and cleansed in this manner. In the latter event, the filtering material may be suitably treated to increase its effectiveness.

If the cooling unit of Fig. 4 is employed, the pan 59 and the perforated tray 51 disposed therein and partially filled with ice 50 are placed on the floor beneath the circulating fan assembly with the upstanding flange 51 of the tray abutting the inturned flange 41 of the housing. With the shutter sections 28a closed, operation of the fan 9 causes air to be drawn through the perforations and over the ice whereby the air to be circulated is cooled or conditioned.

If it is desired to heat the air, the novel heating unit shown in Figs. 8 and 9 is detachably mounted in operative position in the base of the circulating assembly by the thumb-actuated mounting bolt 68 secured to the motor clip or bracket 69. In the assembled position of Fig. 9, the peripheral edge of the top plate or cover 72 is drawn tightly against the inturned flange 41 on the housing 22 by turning of the bolt 68, whereupon connecting the plug 86 to the receptacle in the face plate 26, and moving the knob or switch handle B to "on" position the fan 9 will operate and the heating element 74 will become energized. The fan then draws the heated air upwardly and outwardly through the openings or slots 81 and discharges it from beneath the deflector 8. As with the operation of the humidifying and cooling units, when the heating unit is employed the shutter sections 28a are closed and the air to be heated is drawn into the heating chamber through the openings or slots 78 in the perforated grill 79.

Although it is generally intended that the shutter sections 28a be fully closed if the air drawn into the lower open end of the housing or enclosure 22 by the fan 9 is to be heated, cooled or humidified, it will be evident that the amount of air drawn into the base of the assembly may be varied or controlled by a partial or complete opening of the shutter sections. In other words, the entering air will take the path of least resistance and when the shutter sections are fully open and the fan is operating, air will be drawn through the aligned slots 23 and 29 (Figs. 1 and 4). If these slots are completely closed, air can only enter the housing or enclosure 22 through the open lower end and in which end the humidifying, cooling or heating unit is placed. But if these slots are partially opened, the amount of air drawn into the base of the enclosure and through the conditioning unit by the fan may be controlled.

Although the cord or wire connected to the switch box 27 for supplying current to energize or operate the heating unit and the motor A is not shown, it is to be understood that a cord similar to the cord 84 and having a plug similar to the plug 86 is provided. Such supply plug is adapted to be inserted in a wall or other electrical receptacle, and with the supply leads passing from the switch 27 through the conduit 87 to the motor for controlling its operation.

The switch and its handle or knob B are preferably so constructed and arranged as to permit adjustment of the speed of the motor A by turning the knob or handle to different indicated positions.

From the above description and the disclosure in the drawings, it will be readily appreciated that the present invention comprehends a novel air circulating and conditioning unit that may be quickly converted from an air circulating fan into a forced draft heating unit, a cooling unit

or a humidifying or air treating unit whereby the air may be most effectively conditioned for optimum comfort in any room or enclosure.

Having thus disclosed the invention, I claim:

1. An air circulating and conditioning assembly, comprising a housing open at its upper and lower ends, a fan mounted for operation on a vertical axis within the housing, an upwardly and outwardly dished deflector mounted adjacent the top of the assembly and directly above the fan in spaced relation with the upper end of the housing to provide an annular discharge opening between the housing and the deflector and directing the air discharged from the fan upwardly and outwardly from the housing, and an air conditioning unit in the base of the assembly for conditioning the air as it is drawn into the housing by the suction of the fan, said unit including a removable pan disposed beneath and spaced from the lower open end of the housing to provide an annular air passage therebetween and adapted to contain water for conditioning the air, and an annular wall of absorbent material mounted in and upon the base of the pan and projecting above the upper edge of the pan into the space between the pan and the lower open end of the housing to bridge the passage therebetween, said absorbent material projecting into and wetted by the water in the pan whereby the air entering the space between the pan and lower end of the housing must pass through the absorbent material and is thereby conditioned.

2. An air circulating and conditioning assembly, comprising a housing open at its upper and lower ends, a fan mounted for operation on a vertical axis within the housing and provided with a plurality of blades for drawing the air into the base of the assembly and discharging it upwardly, an inverted cone-shaped deflector mounted at the upper open end of the housing and disposed in spaced relation with the upper end of the housing and above the fan blades for directing the discharged air upwardly and outwardly through the continuously open space provided between the periphery of said deflector and the housing, and an air conditioning unit in the base of the assembly for conditioning the air as it is drawn into the housing by the fan, said unit including a separate and removable pan disposed beneath and having its upper peripheral edge spaced from the lower open end of the housing to provide a continuous annular opening, and a perforate partition disposed within the pan and projecting between the pan and this lower open end through which the air to be conditioned enters, the lower end of the partition being supported upon the base of the pen and the upper end of the partition projecting into the lower end of the housing and seating thereagainst and with its outer surface spaced from the side walls of the pan.

3. An air circulating and conditioning unit, comprising a vertically arranged housing, a fan mounted in the housing with its operating shaft and blades rotating on a vertical axis, said housing being open at its upper and lower ends, a deflector provided adjacent to and spaced upwardly from the upper open end of the housing for discharging the air upwardly and outwardly therefrom through the opening between the housing and deflector, and an air conditioning system at the lower open end of the housing for conditioning the air drawn into the housing through the lower end, said system including a separate, removable pan disposed beneath and spaced from the lower open end of the housing and a perforate partition containing a conditioning medium, said partition being supported at its lower end in the pan and spaced inwardly from the side walls of the pan and at its upper end extending into the lower end of the housing whereby to bridge the space therebetween and restrict air entering the lower open end of the housing to passage through the partition.

4. A portable air circulating and conditioning unit, comprising a support having spaced depending legs for supporting the unit upon the floor, a vertically arranged housing mounted on the legs intermediate their ends, a fan mounted in the housing with its operating shaft and blades rotating on a vertical axis, said housing being open at its upper and lower ends and provided adjacent its upper open end and above the fan with a plurality of discharge openings and a deflector thereabove for discharging the air upwardly and outwardly therefrom through an annular opening between the deflector and the upper end of the housing, passages provided in the side walls of said housing intermediate its ends and adjacent the fan blades for the entrance of air to the fan, and a shutter conforming to and slidably mounted on the housing and provided with similarly arranged passages which when in alignment with the passages in the housing allows for air to be drawn therethrough and to the fan and when said passages are out of alignment prevents the transmission of air therethrough to the fan whereupon air is drawn by the fan through the lower open end of the housing.

5. A portable air circulating and conditioning unit, comprising spaced legs for supporting the unit upon the floor, a vertically arranged housing spaced from the floor when in use, a fan mounted in the housing with its operating shaft and blades rotating on a vertical axis, said housing being mounted on the legs intermediate their ends and open at its upper and lower ends, a dished deflector provided adjacent to and supported on said legs above the upper open end of the housing to provide an annular opening therebetween for discharging the air upwardly and outwardly therefrom, passages provided in the side walls of said housing intermediate its open ends and adjacent the fan for the entrance of air to the fan, means for controlling the transmission of air through said passages and through the open lower end of the housing, and an air conditioning unit at the lower open end of the housing and disposed beneath the control means for conditioning the air drawn into the housing through the lower end when the passages in the side walls are closed.

6. A portable air circulating and conditioning unit according to claim 5, wherein the air conditioning unit includes a perforated tray for the reception of cubes or pieces of ice for cooling the air as it passes through the perforations, and a pan therebelow for collecting the water draining from the tray.

7. A portable air circulating and conditioning unit according to claim 4, including a perforated tray positioned beneath the lower end of the housing and adapted to contain ice for cooling and conditioning the incoming air, and a floor pan receiving the tray and collecting any water draining from the tray.

8. A portable air circulating and conditioning unit according to claim 5, wherein the air conditioning unit includes a heating unit detach-

ably mounted at the lower end of the housing for heating the incoming air.

9. A portable air circulating and conditioning unit as set forth in claim 5, wherein the air conditioning unit includes a readily removable heating unit detachably mounted at the lower open end of the housing for heating the incoming air and directing it upwardly and outwardly through the upper open end.

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