March 3, 1942. G. H. GREENWAY 2,275,295

AIR CONDITIONING UNIT

Filed Aug. 12, 1939 2 Sheets-Sheet 1

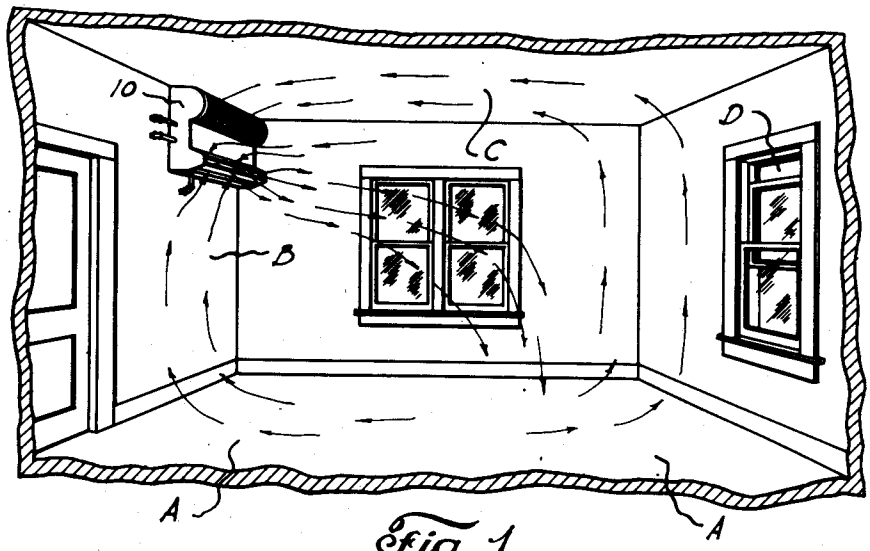

Fig. 1.

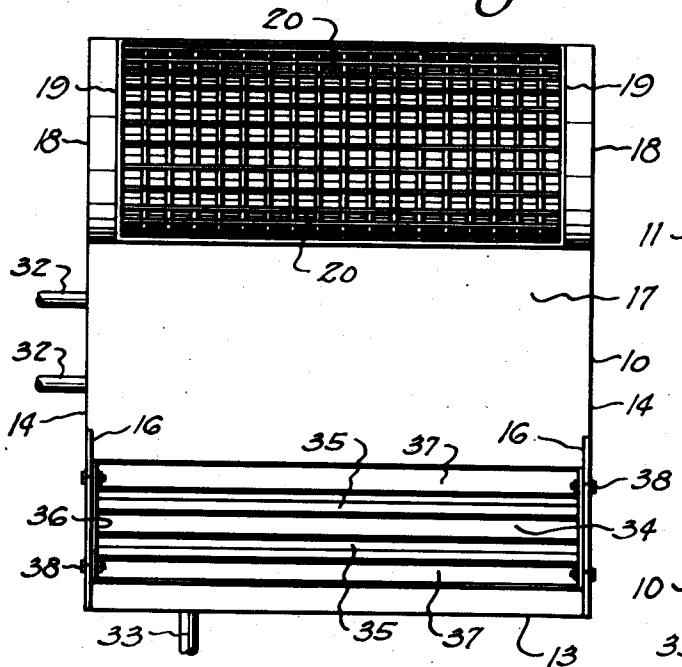

Fig. 2.

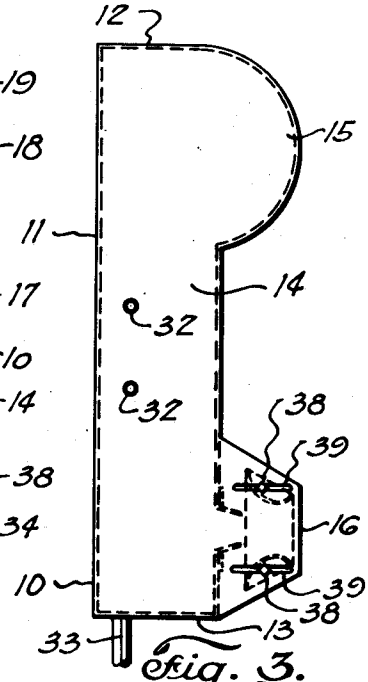

Fig. 3.

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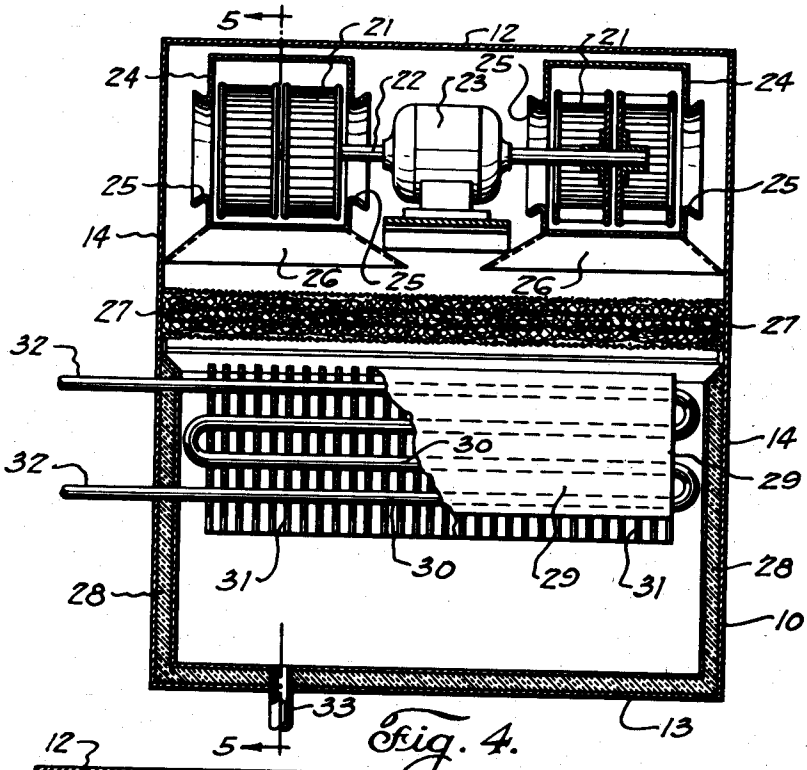

Fig. 4.

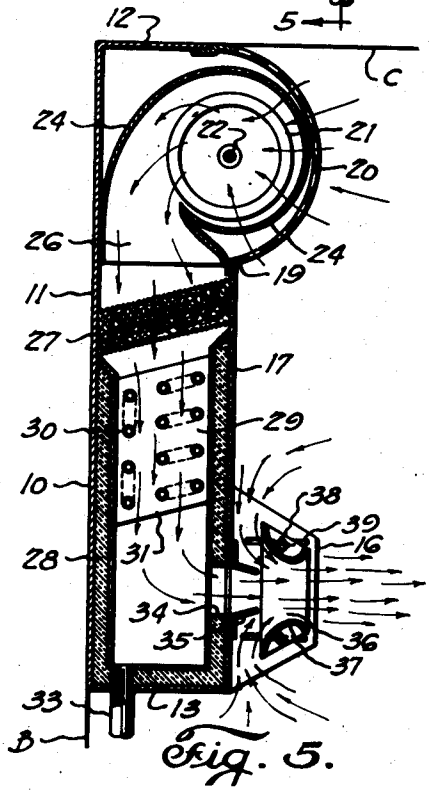

Fig. 5.

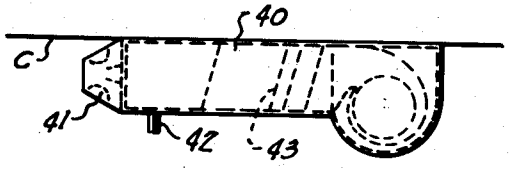

Fig. 6.

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UNITED STATES PATENT OFFICE

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AIR CONDITIONING UNIT

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Application August 12, 1939, Serial No. 289,729

6 Claims. (Cl. 62—140)

This invention relates to new and useful improvements in air conditioning units.

One object of the invention is to provide an improved air conditioning unit which may be readily and easily installed and which efficiently cools, dehumidifies, cleans and circulates the air within a room, or other enclosure, wherein it is located.

An important object of the invention is to provide an improved air conditioning unit which properly conditions the air within a room in a relatively short time and which is so constructed that a large amount of fresh air may be constantly supplied to the room, which is essential to healthful, as well as comfortable, conditioning of the room air, thereby avoiding recirculation of all of the used air in said room.

Another object of the invention is to provide an improved unit, of the character described, wherein a small volume of air is conditioned at one time so as to reduce the temperature and relative humidity thereof to a comparatively low degree, the conditioned air then being admixed with a portion of the room air before it is ejected into said room, whereby efficient air conditioning is performed gradually and evenly without setting up a draft of unpleasantly cold air; the construction of the unit being such that rapid circulation and conditioning is made possible.

A particular object of the invention is to provide an improved conditioning unit having means for admixing room air with conditioned air so as to materially moderate the latter and gradually reduce the temperature and relative humidity of the former, said means being adjustable whereby its capacity for room air may be varied in accordance with the size of the room to be conditioned.

A further object of the invention is to provide an improved conditioning unit having means for cooling and absorbing moisture from, or dehumidifying, the air which means is inclined away from the outlet of said unit, whereby the absorbed moisture will be directed out of the path of said air to eliminate the danger of the same being picked up and carried through said outlet into the room.

Still another object of the invention is to provide an improved unit, of the character described, which is portable, being small and compact, and which is adapted to be mounted on the wall of a room adjacent its ceiling, or on the ceiling, since it is of shallow depth, whereby all available floor space of the room remains unoccupied and due to its position initially conditions the most undesirable air and incidently promotes and induces proper circulation of air within said room.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is an isometric view of an air conditioning unit, constructed in accordance with the invention, and shown mounted on one wall of a room,

Figure 2 is an enlarged, front elevation of the unit,

Figure 3 is an enlarged side elevation of said unit, showing the discharge outlet and adjustable jet in dotted lines,

Figure 4 is a view, partly in section and partly in elevation, taken vertically and longitudinally through the unit,

Figure 5 is a transverse, vertical, sectional view, taken on the line 5—5 of Figure 4, and

Figure 6 is a reduced side elevation of a slightly modified form of the unit adapted to be mounted on or suspended from the ceiling.

In the drawings, the numeral 10 designates a casing or cabinet, of a general rectangular shape, which has considerably greater height and width than depth and which may be constructed of metal, wood or other suitable material. The cabinet is provided with a flat rear wall 11, top 12, bottom 13 and relatively narrow end walls 14. An arcuate or semi-circular extension 15 is made integral with the upper end of each wall 14 at its forward vertical edge, while an angular projection 16 is formed therebelow. The upper and lower marginal edges of the projection 16 are inclined forwardly or outwardly toward each other and the outer portion extends vertically, as is clearly shown in Figure 3. The forward wall or front 17 of the cabinet is provided with an offset, semi-circular or arcuate portion 18 at its upper end which extends longitudinally thereacross and has its vertical edges overlying the extensions 15 of the end walls. Substantially the entire portion 18 is open as shown at 19 and is arranged to receive a longitudinal, semi-circular or curved grill 20 which may be secured therein in any suitable manner (Figures 2 and 5).

The cabinet is adapted to be mounted within each room or area A, the interior of which is to be conditioned, on one of the walls B thereof, preferably, adjacent its ceiling C. Thus, the rear

wall 11 of the cabinet lies contiguous to the wall B, while the top 12 is in close proximity to the ceiling, as is clearly shown in Figure 1. One or more of the windows D of the room may be opened from the top, whereby entry of fresh, outside air into said room is permitted. With the cabinet disposed in this position, ideal circulation of air within the room is made possible and proper conditioning of said air facilitated.

A centrifugal impeller or blower 21 is mounted in the upper end of the cabinet within the offset portion 18 and adjacent each end wall of said cabinet (Figure 5). The impellers are spaced apart and are connected to the drive shaft 22 of a suitable electric motor 23 which is positioned therebetween, as shown in Figure 4. Each impeller is provided with the usual cylindrical hood or casing 24 which has diametrically-opposed flared openings 25 in its ends for drawing air from the exterior of the cabinet through the grill 20. An enlarged discharge flue 26 is made integral with each hood so as to force and direct a blast of air downwardly into the interior of the cabinet.

An air cleaner or filter 27 of spun glass, metal or other suitable material, extends transversely across the interior of the cabinet immediately below the discharge end of the flue 26, whereby the air discharged from the impellers is thoroughly cleaned of dust, pollen and other extraneous matter. The filter is inclined downwardly and rearwardly of the cabinet so that excess moisture and extraneous matter will tend to be directed toward the back of said cabinet. The entire lower portion of the cabinet below the filter may be lined with refractory material or satisfactory insulating material, as shown at 28.

A cooling element 29 is positioned within the upper end of the insulated portion of the cabinet and includes a continuous cooling coil 30 and spaced, transverse, vertical fins 31. As is clearly shown in Figures 4 and 5, the coil 30 extends back and forth across the length of the cabinet so as to cover substantially the entire area of the interior thereof, whereby air flowing through said cabinet will contact the coil and fins. A suitable refrigerant, such as ice water, having a temperature of about 40° F., is circulated through the coil by means of the inlet and discharge pipes 32 which are adapted to be connected to a source of supply (not shown). It is pointed out that the coil and the upper and lower edges of the fins are inclined rearwardly and downwardly so as to induce and encourage excess moisture or water to drain to and accumulate at the rear of the cabinet out of the path of the air passing through the cooling element. Thus, the water may drip down the rear wall 11 of the cabinet and escape through a discharge pipe 33 mounted in the bottom 13 of said cabinet.

A longitudinally-extending opening 34 is located in the front 17 of the cabinet below the cooling element 29 and is spaced from the bottom 13. The opening extends substantially entirely across the cabinet and serves as a discharge for the conditioned air escaping from the interior of the cabinet into the room to be conditioned. A pair of elongate, angle irons 35 are secured to the external surface of the front 17 by welding, or other suitable means, one below and one above the opening 34, as shown in Figure 5. The outwardly directed flanges of the angle irons are bent or inclined inwardly, at an angle to the horizontal, toward each other, whereby the area or size of the discharge opening is reduced to form an elongate nozzle.

A rectangular mixing member 36 extends longitudinally across the front of the cabinet between the forwardly projecting extensions 16 of the end walls 14 and is provided with upper and lower horizontal bars 37 which are curved or arcuate in cross-section. These bars are disposed immediately above and below the opening 34 and nozzle 35 with their curved surfaces directed toward each other and said nozzle. For adjustably mounting the member 36 between the extensions 16, each end section of said member is provided with a pair of vertically-alined bolts and nuts 38 which engage within elongated horizontal slots 39 formed in each extension, as shown in Figure 3. By moving the bolts backward and forward within their respective slots, the position of the mixing member may be changed to vary the distance between said member and the nozzle 35.

With the above arrangement, it is manifest that when cold or conditioned air is ejected from the nozzle, warm room air is drawn through the openings between the curved surfaces of the bars 37 and said nozzle, whereby the temperature of said cold air is materially moderated. Thus, a Venturi type of discharge is provided which is adjustable to the size of the room or area to be conditioned and which only slightly reduces the temperature and relative humidity of the air ejected therefrom. It is pointed out that the position of the mixing member determines the amount or quantity of room air admixed with the conditioned air and that said amount may be materially decreased by moving the same rearwardly toward the nozzle. Obviously, a blast of extremely cold air, which is unpleasant and unhealthy, is avoided by this unique structure which is an important feature of the invention.

When the impellers 21 are operating, air is drawn from the room A and is forced downwardly through the filter 27 where it is thoroughly cleaned of dust, pollen and extraneous matter. A portion of this air may be fresh air admitted into the room through the open window D. The air then passes between the cooling coils 30 and fins 31 of the cooling element where it is cooled as well as dehumidified. Due to the inclination of the coils and the transverse edges of the fins, moisture absorbed by the cold surfaces of said coils and fins will flow rearwardly of the cabinet out of the path of the air passing therethrough and will escape through the pipe 33. The relatively cold, dehumidified air will then pass outwardly through the opening 34, nozzle 35 and mixing member 36 where it will be admixed with a predetermined portion of the warm, humid room air, whereby a moderated stream of conditioned air is delivered to the room, as hereinbefore set forth. While the admixed room and reconditioned air is being discharged into the room, the impellers 21 are constantly drawing more air into the cabinet so as to continue the conditioning operation.

It is pointed out that the capacity and number of impellers or blowers used depends upon the size of the room or area to be conditioned, and that one impeller might be sufficient for a very small room. Obviously, an air conditioning unit constructed in accordance with the invention herein set out may be housed within a comparatively small cabinet or casing which takes up very little space and does not require a complicated system of ducts in order to accomplish

circulation, as well as proper conditioning. The shallow depth and light weight of the cabinet permits the same to be supported by one of the walls of a room in an ideal position. It is contemplated that the cabinet may be mounted within a wall recess and the same has been designed with this possibility in mind. It is also noted that this cabinet does not require any floor space nor obstruct any windows of the room to be conditioned. The cabinet is not only attractive in appearance, without sacrificing efficiency, but also may be readily installed in a room without materially injuring the appearance or utility thereof. It is further noted that this self-contained unit is arranged to be mounted in each room or area to be conditioned and is not dependent upon any other mechanism other than the means for supplying a refrigerant to the continuous coil 38. Since an individual unit is provided for each room, any danger of spreading contagious diseases is reduced to a minimum. The presence of stale or foul air within the room is obviated by the constant entry of fresh air through the opened window or windows.

In some instances, it might be desirable, due to the height of the room, its use, arrangement or the position of its openings, to mount the air conditioning unit on the ceiling C, as shown in Figure 6. This modified form of cabinet 40 is similar to the preferred form and has substantially the same external appearance. The discharge opening with its nozzle and adjustable mixing is disposed at the lower end of the cabinet as shown at 41 instead of on the front, while the water discharge pipe 42 is located in said front which extends parallel to the ceiling. It is pointed out that the cooling element and filter are inclined downwardly and forwardly toward the cabinet front, as shown in dotted lines at 43, whereby excess moisture or water is directed toward the same so as to escape through the pipe 42. The operation of this form of the invention is the same as that of the preferred form.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. An air conditioning unit adapted to be mounted adjacent the ceiling of a room including, an elongate casing having an air inlet at its upper end which inlet extends substantially throughout the longitudinal width thereof, a curved grille covering said inlet, an air outlet extending substantially throughout the width of the casing at its lower end, air-current impellers disposed within the casing adjacent the inlet for circulating air downwardly through the casing, and a cooling unit mounted within the casing and having transverse coils and also having upright fins mounted on said coils, said fins having their bottom edges inclined in a direction to cause droplets of water to gravitate out of the path of the air currents.

2. An air conditioning unit adapted to be mounted adjacent the ceiling of a room including, an elongate casing having an air inlet at its upper end which inlet extends substantially throughout the longitudinal width thereof, a curved grille covering said inlet, an air outlet extending substantially throughout the width of the casing at its lower end, air-current impellers disposed within the casing adjacent the inlet for circulating air downwardly through the casing, a cooling unit mounted within the casing and having transverse coils and also having upright fins mounted on said coils, said fins having their bottom edges inclined in a direction to cause droplets of water to gravitate out of the path of the air currents, supporting elements secured to the casing on each side of the outlet and extending outwardly from said casing, and an elongate mixing member adjustably mounted between the supporting elements and extending throughout the length of the outlet, said member being spaced from and co-acting with said outlet for admixing room air currents with the conditioned air currents discharged through said outlet.

3. An air conditioning unit adapted to be mounted adjacent the ceiling of a room including, an elongate casing having an air inlet at its upper end which inlet extends substantially throughout the longitudinal width thereof, a curved grille covering said inlet, an air outlet extending substantially throughout the width of the casing at its lower end, air-current impellers disposed within the casing adjacent the inlet for circulating air downwardly through the casing, a cooling and dehumidifying unit within the casing between the inlet and the outlet and in the path of the air currents, supporting elements secured to the casing on each side of the outlet and extending outwardly from said casing, and an elongate mixing member adjustably mounted between the supporting elements and extending throughout the length of the outlet, said member being spaced from and coacting with said outlet for admixing room air currents with the conditioned air currents discharged through said outlet.

4. An air conditioning unit including, an elongate casing having an air inlet at its upper end which inlet extends substantially throughout the longitudinal width thereof, a grille covering said inlet, an air outlet extending substantially throughout the width of the casing at its lower end, air-current impellers disposed within the casing adjacent the inlet for circulating air downwardly through the casing, and a cooling unit mounted within the casing and having transverse coils and also having upright fins mounted on said coils, said fins having their bottom edges inclined in a direction to cause droplets of water to gravitate out of the path of the air currents.

5. An air conditioning unit including, an elongate casing having an air inlet at its upper end which inlet extends substantially throughout the longitudinal width thereof, a grille covering said inlet, an air outlet extending substantially throughout the width of the casing at its lower end, air-current impellers disposed within the casing adjacent the inlet for circulating air downwardly through the casing, a cooling unit mounted within the casing and having transverse coils and also having upright fins mounted on said coils, said fins having their bottom edges inclined in a direction to cause droplets of water to gravitate out of the path of the air currents, supporting elements secured to the casing on each side of the outlet and extending outwardly from said casing, and an elongate mixing member adjustably mounted between the supporting elements and extending throughout the length of the outlet, said member being spaced from and co-acting with said outlet for admixing room

air currents with the conditioned air currents discharged through said outlet.

6. An air conditioning unit including, an elongate casing having an air inlet at its upper end which inlet extends substantially throughout the longitudinal width thereof, a grille covering said inlet, an air outlet extending substantially throughout the width of the casing at its lower end, air-current impellers disposed within the casing adjacent the inlet for circulating air downwardly through the casing, a cooling and dehumidifying unit within the casing between the inlet and the outlet and in the path of the air currents, supporting elements secured to the casing on each side of the outlet and extending outwardly from said casing, and an elongate mixing member adjustably mounted between the supporting elements and extending throughout the length of the outlet, said member being spaced from and coacting with said outlet for admixing room air currents with the conditioned air currents discharged through said outlet.

GEORGE H. GREENWAY.