Nov. 26, 1935. C. P. ERSCHEN ET AL 2,022,463

AIR CONDITIONING APPARATUS

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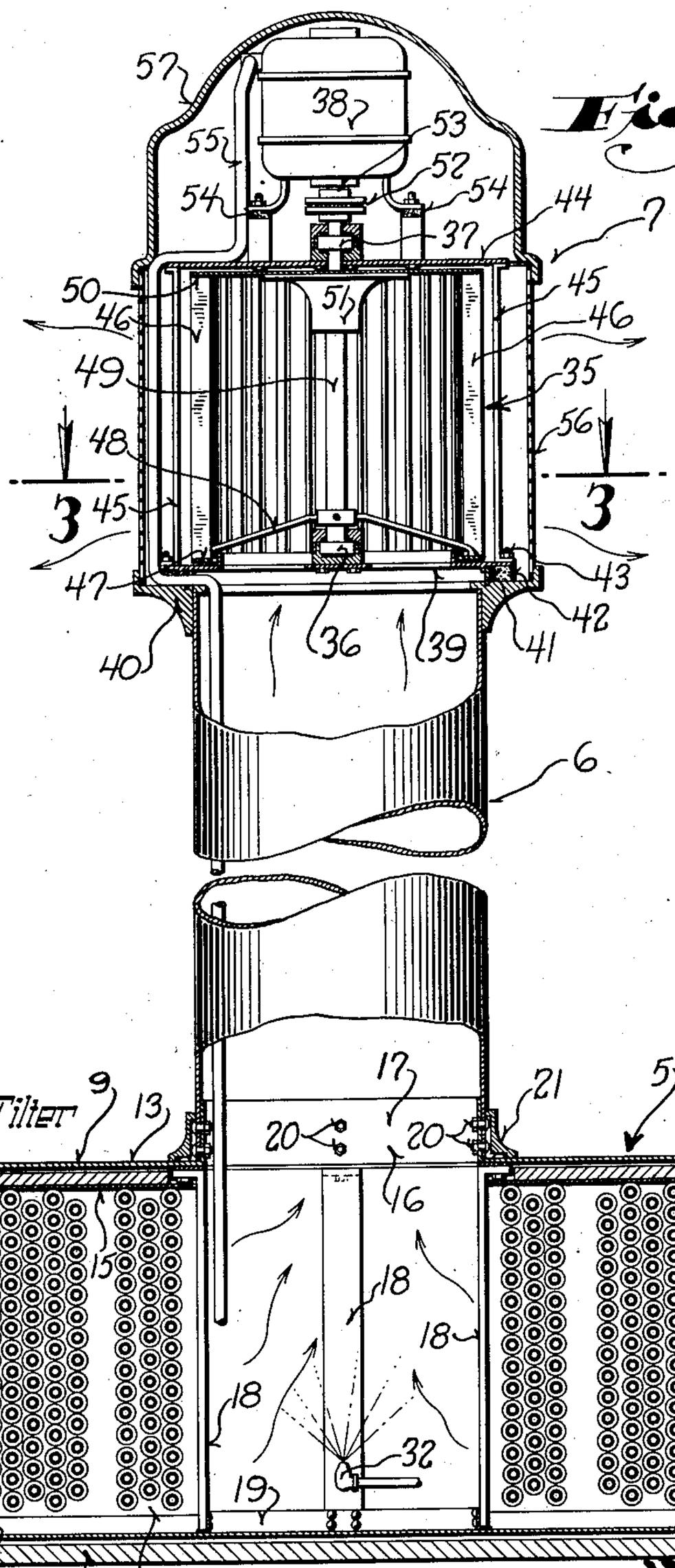

Fig. 1.

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Fig. 2.

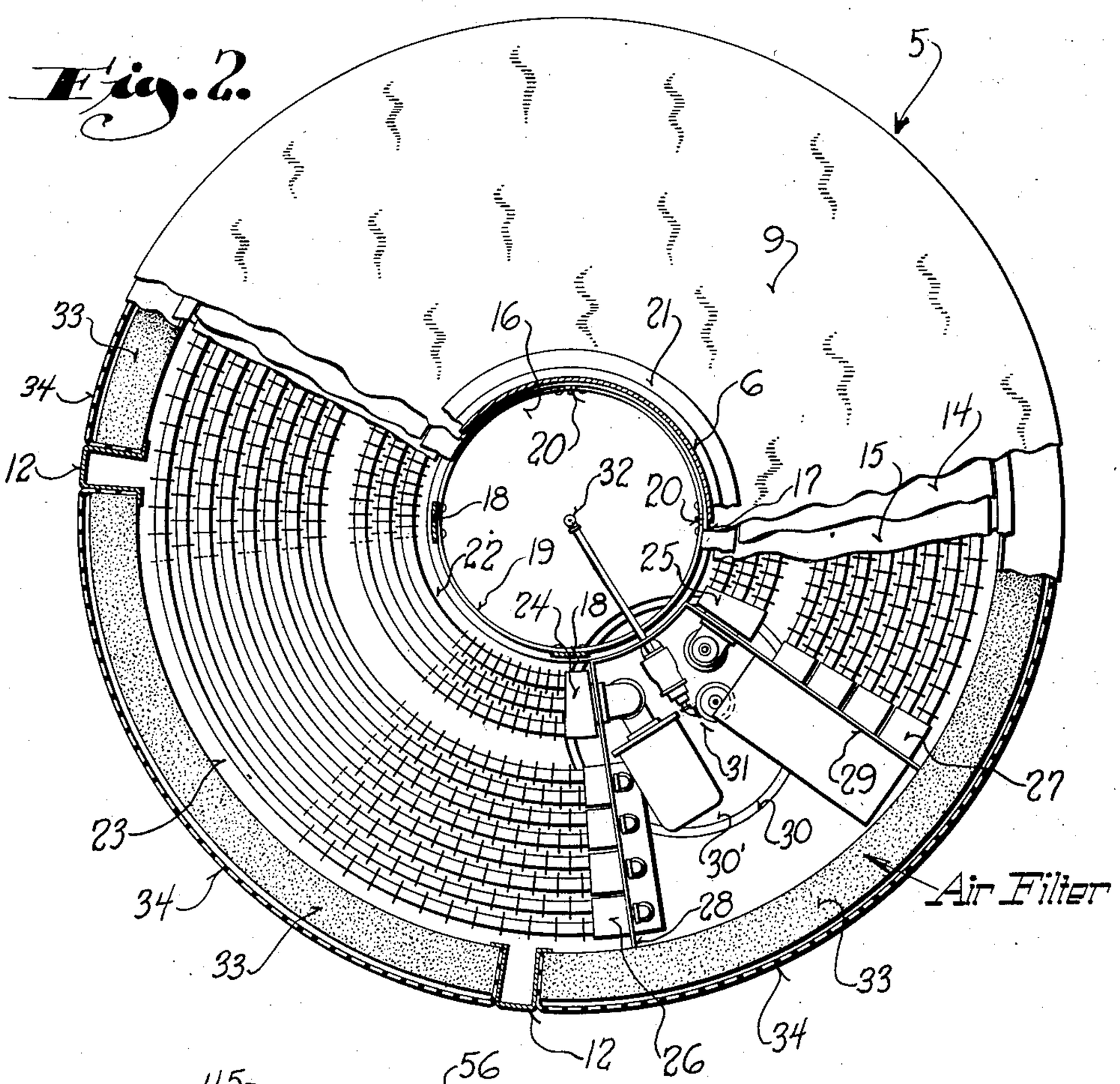
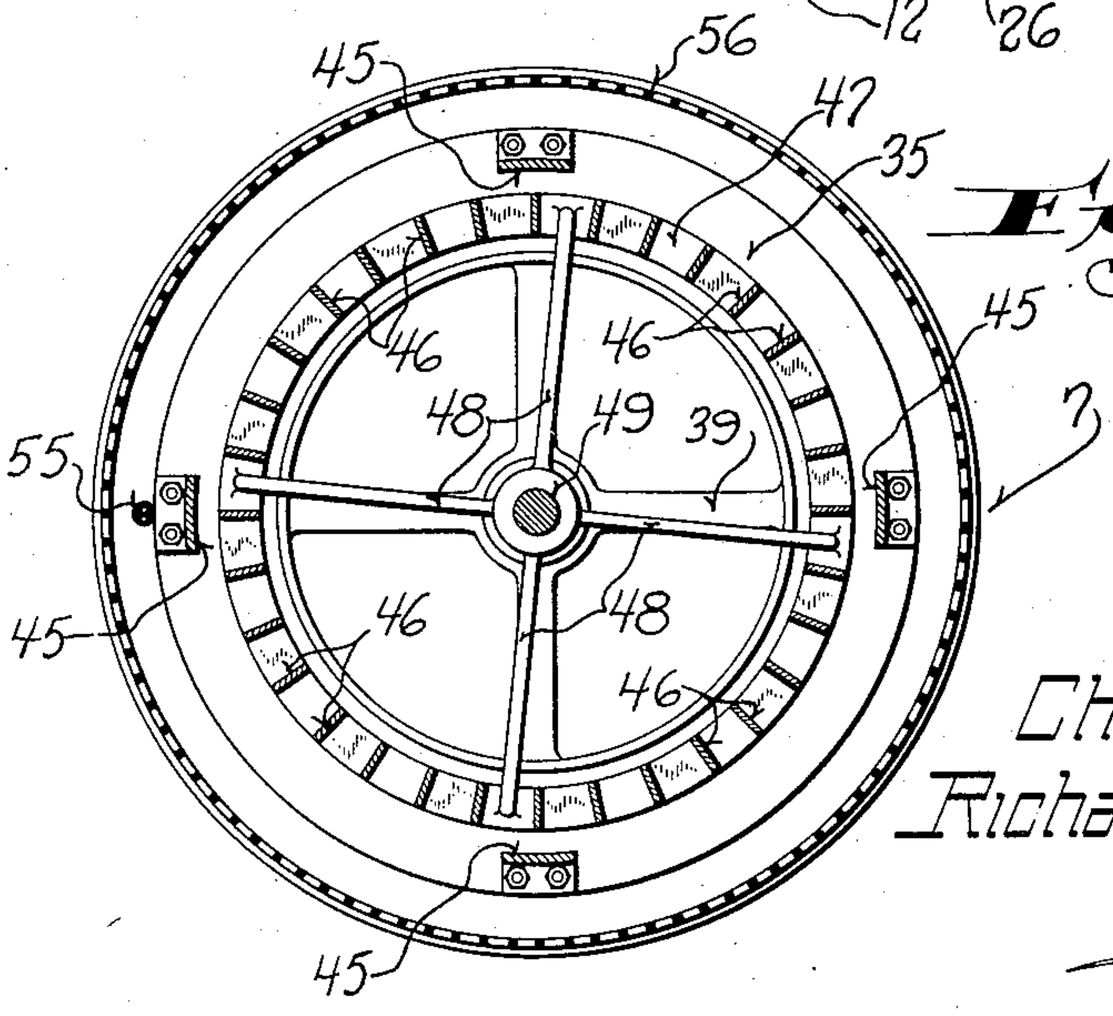


Fig. 3.



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AIR CONDITIONING APPARATUS

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Fig. 4.

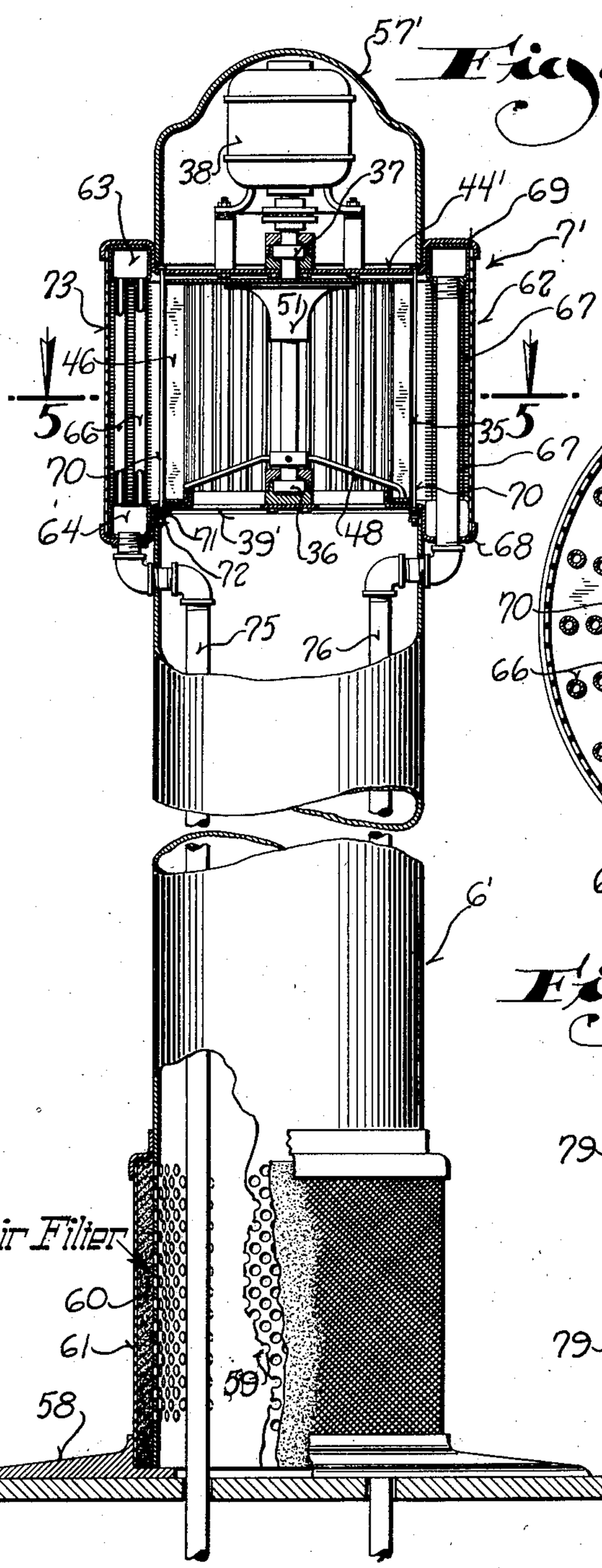


Fig. 5.

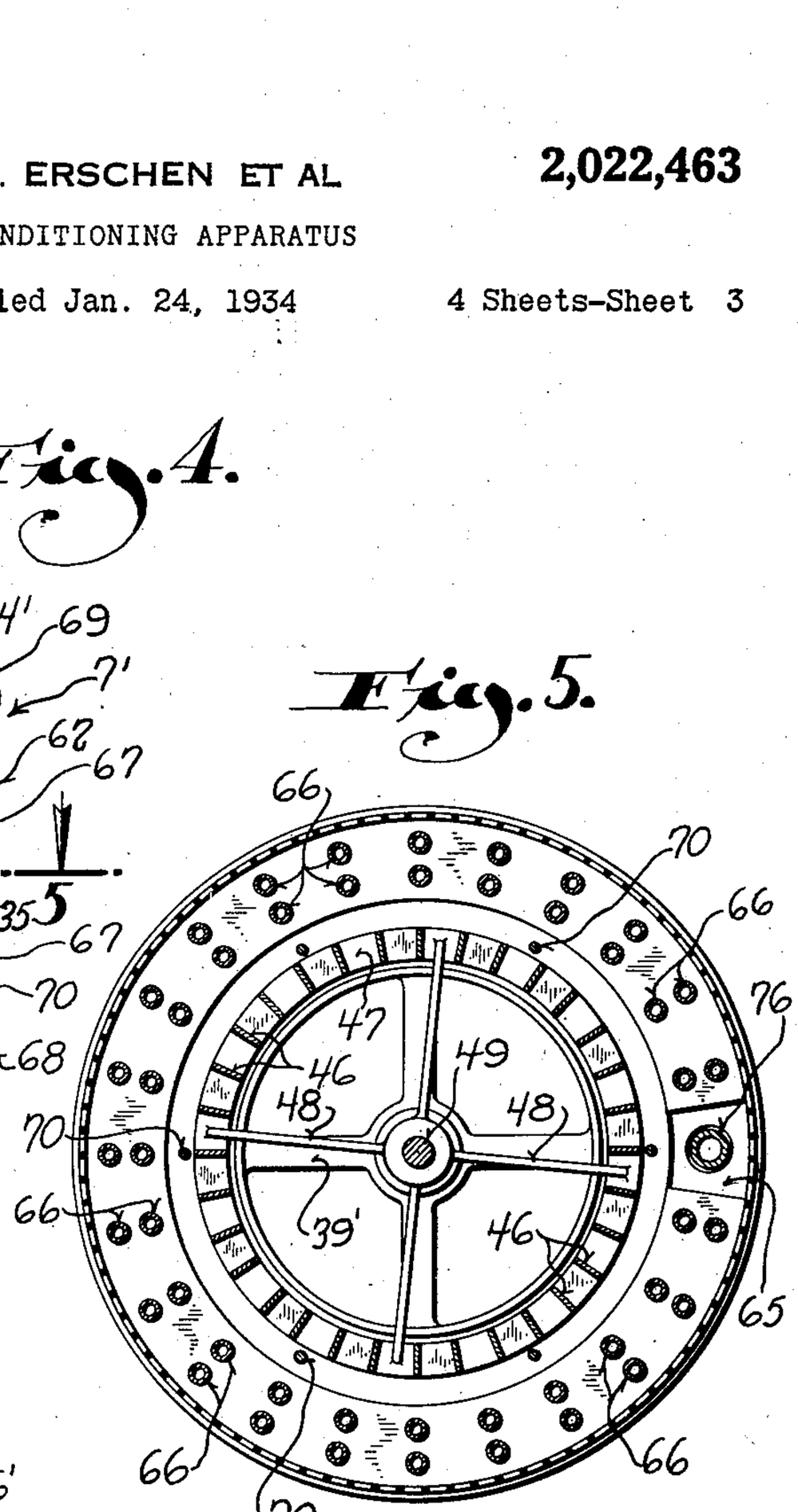
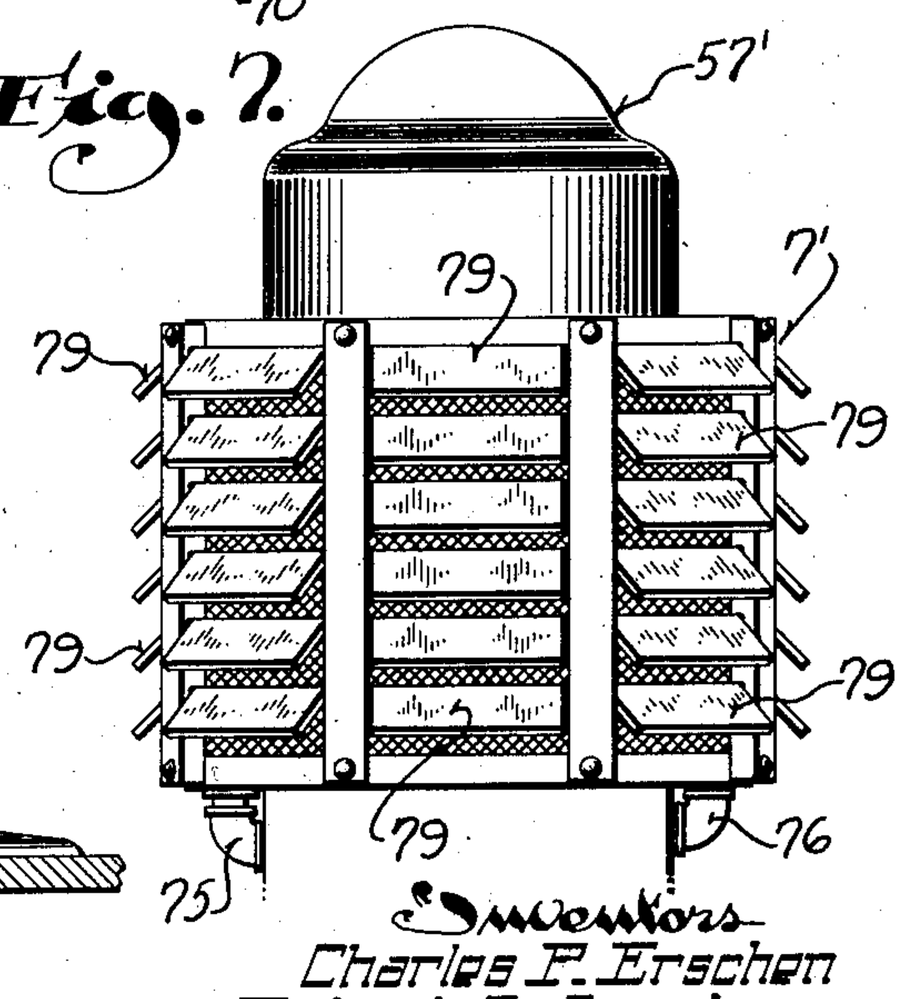


Fig. 7.



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AIR CONDITIONING APPARATUS

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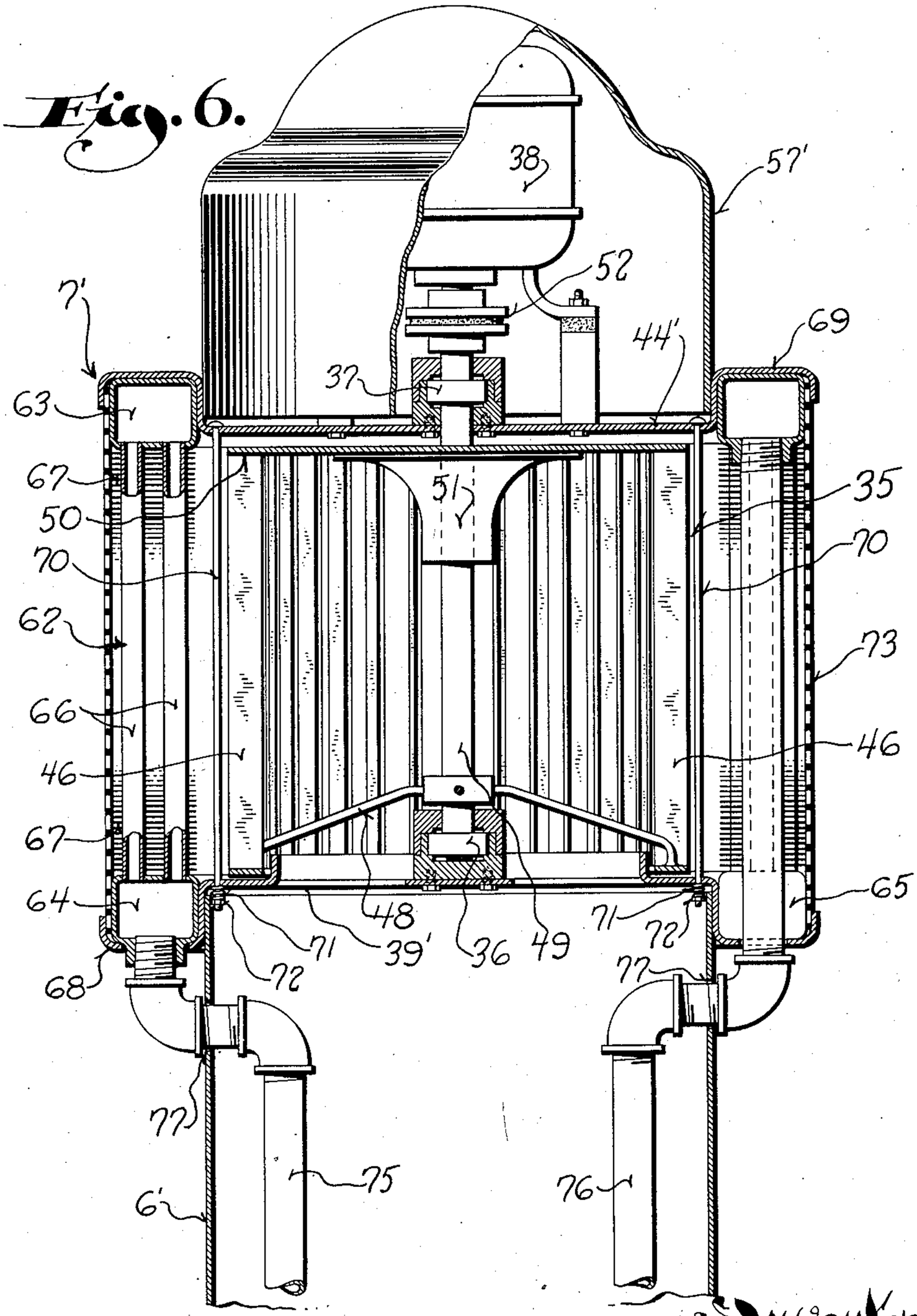
Fig. 6.



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UNITED STATES PATENT OFFICE

2,022,463

AIR CONDITIONING APPARATUS

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Application January 24, 1934, Serial No. 708,096

14 Claims. (Cl. 257—69)

This invention relates to new and useful improvements in air conditioning apparatus, and has as an object the provision of a compact self-contained air conditioning unit specifically designed to meet the requirements of small commercial buildings and industrial offices.

Another object of this invention is to provide an air conditioning apparatus so designed that distributing ducts are entirely eliminated.

Another object of this invention is to provide an air conditioning unit so constructed that the necessary plumbing, heating, refrigerating, and electrical connections may be brought up from the basement directly into the unit through a hole in the floor, which is covered by the unit.

Another object of this invention is to provide an air conditioning apparatus so constructed that a portion thereof may be used as a seat, and another portion thereof as a convenient support for display shelves.

Another object of this invention is to provide novel means for directly diffusing the air after it has been properly conditioned.

Another object of this invention is to provide a novel air temperature controlling unit, which is so constructed as to simultaneously diffuse the air in all directions.

More specifically, it is an object of this invention to provide a novel heat exchange unit, wherein a blower wheel revolves within a circular convector to diffuse the air outwardly therethrough in all directions.

And a further object of this invention is to provide a compact air conditioning apparatus of exceptional efficiency with a capacity for handling a large volume of air without necessitating a high velocity of the air through the conditioning elements.

With the above and other objects in view which will appear as the description proceeds, our invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, we have illustrated several complete examples of the physical embodiment of our invention constructed according to the best modes we have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view partly in vertical section and partly in side elevation, illustrating an air conditioning apparatus embodying this invention;

Figure 2 is a cross section view taken on the plane of the line 2—2 of Figure 1;

Figure 3 is an enlarged cross section view taken through the upper portion of the unit on the plane of the line 3—3 of Figure 1;

Figure 4 is a view similar to Figure 1 illustrating a modified embodiment of the invention;

Figure 5 is a cross section view through Figure 4 on the plane of the line 5—5;

Figure 6 is an enlarged detail view partly in side elevation and partly in vertical section of the head of the unit shown in Figure 4; and

Figure 7 is a side elevation of the head of the unit shown in Figure 4, showing the same equipped with louvers to direct the air flow.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates the base of the air conditioning unit of this invention, from which a central tubular column 6 projects upwardly to mount an air diffusing head 7. The base 5, as illustrated is considerably larger in diameter than the column 6 and rests on the floor 8 of the building in which the unit is installed, with its top 9 raised from the floor a distance corresponding to the normal height of a chair so that it may be used as a seat.

As shown in Figure 1, the base has a circular bottom wall 10, upon which the structure is built. The peripheral edge portion of the bottom wall 10 is stepped upwardly to define an annular ledge 11 from which vertical uprights 12 project at spaced intervals to support the top 9.

The top 9 includes an upper plate 13 suitably supported from the uprights 12 and a layer of heat insulating material 14 disposed beneath the plate 13 and confined between it and an inner plate 15, the plates 13 and 15 being suitably connected to each other.

At its center, the top plate 13 has a circular hole 16 provided with an upstanding flange 17 over which the column 6 is telescoped. Spaced about the periphery of the hole 16, there is a plurality of vertical supports 18 to rigidly support the inner portion of the top 9 and the weight of the column and head. These vertical supports 18 may be in the form of flat bars having their upper ends bent laterally and secured to the outer plate 13 by bolts, and their lower ends riveted to a ring or hoop 19, which rests on and is fixed to the bottom wall 10.

To secure the column 6 to the base, it is bolted as at 20 to the upwardly extending flange 17 encircling the hole 16. The heads of the bolts 20 are preferably concealed by a collar 21, which encircles the base of the column, and has the appearance of a finish molding.

Disposed within the base are two sets of heat exchange coils 22 and 23, equipped with radiating fins. The coils 22, which are innermost, have their ends terminated in headers 24 and 25 and provide means for circulating a heating medium. The outer set of coils 23 have their ends terminated in headers 26 and 27 and provide means for circulating a cooling medium.

The headers 24, 25, 26, and 27 are suitably supported on upright walls 28 and 29 extending radially from the periphery of the column outwardly to the inner edge of the ledge 11, see Figure 2. The space between these angularly disposed walls 28 and 29 affords a convenient housing for the control equipment of the unit, the specific construction and arrangement of which forms no part of this invention, suffice it to say that motorized valves are provided for regulating the flow of heating and cooling mediums through the coils.

The bottom wall 10 has an opening 30 in line with the space between the walls 28 and 29, and the unit is so placed on the floor that the opening 30 is directly over a hole 30' in the floor. Hence, the necessary plumbing, heating, cooling and electrical conduits may be brought up from the basement and run directly into the unit without necessitating their being exposed to view.

Besides the necessary equipment for controlling the passage of heating and cooling mediums through the heat exchange coils, the space defined by the angularly disposed walls 28 and 29 houses a control unit 31 for a humidifying spray nozzle 32, disposed centrally within the lower portion of the base to direct the spray upwardly into the bottom of the column as shown in Figure 1.

Encircling the heating and cooling coils is an air filter 33, preferably arranged in segments and supported directly on the ledge 11 between the upright supports 12. This air filter may be formed of any suitable material and provides an air inlet of large area so that the necessary volume of air may pass therethrough at low velocity. The filter is protected from injury by a grille 34 of any suitable construction.

The head of the unit mounted at the top of the column comprises a blower wheel 35 journalled on roller bearings 36 and 37 and driven by an electric motor 38. The bearing 36 is supported by a spider 39, disposed across the top of the column 6, where it is supported by a collar 40 fixed to the column. To avoid the transmission of vibration from the blower to the column, the spider is cushioned by a rubber ring 41 and rubber pillow blocks 42 through which studs 43 pass to hold the spider down on the collar 40. The upper bearing 37 is carried by a transverse plate 44, supported from the spider 39 by a plurality of upright supports 45.

The blower wheel 35 is of the conventional type comprising a series of vertical blades 46 having their lower ends fixed to a ring 47 suspended by radial arms 48 from the spindle 49 of the wheel. The upper ends of the blades are fastened to a plate 50, which is secured to the spindle 49 by a flared collar 51, which aids in dispersing the air outwardly.

The spindle 49 extends up through the bearing 37 to be connected through a flexible coupling 52 with the drive shaft 53 of the motor 38. The motor 38 rests on the supporting plate 44, being mounted thereon by cushioned supports 54. A conduit 55 which carries the leads for the motor extends from the motor down past the blower and down through the column 6 to the aligned openings 30 and 30'.

Encircling the blower there is a grille 56 of suitable construction, which rests directly on the collar 40 with its upper end supporting a hood 57 to enclose the motor and afford a neat finished appearance.

If desired, the invention may be embodied in a modified form as shown in Figure 4. In this construction, the large base is eliminated and the column 6' extends down to the floor, or at least to a flat flange 58, which rests directly upon the floor and upon which the entire unit is built.

The lower portion of the column 6' is perforated as at 59 to provide an air inlet. Encircling the perforated lower portion of the column is an air filter 60 protected by a grille 61. The head 7' of the unit not only provides means for diffusing the air drawn upwardly through the column, but also includes a heat exchange device for regulating the temperature of the air as it is disseminated from the unit.

In its general aspects, the head 7' is similar to that illustrated in Figure 1, that is the same type of blower wheel is employed, and it is driven in the same manner from a motor mounted above the wheel. The specific construction of the head, however, is different, as best illustrated in Figure 6.

The primary distinction between the head 7' and the head 7 is that the head 7' includes a heat exchange device or radiator unit 62 encircling the blower wheel. This radiator comprises annular upper and lower headers 63 and 64 respectively, the lower header 64 being interrupted at one point in its periphery to provide a space 65 as shown in Figure 5.

A plurality of vertical tubes 66 connect the headers 63 and 64 to provide for the passage of a heating or cooling medium from one header to the other. Radiating fins 67 in the form of rings interrupted in the same manner as the lower header 64 are disposed in superimposed relationship on the tubes 66 to increase the efficiency of the unit.

The lower header 64 rests on a flange 68 formed by an annular extension of the spider 39' which supports the lower bearing 36 of the blower wheel. This flange 68 is stepped downwardly as shown to telescope over the upper end of the column.

The transverse plate 44', which supports the top bearing 37 of the blower wheel has an upwardly stepped annular flange 69, which engages over the upper header 63 to be supported thereby, and tie rods 70 serve to connect the plate 44' with the spider 39' to clamp the heat exchange unit therebetween. To compensate for expansion and contraction, springs 71 are confined between the nuts 72, threaded on the rods, and the spider 39'.

The outer protecting grille 73, which encircles the heat exchange unit, has its ends received in the space between the flanges 68 and 69 and the outer periphery of the headers 63 and 64 and is thereby conveniently held in position. The hood 57' over the drive motor 38 is mounted by being telescoped within the upwardly stepped flange 69.

A heating or cooling medium is circulated

through the heat exchange unit from a suitable source communicated with the unit through pipe lines 75 and 76. Both pipe lines 75 and 76 pass upwardly through the column 6' entering the same through apertures in the floor. The pipe line 75 passes through an opening 77 in the upper end of the column to be communicated or connected to the lower header 64, and the other pipe line 76 passes through a similar opening 77 at a diametrically opposite point in line with the space 65 between the ends of the lower header, to pass upwardly through the space and be connected to the upper header 63. In this manner, the supply and return lines for the heat exchange unit are practically concealed, being visible only where they enter the column.

If desired, the head 7' may be equipped with louvers or shutters 79, as shown in Figure 7, by which the direction of the air thrown out by the blower wheel may be controlled. The specific manner in which these shutters or louvers are mounted and the manner in which they are actuated, forms no part of this invention. It is, of course, understood that while the shutters or louvers are shown applied to the modification illustrated in Figures 4, 5, 6, they may be also applied to the embodiment illustrated in Figures 1, 2, and 3.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art, that this invention affords a novel air conditioning apparatus, which is exceptionally compact, and being entirely self-contained, may be located so as to afford maximum efficiency; and that by reason of the fact that all of its connections and supply lines are brought up through the floor and enter the unit directly, the optimum of convenience in installation is obtained.

It is also noted that the unit is particularly well adapted for use in stores, commercial offices and small places of business, and that when set up in a store, it provides a convenient support for circular shelves so that the space alotted to the unit is in no wise wasted. In certain installations, it is found desirable to utilize the base as a circular seat and if desired, the top thereof may be upholstered.

It is also readily apparent that by disseminating the air from the top of the column, and by diffusing it in all directions simultaneously, the maximum degree of efficiency is obtained, and it is further to be noted that by reason of the novel construction of the combined blower and heat exchange unit, as illustrated in Figures 4, 5, and 6, a novel and exceptionally compact unit heater is afforded, and that by reason of this particular construction, the convector or radiator forms a guard for the blower wheel and obviates the necessity for any housing.

What we claim as our invention is:

1. An air conditioning unit comprising an upright tubular column, an enlarged hollow base having a top wall from which the column projects, said top wall being apertured to communicate the interior of the base and the column and providing a seat encircling the column, the vertical side wall of the base being perforate to provide an air inlet of considerably larger area than the cross sectional area of the column through which air passes for entrance into the lower portion of the column, means to filter the air as it enters the base, and means to create a flow of air through said inlet and upwardly through the column to be diffused from the upper end thereof.

2. An air conditioning unit comprising an upright tubular column, a base from which the column projects, said base having a cross sectional area considerably larger than that of the tubular column and having a perforate side wall whose total area is considerably greater than that of the tubular column to provide an air inlet of large area through which air slowly passes for entrance into the lower portion of the column, filter means covering the inside surface of said perforate side wall to filter the air as it enters the base, and an air blower mounted at the upper end of the column to induce a flow of air into the base through said filter means and upwardly through the column to be disseminated from the upper end thereof.

3. An air treating and circulating unit comprising, an upright tubular column, an enlarged hollow base having a flat horizontal top wall from which the column projects, said top wall extending a considerable distance in all directions from the front of the column to provide a seat encircling the column and having an aperture over which the column seats, the side wall of the base having means to afford an air inlet for the unit, air treating means within the base to which air entering the inlet is subjected, and means to induce a flow of air into the base and upwardly through the column to be disseminated from an outlet at the upper end of the column.

4. A self-contained air conditioning unit including temperature modifying means, an air filter and an air humidifier, a large circular base for the unit forming a housing for said air treating means, the top wall of the base having an opening through which treated air leaves the base and the side wall of the base being perforate to provide an air inlet through which the air to be treated is drawn into the base, said inlet having considerably greater area than that of said outlet opening, so that the air moves into the base and past the conditioning means therein at low velocity, an upright tubular column extending upwardly from the base above the outlet opening in its top wall and having an air discharge at its upper end, and means to induce a flow of air into the base and up through the column to be disseminated from the upper end thereof.

5. A heat transfer unit comprising, spaced substantially annular headers, one of said headers being interrupted for a short distance and having its ends at said interruption closed, a substantially annular radiator core connecting said headers, said radiator core being similarly interrupted at one point to define a space corresponding to the space left between the ends of said designated header, means to throw air outwardly through the radiator core, and supply and return lines leading to the headers, the line leading to the endless header having a portion thereof received in said space provided by interrupting the radiator and the other header.

6. In a device of the character described, a tubular column adapted to be supported from the floor with its upper end at a substantial elevation, means through which air may be introduced into the lower portion of the column to rise upwardly therein, and a diffusing unit at the upper end of the column to induce an upward flow of air through the column and to throw air outwardly from the upper end of the column in all directions, comprising a collar seated on the upper end of the column, a spider carried by said collar and extending across the open top of the

column, a bearing carried by the spider, a transverse plate disposed over the spider at a distance therefrom, means to connect said spider and transverse plate to maintain the same properly spaced, a bearing carried by said transverse plate in alignment with the bearing on the spider, a blower wheel disposed between said spider and the transverse plate and journalled in said bearings, and a drive motor for said blower wheel supported on said transverse plate.

7. A heat transfer unit comprising, a tubular supporting column to conduct air to a point of discharge, said column having an open upper end, a flanged collar seated on the open upper end of the column, a transverse spider carried by said collar and extending across the top of the column, a bearing carried by said spider, an annular radiator seated in the flange of said collar, a flanged transverse plate engaging the top of the annular radiator and extending across the space within the radiator at a distance above the spider, a bearing carried by said transverse plate in axial alignment with the bearing on the spider, a blower wheel journalled in said bearings to revolve inside said annular radiator to throw air conducted thereto by the column out through the radiator, and a drive motor for the blower mounted on said transverse plate.

8. A heat transfer unit of the character described comprising, spaced substantially annular headers, a substantially annular radiator core connecting said headers, a flanged collar engaged with one of said headers, a flanged transverse plate engaged with the other of said headers, means to connect said collar and transverse plate to maintain the same assembled with the headers, axially aligned bearings carried by said collar and transverse plate, a blower wheel journalled in said bearings to revolve inside the radiator to throw air conducted thereto through said collar outwardly through the radiator, and a drive motor for the blower mounted on said transverse plate.

9. In an air conditioner of the character described comprising, an open topped column, a flanged collar seated on the upper end of the column, a transverse support on said collar, a bearing on said transverse support, a heat transfer unit supported on said flanged collar and comprising spaced annular headers, and an annular radiator core connecting the headers, one of said headers resting on the flanged collar, a transverse flanged plate engaging the other of said headers and extending across the top of the heat transfer unit, means to connect said flanged collar and flanged transverse plate to confine the heat transfer unit therebetween, a bearing on said transverse plate coaxial to the bearing on said transverse support, a blower wheel journalled in said bearings to revolve inside the annular radiator core and throw air conducted thereto by the column outwardly through said radiator core, and a drive motor for the blower supported on said transverse plate.

10. In an air conditioner, an open topped upright tubular column, a flanged collar telescoped over the open end of the column, radial arms carried by said column to provide a spider extending across the open top of the column, a bearing supported on said spider, a heat transfer unit comprising spaced parallel headers and an annular radiator core connecting the headers, the lower header being telescoped into the flanged collar and seated on the flange thereof, a flanged transverse plate engaged over the upper header to be supported thereon, a bearing carried by said transverse plate in coaxial alignment with the bearing on the spider, a blower journalled in said bearings to throw air conducted thereto by the column outwardly through the radiator core, and a drive motor for the blower supported on said transverse plate.

11. In an air conditioner, an open topped upright tubular column, a flanged collar telescoped over the open end of the column, radial arms carried by said column to provide a spider extending across the open top of the column, a bearing supported on said spider, a heat transfer unit comprising spaced parallel headers and an annular radiator core connecting the headers, the lower header being telescoped into the flanged collar and seated on the flange thereof, a flanged transverse plate engaged over the upper header to be supported thereon, a bearing carried by said transverse plate in coaxial alignment with the bearing on the spider, a blower journalled in said bearings to throw air conducted thereto by the column outwardly through the radiator core, a drive motor for the blower supported on said transverse plate, and an enclosing hood for the drive motor telescoped inside the flange of the transverse plate.

12. In an air conditioner, an open topped upright tubular column, a flanged collar telescoped over the open end of the column, radial arms carried by said column to provide a spider extending across the open top of the column, a bearing supported on said spider, a heat transfer unit comprising spaced parallel headers and an annular radiator core connecting the headers, the lower header being telescoped into the flanged collar and seated on the flange thereof, a flanged transverse plate engaged over the upper header to be supported thereon, a bearing carried by said transverse plate in coaxial alignment with the bearing on the spider, a blower journalled in said bearings to throw air conducted thereto by the column outwardly through the radiator core, a drive motor for the blower supported on said transverse plate, and a protecting grille for the radiator core encircling the same and held in place by the flanges or the collar and the transverse plate.

13. In an air conditioner, a hollow upright column, an upper perforated annular grille near the top of the column, a lower perforated annular grille at the bottom of the column, the perforations in the lower annular grille providing an air inlet to the interior of the column and the perforations in the upper annular grille providing an air outlet, filter means overlying the inner surface of the lower perforated grille to filter air as it enters the column, means for inducing a flow of air into the column through the lower perforated annular grille and up through the column to be discharged through the upper perforated annular grille, means for modifying the temperature of air passing through the column, and means for modifying the humidity of air passing through the column.

14. In an air conditioner, a hollow upright column, an upper perforated annular grille near the top of the column, a lower perforated annular grille at the bottom of the column, the perforations in the lower annular grille providing an air inlet to the interior of the column and the perforations in the upper annular grille providing an air outlet, filter means overlying the inner surface of the lower perforated grille to clean air as it enters the column, a wall closing the top of the column above the upper annular perforat-

ed grille, a bearing carried by said wall, an air blower disposed within the space defined by said upper annular grille and having a shaft journalled in said bearing, a motor mounted above said wall and connected with said shaft to drive the blower so as to induce a flow of air into the column through the lower perforated grille and up through the column to be discharged through the upper perforated annular grille, and means for modifying the temperature and humidity of the air passing through the column.

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