This invention relates to electric fans, and more particularly has reference to a fan of the radial flow type. In its broadest aspects, the device may be summarized as including a circular housing having an air inlet opening centrally disposed thereon, and having a louvered outlet extending through the full circumference of the housing. Mounted in the housing is an electric motor, driving a suction fan disposed adjacent the air inlet, for the purpose of drawing air into the center portion of the housing. The air drawn into the center area of the housing is directed radially, outwardly thereof through the louvered peripheral area, through the provision of a bladed rotor connected to the shaft of the motor for rotation with the fan blade assembly. The rotor is of annular shape, and is so designed that air sucked by the suction fan assembly into a space centrally located in the housing and surrounded by the annular series of pitched blades in the rotor will be caused by the pitch of the rotor blades to travel outward beyond the rotor periphery through the full circumference thereof, to be directed along radial lines through the louvered open peripheral area of the housing.

The main object of the invention is to provide a generally improved fan of the radial flow type, so designed as to effect a more uniform distribution of air radially outwardly of the fan to the room space surrounding the fan. In this way, persons in said space, may all receive, to an equal extent, the advantages of the more uniform air distribution, as distinguished from the ordinary oscillating type of electric fan in which distribution is highly uneven, and tends to create discomfort on the part of some of the persons disposed within range of the flow of air from the fan, as compared to others also located within said range who may find the air flow to be comfortable.

Another object is to provide a device of the character described that will be characterized by its simplicity, the design being such as to facilitate manufacture of the device at relatively low cost, considering the more uniform air distribution to be achieved through the use thereof.

A further object is to form the fan in such a manner that the assembly and disassembly thereof can be facilitated, so as to further lower the cost of manufacture, this feature of the invention further being adapted to permit maintenance and repair of the fan at a comparatively low cost.

Yet another object is to provide a fan of the character described which will be highly compact considering the amount of air moved thereby.

A further important object of the invention is to so locate the suction fan and rotor as to insure to the maximum extent against injury to persons who may accidently or intentionally insert their fingers through the louvered periphery of the housing.

Still another object is to provide a device of the character described that will be mechanically constructed in such a way as to lend itself to formation in an attractive design that will be acceptable to persons intending to dispose the fan in an area in which the appearance of the fan should not detract from the decor of the room.

Still another object is to so design the fan as to permit either a heating or refrigerating unit, or both of them, to be incorporated in the fan construction with minimum modification of the basic design thereof.

Other objects will appear from the following description, the claims appended thereto, and from the annexed drawing, in which like reference characters designate like parts throughout the several views, and wherein:

Figure 1 is a side elevational view of a fan according to the present invention;

Figure 2 is a bottom plan view thereof;

Figure 3 is a horizontal section on line 3—3 of Figure 1;

Figure 4 is a sectional view taken diametrically through the fan, substantially on line 4—4 of Figure 3;

Figure 5 is an elevational view of the air inlet guard, per se;

Figure 6 is a top plan view of the suction fan blade assembly per se;

Figure 7 is a detail sectional view of one of the support legs of the fan housing;

Figure 8 is an elevational view of one of the peripheral louvers per se;

Figure 9 is a view looking upwardly at the suction fan assembly casing and the air inlet guard, taken substantially on line 9—9 of Figure 4, the suction blade assembly being removed; and

Figure 10 is a fragmentary plan view of the louver reinforcing ring, per se.

Referring to the drawings in detail, the fan constituting the present invention includes a hollow housing generally designated 8. This is of circular outer configuration, has a generally flattened appearance, and has convexly formed top and bottom surfaces.

The housing includes a base plate 10, of concavo-convex formation, having adjacent its periphery openings angularly spaced about the circumference of the base plate 120 degrees apart. The openings of the base plate are smooth-walled, and receive the threaded upper ends of support legs 12 which diverge downwardly from the base plate and support the same at a relatively low elevation above a supporting surface 5. The legs 12 are ball elements 13 threaded onto their lower ends, to prevent damage to the supporting surface, and at their upper ends, the legs are threaded into the nuts 14, which are threaded inwardly toward each other against the top and bottom surfaces of the base plate, washers 15 being interposed between the nuts and the base plate.

An electric motor 16 is vertically mounted on the under the center of the base plate 10, through the provision of angularly spaced feet or mounting brackets 18 rigid with the motor casing and bolted to the base plate. The shaft 20 of the motor projects vertically upwardly within the housing, and positioned over the shaft is a cylindrical block 22 axially recessed to receive the shaft. The shaft has a flat surface, engageable by a set screw 24 of the block 22.

Block 23 is integrally formed with an axial, upwardly projecting, reduced extension 26, also having a flat surface.

A suction blade assembly generally designated 27 includes a plurality of pitched, relatively short, closely spaced blades 28 radiating from and rigid with a hub 30 pressed-fitted over the extension 26 and having a flat surface 31 formed on the wall of the bore of the hub 30.

Thus, the block 22 is removably connected to the shaft 20 for rotation therewith, and the blade assembly is in turn removably connected to the extension of the block for rotation with the block and the motor shaft.

The block 22 and its extension 26 constitute com-
ponents of a bladed distributing rotor generally designated 33, used to force air sucked into the housing by the blade assembly 27 in a direction radially outward toward the periphery of the housing.

The rotor 33 includes in addition to the block and extension, radial arms rigid with block 22 and diverging in a direction downwardly from the block as shown in Figure 4. Arms 32 at their outer ends are integral or otherwise made rigid with a lower rotor ring 34 of endless formation, lying in a plane normal to the axis of rotation of the rotor.

Rigidly secured at their lower ends to the top surface of the ring 34 are rotor blades 36. These are pitched obtuse 45° to 60° in planes that are parallel to the axis of rotation the rotor as shown in Figure 3, in directions circumferentially of the ring 34. The inner side edges of the blade 36 are disposed upon the inner edge of the ring 34, while the outer side edges of said rotor blades are disposed at the outer edge of the lower rotor ring. The rotor blades 36 are angularly spaced uniformly through the full circumference of the rotor with the inner side edges of the blades leading in the sense of direction of rotation of the rotor, which is clockwise in Figure 3.

As will be noted, the blades 36 are in an annular series, the diameter of which is substantially greater than the outer diameter of the blade assembly 27, with said annular series being concentric with the blade assembly 27. Further, it will be noted that the rotor blades are so disposed that their lengths parallel the axis of rotation of the rotor, while the blades 25 of the blade assembly are so disposed that their lengths are normal to said axis of rotation.

At their upper ends, the blades 36 are integral with or otherwise rigidly secured to an upper rotor ring 38 matching the lower ring 34 in diameter.

It is also worthy of note that the blades 28 of blade assembly 27 rotate in a plane spaced above the upper rotor ring 38, in an arrangement the characteristics of which will be described hereinafter in greater detail.

At its periphery, the base plate 10 is integrally formed with an inwardly directed, circumferential flange 40 which is of frusto-conical formation, so that in cross section it is inclined upwardly from the outer periphery of the base plate.

Peripheral, fixed louvers 42 are fixedly secured at their lower ends to the flange 40, and correspond in width to the width of the flange. The louvers 42 have their lengths parallel to the lengths of the blade 36, but are radially spaced outwardly a substantial distance from the annular series of rotor blades as shown in Figure 3. The fixed louvers all lie in the plane disposed radially outwardly from the housing and include the axis of rotation of the rotor so that air forced outwardly by the rotor is directed in radial paths beyond the periphery of the housing, to be distributed uniformly through the space surrounding the electric fan.

A top plate 44 is also of concavo-convex formation, its concavo-convexity being formed on a radius equal to that employed in similarly forming the base plate 10. Top plate 44, at its periphery, has a frusto-conical, inwardly directed flange 46 inclining downwardly from the periphery of the top plate when viewed in cross section as shown in Figure 4. The upper ends of the louvers 42 are fixedly secured to the flange 46.

Rigidly secured to the underside of the top plate 44 is a cylindrical blade assembly casing 48 opening downwardly into the space circumscribed by the series of rotor blades 36. Radial, inclined braces are connected between the casing 48 and the top plate, to brace the casing in its proper position.

To reinforce the peripheral series of louvers, there is provided medially between the ends of the louvers a reinforcing ring 52 having uniformly spaced, radial slots 54 opening upon its inner edge as shown in Figure 10. Slots 54 extend through half the width of the reinforcing ring 52, and correspond in number and spacing to the louvers 42. The louvers 42, as shown in Figure 4, have medially between their ends transverse slots 56 extending through half the width of the louvers, and opening upon the outer side edges of the louvers to receive the reinforcing ring. In this way, the louvers 42 are interlockingly engaged with the reinforcing ring 52, which ring 52 lies in a plane parallel to and located medially between the planes of the upper and lower rings 34, 38, (of Figure 4).

Centrally formed in the top plate is an air inlet opening 57, and seating in position to overlie said opening is an air inlet guard (see Figure 5) including an annular frame 58 to which is secured an upwardly concavo-convex screen mesh guard element 60. Integral or otherwise rigid with the frame 58 are the louvers 25 of the blade assembly 27 which are rotating.

For the purpose of applying power to the motor, there is provided an electric cord 64, which would be equipped with a suitable plug, not shown, for connecting the same to conventional receptacle, also not shown.

From the construction illustrated and described, it will be seen that the oppositely concavo-convex base and top plate define between them a circumferentially extending outlet of substantial size in a vertical direction, through which the air is forced to the space surrounding the fan. In this connection, there is a minimum obstruction to the free passage of air from the air inlet to said outlet, due to the fact that the motor 16 is disposed in the dished center portion of the base plate, and does not project upwardly from the base plate to a distance such as will cause said motor to be disposed in the path of air that is being moved by the fan during operation thereof. Further, the rotor is so designed as to have a vertical dimension matching closely the vertical dimension of the circumferentially extending outlet of the housing, that is the inner edges of the louver-connected flanges 40, 46 of the base and top plate respectively are disposed in planes common to the planes of the lower and upper rings 34, 38, respectively, of the rotor.

Still further, it will be noted that the rotor is wholly open at its upper end, in the space surrounding the block 22, so that air sucked through the inlet by the blade assembly is permitted to be moved freely into the open upper end of the rotor. The blade assembly, as previously noted, is disposed wholly in a plane above the plane of the top plate, that is, it is disposed entirely within the dished portion of the top plate. The air is sucked in during operation of the blade assembly, and is led straight downwardly into the area circumscribed by the series of rotor blades, after which the pitch of the rotor blades will cause the same to change direction and move along radial paths straight outwardly from in which the housing.

In this way, a compact, efficiently operating fan, so designed as to not detract from the furnishings of a home, is provided, with said fan being so designed as to assure uniform distribution of air throughout the space surrounding the fan. Further, the fan can be readily disassembled, since the blade assembly is easily removed from the rotor, and the rotor is in turn easily removed from the motor shaft.

It is believed apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, since such construction is only intended to be illustrative of the principles, it being considered that the invention comprehends any minor change in con-
2,905,877

5 structure that may be permitted within the scope of the appended claims.

What is claimed is:

1. A radial flow electric fan comprising: a housing including circular base and top plates of oppositely, shallowly concavo-convex form vertically spaced from each other in coaxial alignment, said plates having in-

wardly directed circumferential flanges extending con-

tinuously through their full circumferences, the top plate having a center opening; a plurality of louvers disposed in vertical planes that extend radially from the common axis of the plates, said louvers comprising deflectors for air currents directed against the same from the space between the plates to cause said currents to follow paths that extend radially outwardly of the plates follow-

ing movement of the currents past the louvers, said louvers being fixedly connected between the peripheries of the plates and comprising the sole connection between the plates; a motor centrally mounted upon the base plate and including a shaft projecting upwardly into the space between the plates; a rotor connected in said space to the shaft for rotation therewith and including an annular series of vertically extending blades pitched to move air downwardly from the space circumscribed by said series to the louvers, said series being concentric with and being spaced inwardly a substantial distance from the circumferences of the plates to define between the blades and louvers an annular space extending in a vertical direction the full length of the louvers and blades and extending a substantial distance in a horizontal direction measured radially of the shaft between the series of blades and said plurality of louvers, said rotor at its top lying wholly in the approximate plane of the periphery of the top plate, thereby to form a space between the rotor and said top plate in the area below the center opening of the top plate; a cylind-

rical casing concentric with and extending about said opening, said casing extending downwardly from the top plate and terminating at its lower end in closely spaced relation to the top of the rotor radially inwardly a substantial distance from the series of blades; and a suction blade assembly having a connection to the rotor for rotation therewith and including blades pitched to draw air downwardly through said opening into the space within the rotor circumskried by the series of rotor blades,

2. A radial flow electric fan comprising: a housing including circular base and top plates of oppositely, shallowly concavo-convex form vertically spaced from each other in coaxial alignment, said plates having inwardly directed circumferential flanges extending continuously through their full circumferences, the top plate having a center opening; a plurality of louvers disposed in vertical planes that extend radially from the common axis of the plates, said louvers comprising deflectors for air currents directed against the same from the space be-

tween the plates to cause said currents to follow paths that extend radially outwardly of the plates following movement of the currents past the louvers, said louvers being fixedly connected between the peripheries of the plates and comprising the sole connection between the plates; a motor centrally mounted upon the base plate and including a shaft projecting upwardly into the space between the plates; a rotor connected in said space to the shaft for rotation therewith and including an annular series of vertically extending blades pitched to move air outwardly from the space circumscribed by said series to the louvers, for deflection by the louvers into said paths on rotation of the shaft in a predetermined direction, said blades being substantially coextensive in length with the louvers, said series being concentric with and being spaced inwardly a substantial distance from the circumferences of the plates to define between the blades and louvers an annular space extending in a vertical direction the full length of the louvers and blades and extending a substantial distance in a horizontal di-

rection measured radially of the shaft between the series of blades and said plurality of louvers, said rotor at its top lying wholly in the approximate plane of the periphery of the top plate, thereby to form a space between the rotor and said top plate in the area below the center opening of the top plate; a cylindrical casing concentric with and extending about said opening, said casing extending downwardly from the top plate and terminating at its lower end in closely spaced relation to the top of the rotor radially inwardly a substantial distance from the series of blades; and a suction blade assembly having a connection to the rotor for rotation therewith and including blades pitched to draw air downwardly through said opening into the space within the rotor circumskried by the series of rotor blades, the rotor including a center block having a downwardly opening axial recess receiving the shaft, said block being fast to the shaft and having a rigid connection to the series of rotor blades, the block being formed with a reduced upwardly projecting axial extension defining a shoulder at the base of said extension, said blade assembly including a hub axially bored to re-

ceive the extension, said hub seating on said shoulder and being made fast to the extension, the blades of the suction blade assembly projecting from and being fast to the hub.

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