

Jan. 15, 1929.

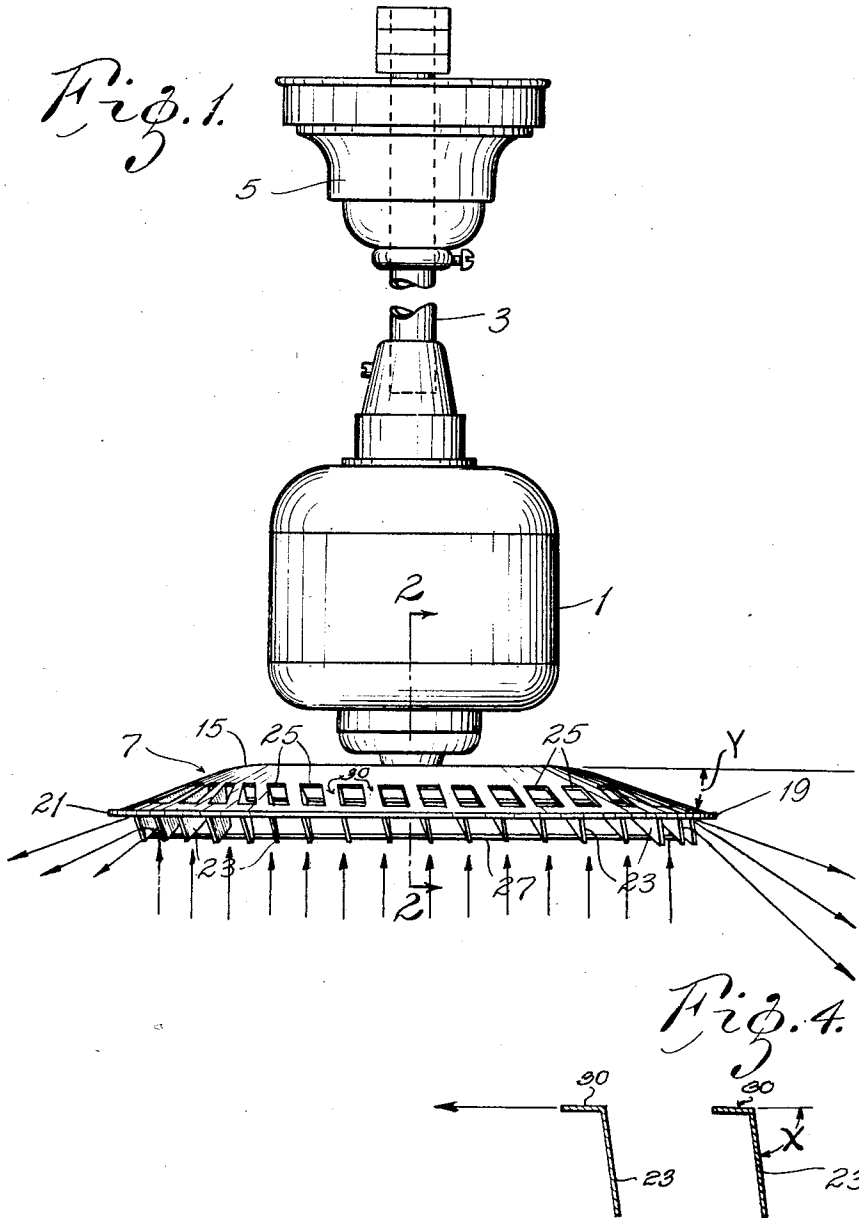
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1,699,201

FAN

Filed Nov. 27, 1928

3 Sheets-Sheet 1



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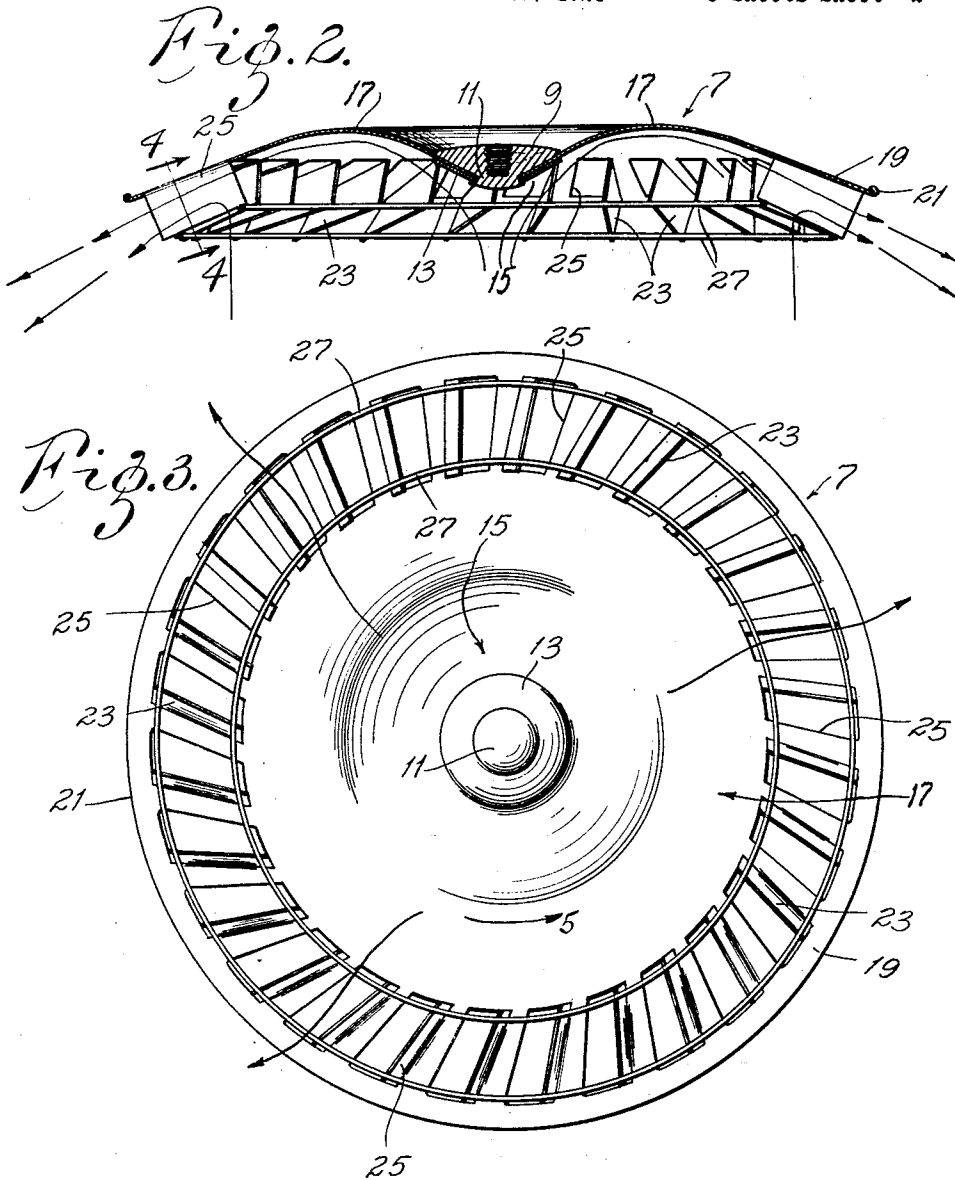
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Fig. 5.

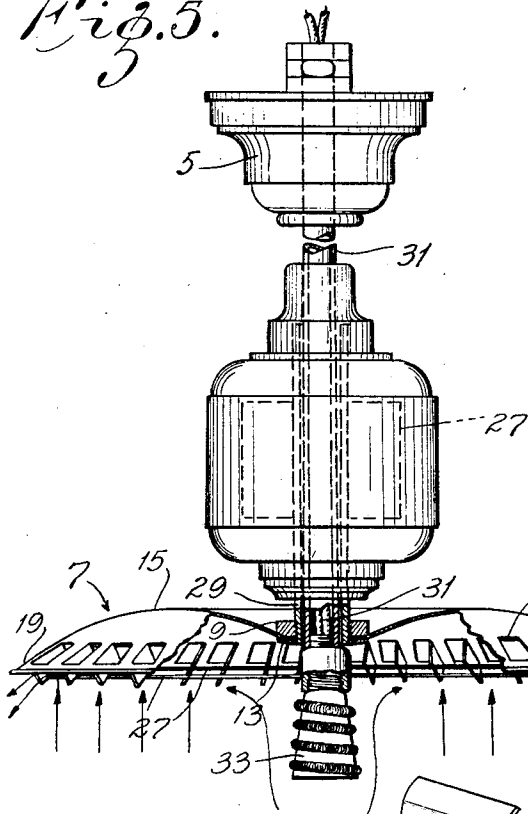


Fig. 6.

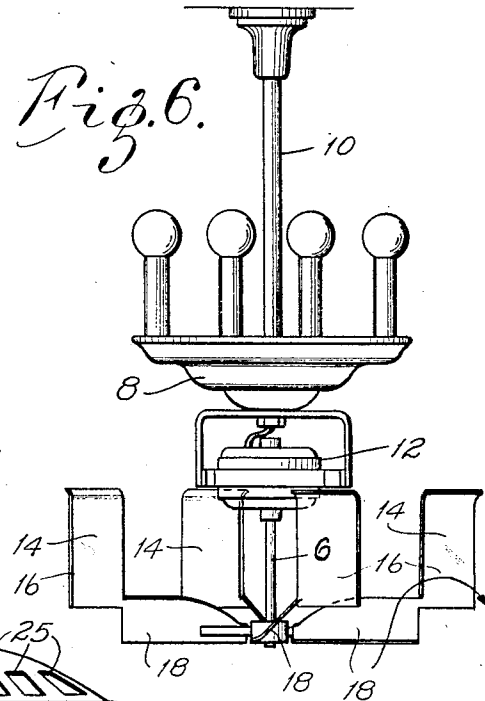
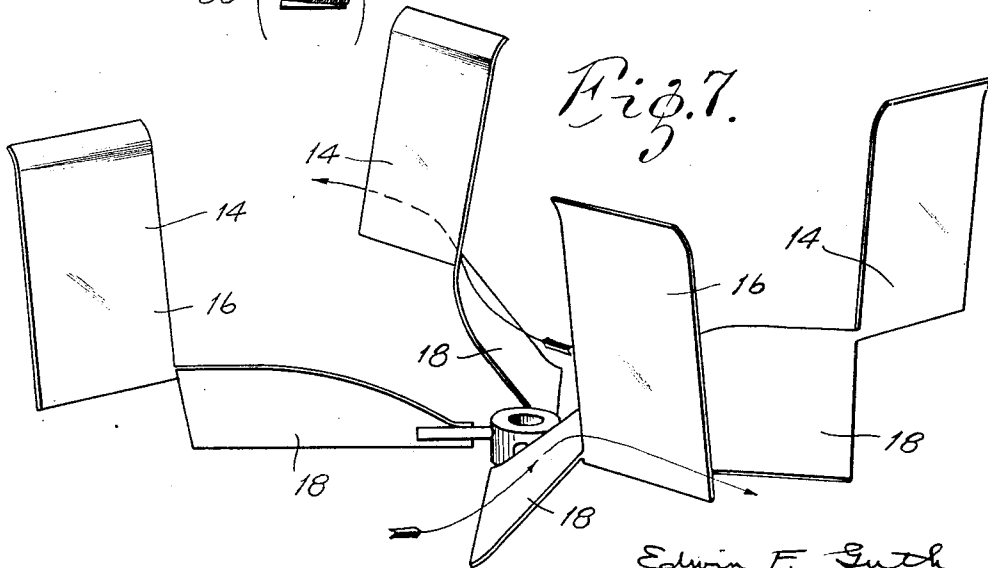


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWIN F. GUTH, OF WEBSTER GROVES, MISSOURI.

FAN.

Application filed November 27, 1928. Serial No. 322,290.

This application is in part a continuing application of my co-pending application, Serial Number 289,714.

My invention relates to fans, and more particularly to a certain type of fan, i. e. centrifugal fans.

My invention has for its object to produce a fan which will cause an efficient circulation of air in the lower portion of a room without materially disturbing the air in the upper portion thereof. I accomplish this by a construction which will induce a column of air into the fan. The air is then turned by the vanes in a substantially reverse direction, being propelled and directed downwardly and outwardly in an annulus of a conoidal shape. The air leaves the fan in a relatively thin annulus which spreads as it leaves the vanes of the fan, the air in the annulus moving in a direction which is more than 90° from its movement as it enters the fan. The air in the upwardly moving column is larger at its base than when it reaches the fan.

The preferred form for embodying my invention enables me to produce a unit consisting of a small vertical motor having a dish-shaped multi-blade fan, the blades being formed on the disk on the concave side. As illustrated in the drawings, it is shown on the side away from the motor. These vanes extend inwardly a short distance and form an annulus adjacent the periphery of the disk.

In the device as illustrated in the drawings and as described immediately above, the fan will produce a conoidal shaped air circulating zone having an induced up draft which is surrounded by this angularly disposed forced down draft whereby an improved cooling effect is accomplished. With the unit properly hung as to height, a very pleasant breeze will be noted throughout the entire area normally occupied, keeping the cool air, which would normally be found in the lower part of the room, in constant circulation, but eliminating from circulation that strata of warm air which normally collects in the upper part of the room. The air distribution from the tip of the vanes will be quite uniform throughout the entire revolution of the fan. This results in a uniform distribution of air to all sides.

A further object of my invention is to construct a fan stamped from sheet metal, the vanes being cut and formed without remov-

ing any of the metal from the disc. From this it follows that if the sheet is of uniform thickness, that the fan will be balanced and will retain its balance indefinitely.

In the accompanying drawings I have illustrated a form which will accomplish the foregoing objects and is an embodiment of my invention. These drawings, however, are furnished solely for illustrative purposes and I do not desire to be understood as limiting myself to the specific structure shown and described.

As shown in the drawings:

Fig. 1 is a side elevation of a form of my fan showing its primary elements.

Fig. 2 is a cross section of the fan taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a bottom plan view of the fan as shown in Fig. 1.

Fig. 4 is a fragmentary section taken on line 4—4 of Fig. 2 showing a vertical cross section of one of the vanes of the fan.

Fig. 5 is a side elevation of my invention adapted to circulating heated air, a part of the fan disc being broken away to show interior construction.

Fig. 6 is a side elevation of a form of fan embodying my invention.

Fig. 7 is an isometric perspective view of the same.

Similar reference numerals refer to similar parts throughout the entire description.

As shown in Fig. 1, a vertically arranged electric motor 1 is suspended from a ceiling (not shown) by a pipe 3, the pipe having a conventional slip canopy 5 at its upper end. The electric wiring leading to the motor passes through said pipe 3. The motor is wound for running in a counter clockwise direction. As illustrated, I have provided a desirable means to secure the disc 7 to the motor shaft 4, which consists of a steel plug 9, which is threaded onto the shaft 4 and having a stem 11 which extends through the disc 7 and also through a steel washer 13. This stem 11 is then peened over the washer and thus clamps the disc 7 to the plug 6. By running the motor in a counter clockwise direction, the tendency of the fan when in motion will be to tighten the plug 9 on the shaft 4. Thus an effective, simple and neatly appearing fastening is produced.

The vanes of the fan are formed from the outwardly directed portion 17 of the disc 7 adjacent its periphery 19 by cutting out

and bending in a direction away from the motor a series of vanes 23 in such a fashion that the material forming the vanes 23 is cut and bent down from the material adjacent the peripheral portion 19 of the fan disc, thereby leaving spaces or openings 25.

As clearly seen in the drawings, the spaces or openings 25 are of such size as to leave a considerable portion 30 of metal intermediate each of the openings forming what may be termed a bridge. This bridge 30 of metal extends ahead of the vanes and partially over the space between the bent portions of the vanes and cooperates therewith to direct the air. Although I have described the vanes and disc as being integrally formed, this is not necessary but is merely the preferred construction. Preferably the edge of the disc is headed by overrolling as indicated at numeral 21. The vanes are given a slight inclination backwardly from the vertical taking the direction of moving as indicating the forward side. This movement is indicated by means of an arrow 5 shown in Fig. 3. Each blade is also given a back pitch with reference to a radial line by forming the inner portion of each blade to lead the outer portion in peripheral movement. After the blades are cut and bent in the manner and position described, they are made more rigid and at the same time provided with a guard by spot welding to their lower edges a plurality of wire rings 27. The rings do not interfere to any extent with the circulation of air to, through or from the fan.

The operation of the fan is as follows:

The motor 1 is so wired that when it is turned on, it rotates the disc in such a direction that the vanes have an outward radial back pitch (referring to the direction of rotation) and a back slope with respect to the vertical, so that a current of air is induced which then moves radially and downwardly in an annulus of conoidal shape.

The rotation of the fan induces an axial up draft primarily toward and directly into the blades by way of their unobstructed bottom edges. This air is then deflected by the vanes and thrown outwardly and downwardly. The centrifugal effect from the rotation of the vanes produces a partial vacuum so that the circulation is continuous and uniform.

Practice has shown that when a fan is constructed as above described, that substantially no air will pass in either direction through the openings 25, and that I am able to control and direct the air below the disc in a predetermined manner without materially disturbing the air above the disc. The fan should be so hung that its general plane will be substantially horizontal and above the heads of the occupants of a room. This has the effect of dividing the upper portion of the room from the lower portion. The air

at the ceiling is warmer, due to the hot air rising from the motor, and also because of the heat from any lighting fixtures usually positioned above the fan.

Fig. 5 illustrates a modification adapted to heating purposes, wherein the armature 27 of the motor is formed upon a hollow motor shaft 29, the latter rotating on a hollow supporting tube 31, through which tube wires are led for feeding current to the motor. A socket to which wires are led through the tube is placed at the bottom of said tube 31 for removably accommodating an electrical resistance heating element 33 adapted to project downwardly and be positioned within the confines of the air cone. The fan is affixed to and rotatable with the hollow motor shaft around the tube 31. The result is that the solid disc functions to radiate heat into the column of air being drawn up. This radiantly heated air, together with the convected heat from the resistance element is projected outwardly and downwardly in the manner hereinbefore described for the cool air. It is to be understood that some air is drawn up centrally by the drag of the cylindrical column of air approaching the bottom of the blades. This air is deflected by the inner portions of the disc and is drawn into the inside edges of the blades to be thrown outwardly.

To convert the device from a heater in winter to a cooler in summer requires only the turning off of current to the heating element or the removal of said element from its socket.

As illustrated in Figs. 6 and 7, I illustrate a construction which will accomplish the objects hereinbefore set forth. In this construction the blades or vanes are carried by a plurality of spokes instead of a disc, as hereinbefore described. Each of the vanes or blades comprises a forwardly and downwardly sloping tractor element 18, shaped to draw the air upwardly in a central column, and another portion 16 which then directs this air and thrusts it outwardly and downwardly in the conoidal form hereinbefore described. Inasmuch as the portion 18 is balanced so as to draw up the required volume of air to supply the partial vacuum created by the rotation of the portion 16 substantially no air will be drawn from above the horizontal plane occupied by the fan, the blades being so bent and formed that it will function precisely as where the disc is used. As shown in the drawings, the lower edge of each portion 18 is preferably curved forwardly so as to enhance the tractive action. The portion 16, as illustrated, lies in a plane above the plane of the tractive portion 18 and may be provided with some outward back pitch referring to a radial line. In some cases, it may be found desirable to impart to the portion 16 a forward upward slope, as illustrated in Fig. 7. A forward curvature may

also be given to the top of these parts 16 to further assist in deflecting outwardly moving air into a downward direction.

Having described my invention, what I regard as new and desire to secure by Letters Patent is:

1. A fan mechanism comprising a fan and means to rotate said fan, a plurality of vanes on said fan in an annulus adjacent its periphery, said vanes being slightly inclined from the perpendicular with respect to the fan and given a back pitch with reference to the radius, whereby rotation of the fan will draw the air directly into the vanes and thrust it outwardly after turning the air through an angle of more than 90° from that of the entering air.

2. A fan mechanism comprising a fan and means to rotate said fan, a plurality of vanes in an annulus on said fan adjacent its periphery, there being alternate open and closed spaces in the annulus, the closed spaces located in front and the open spaces in the rear of the vanes, which vanes, when the fan is rotated, draw the air upwardly in a column and thrust it outwardly below the horizontal plane occupied by the fan.

3. A fan mechanism comprising a fan and means to rotate said fan, a plurality of vanes on said fan forming an annulus adjacent its periphery, there being openings intermediate said vanes and a bridge in front of each vane and coacting with the vanes, whereby the rotation of the fan will draw the air directly into the vanes which thrust it outwardly and downwardly below the horizontal plane occupied by the fan.

4. A fan mechanism comprising a fan and means to rotate said fan, a disc, a plurality of vanes thereon slightly inclined from the perpendicular with respect to the disc and given a back pitch with reference to the radius, whereby the rotation of the disc will draw the air upwardly axially of the fan and propel it outwardly and downwardly below the horizontal plane occupied by the fan.

5. A fan mechanism comprising a fan and means to rotate said fan, a disc, means on said disc to draw the air upwardly into the fan, and means cooperating therewith to thrust the air outwardly and downwardly in an annular path without materially disturbing the air above the fan.

6. A fan, comprising a dish-shaped disc stamped from sheet metal, vane portions cut and bent from said disc in an annulus adjacent its periphery, there being alternate open and closed spaces in the annulus, the closed space located in front, and the open space at the back, of each of the vane portions, said vane portions being slightly inclined from the perpendicular with respect to the disc, the vanes, when rotated, drawing the air upwardly and directly into them and then thrusting the air outwardly and downwardly

in an annular path after turning the air through an angle of more than 90° to that of the air entering the fan.

7. A fan, comprising a disc stamped from sheet metal, vane portions cut and bent from said disc in an annulus adjacent its periphery, there being openings in the disc intermediate said vane portions and a bridge portion in the plane of the disc in front of each vane portion, whereby the rotation of the fan will cause the air below the fan to be moved upwardly in a column into the fan and be propelled and directed outwardly and downwardly in an annular path.

8. A fan, comprising a disc stamped from sheet metal, vane portions cut and bent from said disc adjacent its periphery, said disc having an open space adjacent each vane portion and a considerable portion of metal which extends over the space intermediate the vane portions and in front of the same, said vane portions being slightly inclined from the perpendicular with respect to the disc and given a back pitch with reference to the radius, whereby rotation of the vanes will cause the air below the fan to move upwardly in a column into the vanes, which then thrust it outwardly and downwardly below the horizontal plane occupied by the fan.

9. A fan, means to rotate said fan, said fan comprising a disc, a multiplicity of vanes thereon, said disc and vanes being so shaped as to draw air directly into the vanes and then propel and turn substantially all of it outwardly and downwardly in an annular path in a direction more than 90° from that of the entering air.

10. A fan, means to rotate it, said fan comprising a multiplicity of vanes formed thereon to draw the air upwardly into the vanes, and means cooperating with said vanes to turn said air and direct and propel it in an annular path in a direction more than 90° from the direction of its movement in entering the fan.

11. A fan, means to rotate said fan, means comprised in said fan to draw the air upwardly into the fan, and means cooperating with said last mentioned means to thrust the air outwardly and downwardly in a relatively thin conoidal-shaped annulus as it leaves the fan.

12. In a device of the character described, a disc, means to rotate said disc, means on said disc for inducing a column of air into the said means and means coacting with said first mentioned means for both directing and propelling said air in an annular conoidal path outside of and in a direction more than 90° from that of the movement of the air in said column.

In testimony whereof, I have signed my name to this specification this 24th day of November, 1928.

EDWIN F. GUTH.