

June 28, 1966

N. LAING

3,258,195

FANS

Filed Nov. 26, 1963

4 Sheets-Sheet 1

FIG. 1.

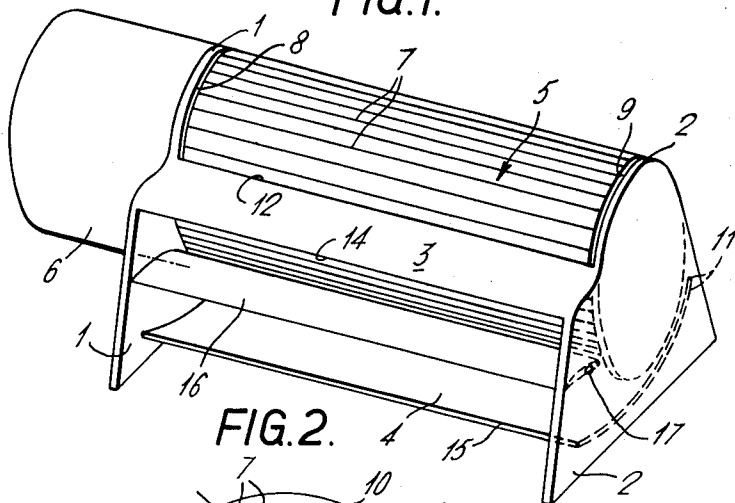


FIG. 2.

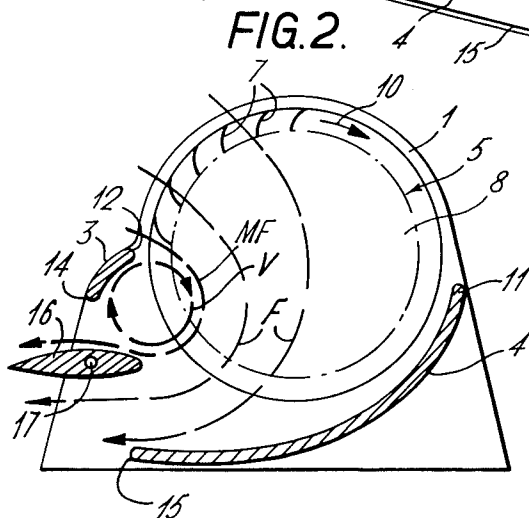


FIG. 3.

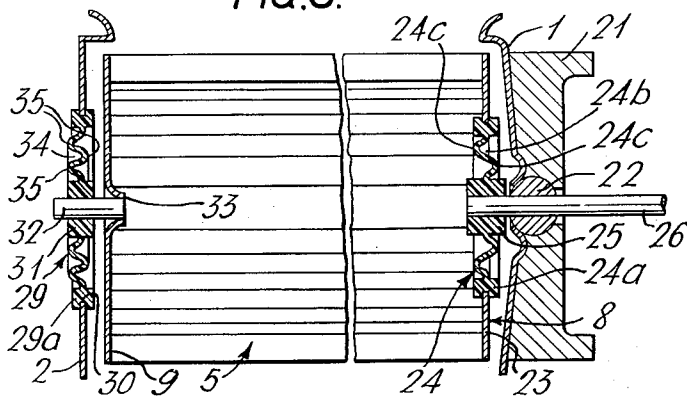
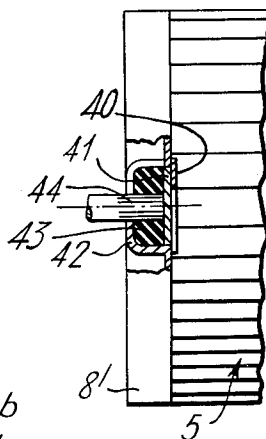


FIG. 4.



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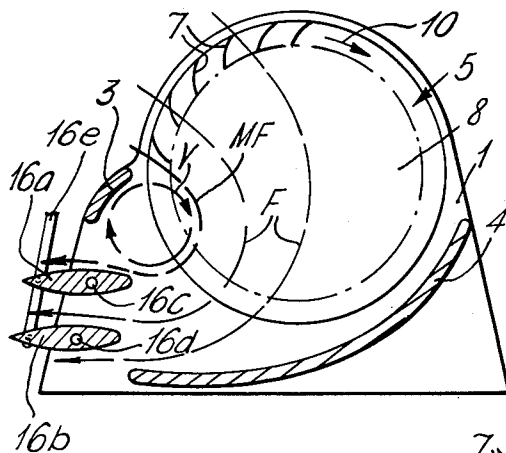


FIG. 5.

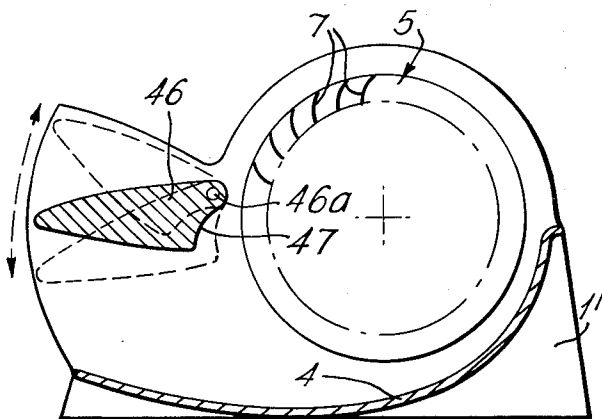


FIG. 6.

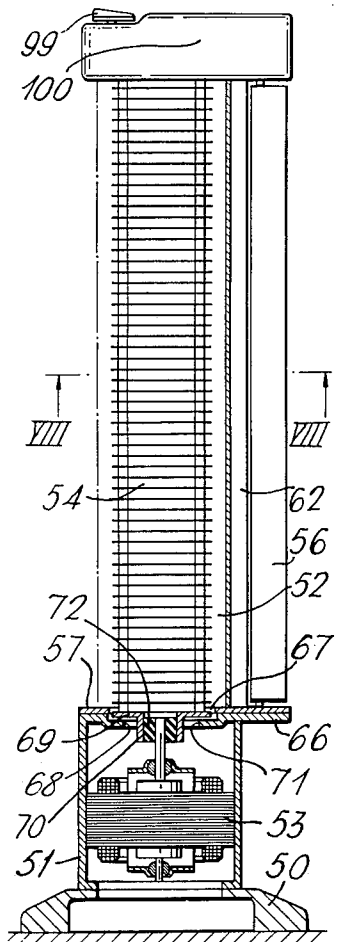


FIG. 7.

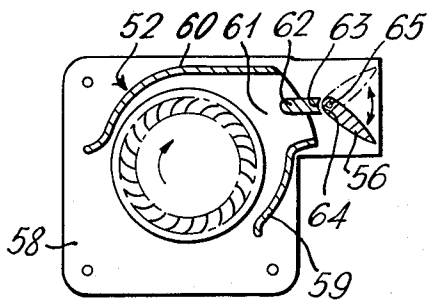


FIG. 8.

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FIG. 9.

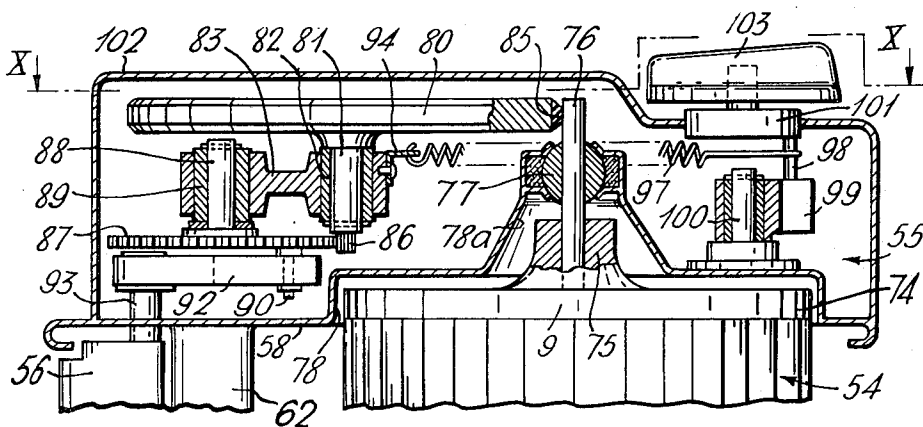
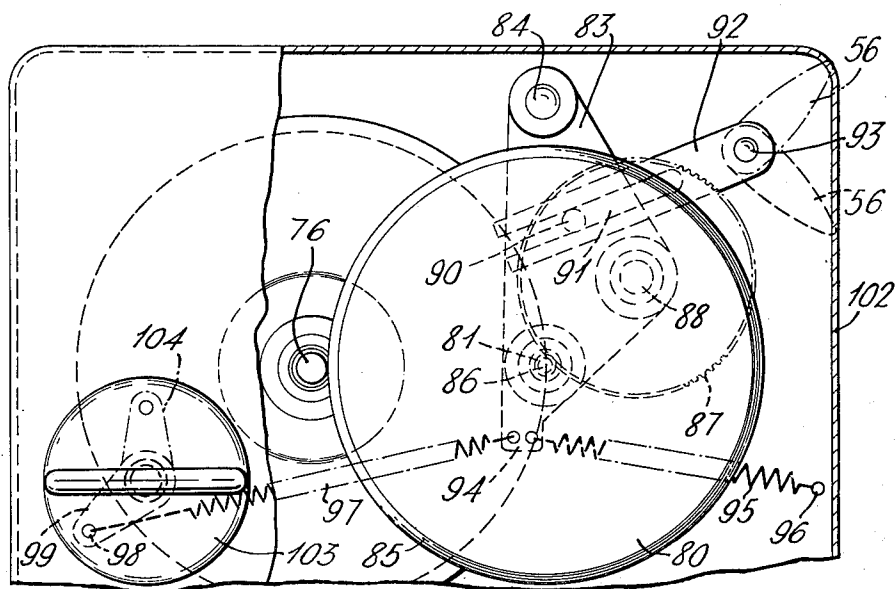


FIG. 10.



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FIG. 11.

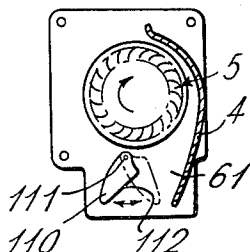
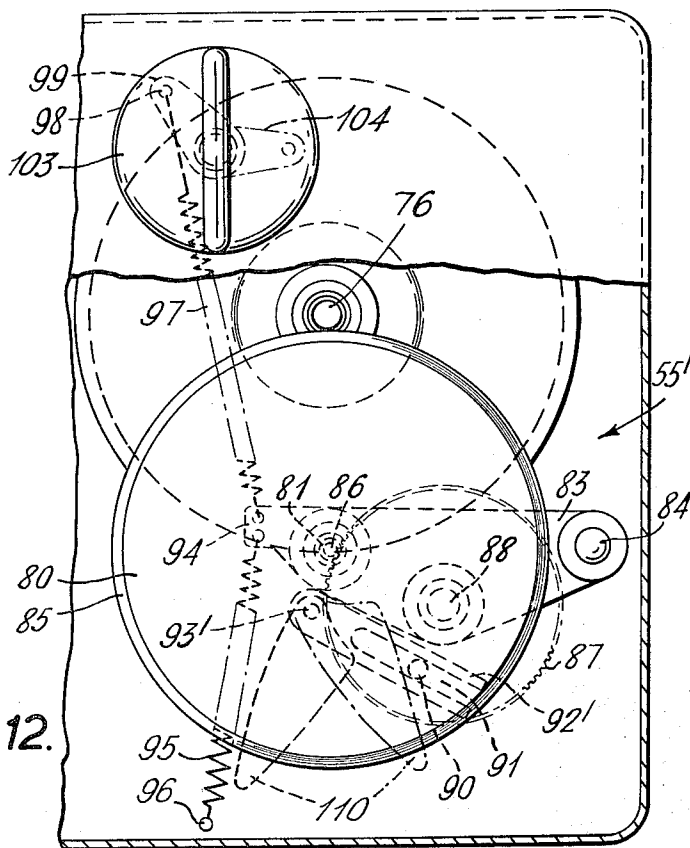


FIG. 12.



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Filed Nov. 26, 1963, Ser. No. 326,297

Claims priority, application Germany, Mar. 11, 1960,

L 35,582

12 Claims. (Cl. 230—114)

This application is a continuation-in-part of pending application Serial No. 95,393 filed March 13, 1961, now abandoned.

This invention relates to fans, and more particularly to cross flow fans i.e. fans having a cylindrical bladed rotor and guide means co-operating with the rotor on rotation thereof whereby air flows from a suction side of the rotor through the path of the rotating blades thereof to the rotor interior and thence again through the path of the rotating blades to a pressure side of the rotor.

The general object of the invention is to provide a cross-flow fan for ventilating the rooms of dwelling-houses, offices and so forth wherein the direction of the air flow can be varied without moving the body of the fan.

The invention preferably makes use of the teachings of abandoned U.S. application Serial No. 221,620 filed September 5, 1962 by myself and Bruno Eck which is a continuation-in-part of abandoned application Serial No. 671,114 filed July 5, 1957. According to this teaching, as adopted for the purposes of the present invention, the rotor has its interior unobstructed by stationary guides and the guide means is well spaced from the rotor at all points and co-operates therewith in operation to set up a vortex of Rankine type whereby flow is guided through the rotor along lines which are strongly curved about the vortex core. It has been found that by reason of the vortex the air flow leaving the rotor has a velocity profile with a pronounced peak and as a consequence this flow is markedly directional and of surprising penetrating or carrying power: that is to say, the air flow leaving the rotor can be felt as a distinct sharply defined jet at a surprisingly great distance from the rotor, whereas with comparative axial fans the flow even at a shorter distance can only be felt as a general disturbance of the air over a fairly large area. While for some ventilation applications it will suffice to have the fan directed permanently in one direction, or to adjust the outflow direction by moving the body of the fan, it will commonly be preferably, particularly with fans of larger size, to be able to regulate the outflow direction by moving only some readily adjusted portion of the fan and leaving the body stationary. It will be desirable to obtain this regulation of outflow direction without impairing the advantageous directional qualities of the fan or its carrying power. Where a cross-flow fan is required to produce a widespread air-moving effect in a room it will be desirable to vary the outflow direction cyclically and automatically. The specific object of the invention in its preferred aspects is to achieve these desiderata.

The invention provides a fan having support means, a cylindrical bladed rotor mounted for rotation on the support means, guide means extending the length of the rotor and co-operating with the rotor on rotation thereof to induce a flow of air from a suction side of the rotor through the path of the rotating blades of the rotor to the interior of the rotor and thence again through the path of the rotating blades to a pressure side of the rotor

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said guide means including an adjustable portion which extends with uniform cross-section over the length of the rotor at the pressure side thereof and which is mounted in articulated manner with respect to the support means for generally pivotal movement about an axis parallel to the rotor axis whereby in operation air leaving the rotor flows against at least one side of said adjustable guide portion and has its outflow direction substantially determined by the setting thereof.

The adjustable guide portion may be a blade of streamline profile simply pivoted about an axis which intersects the blade chord intermediate in its length, the rotor throughput passing over both sides of the blade. Two such blades can be provided in parallel relation and interconnected for movement together. In another embodiment, the upstream part of such a blade is fixed, while the downstream part only is adjustable. In yet another embodiment, a wall defining one side of an outlet passage at the pressure side and presenting a vortex stabilizing surface to the rotor is pivotable as a whole about an axis close to the outer envelope of the rotor. In all cases the adjustable guide portion may be pivoted cyclically and automatically, preferably by mechanical means operated by the same motor as drives the rotor.

Preferably, as previously explained, the guide means are such as to set up in operation a vortex of Rankine type. The resulting strongly directional outflow can, it is found, readily be deflected by the simple means which the invention contemplates and without substantial loss of this advantageous directional characteristic or of carrying power.

Certain preferred embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of one form of fan according to the invention;

FIGURE 2 is a transverse section of the FIGURE 1 fan;

FIGURE 3 is a longitudinal section of the fan showing certain constructional details;

FIGURE 4 is a partial longitudinal section of a fan similar to that of FIGURES 1 to 3 but illustrating a different manner of mounting the driven end of the rotor;

FIGURE 5 is a section similar to FIGURE 2 of a further form of fan illustrating a modified form of adjustable guide portion;

FIGURE 6 is also a section similar to FIGURE 2, and illustrates yet another form of adjustable guide portion;

FIGURE 7 is a front elevation of yet another fan according to the invention, which includes means for cyclically and automatically pivoting the adjustable guide portion;

FIGURE 8 is a transverse section of the FIGURE 7 fan taken on a plane indicated at VIII—VIII in FIGURE 7;

FIGURE 9 is a partial longitudinal section of the FIGURE 7 fan showing the means for cyclically and automatically pivoting the adjustable guide portion;

FIGURE 10 is a partially sectioned end view of the fan again showing the means for pivoting the guide portion; and

FIGURES 11 and 12 are views corresponding to FIGURES 8 and 10 but showing a different form of adjustable guide portion, somewhat similar to that of FIGURE 6.

Referring to FIGURES 1 and 2 of the drawings, the unit there illustrated comprises a pair of stout vertical end plates 1, 2 which are secured together rigidly by first and second guide walls 3, 4 which extend between them. A cylindrical bladed rotor 5 is mounted at either end upon the end plates 1, 2 respectively for rotation about a horizontal axis and a small electric motor (not shown) is provided to drive the rotor, this motor being enclosed in a housing 6 supported upon the end plate 1. The rotor 5 has blades 7 extending parallel to the axis between end members 8, 9: these blades are concave facing the direction of rotation, indicated by the arrow 10, and have their outer edges leading their inner edges.

The guide walls 3, 4 and rotor present a constant cross-section as indicated in FIGURE 2 at all points along the rotor axis. The first wall 3 is narrow and as seen in cross-section converges with the rotor 5 in the direction of rotor rotation. The second wall 4 is wider than the wall 3 and extends opposite it from a line 11 diametrically opposite the line 12 of nearest approach of the wall 3 to the rotor: at the line 11 the wall 4 is separated from the rotor 5 by a distance which substantially exceeds a working clearance and which may be one third to one half the blade depth. From the line 11 the wall 4 diverges from the rotor with steady increase in radius of curvature. The guide walls 3, 4 define with the end plates 1, 2 the outlet from the rotor. The walls 3, 4 terminate in lines 14, 15 lying in a plane which is oblique to the direction of flow across that plane.

In operation of the fan unit as so far described a cylindrical vortex having a core shown by the flow lines V in FIGURE 2 is set up adjacent the first guide wall 3 and parallel and eccentric to the rotor axis. Air is guided through the rotor 5 as shown by the flow lines MF, F which are strongly curved about the vortex core and is discharged through the outlet defined by walls 3, 4 and end plates 1, 2. By reason of the vortex, the flow tube adjacent the vortex core, designated MF, is of much greater velocity than the remainder of the flow, giving rise to a velocity profile in the outlet which has a pronounced peak. The design and operation of the rotor 5 and guide walls 3, 4 follows the principles enunciated in the U.S. application 221,620 above referred to.

At the outlet and midway between the walls 3, 4 a deflecting element 16 having a uniform cross-section of stream line shape and extending over the length of the rotor 5, is mounted for angular movement about an axis 17 parallel to the rotor axis and passing about through the centre of gravity of the element: the deflecting element is adjustable manually and is such as to remain in adjusted position on account of friction. It will readily be appreciated that the direction of outflow from the fan unit can be varied as desired by adjustment of the deflecting element 16.

It will be seen that the end plates 1, 2 provide mounting means to carry the rotor 5, motor (not shown) and guide means and to enable the unit to be supported on a table or the like. End plates 1, 2 and guide walls 3, 4 can conveniently be made of sheet metal, as can also the rotor 5 and deflecting element 16.

FIGURE 3 shows the manner in which the rotor 5 is mounted for rotation.

At the right hand side of the rotor 5 (as seen in FIGURE 3) the end plate 1 is rigid with a casting 21 mounting a self-aligning bearing in the form of a spherical bushing 22 capable of limited universal movement within the casting: the casting 21 and bushing 22 form part of the motor, which is not shown—for clarity the motor casting is also omitted. The rotor end member 8 is constructed as a flat metal ring 23 surrounding a flexible membrane 24. The membrane 24 has at its outer periphery a circumferential grooved flange or connecting ring 24a within which the inner periphery of the ring 23 engages, a central boss 25 which grips elastically over the motor drive spindle 26 mounted rotatably in the bush-

ing 22, and an intermediate annular area 24b which is flexible and is formed with annular corrugations 24c. This arrangement enables the rotor 5 to be driven by the spindle 26 without undue friction despite a limited degree of misalignment between their axes.

The non-driven end of the rotor 5 is supported on the end plate 2. Like the rotor end member 8 the end plate 2' is centrally apertured and surrounds a flexible membrane 29. Like the membrane 24, the membrane 29 has at its outer periphery a circumferential flange or connecting ring 29a which is formed with a radial groove 30 receiving the edge of the aperture in the end plate 2'. The membrane 29 has a central boss 31 which carries a fixed stub-shaft 32 engaging a boss 33 formed in the sheet metal of the rotor end disc 9: alternatively the stud shaft could be fixed to the boss 33 and rotatable in the boss 31. Intermediate the central boss 31 and connecting ring 29a the membrane 29 presents an annular area 34 having annular corrugations 35. This arrangement enables the end plate 2' to support the rotor 5 despite imperfect alignment. Alternatively the non-driven end of the rotor 5 can be supported by the means similar to that shown at the right hand side of the figure.

The membranes 24, 27 are conveniently injection moulded of an elastic plastics material on to the end disc or end plate, as the case may be.

By reason of the flexible mounting of the rotor 5 there is no need to take the careful precautions that would otherwise be necessary to ensure proper alignment of the rotor and its supporting means. Thus the invention facilitates economic mass-production of the fan.

FIGURE 4 shows an alternative arrangement for the support through flexible means of the driven end of the rotor of a fan having the general construction illustrated in FIGURES 1 and 2. The rotor, which once again is designated 5, has an end member 8" stamped to provide inwardly joggled lugs 40 locating a disc 41 and outwardly joggled lugs 42 which hold a rubber bushing 43 captive against the washer and in a state of compression. The milled end 44 of a motor shaft is pressed into the bushing 43: the elasticity of the bushing, compressed between the rotor end member and the shaft, enables the shaft to drive the rotor despite minor misalignment between them.

FIGURE 5 illustrates a modification of the fan unit shown in FIGURES 1 to 4 where instead of the single deflecting element 16 there shown, two such elements 16a, 16b are provided: as with the element 16, the elements 16a, 16b are each pivoted to the end plates 1, 2 for movement about axes 16c, 16d respectively which are parallel to the rotor axis and about at the centre of gravity of the element. The deflecting elements 16a, 16b are interconnected for movement in parallel relation by a lever 16e situated adjacent one of the end plates 1, 2: this lever can be used for manual adjustment of the deflecting elements. As with the fan unit of FIGURES 1 to 4, the pivot friction is made such that, though the deflecting elements are readily adjustable manually, yet the elements are held in adjusted position against vibration and the like. Parts of the FIGURE 5 construction which are similar to those of FIGURES 1 to 4 are given the same reference numerals and will not need further description.

The FIGURE 6 fan unit comprises end plates which are similar to those of FIGURES 1 to 4 and enable the unit to stand on a table. Only one such end plate, designated 1', is shown in the figure. The end plates carry a rotor similar to that of FIGURES 1 to 4 and designated 5 and a driving motor therefor which is not seen in the figure: between the end plates extends a guide wall similar to the wall 4 of FIGURES 1 to 4 and indicated by the same numeral. In place of the guide wall 3 of FIGURES 1 to 4 a guide member 46 of uniform approximately triangular section is mounted between the end plates for pivotal movement about an axis shown at 46a which is parallel to the rotor axis. Three alternative positions of the guide member are illustrated, but it will

be understood that the member can adopt intermediate positions. As with previous embodiments of the invention, pivot friction is sufficient to hold the member 41 in position in operation but readily permits manual adjustment of the member. The guide member 46 provides a concave surface 47 equivalent in function to the wall 3 of FIGURES 1 to 4. In all operative positions of the guide member 41 the flow through the fan unit takes place on the lines described with reference to FIGURE 2. However, the position and size of the vortex and the position and direction of the flow tubes will change somewhat as the guide member is moved between its extreme positions, and the flow tubes carrying the major part of the throughput will tend to follow the surface 47 of the guide member 46 which extends away from the rotor and assists in defining the outlet. Thus pivoting the guide member 46 varies the outflow direction.

FIGURES 7 to 10 illustrate a comparatively large room fan unit supported vertically on a pedestal 50 and provided with automatic means for varying the outflow direction. The fan unit comprises a motor casing 51 upstanding from the pedestal 50; a fan guide structure designated generally 52 is supported upon the motor casing and extends vertically above it. A motor 53 enclosed by the casing 51 drives a cylindrical bladed rotor 54 situated within the guide structure, the motor and rotor being aligned on a vertical axis. The top of the fan guide structure 52 mounts an automatic device designated generally 55 for cyclically oscillating a deflector vane 56 situated at the outlet from the guide structure whereby to vary the direction of outflow from the fan, this device 55 being driven from the top end of the rotor.

The fan guide structure 52 is constructed of sheet metal and includes a pair of horizontal end members 57, 58 which are rigidly interconnected and held in spaced parallel relation by a pair of vertical guide walls 59, 60 which present the same horizontal cross-section (shown in FIGURE 8) at all points in their length and which are shaped to the general configuration of the walls 3, 4 as shown in FIGURE 2. The guide walls 59, 60 define an outlet 61, and a fixed vane 62 is mounted in the outlet half way between the guide walls with its ends secured to the end members 57, 58 of the guide structure 52. The deflector vane 56 is pivotally mounted between the end members 57, 58 at the rear of the fixed vane 62. Both vanes 62, 56 have profiled cross-sections, as seen in FIGURE 8, and when in alignment combine to present a profile of streamline cross-section somewhat similar to that of the deflector element 16 of FIGURES 1 to 4. The trailing edge 63 of the fixed vane 62 is concave to accommodate the rounded leading edge 64 of the moving vane 56: curvatures of these edges 63, 64 are centred approximately on the pivot axis 65 of the moving vane.

The end plate 57 of the guide structure is secured in abutting relation with a top wall 66 of the motor casing 51. The end plate 57 is apertured at 67 and the wall 66 is recessed at 68 to accommodate a blade-supporting end member 69 of the rotor 54 which has a central boss 70 projecting downwardly through a central hole 71 in the wall 66. A sleeve 72 of soft rubber or other elastomeric material located within the boss 70 is compressed radially about the shaft 73 of the motor 53 so that the rotor 54 is supported on and drivingly connected to the shaft through the intermediary of this sleeve, which can accommodate minor misalignment between the axes of the rotor and of the motor.

A blade-supporting end member 74 (FIGURE 9) at the top end of the rotor 54 has an upwardly projecting boss 75 which carries a stub shaft 76 mounted in a self-aligning bearing 77 supported in the top end member 58 of the guide structure 52, the latter member 58 being recessed at 78 to receive the rotor end member 74 and further recessed at 78a to accommodate its boss 75. Once again, this top bearing arrangement permits minor angular movement of the rotor axis. The support of the

rotor 54 at top and bottom thus provides an adequate location of and drive connection to the rotor without imposing close tolerances such as would complicate mass-production and render it unduly expensive.

The device 55 for varying the outflow direction of the fan comprises a large wheel 80 mounted upon a spindle 81 journaled for rotation in a bearing 82 carried by a bracket 83 pivotally mounted a post 84 upstanding from the upper end member 58 of the guide structure. The wheel 80 has a rim 85 of soft rubber or the like which, in the position shown, is urged against the upper end of the rotor-supporting stub shaft 76; thus the shaft rotates the wheel 80, but at greatly reduced angular speed. A small pinion 86 on the spindle 81 meshes with a second much larger pinion 87 on a spindle 88 mounted in a bearing 89 on the bracket 83. This second pinion 87 carries a downwardly extending pin 90 engaging in a slot 91 in an arm 92 secured to a stub shaft 93 which is rigid with the deflector vane 56 and journaled in the guide structure end member 58. Thus as the rotor 54 rotates the pin 90 rotates slowly and oscillates the arm 92 and thereby the vane 56.

A lug 94 on the bracket 82 remote from the support post 84 therefor is acted upon by a tension spring 95 secured to a fixed pin 96 on the top guide structure member 58, whereby to urge the bracket in a direction to bring the wheel 80 away from the stub shaft 76. Another tension spring 97 acts upon the lug 94 in the opposite direction, and is connected between the lug and a pin 98 extending between an arm 99 pivotally mounted on a post 100 upstanding from the end member 58 and a co-axial disc 101 rotatably mounted in a cover 102 which encloses the device 55 and is secured to the member 58. The arm 99 is movable under the control of a knob 103 secured to the disc 101 between two end positions defined by stops (not shown): the arm 99 is shown dotted in FIGURE 10 in one extreme position, while the other such position is shown chain dotted at 104.

With the arm 99 in the dotted position shown the spring 97 is tensioned to hold the wheel 80 with its rim 85 in contact with the shaft 76; the deflector vane 56 is then slowly oscillated in operation of the fan between the positions indicated in chain dotted lines in FIGURE 10 and the direction of flow of air out of the outlet 61 is correspondingly cyclically varied. When the knob 103 is moved to bring the arm 99 to its position designated 104 in FIGURE 10, then the spring 95 overcomes the spring 97, which is now less tensioned, and pulls the wheel 80 away from the shaft 76, so that the vane 56 remains fixed. In moving between its two positions the arm 99 increases tension in the spring 97, and it thus remains firmly urged against the corresponding stop (not shown) in whichever position it is set.

It is to be understood that the rotor 54 is similar to that illustrated at 5 in FIGURES 1 to 4 and in operation co-operates with the guide structure 52 in the same way as the rotor 5 with its guide walls 3, 4 as described above.

FIGURES 11 and 12 illustrate a modification of the fan described with reference to FIGURES 7 to 10, where the guide wall 59 is replaced by an angularly movable guide member 110 similar in construction and operation to that shown at 46 in FIGURE 6, and the fixed and moving guide vanes 62, 56 are eliminated. The guide member 110 is oscillated between the positions indicated in FIGURES 11 and 12 by means of a device 55' similar to the device 55 of FIGURES 7 to 10 except as to the location of the arm 92 and shaft 93: in the modification of FIGURES 11 and 12 the corresponding parts, designated 92' and 93' are moved so that the latter coincides with the pivot axis of the member 110, designated 111 in FIGURE 11.

Parts of the modification of FIGURES 11 and 12 which are identical with those of FIGURES 7 to 10 are given the same reference numerals and will not require further

description, and the operation of the fan will be understood from the foregoing description of FIGURES 7 to 10 taken in conjunction with that of FIGURE 6. Thus, the air leaving the outlet 61 tends to follow the surface 112 of the guide member 110 and as this member is oscillated automatically by the device 55' so the direction of outflow is cyclically varied.

It will be understood that various modifications can be made in the fans described. Thus, the fixed and moving vane arrangement of FIGURES 7 to 10 (parts 62 and 56) can be replaced by a single member, such as that designated 16 in FIGURES 1 to 4, which is oscillated by the device 55. Alternatively, the single element 16 of FIGURE 1 can be replaced by fixed and moving members, such as the members 62 and 56 of FIGURES 7 to 10, but with the latter manually adjustable. The two deflecting members 16a, 16b of FIGURE 5 could be oscillated by automatic means, such as the device 55 of FIGURES 7 to 10. The fan of FIGURES 7 to 10, or the modification of FIGURES 11 and 12 could be mounted with the rotor axis horizontal. The various deflector elements shown (and designated 16; 16a; 16b; 46; 56; 110) could be made as simple strips of sheet metal bent in the case of elements 46, 110.

In the FIGURE 6 fan unit, the fixed guide wall 4 can be eliminated provided that the end plates 1, 2 are connected together in some other way. A similar modification can be made in FIGURES 11 and 12.

I claim:

1. A fan including support means, a cylindrical bladed rotor mounted for rotation on the support means, guide means extending the length of the rotor and co-operating with the rotor on rotation thereof to induce a flow of air from a suction side of the rotor through the path of the rotating blades of the rotor to the interior of the rotor and thence again through the path of the rotating blades to a pressure side of the rotor said guide means including an adjustable portion which extends with uniform cross-section over the length of the rotor at the pressure side thereof and which is mounted in articulated manner with respect to the support means for generally pivotal movement about an axis parallel to the rotor axis, air leaving the rotor in operation flowing against at least one side of said adjustable guide portion and has its outflow direction substantially determined by the setting thereof.

2. A fan as claimed in claim 1, wherein the guide means comprises a pair of end plates in spaced parallel relation disposed one at either end of the rotor and a pair of guide walls extending in spaced relation between the end plates and defining said suction and pressure sides, and said adjustable guide means portion is pivotally mounted on the end plates.

3. A fan as claimed in claim 2, wherein the adjustable guide means portion is a single blade extending between the end plates and midway between said walls and pivoted to the end plates about an axis situated part way along the blade chord.

4. A fan as claimed in claim 2, wherein the adjustable guide means portion comprises a plurality of blades extending between the end plates and in spaced relation to each other and to said walls, each blade being pivoted to the end plates about an axis situated part way along the blade chord, and means interconnecting the blades for movement together in parallelism.

5. A fan as claimed in claim 2, wherein the guide means further includes a fixed blade portion extending between the end plates and part way between said guide walls and the adjustable guide means portion includes an adjustable blade portion disposed downstream of the fixed blade portion with its forward edge adjacent the trailing edge of the fixed blade portion and pivoted between the end plates about an axis adjacent its forward edge.

6. A fan as claimed in claim 1, wherein the guide means includes a pair of end plates in spaced parallel

relation one at either end of the rotor and a first guide wall extending between the end plates and generally perpendicular thereto, and the adjustable guide means portion comprises a second guide wall extending between the end plates opposite the first guide wall and extending away from the rotor to define with the first guide wall an outlet from the rotor at said suction side, the second guide wall being pivoted about an axis adjacent the rotor periphery.

7. A fan including support means comprising a pair of spaced parallel end plates adapted to rest in a flat surface, guide means comprising a fixed guide wall extending between the end plates and generally perpendicular thereto, a cylindrical bladed rotor extending between the end plates and mounted for rotation about an axis perpendicular thereto, the guide means and rotor co-operating on rotation thereof to induce a flow of air from a suction side of the rotor through the path of the rotating blades of the rotor to the interior of the rotor and thence again through the path of the rotating blades to a pressure side of the rotor said guide means including an adjustable portion which extends with uniform cross-section between the end plates and is pivotally mounted thereon for manual adjustment under frictional restraint, air leaving the rotor in operation flowing against at least one side of said adjustable guide portion and has its outflow direction substantially determined by the setting thereof.

8. A fan as claimed in claim 7, wherein one end plate carries a motor on the side away from the other end plate, and the rotor has one end flexibly mounted upon the motor shaft and the other end flexibly mounted on said other end plate.

9. A fan comprising support means, a cylindrical bladed rotor mounted for rotation with respect to the support means, guide means comprising a first guide wall fixed to the support means and a second guide wall articulately connected to the support means, the guide walls extending the length of the rotor and defining an outlet therefrom and a suction side thereof, and the second guide wall having one edge portion adjacent to and spaced from the rotor periphery and being movable on a pivot axis adjacent said edge portion, the rotor and guide means co-operating on rotor rotation to induce a flow of air from the suction side of the rotor through the path of the rotating blades to the rotor interior and thence again through the path of the rotating blades to the outlet the flow of air leaving the outlet in a direction dependent upon the setting of the second guide wall.

10. A fan comprising a fixed structure, a motor mounted on the fixed structure, a cylindrical bladed rotor aligned with the motor shaft and having one end mounted thereon and drivingly connected thereto and the other mounted on the guide structure, guide means extending the length of the rotor and comprising a guide wall provided by a portion of said fixed structure and a movable portion connected in articulated manner to the fixed structure, the guide means defining an outlet from the rotor and a suction side thereof and co-operating on rotor rotation to induce a flow of air from the suction side of the rotor through the path of the rotating blades to the rotor interior and thence again through the path of the rotating blades to the outlet the flow of air leaving the outlet in a direction dependent upon the setting of the movable guide means portion, and means driven from the motor and oscillating the movable guide means portion for automatic cyclical variation in the outflow direction.

11. A fan as claimed in claim 10, wherein the oscillating means includes a rotating element driven through the end of the rotor opposite the motor and co-operating with a pivoting arm connected to the movable guide means portion.

12. A fan as claimed in claim 10, wherein the end of the rotor opposite the motor carries an axially extending stub shaft and the oscillating means includes a

rotatable wheel with a friction rim movable to bring its rim selectively into, and out of, driving engagement with the stub shaft, a rotatable element driven by the wheel and co-operating with an arm rigid with the movable guide means portion.

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