March 5, 1935. W. F. PETERS ET AL 1,993,622

VENTILATOR

Filed March 15, 1933 2 Sheets-Sheet 1

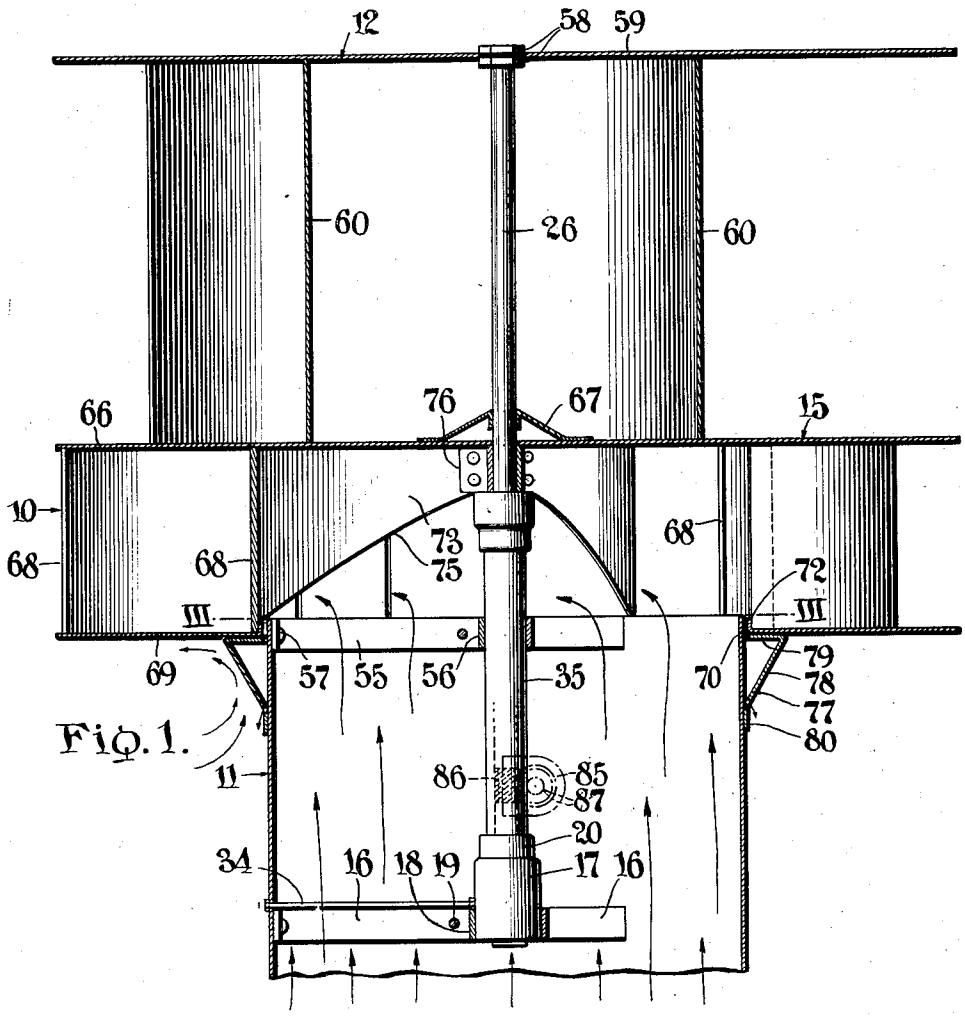


Fig. 1.

Fig. 4.

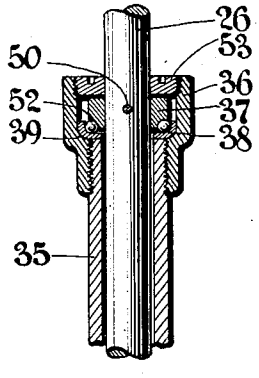


Fig. 5.

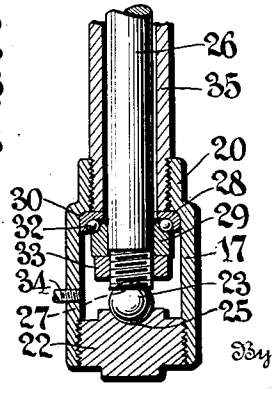
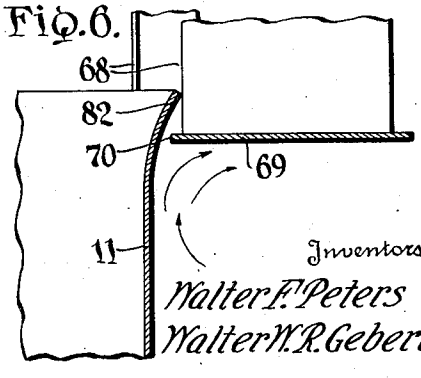


Fig. 6.



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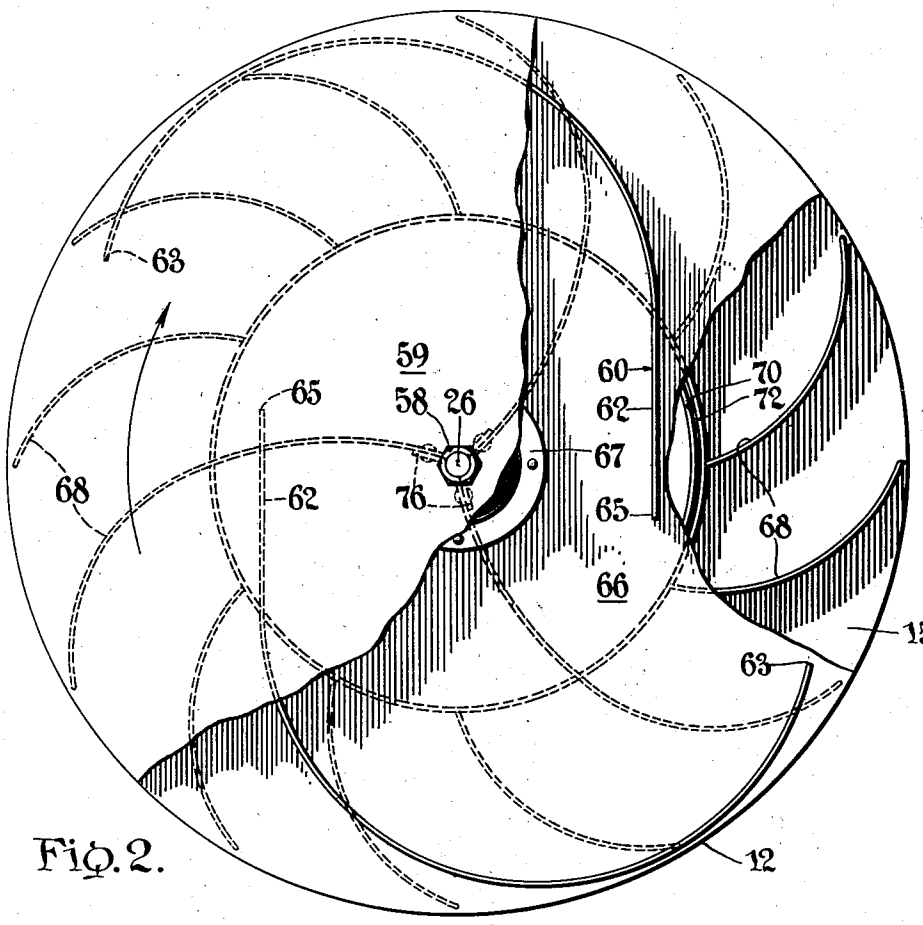


Fig. 2.

Fig. 7.

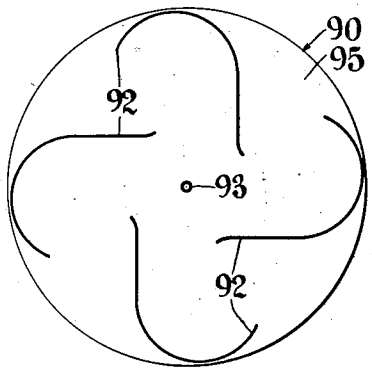
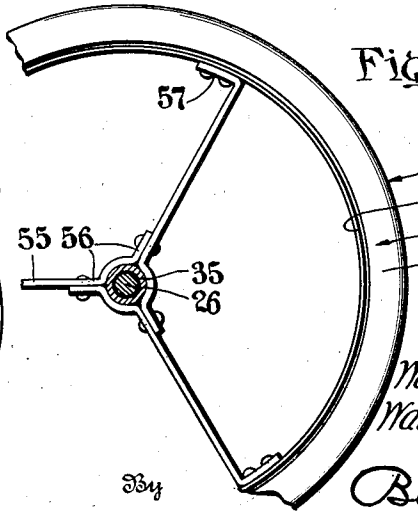


Fig. 3.



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VENTILATOR

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Application March 15, 1933, Serial No. 660,938

4 Claims. (Cl. 98—72)

This invention relates to ventilators and it has particular relation to ventilators of the type employed to draw air from buildings, vessels, mines, or the like, and rotatable by means of air currents or by mechanical power producing means.

One object of the invention is to provide a ventilator which is particularly adapted to respond to air currents from various directions and to obviate the restricting effect of cross currents or upwardly directed air currents caused by the slanting conformation of roofs and which might otherwise tend to obstruct the outward flow of air from the ventilator.

Another object of the invention is to provide a ventilator which has passages running from one side thereof entirely through the construction, and so arranged as to create a suction to draw air outwardly from the ventilator even when the air current is not sufficient to drive or rotate it.

Another object of the invention is to provide a ventilator in which so-called storm bands are not required, but in which the air discharging elements are of such shape as to prevent moisture from entering the passages of the ventilator.

In the drawings:

Fig. 1 is a vertical section, with portions shown in elevation, of a ventilator constructed according to the invention;

Fig. 2 is a fragmentary plan view of the ventilator;

Fig. 3 is a horizontal section taken substantially along the line III—III of Fig. 1;

Fig. 4 is a fragmentary section, on a larger scale, of an axial bearing portion of the ventilator;

Fig. 5 is a fragmentary vertical section, on a larger scale, of another axial bearing portion of the ventilator;

Fig. 6 is a fragmentary section of another form of ventilator tube and surrounding construction; and

Fig. 7 is a diagrammatical section of another form of ventilator.

A ventilator 10, embodying the invention, includes a ventilating conduit or tube 11 which serves as a support for a combined rotor or impeller section 12 and an air expelling blade section 15. Braces 16 secured to the inner wall of the tube 11 support a bearing housing 17 centrally by means of a series of bracket-like end portions 18 and suitable fastening elements 19. This housing comprises an outer sleeve 20 (Fig. 5) having a bearing plug 22 screw-threaded into the lower end thereof to receive a thrust bearing 23 in a depression 25 formed in the upper surface of the plug. The lower end of an upright shaft 26 has a recess 27 in which the bearing engages to support the shaft. Two bearing rings 28 and 29 disposed against an inner shoulder 30 of the sleeve 20 and about the lower end portion of the shaft 26, respectively, receive between them bearing member 32 and are held in adjustable position by means of a nut 33 screw-threaded on the lower end of the shaft. A suitable lubricant-supplying tubular device 34 is screw-threaded into the outer sleeve 20 to insure proper lubrication of the bearing members.

As best shown in Fig. 4, the shaft 26 is enclosed in a vertical cylindrical casing 35, the lower end of which is screw-threaded into the upper end of the sleeve 20 and its upper end is likewise screw-threaded into a sleeve housing 36. Bearing rings 37 and 38 resting upon a shoulder 39 of the housing enclose bearings 52 between them. A pin 50 secures the ring 37 to the shaft 26 for sustaining an intermediate portion of the shaft. A suitable cover or cap 53 is threaded into the upper end of the housing to provide a closed casing and the shaft extends axially through the cover.

An intermediate portion of the cylindrical casing is provided with braces 55 having interconnected end portions 56 embracing the casing and having their outer end portions extending to the inner wall portions of the ventilator tube 11 where they are secured, as indicated at 57, for maintaining the casing and shaft in a substantially rigid upright position. The upper end of the shaft 26 is rigidly connected, as indicated at 58, to a horizontal plate 59 from which depend upright impeller or rotor vanes 60. Inner marginal portions 62 of these vanes (Fig. 2) are spaced substantially equi-distant from the shaft 26 and such portions are substantially parallel. However, the blades extend in substantially opposite directions in oppositely curved relation, as indicated clearly in Fig. 2. It will be observed that the outer extremity 63 of each vane 60 is spaced outwardly beyond the inner extremity 65 of the other blade.

The lower edges of these vanes 60 are secured upon the upper surface of a disc-like plate 66 through which the shaft extends centrally and which is braced with respect to the shaft by means of a spider 67 rigidly secured to the shaft and to the upper surface of the plate. A plurality of upright curved blades 68 are regularly arranged with their upper edges secured to the lower surface of the plate, and their lower edges are secured to the upper surface of an annular plate 69 that is parallel to the plate 66.

The inner portion of the lower plate 69 is cut out centrally to form an opening 70 and its inner edge is formed into an upright flange 72 which surrounds in slightly spaced relation the upper end of the ventilator tube 11. Several of these blades 68 are provided with inwardly projecting and curved extensions 73 having their lower edge portions cut away, as indicated at 75 in Fig. 1, and having their inner extremities formed into interconnected securing means 76 firmly embracing the shaft 26 and disposed upon the upper edge of the housing 36.

It is to be understood that any number of these blade extensions 73 can be provided commensurate with the size of the tubular support 11 and the volume of air desired to be exhausted outwardly through the latter. It has been found that these inward blade extensions 73 materially increase the suction force and thus enhance the efficiency of the ventilator. Thus the inner extensions 73 of the blades serve as suction producing structure, while the outer marginal blade portions serve as air motor structure, as well as suction producing means.

It will be observed that the diameters of the plates 66 and 69 are substantially the same and that the outer edges of the curved blades 68 terminate at the circumferences of these plates at relatively sharp angles. As best visualized in Fig. 2, any radial plane containing the line of the axis of the shaft 26 intersects one of the blades 68 between the opening 70 or plate flange 72 and the outer edges of the plates 66 and 69.

A deflector 77 secured about the upper portion of the ventilator tube 11 is provided with an outwardly and upwardly directed wall 78 terminating immediately below the surface of the lower plate 69, and is provided with an inwardly turned flange 79 that is parallel to the lower surface of the plate 69. A securing band portion 80 closely embracing the ventilator 11 is rigidly secured thereto by means of soldering, riveting, or other suitable securing means.

Referring to Fig. 6, the upper end of the ventilator 11 is not provided with a deflector, but in place thereof, the upper end of the tube is outwardly flared to form a funnel-like portion 82 extending beyond the opening 70 of the lower plate 69. In this construction the flange 72 shown in Fig. 1, can be omitted.

This type of ventilator described above operates satisfactorily in response to air currents, but if it is desired to install a driving mechanism, a suitable gear 85 detachably engaging a gear portion 86 on the shaft 26 can be mounted upon the upright cylindrical casing and connected to a driving shaft 87 of any suitable type of motor (not shown).

In the form of the invention shown in Fig. 7, a ventilator 90 is constructed in the same manner as that shown in Fig. 1, with the exception that four rotor vanes 92 instead of two, corresponding somewhat in shape to the vanes 60, are provided. A supporting shaft 93 and disc 95 correspond substantially to the like elements 26 and 66 previously described.

In the operation of the device, a current of air from any direction striking the impeller or rotor vanes 60 rotates the impeller section and the air expeller section as a unit; that is, the structure disposed above the ventilator tube 11 which is rotatably supported upon the shaft 26. The action of the air currents upon the blades 68 also provides an additional force for causing rotation of these elements, and this unit including the sections 12 and 15 can properly be termed a rotor. As the sections rotate, the curved shape of the blades 68, all of which are curved outwardly, is such as to cause them to draw air by suction from the interior of the ventilator tube 11 and expel it in a horizontal direction from the space about the blades 68. It will be observed that the rotation of the rotor section and air expelling section is in a clockwise direction, as viewed in Fig. 2. The rotor and air expelling sections are properly balanced upon the shaft 26 which is rotatable freely in the bearings 23, 32 and 52, and only a slight force is required to initiate the rotative action.

Air currents flowing upwardly at an angle to the vertical, such as those frequently caused by the configuration of slanting roofs, are deflected from the rotating section by means of the deflector walls 78 and in a lateral direction corresponding substantially to the direction of flow of air from the air expelling section. Hence these currents cannot interfere with the proper operation of the device, but on the other hand, tend to assist in creating suction from the interior of the tube 11.

In the construction shown in Fig. 6, these upwardly flowing air currents are deflected partially through the opening 70 and into the air expelling section between the blades 68, and in an outward direction to assist in the outwardly expelling action of the vanes. Both forms of structure shown provide for creating suction to aid in the outward flowing action of the air from the interior of the tube 11, and the direction of flow is substantially horizontal. Since any moisture tending to enter the air expelling section 15 must strike the blades 68, and the outward flow of air further opposes entrance of moisture, and since the centrifugal force of the rotating portion of the ventilator also prevents the moisture from entering the tube 11, any tendency of moisture to be carried inwardly between the plates 66 and 69 into the construction shown in Figs. 1 and 2, is very effectively obviated. The inner flange 72 further prevents such moisture from entering the tube 11 when the ventilator is not rotating. In Fig. 6, if the moisture tends to flow inwardly, it can drip through the opening 70 outside the ventilator tube, but has no tendency to travel upwardly over the flared end portion 82 of the tube.

Although only the preferred forms of the invention have been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. A ventilator comprising an upright tubular section, a shaft rotatable axially of the tubular section, means for rotatably supporting said shaft in the tubular section, a substantially horizontal plate rigidly secured to the shaft, a plurality of spaced upright rotor vanes having parallel inner wall portions spaced from the shaft and having outer curved portions, lower edge portions of the vanes being carried upon one side of said plate, a plurality of curved blades having edge portions carried upon the other side of said plate and arranged about an annular path, an annular plate carried upon the lower edges of the blades opposite those carried by said horizontal plate and defining said annular path, said annular plate surrounding the upper end of said tubular sup-

port, said plates and blades forming openings communicating laterally with the upper end of the tubular support for expelling gases from the tubular support into the region of the blades and outwardly between the latter.

2. A ventilator comprising a tubular supporting section, a rotor construction responsive to air currents to rotate it, means for rotatably supporting the rotor construction about a substantially vertical axis upon the supporting section, the air current responsive rotor construction including suction producing elements operable to expel air laterally therefrom, the upper end portion of the tubular supporting section having a flared portion embraced inside a portion of the rotor for deflecting air currents outwardly from the suction producing elements.

3. A ventilator comprising a tubular supporting section, a rotor section having a plurality of upright rotor vanes of substantially U-shape in cross section, a combined power producing and air expelling section including blades arranged in spaced relation and supported in conjunction with the rotor section, said blades curving outwardly from the axis of the rotor, and means for supporting both sections upon the tubular support, said blades obscuring the axis of the second mentioned section from all directions radially from said axis.

4. A ventilator comprising an upright tubular air conduit, a rotor section having a plurality of upright rotor vanes spaced from each other to provide air passage through the rotor section, an air expelling section of substantially annular form mounted about the upper portion of the air conduit and responsive to air currents to assist in rotating the ventilator, means for rotatably supporting the rotor section and the air expelling section upon the air conduit, and a plurality of curved blades included in the air expelling section and exposed directly to the outer atmosphere about the ventilator, said blades being curved outwardly in the annular configuration of the air expelling section, any plane containing the line of the axis of rotation of the air expelling section intersecting one of the blades.

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