

March 4, 1969

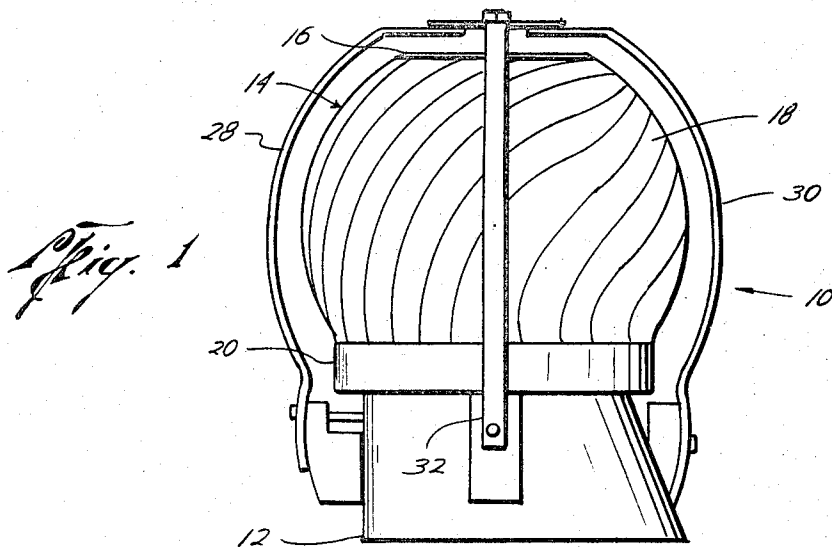
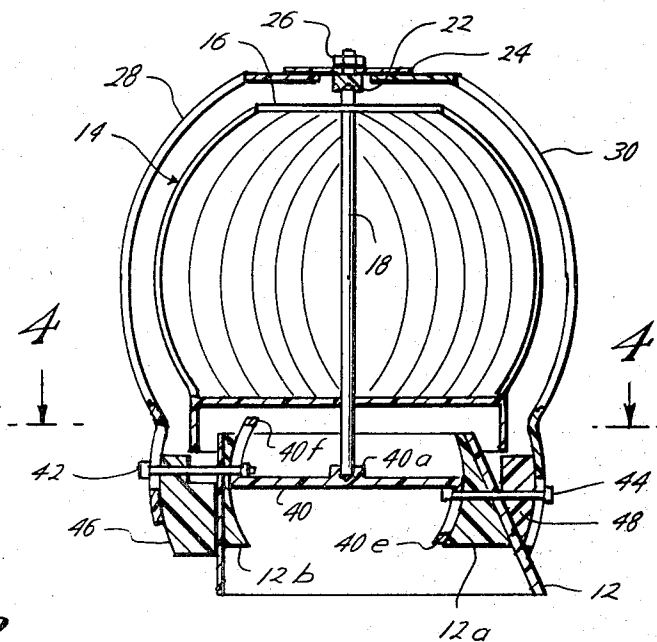
J. D. SMITH ET AL

3,430,550

PLASTIC ROTARY TYPE VENTILATOR

Filed Oct. 23, 1967

Sheet 1 of 2



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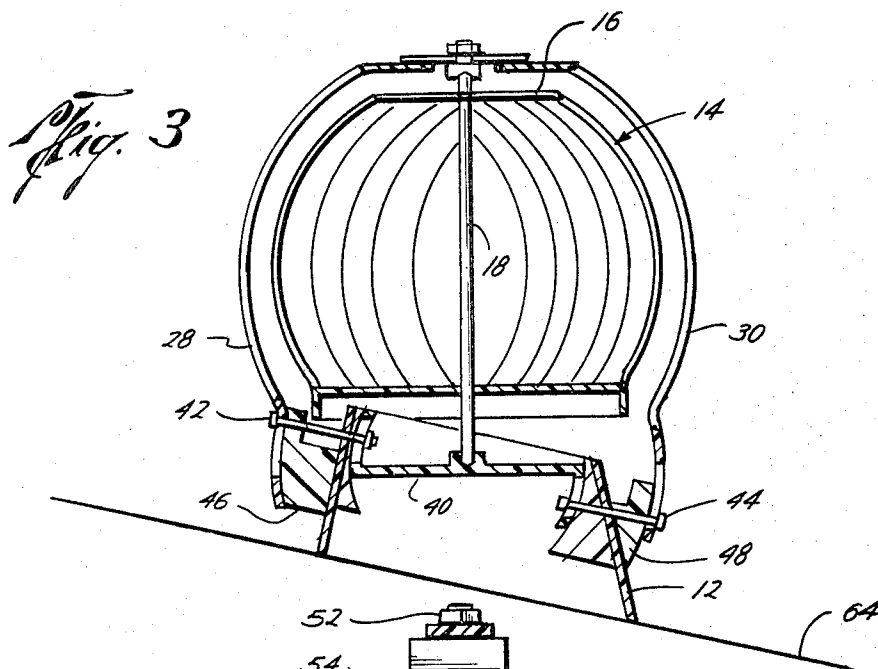
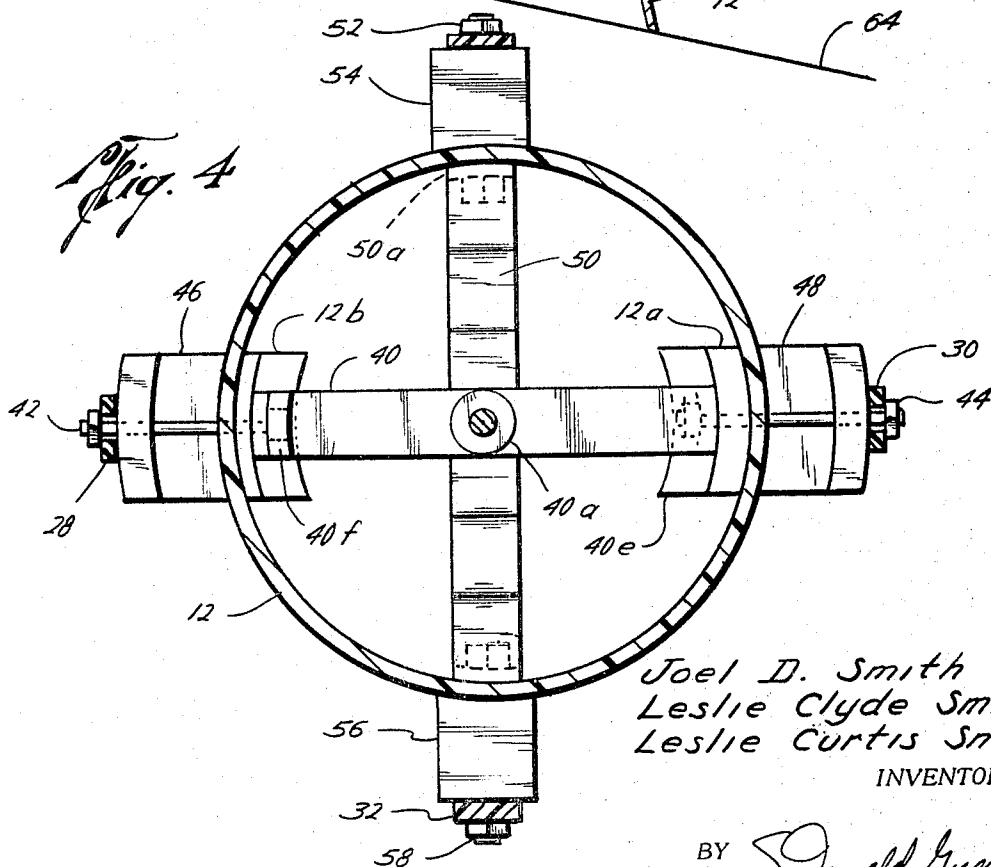
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PLASTIC ROTARY TYPE VENTILATOR

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Continuation-in-part of application Ser. No. 548,372, May 5, 1966. This application Oct. 23, 1967, Ser. No. 677,260

U.S. Cl. 98—72

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4 Claims

ABSTRACT OF THE DISCLOSURE

In a rotary ventilator, a turbine is mounted above a draw pipe wherein said turbine rotates on a shaft. The said shaft is supported in bushings at both ends and rotatably positioned by a cross-bar at the lower end. The crossbar is constructed and arranged to pivot and rotate in a plane perpendicular to said draw pipe and the upper bushing is supported by a plurality of external struts. The struts are connected to said draw pipe for pivotal movement of the turbine to thereby position said turbine at an angle to said draw pipe and such that the turbine remains vertical when installed on a roof of no slope or slope of a substantial angle.

Related applications

This application is a continuation-in-part of Ser. No. 548,372, filed May 5, 1966 and now abandoned.

Summary of problem and invention

Turbine ventilators for installation on the roofs are well known from times past. Several problems inhibit the wide range of flexibility required for turbine ventilators as will be noted. It is difficult for a manufacturer or distributor of turbine ventilators to maintain an adequate store of turbine ventilators for the great variety of roofs presently in use. This results from the fact that the turbine ventilators of present-day manufacture are generally limited to installation on a single pitch. Thus, a turbine ventilator suitable for installation on a flat roof is not adaptable to a roof having a five-thirteen pitch, or any other slope. While devices have been known for pivoting the major axis of a turbine with respect to a chimney such as shown in the 1899 British patent to Brown, such device has been found inadequate for the reason that the turbine does not pneumatically cooperate with the draw pipe because the Brown structure did not contemplate use at an angled position. Thus, the apparent flexibility of the Brown structure is, in fact, misleading, since the device is only intended to permit a chimney sweep to have access to the chimney by moving the device temporarily aside wherein the device is afterwards returned to the vertical position.

Of further interest in the prior art is the patent of Shur, dated 1966, wherein an air duct diffuser is disclosed which permits angled position to the diffuser for directing air through the duct. Devices of this nature are of no particular assistance to the problem above stated, the problem of maintaining a vertically erect turbine above a drawpipe in a manner such that the draw pipe is protected against entry of water and foreign material, while providing an air-draw through the pipe when placed on roofs of all slopes and descriptions.

With the limitations of the prior art in view, and further considering the basic problem of providing a single

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structure adapted for installation on roofs of all slopes, the present invention is summarized as providing a turbine mounted on a rotatable shaft extending therethrough, the turbine being positioned above the draw pipe, and maintained in vertical alignment by the shaft wherein the upper end of the shaft is guided in a bushing externally of the turbine, and wherein said bushing is held in desired spatial relationship by external struts which extend around the turbine and downwardly toward the draw pipe. The lower end of the rotatable shaft is supported on a cross-bar adapted to be tilted in a plane extending at an angle to the draw pipe whereby the cross-bar member is horizontal, while the draw pipe is inclined on a roof of sloping construction of any degree and draws air into the turbine vertically positioned. Said turbine incorporates a lower skirt adapted to surround and protect the drawpipe from entry of rain and other foreign matter without regard to the angular position of the draw pipe with respect to the turbine.

One object of the present invention is to provide a new and improved rotating turbine ventilator suitable for installation on roofs of any slope.

A related object of the present invention is to provide a new and improved turbine ventilator wherein the draw pipe or chimney is protected against the entry of rain and foreign objects even when the turbine is tilted with respect to the draw pipe.

Another object of the present invention is to provide a new and improved turbine ventilator in which the turbine is maintained vertically erect and rotatable about its vertical axis wherein the upper end is supported by a plurality of external struts of adjustable connection and the lower end is supported on a member positioned in a horizontal plane during installation.

An important object of the present invention is to provide a new and improved turbine ventilator suitable for construction of plastic or other semi-rigid materials.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following specification and drawings, wherein:

FIG. 1 is a side view of the turbine ventilator of the present invention;

FIG. 2 is the same view as shown in FIG. 1 with a section line taken along a major diameter of the present invention;

FIG. 3 is a view similar to FIG. 2 showing the present invention installed on a sloping roof; and,

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 2 for illustrating additional details of internal construction.

In the drawings, attention is first directed to FIG. 1 for a detailed description of the present invention summarized hereinbefore. In FIG. 1, the turbine ventilator is indicated by the numeral 10 and incorporates the upper end of a draw pipe 12 adapted to communicate with a chimney or other source of air to be circulated by the present invention. The draw pipe 12 is suitable for connection to the roof of a structure by the appropriate installation of flashing thereabout (not shown), and may be also adapted to receive an internal pipe of suitable size to open in the drawpipe 12 for communicating the air duct to the turbine ventilator. The turbine ventilator 10 further includes a circular turbine 14 having an upper rain plate 16 fixedly joined to a plurality of vanes 18 which bend arcuately about the circumference of the

turbine 14 and which overlap with a view of shielding the draw pipe 12 from rain or foreign objects and yet which are spaced from one another to provide openings whereby a breeze or wind rotates the turbine 14. The number of vanes in the turbine 14 is subject to a range of variation, and the vertical height of the turbine is likewise variable. Since turbine ventilator measurements are usually defined as the diameter of the draw pipe, it is sufficient to note for the present invention that the vanes 18 are connected with a lower skirt 20 which encircles the upper neck of the draw pipe 12 as shown in FIG. 1.

Attention is next directed to the sectional view of FIG. 2 which illustrates the rain plate 16 at the upper end of the turbine 14 fixedly joined to the vertical shaft 18 on which the turbine 14 rotates. The vertical shaft 18 includes a pointed upper end positioned within a bushing 22 which is solidly joined to a spider 24 extending in a plurality of directions. The spider 24 is locked in position by a nut 26 engaged with a threaded shaft carried on the bushing 22.

The spider 24 permits connection of a plurality of struts which secure it in position. There are four struts preferably spaced around the turbine 14 and connected to the spider 24, with three of the struts indicated by the numerals 28 and 30 shown in FIG. 2, and an additional strut indicated by the numeral 32 located at right angles in FIG. 1. The struts are generally arcuate in shape at the upper portions, and have connective portions near their lower ends as will be described.

Attention is directed to FIG. 2 of the drawings for description of the lower support means for the turbine 14. In FIG. 2, the shaft 18 which rotates with the turbine means 14 is supported in central, upturned bushing 40a carried on a cross-support member 40. The member 40 extends essentially across the width of the draw pipe 12 and abuts a pair of arcuately curved bushing members indicated by the numerals 12a and 12b. Each of the bushing members is secured to the drawpipe 12 and includes a curved face as shown in FIG. 2 wherein the center of the curvature coincides with the center of the cross-bar 40. The cross-bar 40 contacts the arcuate faces of the bushings with a pair of curved tabs 40e and 40f which are constructed and arranged to smoothly seat against the faces to suitably anchor and position the cross-bar 40. Moreover, the tabs 40e and 40f are bifurcated with either a central opening or a slot (as illustrated) whereby the cross-bar 40 is rotated about an axis perpendicular to the plane of FIG. 2 and then anchored as will be described. More particularly, the openings in the tabs 40e and 40f are positioned and aligned by the illustrated bolts means 42 and 44 shown in FIG. 2.

The bolts 42 and 44 extend through a pair of seat members 46 and 48 shown in FIG. 2 for engaging the lower ends of the wind braces or struts 28 and 30 and will be described. The braces 28 and 30 are preferably arcuately curved near their lower ends as shown in FIG. 2 to smoothly seat against the external faces of the seat members 46 and 48, respectively. The seat members 46 and 48 incorporate a central opening in line with bolt holes in the side wall of the draw pipe 12 and extending through the internal bushings 12a and 12b to position the bolts 42 and 44 in the illustrated manner. It is not critical whether the bolt head is located at either end of the bolt; it is sufficient to provide either a bolt head and nut of adequate width to clamp the lower end of the wind brace or strut to the seat member while also clamping the bifurcated tab carried on the cross-brace 40 as shown in the drawings. As a matter of convenience, when either end is tightened with a wrench or other suitable tool, both ends are pulled snugly against the arcuate tab members on the illustrated seats for positioning and locking the members of the present invention.

Note should be taken of the construction of the various components described hereinabove. As previously mentioned, the new and improved turbine ventilator 10 of the

present invention is preferably formed of plastic. While sheet metal is suitable, the device is preferably formed of a plastic such as polyethylene or other slightly yieldable, high-impact plastic which has good weathering characteristics. Further, the plastic chosen is preferably slightly yieldable, and able to deform to some extent on impact. The turbine itself is preferably formed in a two-step molding process wherein the rain plate 16 and the vanes 18 are formed integrally as shown with the lower ends of the vanes free of the skirt 20. If needed, the various vanes can be spread somewhat from the illustrated construction during fabrication to thereafter permit the free ends to be joined to the encircling means 20 of the apparatus. Preferably, an opening is left in the rain plate 16 and the shaft 18 is positioned therethrough and joined by an appropriate adhesive to the plate 16 whereby true alignment of the shaft 18 is maintained.

Other steps noted in regard to the manufacture of the device of the present invention include the joinder of the bushings 12a and 12b to the drawpipe 12 by means of an appropriate adhesive. While it is possible to fabricate the bushings integrally with the drawpipe 12, the mold configuration is more easily obtained by the fabrication of separate components and the later joinder of the various blocks and components to the draw pipe 12 as described herein. Generally, all components of the completed structure are formed of plastic with the exception of the nuts and bolts in the struts, and it is also helpful to place a bronze bushing or thrust bearing at each end of the shaft 18 to enhance its freedom of rotation.

Attention is next directed to FIG. 4 of the drawings which illustrates in greater detail the means whereby the turbine means 14 is tilted with respect to the draw pipe and yet remains vertically aligned to thereby accommodate roofs of multiple pitches. In FIG. 4, the cross-bar 40 is illustrated extending between the bushings 12a and 12b wherein the upstanding tab 40f is shown locked in position. It will be appreciated that the tab 40e extends downwardly as viewed in FIG. 4. The two tabs are positioned in an abutting relationship against the arcuate faces of the two bushings and are locked in position by the bolt means 42 and 44. The bolt means 42 and 44 have been previously noted to extend fully through the internally located bushing means and the externally mounted connecting blocks 46 and 48.

Of particular interest in FIG. 4 is an optionally included means extended transversely to the cross-bar 40. The transversely extending member 50 passes under and supports the perpendicularly arranged cross-member 40 to add support to the bushing 40a on which the weight of the turbine rests. The transverse member 50 includes a perpendicular tab 50a shown in dotted line in FIG. 4 which pivots about a bolt means 52. The bolt means 52 is axially in line with the bushing 40a (see FIG. 2) so as to coincide with the center of rotation since the axis of rotation of the bolt means 52 controls rotation of the member 50 and pivotal movement of the wind braces 32. That is to say, the bolt means 52 is partially an axis of rotation for the bushing means 40a to thereby permit pivotal movement of the turbine means 14, the wind struts externally located of the turbine, and the support means at the lower end of the shaft 18 including the cross-member 40 as will be described in greater detail hereinafter.

To permit the strut secured by the bolt means 52 to extend arcuately and have approximately the same shape and construction as the wind struts 28 and 30, an extender block 54 is positioned between the draw pipe 12 and the head of the bolt 52. Since the lower ends of the two struts (excluding the struts 28 and 30) only pivot and do not slidably move with respect to the draw pipe 12, the extender block 54 may be omitted if desired.

FIG. 4 illustrates symmetrically located extender

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means 56 being identical to the means 54 shown in the top portion of the drawing. In further particular, bolt means 58 is likewise similar to the bolt means 52 above described. Again, the location of the bolt means 58 is axially in line with the bolt means 52, and the bolts are likewise in alignment with the axis of rotation extending perpendicular to the plane of FIG. 2, and extending through the bushing means shown thereat. The extender block means 56 is the point of connection for the wind brace 32 previously shown in FIG. 1.

In the use of the present invention on a flat roof, the device is installed with appropriate flashing metal and suitable connections are made with the smoke pipe or other air duct communicated with the draw pipe 12, and reference is made to FIGS. 1 and 2 for a detailed illustration showing the use of the present invention on a flat roof. However, for a consideration of the more common installation wherein the device of the present invention is placed on a sloping roof, attention is directed to FIG. 3.

In FIG. 3, a roof-line is indicated at 64 extending at an angle with respect to the horizontal. The roof 64 is connected to the draw pipe means 12 by suitable means and techniques known to one skilled in the art. The draw pipe 12 extends at an angle with respect to the turbine means shown in FIG. 3. The angular position of the turbine means 14 with respect to the draw pipe is obtained in the following manner. The bolts 42 and 44 are first loosened to permit movement of the lower ends of the struts 28 and 30 with respect to the mounting blocks 46 and 48. In further particular, loosening of the bolts 42 and 44 also frees the tabs 40e and 40f carried on the ends of the cross-bar 40 to slide with respect to the bushings located internally of the draw pipe 12. As shown in FIG. 3, the cross-bar 40 is positioned horizontally without respect to the angle of inclination of the roof 64. More particularly, the tabs are moved across the faces of the bushings and are anchored when the cross-piece 40 is horizontal by re-tightening the bolts 42 and 44. Thus, it will be noted that the tabs 40e and 40f are appropriately located to position the cross-piece horizontally and the wind struts 28 and 30 are slidably moved with respect to the draw pipe prior to tightening the bolts, the adjustments at the four locations being accomplished preferably simultaneously. The net result is to provide a horizontal support for the shaft 18 on which the turbine rotates. Moreover, such movement provides the shaft 18 with the vertical orientation necessary to align the lower end of the shaft 18. Also, the bushing at the upper end of the shaft 18 is trued to a vertical position directly above the bushing carried on the cross-piece 40.

This is accomplished wherein the wind struts at the left and right of FIG. 3 are respectively shortened and lengthened whereby the externally located support for the upper end of the shaft is made substantially stable as required for an installation left untended in the elements for a number of years. Of course, the two remaining wind braces only pivot with respect to the draw pipe 12, and to this end (reference is made to FIG. 4) the bolt means 52 and 58 are slightly loosened and thereafter tightened to permit the pivotal movement. Since the movement is pivotal and not sliding, adjustment slots are not required to relatively locate the pair of struts with respect to the draw pipe 12. Referring again to FIG. 3, it will be noted that in the final installation, the wind strut 28 is shortened, the strut 30 is lengthened, and the two other struts (not shown in FIG. 3) remain the same in length although they are pivoted to an angular position with respect to the draw pipe 12.

It should be noted that the device of the present invention is adapted for installation on a number of slopes of any measure within reason. Moreover, accommodation of greater slope is attained by merely lengthening the slots and arcuate portions at the lower end of the wind

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struts 28 and 30 while also extending the length of the tabs 40e and 40f carried on the cross-piece. Also, the arcuate length of the internally located bushings 12a and 12b and the externally located blocks 46 and 48 is of some effect on proper seating, the curved faces being related to the center of rotation of the turbine 14.

It should be noted that the lower mouth or open end of the turbine 14 is somewhat wider than the upper end (the diameter of the rain plate 16) whereby the draw pipe 12 is permitted to extend upwardly into the turbine 14. Since the lower mouth or opening of the turbine is somewhat larger than the draw pipe, interference of the two parts on installation as shown in FIG. 3 is avoided and room is made to permit the addition of an optional extender collar above the draw pipe 12 so as to communicate the draw pipe fully within the lower mouth of the turbine. As will be appreciated, some slight leakage may occur from the atmosphere into the turbine 14 to interfere with the draft pulled through the draw pipe 12 on extremely sloping surfaces. However, this is easily accommodated with the device of the present invention.

While other details may be noted concerning the construction and installation of the plastic rotary turbine ventilator 10 of the present invention, the scope of the present invention is defined by the claims appended hereto.

What is claimed is:

1. A turbine ventilator comprising:

- (a) a generally upwardly extending draw pipe means adapted to extend above a roof and adapted to provide air flow communications therethrough;
- (b) turbine ventilator means adapted to be rotated about a shaft means;
- (c) bushing means adapted to engage said shaft means;
- (d) support means carrying said bushing means within the projected opening of said draw pipe means;
- (e) said support means adapted to be positioned at an angle with respect to said draw pipe means and adjustable to maintain said shaft means essentially vertically;
- (f) means constructed and arranged for inclining said shaft means with respect to said draw pipe means to maintain said shaft generally vertically directed when said draw pipe means is inclined upon installation on a sloping roof; and
- (g) said means functioning in cooperation with said shaft means below said ventilator means.

2. The invention of claim 1, including:

- (a) connective means externally of said draw pipe means; and
- (b) support means for the upper end of said shaft means cooperative with said connective means and adapted to be adjusted in position relative thereto.

3. The invention of claim 2 wherein said upper and lower support means are simultaneously and cooperatively adjustable together for positioning said shaft means vertically.

4. A turbine ventilator comprising:

- (a) a generally upwardly extending draw pipe means adapted to extend above a roof and adapted to provide air flow communications therethrough;
- (b) turbine ventilator means adapted to be rotated about a shaft means;
- (c) means constructed and arranged for inclining said shaft means with respect to said draw pipe means to maintain said shaft generally vertically directed when said draw pipe means is inclined upon installation on a sloping roof;
- (d) said means functioning in cooperation with said shaft means below said ventilator means;
- (e) a first support means located with the projection of said draw pipe means;
- (f) second means for releasably connecting said support means horizontally when said draw pipe means

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is positioned at an angle with respect to the vertical; and
(g) said second means including tab means movable with respect to clamping means deriving structural position from said draw pipe means.

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