

[54] **TURBINE VENTILATOR**

[75] Inventor: **James D. Jones**, Houston, Tex.

[73] Assignee: **Wind-Wonder, Inc.**, Houston, Tex.

[22] Filed: **Aug. 10, 1972**

[21] Appl. No.: **279,474**

[52] U.S. Cl. **98/72, 98/75, 416/186**

[51] Int. Cl. **F23I 17/02**

[58] Field of Search **98/46, 72, 73, 75; 415/2, 415/3, 4; 416/186**

[56] **References Cited**

UNITED STATES PATENTS

3,430,550	3/1969	Smith et al.	98/72
3,200,735	8/1965	Bergen	98/73 X
3,267,833	8/1966	Artis et al.	98/72
3,066,596	12/1962	Gray et al.	98/72
1,876,518	9/1932	Mathis	416/186

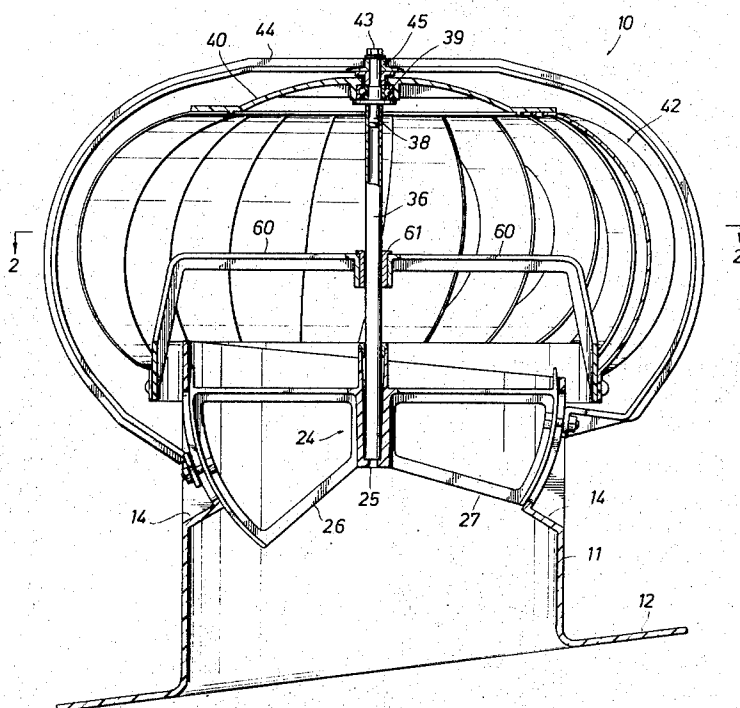
Primary Examiner—William F. O'Dea
Assistant Examiner—Peter D. Ferguson
Attorney, Agent, or Firm—Donald Gunn

[57]

ABSTRACT

A turbine ventilator adapted to be used with a roof of variable pitch, ranging from flat to about 7/12, which incorporates an upstanding elliptical air pipe which has an internal pair of facing curved surfaces which support matching segments of a movable support base. The support base is connected to a vertical spindle which extends to the top of the turbine where it is braced and supported by four wind braces. The braces support a bushing which, in conjunction with a bearing assembly, supports a rotatable turbine. The rotatable turbine is held rigid by two cross arms which intersect at a bushing which surrounds the shaft at its center portion. The support base for the shaft is adjustable to position the shaft vertically, thereby accommodating variations in pitch. The entire apparatus is preferably formed of plastic, except for the bearing assemblies, nuts, bolts, and other components, to thereby define a structure which is resilient and shock resistant in use and operation. The device can be colored to coordinate with the color of the structure on which it is to be placed.

14 Claims, 14 Drawing Figures



SHEET 1 OF 4

FIG. 1

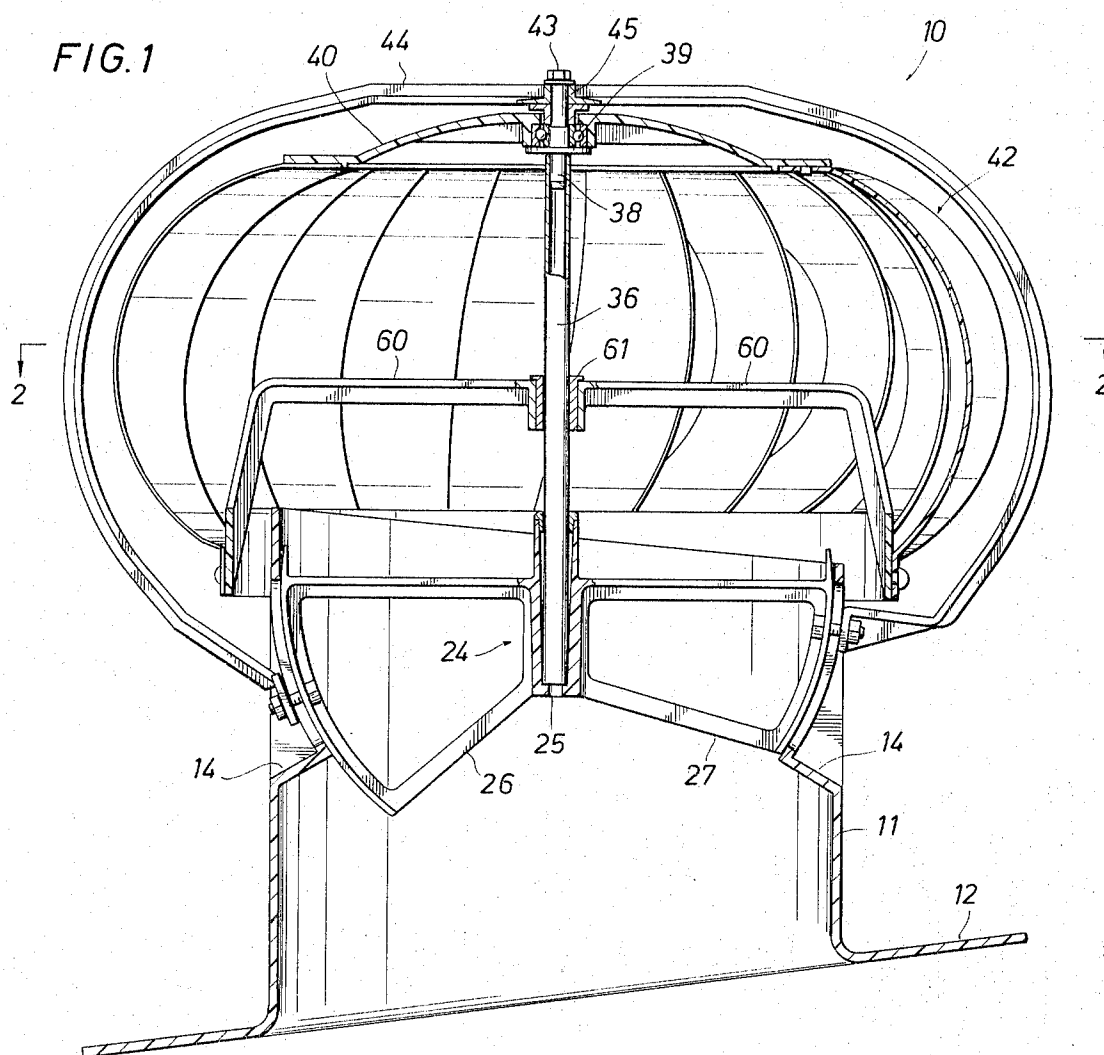


FIG. 2

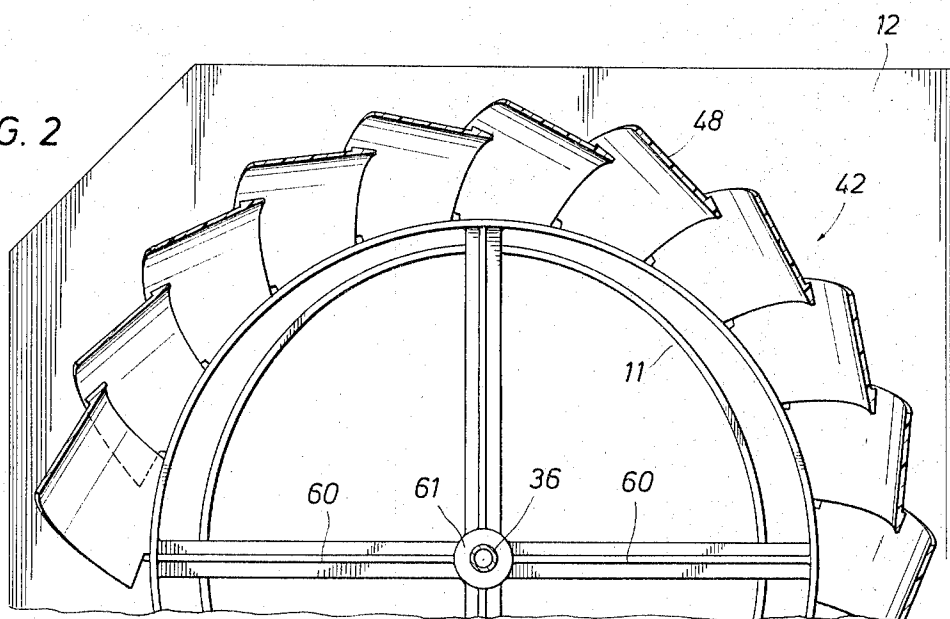


FIG. 3

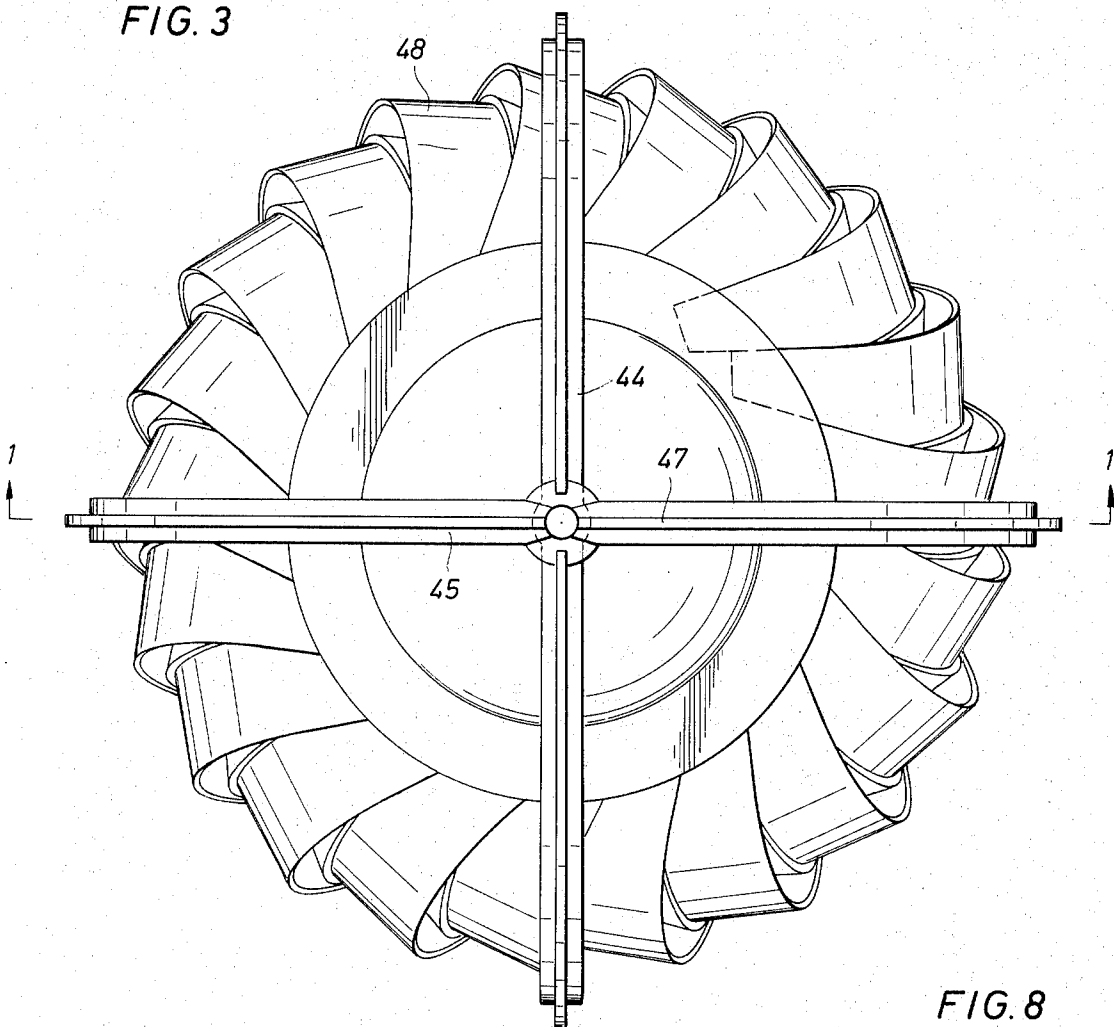


FIG. 7

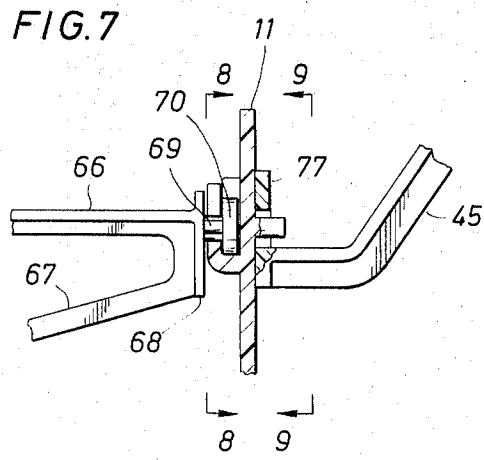


FIG. 8

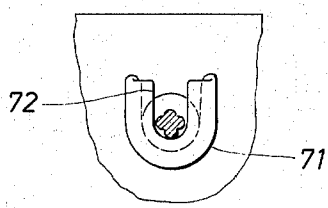
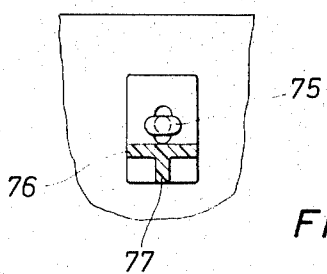
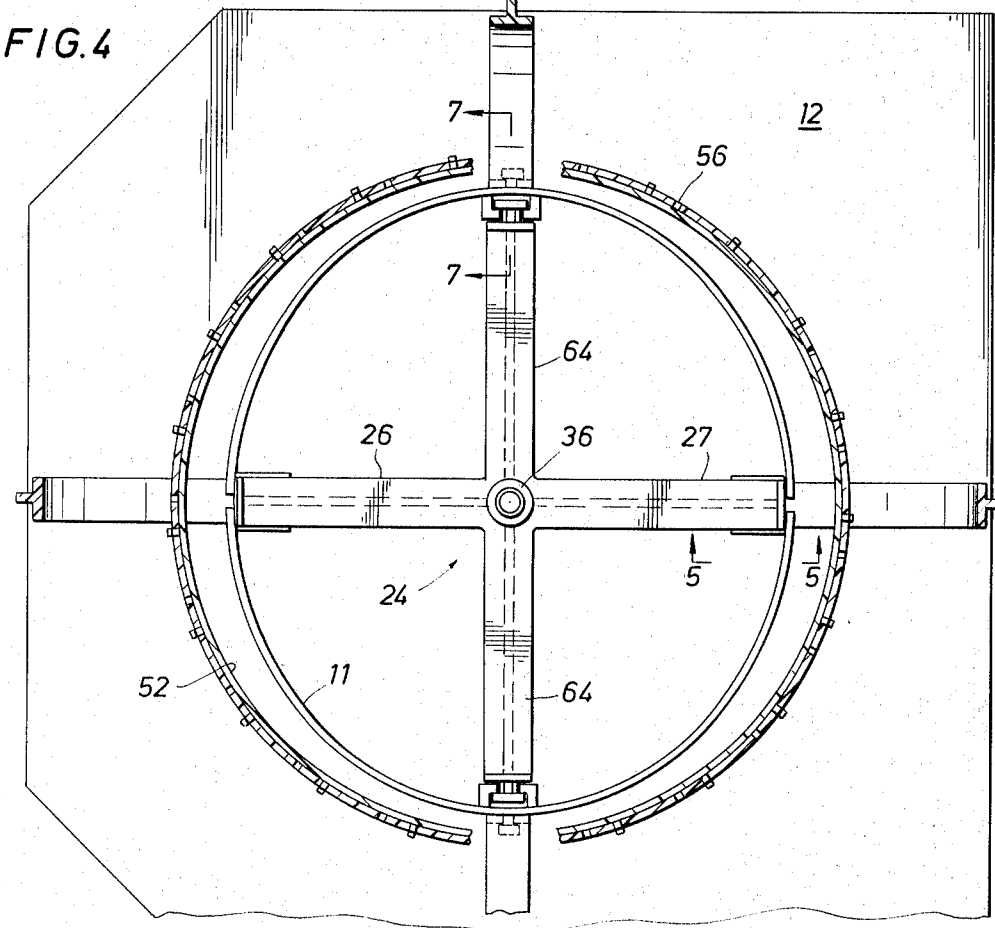
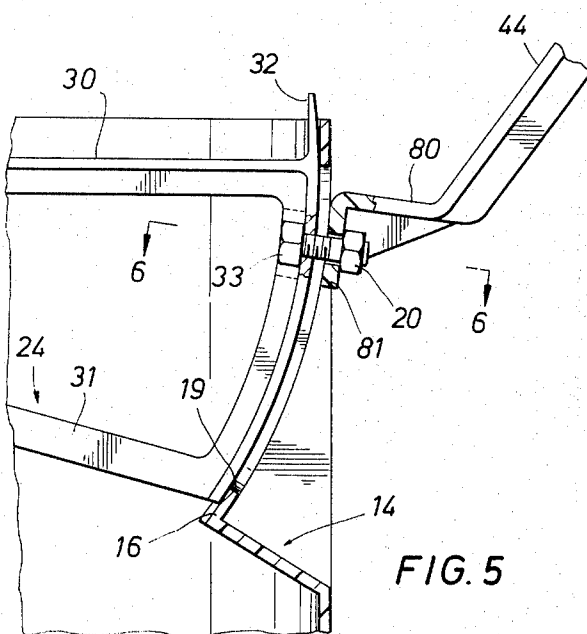
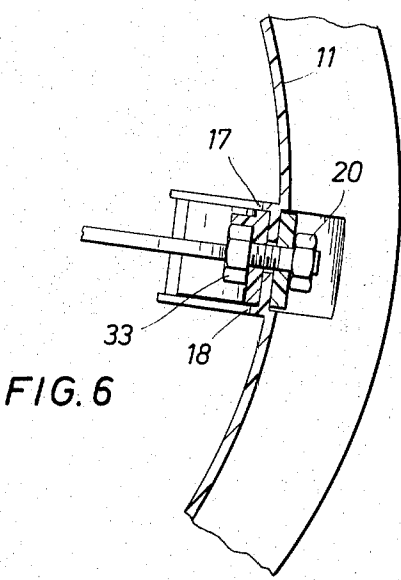
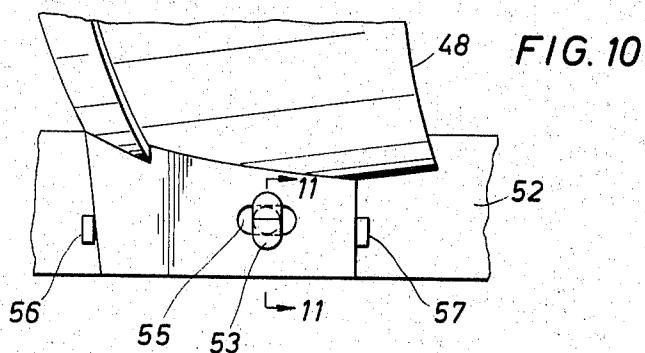
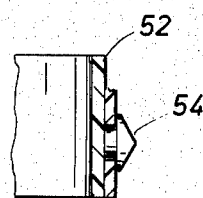
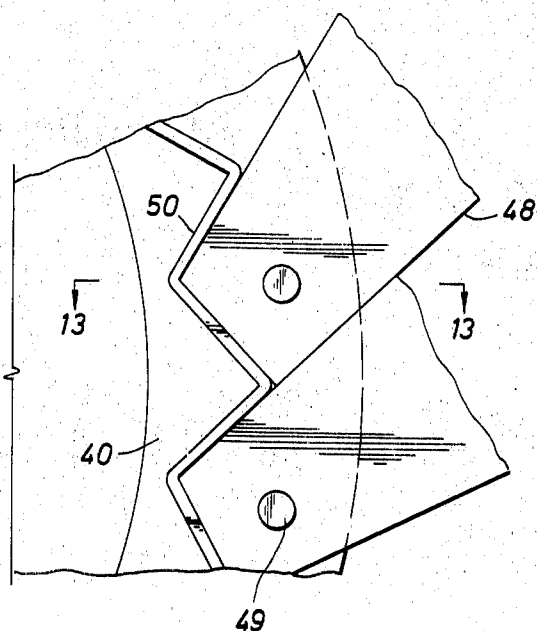
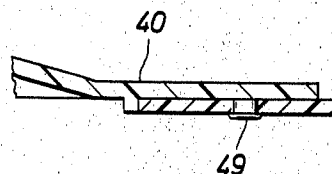
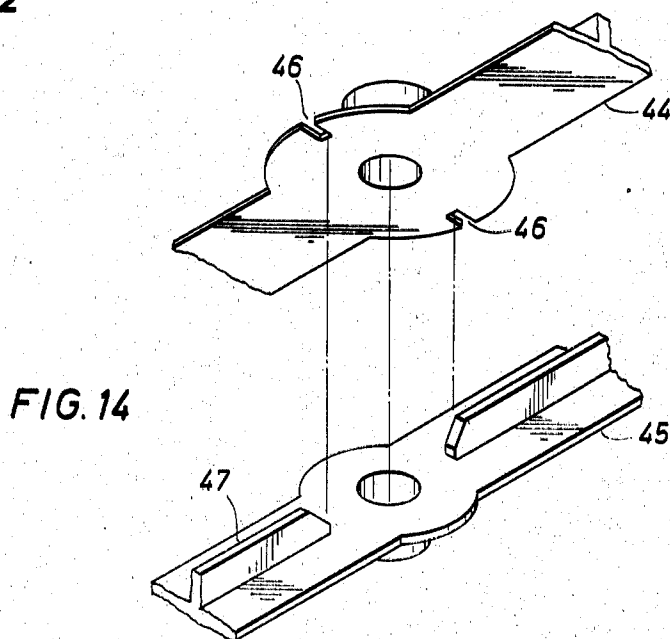


FIG. 9







TURBINE VENTILATOR

PRIOR ART

U.S. Pat. No. 3,430,550

BACKGROUND OF THE INVENTION

Turbine ventilators are used to cool attic spaces. In warmer climates, temperature in an attic space may reach 160° - 170° when the outside temperature is perhaps 95° F. Turbine ventilators using a wind pipe opening into the attic space which extends upwardly into a rotating turbine are used to cool attic spaces. Turbines are normally formed of sheet metal material, and are not normally resistant to shock or impact as might occur in a hail storm or other harsh weather. They are susceptible to freight damage during shipping. Once the sheet metal ventilator has been bent, it takes an easy set and when bent back to its original shape, it normally retains wrinkles. The wrinkles tend to crack or break the galvanizing coating or paint on the metal, and it will be susceptible to rust damage at the point of flexure.

Turbine ventilators are customarily manufactured for installation on a roof with a particular pitch. The prior art patent discloses an adjustable turbine ventilator which accommodates some range of variation in roof pitch. However, the present invention constitutes an improvement over the referenced patent inasmuch as it discloses an easily manufactured, adjustable pitch turbine ventilator which is preferably formed of elastomeric materials. The elastomeric materials, however, do not make a one-to-one replacement for materials made of metal. Sheet metal materials used in the fabrication of turbine ventilators are either joined by rivets, sheet metal screws, or spot welding. Thermoplastic materials cannot be joined in this manner.

The present invention deals with the problem of fabrication of an all plastic turbine ventilator by providing new and novel means for joinder of the components. The present invention is constructed and designed for ease of fabrication of the repetitive parts, such as the many ribs used in the assembly of a turbine. The present invention contemplates the joinder of a plurality of ribs about a turbine wherein a twist-lock connection is achieved joining the ribs to a circular brace or support at the bottom of the turbine. This not only provides a means of assembly, but serves as a means of reinforcing the ribs once they are assembled. By way of contrast, the ribs at the upper end pass beneath a bonnet which clamps from the top onto the rib.

The problem of assembly of a turbine ventilator by incorporating connections which can be achieved through the use of plastic parts and holding the number of metal joinder parts to a minimum is also dealt with. The few metal components which are used find advantage in that they are adjustable as in the example of adjustment for the purpose of repositioning the turbine ventilator to accommodate changes in roof pitch. Also the present invention incorporates high quality bearings and bushing assemblies, particularly on the shaft which supports the rotative turbine for long life.

The present invention constitutes an improvement over devices of the prior art in the use of foamed high impact plastic material around the collar, thereby enabling the collar to be nailed to a roof. This provides better gripping in contrast with sheet metal flashings,

and anchors the adjustable turbine ventilator firmly to the roof without risk of working loose or leaking in the event of rain.

SUMMARY OF THE INVENTION

The present invention is summarized as incorporating a non-round air pipe joined at its lower end to a planar flashing member which is adapted to extend under shingles. The tubular member incorporates a pair of facing curved members which lie on a common circle. They are adapted to slidably contact a base support which is constructed of segments of a circle. It spans the width between the facing members and supports an upright shaft which extends to the topmost point where it is connected with four wind braces which extend on the exterior of the turbine ventilator. There are four wind braces which maintain the shaft in an upright position. The shaft has a bushing and bearing assembly at its upper end. The bearing assembly connects with the bonnet of a rotatable turbine. The rotatable turbine is formed of a number of identical ribs which gather air and cause the turbine to rotate. The ribs extend downwardly to an external circular collar which is trued as a circle and positioned with respect to the shaft by means of four internal braces.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view along the center line of the turbine ventilator of the present invention;

FIG. 2 is a sectional view of the turbine ventilator of the present invention looking downwardly into the turbine and the draw pipe therebelow;

FIG. 3 is a plan view of the turbine ventilator of the present invention;

FIG. 4 is a sectional view taken across the air or draw pipe and internal braces which support the turbine and showing details of construction thereof;

FIG. 5 is a sectional view taken along the line 5 - 5 of FIG. 4 illustrating details of construction of the wind brace and the rotatable base support;

FIG. 6 is a sectional view taken along the line 6 - 6 of FIG. 5 showing additional details of construction;

FIG. 7 is a sectional view taken along the line 7 - 7 of FIG. 4 showing one means of connecting two of the four wind braces to the fixed collar;

FIG. 8 is a sectional view taken along the line 8 - 8 of FIG. 7 illustrating one means of connection of the base support to the fixed wind pipe;

FIG. 9 is a sectional view taken along the line 9 - 9 of FIG. 7 illustrating details of construction of one means for connecting the alternate wind braces to the fixed collar;

FIG. 10 is a detailed view of the lower end of a rib of the turbine showing means for connection to the internal collar;

FIG. 11 is a sectional view taken along the line 11 - 11 of FIG. 10 illustrating additional details of construction of the mechanical connective device;

FIG. 12 is a view of a portion of the top of the turbine showing a means of connecting the ribs to the bonnet;

FIG. 13 is a sectional view taken along the line 13 - 13 of FIG. 12 showing additional details; and,

FIG. 14 shows the intersection of the wind braces at the top and means for providing for structural integrity thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Attention is first directed to FIG. 1 where a turbine ventilator 10 is shown. The turbine ventilator is adapted to be installed on a roof, not shown, wherein a draw pipe 11 extends upwardly through an opening in the roof. The lower flange 12 is adapted to be nailed, glued, tarred, or otherwise joined to the roof. As shown in FIG. 2, the draw pipe is not perfectly round, but is somewhat oval shaped. This is to accommodate movement of the turbine ventilator and permit interference with the collar of the turbine at its lower periphery. The draw pipe 11 incorporates arcuate indentions 13 on the left and 14 on the right which are similarly formed. They are formed of a lower portion of a circle divided along the straight line and include portions of arcs as better shown in FIG. 5.

The indentation 14 is illustrated in FIG. 5 and incorporates a slotted arcuate internally facing surface 16. The arcuate facing surface has a pair of lengthwise shoulders 17 and 18 as shown in FIG. 6. The shoulders 17 and 18 capture a connective apparatus which will be described. The curved face 16 is preferably a portion of a circle. It includes a lengthwise slot 19 which is sufficiently wide to receive a bolt 20 therethrough as illustrated. The upper end of the curved face 16 fairs smoothly into the oval but cylindrical shape of the draw pipe 11. The slot 19 positions the bolt 20 perpendicularly.

The curved face 16 is not very wide, as is better shown in FIG. 6. It is sufficiently wide to receive, position and support an arcuate segment of a support base 24. The support base is generally indicated in FIG. 5. The support base 24 is shown in FIG. 1 to be comprised of a central hub or spindle 25. It is connected with a pair of angled supports 26 and 27 which extend at equal angles below a common diameter. They support two arcs which engage the curved faces 16 on the two facing arcuate indentions 13 and 14. The dimensions are such that the support base 24 is supported by the pair of arcuate curved faces. The support base 24 and the two curved indentions 13 and 14 have a common center. This permits the support base 24 to be rotated, yet supported by the two facing curved surfaces 16. The support base can be positioned so that the turbine ventilator is held upright, or it can be held in some other position as desired. More will be noted concerning this hereinafter.

In FIG. 5, the support base 24 has a diametric arm 30 and a lower arm 31. The arms 30 and 31 define an included angle which is spanned by the facing arcuate surface 32. The surface 32 is equal in width to the surface 16 which it contacts, and it is adapted to slide against the surface, moving upwardly or downwardly, and is captured by the pair of adjacent shoulders 17 and 18. In FIG. 6, the construction of the members 30, 31 and 32 is more clearly shown to be L-shaped for rigidity. A hole is drilled through the arcuate surface 32 to receive the bolt 20 and a nut 33 fixes the members together.

Returning to FIG. 1, the support base 24 supports a hollow, upstanding shaft 36 in the central tubular socket 25. The shaft 36 is vertically aligned by the support base 24. Without regard to the pitch of the roof, the support base 24 is positioned to hold the shaft 36 vertically. The shaft 36 supports a flanged bushing 38

which supports a bearing assembly 39 shown in FIG. 1. The bearing assembly is received in a downwardly facing receptacle in a bonnet 40 which is positioned on the top of the rotating turbine 42. The turbine ventilator is supported from the bonnet 40 which rests on the bearing assembly. A bolt 43 extends downwardly into and through openings in a pair of wind braces which are arranged perpendicularly and indicated at 44 and 45. In FIG. 14, the two wind braces 44 and 45 are arranged coaxially of openings to receive the bolt 43. The upper wind brace 44 has a pair of notches formed at 46 which receive and lock with the upstanding reinforcing rib 47 arranged along the length of the lower wind brace 45. The four wind braces connect to the draw pipe 11 in the manner to be described hereinafter. All of the wind braces have a reinforcing rib which improves their strength.

Returning to FIG. 1, the bonnet 40 is at the top of the turbine, just below the four wind braces which extend across the bonnet. Attention is momentarily directed to FIGS. 12 and 13 jointly where the bonnet 40 is identified. The bonnet provides the connection for the upper end of a multiplicity of ribs which are identical and are indicated at 48 in FIG. 12. The ribs are all perforated at one end. Projecting pins 49 extending from the lower side of the bonnet 40 connect with the openings in the ribs. The bonnet 40 has a zig-zag lip 50 on its lower face which encircles the bonnet 40. The lip 50 locks against the two edges of each rib and points them toward the lower collar as will be described. The lip or edge 50 controls the positioning of each rib with respect to the other to define the rotating turbine. The pin 49 incorporates an enlarged head as shown in FIG. 13.

Attention is next directed to FIG. 4 which is a sectional view taken through the collar at the bottom edge of the turbine and looking downwardly into the draw pipe 11. FIG. 4 illustrates a collar 52 which encircles the lower portions of the turbine 42. The collar 52 is equipped with a number of protruding lugs. The collar is shown in greater detail in FIG. 10 where a single protruding lug 53 is shown. The lug 53 has an enlarged head 54 as shown in FIG. 11. The head is oval shaped. The rib 48 of the turbine ventilator incorporates a hole 55 which is shown in FIG. 10. The hole 55 is shaped to pass over the head 54. The head and hole are non-round, and are preferably somewhat oblong. The hole 55 is oriented across the narrow width of the rib or vane 48. The connection of the two components is made by placing the rib in the plane of the collar 52. The rib is passed over the head 54 and is seated on the narrow neck behind the head. The rib is then rotated through ninety degrees to a position approximately perpendicular to the plane of the collar. This rotates the hole 55 to the position shown in FIG. 10. Small outwardly protruding lock tabs 56 and 57 cooperate with the rib and collar to secure the rib in the required position. The small tabs 56 and 57 provide registration of the individual ribs.

Many ribs are locked to the collar. FIG. 4 shows the several ribs about the periphery, each abutting the tabs 56 and 57 shown in the drawings. The tabs are spaced about the collar 52 and position all of the ribs 48 to thereby assemble and hold together the turbine ventilator in the desired arrangement.

The turbine 42 is reinforced across the bottom by the use of four reinforcing ribs 60 shown in FIG. 1. The ribs

60 join the inside of the collar 52 shown in FIG. 2. The four ribs all extend to a central hollow spool 61 which is positioned about the rotatable shaft 36. The shaft is stationary while the hub 61 rotates with the turbine 42. The bushing or spool 61 aligns the lower portion for axial rotation and prevents wobble of the turbine ventilator. The weight of the turbine ventilator is carried on the bearing assembly 39 previously described.

The turbine is tiltable about a center point and rotatable with respect to the wind pipe 11. The turbine is supported and positioned by the base support 24. Two of its legs pivot while two of its legs slide in the arcuate indentions 13 and 14 previously described. Considering first the legs which pivot in their connection with the draw pipe 11, attention is directed to FIG. 4 where laterally extending legs 64 of the support base 24 are shown. The support base 24 incorporates the central hollow bushing 25 which supports the shaft 36. Description has been given previously of the arcuate and movable struts which were described in reference to FIGS. 1 and 5. In FIG. 4, perpendicularly arranged struts 64 extend from the central hub 25. They include upper and lower individual struts 66 and 67 shown in FIG. 7. The struts 66 extend from the top of the hollow hub 25 while the struts 67 extend from its bottom portions. The struts 66 and 67 come together at a vertical flange 68. The flange 68 supports a horizontal shaft 69 which has an enlarged head 70. The head 70 is received into an upwardly facing pocket 71 shown in FIG. 8 which is formed in the interior of the wind pipe 11. The pocket 71 is notched at 72 to receive the shaft 69. The shaft 69 supports the weight of the base support 24. The enlarged head 70 is preferably round and is rotatable in the pocket 71.

The base support 24 is supported by the pivotal arrangement of FIG. 7 on opposite sides to define an axis of rotation through the shaft 69. This permits the base support to rotate and carries with it the turbine and shaft.

In FIG. 7, the wind strut 45 is shown connected to the draw pipe 11. The draw pipe 11 has a protruding pin 75 which has an enlarged head better shown in FIG. 9. It has a head which is enlarged and of non-round configuration. The wind strut 45 is constructed of a T-shaped cross section including the wide member 76 and a ridge 77 shown in FIG. 9. At the lower end, the wind strut 75 supports a perpendicular flange 77 shown in FIG. 7. The flange 77 has a hole or opening which is contoured to pass over the head of the pin 75. It is passed over the head by positioning the wind strut 45 horizontally. The wind strut is then rotated from the horizontal to the vertical which locks the flange 77 to the pin. Tilting of the wind strut with respect to the draw pipe 11 is permitted.

As described to this juncture, the turbine 42 is tilted along with the shaft 36 which supports it. Tilting of the turbine and supportive shaft requires that the wind strut 45 pivot in the manner shown in FIGS. 7 and 9. Such movement is assisted by the sliding movement of the other wind strut, and for this purpose, reference is directed to FIG. 5 where the wind strut 44 is mounted for sliding movement accommodating change in position of the turbine ventilator 42. In FIG. 5, the wind strut 44 is shown secured by the bolt 20. At the lower end, the wind strut includes a bent portion 80 which is directed at right angles against the outer face of the curved surface 16. The wind strut 44 terminates at its

lower end in a facing flange member 81. The flange member 81 is perforated to receive the bolt 20 therethrough. The same bolt 20 in cooperation with the attached nut 33 holds the base support 24 and the wind strut in position with respect to the draw pipe 11. The two movable members illustrated in FIG. 5 move together in contact with the arcuate surface 16. The bolt 20 can be loosened to permit the two members to be repositioned. The bolt and nut can be re-tightened after repositioning.

In operation, the turbine ventilator of the present invention is installed on a structure roof having a pitch from flat to about 7/12. The present invention is particularly adapted for adjustment for roofs of different pitches. The foregoing description is adequate to understand the operational procedure. The present invention is advantageous in the cooling of a living space. The heat rising through the draw pipe 11 passes through the turbine in a manner to act on the ribs, forcing some rotation on the turbine. Any external breeze will force the turbine to rotate due to the construction and arrangement of the ribs as illustrated. As the turbine rotates, air within the turbine is drawn from it, and additional air drawn into the turbine. The cooling process is accelerated on hot days by removing the extremely hot air from the attic space. If the temperature of air drawn into the turbine is increased, the turbine operates at a more rapid rate. As the rate of rotation increases, it draws hot air through the draw pipe at a greater rate of speed.

The present invention is adapted to be manufactured of plastic components. All of the components shown are preferably formed of plastic, with the exception of the nuts, bolts, and bearing assembly and the supportive shaft. The major components are preferably formed of carbon filled polyethylene. Carbon in the polyethylene disposes of the problem of ultraviolet radiation which tends to crack or craze untreated plastic material, making it unduly brittle. The wind struts are preferably reinforced with fiber glass. The present invention is able to resist shock and impact as might occur in a hail storm or from falling limbs and other debris. The use of plastic materials such as those mentioned enables the present invention to resist impact by flexing and returning to its original shape. This is likewise advantage during shipping and installation.

Many alterations and variations can be incorporated, but the scope of the present invention is determined by the claims which are appended hereto.

I claim:

1. A turbine ventilator comprising
 - a draw pipe adapted to be connected with an opening in a roof;
 - a base support in said draw pipe;
 - an upright support shaft supported by said base support thereabove;
 - a rotatable turbine supported by said support shaft, said turbine extending over said draw pipe and being formed of a plurality of ribs which define an air moving and air drawing mechanism for inducing air through said draw pipe;
 - wind struts supporting the upper portion of said shaft;

adjustable connection means on said struts collectively enabling adjustable connection of said turbine above said draw pipe to accommodate

7

changes in angular position with respect to said draw pipe;

a generally planar flanged member joined to the lower portions of said draw pipe and adapted to be joined to a roof;

said turbine including

a top bonnet which incorporates an abutting shoulder thereon which contacts a plurality of individual and similar ribs, said shoulder positioning the upper end of said ribs which are joined to said bonnet by means of a connective pin in said ribs and said ribs are directed at predetermined angles by said shoulder with respect to said bonnet and with respect to one another to thereby define said turbine ventilator; and,

an encircling collar connected to said ribs at their lower ends.

2. The turbine ventilator of claim 1 wherein said draw pipe is non-round and said rotatable turbine incorporates a round collar at its lower portions which is larger than said draw pipe and surrounds said draw pipe.

3. The turbine ventilator of claim 1 wherein said base support incorporates four approximately perpendicular members extending outwardly from a central bushing, said bushing receiving said support shaft therein, said four members being arranged wherein two of said four members are pivotally connected with respect to said draw pipe for rotation along an axis through said pivot and through said bushing and wherein the remaining two of said four members are slidably connected with respect to said draw pipe, said slidable connections being along a radius of curvature utilizing the axis as a center point.

4. The structure of claim 3 wherein said two slidably connected slidable connections incorporate

a pair of curved segments attached to said draw pipe on the interior thereof and having a radius of curvature utilizing said axis as its center;

a pair of diverging struts comprising each of said members and extending to an arcuate curved surface conforming with said curved segments and adapted to have slidable contact therewith;

a guide lip on one of said curved surface and said curved segments; and,

releasable joinder means for releasably connecting said support base at a selected angle with respect to said curved surfaces.

5. The structure of claim 4 wherein said releasable means includes an elongate slot means in said curved segments, a bolt extending therethrough and adapted to be connected with a nut, and an opening means for receiving said bolt into said support base.

6. The structure of claim 1 wherein said collar is circular and has on its exterior a plurality of projecting pins having enlarged non-round heads thereon and wherein said ribs include opening means thereon for engaging said pins, said opening means being of non-round configuration such that said opening means pass over said pins in a first position with respect to said col-

8

lar and move to a locking relationship on movement to a second position with respect to said collar.

7. The structure of claim 6 wherein said collar includes at least a pair of radially inwardly directed braces which connect to a central bushing which surrounds said support shaft.

8. The structure of claim 7 wherein said collar includes spaced lock tabs about the periphery thereof which are adapted to contact and align the respective edges of the plurality of ribs connected therewith.

9. The structure of claim 8 wherein said lock tabs abut adjacent pairs of said ribs.

10. A turbine for use with a ventilator comprising a base support adapted to span a pipe in a roof; an upright shaft supported by said base support; a rotatable turbine supported by said shaft, said turbine including a plurality of ribs which define an air moving and air drawing mechanism for inducting air through said turbine;

a bonnet on the top side of said turbine joined to said ribs;

a bushing on the lower side of said bonnet for engaging said shaft for rotation;

an internal cross brace in said turbine extending thereacross;

an alignment guide on said cross brace which guide cooperates with said bushing and said shaft to align and position said turbine in a specified upright position;

an abutting shoulder which contacts a plurality of individual and similar ribs, said shoulder positioning the upper end of said ribs which are joined to said bonnet by means of a connective pin in said ribs and said ribs are directed at predetermined angles with respect to said bonnet and with respect to one another to thereby define said turbine ventilator; an encircling collar for connection of the lower ends of said ribs;

a plurality of projecting pins having enlarged non-round heads on said collar; and,

opening means in said ribs for engaging said pins, said opening means being of non-round configuration such that said opening means pass over said pins in a first position with respect to said collar and move to a locking relationship on movement to a second position with respect to said collar.

11. The structure of claim 10 wherein said collar includes spaced lock tabs about the periphery thereof which are adapted to contact and align the respective edges of the plurality of ribs connected therewith.

12. The structure of claim 11 wherein said lock tabs abut adjacent pairs of said ribs.

13. The apparatus of claim 10 wherein said base support includes a fixed, upstanding open-ended elongate hollow passage.

14. The apparatus of claim 10 wherein said cross brace and guide surround said shaft, and said bushing includes thrust bearing means.

* * * * *