Jan. 16, 1945. E. L. WISEMAN 2,367,454

VENTILATOR

Filed Jan. 15, 1943

Fig. 1

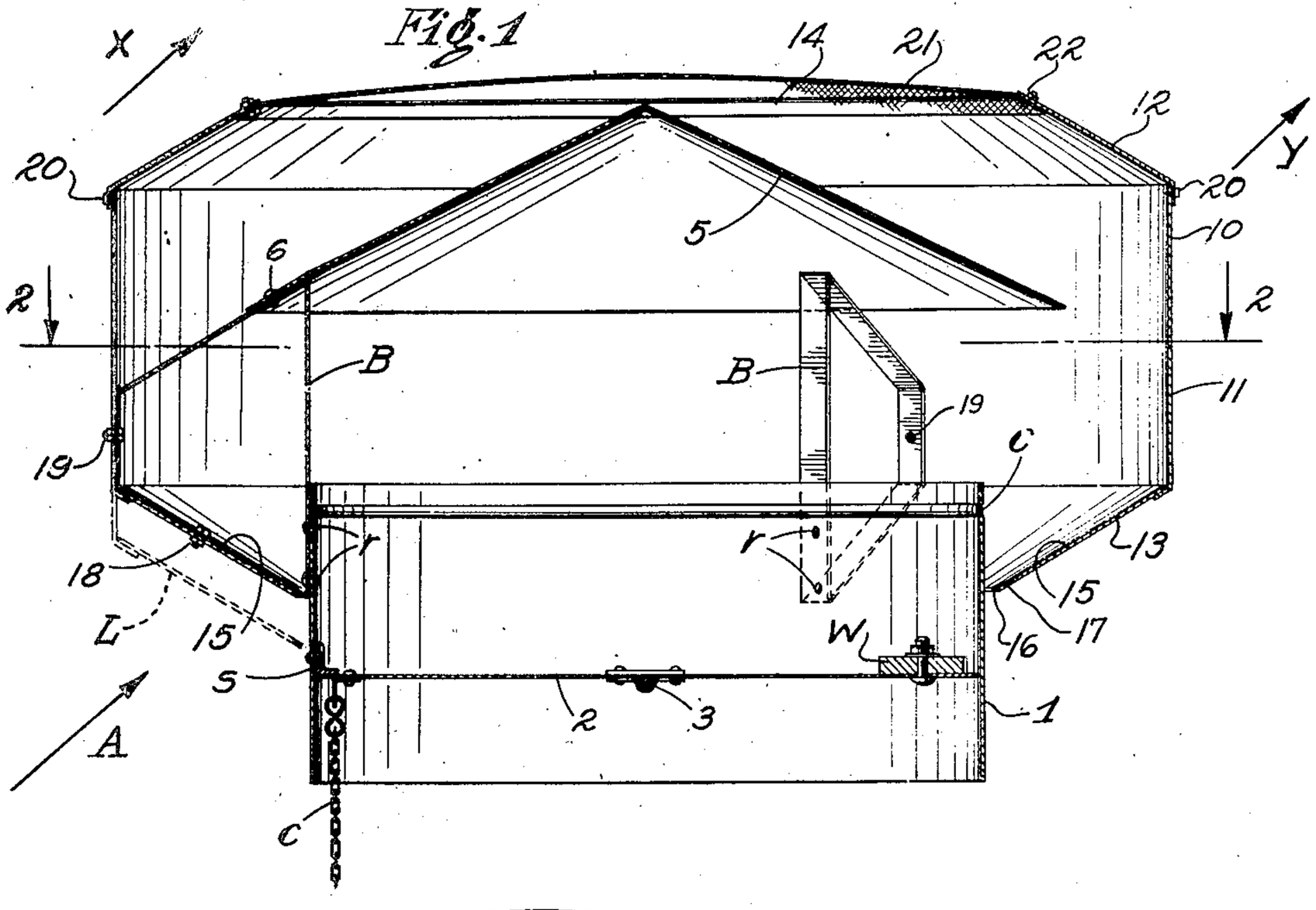
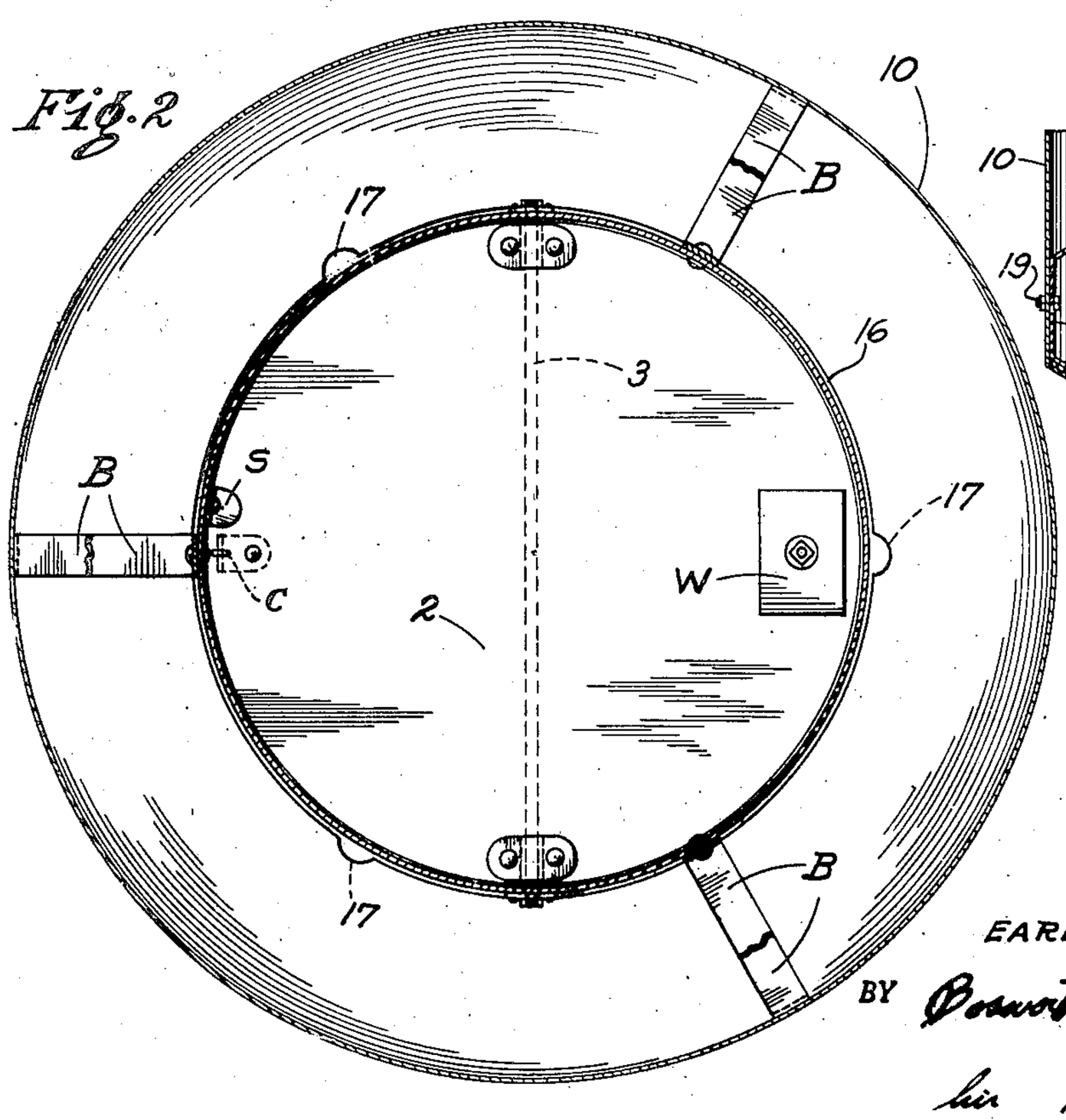


Fig. 2



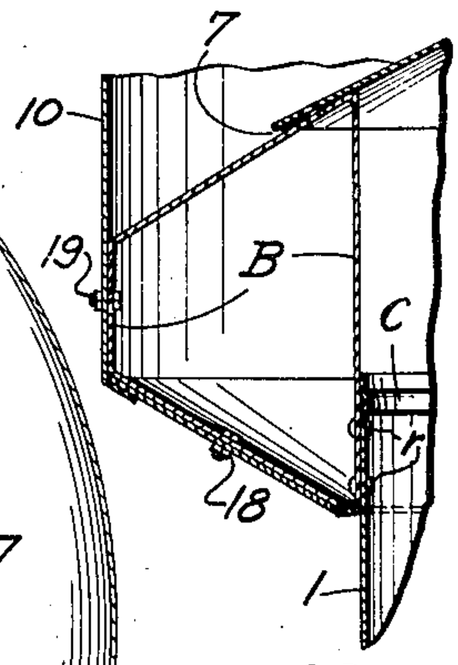


Fig. 3

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VENTILATOR

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7 Claims. (Cl. 98—85)

This invention relates to roof ventilators, and more particularly to the plain stationary type of roof ventilator.

The purpose of such ventilators is broadly to facilitate the outflow of air, gases, fumes and the like from rooms and buildings, while excluding the ingress of "weather" such as rain, snow and sleet. Ordinarily, such ventilators are attached directly to the roofs of the buildings above the space to be ventilated. Reasons of economy suggest that the ventilators be spaced but a reasonable minimum height above the roof to conserve the length of the eduction pipe or stack leading from the roof opening.

Since roofs have been and often are designed without regard to, or even knowledge of the original and later arising problems of ventilation, and since roofs take an endless variety of shapes, flat, sloping, saw-toothed, gabled etc., and since the location of ventilators is often, if not largely determined by the "hot spot" or other conditions within the building, many of which have no relation to the shape of the roof, one of the cardinal objects of my invention is to provide a ventilator having universality of utility and efficiency over a wide range and variety of roof configurations.

Another object of my invention is to provide a ventilator which will take the best advantage of the wind and outside air currents to aid or accentuate the natural draft through the ventilators. As a complement to this object, it is a further object of my invention to provide against the impairment of the natural draft through the ventilator by the influence of the wind and outside air currents. A further object is to exclude "weather" from entering the building or space to be ventilated, and to prevent weather or weather conditions from impairing the operation and efficiency of the ventilator. Among other things it is the object of my invention to prevent the ventilator from freezing up, i. e., as by the collection of ice internally thereof or in any manner which might either impair its function as a ventilator or overload its structure. Another object is to provide a ventilator from which birds, squirrels, and other small animals can be excluded without elaborate and involved screening.

With these objects, a further object is to provide a ventilator of simple, inexpensive and rugged construction, devoid of moving parts except for such agencies as fans or dampers where the same are sought to be added for their additional functions, and to provide in such construction the means of ready accessibility for replacement or repair of parts and for inspection, cleaning, painting and the like.

These and other objects will more fully appear in the following description of a preferred form of my invention, reference being had to the accompanying drawing, in which Figure 1 is a vertical longitudinal section of a ventilator embodying my invention; Figure 2 is a horizontal section taken on the line 2—2 Figure 1, and Figure 3 is a fragmentary view of a part of Figure 1 showing the preferred relation of the marginal edge of the cap to one of its supporting brackets prior to final attachment thereto.

In the preferred form of my invention, I provide a round stack or eduction pipe 1, which while shown to be short in relation to its diameter may have any desired length, and as is well understood in the art will be connected at its bottom to communicate with the roof opening through suitable connecting, supporting and flashing structure not shown. As will be seen, I prefer to mount a damper 2 on an axis 3, which is journalled at its ends in bearings carried by the eduction pipe 1. Preferably the damper has a weight W on one side which tends to hold the other side upwardly against a stop S to maintain the damper in its closed position. A chain C permits opening of the damper more or less as desired.

In this form of my invention and with particular regard to the simplicity and ruggedness of construction, I secure to the upper end of the pipe 1 preferably at three points circumferentially spaced there around, trapezoidal shaped rigid brackets B. These brackets may be secured to the upper end of the pipe 1 as by rivets *r* at the lower ends of the longer of the parallel vertical sides of the brackets. Preferably the upper end of the pipe 1 is stiffened by such means as the annular corrugation C.

A cap 5 preferably of conical form is positioned directly above and spaced away from the upper open end of the eduction pipe 1 and overlies, i. e. its marginal edge overhangs, the upper opening of the pipe whereby to exclude weather therefrom. The cap 5 rests upon and is secured to the upper sloping leg of the brackets B so that the cap is given a three point support and has removable attachment to these brackets preferably through nuts and bolts 6. As shown in Figure 3, I prefer that the slope of the upper legs of each of the brackets be inclined a little more steeply than the idle pitch of the conical cap 5, so that edge of the cap tends to be spaced from the bracket as at 7 in Figure 3, before the parts are secured together. In this way the parts are stressed in the

course of their attachment with the result that the whole structure is given firmness and rigidity. Not only is the cap supported by the brackets, but also the cap in turn serves as an annular ring tying the brackets together and holding them upright against their tendency to tip or swing outwardly under the cantilever load of the storm band which is carried on the outwardly extending parts of the brackets.

The same brackets B support the annular storm band 10, which comprises not only the ordinary cylindrical portion 11 but also comprises in functional unity therewith, upper and lower inturned edges or baffle parts 12 and 13 which extend respectively inwardly and upwardly and inwardly and downwardly, terminating in circular edges approaching the diameter of the eduction pipe 1. The baffle parts 12 and 13 may each preferably be of frusto-conical form pitched substantially as shown in the drawing. The upper edge or baffle portion 12 of the storm band 11 extends inwardly and upwardly to a circular edge overhanging the marginal edge of the cap 5 and defining the top circular ultimate outlet opening 14 of the ventilator. This overlapping relation of the uppermost edge of the storm band taken with the balance of the construction and arrangement thereof guarantees the exclusion of weather entering the opening 14 from entering the open end of the eduction pipe 1. Rain entering the opening 14 of the ventilator will fall on the cap 5 and be diverted downwardly and outwardly upon the inturned edge or baffle 13 of the storm band 11 at a substantial distance radially outward from the eduction pipe 1 and substantially below the level of the upper end of this pipe, as for example, in about the zone indicated by the numeral 15.

The relation of the conical baffle part 13 to the upper edge of the pipe 1 in regard to distance and slope is governed in a considerable measure with regard to the splashing of the rain falling from the cap 5 to the zone 15 so that the water falling on the part 13 will not splash into the upper open end of the pipe 1. I have found the proportion and arrangement shown in the drawing to be generally satisfactory in this respect as well as economical of material, but I suggest that where torrential rain storms are to be dealt with, that the cylindrical part of the storm band and brackets be extended downwardly somewhat and the whole of the part or baffle 13 be lowered with respect to the upper edge of the pipe 1, as indicated in the dotted lines L on the left side of Figure 1.

The part 13 at its lower and inward circular edge approaches contact with the outer cylindrical surface of the eduction pipe 1 and is preferably spaced therefrom only by such a narrow annular space or crack 16 as to permit the egress of rain or water forming snow or sleet entering the opening 14 at a rate sufficient to prevent overflow into the upper end of the pipe 1. I prefer that the lower inner edge of the part 13 be substantially circular and substantially uniformly spaced from the outer surface of the pipe 1. As a matter of manufacturing convenience and economy, geometric precision is seldom practicable or necessary in this respect, and I find that the space 16, while not being necessarily uniform all the way around the ventilator, is adequate to permit the egress of water therethrough if the opening defined by inner edge of the part 13 has just about a "good" manufacturing tolerance in excess of the outside diameter of the pipe 1. For example, if the pipe 1 were one foot in outside diameter, I would design the hole defined by the inner edge of the part 13 to be about 12¼ inches diameter. This would give an easy tolerance for assembly and give a gross opening 16 of the order of about 2 to 4% of the cross-sectional area of the eduction pipe 1. Of course where torrential storms are to be dealt with, the opening 16 can be increased or the inner edge of the part 13 may be notched or scalloped as at 17 to permit the greater outflow of water.

The proximity of the lower edge of the part 13 to the eduction pipe, its upward and outward slope therefrom, and its integral functional relation to the storm band as a whole excludes wind and outside air currents substantially entirely from the interior of the ventilator. In this way, I prevent cold down-drafts from working into the eduction pipe from below the storm band, and also maintain the ventilator weather-proof as against driving rains, or even upwardly blown spindrift which might otherwise get below storm bands of the type used in the prior art. Where ventilators embodying my invention are exposed merely to horizontal air currents those currents aid the natural draft as they aid the draft from a chimney with the added impetus of such influences as I believe tend to follow from the enlarged gross exterior of the ventilator. When the outside wind as shown by the arrow A has an upward inclination as is frequently given by a sloping roof, wind for the reasons above stated is prevented from entering the ventilator, and produces a substantial augmentation of the natural draft by virtue of the enlarged projected area of the ventilator as a whole, taken substantially normal to the direction of the arrow A. In the form shown such a projected area is about twice as great as the cross-sectional area of the eduction pipe 1. It should be noted that wind approaching the ventilator from the direction of the arrow A is not confronted with exposed lips or edges or other structural forms which tend to set up eddy currents or other energy wasting influences. On the contrary my ventilator prevents smooth continuous rounded surfaces which while diverting the wind so that its current encompasses the ventilator, does so in a manner that permits the fair maintenance of the wind velocity passing the ventilator as I have indicated roughly by the arrows x and y with the result that the suction effect at and on the upper opening 14 is much augmented. These advantages also persist as the wind currents take directions varying from that of the arrow A, since the smooth rounded exterior of the ventilator and eduction pipe does not unduly back up, trap or hinder the smooth flow of air on the windward side of the structure. The wind striking the lower baffle 13 of the storm band is guided smoothly along from its point of impact, flowing around the pipe 1 and/or flowing upwardly and around the cylindrical part 11 of the storm band, and in all events having a good velocity head on the lee side of the ventilator with the consequent enhanced rarification of the air to leeward of the outlet opening 14 and in the direction of outflow therefrom.

Referring back to the construction of the ventilator, the lower baffle part 13 of the storm band is preferably secured as by detachable bolts and nuts 18 to the lower sloping legs of the brackets B. The cylindrical part 10 of the storm band is secured, preferably by detachable bolts and nuts, to the outer vertical legs of the brackets B, having its lower edge overlapping the outer edge of the baffle 13 in "air tight" or wind proof relation. The cylindrical part 10 being thus firmly secured in

the structure at three, preferably equally spaced, circumferential points is in turn used as the structural element to sustain the upper part 12 of the storm band which overlies it, and is attached by suitable removable metal screws or the like 20 at a plurality of points around the overlapping edges. The joint between these parts is also "air tight" or wind proof, so that the storm band as a whole 11, 12 and 13 functions aerodynamically as an integral unit.

The opening 14 is preferably screened as by a screen 21 secured preferably by removable bolts and nuts to the upper and inner edge of the part 12 as at 22. Since the opening 14 is the only opening of any substantial size, the single circular screen 21 excludes from the whole interior of the device all nest making birds and animals of any size greater than the very smallest which might enter through the crack or space 16.

The arrangement of the parts above described permits ready assembly and removal of the parts and ready access to the interior of the ventilator for all purposes. The parts are mutually self-supporting and reinforcing and the whole structure is given balance, simplicity and ruggedness in an economical construction.

It may be noted in passing that among other advantages of my invention there is this, that moisture entering the ventilator under conditions otherwise tending to form ice adjacent the drain opening 16 is prevented from freezing by the warm gases coming up through the pipe 1, which tend to melt any ice that might form and otherwise clog the opening 16 and impair the drainage of the ventilator. In this way, my ventilator tends to be self cleaning as against the formation of ice which might otherwise impair the drainage thereof.

The smooth rounded and unbroken exterior surface of my ventilator on all outside surfaces from the roof to the topmost opening 14, viewed from every direction and angle permits my ventilator to function with high efficiency in association with a wide range of roof structures and designs and in response to wind and air currents from every point of the compass and through a wide range of vertical angles.

While I have illustrated and described a preferred form of my invention, changes, improvements and modifications will occur to those skilled in the art without departing from the major precepts thereof, and I do not care to be limited in my patent claims to the preferred form or the details thereof, or in any manner other than by the claims appended hereto.

I claim:

1. A ventilator comprising a round eduction pipe, a cap spaced from and overlying the upper open end of the said pipe, and an annular storm band encompassing the upper end of said pipe and said cap in spaced relation thereto and having an inturned imperforate lower inclined edge portion extending inwardly and downwardly to close proximity with the exterior surface of said pipe below the upper end thereof, the proximity of said lower edge to said pipe substantially preventing ingress of wind while permitting egress of water therebetween.

2. A ventilator comprising a round eduction pipe, an imperforate cap spaced from and overlying the upper open end of the said pipe, and an imperforate annular storm band encompassing the upper end of said pipe and said cap in spaced relation thereto and having inturned inclined upper and lower imperforate edge portions which respectively overlie the edge of said cap and extend inwardly and downwardly to close proximity and rough fit with the exterior surface of said pipe below the upper end thereof, the proximity of said lower edge to and its fit with said pipe substantially preventing imgress of wind while permitting egress of water therebetween.

3. A ventilator comprising an eduction pipe, a cap spaced from and overlying the upper open end of the said pipe, a storm band encompassing the upper end of said pipe and said cap in spaced relation thereto and having inturned imperforate upper and lower edge portions which respectively overlie the marginal edge of said cap and extend obliquely to close proximity with the exterior surface of said pipe below the upper end thereof and inclined outwardly and upwardly from said surface, the proximity of said lower edge to said pipe substantially preventing ingress of wind therebetween while permitting egress of water therebetween, and means carried by the upper end of said pipe supporting said cap and said band.

4. A ventilator comprising an eduction pipe, a cap spaced from and overlying the end of said pipe, an annular storm band comprising a part extending coaxially of said pipe and surrounding said cap in spaced relation thereto, the lower edge of said part lying at about the level of the upper end of said pipe, said storm band also comprising a lower inclined part joining the lower edge of said first part and sloping inwardly and downwardly to substantial contact with said pipe below the end thereof and spaced therefrom at least at intervals only enough to permit egress of water therebetween, and brackets carried by the upper end of said pipe supporting said cap and said parts, said cap constraining said brackets against outward tipping movement induced by the cantilever load of said parts.

5. A ventilator comprising a round eduction pipe, a cap spaced from and overlying the end of said pipe, an annular storm band comprising a cylindrical part extending coaxially of said pipe and surrounding said cap in spaced relation thereto, the lower edge of said part lying substantially at the level of the upper end of said pipe, said storm band also comprising a lower substantially conical part joining the lower edge of said cylindrical part and sloping inwardly and downwardly to substantial contact with said pipe and spaced therefrom at least at intervals only enough to permit egress of water therebetween, said storm band also comprising an upper baffle joining the upper edge of said cylindrical part and rising and extending inwardly to overlie the marginal edge of said cap, and brackets carried by the upper end of said pipe supporting said cap and said parts, said cylindrical part supporting said baffle.

6. A ventilator comprising a round eduction pipe, a cap spaced from and overlying the end of said pipe, an annular storm band comprising a cylindrical part extending coaxially of said pipe and surrounding said cap in spaced relation thereto, the lower edge of said part lying substantially at the level of the upper end of said pipe, said storm band also comprising a lower substantially conical part joining the lower edge of said cylindrical part and sloping inwardly and downwardly to substantial contact with said pipe and spaced therefrom at least at intervals only enough to permit egress of water therebetween, said storm band also comprising an upper baffle

joining the upper edge of said cylindrical part and rising and extending inwardly to overlie the marginal edge of said cap, brackets carried by the upper end of said pipe vertically supporting said cap and being horizontally supported thereby and said brackets supporting said parts, said cylindrical part supporting said baffle, said ventilator having no substantial opening to atmosphere other than defined by the inner edge of said upper baffle, and a screen disposed in said opening carried by the inner edge of said upper baffle.

7. A ventilator comprising in combination a round eduction pipe, an annular storm band comprising a cylindrical part extending coaxially of said pipe and surrounding the upper end of said pipe in spaced relation thereto, said storm band also comprising a lower substantially conical part joining the lower edge of said cylindrical part and sloping inwardly and downwardly to substantial contact with said pipe below the upper end thereof and spaced therefrom only enough to permit egress of water therebetween, means for excluding weather from entering the said upper end of said pipe, and means supported by the end of said pipe and connected with said first named means for supporting said storm band.

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