This invention relates generally to assemblies used as roof-exhausters and in particular to a vertical discharge exhauster assembly which is weatherproof.

Conventional roof exhausters discharge downwardly toward the roof or other surface upon which they are instilled. While, for some installations, these give satisfactory service, in applications where relatively hot, corrosive, or grease-laden gases are discharged, the downwardly directed gases cause roof deterioration and are a fire hazard. Vertical discharge fans are advantageous for use with domestic or restaurant kitchen canopies in that the odor and grease laden air is directed upwardly for dispersal in the atmosphere rather than directed downwardly to accumulate at lower levels under certain atmospheric conditions. In such applications, accumulations of grease in ducts sometimes catch fire and where downwardly discharging exhausters are used, the flames are driven into the adjacent roof surfaces. When such fires occur where vertical discharge exhausters are used, the flames are directed upwardly and the danger to roofs and other surrounding surfaces is minimized.

Vertical discharge fan or exhaust assembly are not unknown in the prior art, however, these conventional devices require that the discharged air be directed against a wall or roof which are opened by the air pressure. The problem of weatherproofing these assemblies is obviously present, also the louvers corrode and load with grease making their use with vertical-discharge exhausters, at best, only a partial solution to the problem of weatherproofing a vertical discharge exhauster.

A further object of the present invention is to provide a vertical discharge fan assembly in which the motor enclosure is removed from the air stream but nevertheless obtains cooling air from outside the fan assembly thereby adapting the assembly for use in discharging corrosive fumes.

A further object of the present invention is to provide an assembly of the type referred to which is formed so that the motor enclosure shields the fan inlet from rain and snow with accumulated moisture being collected in a gutter means and drained away from the assembly.

A further object of the present invention is to provide a vertical discharge fan assembly adapted to be mounted on a roof within the curb area whereby the overall height of the installation is minimized.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

FIG. 1 is a side sectional view of an assembly embodying the present invention.

FIG. 2 is a side sectional view similar to FIG. 1 but showing an assembly adapted for use with an axial fan type of impeller.

FIG. 3 is a fragmentary, side sectional view of a modified form of the assembly.

Referring initially to FIG. 1, the fan assembly includes a base frame indicated generally at 10 which overlies and is supported on a curb structure extending upwardly from a roof or other supporting surface. The curb structure borders the mouth of an air passage (not shown) located within the roof or supporting surface structure. The upper end of the frame has a portion 12 extending horizontally inward and normal to the axis of the frame. The inner marginal area of the portion 12 is bent to form an inwardly and upwardly inclined circular flange 13.

A member 14, circular in cross section, overlies the frame 10 and is intermediately bent to provide an inclined flange 16 which overlies the flange 13 and is rigidly secured thereto by means of rivets 17 or similar fastening means. The angle formed in the member 14 at the flange 16 provides a continuous circular gutter 18 and spaced drainage apertures 19 in the member 14 adjacent the gutter provide for drainage thereof.

The portion of member 14 extending below the gutter 18 is bowl-shaped and terminates in a horizontally extending portion 20 having an upturned marginal lip 20a. The upper marginal area of the member 14 is formed to provide a horizontal flange 21 to which is secured by means of sheet metal screws 22 a horizontally flanged portion 23 of a concave-convex member 24. The members 14 and 24 form a bowl or hood which is of outwardly convex configuration and which is circular in cross section. The upper marginal area of the member 24 is rolled as indicated at 26, the rolled margin of the member 24 defining a discharge aperture.

Mounted at spaced points upon the inner surface of the hood are generally S-shaped resilient elements or spring blades indicated at 27. It will be understood that while the resilient elements 27 are here shown as S-shaped, other configurations might be used, the important functional requirement being that the elements be shaped so that dropping on the elements will move to a point overlying the gutter 18 before falling from the elements. It will be further understood that the elements 27 might be non-resilient in which case they would act as solid supports not as spring elements. The inner ends of the elements 27 are rigidly secured to the lower member 28 forming a portion of a drive motor enclosure which includes the upper portion 29.

The enclosure formed by the members 28 and 29 is circular in cross section and its configuration is such that its cross sectional diameters at its upper and lower ends are substantially smaller than its intermediate or central cross sectional diameter. The members 28 and 29 are joined by means of sheet metal screws 31, or similar fastening means, and the marginal area of the member 29 is flared outwardly to provide an annular drip ridge 32. The ridge serves to direct rain and condensation, present in the upper area of the assembly, in an outward direction away from the enclosure. The portion of the member 28 adjacent the ridge and indicated at 33 is formed so as to recede from the ridge to prevent the entry, by capillary action, of water into the joint between the members 28 and 29.

A fan motor 34 is mounted within the enclosure by means of bolts 36 and its shaft 37 extends vertically downward from the lower end of the enclosure. Attached to the shaft 37 for rotation thereby is a centrifugal type impeller 38a. The impeller is of conventional form and includes a hub 40 carrying a vane assembly in which the annular member 48b is a structural part. The hub 48b is provided with a downwardly bent margin 49b. Means are provided for circulating air from the exterior of the fan assembly into the motor enclosure to limit the temperature rise of the motor. This means includes a plurality of tubes 41 disposed at spaced intervals between the members 14 and 28. The tubes 41, which may be formed of rigid plastic or aluminum, may have a flanged upper end 42 which seats against a grommet 43 through which the tube extends. The lower end of the tubes 41 extends slidably through a grommet...
It will be understood that the tubes are slidable within their supporting grommets so that the function of the resilient elements 27 in providing a spring suspension mounting for the motor enclosure is not disturbed. As an alternate construction, the tube 41 might be rigidly secured to the members 14 and 28, but formed of a somewhat flexible elastomer so that they may flex upon movement of the enclosure with relation to the hood 12. It will be understood that, under certain circumstances the resilient elements 27 might be omitted and the tubes 41 themselves used as the supporting means for the motor enclosure. The tubes 41 permit entry of air from the exterior of the assembly into the motor enclosure. Exhaust apertures 46 formed in the members 28 permit air to leave the enclosure, exhaust from the apertures 46 being induced by the flow of air caused by rotation of the impeller.

In operation, with the impeller being driven by the motor 34, air will be drawn upwardly through the frame member and through the space between the hood and the motor enclosure, to be discharged from the top of the hood, as indicated by arrows in FIG. 1. Condensation within the assembly and snow or rain which may enter the assembly through its discharge aperture will impinge upon the enclosure and in running off the enclosure will be discharged over the ridge 32. The water or condensate will be caught in the gutter 18 and drained through the apertures 19 to the exterior of the assembly. Means may be provided, if desired, for carrying off the liquids draining through the apertures.

It will be noted that the maximum cross-sectional diameter of the motor enclosure is greater than the diameter of the aperture bounded by the flange 13. The motor enclosure thus serves to shelter the fan inlet from rain and snow entering the open end of the assembly. It will be understood that while the motor enclosure and cowl are referred to as being circular in cross-section, these elements might also have an outer configuration other than circular or the cowl might extend vertically upwardly from the flange 23, the important functional requirement being that the enclosure have an effective horizontal cross-sectional area which overlaps the area of the inlet aperture bounded by the lip 24 on the member 14 so as to shelter this aperture.

The resilient elements 27 are curved so that liquid dripping from the ridge 32, and intercepted by the resilient elements, will not flow inwardly of the gutter 18 but will move off of the resilient elements and fall to the underlying inclined surface of the member 14. As previously pointed out, the resilient elements might be provided a contour other than S-shaped. The lip 20 on the horizontal portion 20 of member 14 serves as a secondary moisture arresting member by holding any splash over from the gutter 18. It will be noted that the assembly places the motor out of the air stream and yet permits cooling air from outside the assembly to be circulated to the motor, the construction being thereby particularly adapted for use in moving corrosive fumes. The placement of the impeller at least partially within the frame 10 serves to reduce the overall height of the assembly.

Referring now to FIG. 2, there will be described a somewhat modified form of the fan assembly construction, which is adapted to incorporate an axial air movement type of impeller. In FIG. 2, parts which are substantial duplicates of parts found in FIG. 1 are given the same reference numerals as in FIG. 1.

In the structure of FIG. 2, the lower marginal area of member 14 terminates at the gutter flange 160. The annular flange 160 is secured by means of rivets 17 to an adjacent portion of the gutter, so that a flange or lip 130 formed at the inner marginal edge of the horizontal portion 12 of the frame 10. The lip 130 forms a venturi for the axial type fan assembly which includes the hub 35 carrying blades 39.

The operation of this form of the invention is the same as described with reference to FIG. 1. The tubes 41 provide for the flow of air into the motor enclosure and the motor enclosure is sized so as to shield the aperture defined by lip 130 from moisture entering the upper end of the assembly.

In FIG. 3, 3,045,579 a somewhat further modified form of the assembly shown in FIG. 1 is illustrated. The end view of FIG. 3 differs from that of FIG. 1 in the means for draining moisture from the interior of the cowl formed by members 14 and 24. In FIG. 3, parts which are substantially identical to those of FIG. 1 are given the same reference numerals as in FIG. 1.

Referring to FIG. 3 the number 14 is formed in two parts 14a and 14b. The portion 14a is provided with a flanged lower margin 14c which is joined to the flange 12a on the portion 12 of frame 10 and to the downwardly extending flange 14d at the upper margin of portion 14b by means of bolts 14e. The flanges 14a and 14d are held in spaced relation by means of spaced blocks 15 disposed at intervals between these elements. The arrangement thus provides a circular slot or gap between the parts 14a and 14b which is broken, at intervals, by the blocks 15.

In operation, the moisture which enters the cowl is directed into the space separating the portions 14a and 14b and drains therethrough to the exterior of the assembly. It will be evident that the form of the assembly shown in FIG. 3 makes unnecessary the drainage apertures 19 of FIGS. 1 and 2.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A vertical discharge exhauster assembly adapted to be mounted on a preconstructed curb provided on a building roof or the like, said assembly comprising a tubular base frame supported on said curb with its axis extending vertically therefrom, the upper end of said frame having an inturnd portion extending normal to the axis of said frame, the inner margin of said inturnd portion being formed to provide a generally upwardly extending circular flange, an outer curb open at its upper and lower ends disposed with its axis coincident with the axis of said frame and having an outwardly convex configuration, the lower portion of said curb having an upwardly inclined annular surface formed therein overlying said circular flange on said frame and rigidly secured thereto, the angle formed in said curb at the juncture of said inclined annular surface and the adjacent curb surface proper forming a continuous circular gutter, drainage apertures in said curb adjacent said gutter for draining thereof, spaced resilient elements mounted on the inner surface of said curb, a motor enclosure supported by said resilient elements and spaced from said curb in a way between said enclosure and said curb extending between the upper and lower ends thereof, said enclosure being circular in cross-section and having a configuration such that its cross-sectional diameters at its upper and lower ends are substantially smaller than its intermediate cross-sectional diameter, an annular ridge extending outwardly from the outer surface of said motor enclosure at its greatest diameter, the outer edge of said ridge being disposed outward of said curb, an impeller-driving motor mounted within said motor enclosure with its shaft extending vertically downward from the lower edge of said enclosure, and a gas moving impeller carried by said shaft and disposed at least partially within said frame, whereby rotation of said impeller by said motor moves gases through said frame and between said curb and motor enclosure to be discharged through the open, upper end of said curb, condensate and rain entering said upper end of the curb being directed by said ridge into said curb.
2. An exhauster assembly as claimed in claim 1 in which the said spaced resilient elements are provided with a contour which directs liquid impinging on the elements into the area outboard of said gutters.

3. An exhauster assembly as claimed in claim 1 having means for circulating air from the exterior of said cowl through said motor enclosure, said means including an air-conducting inlet tube extending between apertures in said hood and said enclosure, and air discharge apertures in said enclosure adjacent said impeller.

4. A vertical discharge exhauster assembly adapted to be mounted on a preconstructed curb provided on a building roof or the like, said assembly comprising a tubular base frame supported on said curb with its axis extending vertically therefrom, the upper end of said frame having an inturnd portion extending normal to the axis of said frame, an outer cowl disposed with its axis coincident with the axis of said frame and having a bowl-shaped lower portion, said lower portion of said cowl having an upwardly inclined annular surface formed immediately therein, said cowl being supported on said frame, the angle formed in said cowl at the junction of said inclined annular surface and the adjacent cowl surface proper forming a continuous circular gutter, drainage apertures in said cowl adjacent said gutter for draining thereof, spaced support elements mounted on the inner surface of said cowl, a motor enclosure supported by said support elements and spaced from said cowl to form a passageway between said enclosure and said cowl extending between the upper and lower ends thereof, said enclosure being circular in cross-section and having a configuration such that its cross-sectional diameter at its lower end is substantially smaller than its intermediate cross-sectional diameter, an annular ridge extending outwardly from the outer surface of said motor enclosure, the outer edge of said ridge being disposed outwardly of said cowl, an impeller-driving motor mounted within said motor enclosure and a shaft rotated by said motor extending vertically downward from the lower end of said enclosure, and a gas moving impeller carried by said shaft, whereby rotation of said impeller by said motor moves gases through said frame and between said cowl and motor enclosure to be discharged through the open, upper end of said cowl, condensate and rain entering said upper end of the cowl being directed by said ridge into said gutter.

5. An exhauster assembly as claimed in claim 4 having means for circulating air from the exterior of said cowl through said motor enclosure, said means including an air-conducting inlet tube extending between apertures in said cowl and said enclosure, and air discharge apertures in said enclosure adjacent said impeller.

6. A vertical discharge exhauster assembly adapted to be mounted on a horizontal support surface, said assembly comprising a tubular base frame having its central axis extending vertically, a bowl-shaped outer cowl open at its upper and lower ends, means for supporting said cowl on said base frame with its central axis coincident with the central axis of said base frame, means for spacing the lower portion of said cowl radially inwardly from the upper portion thereof to provide an elongated aperture at the junction of said upper and lower cowl portions, a motor enclosure circular in cross-section, means for supporting said motor enclosure within said cowl in spaced relation to the inner surface thereof to form a passageway between said motor enclosure and said cowl, whereby rotation of said impeller by said motor moves gases through said base frame and between said cowl and motor enclosure to be discharged through the open, upper end of said cowl, condensate and rain entering the upper end of said cowl being directed by said ridge into said enclosure.

7. An exhauster assembly as claimed in claim 6 having means for circulating air from the exterior of said cowl through said motor enclosure, said means including an air-conducting inlet tube extending between the open, upper end of said cowl and condensate and rain entering the upper end of said cowl being directed by said ridge into said elongated aperture.

8. A vertical discharge exhauster assembly adapted to be mounted on a horizontal support surface, said assembly comprising a tubular base frame having its central axis extending vertically, a bowl-shaped outer cowl open at its upper and lower ends, means for supporting said cowl on said base frame with its central axis coincident with the central axis of said base frame, means for spacing the lower portion of said cowl radially inwardly from the upper portion thereof to provide an elongated aperture at the junction of said upper and lower cowl portions, a motor enclosure circular in cross-section, means for supporting said motor enclosure within said cowl in spaced relation to the inner surface thereof to form a passageway between said motor enclosure and said cowl, and a gas moving impeller carried by the shaft and disposed at the lower end of said cowl, whereby rotation of said impeller by said motor moves gases through said base frame and between said cowl and motor enclosure to be discharged through the open, upper end of said cowl, condensate and rain entering the upper end of said cowl being directed by said ridge into said enclosure.

9. A vertical discharge exhauster assembly comprising a vertically-mounted tubular cowl having open upper and lower ends, the open upper and lower ends of said cowl providing air discharge and air intake apertures respectively, the diameter of said intake aperture being less than the intermediate cross-sectional diameter of said cowl, a power unit assembly circular in cross-section, means for supporting said power unit assembly within said cowl and spaced from the inner surface thereof to provide a passage between the power unit assembly and the cowl and extending between said air discharge and air intake apertures, an air-moving impeller disposed adjacent said air intake aperture, and driven by said power unit assembly, said power unit assembly having a cross-sectional diameter greater than the diameter of said cowl.

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