This invention relates to ventilators and is concerned with powered discharge ventilators employing an extraction fan, which may have an impeller of the axial flow type (or the propeller type), for use mounted on a boundary structure (e.g. a wall or roof) of a space to be ventilated by the ventilator to extract air from said space and discharge it to the outside of said boundary structure.

This invention is based upon prior practice with such ventilators using the propeller type of fan having been in common use in which the ventilator unit has been mounted on a so-called diaphragm plate in a body structure of the ventilator to be carried on the bounding structure, the impeller blades of the fan running with clearance in a circular aperture in the plate which aperture communicates on the upstream side with the space from which air is to be extracted, and on the downstream side with passage means defined by the body structure and leading outside said space for the discharge of the extracted air.

According to the present invention, in a ventilator of the kind envisaged in the opening paragraphs of this specification, the impeller is mounted to run closely within the downstream end of a circular sectioned ducting or shroud which extends upstream of the impeller to communicate with said space through a flared or bell mouthed entry portion, the ducting or shroud communicating on its downstream side with said passage means.

By the use of such a bell mouthed ducting leading air into the impeller as opposed to a simple diaphragm plate, the entry conditions to the ventilator are improved insofar as air is drawn more uniformly into the whole of the area swept by the blades of the impeller. The efficiency of the ventilator is accordingly improved compared with the diaphragm plate arrangement and this may be employed in a reduction of the fan speed so as to lessen the noise generated by the ventilator whilst maintaining the same rate of extraction.

According to a feature of the invention, said passage means is arranged to communicate, upstream, with said space around the outside of the impeller ducting or shroud, the passage means receiving at least the downstream end of the impeller ducting.

This feature of the present invention finds particular application to constructions of powered ventilator in which the body structure of the ventilator and the passage means receiving the air extracted by a fan are rectangular in cross-section. This rectangular sectioned passage means, according to the last described feature of the invention, receives at least the downstream end of the circular-sectioned impeller ducting, the opening or openings being defined between the circular-sectioned ducting and the rectangular sectioned passage means being left open, at least in part, for the entrainment therethrough of air from said space into the air stream discharging from the fan. In this way the effectiveness or performance of the ventilator is still further improved. Instead of the passage means being of rectangular section, circular-sectioned passage means could be used, the circular-sectioned passage means being of larger diameter than the downstream end of the impeller ducting so as to leave an annular gap for the entrainment of air.

The air entering the passage means from the impeller ducting is caused to expand thereby creating a relatively lower, downstream pressure zone in the passage means so that air is drawn through the passage means from said space and entrained in the main extracted air stream discharging from the fan.

A specific embodiment of the present invention will now be described, merely by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a cross-sectional side elevation of a powered discharge roof ventilator according to the present invention,

FIG. 2 is a plan view of the ventilator with parts removed to show certain details of construction,

FIG. 3 is a plan view of the impeller shroud or ducting provided according to the present invention, and

FIG. 4 is a cross-section on line 4-4 in FIG. 3.

The ventilator comprises a body structure made up of a rectangular base plate 10 which is intended to be fastened to the roof, the plate 10 having a rectangular aperture from which an upwardly extending, uniformly rectangular sectioned trunking providing a passage means 12 is provided leading to an outlet through an assemblage of non-return shutters 13 and under a cowl 14 carried by the body structure and leading the upper end of the passage means which is closed by the non-return shutters when the ventilator is not operating.

In each corner of the passage means 12 a triangular bracket or support plate 15 is provided bolted or otherwise attached at 16 to the wall of the passage means. Carried on these support plates 15 is a fan motor unit 18 of which the electric motor is carried on depending arms 17 attached at their upper ends to the underside of the support plates 15. The motor lies in the rectangular aperture 11 in the plate 10 and the impeller 20, which in the present example is of the axial flow type as normally used in an axial flow fan is positioned downstream of the motor within the passage means 12 at about the level of the support plates 15. Also supported from the plates 15, by means of brackets 22, is a circular-sectioned ducting or impeller shroud 25 the downstream end of which lies within the passage means 12. The impeller 20 is encircled closely by and lies in the downstream end of this shroud. The shroud 25 extends a short distance upstream of the fan through the aperture in the base plate 10. The shroud or ducting 25 has a flared or bell mouthed entry portion 26 (see also FIGS. 3 and 4) at its upstream end. The flared entry portion 26 allows air to flow smoothly in and along the shroud or ducting wall so that the lips of the impeller blades are properly supplied with air and the shroud runs "full" of air at its downstream end. The space 30 between the rectangular sectioned passage means 12 and the circular-sectioned ducting 25 is blocked only by the support plates 15 which are confined to the corners of the rectangular sectioned passage means previously explained. A considerable opening is therefore defined between the ducting and the passage means through which extra air may be entrained from the space being ventilated.

The portion 26 lies in part within the passage means 12 and the entry portion 26 is cut away as at 32 at the ends of two diameters at right angles and in planes respectively parallel to the four walls of the passage means 12 to enable the portion 26 to be received within the passage means. This arrangement permits the use of an impeller of a diameter approaching the distance between opposite pairs of walls of the passage means without forfeiting the advantages of the bell mouthed entry portion whilst at the same time not having to locate the bell mouthed entry portion entirely upstream of the plate 10.

If the ventilator has a considerable depth of roof structure to penetrate (such as might be involved in a ceiling)
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in order to communicate with the interior space to be ventilated, a further rectangular sectioned trunking 35 is provided (as shown chain dotted in FIG. 1) extending downwardly from the aperture in the plate 10. The bell mouthed entry portion 26 of the ducting 25 is received within the upper end of the trunking 35. With this arrangement air may still be entrained from the trunking around the outside of the ducting 25.

The axial flow fan impeller 20 has blades which are of aerofoil cross-section.

We claim:

1. A powered discharge ventilator for use mounted on a bounding structure of a space to be ventilated by the ventilator to extract air from said space and discharge it to the outside of said bounding structure, the ventilator comprising a body structure adapted to be mounted on the bounding structure, support means carried by said body structure, an extraction fan including an impeller motor unit mounted on said support means and housed in said body structure, said body structure defining a passage means leading outside said space for the discharge of the extracted air, a circular sectioned shroud mounted on said support means and housed in said body structure, said shroud having a downstream end and an upstream end, the downstream end of the shroud closely surrounding the tips of the blades of the impeller of said impeller motor unit, the shroud extending upstream of the impeller to its upstream end and opening through its downstream end into said passage means, the upstream end of said shroud opening into the space to be ventilated by the ventilator, the shroud defining a flared entry portion for extracted air at its upstream end.

2. A ventilator as claimed in claim 1, in which said passage means is arranged to communicate, upstream, with the space to be ventilated by the ventilator around the outside of the shroud, the passage means receiving at least the downstream end of the shroud.

3. A powered discharge ventilator for use mounted on a bounding structure of a space to be ventilated by the ventilator to extract air from said space and discharge it to the outside of said bounding structure, the ventilator comprising a rectangular sectioned body structure adapted to be mounted on the bounding structure, an extraction fan including an impeller motor unit mounted on said body structure, said body structure defining a passage means leading outside said space for the discharge of the extracted air, a circular sectioned shroud mounted on said body structure, said shroud having a downstream end and an upstream end, the downstream end of the shroud closely surrounding the tips of the blades of the impeller of said impeller motor unit, the shroud extending upstream of the impeller to its upstream end and opening through its downstream end into said passage means, the upstream end of said shroud defining a flared entry portion for extracted air at its upstream end.

4. A ventilator as claimed in claim 3, in which the flared entry portion of the shroud extends at least in part within said rectangular cross-sectioned passage means which is of uniform rectangular cross-section defined by four planar wall sections and the flared entry portion of the shroud is cut away at right angles and in planes respectively parallel to the four wall sections of the passage means enabling the flared entry portion to be received within the passage means.

5. A ventilator as claimed in claim 3 the preceding claims having a fan impeller of the axial flow type and runs in a cylindrical portion of the shroud, said flared entry portion of the shroud opening directly into said cylindrical portion.

6. A powered discharge ventilator for use mounted on a bounding structure of a space to be ventilated by the ventilator to extract air from said space and discharge it to the outside of said bounding structure, the ventilator comprising a rectangular sectioned body structure adapted to be mounted on the bounding structure, support means carried by said body structure, an extraction fan including an axial flow impeller motor unit mounted on said support means and housed in said body structure, said body structure comprising four planar wall sections defining passage means of uniform rectangular cross-section leading outside said space for the discharge of the extracted air, a circular sectioned shroud mounted on said support means and housed in said body structure, said shroud having a downstream end and an upstream end, the downstream end of the shroud closely surrounding the tips of the blades of the impeller of the impeller motor unit, the shroud extending upstream of the impeller to its upstream end and opening through its downstream end into said passage means, the upstream end of said shroud defining a flared entry portion for extracted air at its upstream end, the flared entry portion of the shroud opening directly into said cylindrical portion of the shroud and extending at least in part within said rectangular cross-sectioned passage means, the flared entry portion of the shroud being cut away at opposite ends of two diameters at right angles in planes respectively parallel to the four wall sections of said passage means enabling the flared entry portion to be received within the passage means.

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