UNIT VENTILATOR WITH INCLINED RAMP FOR SUPPORTING AIR FILTER

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ABSTRACT OF THE DISCLOSURE

A unit ventilator having a ramp-type support means in its lower portion for removably supporting a fresh air filter and return air filter. The ramp is inclined from front to rear so that two filters can be slid into the air conditioning unit in train-like fashion, after which the front-most filter can be hinged upwardly about its connection with the rear filter whereby the front filter has its media presented to the air stream coming into the conditioner from the room. The rear portion of the ramp is opened or cut out so that the media in the rear filter is presented to the fresh air stream. Installation and removal of both filters is accomplished from in front of the air conditioning unit without removal of any panels.

Background of the invention

This invention relates to a unit ventilator usable for example in a school room to deliver conditioned air (hot or cold) to the room.

Such a ventilator usually includes an upright ventilator casing positioned against a room wall and containing one or more heat exchange coils adapted to be connected with sources of hot or cold water. Positioned within the casing is a blower mechanism comprising one or more centrifugal fans arranged to blow or draw air through the heat exchange coils. In some cases the discharge air temperature is varied by means of a bypass damper arranged to divert all or part of the air through an additional coil. Normally the ventilator casing is provided with a return air inlet in the lower part of its front wall, and a fresh air inlet in the lower part of its rear wall. Filters are provided within the ventilator casing adjacent the respective inlets for filtering the individual air streams. Conventionally a roll type proportioning damper is located above the filters to provide variable amounts of fresh and return air.

The drawings

In the drawings the single figure is a sectional view taken through the lower portion of a unit ventilator having features of the invention incorporated therein.

General arrangement

The illustrated unit ventilator comprises an upright casing having a fixed rear wall 10, removable front wall 12 and fixed bottom wall 14. Wall 14 is provided with an upwardly turned flange 16 which cooperates with the downwardly angled flange 18 on wall 10 to provide a fresh air inlet 20. A return air inlet 26 is formed by the forward edge 22 of wall 14 and the fixed horizontal frame 24 located between the end of wall 12. For present purposes frame 24 can be considered part of the front wall.

Positioned within the unit ventilator casing are two or more conventional centrifugal fan housings 28 containing fan wheels 30 mounted on a single drive shaft 32. Rotation of wheel 30 in the arrow 34 direction causes air to be drawn into the eye 36 of the fan and discharged through the conventional rectangular opening (not shown) in the scroll type fan housing 28. The discharged air is blown through a heat exchange coil (not shown) in the upper portion of the ventilator casing and thence outwardly through a grill in the casing top wall into the room being conditioned.

The unit ventilator casing may be constructed in various dimensions, as for example a front to rear dimension of about 15½ inches, a vertical height of about 30 inches, and a length (normal to the paper) varying from about 60 inches to 102 inches. Usually the casing is provided with two upright partitions 38 (only one shown) which divide the casing into a relatively wide central air passageway and two end compartments. The end compartments are relatively narrow, on the order of 12 inches, and are used to house the various controls, valves, and drive motor for fans 30.

Conventionally the proportion of fresh air to return air is regulated by a roll damper 49 of arcuate sheet metal construction extending across the entire air passageway between partitions 38. Support for the roll damper is provided by a pair of sector arms 42 swingingly suspended on stub shafts 44 which are mounted in bearings in partitions 38. One of the stub shafts may be extended beyond its bearing for connection with a thermostatically controlled damper operator (not shown electric). It will be seen that in the illustrated position of damper 40 all of the air supplied to fan 30 is return air from inlet 26. This air is drawn by the blower through the flat rectangular filter 46 and into the space between the damper's front edge 48 and fixed baffle 50.

As the roll damper moves counterclockwise its rear edge 52 moves away from the fixed baffle 54 to permit the blower to draw air from the fresh air inlet 20 through flat rectangular filter 56 into the space between wall 54 and the damper's rear edge 52.

A longitudinal partition 58, extending the full width of the air passageway, prevents the two air streams (fresh air and return air) from intermingling prior to their engagement with the roll damper surface, i.e. the partition prevents the air streams from bypassing the roll damper. The general arrangement is such as to enable the ventilator to be supplied with one hundred percent return air, one hundred percent fresh air, or various fresh air and return air percentages, depending on the position of the damper as controlled by the damper operator.

The invention

The present invention is concerned principally with a ramp type support mechanism for supporting the two conventional filters 46 and 56. The support mechanism comprises two parallel facing channels 61 (only one shown) carried by respective ones of the two partitions 38. Each channel is formed with a lower flange 60, an upper flange 62, and a web 64, so that filter 56 can be slid upwardly along wall 70 until its lateral edges move into the channels 61. The filters are normally quite long in transverse or lateral directions, as for example, 66 inches. Around the filter, at the center of the filter, is located a series of long, narrow, parallel support channels 74 which are alternately integrally formed and removably inserted into the supporting channel 61. The support element may be set to any desired position by the user; and, as the channel 61 is changed, a filter element 68 is moved upwardly and retains the channel 61 in the upper return air passage.

Aforementioned wall 70 takes the form of a flat imperforate plate extending across the entire width of the air passageway. This plate has the same inclination as strip portions 66 and the lower flange 60 of each channel 61. Accordingly filter 56 can be installed in the ventilator by sliding same upwardly along plate 70 and into the channels 61. Plate 70 cooperates with the two chan-
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3. Return air filter 46 may be hingedly connected with filter 56 by means of two or more C-shaped wire clips 72 extending outwardly from the filter frames. Alternately the hinged connection can be formed by tape adhered to adjacent edge portions of the two filters. The rear edge of filter 46 may be supported on the surface of ramp wall 70 as shown, while the forward edge of the filter may be supported on two or more clips 74 spaced along the length of frame 24.

Each clip 74 is formed as a relatively flat metal strip having a turned or angled end 76 held against the depending wall 25 of frame member 24 by a semi-ribbed plate 78. The plate is provided with a slot which permits a narrow neck portion of the clip 74 to extend through the plate, thus trapping portion 76 against frame wall 25. A screw-nut means 81 may be provided to draw plate 78 toward wall 25, thus tending to hold clip 74 in its illustrated position supporting the front portion of filter 46 against the undersides of frame 24. A manual counterclockwise pull on the front end of each clip 74 will move the same to the dotted line position 74a against the resilient resistance offered by the respective plate 78. In the dotted line position each clip is retracted free and clear of the filter 46 so that the filter may be lowered and drawn forwardly out of the ventilator casing. Since filter 46 is hingedly connected with filter 56 both filters may be drawn out of the casing together.

Installation of the two filters may be readily accomplished by moving the two filters upwardly along the inclined ramp defined by surfaces 70, 66, and 60 and then hinging filter 46 upwardly to its illustrated position engaged with frame member 24. The clips 74 may then be slipped to their full line operating positions for retaining filter 46 in place. For best operation the device should be constructed so that the angle of inclination of the ramp is about 27 degrees.

It will be noted that ramp wall 70 is imperforate, thus preventing the fresh air from reaching filter 46 or the return air from reaching filter 56, i.e. ramp wall 70 prevents intermingling of the two air streams. The separate air streams are further prevented from intermingling by an elongated partition 58 which has its lower end configured to mount an elongated felt seal 90, said seal being out of the way of the filter 56 as the filter is being slid up the ramp, but automatically engaging the filter 46 as said filter is tilted up to its illustrated position. The upper portion of partition 58 mounts a second felt seal 82 which brushes against the surface of roller damper 49 to seal against air passage between partition 58 and the damper surface.

Partition 58 is of generally T-shaped cross section, comprising two horizontal legs 84 and 86 which act as stops for limiting movement of the roller damper in its two extreme positions. Rubber bumpers 88 and 90 may be suitably carried by the damper to engage the stops 84 and 86 with a noiseless action.

It will be appreciated that the description has necessarily centered on a concrete embodiment of the invention. However some variations in structure and arrangement can be resorted to without departing from the spirit of the invention as encompassed by the appended claims:

1. A unit ventilator comprising an upright casing having front and rear walls terminating above the casing lower limits to define return and fresh air inlets, respectively; inclined stationary ramp means secured within said casing and extending generally from the lower edge of the return air inlet to the upper edge of the fresh air inlet; a first rectangular filter supported flatwise on the rear portion of the ramp means to intercept the incoming fresh air stream; and a second filter supported conjointly by the ramp means and a lower edge portion of the casing front wall to intercept the incoming return air stream; the upper surface of said ramp means being essentially flat and free of upward projections, whereby both filters can be slid into the ventilator by rearward sliding movement thereof along the ramp means surface; the rear portion of the ramp means having air passage cut-outs therein for admitting fresh air to the first filter.
2. The ventilator of claim 1 wherein the ramp means has an inclination angle of about 27 degrees.
3. The ventilator of claim 1 wherein the filters are hingedly connected together at their adjacent edges for simultaneous installation in the ventilator by a rearward sliding movement of both filters on the ramp means, followed by an upward tilting movement of the return air filter about its hinged connection with the fresh air filter.
4. The ventilator of claim 1 wherein the front portion of the ramp comprises a flat imperforate plate extending to the front edge of the fresh air filter to prevent intermingling of the two air streams.
5. The ventilator of claim 1 and further comprising a roll damper arranged above the two air filters to apportion the air flow through the ventilator; a transverse partition located immediately above the joint between the two filters; a first seal carried by the partition to engage the roller damper; and a second seal carried by the partition to engage one of the filters.
6. The ventilator of claim 5 wherein the partition has a generally T-shaped cross section, the two horizontal legs of the T forming stops for limiting movement of the roll damper in its two extreme positions.
7. The ventilator of claim 5 wherein the partition has two oppositely extending legs forming stops for limiting movement of the roll damper in its two extreme positions.
8. The ventilator of claim 1 wherein the rear portion of the ramp means comprises two channels positioned to receive the end edge portions of the fresh air filter.
9. The ventilator of claim 1 wherein the casing front wall comprises a horizontal frame member having at least one retractable clip carried thereon; said frame member being located to sealingly engage against the upper face area of the return air filter, and said clip being movable from a retracted position free of the filter to an operating position forcibly engaged with the under face area of the filter.
10. The ventilator of claim 9 wherein the horizontal frame member includes a depending front flange; said retractable clip comprising a leaf element mounted on the frame member front flange for swinging movement from a retracted position extending forwardly and downwardly of its swing axis to an operating position extending rearwardly of its swing axis.

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