A back draft air damper is incorporated within a ventilating louver with pivotally mounted damper blades movable between a closed position in which the damper blades restrict air flow in a reverse direction and an open position in which the damper blades permit a substantial flow of air in a forward direction between fixed ventilating louver blades. Each damper blade has a lower seal for engaging a next lower louver blade and surfaces along each vertical side thereof to seal against a vertical side frame member. The damper blades are hinged along their upper edges to a louver blade thereabove to provide a sealed relationship at the top of the damper blades.
COMBINED VENTILATING LOUVER AND BACK DRAFT DAMPER

This invention relates to ventilating louvers, particularly to ventilating louvers incorporating air dampers and having fixed louver blades and movable damper blades, and more particularly to back draft dampers in which the damper blades are movable between an open position in which air flows through the ventilating louver and a closed position in which air is prevented from flowing through the louver.

Back draft dampers are designed to allow air to flow in a first direction as, for example, from the interior of a building, and to preclude air flow in the opposite direction as, for example, into the interior of the building. It is particularly desirable that the damper preclude a substantial air flow in the wrong direction at high velocities which would transport rain, snow or other foreign matter into the building. In some installations, the movable blades are designed to shift to the closed position when the air pressure differential in the reverse direction reaches a predetermined level, as during a wind storm. In other installations, the damper blades are shifted by a mechanical actuator between open and closed positions.

Of particular significance to a commercially acceptable ventilating louver incorporating a back draft damper is that it can be formed in a compact size of relatively few and simple components which are readily assembled to provide a low cast assembly. In addition to size and cost, it is important to provide a good seal to air flow in reverse direction, particularly at high velocities which can transport rain or snow.

Accordingly, an object of the invention is to provide an improved ventilating louver incorporating a back draft damper.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of a combined ventilating louver and air damper embodying the novel features of the invention;

FIG. 2 is an enlarged, cross-sectional view of an upper corner of the assembly of FIG. 1;

FIG. 3 is a fragmentary, cross-sectional view in perspective illustrative of the connection of fixed and movable louver blades to a rigid frame for the damper shown in FIG. 1; and

FIG. 4 is an enlarged sectional view of a portion of another embodiment of the invention shown in FIG. 2 in which movable louver blades are positioned at open and closed positions by a mechanical actuator.

As shown in the drawings for purposes of illustration, the invention is embodied in a ventilator unit 10 combining a ventilating louver and a back draft damper of the type used for building ventilation, usually for exhausting smoke or air from the building interior. The ventilating louver is usually secured in an upright position, such as illustrated in FIG. 1, on the exterior of the building with its rigid frame 13 secured in fluid communication with an air duct (not shown) which leads to the interior of a building. Air is usually exhausted forwardly from the duct and into the louver through rear side 14 thereof to flow between fixed louver blades 15 within the frame 13 and along air passageways 17 to the outside atmosphere at a front side 18 of the louver. A ventilating louver of this general kind is shown in U.S. Pat. No. 3,422,744.

In accordance with the present invention, an air damper is incorporated with the ventilating louver to provide a combined unit 10 which may be easily assembled, relatively trouble free in operation and produced in large quantities at a low cost. Also, as will be explained in greater detail hereinafter, the back draft damper of the present invention comprises damper blades 21 that restrict the reverse air flow not only at the area of the blades themselves and along lower seals 23 between the lower edges of the damper blades and a portion of the next lower louver blades 15 through a portion of the next lower louver blades but also along vertical side seal areas 24 at which the damper blades have sealing relationships with vertically extending side flanges 25, as best seen in FIG. 3, along the rear edges of the side members 27 of the rigid frame 13. In operation, the usual exhaust air pressure is sufficient to swing the damper blades 21 upwardly from a closed position, as illustrated in the solid lines of FIG. 2 to an open position, as illustrated in phantom lines of FIG. 2, and to maintain the damper blades in the open position to permit a substantial flow of air through the air passageways 17 and from the ventilating louver. On the other hand, a gust of high velocity air in the opposite direction, as during a wind storm or rain storm, will exert sufficient pressure on the damper blades in the opposite direction to swing the damper blades 21 to a closed sealed position to block the flow of air and hence rain, snow, etc. into the duct and into the interior of the building.

Referring now in greater detail to the individual elements of the ventilating louver, the rigid frame 13 is preferably rectangular in shape and formed with a pair of opposite parallel vertical side members 27 which are joined at the upper ends thereof to a horizontally disposed top member 29 and at the bottom edges thereof to a horizontally disposed bottom member 31. These frame members thus encompass a rectangular framework with a rectangular opening into which are fitted the fixed louver blades 15 and the damper blades 21. The rigid frame also defines a frame plane, which is usually vertical, with the fixed louver blades 15 mounted in the frame inclined downwardly and forwardly to prevent rain or snow from being carried therethrough. The frame has a narrow front to rear profile as the damper blades are pivoted within the frame and no portions of these blades can swing outwardly of the frame.

For the purpose of interlocking the fixed louver blades 15 to the side members 27 without the use of fasteners and in a quick and easy manner, it is preferred that each of the side members be provided with two vertically extending rails 33 and 34 which project inwardly and which are integral with a wall 35 of the side member 27. Each of the rails 33 and 34 is aligned with a corresponding rail 33 or 34 of the opposite side member 27 in a vertical plane, and these respective vertical planes are disposed parallel to one another. The preferred interlocking arrangement between the fixed louver blades and the side members is accomplished by having a number of slots 37 formed in the rails 33 and 34 to receive therein the ends of the fixed blades. More specifically, the slots 37 in one rail 33 are
spaced apart in the vertical direction and are spaced vertically from similar slots 37 in the adjacent rail 34. The vertical spacing of the slots in the respective rails 33 and 34 determines the inclination of the fixed blades 15 which are held in the slots in the respective rails 33 and 34.

To restrict air borne snow or rain from traveling around the vertical side edges of the damper blades 21 at the area of the side rails 33 and 34, the damper blades 21, when in the closed position, abut or are very close to abutting the vertical, side flanges 25 at the rear of the ventilating louver. More specifically, the side seal flanges 25 project inwardly, i.e. toward each other, beyond the inward projection of the rails 33 and 34. With this arrangement, ends 39 of the damper blades 21 may swing freely past the rails 33 and 34 when swinging between the open or closed positions and still engage the side flanges 25 to effect vertical side seals to the reverse direction flow of air.

Each frame side member 27 is also formed with a forward, vertically extending flange 45, as best seen in FIG. 3, against which is abutted a down-turned forward end 46 of each fixed blade 15 to help prevent a fixed blade from sliding downwardly and forwardly and to provide additional rigidity to the frame. Each of the fixed louver blades is also held against sliding relative to the rails 33 and 34 by projections 47 and 49 which extend on either side of the rails at the location of the slots 37. The projections 47 and 49 also provide additional rigidity to the louver. The projections 47 and 49 define therebetween a slot or opening which has walls converging to an upper wall which will rest on the rails 33 and 34 in the slots 37.

The fixed louver blades 15 are inclined to the vertical and horizontal to shelter the interior of the duct. Unless wind driven at high velocity, rain and snow falling on the louver blades 15 fall downwardly and outwardly along the upper surfaces 55 of the fixed blades 15 to be discharged externally of the building. The blades 15 obscure the interior of the ducts to the view, and also prevent a direct horizontal access for air, water or dust. Water is particularly damaging if allowed to enter into a duct, and for this reason it is preferred that fixed louver blades have a first rain barrier 53 which projects generally in a horizontal plane from a central part of the upper side 55 of each fixed blade. Water droplets being driven by the wind upwardly along the upper side 55 of a fixed blade 15 will be stopped and gathered at the lower side of the rain barrier 53 to accumulate in sufficient quantities for flowing down the blade and from the louver. Also, the top portion 41 of each fixed blade has a forwardly and horizontally extending flange 57 which acts as a second catch or rain barrier to prevent the driving of water up along the top portion of a fixed blade and into the interior of the building. The lower seal 23 for the damper blades 21 preferably engages and edge or end 59 of the flange 57 of the fixed blades 15.

A preferred hinge means is provided by an integral, semi-circular, cross-sectioned hinge portion 61 of the fixed louver blade 15 and a mating circular cross-sectioned hinge end 63 on the top edge of the damper blade 21. The preferred hinge portion 61 is formed during extrusion of the blade and extends downwardly and across the underside of the fixed louver blade and has an interior curved surface generally complementary to a curve of the upper hinge end 63 on its associated damper blade. The parts fit together loosely, the relative sizes of the hinged portions being such that the damper blades 21 will freely swing and will not usually become bound by corrosion, dirt or other foreign matter. The hinge connection also serves as an air seal against flow of air or moisture along the upper edges of the damper blades 21 into the interior of the building.

Each damper blade 21 is mounted for free swinging movement and has a lower seal 23 for sealing engagement with the horizontally disposed flange 57 of the fixed blade. More specifically, each damper blade preferably carries a seal pad 69 of elastomeric, or resilient material such as rubber or plastic for abutting the flange end 59 and providing therewith a tight seal which is substantially moisture-proof and air-tight while the resilient seal pad 69 is urged under the force of reversely directed air flow tightly against the edge 59 of a fixed louver blade. The seal pad 69 is secured at the base 71 of a channel 73 formed on the lower end of each damper blade. The upper side of the channel 73 is defined by a forwardly extending web 75 which is parallel to and slightly above the fixed blade flange 57 and is integrally attached to a vertically extending flat blade portion 77 which at its lateral ends 39 may abut with the side seal flanges 25. The blade portion 77 is the portion that covers the opening between successive blades 15. In the closed position, this blade extends downwardly rearwardly of the hinge to seal the opening. A blade section 79 extends downwardly and rearwardly from the hinge end 63 to connect the blade portion 77 to the hinge end 63, so that the latter may support the portion 77 for pivotal movement between the open and closed positions. The preferred manner of assembly is to insert one end of each louver blade into slots 37 in rails 33 and 34 of one frame side member with the louver blades held by a jig in proper alignment relative to each other and the top and bottom frame members 29 and 31. Then the opposite side member is positioned to receive the blade ends and is secured to the top and bottom members to provide the completed unit.

As seen in FIG. 2, all of the closure elements of the damper blades 21 are rearsward of the rails 34 while the blades are in their closed position. Because the damper blades 21 are loosely hinged by a hinge formed by sliding the hinge end 63 into the hinge portion 61 of a louver blade 15, the damper blades 21 would be free to slide behind the rails 34 and become locked in the closed position but for a stop 80 extending outwardly from each damper blade 21. The stop 80 extends outwardly between opposing rails 34 and keeps the blade 21 centered between the rails, permitting free swinging of the damper blade past the rails but preventing longitudinal sliding of the hinge end 63 relative to the stationary hinge the damper 61 of its associated fixed blade 15.

The damper blades 21 may be sufficiently light in weight that air leaving the building under slight pressure pushes the damper blades to their open position. Ordinarily, the pressure and velocity of the air is sufficient to push the damper blades to the position shown by phantom lines in FIG. 2, where the damper blades 21 are stopped by the respective stops 80 striking the underside of the fixed blade 15 thereabove.
Upon the occurrence of a back draft, as when the wind blows more strongly against the outside of the louver than the exhaust air within the building is blowing against the inside of the louver, the damper blade 21 fall toward their closed positions under the force of gravity and are pushed into their closed positions by the greater external pressure. In the closed position, the unit 10 is entirely sealed against the entry of rain, snow, etc.

For some installations it is preferred that the damper blades 21 be positively controlled and shifted at will. Rather than having the damper closed by gravity and air pressure, the dampers are closed by an operator when required by conditions, such as rain. As shown in FIG. 4, an actuating means 81 may be used to move the damper blades 21 between open and closed positions rather than relying on air pressure differentials. More specifically, the actuating means 81 includes a series of cranks 83, each crank being connected at its lower end 85 to the rear of a respective damper blade 21 and pivotally mounted at its opposite end on a pivot pin 87 fixed to a vertically movable actuating rod 89. The actuating cranks are each formed with a pair of spaced arms 91 between which is inserted the actuating rod with the pivot pin 87 projecting through openings 93 in the respective arms 91. By raising the actuating rod 89 and the pivot pins, the damper blades 21 are swung in a counterclockwise direction to the closed position, as shown in solid lines in FIG. 4, in which the seal pads 69 on the damper blades 21 engage the fixed blade flange ends 89 and in which the lateral ends 39 of the damper blades are in sealing engagement with the side flanges 25 of the rigid frame 13. Conversely, by pulling down on the actuating rod 89, the crank arms 91 pivot clockwise on pivot pins 87 and force the damper blades 21 to pivot about their respective axes through the hinge portions 61 of the fixed blades 15, until the stops 80 of damper blades abut the fixed blades thereabove.

From the foregoing, it is seen that the present invention provides an inexpensive combined back draft damper and ventilating louver unit which is formed of relatively few and simple parts and which may be readily assembled without the use of fasteners or other connecting devices. The sealing engagement along the vertical sides of the damper blades and the vertical side flanges of the rigid frame and between resilient pad seals and fixed blades results in a substantial blocking of a reversely directed flow of high velocity air which would otherwise carry moisture or other foreign material into the interior of a duct leading into the building.

While a preferred embodiment has been shown and described, it will be understood that there is no intent to limit the invention by such disclosure, but, rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention. For example, although a single ventilating louver is illustrated, it is contemplated that four such louveres be mounted as the four sides of a penthouse atop a building, so that the louver facing the wind may be closed while leaving the others open for ventilation. Also, the ventilating louver and back draft damper need not necessarily be disposed in a truly vertical plane or position to function or to come within the ambit of the invention.

What is claimed is:

1. A combined ventilating louver and back draft damper unit comprising a rigid frame having parallel, vertical side members and defining an opening through which air may flow, a plurality of fixed louver blades spanning said opening and joined to said side members, said fixed lower blades being spaced vertically from each other to define air passageways therebetween and extending downwardly and forwardly from upper, rearward portions thereof, a plurality of damper blades pivotally mounted for swinging between an opening position in which air may flow through said passageways in a forward direction and a closed position in which said blades substantially close said passageways to air flow in a reverse direction, a lower seal on said damper blades for swinging into sealing engagement with a fixed louver blade therebeneath when said damper blades are in said closed position, said vertical side members of said frame having vertically extending and inwardly projecting side seal flanges adjacent the rear of said ventilating louver, hinge means pivotally mounting said damper blades on the undersides of said fixed blades at positions forward of said side seal flanges, said hinge means comprising interlocking hinge portions on the respective damper and louver blades assembled by axial sliding of one relative to the other, said damper blades having portions extending in a rearward direction from said interlocking hinge portions and then extending downwardly to provide surfaces disposed relative to said side seal flanges for sealing engagement therewith when said damper blades are in said closed position.

2. A unit in accordance with claim 1 in which vertically extending rails are provided on said side members and have portions interfitted with said fixed louver blades and in which stop means on said damper blades center the same between said rails to limit longitudinal sliding movement of said movable blades relative to said fixed louver ventilator blades.

3. A unit in accordance with claim 1 in which rain barriers having horizontally extending flanges are formed on the upper portion of said fixed blades and are disposed for sealing engagement with said lower seals.

4. A unit in accordance with claim 1 in which said lower seal includes a resilient seal pad carried on the lower end of said damper blades to abut said fixed blade flanges.

5. A combined ventilating louver and back draft damper unit comprising a rigid frame having parallel, vertical side members and defining an opening through which air may flow, a plurality of fixed louver blades spanning said opening and joined to said side member, vertically extending rails projecting inwardly from said vertically extending side members and interfitted with said fixed louver blades and spacing the same vertically from each other to define air passageways therebetween, said fixed louver blades extending downwardly and forwardly from upper, rearward portions thereof, a plurality of damper blades, hinge means on the undersides of said fixed blades for pivotally mounting said damper blades for swinging between an open position in which air may flow through said passageways in a forward direction and a closed position in which said blades substantially close said passageways to air flow in a reverse direction, said
hinge means comprising interlocking hinge portions on the respective damper and louver blades, a lower seal on said damper blades for sealing engagement with a fixed louver blade therebeneath when said damper blades are in said closed position, said vertical side members of said frame having inwardly projecting side seal flanges adjacent the rear of said ventilating louver and located rearwardly of said hinge means, said damper blades having portions extending in a rearward direction from said interlocking hinge portions and then extending downwardly and having surfaces disposed relative to said side seal flanges for sealing engagement therewith when said damper blades are in said closed position, said damper blades having stop means thereon projecting forwardly therefrom between and adjacent an opposing pair of said inwardly projecting rails to continuously limit axial sliding of said hinge portions relative to one another.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,682,084 Dated August 8, 1972

Inventor(s) Sherwin S. Tarnoff

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 31, change "cast" to --cost--;
Column 2, lines 14 and 15, delete "through a portion of the next lower louver blades";
Column 3, line 59, change "and" to --an--;
Column 4, line 58, change "the damper" to --portion--;
Column 5, line 4, change "blade" to --blades--;
Column 5, line 7, after "external" insert --air--;
Column 5, line 21, after "opposite" insert --upper--;
Claim 1, line 6, change "lower" to --louver--;
Claim 1, line 10, change "opening" to --open--;
Claim 4, line 4, change "blade flanges" to --louver blades--.

Signed and sealed this 23rd day of January 1973.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents