



Description

Drainable Blade Louver

Background of the Invention

It is often desirable to minimize the intrusion of water through a louver. In such cases, the use of a drainable-blade louver, many forms of which are available commercially, is called for. Common to almost all drainable blade louvers is the provision of troughs on the front edges of the upper surfaces of the blades for capturing water that would otherwise run down the blades and fall from the front edges onto the blades below. If water were allowed to fall from blade to blade, some of the water dripping from the front edges of the blades would become entrained in the air flow and carry through the louver. The troughs capture the water and drain it to vertical drainage channels in the jambs of the blade frames. Some drainable louvers have offsets in the blades to stop water from being blown up the blade surfaces and off the upper, rear edges. Other drainable blade louvers, such as the one described and shown in U. S. Patent No. 4,103,468 (Olsen, August 1, 1978), have additional troughs intermediate the front and rear edges of the blades and an upper rear flange for capturing water from splash and water blown up the blade surfaces. At least one commercially available drainable blade louver, which is of the sightproof type with inverted V-shaped blades, has troughs on the bottom sides of the rear edges of the blades to catch water carried by centrifugal force of the air flow onto the undersides of the back portions of the blades.

Windblown rain enters the front of a louver and impinges on the blades with considerable force. Water



drops that strike the blades splash into small droplets, some of which become entrained in the airflow and some of which are carried up, either by their momentum or by rising turbulent air currents, and wet the underside of the blade above. Some of the droplets fall back onto the blade surface. Droplets that are captured by the undersides of the blade surfaces and collect on the blade surfaces tend to coalesce into a layer of water. The air flow tends to push the water layer formed from the droplets up the blade surfaces.

Previously known drainable blade louvers vary in their effectiveness in preventing water intrusion (carry-through). Most drainable blade louvers, for example, make no provision for capturing water caught on the undersurfaces of the blades. Many lack sufficient drainage trough capacity to drain off all water captured by the troughs in heavy storm conditions, and the troughs overflow. Previously known drainable blade louvers also make no provision for promoting the formation of large, heavy drops from droplets that collect on some surfaces, and the droplets on such surfaces are prone to being picked up and entrained in the air flow.

Summary of the Invention

An object of the present invention is to provide a drainable blade louver that provides for capturing and draining off to the jambs of the louver frame water blown along the undersurfaces of the blades. Another object is to provide a drainable blade louver that has a large drainage capacity in the form of several troughs, each of which captures water and drains it off to the jambs. Yet another object is to provide surfaces on the blade directly exposed to the airflow that promote the formation of large heavy drops and



drip points arranged to release the drops onto the blade surface near or into a trough.

The foregoing objects are attained, in accordance with the present invention, by a drainable blade louver

5 comprising a peripheral rectangular frame having spaced-apart vertical jambs, a sill and a header and a multiplicity of inclined blades extending horizontally between the jambs. Each blade has in cross-section a base portion sloping smoothly upwardly from a lowermost

10 point at the front edge of the blade to an uppermost point proximate to the rear edge of the blade. The undersurface of the base portion is free of protuberances so that there are no drip points and water clinging to the undersurface of the base portion

15 is transported along the undersurface by the air flowing through the louver. A generally C-shaped bottom trough portion is provided adjacent the upper edge of the blade, the bottom trough portion having an upper arm joined to the base portion at a smoothly

20 curved juncture, being oriented with its opening facing toward the front of the louver, and having a lower arm forming a trough for capturing water blown along the undersurface of the blade and draining it toward the jambs. A front flange portion extends upwardly from

25 the lower front edge of the base portion and defines with an adjacent part of the base portion a top front trough for capturing water and draining it toward the jambs. At least one rib portion extends upwardly from the base portion intermediate the front and rear edges

30 of the blade and defines a top intermediate trough for capturing water and draining it toward the jambs.

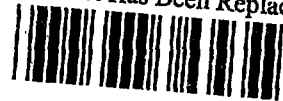
Preferred embodiments of the invention include one or more of the following features, alone or in combination.

- 35 • A rear flange portion extends upwardly from the rear edge of the blade, is joined to the lower arm of the



bottom trough portion, and defines with part of the bottom trough portion a top upper trough for capturing water and draining it toward the jambs.

- The rear flange portion has a curved hook part at its upper edge that is curved smoothly forwardly and downwardly to establish a drip point in front of and below the uppermost extremity of the rear flange portion.
- Each of the rib portions has a curved hook part at its upper edge that is curved smoothly forwardly and downwardly to establish a drip point in front of and below the uppermost extremity of the rib portion.
- The front flange portion has a curved hook part at its upper edge that is curved smoothly rearwardly and downwardly to establish a drip point behind and below the uppermost extremity of the front flange portion.
- A front hook-like screw boss extends above the base portion between the front flange portion and the top intermediate trough and a rear hook-like screw boss extends above the base portion between the rear flange portion and the top intermediate trough.
- The rear screw boss is located at the juncture between the base portion and the upper arm of the bottom trough portion.
- The screw boss portions curve forwardly and downwardly so as to aid in catching water blown along the upper surface of the blade by the air flow through the louver and to form drip points in front of and below the upper extremities of the screw bosses.
- Each jamb includes a front vertical drainage channel registering with the ends of the top front troughs of the blades, an intermediate vertical drainage channel registering with the ends of the top intermediate troughs of the blades, and a rear vertical drainage channel registering the bottom drainage troughs of the



blades and also with the top rear drainage troughs when they are included.

- The rib portion nearer the rear edge of the blade defines with a part of the base portion rearwardly of it a second intermediate drainage trough for capturing water and draining it toward the jams, and the intermediate drainage channels of the jams register with the second intermediate drainage troughs of the blades.

- The drainage channels of each jamb are arranged symmetrically with respect to the axial centerline of the jamb so that the jams may be reversed front to back and still be positioned in register with the blade drainage troughs.

According to another aspect of the present invention, a composite louver is composed of one or more louvers placed behind a front louver. The drainage channels of each jamb of each louver are arranged symmetrically with respect to the axial centerline of the jamb. The jams of the back louver are reversed front to back relative to the jams of the front louver. The front flange portion of each blade of each louver behind the front louver is shaped to match and mate with the rear flange portion of the louver in front of it with the uppermost surfaces of the mating flange portions substantially flush.

Preferably, the louver includes a flashing member of L-shape in cross section having a base portion located under the sill (under the sills of all louver units when they are combined) and an upright portion located behind the sill (the rearward-most unit in the case of multiple unit installations). The sill has openings located proximate to the upright portion of the flashing member to allow water to drain from the sill onto the base portion of the flashing member. The



water drains from the exterior edge of the sill to the exterior of the building.

The fact that the blades slope upwardly from front to back minimizes turbulence in the air flow through the louver and, therefore, minimizes the pressure drop across the louver. The lack of protuberances or surface irregularities on the bottom surface of the blade means that there are no drip points, and water clinging to the underside of the blades is transported by high velocity air flow in strong winds along the underside of the blade to the bottom drainage trough portion at the upper, back edge of the blade. The drainage trough on the upper surface of the blade increases the drainage capacity of the blade. The elements that project up from the top surface of the blade to form the troughs have wide surfaces that curve in a desired direction to establish drip points for relatively large and heavy drops that coalesce on them from droplets. The larger drops that form on those surfaces are less likely to become entrained in the air flow than are smaller drops that form on narrower surfaces.

For a better understanding of the invention, reference may be made to the following description of an exemplary embodiment, taken in conjunction with the accompanying drawings.

Description of the Drawings

Fig. 1 is an end view of the embodiment in which the jamb at the end being viewed has been removed;

Fig. 2 is a top plan view of the embodiment in which the header of the frame has been removed, the blades partly cut away, and the details of the blade omitted;

Fig. 3 is an end view of a typical blade of the embodiment;



Fig. 4 is a partial top view, again with the header removed and the blade details omitted, showing the combining of two louvers front to back to make a deeper composite louver; and

5 Fig. 5 is an end view of the louver shown in Fig. 4 with the near jamb of the frame omitted.

Description of the Embodiment

Referring to Figs. 1 to 3, the louver comprises a
10 rectangular frame 10, which is composed of a sill 12, a header 14 and two jambs 16, and a multiplicity of equally spaced apart, horizontal blades 18 extending between and fastened to the jambs. The blades 18 of the embodiment are identical, but it is envisioned that
15 blades of shapes differing from each other may be provided. Each blade is of uniform cross-section along its length. Fig. 1 shows a louver with four blades, but in practice there will almost always be many more blades. The blades are, preferably, pieces cut from an
20 extrusion of a suitable material, such as aluminum. Each blade 18 has in cross-section a base portion 181 that slopes smoothly upwardly from a lowermost point at the front edge of the blade, which is to the left in Figs. 1 and 3, to an uppermost point proximate to the
25 rear edge of the blade. In the illustrated embodiment, the base portion 181 is planar, but it may be smoothly curved or have both planar and curved portions.

The undersurface of the base portion 181 of each blade is free of protuberances, edges or abrupt changes
30 in shape so that there are no drip points and water clinging to the undersurface of the base portion can be driven along the undersurface by the air flowing through the louver. In heavy wind-driven rains, droplets striking the tops of the blades produce
35 splash, and some droplets from the splashes cling to the undersurface of the blade above. The droplets



driven upwardly and rearwardly along the undersurface of the base portion 181 are captured in a generally C-shaped bottom trough portion 182 located adjacent the upper back edge of the blade. The bottom trough
5 portion 182 has an upper arm 182a joined to the base portion 181 at a smoothly curved juncture 182aa, is oriented with its opening 182b facing toward the front of the louver, and has a lower arm 182c forming a
10 trough 182d for capturing water blown along the undersurface of the blade and draining it toward the jambs 16.

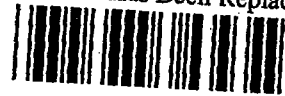
A front flange portion 183 extends vertically upwardly from lower front edge of the base portion 181 and defines with an adjacent part of the base portion
15 181 a top front trough 183a for capturing water and draining it toward the jambs. A pair of spaced-apart rib portions 184f, 184r extend upwardly from the base portion intermediate the front and rear edges of the blade and define two top intermediate drainage troughs
20 184fa and 184ra for capturing water and draining it toward the jambs. A rear flange portion 185 extends upwardly from the rear edge of the blade, is joined to the lower arm 182c of the bottom trough portion, and defines with part of the bottom trough portion a top
25 back trough 185a for capturing water and draining it toward the jambs. The top back trough 185a is preferred, but not essential. The juncture 185d between the rear flange portion 185 and the bottom trough portion 182 is radiussed so that any water drops
30 that reach the juncture 185d will cling to the underside of the bottom trough portion 182, flow along it toward the front of the louver and drip further upstream from the lowest point of the part 182c.

The rear flange portion 185 has a curved hook part
35 185b at its upper edge that is curved smoothly forwardly and downwardly to establish a drip point at



its tip in front of and below the uppermost extremity of the rear flange portion. Similarly, each of the rib portions 184f and 184r has a curved hook part 184f' and 184r' at its upper edge that is curved smoothly forwardly and downwardly to establish a drip point at its tip, which like the hook part 185b, is located in front of and below the uppermost extremity of the respective rib portion. Also in a like manner, the front flange portion 183 has a curved hook part at its upper edge that is curved smoothly downwardly, but in this case rearwardly, to establish a drip point behind and below the uppermost extremity of the front flange portion. Droplets that fall onto the hook portions tend to coalesce into large heavy drops, which fall by their weight from the tips of the hook parts. The hook parts are intentionally made to have relatively large areas to promote formation of large drops. The drops falling from those drip points are collected in the adjacent troughs.

20 A front hook-like screw boss 186f extends above the base portion between the front flange portion 183 and the front top intermediate trough 184fa, and a rear hook-like screw boss 186r extends above the base portion between the rear flange portion 185 and the top intermediate trough 184ra at the juncture 182aa between the base portion and the upper arm 182a of the bottom trough portion 182. The main function of the screw bosses is, of course, to receive screws (not shown) that pass through holes in the jambs and by which the blades are fastened to the jambs. The screw boss portions curve forwardly and downwardly and serve the additional function of catching water blown along the upper surface of the blade by the air flow through the louver. The tips of the screw boss portions form drip points in front of and below the upper extremities of the screw bosses.



water, in that the total amount of water collected by and drained from the blades is divided among the multiple channels.

One way of handling the water draining down the channels of the jambs 16 is to allow it to flow from the channels onto the upper surface of the sill 12. Some of the water will drain immediately from the sill through a gap between the lower, external edge of the lowermost blade and the external edge of the sill. In order to prevent build up and carry-through by high velocity air passing between the lowermost blade and the sill of water that does not drain from the sill, holes 121 are provided at intervals along the sill near the rear flange. One inch diameter holes on 12 inch spacing have been found to be adequate. An L-shaped flashing member is installed under the sill, leaving a gap to allow the water to flow to the exterior between the sill and the flashing member. The flashing member has a base portion 201 under the sill and an upright flange portion 202 behind the sill. The holes 121 prevent wind-driven water from collecting near the back of the sill and droplets becoming entrained in the air flow. Water passing through the holes onto the flashing drains from an inclined lip portion of the flashing to the exterior of the building.

The drainage channels of the jambs are symmetrically placed with respect to the axial centerline of the jamb 16 and that the front and rear drainage channels 163a and 164a are of the same width. That configuration permits two louver units 10 and 10' to be placed front to back, as shown in Figs. 4 and 5, to form a composite louver having twice the depth of the single unit louver shown in Figs. 1 to 3. The jambs 16 of the rear louver 10' are reversed front to back, relative to those of the front unit. The header 14 and sill 12 are fastened to the jambs by screws (not



shown) received in screw bosses 166, which are also symmetrically located with respect to the axial center-line. A composite louver made from three single louver units can also be made with minor changes in the jambs, sill and header of the center unit. At least one rear unit of a multi-unit composite louver may have blades different from the front unit without significantly reducing the ability of the louver to minimize water carry-through.

10 In louvers composed of multiple units of the form shown in Figs. 1 to 3, the blades 18' of units (e.g. 10') placed in back of the front unit 10 are modified by forming the front flange portions 183' so that they mate with the rear flange portions 185 of the front
15 unit 10 and present top surfaces that are flush with the tops of the flange portions 185 of the front unit 10 (see Fig. 5). The louver of Fig. 5 also has a flashing member 20' for catching and draining to the exterior of the building water drained onto the sill
20 from the channels in the jambs and passing through holes 121' in the sill 12' of the rear louver unit 10'.



Each jamb 16 (see Fig. 2) includes front and rear face flange portions 161 and 162, respectively, that partially overlap the front and rear edges of the blades and front and rear L-shaped portions 163 and 164 that define with adjacent portions of the flanges 161 and 162 a front vertical drainage channel 163a and a rear vertical drainage channel 164a. The front drainage channels 163a register with the ends of the top front troughs 183a of the blades, and the rear drainage channel 164a registers with the rear top drainage trough 185a and the bottom drainage trough 182d of each blade. An intermediate vertical drainage channel 165a is defined by a U-shaped portion of each jamb 16 and registers with the ends of the top intermediate troughs 184a of the blades. The rear rib portion 184r nearer the rear edge of the blade defines with a part of the base portion rearwardly of it a second top intermediate drainage trough 184ra for capturing water and draining it toward the jambs, the intermediate drainage channels of the jambs registering with the second intermediate drainage troughs of the blades. The edges of the drainage channels are shown by the dotted lines in Fig. 1. The bottom troughs 182d collect water droplets that cling to the undersides of the blades and are blown upwardly along the blades by the air flow. Accordingly, those droplets are not blown off the back edges of the blades.

By capturing water in several top troughs, each blade has the ability to handle a large amount of water. The water captured in each trough drains to the ends of the blades and empties into the respective drainage channels. The water received in the channels from the blades flows down the channels to the bottom of the louver and is discharged in a suitable manner. The provision of multiple channels also contributes to the ability of the louver to handle large amounts of

Claims

- 1 1. A drainable blade louver comprising a peripheral
2 rectangular frame having spaced-apart vertical
3 jambs, a sill and a header, and a multiplicity of
4 inclined blades extending horizontally between the
5 jambs, each blade having in cross-section a base
6 portion sloping smoothly upwardly from a lowermost
7 point at the front edge of the blade to an
8 uppermost point proximate to the rear edge of the
9 blade, the undersurface of the base portion being
10 free of protuberances so that there are no drip
11 points and water clinging to the undersurface of
12 the base portion is transported along the
13 undersurface by the air flowing through the
14 louver, a generally C-shaped bottom trough portion
15 adjacent the upper edge of the blade, the bottom
16 trough portion having an upper arm joined to the
17 base portion at a smoothly curved juncture, being
18 oriented with its opening facing toward the front
19 of the louver, and having a lower arm forming a
20 trough for capturing water blown along the
21 undersurface of the blade and draining it toward
22 the jambs, a front flange portion extending
23 upwardly from lower front edge of the base portion
24 and defining with an adjacent part of the base
25 portion a top front trough for capturing water and
26 draining it toward the jambs, and at least one rib
27 portion extending upwardly from the base portion
28 intermediate the front and rear edges of the blade
29 and defining a top intermediate trough for
30 capturing water and draining it toward the jambs.
- 1 2. A drainable blade louver according to claim 1
2 wherein each blade further includes in cross-
3 section a rear flange portion extending upwardly



- 4 from the rear edge of the blade, joined to the
5 lower arm of the bottom trough portion, and
6 defining with part of the bottom trough portion a
7 top upper trough for capturing water and draining
8 it toward the jambs.
- 1 3. A drainable blade louver according to claim 2
2 wherein the rear flange portion has a curved hook
3 part at its upper edge that is curved smoothly
4 forwardly and downwardly to establish a drip point
5 in front of and below the uppermost extremity of
6 the rear flange portion.
- 1 4. A drainable blade louver according to claim 1
2 wherein the rib portion has a curved hook part at
3 its upper edge that is curved smoothly forwardly
4 and downwardly to establish a drip point in front
5 of and below the uppermost extremity of the rib
6 portion.
- 1 5. A drainable blade louver according to claim 1
2 wherein the front flange portion has a curved hook
3 part at its upper edge that is curved smoothly
4 rearwardly and downwardly to establish a drip
5 point behind and below the uppermost extremity of
6 the front flange portion.
- 1 6. A drainable blade louver according to claim 1
2 wherein each blade further includes in cross-
3 section a front hook-like screw boss extending
4 above the base portion between the front flange
5 portion and the top intermediate trough and a rear
6 hook-like screw boss extending above the base
7 portion between the rear flange portion and the
8 top intermediate trough.



- 1 7. A drainable blade louver according to claim 6
2 wherein the rear screw boss is located at the
3 juncture between the base portion and the upper
4 arm of the bottom trough portion.

- 1 8. A drainable blade louver according to claim 6
2 wherein the screw boss portions curve forwardly
3 and downwardly so as to aid in catching water
4 blown along the upper surface of the blade by the
5 air flow through the louver and to form drip
6 points in front of and below the upper extremities
7 of the screw bosses.

- 1 9. A drainable blade louver according to claim 1
2 wherein each jamb includes a front vertical
3 drainage channel registering with the ends of the
4 top front troughs of the blades, an intermediate
5 vertical drainage channel registering with the
6 ends of the top intermediate troughs of the
7 blades, and a rear vertical drainage channel
8 registering with the bottom drainage troughs of
9 the blades.

- 1 10. A drainable blade louver according to claim 9
2 wherein each blade includes a second rib portion
3 intermediate the front and back edges and defining
4 with a part of the base portion rearwardly of it a
5 second intermediate drainage trough for capturing
6 water and draining it toward the jambs, and
7 wherein the intermediate drainage channels of the
8 jams register with the second intermediate
9 drainage troughs of the blades.

- 1 11. A drainable blade louver according to claim 9
2 wherein the drainage channels of each jamb are
3 arranged symmetrically with respect to the axial



4 centerline of the jamb so that the jambs may be
5 reversed front to back and still be positioned in
6 register with the blade drainage troughs.

1 12. A drainable blade louver according to claim 1 and
2 further comprising a flashing member of L-shape in
3 cross section having a base portion located under
4 the sill and an upright portion located behind the
5 sill, and wherein the sill has openings located
6 proximate to the upright portion of the flashing
7 member to allow water to drain from the sill onto
8 the base portion of the flashing member.

1 13. A composite drainable blade louver comprising a
2 front louver unit as claimed in claim 9 and a back
3 louver unit as claimed in claim 9 placed front to
4 back, wherein the drainage channels of each jamb
5 are arranged symmetrically with respect to the
6 axial centerline of the jamb, and wherein the
7 jambs of the back louver are reversed front to
8 back relative to the jams of the front louver.

1 14. A composite drainable blade louver according to
2 claim 13 where the front flange portion of each
3 blade of the back louver is shaped to match and
4 mate with the rear flange portion of the front
5 louver with the uppermost surfaces of the mating
6 flange portions substantially flush.

1 15. A composite drainable blade louver according to
2 claim 13 and further comprising a flashing member
3 of L-shape in cross section having a base portion
4 located under the sills of the front and back
5 louver units and an upright portion located behind
6 the sill of the back louver unit, and wherein the
7 sill of the back louver unit has openings located



8 proximate to the upright portion of the flashing
9 member to allow water to drain from the sills of
10 the units onto the base portion of the flashing
11 member.

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