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Dowdell et al.

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[54] **LOUVER ASSEMBLY HAVING IMPROVED WEATHERPROOFING AND AIR FLOW CHARACTERISTICS**

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[21] Appl. No.: **153,668**

[52] **U.S. Cl.** ..... **52/473,** 98/121 R

[51] **Int. Cl.** **F24f 13/08**

[58] **Field of Search** ..... 52/473, 209, 97, 52/84; 98/121 R, 121 A

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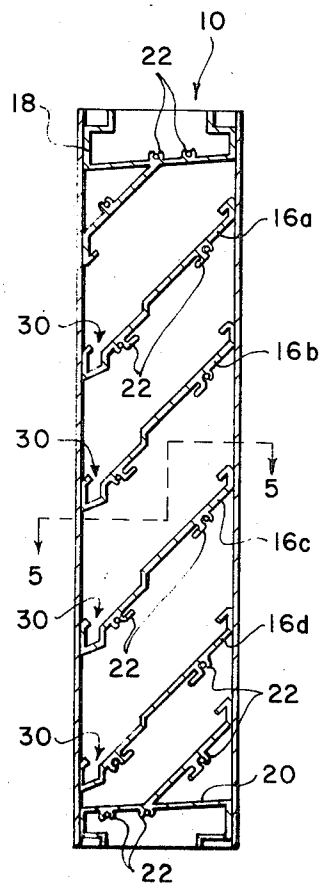
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[57] **ABSTRACT**

The specification discloses a louver assembly for being mounted in a building and which includes a plurality of louver blades mounted in inclined positions sloping downwardly from back to front. Each of the louver blades includes an elongated open-topped trough having a rhomboidal cross section which extends along the lower edge of the louver blades. Each of the louver blades also includes a vertical rise along the mid-region thereof to allow water to freely drain down the blade into the trough while restraining water from flowing up the blade. A lip portion extends along the upper edge of each of the louver blades to prevent water from flowing over the upper edge of the blades. Apertures are defined at the ends of each of the troughs to allow water to drain therefrom. The louver assembly may be utilized in a conventional rectangular building louver or in a penthouse louver configuration.

5 Claims, 8 Drawing Figures



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SHEET 1 OF 3

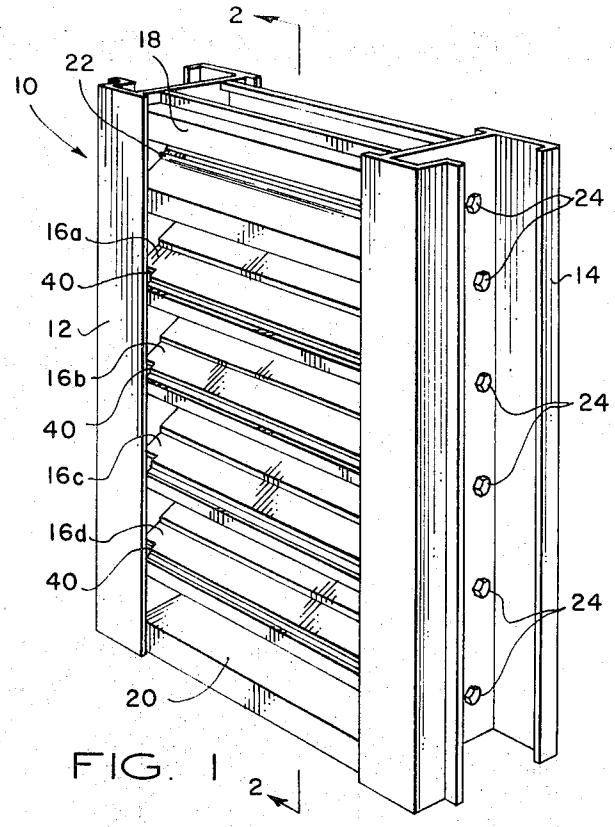


FIG. 1

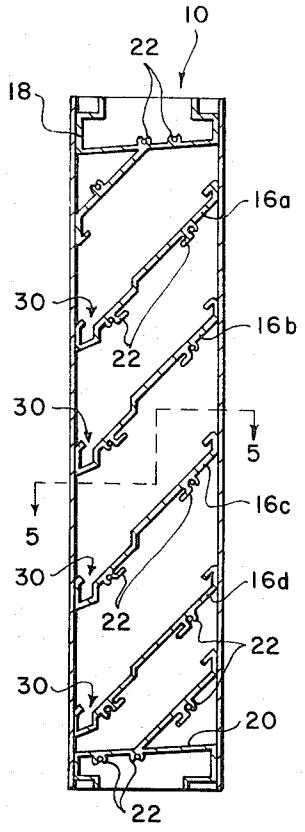


FIG. 2

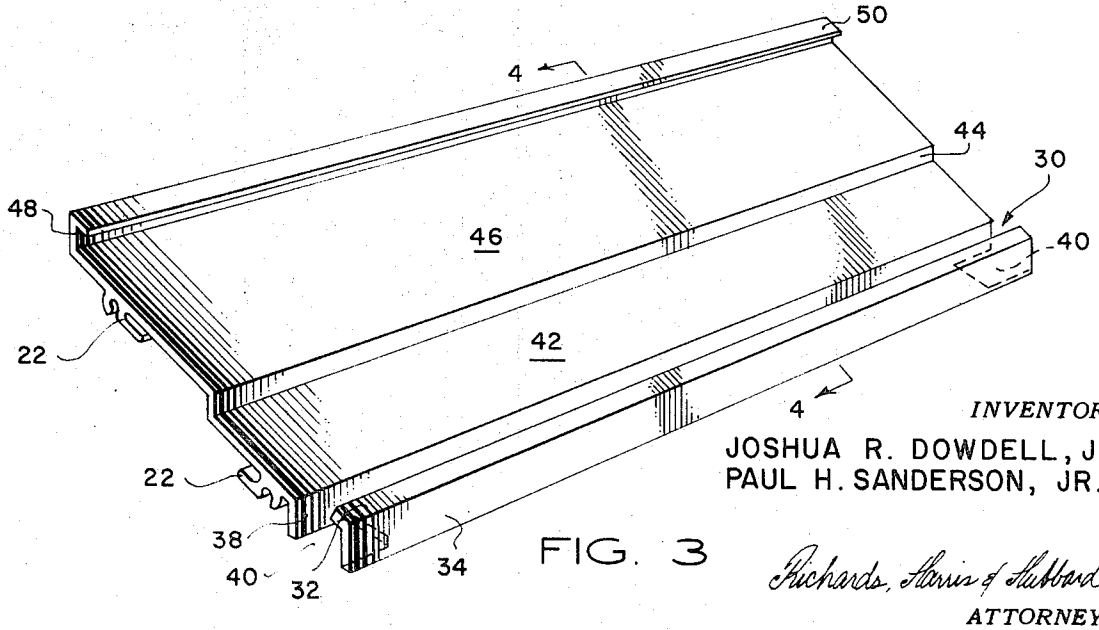


FIG. 3

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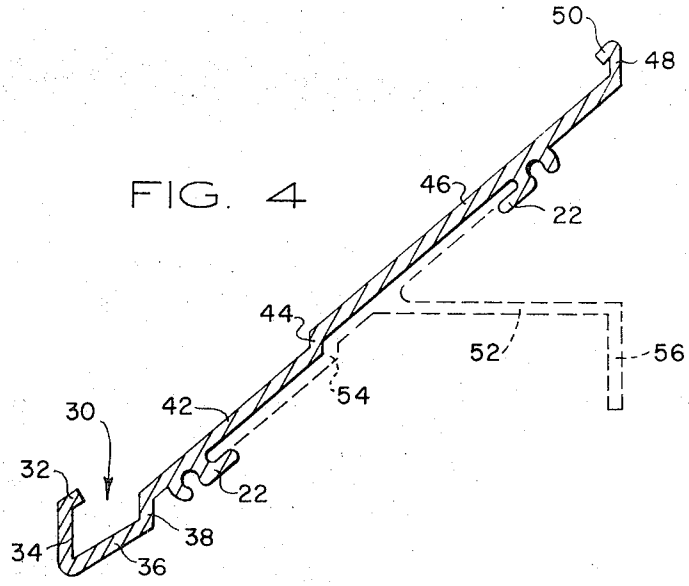


FIG. 4

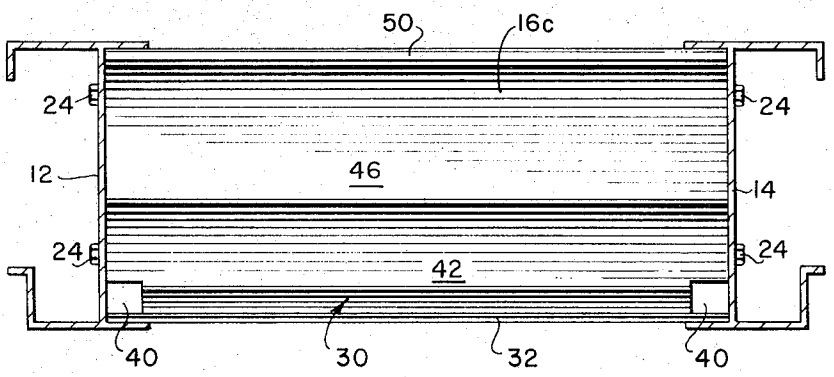


FIG. 5

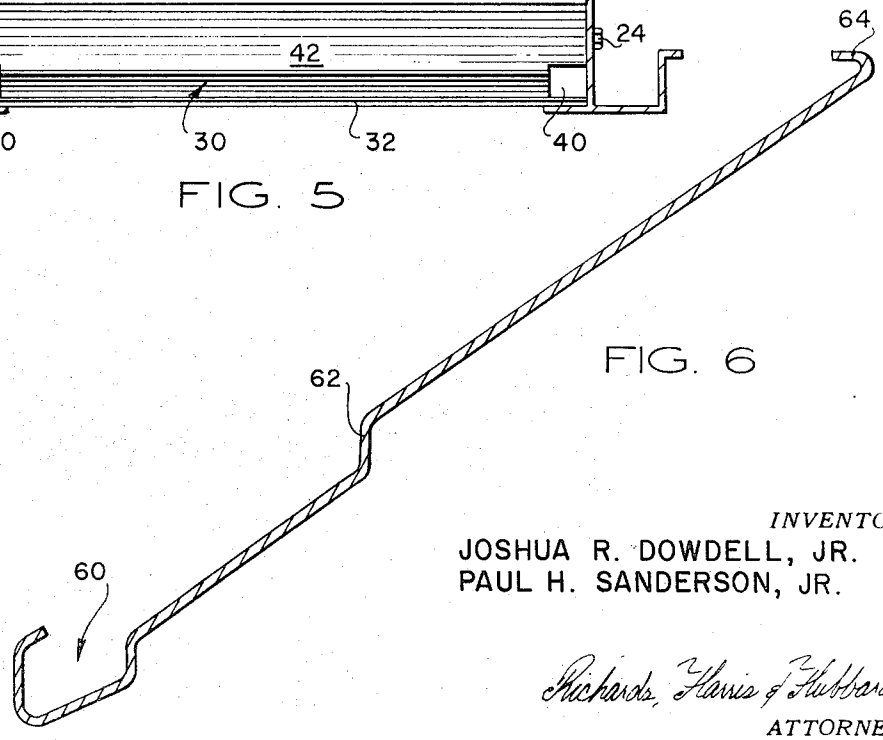


FIG. 6

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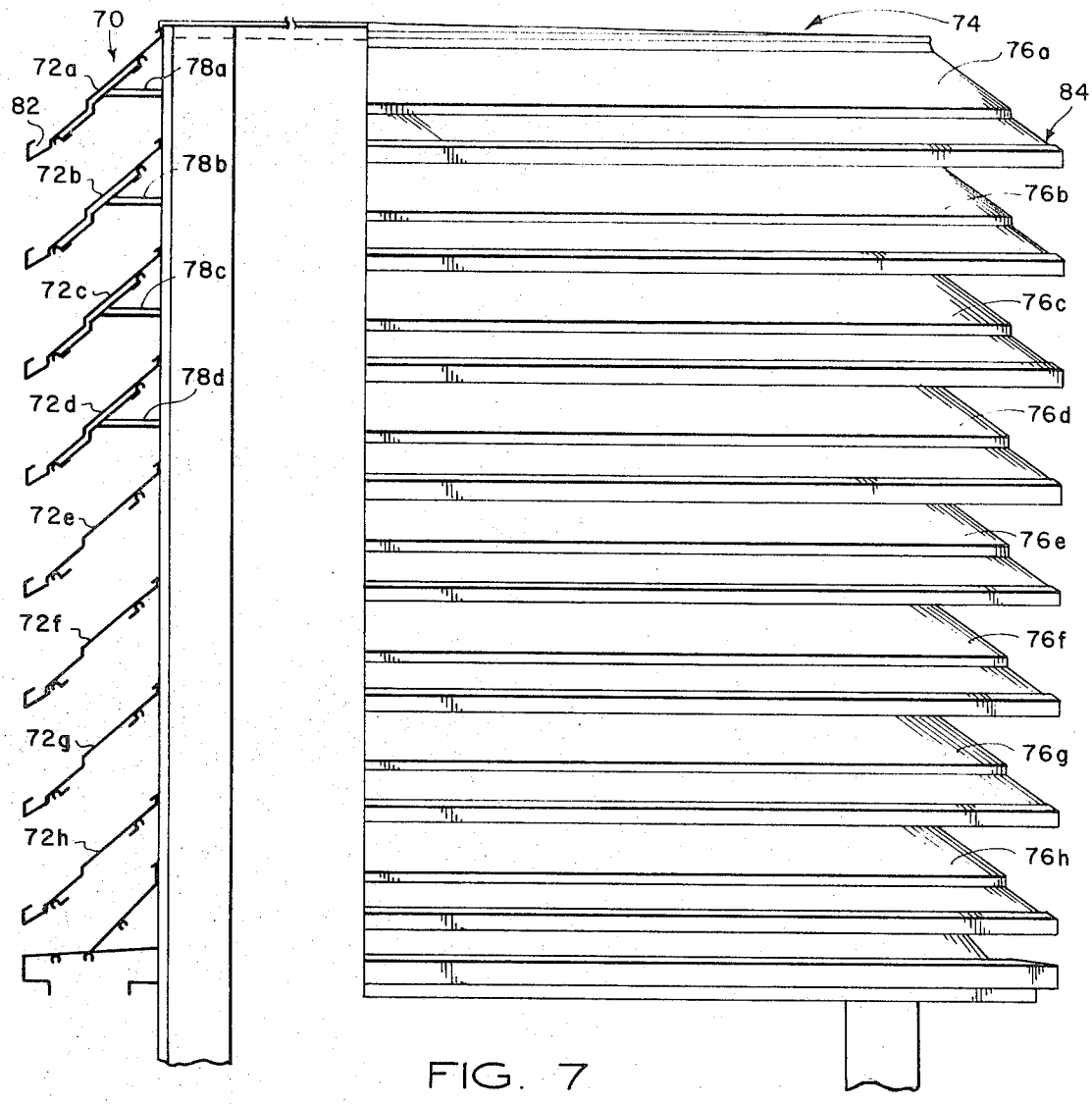


FIG. 7

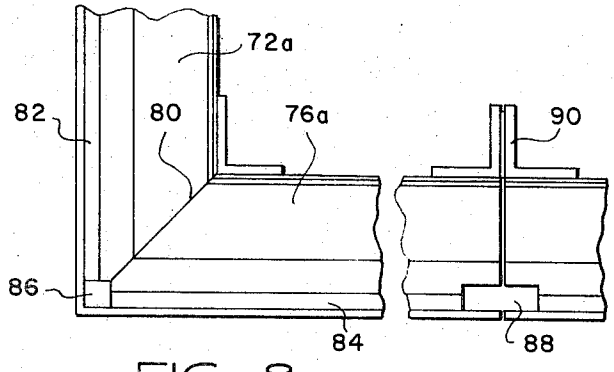


FIG. 8

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LOUVER ASSEMBLY HAVING IMPROVED WEATHERPROOFING AND AIR FLOW CHARACTERISTICS

FIELD OF THE INVENTION

This invention relates to louvers, and more particularly to louver assemblies restricting the amount of moisture which may be carried therethrough while providing relatively low pressure drops due to air flow therethrough.

THE PRIOR ART

A variety of different types of louvers have been heretofore developed for use in buildings as air intakes or exhausts wherein one side of the louver is exposed to the outside environment. Examples of such louvers are disclosed in U. S. Pat. No. 3,191,241, issued on June 29, 1965, and in U. S. Pat. No. 3,287,870, issued on Nov. 29, 1966. Such prior louver assemblies have often utilized grooved portions or other obstacles to slow or retard the water flowing down the sloped louver blades, and have thus often tended to maintain substantial amounts of water in contact with the air flowing through the louvers so that a substantial amount of moisture is carried through the louvers.

In addition, previously developed louver assemblies have often included lower troughs along the lower edge thereof in combination with drain channels formed in the side jambs, but such structure has not been completely satisfactory in collecting and draining the water so as to prevent cascading overflow onto lower louver blades. Such cascading water overflow, in addition to the retention of substantial amounts of water by flow retarding portions of the louver blades, has often resulted in unsatisfactory amounts of moisture transfer through prior louver systems. Moreover, previously developed louvers have often required excessive size due to the high pressure drops created by air flow through the louvers.

SUMMARY OF THE INVENTION

In accordance with the present invention, a louver assembly is provided with improved air flow characteristics to provide relatively low pressure drops thereacross while restricting the amount of moisture carried therethrough to acceptable levels. The present assembly accomplishes such improved operating characteristics by a particular shape and operation of the individual louver blades, in combination with a particular spacing between adjacent louver blades to allow laminar flow of air therethrough while preventing the occurence of turbulent air flow.

In accordance with the present invention, a louver blade is adapted to be mounted in an inclined position and includes an elongated open-topped trough extending along the lower edge thereof. The trough has an overhanging lip and a generally quadrilateral cross-sectional area. A main blade portion extends angularly upwardly from the trough and includes a vertical rise in the midregion thereof such that the lower half of the blade portion is offset but parallel to the upper half of the blade portion. The louver blade includes a turned-back lip portion extending along the upper edge of the blade, such that water is allowed to freely drain down the blade into the trough while being restrained from flowing up the blade.

In accordance with another aspect of the invention, a louver assembly is provided which includes a pair of spaced apart side jambs, a plurality of louver blades being mounted between the jambs in inclined positions sloping downwardly toward the front faces of the jambs. The louver blades are dimensioned and spaced apart from one another by distances sufficient to allow laminar flow of air therethrough, while preventing the occurrence of turbulent air flow. A water-collecting trough is disposed along the lower edge of each of the louver blades, with each of the louver blades being shaped to allow water impinging thereon to freely drain downwardly into the troughs while restraining the water from flowing upwardly along the blades. Drain structure in the troughs allows collected water to drain freely, thus preventing water from cascading down upon lower louver blades and preventing excessive atomization of accumulated water which creates water carrythrough.

In accordance with a more specific aspect of the invention, a louver assembly includes a pair of spaced apart side jambs. A plurality of spaced apart louver blades are mounted between the jambs and slope downwardly from back to front. Each of the louver blades has an elongated open-topped trough extending along the lower edge thereof. Each of the louver blades includes a vertical rise along the mid-region thereof and a lip portion extending along the upper edge thereof. Apertures are formed in the ends of each of the troughs to allow water to drain therethrough. A sloped water-diverting sill is mounted between the jambs below the blades.

In accordance with another aspect of the invention, a penthouse louver assembly includes four sets of louver blade assemblies each having mitered edges for being adjacently mounted at right angles to one another to form a corner. The louver blades slope downwardly from back to front and have open-topped troughs formed along the lower edges thereof. Each of the louver blades has an upward rise in the mid-region thereof, wherein water is allowed to freely flow downwardly into the troughs but is restrained from flowing upwardly along the blades. A lip portion is formed along the upper edges of each said blade to prevent water from flowing over the upper edges.

DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and for further objects and advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates a perspective view of a rectangular louver assembly according to the invention;

FIG. 2 is a cross-sectional view taken generally along the section lines 2—2 in FIG. 1;

FIG. 3 is a perspective view of a single louver blade utilized in the assembly shown in FIG. 1;

FIG. 4 is a sectional view of the blade shown in FIG. 3 taken generally along the section lines 4—4;

FIG. 5 is a sectional view taken generally along the section lines 5—5 in the view shown in FIG. 2;

FIG. 6 is a sectional view of a second embodiment of a louver blade for use in the present invention;

FIG. 7 is a view, partially sectioned and cut away, of a typical penthouse assembly according to the present invention; and

FIG. 8 is a top view, partially broken away, of the corner of the penthouse assembly shown in FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, a louver assembly according to the present invention is indicated generally by the numeral **10**. The assembly comprises a pair of spaced apart jamb sides **12** and **14**, with a plurality of louver blades **16***a* –*d* being connected between the jambs. A head member **18** is connected between the upper ends of the jambs **12** and **14**, while a sill **20** is connected between the lower ends of the jambs.

As shown in FIG. **2**, the head member **18**, the louver blades **16***a* –*d* and the sill **20** are extruded with projections **22** which form elongated grooves. Metal screws **24** (FIG. **1**) are disposed through the side jambs **12** and **14** and are threaded into the grooves in order to rigidly interconnect the louver assembly.

As shown in FIG. **2**, the louver blades **16***a* –*d* are mounted between the jambs **12** and **14** in inclined positions sloping downwardly toward the front faces of the jambs. An important aspect of the present invention is the vertical spacing between the louver blades **16***a* –*d*, such that the air flowing through the louver assembly has laminar flow characteristics and such that turbulent flow is reduced. This creation of laminar air flow through the present louver assembly creates a substantially lower pressure drop at higher operating face velocities than occurs with many previosuly developed louver assemblies. The increased face velocity available with the present louver assembly permits the use of smaller sized louvers and thereby reduces manufacturing and installation costs.

The spacing between louver blades required to obtain laminar air flow characteristics will vary somewhat for different shapes and dimensions of louver blades. However, with the use of the louver blades of the present invention mounted at angles of 40° to the horizontal between jambs approximately four inches wide, a three inch vertical spacing between the louver blades has been found to provide laminar air flow resulting in low pressure drops at face velocities of 600 to 700 feet per minute for intake applications and from 800 to 900 feet per minute for exhaust applications. With louver blades constructed according to the present invention mounted at 35° to the horizontal between jambs 6 inches in width, a three and one/half inch vertical spacing between the louver blades has been found to provide laminar air flow also resulting in low pressure drops at the operating face velocities noted above.

The particular louver sizes and dimensions will be chosen for the desired operating criteria. For example, if it is desired to handle 6000 c.f.m. at .125 inches H_2O pressure drop, a louver assembly according to the present invention having 36 inches height and 46 inches width will meet the selected criteria with a face velocity of 520 f.p.m.

The particular cross-sectional shape of the present louver blades has been found to substantially reduce the amount of moisture which may pass through the louver assembly, while maintaining a relatively low pressure drop thereacross. As best shown in FIGS. **2–4**, each louver blade includes an elongated open-topped trough **30** which extends along the lower edge of the blade. Each trough **30** has a rhomboidal cross section which is formed by an overhanging lip **32** which extends angularly upwardly, by a vertical front side **34**, by an angularly upwardly extending bottom side **36** and a vertically upwardly extending back side **38**. Trough **30** is shaped to provide a large gutter area for collection of water draining down the blade, with a vertically extending back side **38** restraining the collected water from flowing upwardly along the blades.

An important aspect of the present louver blade is the provision of drain apertures **40** at the ends of each of the troughs **30**. As best shown in FIG. **5**, the aperatures **40** are preferably provided with a square cross section, although the shape of the apertures may be varied for different applications. The drain apertures formed at the ends of the troughs **30** enable the water collected within the troughs to quickly drain therefrom. The drain apertures **40** of each of the louver blades **16***a* –*d* shown in FIG. **2** are vertically aligned so that the water draining from higher louver blades does not tend to collect on the lower louver blades. As shown in FIG. **2**, the sill **20** is provided with an incline from back to front of the louver assembly in order that the water draining from the louver blades is allowed to quickly drain from the sill.

The lower main blade portion **42** extends angularly upward from the trough **30** and includes a vertical rise **44** in the general mid-region of the louver blade. In the preferred embodiment, the vertical rise **44** will not be disposed in the exact mid-region of the louver blade, but will be spaced slightly nearer the front side **34** than the upper edge of the louver blade. The upper portion **46** of the louver blade extends angularly upward from the vertical rise and terminates in a turned-back lip portion **48**. An overhanging lip **50** extends angularly downwardly and generally parallel to the upper blade portion **46** to allow water to drain therefrom while preventing water from flowing over the upper edge of the louver blade. As is best shown in FIG. **4**, the lower blade portion **42** is offset, but parallel to the upper blade portion **46**.

The objective of the present louver blade design is to allow water to freely drain down the sloping blades, but to prevent water from being blown or otherwise flowing up the inclined blades. This prevents water from accummulating upon the louver blade surfaces and reduces atomization of water and subsequent passage of airborne water particles through the louver assembly. It is believed that the spacing of the present louver blades to provide laminar flow therethrough, in combination with the particular cross section of the present louver blades, interact to provide lower pressure drops at higher operating face velocities, while allowing minimum water penetration of the louver assembly. In tests involving the present louver assembly, less than 0.5 grams of water per square foot per minute passed through an assembly having a 6 -inch jamb width, and less than 3 grams of water per square foot per minute passed through the present louver assembly utilizing a 4 -inch jamb, based upon a 2 inch per hour rainfall rate and free falling rain across the louver faces at 650 f.p.m. face velocity.

Also illustrated in FIG. **4** is a louver brace **52** which includes an angularly disposed member **54** which is configured to fit between projections **22** on a louver blade. The portion **56** of the brace **52** may be rigidly connected to an angle member of sufficient strength and rigidity to support the present louver blade for assemblies requiring relatively long louver blade configurations. This angle member may then in turn be affixed

to the building to prevent deflection of the blade due to wind.

FIG. 6 illustrates a cross section of a second embodiment of a louver blade according to the present invention. This louver blade will generally be constructed from galvanized steel or the like instead of being extruded. The illustrated blade is welded to side jambs or other supports instead of utilizing fastening screws as with the extruded blades.

The blade includes a trough 60 having a rhomboidal cross section similar to that previously described, in order to collect and disperse water as previously noted. The main blade portion includes a vertical rise 62 generally in the mid-region thereof in order to allow water to freely flow downward down the blade, but to restrain water flowing upwardly along the blade. A turned-back lip 64 is provided along the upper edge of the blade in order to prevent water from flowing over the rear edge of the blade and cascading down the louver assembly.

FIGS. 7 and 8 illustrate the use of the present louver blade assembly in a penthouse corner configuration. The assembly comprises a first set of vertically disposed louver blades 70 which includes louver blades 72*a* –*h*. A second set of vertically stacked louver blades 74 comprises louver blades 76*a* –*h*. Each of the louver blades 72*a* –*h* and 76*a* –*h* are configured in the manner shown in FIGS. 1–6 and include the water collecting and dispensing troughs, the vertical rise and the upper turned-back lip in order to allow water to freely flow down the blades while restraining the flow of water up the blades. The louver blades 72*a* –*h* and 76*a* –*h* are spaced apart in the manner previously described in order to provide laminar flow characteristics therethrough. For relatively long louver blade spans, braces 78*a* –*d* will be utilized to support the louver blades. Additionally, concealed mullions will be utilized for additional support of the blades.

FIG. 8 illustrates a top view of the miter joint of the penthouse assembly shown in FIG. 7. The edges of each of the louver blades are beveled to form a miter corner joint 80. The troughs 82 and 84 of the louver blades include cutout portions therein to form a corner drain aperture 86 to allow water drainage. An additional drain aperture 88 is illustrated as being formed in the louver blade 76*a* . A concealed mullion 90 supports the louver blades when joints are required. The present penthouse louver configuration thus provides superior air flow characteristics, while preventing substantial moisture carrythrough. It will be understood tat in other environments, it may be desired to use a post corner penthouse louver assembly rather than the illustrated miter assembly. In such post corner configurations, four rectangular assemblies similar to that shown in FIG. 1 are set together in such a way as to form the penhouse walls.

It will thus be understood that the present invention provides a louver blade assembly with significantly improved weatherproofing and air flow characteristics. The present louver assembly prevents cascading of water from upper louver blades down upon lower blades, and thus prevents the cumulative amounts of water which fall from blade to blade on many previously developed louver assemblies. The shape of the present blades prevents water from flowing up and over the blade, while catching the majority of the water hitting the blade. The drain structure of the blades then drains the water from the troughs to prevent water accumulation and subsequent atomization of the water which promotes water carrythrough. Further, the blades are so configured that any splashing of the water against the blades causes relatively large drops which do not carrythrough the louvers.

Whereas the present invention has been described with respect to specific embodiments thereof, it will be understood that various changes and modifications will be suggested to one skilled in the art, and it is intended to encompass such changes and modifications as fall within the scope of the appended claims.

What is claimed is:

1. A louver assembly comprising:
- a pair of spaced apart side jambs,
- a plurality of spaced apart louver blades mounted between said jambs and sloping downwardly from back to front to form a louver assembly extending uninterruptedly between said jambs,
- each of said louver blades having an elongated open-topped trough having a rhombodial cross section extending along the lower edge thereof and comprising an overhanging lip and a bottom both extending generally parallel to the slope of the blades whereby laminar air flow across the blades is facilitated,
- each of said louver blades including a vertical rise along the mid-region thereof such that the lower half of each blade is offset but parallel to the upper half of each blade,
- a lip portion extending along the upper edge of each of said blades and characterized by a relatively small vertical dimension thereby simultaneously preventing water flow up the blade and facilitating laminar air flow across the blade, cutout sections formed in the ends of the bottom of each said trough and extending inwardly from the ends of said blades to allow water to drain therefrom, and
- a slope water-diverting sill mounted between said jambs below said blades, wherein said assembly tends to reduce water from cascading downwardly upon lower blades and reduces water accumulation and subsequent water atomization from said blades.

2. The louver assembly of claim 1 wherein said louver blades are spaced apart by distances which allow laminar flow of air therethrough while preventing turbulent air flow.

3. The louver assembly of claim 1 wherein the cross section of said troughs are rhomboidal and wherein said lip portions slope angularly downwardly to enable water to drain therefrom.

4. A penthouse louver assembly comprising:
- at least two sets of louver blade assemblies having mitered edges for being adjacently mounted at right angles to one another to form a corner for attachment over the upper corner of a penthouse,
- said louver blades sloping downwardly from back to front and having open-topped troughs formed along the lower edges thereof, said lower blades extending uninterruptedly across the full length thereof,
- said open-topped troughs having overhanging lips and bottoms extending generally parallel to the slope of the blades to facilitate laminar air flow thereacross,
- a cutout portion in the bottoms of said troughs of each said set of louver blades in the region of said

mitered edges to form a common aperture to drain water from said troughs,

said louver blades having upward rises in the mid-region thereof wherein water is allowed to freely flow downwardly into said troughs but is restrained from flowing upwardly along said blades,

a lip portion formed along the upper edges of each said blade and characterized by a relatively small vertical dimension thereby both preventing water from flowing over the upper edges and facilitating laminar air flow across the blades, and

brace means for being rigidly connected to the walls of a penthouse and extending outwardly to support said louver blades in the desired inclined position.

5. The penthouse louver assembly of claim 4 wherein each of said troughs has a rhomboidal cross section.

* * * * *