April 30, 1963 G. I. HOLMES 3,087,412

LOUVERED OUTSIDE AIR INTAKE

Filed April 6, 1961

FIG. 1

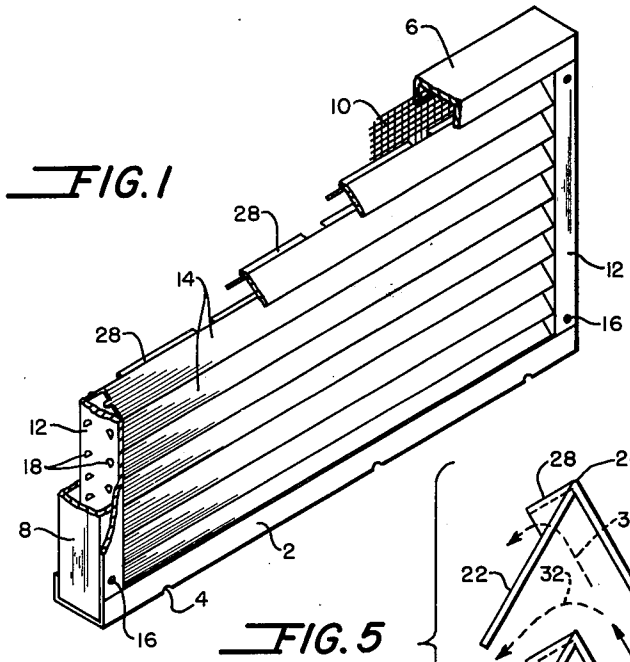


FIG. 5

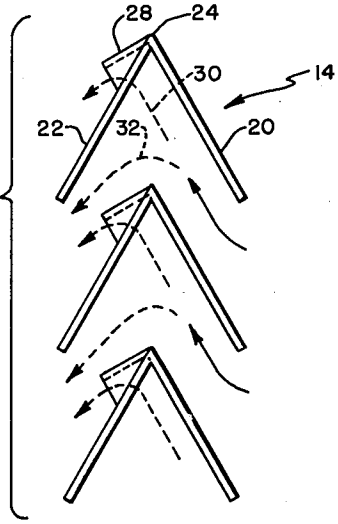


FIG. 2

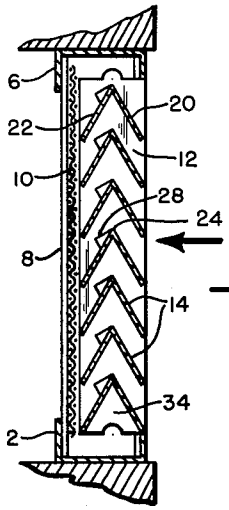


FIG. 3

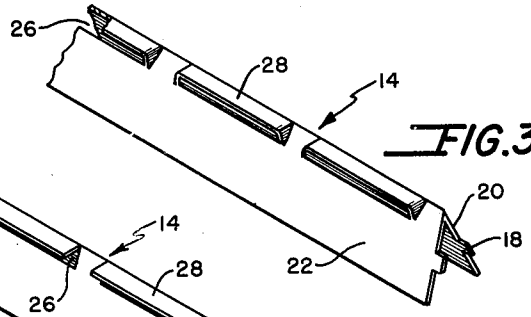
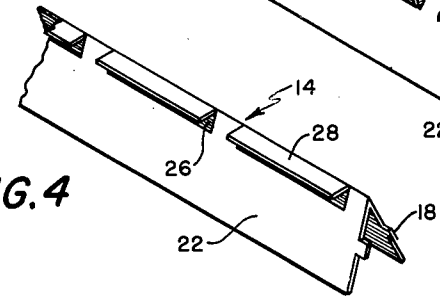


FIG. 4



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LOUVERED OUTSIDE AIR INTAKE

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This invention relates to an improved outside air intake of the chevron louver type. Such intakes are typically formed of a series of vertically-spaced, chevron-shaped louver blades disposed to extend horizontally across an air inlet opening to permit outside air to pass therethrough but to preclude the passage of rain, snow and other foreign matter.

The angle between the blades or legs forming the chevron cross-section of each blade is normally intended to be such that a sufficiently tortuous path is formed between adjacent chevrons that the foreign matter is substantially blocked while adequate outside air can enter without undue resistance to flow. This condition preferably should exist even though at times high velocity and gusty winds directed toward the exterior face of the intake are encountered.

It is generally known that decreasing the included angle of each chevron serves to more effectively block the entrance of unwanted foreign matter and tends to make passage of gusts of wind through the intake more difficult. However this also increases the resistance of the intake to air flow so that in effect the air flow capacity of the intake under a given pressure condition is reduced. An ancillary but important advantage of chevrons having a reduced included angle is that the intake is correspondingly decreased in depth with a resultant substantial saving of material.

Accordingly, the object of this invention is to provide an outside air intake of the chevron louver type so constructed that although chevrons with reduced included angles are used so that the advantages to be obtained thereby are effected, the construction is such that a commensurate increase in air flow resistance to be expected from the reduction in angle does not result.

This object is attained, in accordance with the principles of my invention, by providing a series of chevron louvers arranged in the conventional spaced, superposed relation, but with each chevron having a sub-louver arrangement lying along its apex. The sub-louver arrangement takes the form of a series of slots extending along the apex of the chevron with a visor-like tab projecting in a downstream direction from the apex and overlying each slot. With this arrangement, the included angle of the chevrons may be considerably less than with typical chevrons. Consequently, the depth of the intake is substantially reduced, and the number of chevrons required to cover a given height is reduced, both reductions resulting in a savings of material. Further the air flow capacity is only slightly reduced and the intake more effectively blocks the entrance of foreign matter and gusty winds under adverse weather conditions.

The invention will be further described in connection with the accompanying drawing illustrating several embodiments incorporating the principles of the invention by way of example and wherein:

FIGURE 1 is an isometric view, partly broken away and in section, of an air intake incorporating the principles of the invention;

FIGURE 2 is a vertical sectional view of the air intake as mounted in a building opening;

FIGURE 3 is a fragmentary isometric view of a chevron louver blade of the invention illustrating one form which the sub-louvers may take;

FIGURE 4 is a fragmentary isometric view of a chevron louver blade illustrating another form which the sub-louvers may take; and,

FIGURE 5 is an end view of a series of chevron louver blades for illustrating the flow path of air therethrough.

Referring to the drawing, the air intake includes an open-faced perimetric frame, a bird screen panel covering the downstream or rear opening, and a louver blade assembly adapted to be inserted from the upstream or front side to extend across the frame interior and secured to the frame at its ends. The illustrated frame is formed of a series of inwardly-directed channel members including a sill channel 2 usually provided with a series of weep-holes 4 spaced along the lower front corner, a head channel 6, and opposite end channels 8. The sill channel 2 and head channel 6 are slightly wider than the end channels 8 so that the end channels may be received between the flanges of the sill and head channel, and the overlapping flange corners so provided be secured by spotwelding.

The bird screen 10, which is say, ¼" mesh hardware cloth or the like, lies across the rear opening of the frame to prevent small birds, rodents and such from gaining entrance to the building through the intake.

The louver blade assembly is demountable from the frame and includes a pair of opposite, vertically-disposed L-shaped end members 12, and transversely extending chevron louver blades 14, hereafter simply termed chevrons, secured at their ends to the L-shaped members. When the louver blade assembly is mounted within the frame, the outwardly-directed front flanges of the end pieces 12 overlap the front face flanges of the end channels 8 and are secured thereto by suitable fasteners 16. The other leg of the end pieces 12 includes a pair of vertical rows of angled slots which receive end tabs 18 provided on the ends of each chevron.

The upstream or front leg of each chevron 14 is designated 20 and the downstream or rear leg 22. The chevrons are mounted in vertically-spaced relation and with their included angles being bisected by a vertical plane. The apex 24 of each chevron preferably projects slightly upwardly into the downwardly open trough of the successively higher chevron.

Adjacent the apex 24 of each chevron, a series of what are herein called sub-louvers are provided in the downstream leg 22. Each sub-louver may be considered as comprising a slot or elongate opening 26 extending along the apex 24, and a deflector or visor-like member 28 overlying the slot and formed of the material displaced from the plane of the downstream leg 22 to form the slot. The exact form of the sub-louvers may vary somewhat depending upon the chevron material and the manufacturing process used. Two examples of the forms which the sub-louvers may take are shown in FIGURES 3 and 4.

The number of sub-louvers, the length of each sub-louver and the space between adjacent sub-louvers provided on a single chevron may vary considerably. Preferably each sub-louver should be as long as possible without unduly weakening the chevron and permitting a flutter of the downstream leg. The space between adjacent sub-louvers on a single chevron may be a minimum of, say, ½" when the chevrons are formed of 14 gauge steel for example. While it is not necessary that the sub-louvers of the different chevrons be aligned in a vertical direction, from the standpoint of manufacturing economy it is preferable that each chevron be the same, and consequently the sub-louvers will be vertically aligned.

Chevron louver air intakes are frequently used with classroom unit ventilators wherein air flow is induced through the intake when the unit ventilator fans are operating. For such intakes, the included angle of the chevrons has typically been about 90°. By providing the sub-louver arrangement described, the included angle can be reduced to about 60° without inordinately re-

ducing the air flow capacity of the intake. By reducing the included angle to that extent the thickness of the air intake is reduced by about 30%. Further, since the legs of the chevron are correspondingly more steeply inclined by the reduction in included angle, the height of each chevron is increased by about 22%. Consequently the number of chevrons required in a given height air intake is reduced by about this percentage. The savings in material resulting from the reduced number of chevrons required and the shallower frame required is substantial from the standpoint of manufacturing economy. The shallower frame also lends itself for use in the relatively thin curtain wall building construction.

While there is some sacrifice in capacity of the air intake in the sense of the air intake having a greater air flow resistance when the chevrons have included angles of 60° rather than 90°, the provision of the sub-louver arrangement effects a change in the air flow characteristics of the air intake so that the reduced capacity of the air intake is only about 10%. This reduction is outweighed by the improved performance of the intake in other respects, and the savings in material and space.

The exact flow pattern of the air through the intake and the pressure conditions existing at various locations between the chevrons is not known with any degree of preciseness. However, it is believed that because of the sub-louver arrangement a part of the air which enters between any two chevrons passes through the slot **26** of the upper chevron and is then deflected downwardly by the deflector **28** to flow closely along the upper surface of the upper chevron downstream leg **22**, and may thereby pull down and smooth out the flow pattern of air passing around the apex of the upper chevron. As illustrated in FIGURE 5, the dotted line paths **30** indicate the air flowing through the sub-louvers while the dotted line paths **32** indicate the flow path of the remainder of the air. Thus it may be that the flow of air along path **30** through the sub-louver smooths out the flow of the remainder of the air along path **32**. Another factor affecting the air flow is the venturi-like passageway formed between the deflector **28** of one chevron and the downstream leg **22** of the next higher chevron. Considering the effect of the venturi on the flow patterns, it may be that the low pressure resulting from the passage of air along path **32** through the venturi causes a higher velocity flow of air along path **30** through the sub-louvers.

It will be noted in FIGURE 2 that the lowest chevron forms what is called a blind louver with the sill channel **2** in the sense that the bottom edge of the upstream leg **20** of the lowest chevron substantially meets the upstanding front flange of the sill channel **2** so that a forwardly-closed pocket **34** is formed between the lowest chevron and the sill channel **2**. With the sub-louver arrangement provided on the lowest chevron however, the venturi effect will cause some air to be aspirated out of this pocket, the air being aspirated out of the sub-louver being drawn into the dead air pocket **30** from between the upstanding rear edge of the downstream leg **22** of the lowest chevron. This circulation of air into and through the pocket **30** will tend to increase the rate of the evaporation of any moisture in the pocket.

The invention claimed is:

1. In an air intake of the type having separate, horizontally extending chevron-shaped louver blades disposed in superposed spaced relation: sub-louver means provided along the apex of each chevron blade, said sub-louver means including a slot in one leg of said chevron and extending along said apex, and an air deflecting tab projecting from said apex and overlying said slot to form, with the other leg of said chevron, an included angle greater than the included angle between the two legs of said chevron.

2. The air intake of claim 1 wherein: said included angle between said chevron legs is about 60°; and said included angle between said tab and said other chevron leg is about 90°.

3. An air intake comprising: an open-faced perimetric frame adapted to be mounted in an opening in the wall of a building structure; a series of separate chevron-shaped louver blades extending horizontally across said frame in vertically spaced relation with the apex of each blade lying approximately in a plane defined by the lower longitudinal edges of the successively higher blade; and a series of sub-louvers extending along the apex of each of said chevron-shaped blades, each sub-louver comprising a slot lying parallel to said apex and an air deflector projecting from said apex in a downstream direction to overlie said slot.

4. The air intake of claim 3 wherein: said deflector comprises material displaced from said blade to form said slot.

5. An air intake comprising: a perimetric frame; a series of separate chevron-shaped louver blades having included angles of about 60° extending horizontally across the open area of said frame in vertically aligned and spaced relation with the apex of each blade projecting through the plane in which the bottom longitudinal edges of the successively higher blade lies, each blade having a series of sub-blades projecting in a downstream direction from the apex of the blade, each sub-blade overlying a corresponding slot extending along the apex of said blade.

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