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AUTOMATIC VENTILATING SHUTTER

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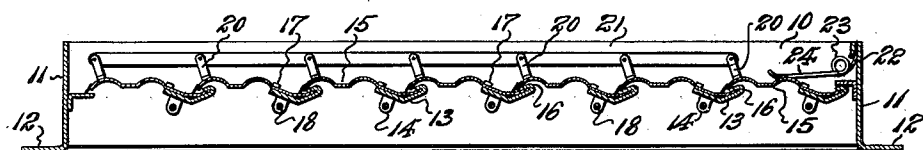


Fig. 2

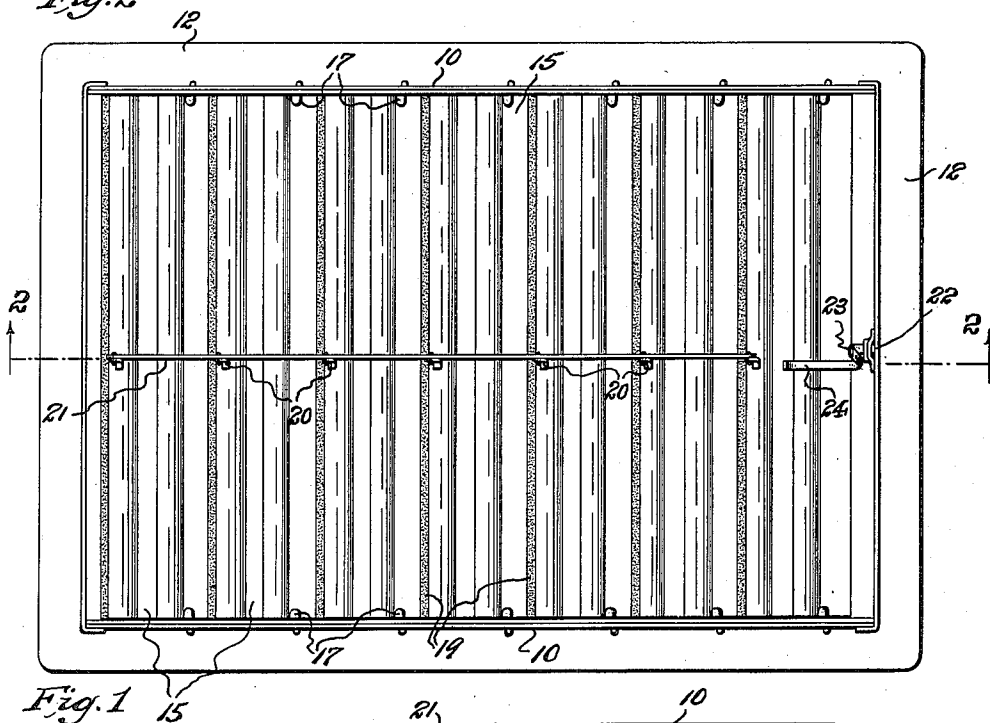


Fig. 1

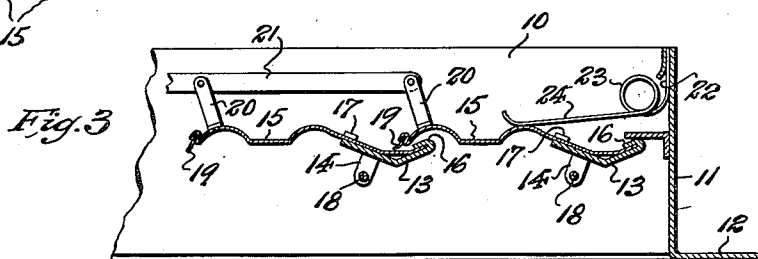


Fig. 3

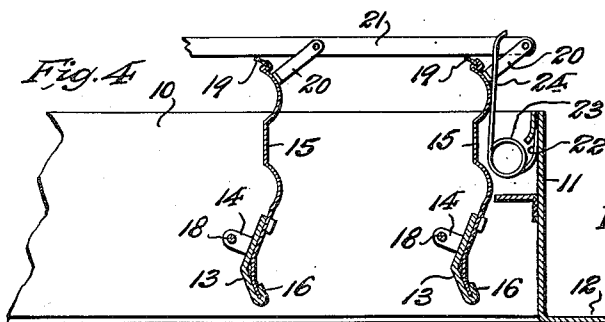


Fig. 4

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AUTOMATIC VENTILATING SHUTTER

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4 Claims. (Cl. 98-119)

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This invention relates to automatic ventilating shutters of the type which are self-closing but which open in response to the pressure of air flow directed against the inner side thereof, as e. g. by the operation of a ventilating fan.

The invention has for an object to provide an improved construction of automatic ventilating shutter of the kind stated which is especially adapted for horizontal installation in ceilings or like locations, and which comprises a series of interconnected pivoted louvers counterbalanced to close by gravity, additional means being provided, which is operative when the louvers are open, to exert upon the open louvers an initial closing thrust independent of gravity, whereby to positively initiate closing movement of the louvers when pressure of air flow against the inner sides thereof is interrupted, thus preventing risk of the louvers becoming stalled in open condition when said air pressure is discontinued.

Other objects of the invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is an exterior plan view of an automatic ventilating shutter according to the invention, the same being shown in normal closed condition; Fig. 2 is a longitudinal sectional view of the same, taken on line 2-2 in Fig. 1; Fig. 3 is a fragmentary longitudinal sectional view of the closed ventilating shutter similar to that of Fig. 2, but drawn on an enlarged scale; and Fig. 4 is a view similar to that of Fig. 3, but showing the ventilating shutter in fully open condition.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to the drawings, the ventilating shutter comprises a preferably rectangular frame formed by side walls 10 and end walls 11, and which is provided with a surrounding outwardly extending base flange 12.

Pivotaly mounted within the frame are a series of shutter members which are preferably arranged to extend across the frame between the side walls 10 thereof.

Each shutter member comprises a suitably shaped carrier bracket 13 having hinge ears 14 projecting from opposite ends thereof at points adjacent the forward or outer margin of the

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same. Said carrier bracket is preferably made of comparatively heavy stamped sheet metal. Mounted on the carrier bracket 13 is a louver 15 which is preferably made of light sheet metal, such e. g. as aluminum, but which may, if desired, be made of other material, such as pressed wood, sheet plastic material, or the like. The louver 15 may be affixed to and so as to be unitary with the carrier bracket 13 in any suitable manner and by any suitable means. Illustratively, as shown, the rearward longitudinal marginal portion of the louver 15 is secured to the carrier bracket by a clamping clip portion 16 which is doubled back from the inner or rearward longitudinal margin of the carrier bracket, so as to embrace and grip said rearward longitudinal marginal portion of the louver. The louver 15 is further secured to the carrier bracket by fastening lugs 17 which extend from the ends of the latter and which are in-turned over and around the ends of the louver.

The shutter members are pivotally supported within the frame by pivoting cross rods 18 which are affixed to the frame to extend between the side walls 10 thereof, and which pass through the hinge ears 14 of the carrier brackets 13. The spaced relation of the shutter members is such that, when the same are closed, the forward or outer longitudinal marginal portions of the louvers 15 will lap the rearward or inner marginal portions of next adjacent louvers. If desired, the forward or outer longitudinal margins of the louvers 15 may be edged with flexible sealing material 19, such e. g. as a strip of felt, rubber or similar material. Said flexible sealing material 19 may be secured to the louver edges by any suitable holding or fastening means.

The shutter members are suitably linked together so as to simultaneously move to their open or closed positions. The means for so linking the shutter members comprises the provision of a lever arm 20 which is affixed to the free or outer face or side thereof. These lever arms 20 are coupled one to another by a common tie bar or link 21 to which the ends of the lever arms are pivotally connected.

The hinge ears 14 of the carrier brackets 13 are disposed in forwardly offset relation to the relatively rearward portions of said carrier brackets so that the latter counterbalance the major part of the weight of the forwardly extending free end portions of the louvers 15 and their interconnecting lever arms 20 and tie bar or link 21. This counterbalancing effect is care-

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fully calculated so that, although the louvers 15 will tend to move to closed positions under gravity, i. e. have a slight closing bias when in or near closed positions, yet the balance is such that the louvers will readily respond to the thrust of air flow pressure directed against their inner faces, so as to quickly and easily open under the influence of such pressure.

It has been found, especially when the ventilating shutter is horizontally disposed, as in the case of a ceiling installation thereof, that, under strong air flow pressure, the louvers swing up to an upstanding fully open position (as shown in Fig. 4), the weight of the free end portions of the louvers 15 together with that of their lever arms 20 and the interconnecting tie bar or link 21, may be carried across a dead center line perpendicular to the pivotal points of the shutter members as provided by the cross rods 18, with the consequence that gravity cannot properly exercise its force to initiate closing movement of the shutter members when air flow pressure against the latter ceases. This opening bias is, of course, undesirable, and to overcome the resultant tendency of the shutter members to stall in open positions under such circumstances, the instant invention provides means to initiate a closing thrust against said shutter members when air flow pressure is reduced or ceases. This means comprises a special form of suitably located spring member having a base or butt section 22 which is suitably affixed to the inside surface of an end wall 11 of the frame exteriorly of the shutter members. Said base or butt section 22 terminates in a convolute section 23, providing at least one convolution, from the outer end of which extends an elongated free end portion or arm 24. The free end portion or arm 24 of the spring member extends over the louver 15 of the shutter member which is adjacent said end wall 11, so as to bear against the same at a point outwardly or forwardly of the pivotal connection of said shutter member to the frame. When the shutter members are disposed in closed positions, the convolute section 23 of the spring member is expanded and substantially fully relaxed, so that the spring member exerts practically no tensional thrust upon said shutter members, and consequently offers but little resistance to initial opening movement of the shutter members under the thrust of air flow pressure upon the inner faces thereof.

When the shutter members swing up to open under the thrust of applied air flow pressure, the arm 24 of the spring member is also upswung with the shutter member engaged thereby. The effect of such upswinging movement of the spring member arm 24 is to exert a contractive winding torque upon the convolute section 23 of the spring member, which, as such upward movement continues, gradually increases the reactive tension of the convolute section. The tension of the convolute section 23 accumulates so gradually that it offers but little resistance to initial and intermediate phases of the opening movement of the shutter members in response to the applied air flow pressure. When, under strong air flow pressure, movement of the shutter members disposes the same in an upright fully opened condition (as shown in Fig. 4), wherein gravity closing may be impeded as above explained, the convolute section 23 of the spring member will have been wound to maximum tension. When the tension of the convolute section 23 is thus at a maximum, such tension is sufficient to exert

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an initial closing thrust upon the shutter members which is strong enough to overcome any tendency of the latter to stall in fully open condition after air flow pressure upon the same ceases.

Preferably the spring member is formed from a thin strip of spring steel or the like, since such form thereof is best adapted to provide desired flexibility and low or light tensional reaction such as to offer but little resistance to shutter opening movements, and yet under a condition of maximum stored tension sufficient to effect the desired initial closing thrust upon the fully open shutter.

Having now described my invention, I claim:

1. An automatic ventilating shutter for ceiling installation comprising a vertically open horizontal frame, a plurality of parallel louver members pivotally mounted across the frame opening on longitudinal axes lying substantially in a horizontal plane to swing upward and outward from lapped closed positions toward upstanding open positions under the influence of upward air flow through said opening, each louver member being constructed and arranged in relation to its pivotal axis to provide a free upwardly opening portion extending forwardly from said axis and a counterbalancing portion extending rearwardly therefrom, a tie-rod linking the forwardly extending portions of all louver members for simultaneous opening and closing movements and being disposed with its weight supported by said forwardly extending portions and thereby tending to close the same, each rearwardly extending portion of the louver members counterbalancing the weight of the forwardly extending portions of the tie-rod to afford slight closing bias to said louver members with their tie-rod load when in or near closed positions and to afford opening bias when in fully open positions, and spring means for resisting opening movement of the louver members and operable to overcome the opening bias produced by the counterbalancing portions thereof upon cessation of airflow.

2. An automatic ventilating shutter as defined in claim 1, wherein the spring means cooperative with the louver members is in the form of a leaf spring having a base affixed to the shutter frame adjacent to the rearwardly extending portion of a terminal louver member, said spring having an arm extending substantially horizontally in overlying relation to said terminal louver member in relaxed condition with its free end bearing against the upper surface of the forwardly extending portion thereof comparatively close to the pivotal axis thereof and adapted for sliding contact with said surface during louver opening and closing, whereby the contact will be at a location more remote from the pivotal axis when the louver is open to increase the leverage of closing action.

3. An automatic ventilating shutter as defined in claim 1, wherein the spring means cooperative with the louver members is in the form of a leaf spring having a base affixed to the shutter frame adjacent to the rearwardly extending portion of a terminal louver member, said spring having an arm connected to the base thereof by a convolute section and normally supported thereby in substantially parallel relation to the said terminal louver member in overlying relation thereto with its free end bearing against the upper surface of the forwardly extending portion of said louver member, said spring be-

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ing in relaxed condition when the louver members are closed and in contact with said terminal louver member at a location comparatively close to the pivotal axis thereof and being adapted for sliding contact therewith during louver opening and closing, whereby the contact will be at a location more remote from the pivotal axis when the louver is open to increase the leverage of closing action and whereby flexing of the spring will be restricted principally to the convolute section thereof.

4. An automatic ventilating shutter as defined in claim 1, wherein the means for pivotally mounting each louver member includes hinge ears affixed to said member and disposed to project downward when the louver member is in closed position and having their free ends pivoted in the shutter frame, whereby when the louver members are fully open the weight of each of said members and a proportionate part of the weight of the tie-rod will be supported by the hinge ears as substantially horizontal lever arms to increase the leverage of opening action.

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