March 19, 1929. O. K. DYER 1,706,280

AUTOMATIC SHUTTER

Filed Aug. 7, 1925

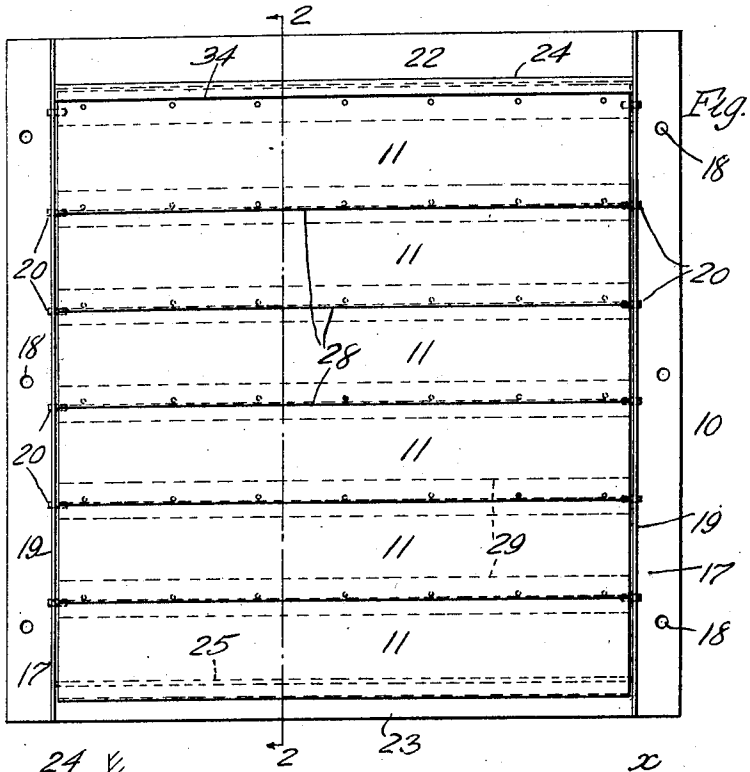


Fig. 1.

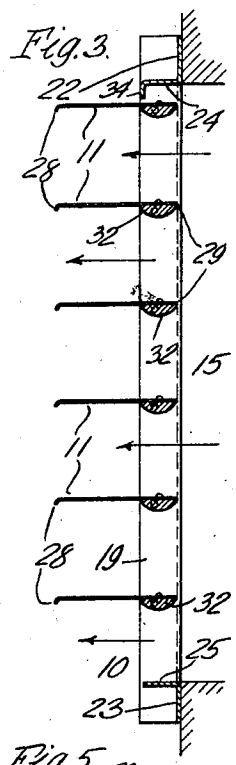


Fig. 3.

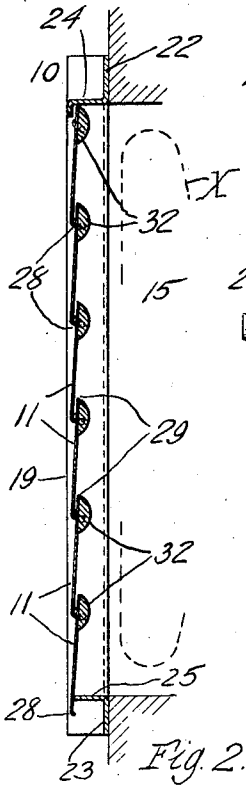


Fig. 2.

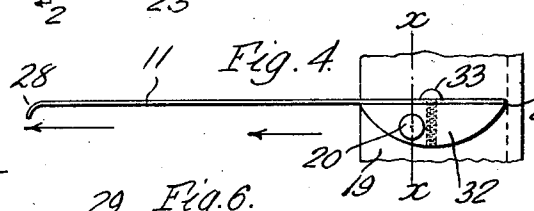


Fig. 4.

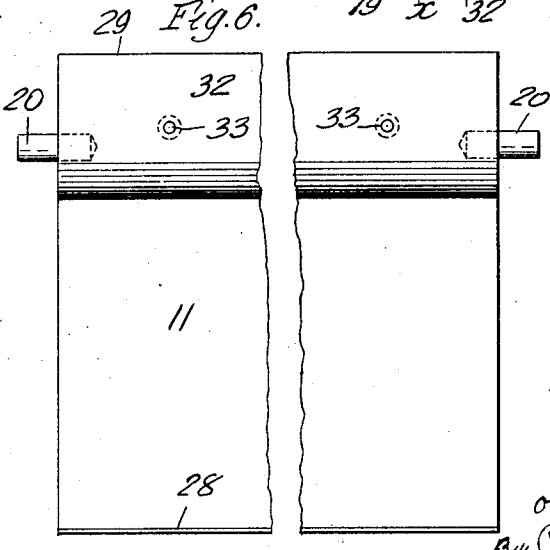


Fig. 6.

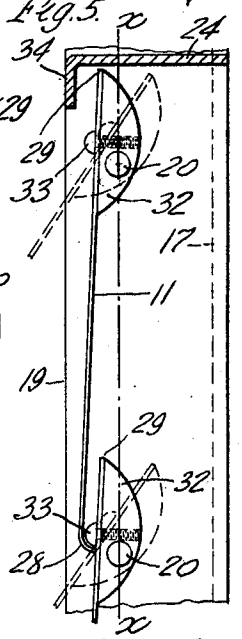


Fig. 5.

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AUTOMATIC SHUTTER.

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This invention relates to improvements in ventilators or shutters of the so called louver type, such as are used, for instance, in connection with ventilating fans and which are opened by the pressure created by air currents from the fan and automatically close when the fan is idle, so as to seal the ventilating opening against the elements.

These devices are generally arranged with the separate blades or vanes extending horizontally and disposed one above another, and means are usually provided for connecting all of the vanes so that they move in unison to and from open position. In some of the constructions heretofore provided the pivots of the several vanes are disposed in a vertical plane, and under these conditions it has been found difficult to maintain all of the vanes with their edges in contact with adjacent vanes to close the spaces between them so that such shutters fail to entirely prevent the entrance of the elements. Other shutters have been constructed so that the plane of the pivotal axes of the shutter vanes is downwardly and outwardly inclined so that the vanes would move effectively and engage one another and close the spaces between them. These latter constructions are objectionable for the reason that they project too far out of the opening or beyond the surface of the wall to which they are attached and are not compact, and in those constructions wherein the several vanes of the shutters are connected to move in unison, considerable additional expense for labor and material in manufacture is entailed.

One of the objects of the present invention is to provide an improved and simplified shutter or ventilator of the character mentioned, consisting of relatively few parts adapted to be inexpensively made and assembled; also to provide a shutter having a plurality of vanes which have their pivots disposed in a vertical plane so that the shutter will be compact, and to provide means for effecting a tight closure of said vanes; also to construct a shutter in which the vanes are independently operable and are in no way connected to each other; also to provide a shutter which is constructed so as to be readily opened and maintained in open position by the air currents passing therethrough and which will quickly and positively close when the air pressure ceases, and in which the vanes are constructed so that the lower edges of the vanes will be yieldingly held in firm engagement against the outer faces of the vanes next below to tightly close the shutter, and whereby inward pressure will be maintained upon the edges of the vanes, causing them to remain firmly in contact with adjacent vanes so that rattling of the vanes one upon the other will be practically eliminated.

Another object of the invention is to provide weighted means for each of the vanes of the shutter and to pivotally mount the vanes in the frame of the shutter in such a manner that when the shutter is in closed position, the center of gravity of the weighted means of each vane will be disposed so as to assist the lower edge of the vane in maintaining contact with the face of the vane next below, and so that as the vane moves from closed to open position, the center of the gravity will be gradually moved, whereby the weighted means will then act to substantially counterbalance the vane so that a relatively slight air pressure is required to maintain the shutter vanes steadily in open position.

Other objects are to improve ventilators or shutters in the other respects hereinafter specified and claimed.

In the accompanying drawings,

Fig. 1 is a face view or front elevation of the outer side of a ventilator or shutter embodying this invention, and showing the same in closed position.

Fig. 2 is a vertical, transverse section thereof on line 2—2, Fig. 1.

Fig. 3 is a similar view showing the shutter vanes in open position.

Fig. 4 is an end elevation or edge view of one of the vanes of the shutter in open position.

Fig. 5 is a similar view showing a vane in closed position.

Fig. 6 is an elevation of the rear face of the two opposite end portions of one of the vanes of the shutter.

The ventilator or louver comprises, as usual a frame or support 10, and a plurality of horizontal vanes or shutter members or louver plates 11, pivoted at their ends in the frame 10 so as to depend with their lower edges slightly overlapping the vanes below, so that the frame opening is entirely closed. The frame 10, generally, may be of any usual or suitable form and construction, that shown being of rectangular shape to fit around an opening 15 (see Figs. 2 and 3) in a wall or

surface and through which air currents are passed by a fan X, as indicated in dotted lines in Fig. 2. The frame is preferably formed of members of angle shaped cross section and includes side uprights which provide lateral flanges 17 adapted to engage and be secured to the supporting surface by suitable fastenings passing through holes 18, and outwardly extending vertical flanges 19 in which the vanes 11 are pivotally supported by pivot studs or pintles 20 projecting from the ends of the vanes into holes in said flanges 19. The frame is completed by an upper horizontal cross piece 22 and a lower horizontal cross piece 23 having outwardly extended flanges 24 and 25 respectively.

The vanes 11 are each suitably formed of rectangular sheet metal plates extending between the side flanges 19 of the frame with their ends adjacent thereto, and the lower edge 28 of each vane is disposed so as to overlap the upper edge 29 of the vane next below and engage the outer face thereof adjacent said upper edge.

In accordance with the invention, the vanes 11 are formed or provided with gravity actuated means in the form of a weighted member, so disposed relatively to the axes of the pivots 20, that, while the vanes are in their closed or upright position, the center of gravity of each of the vanes is located outwardly well beyond the pivotal axes thereof, with the result that the vanes have a considerable tendency to swing on their pivots in a direction to cause an inward movement of their lower edges. Thus the lower edges 28 of the vanes are yieldingly but firmly pressed inwardly against the faces of the adjacent vanes. When, however, the fan X is started, and the air currents therefrom impinge upon the rear faces of the vanes 11, the vanes are caused to swing outwardly upon their pivots to a substantially horizontal position, and the resistance of the vanes to the air pressure during this movement is gradually decreased because of the fact that the center of gravity of each of the weighted vanes moves gradually toward the vertical plane of its pivotal axis. When the vanes are in their wide open positions, there is only a slight tendency of the vanes to close, and very little air pressure is required to keep the vanes in their wide open positions.

For the purpose of effecting the above results each vane 11, in the particular construction shown, is provided with a relatively heavy horizontal cross bar or rod 32 of "half oval" cross section having its flat face engaging the rear face of the vane adjacent its upper edge, said bar being secured to the vane by screws 33 or the like. The bars 32 extend from end to end of the vanes, and the pivot studs 20 are preferably secured in the ends of the bars, below the minor axes and considerably in rear of the flat faces thereof, as shown in Figs. 4 and 5. In these figures, the vertical plane of the pivots 20 is indicated by dot and dash lines x—x, and it will be seen that when the shutter is closed (Fig. 5.), the larger portion of the mass comprising the bars 32, is disposed outwardly beyond the line x—x with the result that the lower edges of the vanes are yieldingly held against the faces of the vanes next below. In the movement of the vanes to open position, the center of gravity of each vane moves toward the line x—x (see the intermediate position in dotted lines Fig. 5), and thereafter the bars 32 act in conjunction with the air pressure to enable the vanes to be easily swung to full open position. In such open position the weight of that portion of the vanes which is disposed at the inner side of the vertical plane x—x is a little less than the weight of those portions of the vanes which are disposed outwardly beyond the pivots so that the vanes float on their pivots and are substantially counterbalanced and only a slight amount of air pressure is necessary to maintain the shutter in open position. This result is further increased by curving the lower edges 28 of the vanes inwardly as shown, whereby the horizontally flowing air impinges upon these edges and causes the vanes to tip upwardly and be held more nearly in horizontal position than would be the case if the vanes were left flat. This arrangement also permits the vanes to be held steadily in open position and a more even and uniform discharge of air with a minimum of resistance thereto results. It will be noted that by means of the arrangement described all of the weight of the vanes and the greater part of the weight of the bars act to hold the vanes in their closed positions and that consequently a great deal more air pressure is required to move the vanes initially out of their closed positions, but when in this position, the full pressure of the air is available to effect movement of the vanes while during the latter part of the movement of the vanes into their open position much less pressure is exerted on the vanes by the air, and by means of the construction described, much less pressure is required to effect this movement.

It will be noted that the lower edges 28 of the vanes engage the faces of the vanes beneath, and approximately opposite to the pivotal axes thereof, whereby the pressure of the vanes one upon another will not tend to open the shutter, as would be the case, for instance, if the lines of engagement were disposed above the pivotel axes. By means of the construction described no connection between the several vanes is required to ensure the closing of all the vanes. If for any reason one of the vanes should stick or tend to remain open after the shutting down of the fan, the next vane above would strike the

open vane at an angle thereto and at a distance from the pivot so that the open vane would be closed thereby. By eliminating the connection frequently employed between vanes, the construction of the device is simplified and furthermore the vanes move more readily into either open or closed position. If the vanes should move into a position above the horizontal, the center of gravity would shift to the vertical line x—x, so that there would be no tendency of the vanes to close, but the air currents from the fan will then again force the vanes into their horizontal positions.

If all of the forces and influences acting upon each vane are resolved into a common force in order to determine its influence upon the vane, it will be noted as by reference to Fig. 5, that this resultant force acts through the center of gravity of the vane and its pivot and that when the vanes are closed this center of gravity will be in front of the vertical line x—x and slightly below a horizontal plane in the pivotal axis of the vane. With the center of gravity so located, it will be observed that as the vane moves outwardly into open position, there may be first a slight outward movement of the center of gravity, but thereafter the movement of this center of gravity will be toward the line x—x with the result that the effective turning moment caused by the force acting at the center of gravity multiplied by its lever arm, which would be the horizontal distance between the center of gravity and the pivotal axis, decreases as the vane approaches its straight-out horizontal or open position. While the vane will have a bias to closed position whether in open, closed or partially closed positions, nevertheless, the bias tending to close the vane will increase as the vane moves from straight-out open position towards depending closed position throughout at least the major portion of the movement of the vane from open to closed positions. Thus, the minimum force will be required to hold the vane in its open position. This is a particular advantage for the reason that when the vanes are closed, the impact of the air current thereon causes the maximum force on the vanes, tending to open the same, and that as the vanes move to open position, the force of the air on the vanes decreases. Since, however, with this novel arrangement and construction of vanes, the bias tending to move each vane from open to closed positions decreases as the vane opens, the decreasing force of the air currents striking the vanes will still be sufficient to entirely open the vanes and hold them open against the action of the bias so long as the air current continues.

The lower edge portion of the bottom vane is adapted to overlap and engage the outwardly extended flange 25 of the bottom cross piece 23 of the frame 10, thus effectually sealing this part of the shutter against the elements when closed, while the top part of the shutter is likewise sealed by a downturned extension or bend 34 formed on or secured to the outer edge of the horizontal flange 24 of the top cross piece 22 of the frame, and overhangs the upper edge 29 of the top vane 11.

I claim as my invention:

1. A shutter having a frame, a plurality of pivoted vanes adapted to be moved about substantially horizontal axis into a substantially horizontal position by a current of fluid, said vanes, when closed, occupying substantially upright positions, each of said vanes including a sheet metal body portion secured at one edge to a bar, pivots extending from said bar and bearing in said frame, and said pivots being so disposed with relation to said bar that when the vane is in its closed position, the weight of the bar tends to yieldingly hold said vane in its closed position, and when said vane is open, the weight of said bar partly counterbalances the weight of said sheet metal portion, whereby very little pressure is required to hold said vanes in their open positions.

2. In a shutter of the character described the combination of a frame, a plurality of separate, independently mounted vanes having substantially parallel upper and lower edges and having pivots arranged at opposite ends adjacent their upper edges and bearing in said frame, said pivots being all disposed in a vertical plane, whereby said vanes are adapted to depend in a substantially vertical closing position with their lower edges overlapping the upper edges of the vanes next below and are movable on said pivots to an outwardly extending, substantially horizontal, open position when subjected to pressure from air currents passing outwardly through said shutter, a weighted member on each vane which is so disposed with relation to the pivotal axis thereof that when said vane is in depending, closed position the center of gravity of said member will be outwardly beyond said axis, thereby causing the lower edge of said vane to swing inwardly and be yieldingly held against the outer face of the vane next below to close said shutter.

3. In a shutter of the character described the combination of a frame, a plurality of vanes having substantially parallel upper and lower edges and having pivots arranged at opposite ends adjacent their upper edges and bearing in said frame, whereby said vanes are adapted to depend in a substantially vertical closing position with their lower edges overlapping the upper edges of the vanes next below, and are movable on said pivots to an outwardly extending, substantially horizontal, open position when subjected to pressure from air currents passing outwardly through said shutter, a weighted member on

each vane which is so disposed with relation to the pivotal axis thereof that when said vane is in depending closed position the center of gravity of said member will be outwardly beyond said axis, thereby causing the lower edge of said vane to swing inwardly and be yieldingly held against the outer face of the vane next below to close said shutter, while as said vane is moved to open position the center of gravity of said vane and weighted member will move toward the pivotal axis thereof into a position to decrease the resistance of said vanes to said air currents.

4. In a shutter of the character described, the combination of a frame, a plurality of vanes pivoted on said frame, each of said vanes being formed of a relatively light sheet of material and having substantially parallel upper and lower edges, a relatively heavy bar secured to the rear face of said vane adjacent its upper edge, and said pivots being secured in the opposite ends of said bar so that the center of mass of said bar may be disposed outwardly beyond said pivots to hold said vane yieldingly in substantially vertical closed position, and said center of mass of said bar being adapted to move to the opposite side of said pivots when said vane is subjected to pressure from air currents passing outwardly through said shutter, whereby said vane is floatingly maintained in open position by the cooperation of the weight of said bar with said air currents.

5. In a ventilating shutter device, a vane pivoted freely upon an approximately horizontal axis, the center of gravity of the vane being so positioned relatively to said axis as to bias said vane into closed depending position with a greater turning movement when said vane is in said closed position than when in its open and approximately horizontal position.

6. In a ventilating device, a conduit, a vane disposed across the conduit and pivoted freely upon an approximately horizontal axis, the center of gravity of said vane being eccentric of said axis and located, when the vane is in depending closed position, slightly below but close to the horizontal plane of said axis and at the side of the vertical plane of the axis toward which the vane moves into open position, whereby said vane will always be biased into depending closed position in all positions between said open horizontal and depending closed position, which bias will increase in effect upon said vane during at least the major portion of its movement from open horizontal to depending closed position.

7. In a ventilating shutter device, a vane pivoted freely upon an approximately horizontal axis for movement between a depending position and an approximately straight out position, the center of gravity of said vane when said vane is in depending position being forwardly of a vertical plane through said axis and in proximity to a horizontal plane through said axis, whereby when said vane aproaches straight out position from depending position, the center of gravity of the vane will move towards said vertical plane to decrease the closing moment on said vane caused by gravity.

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