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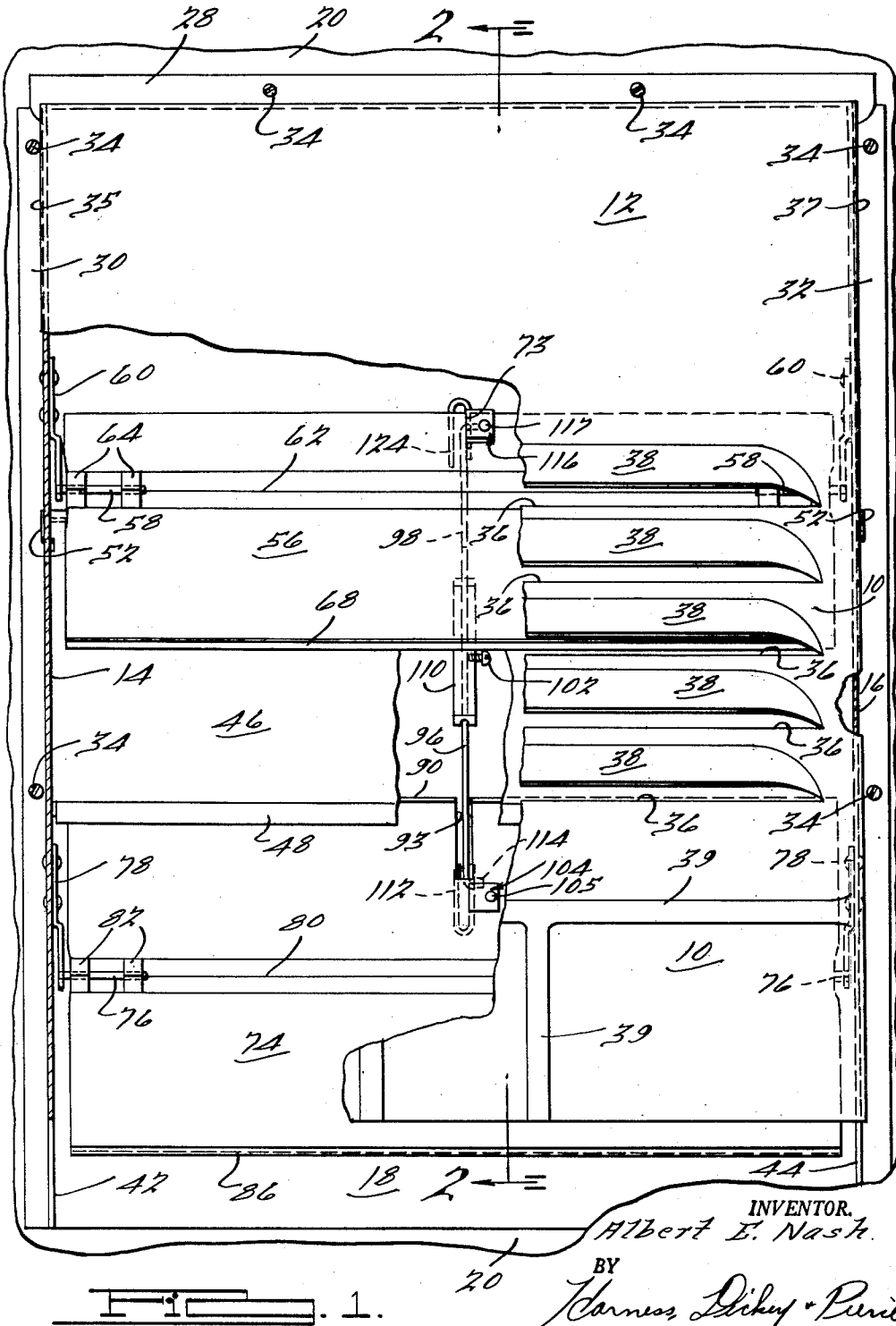
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AUTOMATIC DISCHARGE HOUSING

Filed May 31, 1961

2 Sheets-Sheet 1



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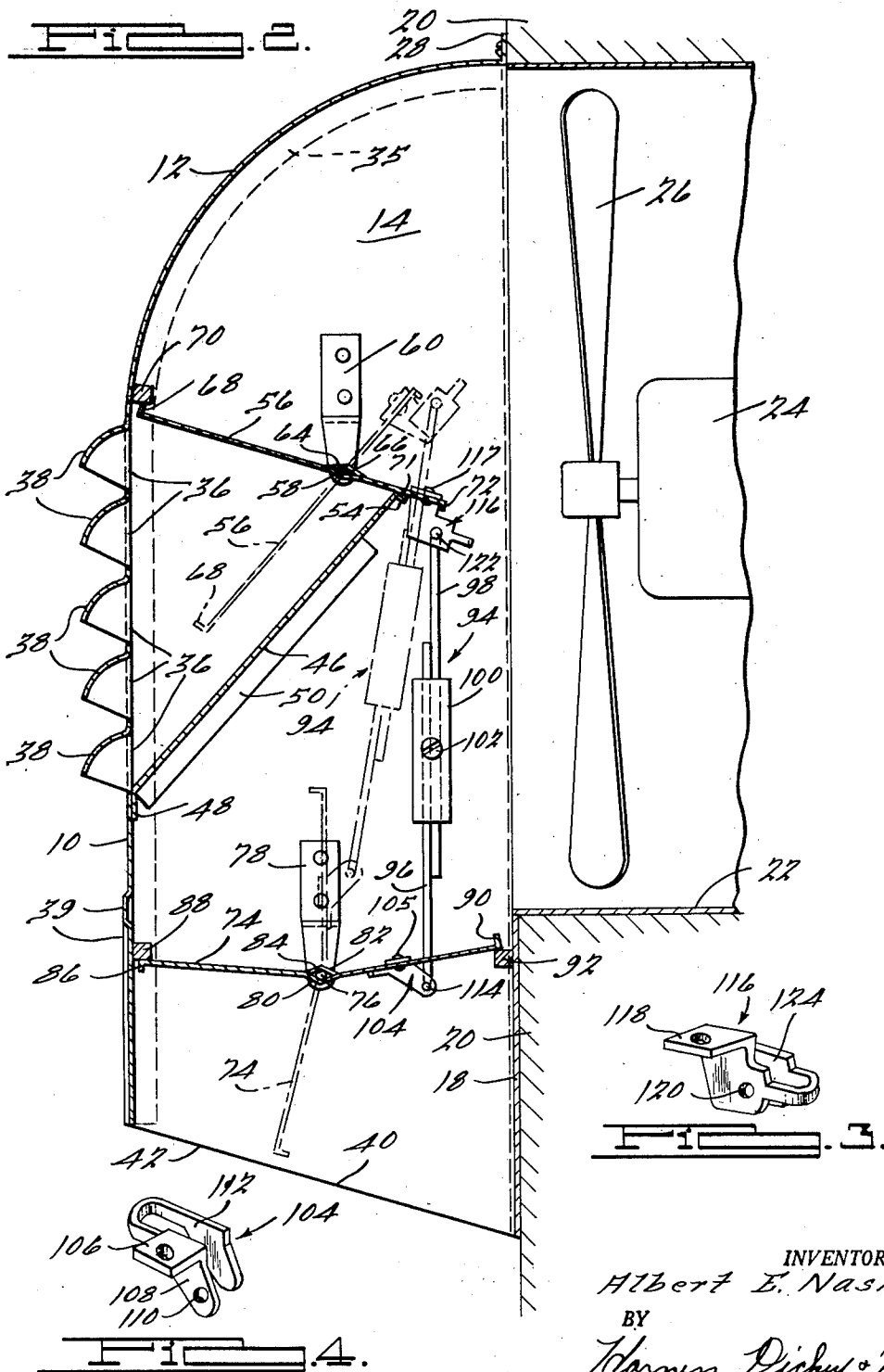
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INVENTOR.
Albert E. Nash
 BY
Korness, Dickey & Poiré
 ATTORNEYS

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AUTOMATIC DISCHARGE HOUSING

Albert E. Nash, Royal Oak, Mich., assignor to Ventrola Manufacturing Company, Owosso, Mich., a corporation of Michigan

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6 Claims. (Cl. 98-116)

The present invention relates generally to ventilation fans, and more particularly to a novel air-operated automatic discharge housing therefor.

As is well known, most air-operated automatic discharge housings, such as those used with kitchen and home exhaust fans, are provided with a single discharge opening for exhausting the flow of air from the fan, this opening usually being provided at the bottom of the housing, opening downwardly, so that protection is provided against rain and other undesirable weather. However, in order to keep the housing to an over-all size suitable for installation on private homes, the discharge opening in the bottom is often restricted to a size which greatly increases the resistance of the air flow therethrough, thus decreasing the amount of air the fan could otherwise exhaust if it were not working at this increased static pressure. Furthermore, the shutters generally utilized to close the discharge opening in many presently available housings are so constructed that in a strong wind they flutter or rattle, creating a very unpleasant and reverberating noise throughout the building to which they are attached.

Accordingly, it is a primary object of the present invention to provide a novel air-operated automatic discharge housing of relatively simple and inexpensive construction which is provided with a plurality of discharge openings so arranged that the static pressure created in the housing by the air flow from the associated fan is greatly reduced, whereby a substantially greater amount of air can be exhausted by a given fan and motor unit or a slower and hence quieter fan may be used to obtain the same output flow.

A further object of the present invention lies in the provision of a discharge housing having a plurality of shutters for controlling a plurality of discharge openings, which shutters are of unique construction and are connected to one another by a novel linkage arrangement, the construction being such that one of the shutters is balanced with respect to its pivotal axis so that it has no tendency to open or flutter in the presence of strong winds and the like outside the housing, but which is so constructed that when the fan is turned on the discharge flow therefrom will quickly open it. A related object concerns the provision of a second shutter which is connected to the abovementioned shutter in such a way that when the latter is locked due to the balanced arrangement thereof when the fan is off this second shutter will also be locked, the arrangement being such, however, that when the fan is turned on the air flow therefrom will cause both shutters to quickly open.

Yet another object of the present invention concerns the provision of a discharge housing having a plurality of discharge openings and individual shutters therefor wherein novel linkage means are provided for interconnecting the shutters in such a way that gravitational force of the linkage itself will tend to maintain the shutters in a closed position when the fan with which the discharge housing is associated is not in operation.

These and other objects of the present invention will become apparent from consideration of the present specification taken in conjunction with the accompanying drawings, in which there are shown several embodiments of the invention by way of example, and wherein:

FIGURE 1 is a front elevational view, partly in section,

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of a discharge housing embodying the principles of the present invention;

FIGURE 2 is a transverse sectional view thereof, taken along line 2-2 in FIGURE 1; and

FIGURES 3 and 4 are perspective views of several parts thereof.

Broadly speaking, the present invention is directed to the provision of means for automatically controlling the discharge of air from ventilation fans and the like, and comprises a discharge housing having an inlet opening adapted to receive the discharge flow from a fan, means defining a plurality of discharge openings in the housing, a first shutter pivotally mounted on the housing for controlling the flow of air through at least one of the discharge openings, a second shutter pivotally mounted on the housing for controlling the flow of air through the remainder of the discharge openings, linkage means interconnecting the first and second shutters so that both shutters will open and close together, the linkage means being so positioned with respect to the pivotal axis of the shutters that the weight thereof tends to close both of them, and means disposed within the housing for directing air from the fan against the first shutter so that the force thereof will cause the latter to pivot to an open position.

Referring more particularly to the drawings, there is illustrated in FIGURES 1 and 2 a discharge housing embodying the principles of the present invention, comprising a generally vertically disposed outer wall portion 10 having an inwardly curved upper surface 12, a pair of end wall portions 14 and 16, and a back wall portion 18. The discharge housing is arranged to be secured to the side of a building or the like 20 having therethrough an opening in which is disposed a fan duct 22, the latter having secured therein in the usual manner a fan motor 24 having a blade 26. As can be seen, the discharge housing is positioned so that the upper edge of outer wall portion 10 is substantially flush with the upper edge of duct 22. To securely hold the housing in place, outer wall portion 10 is provided with a horizontally disposed upper flange 28, and side wall portions 14 and 16 are provided with vertically extending flanges 30 and 32 respectively, all three flanges being provided with suitably spaced apertures adapted to receive screws or the like 34 for tightly securing the entire housing to the building 20 in the manner illustrated. Inner wall portion 18 is secured to the housing and to building 20 in the usual manner, and side wall portions 14 and 16 are secured to outer wall portion 10 by means of inwardly directed flanges 35 and 37 on the latter which overlie the outwardly disposed edges of side wall portions 14 and 16, respectively. Suitable embossments 39 may be formed in outer wall portion 10 for purposes of reinforcement and ornamentation.

As can be best seen in FIGURE 2, the fan is adapted to discharge air from the interior of the building, to the left as shown in this figure. In generally axial alignment with this discharge flow of air there is provided a first discharge opening in the housing comprising a plurality of horizontally disposed louvered slots 36 in outer wall portions 10. Slots 36 are protected from the outside by means of louvers 33 in the usual manner. At approximately right angles to the axis of opening 38 and the direction of flow from the fan, there is provided another discharge opening 40. This discharge opening is in fact the open lower end of the discharge housing, and is defined by the lower edges of inner and outer wall portions 18 and 10, respectively, and upwardly and outwardly lower inclined edges 42 and 44 of side wall portions 14 and 16, respectively, as best seen in FIGURE 2.

In order to divide the discharge flow from the fan between the two discharge openings, and to direct the flow towards lower discharge opening 40 in the proper manner,

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as will be hereinafter described, there is provided a horizontally extending upwardly and inwardly inclined baffle plate 46. As best seen in FIGURE 2, baffle plate 46 is secured to the inside of outer wall portion 10 by means of a downwardly projecting horizontal flange 48, and to each of the side wall portions by means of a pair of downwardly extending flanges 50. Any suitable means may be used to secure the flanges to the discharge housing. In order to accurately position the baffle plates 46 within the housing, the former is provided at the upper edge thereof with a pair of outwardly extending tabs 52, as best seen in FIGURE 1, which project through suitably positioned elongated slots in side wall portions 14 and 16. If desired, baffle plate 46 may be maintained in position solely by means of tabs 52 and the attachment of flange 48 with outer wall portion 10. The upper edge of the baffle plate is provided with a narrow flange portion 54 for reinforcing purposes, and to serve as a stop, as will be apparent hereinafter. Thus, as can be seen, baffle plate 46 is so arranged that the upper edge thereof, at flange 54, is substantially the same level as the axis of fan motor 24, so that the discharge flow of air from the fan will be divided, with one portion thereof passing above baffle plate 46 and out through louvered slots 36 and the other portion thereof passing downwardly through opening 40.

To control the flow of air through discharge opening 36, there is provided an upper shutter 56 extending substantially the full width of the discharge housing and pivoted at each end about pivot pins 58 secured to a pair of brackets 60 mounted in horizontal alignment with each other upon end wall portions 14 and 16. Shutter 56 is provided with a longitudinally extending V-shaped groove 62, each end of which is provided with a pair of reversely bent portions 64 to define an opening 66 (FIGURE 2) for receiving a pivot pin 53. At the outward edge of shutter 56 there is provided an upwardly projecting flange 68 for purposes of reinforcement and to engage a horizontally disposed strip of sealing material 70, such as felt or the like, on outer wall portion 10 in order to effect a seal between the shutter and the interior of the housing. The shutter is substantially flat, and as can be seen, is so arranged that when flange 68 engages sealing strip 70 the inwardly disposed portion thereof engages the upper edge of baffle plate 46, at flange 54, as best seen in FIGURE 2. Another strip of sealing material 71 may be provided along flange 54 to effect a seal between shutter 56 and baffle plate 46. At the inwardmost end of shutter 56 there is provided a downwardly projecting flange 72 for purposes of reinforcement, and intermediate the ends thereof the shutter is provided with a relatively short transverse slot 73, for purposes to appear later. As can thus be seen, shutter 56 is adapted to close louvered opening 36 by transversing the space between the upper edge of the baffle plate and the outer wall portion immediately above the opening.

To control the flow of air through discharge opening 40, there is provided a lower shutter 74 extending substantially the full width of the discharge housing and pivoted at each end about pivot pins 76 secured to a pair of brackets 78 mounted in horizontal alignment with each other upon end wall portions 14 and 16. Shutter 74, like shutter 56, is provided with a longitudinally extending V-shaped groove 80, each end of which is provided with a pair of reversely bent portions 82 to define an opening 84 (FIGURE 2) for receiving a pivot pin 76. At the outward edge of shutter 74 there is provided a downwardly projecting flange 86 for purposes of reinforcement, the upper edge thereof being adapted to engage a horizontally disposed strip of sealing material 88, such as felt or the like, on outer wall portion 10 in order to effect a seal between the shutter and the interior of the housing. At the inwardly disposed end of shutter 74 there is provided an upwardly projecting flange 90 for purposes of reinforcement, the lower edge thereof being

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adapted to engage a horizontally disposed strip of similar sealing material 92 on inner wall portion 18 in order to effect a similar seal along that edge of the shutter. Intermediate the ends of flange 90 the shutter is provided with a transverse slot 93, for purposes to appear later. As can thus be seen, shutter 74 is adapted to close discharge opening 40 by traversing the cross-sectional area of the lower end of the housing.

The proportions of the shutter should be noted, since in this embodiment they are important. So that it may resist fluttering in the presence of outside wind forces, shutter 74 is balanced about its pivotal axis, as defined by pivot pins 76; that is to say, the effective area of shutter 74 is substantially the same on each side of the pivotal axis. Accordingly, upwardly directed gusts of wind will not apply a net torque to the shutter about its pivotal axis in either direction. Thus, when the shutter is closed it will be locked against opening due to wind forces.

In order to operatively interconnect shutters 56 and 74, there is provided an adjustable linkage 94 comprising a pair of connecting arms 96 and 98 disposed in parallel relationship and adjustably secured together by means of a coupling 100. As can be seen, coupling 100 is of conventional construction having therethrough a pair of longitudinally disposed openings adapted to receive connecting arms 96 and 98, the latter arms being adapted to be secured in any relative position with respect to each other within coupling member 100 by means of a slotted set screw 102 adapted to engage the arms to tightly maintain them in position with the coupling. To pivotally secure connecting arm 96 with lower shutter 74 there is provided a fitting 104, secured to the shutter through a short slot disposed just outwardly of the end of slot 93 by means of a rivet or the like 105. As best seen in FIGURE 4, fitting 104 comprises a flange portion 106 having an aperture therein through which may pass rivet 105 for securing the fitting to the shutter. The fitting is also provided with a downwardly extending projection 108 having a transverse aperture 110 therein, and a bendable tab portion 112. Pivotal connection is effected between connecting arm 96 and shutter 74 by providing the lower end of the arm with a transversely bent end portion 114 pivotally receivable within transverse aperture 110. Transversely bent portion 114 is maintained within the aperture by bending bendable tab portion 112 against the opposite side of connecting arm 96 during assembly. As can be seen in FIGURE 2, in the resulting assembly connecting arm 96 extends upwardly from fitting 104 through transverse slot 93 in the shutter.

Upper connecting arm 98 is similarly connected to shutter 56 by means of a fitting 116, best illustrated in FIGURE 3. Fitting 116 is provided with a flange portion 118 having an aperture therein through which a suitable rivet or the like 117 may pass for securing the fitting to shutter 56, with the body of the fitting extending through transverse slot 73. The fitting is also provided with a transversely extending aperture 120 adapted to pivotally receive a transversely bent end portion 122 at the upper end of connecting arm 98, end portion 122 being maintained in position by means of a deformable or bendable tab 124 which may be bent back against the opposite side of upper control arm 98 during assembly.

Linkage 94 is illustrated in FIGURE 2 in its properly adjusted position, wherein both of the shutters are in their fully closed position, as shown in solid lines. As is readily apparent, since the linkage is disposed to the right of the pivotal axes of each of the shutters, the gravitational force thereof will tend to maintain both of their shutters in a closed position when the fan is turned off. This gravitational force in combination with the balanced construction of shutter 74 insures that both of the shutters will be maintained closed when the fan is off, and that they will not be subject to fluttering or opening by the force of wind outside the housing. Shutter 56 will be maintained in a closed position when the fan is off, first

because it is secured to shutter 74 by means of linkage 94, and secondly because any wind forces directed through louvered opening 36 would tend to urge the shutter to a more closed position, rather than an opened position.

However, as soon as the fan is turned on, the portion of the discharge flow therefrom which is directed downwardly by baffle plate 46 will strike the outwardly disposed portion of shutter 74 to pivot it counterclockwise to an open position, and the portion of the discharge flow passing above baffle plate 46, aided by the downward deflection caused by surface 12, will strike shutter 56 to similarly urge it to an open position, as seen in FIGURE 2. The opening of each of the shutters is of course synchronized and the opening of the shutter which is first urged open by the fan discharge will assist in causing the other shutter to open, because of the provision of linkage 94. In this regard it has been found that especially good performance is achieved when shutter 74 is not perfectly flat but is slightly bent in the vicinity of its pivotal axis in an amount roughly in the order of sixteen degrees, as clearly illustrated in FIGURE 2. Such, however, is not necessary. When the lower shutter 74 is fully open, as illustrated in phantom lines, the center of the gravity of the linkage is displaced to a position much closer to the pivotal axis of shutter 74, whereby the gravitational force of the linkage will present a greatly reduced closing force. It is, however, sufficient to close the shutter again when the fan is turned off. The size of coupling 100 may be varied to vary the weight thereof so that the desired closing force may be obtained. It has been found that even when a surprisingly large weight is used, so that the shutter will be held tightly closed when the fan is off, the instant the fan is turned on the shutters will immediately flip open.

Thus, there is disclosed in the above description and in the drawings one exemplary embodiment of the present invention which fully and effectively accomplishes the objects thereof. However, it will be apparent that variations and details of construction may be indulged in without departing from the sphere of the invention herein described, or the scope of the appended claims.

What is claimed is:

1. Means for automatically controlling the discharge of air from ventilation fans and the like, comprising: a discharge housing having; an inside wall portion and an outside wall portion disposed generally opposite said inside wall portion an inlet opening in said inside wall portion adapted to receive the discharge flow from a fan; a first discharge opening positioned in said outside wall portion and a second discharge opening positioned between said inside and outside wall portions; a first shutter pivotally mounted on said housing for controlling the flow of air through one of said discharge openings; a second shutter pivotally mounted on said housing for controlling the flow of air through the other of said discharge openings; linkage means interconnecting said first and second shutters so that both of said shutters will open and close together; means biasing both said shutters toward closed position; and means disposed within and housing for directing air from the fan against one of said shutters so that the force

thereof will overcome the effect of said biasing means and cause the latter to pivot to an open position.

2. Means as defined of claim 1, wherein one of said shutter is balanced about its pivotal axis so that when it is closed and the fan is not operating, wind forces outside said housing will not tend to open it.

3. Means are claimed in claim 2, wherein said balanced shutter controls the flow through said second discharge opening.

4. Means for automatically controlling the discharge of air from ventilation fans and the like, comprising: a discharge housing having an inlet opening adapted to receive the discharge flow from a fan; means defining a plurality of discharge openings in said housing; a first shutter pivotally mounted on said housing for controlling the flow of air through at least one of said discharge openings; a second shutter pivotally mounted on said housing for controlling the flow of air through the remainder of said discharge openings, one of said shutters being balanced about its pivotal axis so that when it is closed and the fan is not operating wind forces outside said housing will not tend to open it; linkage means interconnecting said first and second shutters so that both of said shutters will open and close together; means biasing both of said shutters towards closed positions; and means disposed within said housing for directing air from the fan against one of said shutters so that the force thereof will overcome the effect of said biasing means and cause the latter to pivot to an open position.

5. Means for automatically controlling the discharge of air from ventilation fans and the like, comprising: a discharge housing having an inlet opening adapted to receive the discharge flow from a fan; means defining a plurality of discharge openings in said housing; a first shutter pivotally mounted on said housing for controlling the flow of air through at least one of said discharge openings; a second shutter pivotally mounted on said housing for controlling the flow of air through the remainder of said discharge openings, one of said shutters being balanced about its pivotal axis so that when it is closed and the fan is not operating wind forces outside said housing will not tend to open it; linkage means interconnecting said first and second shutters so that both of said shutters will open and close together; and means disposed within said housing for directing air from the fan against one of said shutters so that the force thereof will cause the latter to pivot to an open position.

6. Apparatus as claimed in claim 5, wherein said discharge openings controlled by said first shutter lie substantially in a plane perpendicular to the direction of discharge flow from the fan, and said discharge openings controlled by said second shutter lie substantially in a plane parallel to said direction of discharge flow.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,120,798

February 11, 1964

Albert E. Nash

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 21, after "pair" insert -- of --;
line 30, for "with" read -- within --; column 5, line 59,
for "and", second occurrence, read -- said --; column 6,
line 4, for "shutter" read -- shutters --; line 7, for
"are" read -- as --.

Signed and sealed this 30th day of June 1964.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents