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Miller

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[54] **VENTING APPARATUS**

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[52] **U.S. Cl.** **98/119,** 98/122, 137/527.6, 137/527.8

[51] **Int. Cl.** **F23l 17/02**

[58] **Field of Search** ..... 98/122, 119, 116, 43 R, 98/43 A, 42, 62, 85, 95; 137/513.5, 527.6; 138/89, 109

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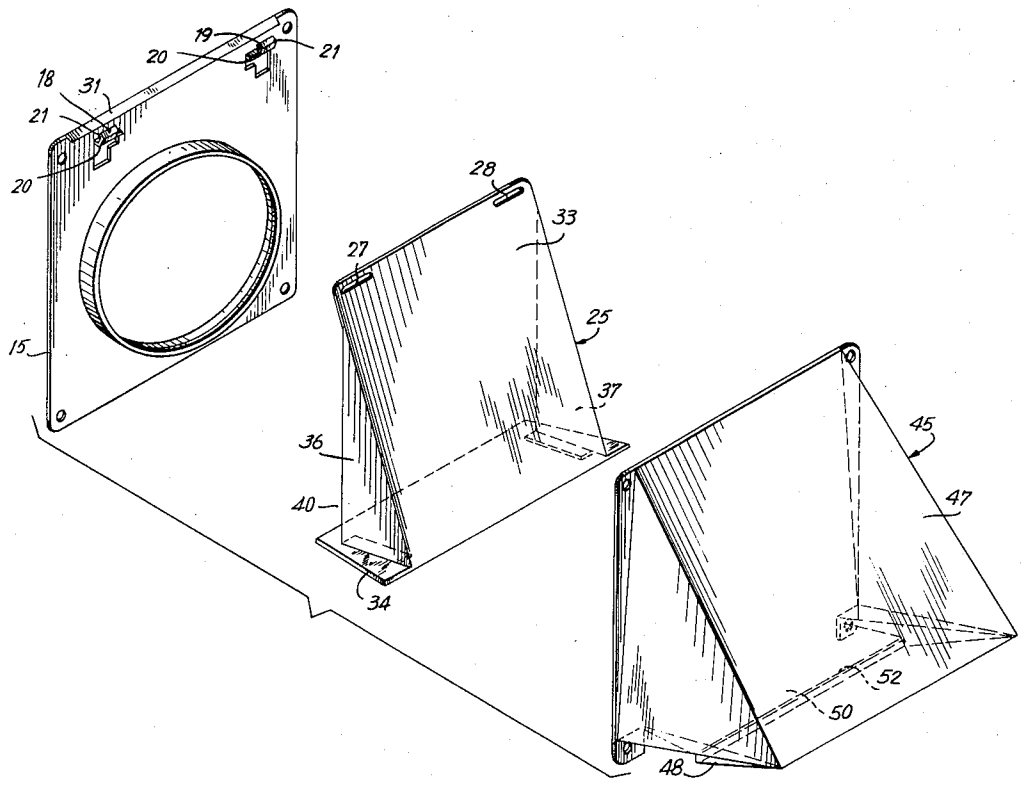
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Assistant Examiner—Paul Devinsky
Attorney, Agent, or Firm—Curtis, Morris & Safford

[57] **ABSTRACT**

A venting device for attachment to the exhaust outlet of an air blower, in which a pivotally supported wedge-shaped shutter opens and closes in response to pressure variations within the outlet but remains in its closed position when the blower is off, even in the event of substantial fluctuations in the ambient external pressure. A housing is disposed about the shutter and defines an enclosed space having an opening for discharging air in a direction generally transverse to the direction of flow through the outlet. The shutter includes a nearly vertical first portion or blade intercepting the flow of air from the blower and a nearly horizontal second portion blocking the discharge opening. When the shutter is closed, the variations in external pressure exert suction and compression forces on the shutter in a direction that is radial to the pivot point and consequently nullified. As the air is blown against the intercepting blade, the shutter swings away from the exhaust outlet and is displaced from the discharge opening.

14 Claims, 5 Drawing Figures



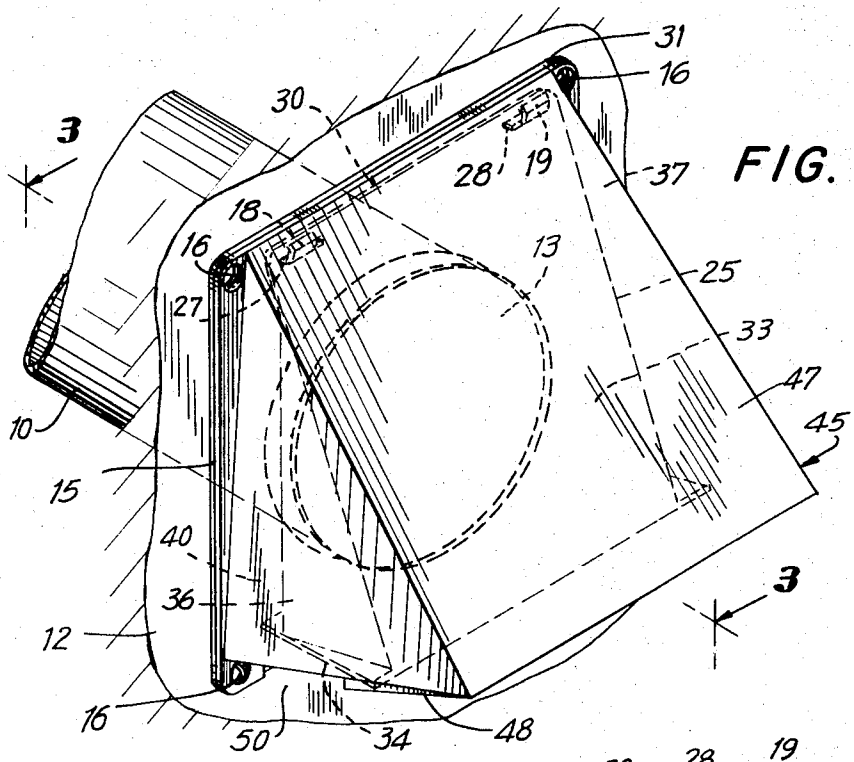

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FIG. 1

FIG. 5

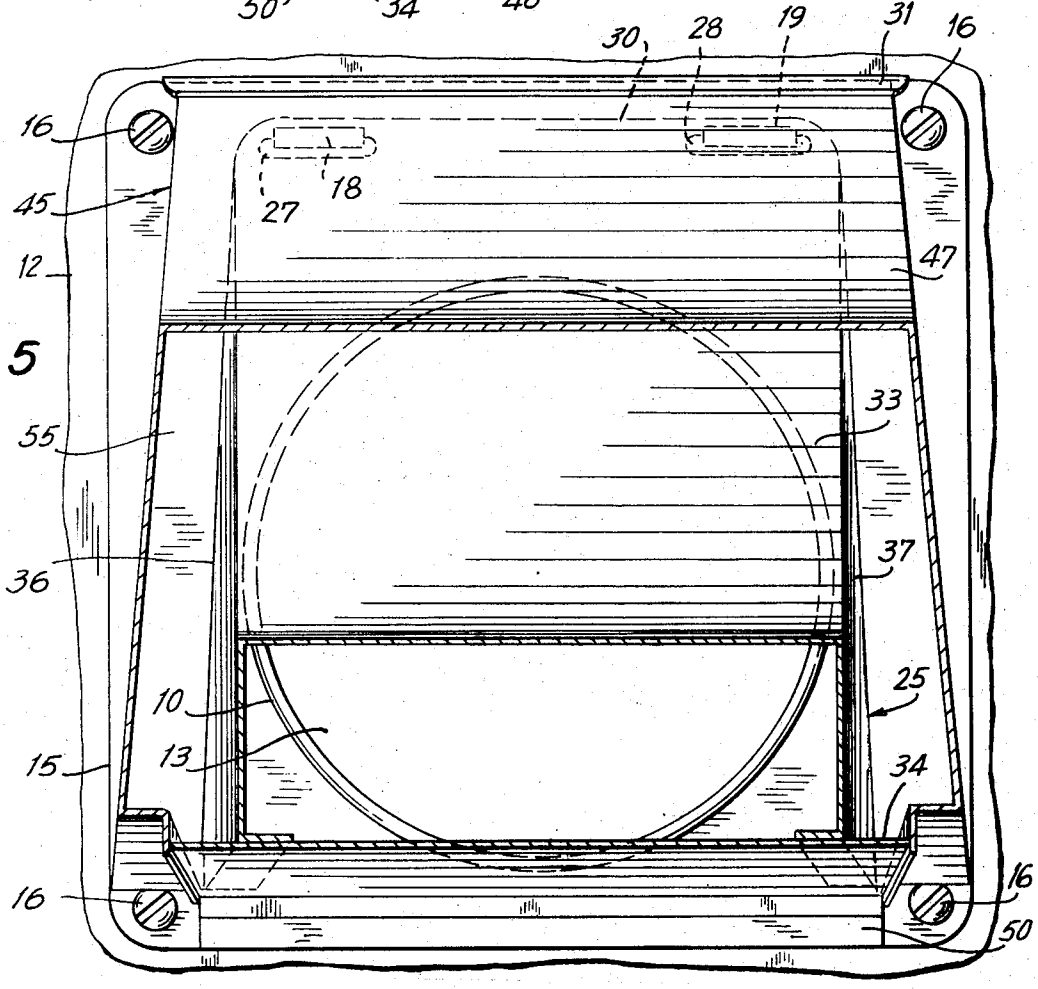

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FIG. 2

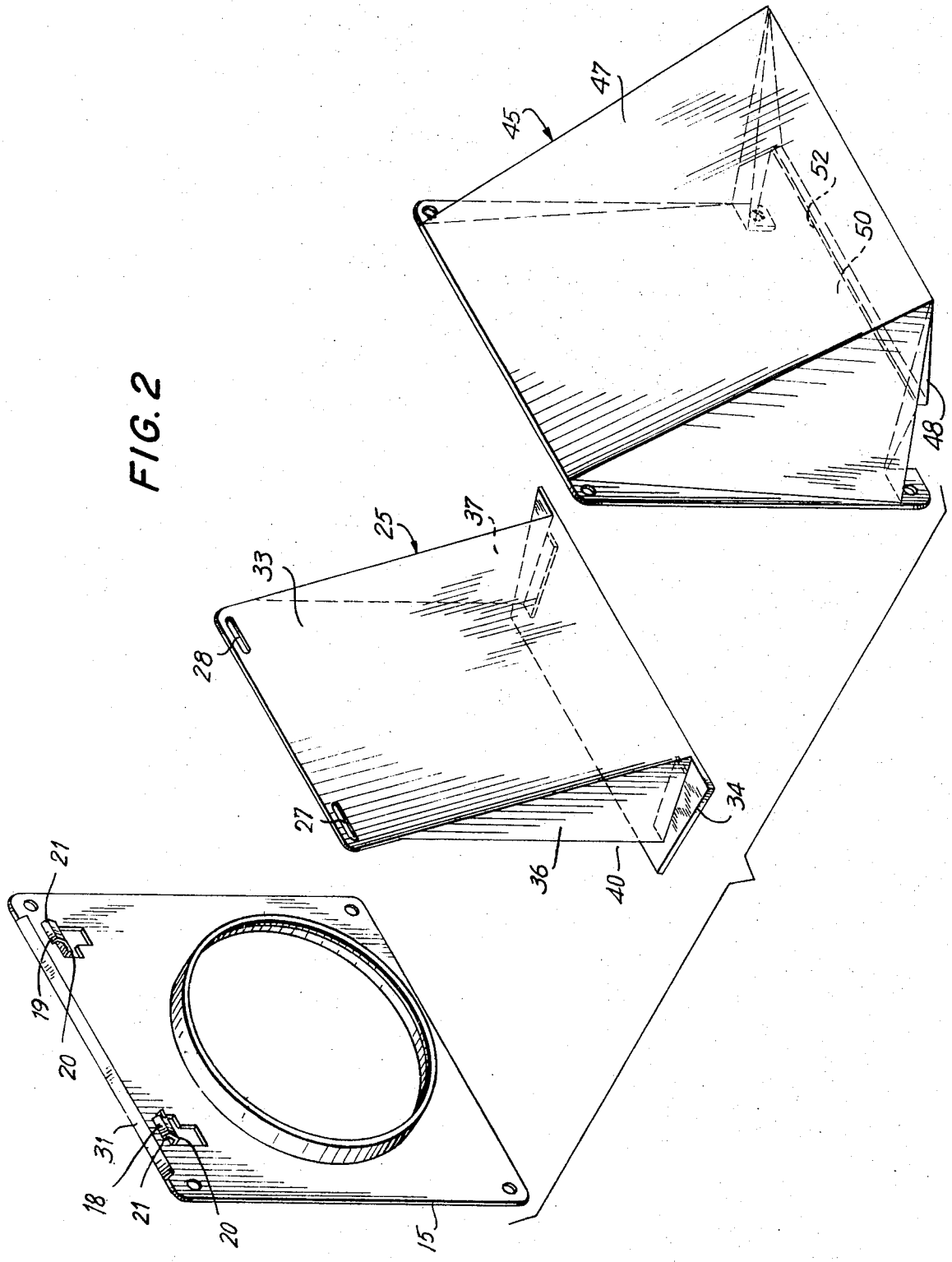


FIG. 4

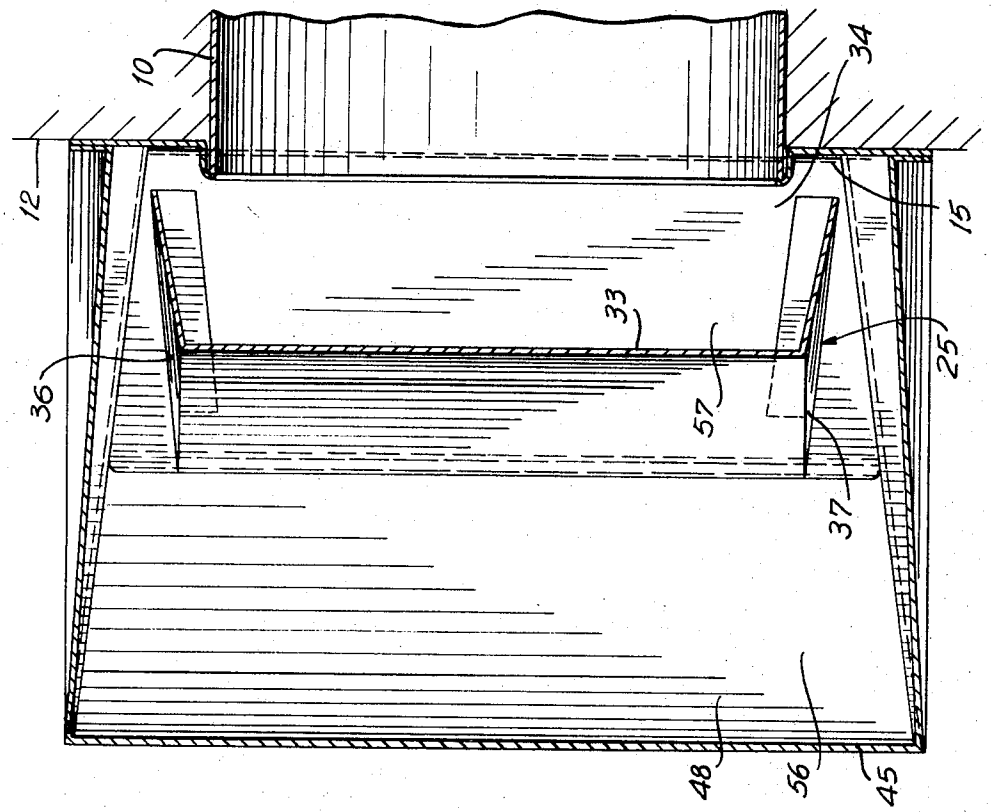
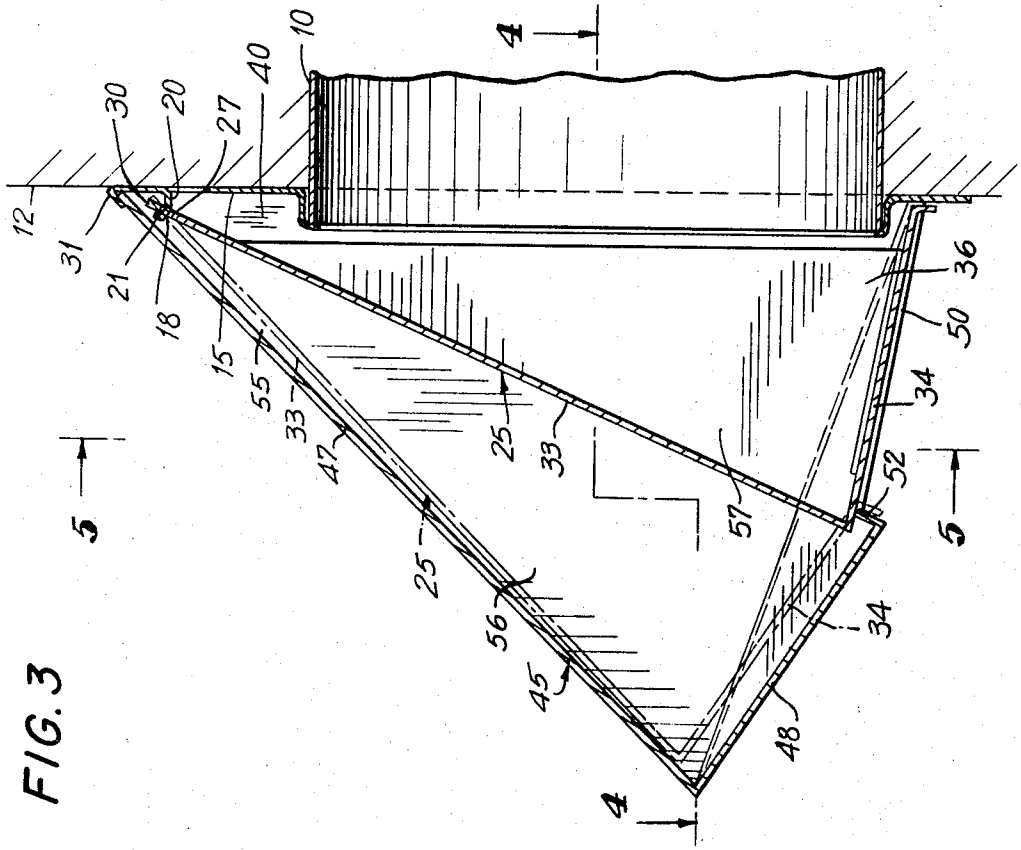

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FIG. 3


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VENTING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to venting apparatus and more particularly to apparatus of the type which includes a shutter or flap valve for opening and closing the exhaust outlet of a blower.

The present invention, while of general application, is particularly well suited for discharging air from the interior of a building to the atmosphere. Such appliances as laundry dryers, bathroom venting units, cooking ranges, ovens, etc., customarily are provided with a blower and a discharge conduit having a pivotally mounted valve plate which is movable in response to variations in pressure within the conduit to open and close the exhaust outlet of the appliance. The plate is opened by the pressure produced when the blower is actuated and is intended to be closed by gravity when the blower is shut down.

One of the disadvantages of the venting devices presently in use is that they are subject to sometimes severe and annoying vibration as a result of variations in pressure on the external surface of the plate when the blower is inoperative. The vibration produces a chattering noise and for the most part is caused by wind movement on the lee side of the building which forms a low pressure condition. In response to this low pressure, the plate pivots slightly to its open position to equalize the pressure on its opposite surfaces, thus exhausting warm air from the building interior. As soon as the pressure on the opposite surfaces becomes equal, the plate drops back to its closed position with the attendant noise, and the cycle is repeated.

Heretofore, attempts to overcome the foregoing problems commonly have utilized weights, springs, permanent magnets, etc., in an effort to restrain unwanted movement of the valve plate. However, devices of this type have either proved unsatisfactory in eliminating chatter or have restricted the movement of the plate to such an extent that it does not readily open when a blower of low power is actuated. For example, when the plate is provided with a weight or spring, the closing force on the plate is smallest at precisely the time when maximum closing force is needed, that is, when the plate is fully closed and the blower is shut down. Permanent magnets have produced an opposite and equally unsatisfactory result, because the influence of the magnetic field is quite strong when the plate is in its closed position but is of little or no effect as soon as the plate moves a short distance away from that position. If the magnetic field is of sufficient strength to eliminate the deleterious chattering effect, the plate does not readily open in response to the actuation of a low power blower, while when the field strength is reduced even comparatively small pressure differences as a result of wind movement can cause the plate to swing to a position in which the field has little or no effect.

SUMMARY

One general object of this invention, therefore, is to provide new and improved venting apparatus for attachment to the exhaust outlet of a blower.

More specifically, it is an object of this invention to provide such apparatus in which the incidence of chattering as a result of pressure variations is substantially eliminated.

Another object of the invention is to provide venting apparatus of the character indicated in which variations in the external pressure have little or no effect on the position of the shutter.

A further object of the invention is to provide venting apparatus having a novel housing for the shutter which permits unrestricted movement as the shutter swings between its open and closed positions.

Still another object of the invention is to provide venting apparatus utilizing comparatively simple mechanical components which is economical to manufacture and thoroughly reliable in operation.

In one illustrative embodiment of this invention, the apparatus includes a discharge conduit which is connectible to the exhaust outlet of a blower. A support plate having a pair of spaced tongues is affixed to the discharge conduit adjacent its open end, and a stationary housing is mounted on the plate. The housing defines an enclosed space having an opening for discharging exhaust air or other fluid at an angle with respect to the axis of the discharge conduit. The tongues on the plate pivotally support a three-dimensional shutter member. This shutter normally blocks the opening in the housing but is responsive to an increase in pressure within the conduit for moving the shutter to an open position and thereby permit the discharge of air or other fluid from the opening.

In accordance with one feature of the invention, when the shutter is closed its position is unaffected by positive or negative external pressures, due to the position of the shutter's exposed surface in relation to its pivotal support. The external pressure acts in a radial direction with respect to the support, with the result that the incidence of chatter and vibration is eliminated.

In accordance with another feature of the invention, in certain particularly important embodiments, the shutter includes a first or blade portion activated by fluid from the blower and a second portion for blocking the discharge opening when the shutter is in its closed position. The first portion of the shutter is responsive to an increase in pressure within the discharge conduit for moving the second portion to its open position and yet is separated or spaced from the housing to enable the equalization of pressure between the housing and the discharge conduit when the shutter is closed. The pressure on opposite surfaces of the first portion is substantially equal to the internal pressure within the discharge conduit when the blower is deactivated, and the possibility of vibration and chatter during adverse wind conditions is eliminated.

In accordance with still another feature of the invention, in some embodiments, the shutter defines a pair of spaced apertures which receive the two tongues on the plate such that the tongues pivotally connect the shutter to the plate. The arrangement is such that the shutter swings freely and easily between its open and closed positions.

The present invention, as well as further objects and features thereof, will be understood more clearly and fully from the following description of a preferred embodiment, when read with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a venting apparatus in accordance with an illustrative embodiment of the in-

vention, together with a portion of the supporting external wall of a building.

FIG. 2 is an exploded perspective view of the apparatus shown in FIG. 1.

FIG. 3 is a vertical sectional view taken along the line 3—3 in FIG. 1.

FIG. 4 is a horizontal sectional view taken generally along the line 4—4 in FIG. 3.

FIG. 5 is a transverse sectional view taken along the line 5—5 in FIG. 3.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2 of the drawings, there is shown a venting apparatus which is arranged for attachment to the exhaust outlet of a blower for a laundry dryer, for example. The apparatus includes a discharge conduit **10** removably connectible in the usual way to the exhaust outlet. The conduit **10** extends through the external wall **12** of a building and has an open end **13** communicating with the outlet.

A flat generally rectangular support plate **15** is rigidly affixed to the discharge conduit **10** adjacent the open end **13.** The plate **15** lies in a vertical plane against the outer surface of the building wall **12** and is suitably secured to the wall as by screws **16.** The plate is formed with a circular opening coextensive with the open end **13,** and a pair of spaced tongues **18** and **19** are bent outwardly and upwardly from the plate a short distance above the opening. As best shown in FIG. **3,** each of these tongues is provided with a horizontal portion **20** and a locking portion **21** which extend in an upward direction at an angle with respect to the portion **20.**

Pivotally carried by the tongues **18** and **19** is a three-dimensional gate or shutter **25.** The shutter **25** is of generally hollow wedge-shaped configuration and includes a pair of horizontally elongated apertures **27** and **28** which respectively receive the tongues **18** and **19** such that the shutter is free to swing relative to the support plate **15.** The upper horizontal edge **30** of the shutter is substantially straight and fits beneath an overhanging lip **31** which is bent outwardly from the corresponding edge of the plate. The tongues **18** and **19** serve to positively connect the shutter to the plate while at the same time permitting unrestrained pivotal movement of the shutter.

As best shown in FIG. **2,** the shutter **25** comprises an intercepting blade portion **33** and a generally horizontal valve portion **34.** The blade portion **33** includes the tongue apertures **27** and **28** and extends downwardly and outwardly from the lip **30** in a substantially flat plane which meets the vertical plate **15** at an acute angle. With this arrangement, the blade portion is in position to intercept the flow of air or other fluid from the discharge conduit **10.** The valve portion **34** meets the blade portion **33** at a somewhat larger acute angle. The valve portion extends inwardly from the blade portion with its inner end resting against the plate **15** when the shutter **25** is in its closed position, that is, the position shown in full lines in FIG. **3.**

The valve portion **34** is in the form of a trapezoidal plate having a longitudinal dimension which is somewhat greater than the horizontal dimension of the blade portion **33.** Two triangular side portions **36** and **37** of the shutter **25** extend upwardly from the portion **34** and are contiguous with the corresponding edges of the portion **33.** Each of these side portions is foreshortened to define an unobstructed passage **40** between the inwardly directed edge of the side portion and the support plate **15.** The passages **40** permit free and open communication between the interior of the discharge conduit **10** and the external surface of the portion **33** at all times, for purposes that will become more fully apparent hereinafter.

A housing **45** is disposed about the open end **13** of the discharge conduit **10.** The housing **45** extends over the shutter **25** and is rigidly mounted on the support plate **15** by the screws **16.** Like the shutter **25,** the housing **45** is of generally hollow wedge-shaped configuration but is somewhat larger than the shutter so that the shutter may move freely within the housing without interference. The housing includes a flat, nearly rectangular face **47** which meets the building wall **12** at an acute angle. The bottom **48** of the housing extends from the lower outer edge of the face **47** toward the plate and is foreshortened to form a discharge opening **50.** This opening faces in a downward direction such that the air or other fluid with which the apparatus is used is discharged in a similar direction and at an angle of approximately 90° with respect to the axis of the conduit **10.** It will be noted that the discharge opening faces away from the pivotal axis of the shutter **25** in a direction transverse to the shutter's direction of movement. The bottom **48** is provided with substantially a right upstanding lip **52** which engages the valve portion **34** of the shutter **25** to provide a substantially airtight seal.

The housing **45** serves to define an enclosed space **55** around the open end **13** of the discharge conduit **10.** The weight of the shutter **25** normally holds it in its closed position (the position shown by full lines in FIG. **3**). In this position the blade portion **33** of the shutter **25** divides the space **55** into an outer chamber **56** and an inner chamber **57,** while the valve portion **34** blocks the discharge opening **50** in the housing. Because of the side passages **40,** the pressure in the chamber **56** and **57,** and hence the pressure on opposite sides of the portion **33,** remains the same and is equal to the internal pressure within the conduit **10.**

Should the ambient external pressure increase or decrease, as a result of a change in wind conditions, for example, the resulting force on the shutter **25** acts in a radial direction toward or away from the pivotal axis and in a direction transverse to the shutter's direction of movement. Because of the radial orientation of the force on the shutter, it has no effect on the shutter's position, and the force is dissipated as it is transmitted to the supporting tongues **18** and **19** and the plate **15.** The weight of the shutter continues to hold it firmly in its closed position with the portion **34** blocking the discharge opening **50.** The change in ambient pressure has little or no effect on the pressure within the spaces **56** and **57,** and the pressure on both sides of the blade portion **33** remains equal to the internal pressure in the conduit **10.** The arrangement is such that the pressure on opposite surfaces of the blade portion is the same even in the event of substantial changes in the external pressure, and the possibility of any substantial vibration of chatter as a result of these changes is eliminated.

When the blower for the appliance is actuated, the pressure within the discharge conduit **10** increases. Because of the wedge shaped configuration of the shutter **25,** the inner chamber **57** holds a comparatively large volume of air, and as the pressure builds up a substan-

tial opening force is exerted against the blade portion **33.** The shutter **25** rapidly swings about the tongues **18** and **19** to its open position, that is, the position shown in dash lines in FIG. **3.** During this movement, the portion **34** rides along the lip **52** and unblocks the discharge opening **50.** The air from the conduit **10** is thereupon discharged in a generally downward direction through the opening **50** to the atmosphere.

When the blower is shut down, the resulting pressure decrease within the discharge conduit **10** permits the shutter **25** to close and again block the opening **50.** The shutter remains in its closed position irrespective of changes in the external pressure until the blower is again actuated.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. Venting apparatus comprising, in combination:
a discharge conduit having an open end;
enclosure means disposed about the open end of the discharge conduit and defining an enclosed space having an opening for discharging fluid; and
shutter means positioned within said enclosed space for movement relative to the enclosure means between an open position and a closed position, the shutter means including a first portion for intercepting the flow of fluid through the discharge conduit and a second portion for blocking said opening when the shutter means is in its closed position, said first portion defining an unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter means is closed, the second portion of the shutter means unblocking said opening upon movement to said open position to dischange said fluid.

2. Venting apparatus comprising, in combination:
a discharge conduit having an exhaust outlet;
a housing disposed about the exhaust outlet of the discharge conduit and defining an enclosed space having an opening for discharging fluid; and
shutter means positioned within said enclosed space for movement relative to the housing between an open position and a closed position, the shutter means including a first portion controlled by the flow of fluid through the discharge conduit and a second portion for blocking said opening when the shutter means is in its closed position, said first portion being spaced from said exhaust outlet and said opening for all positions of the shutter means, the first portion defining at least one unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter means is closed, said shutter means being responsive to an increase in pressure within the discharge conduit for unblocking said opening to discharge said fluid.

3. Venting apparatus as defined in claim **2,** in which the shutter means is of generally wedge-shaped configuration.

4. Venting apparatus as defined in claim **2,** in which the opening in said housing is located in position to discharge fluid at an angle with respect to the axis of the discharge conduit.

5. Venting apparatus comprising, in combination:
a discharge conduit having an exhaust outlet;
a support member affixed to the discharge conduit adjacent its exhaust outlet;
enclosure means disposed about the exhuast outlet of the discharge conduit and defining an enclosed space having an opening for discharging fluid; and

shutter means carried by the support member for movement between an open position and a closed position, the shutter means including a first portion for intercepting the flow of fluid through the discharge conduit and a second portion for blocking said opening when the shutter means is in its closed position, said first portion being spaced from said exhaust outlet and said opening for all positions of the shutter means, the first portion defining at least one unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter means is closed, the second portion of the shutter means unblocking said opening upon movement to said open position to discharge said fluid.

6. Venting apparatus for attachment to the exhaust outlet of a blower, the apparatus comprising, in combination:
a discharge conduit connectible to the exhaust outlet and having an open end;
a support member affixed to the discharge conduit adjacent its open end;
enclosure means disposed about the open end of the discharge conduit, the enclosure means being rigidly mounted on the support member and defining an enclosed space having an opening for discharging fluid; and
shutter means carried by the support member for movement between an open position and a closed position, the shutter means including a first portion controlled by the flow of fluid through the discharge conduit and a second portion for blocking said opening when the shutter means is in its closed position, said first portion defining at least one unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter means is closed and being responsive to an increase in pressure within the discharge conduit for moving the shutter means to said open position.

7. Venting apparatus as defined in claim **6,** in which the support member includes a pair of spaced tongues and an overhanging lip in juxtaposition with the tongues, the first portion of the shutter means being provided with a substantially straight edge disposed beneath the overhanging lip and a pair of spaced apertures for respectively receiving the tongues.

8. Venting apparatus as defined in claim **6,** in which the first and second portions of the shutter means are disposed at an angle with respect to each other.

9. Venting apparatus as defined in claim **8,** in which the first portion of the shutter means is of wedge-shaped configuration and includes two foreshortened side portions which define a pair of unobstructed passages for equalizing fluid pressure between the enclosure means and the conduit when the shutter means is closed.

10. Venting apparatus for attachment to the exhaust outlet of a blower, the apparatus comprising, in combination:

a discharge conduit connectible to the exhaust outlet and having an open end;

a support member affixed to the discharge conduit adjacent its open end;

a housing disposed about the open end of the discharge conduit, the housing being rigidly mounted on the support member and defining an enclosed space having an opening for discharging fluid; and

shutter means pivotally carried by the support member for movement between an open position and a closed position, the shutter means including a first portion for intercepting the flow of fluid expelled from the discharge conduit and a second portion for blocking said opening when the shutter means is in its closed position, said first portion defining at least one unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter means is closed and being responsive to an increase in pressure within the discharge conduit for moving the shutter means to said open position to exhaust fluid through said opening, the fluid being exhausted in a direction substantially transverse to the shutter's direction of movement between said positions.

11. Venting apparatus for attachment to the exhaust outlet of a blower, the apparatus comprising, in combination:

a discharge conduit removably connectible to the exhaust outlet and having an open end;

plate means affixed to the discharge conduit adjacent its open end;

a housing disposed about the open end of the discharge conduit, the housing being rigidly mounted on the plate means and defining an enclosed space having an opening for discharging fluid at an angle with respect to the axis of the discharge conduit; and

a three-dimensional shutter member carried by the plate means for movement between an open position and a closed position, the shutter member including a first portion for intercepting the flow of fluid from the blower and a second portion for blocking said opening when the shutter member is in its closed position, said first portion defining at least one unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter member is closed and being responsive to an increase in pressure within the discharge conduit for moving the shutter member to said open position.

12. Venting apparatus as defined in claim 11, in which the shutter member is of generally wedge-shaped configuration.

13. Venting apparatus for attachment to the exhaust outlet of a blower, the apparatus comprising, in combination:

a discharge conduit removably connectible to the exhaust outlet and having an open end;

plate means affixed to the discharge conduit adjacent its open end, the plate means including a pair of spaced tongues protruding therefrom;

a housing disposed about the open end of the discharge conduit, the housing being rigidly mounted on the plate means and defining an enclosed space having an opening for discharging fluid at an angle with respect to the axis of the discharge conduit; and

a shutter member of generally wedge-shaped configuration pivotally carried by the plate means for movement between an open position and a closed position, the shutter member including a first portion controlled by the flow of fluid through the discharge conduit and a second portion for blocking said opening when the shutter member is in its closed position, said first portion being spaced from said exhaust outlet and said opening for all positions of the shutter member, the first portion defining at least one unobstructed passage for equalizing fluid pressure on opposite sides of the first portion when the shutter member is closed and being responsive to an increase in pressure within the discharge conduit for moving the shutter member to said open position.

14. Venting apparatus for attachment to the exhaust outlet of a blower, the apparatus comprising, in combination:

a discharge conduit removably connectible to the exhaust outlet and having an open end;

plate means affixed to the discharge conduit adjacent its open end, the plate means including a pair of spaced tongues protruding therefrom;

A housing disposed about the open end of the discharge conduit, the housing being rigidly mounted on the plate means and defining an enclosed space having an opening for discharging fluid at an angle with respect to the axis of the discharge conduit; and

a shutter member of generally hollow wedge-shaped configuration pivotally carried by the plate means for movement between an open position and a closed position, the shutter member including a first portion controlled by the flow of fluid through the discharge conduit, a second portion for blocking said opening when the shutter member is in its closed position, and two foreshortened side portions which define a pair of unobstructed passages for equalizing fluid pressure on opposite sides of the first portion when the shutter member is closed, the shutter member being movable to said open position in response to an increase in pressure within the discharge conduit to exhaust fluid through said opening, the fluid being exhausted in a direction substantially transverse to the shutter's direction of movement between said positions.

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