United States Patent

[11] 3,581,650

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[54] **COMBINATION AIR DAMPER**
11 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **98/110,** 98/121, 49/77, 160/236
[51] **Int. Cl.** **F24f 13/08**
[50] **Field of Search** 98/107, 110, 121, 40; 160/236; 49/77

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Primary Examiner—Meyer Perlin
Attorney—Frank J. Benasutti

ABSTRACT: An air damper ventilator combines a fixed blade ventilator with means adaptable to check the flow of air in a plurality of directions or regulate the flow of air as it passes therethrough.

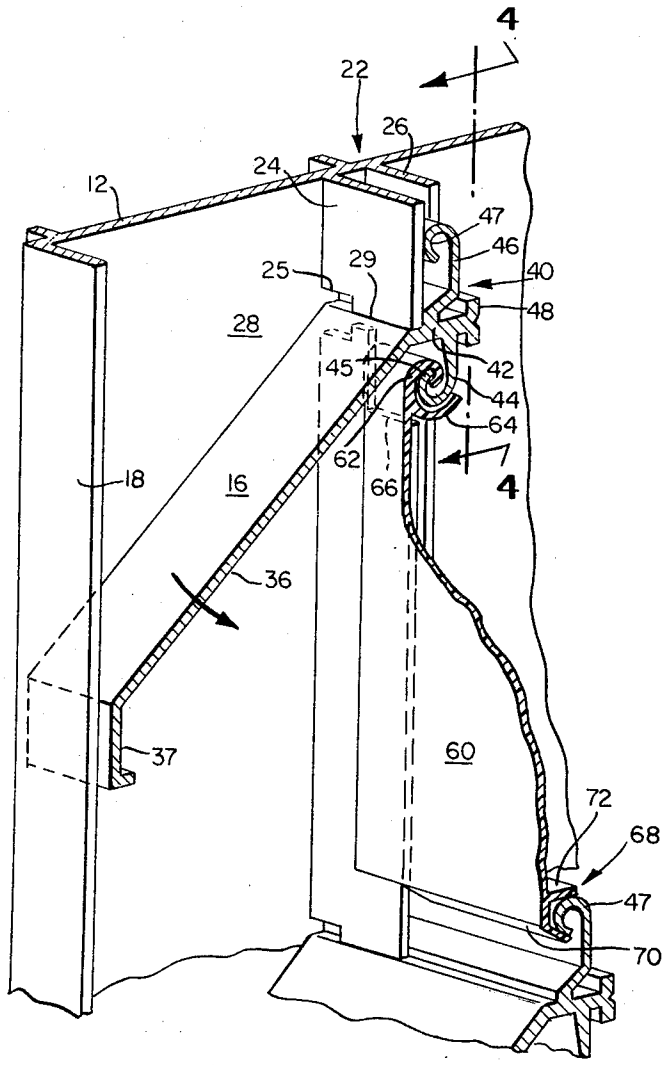
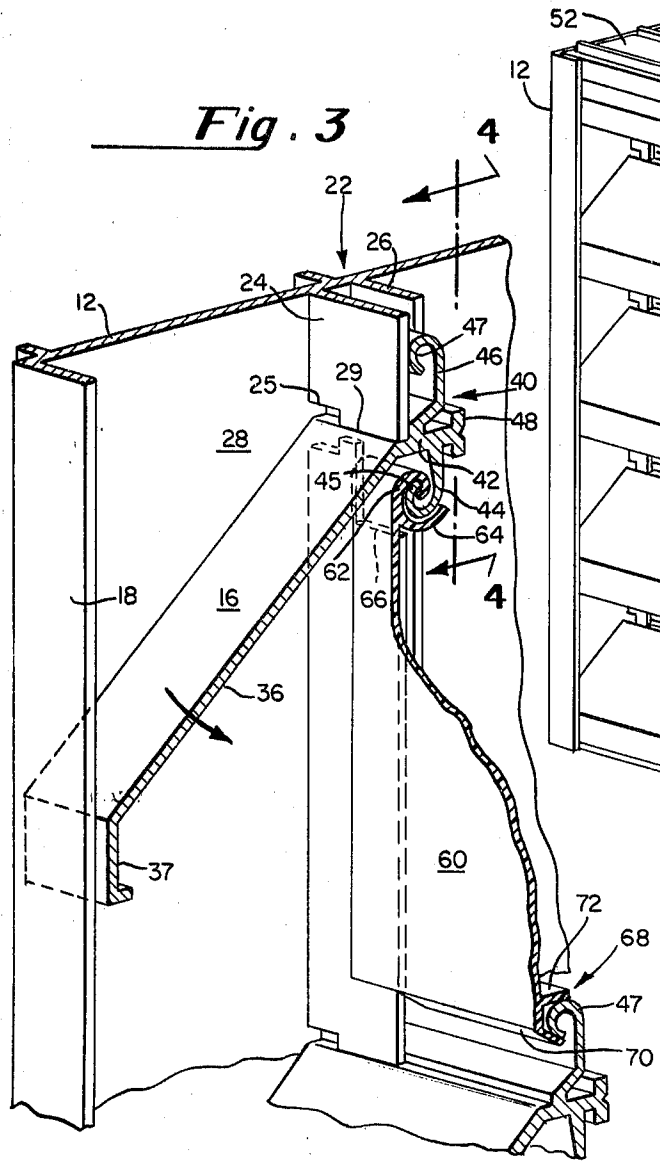


Fig. 3



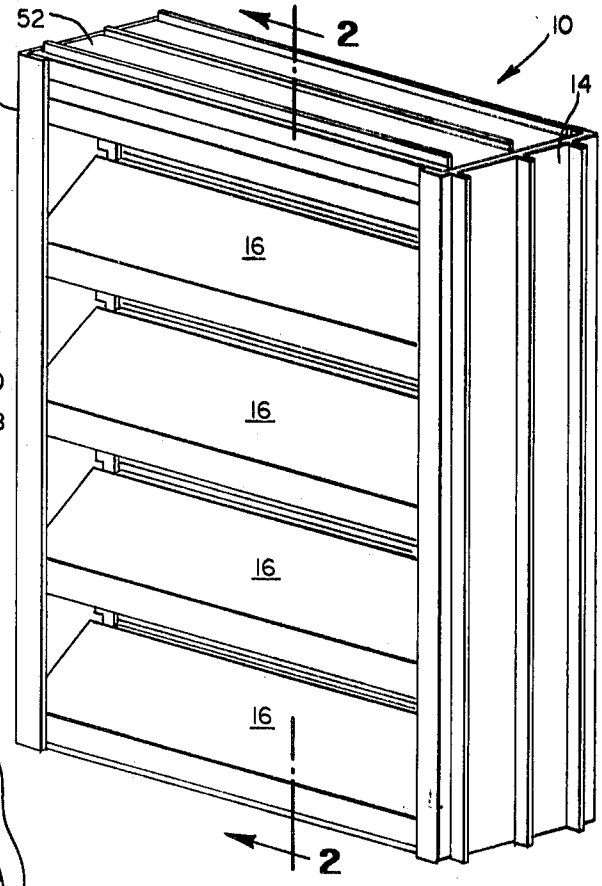


Fig. 1

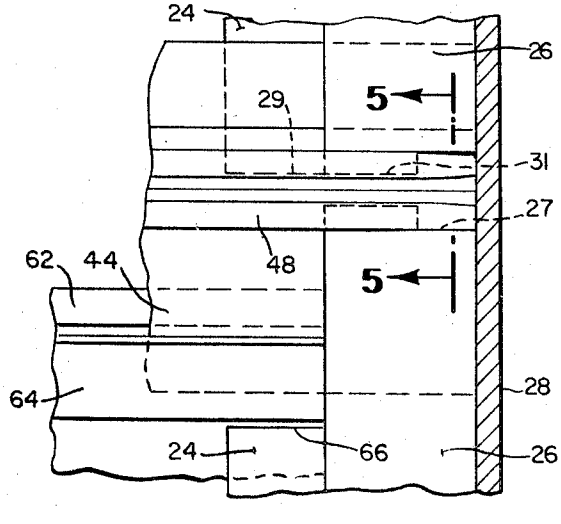


Fig. 4

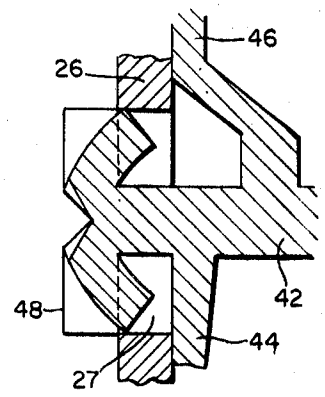


Fig. 5

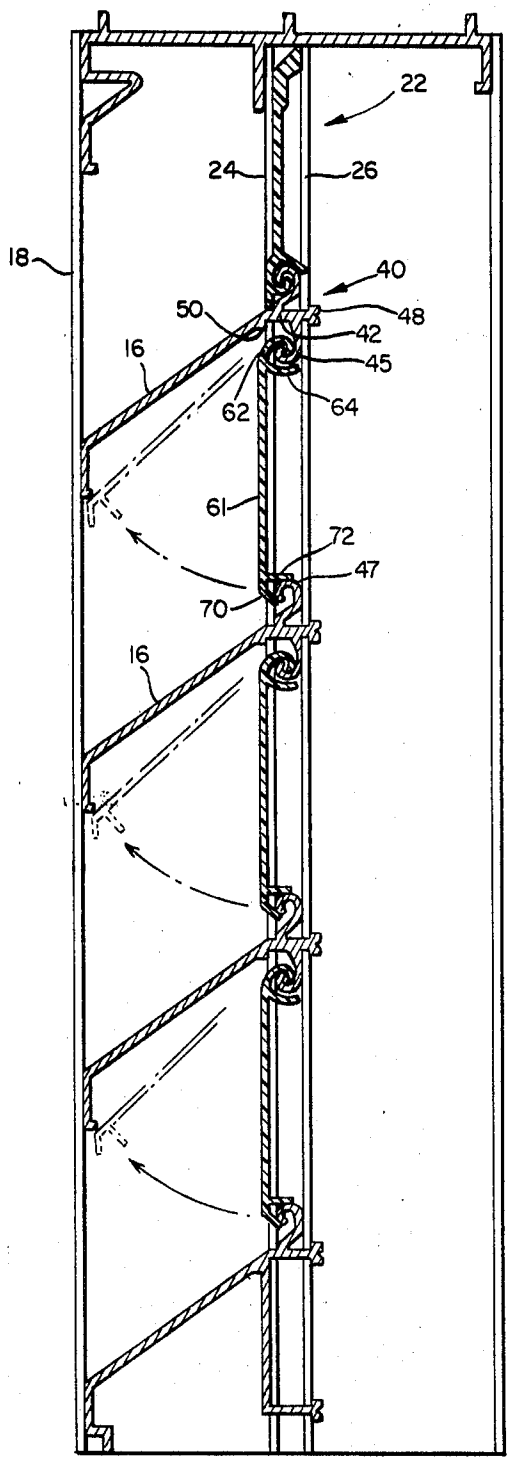


Fig. 2

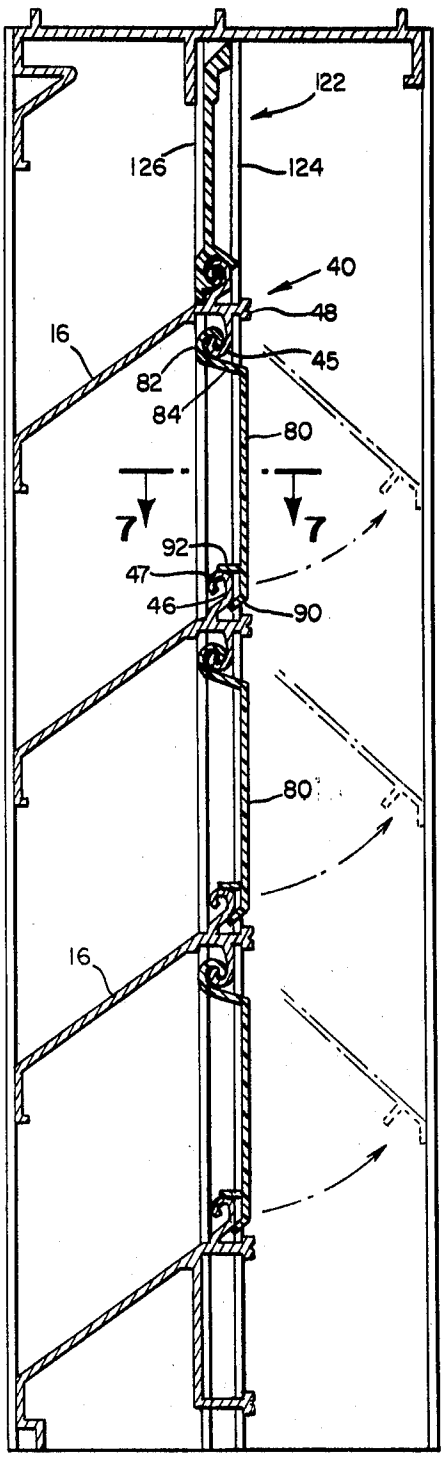


Fig. 6

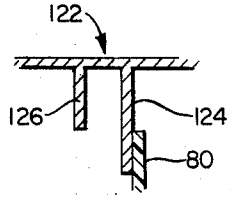


Fig. 7

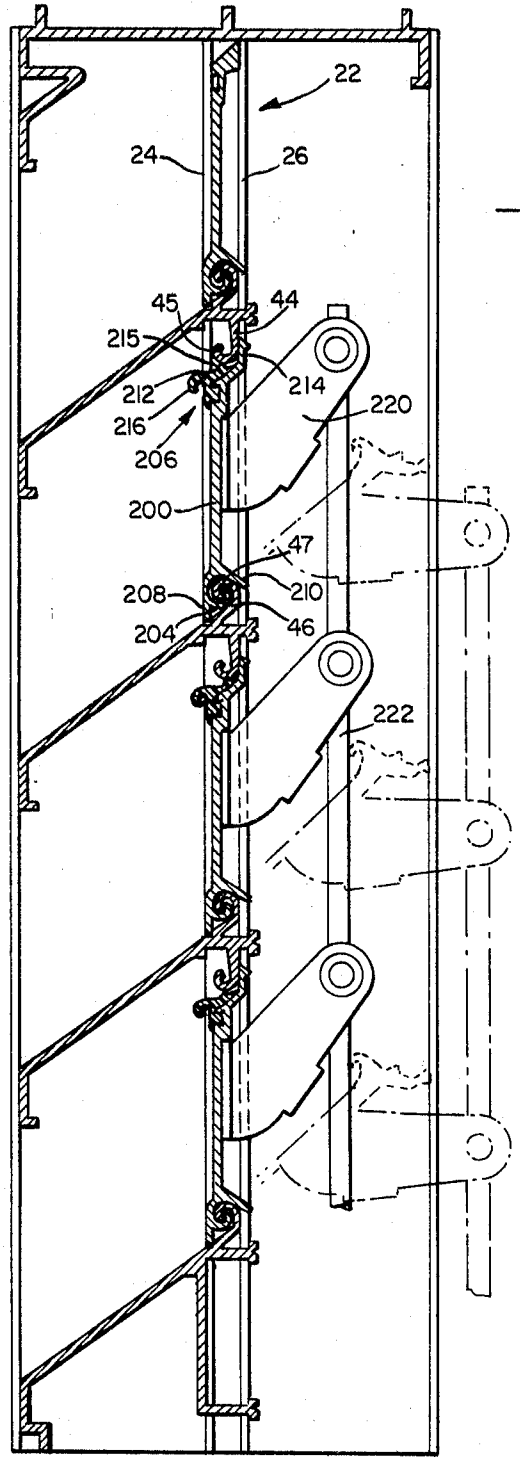
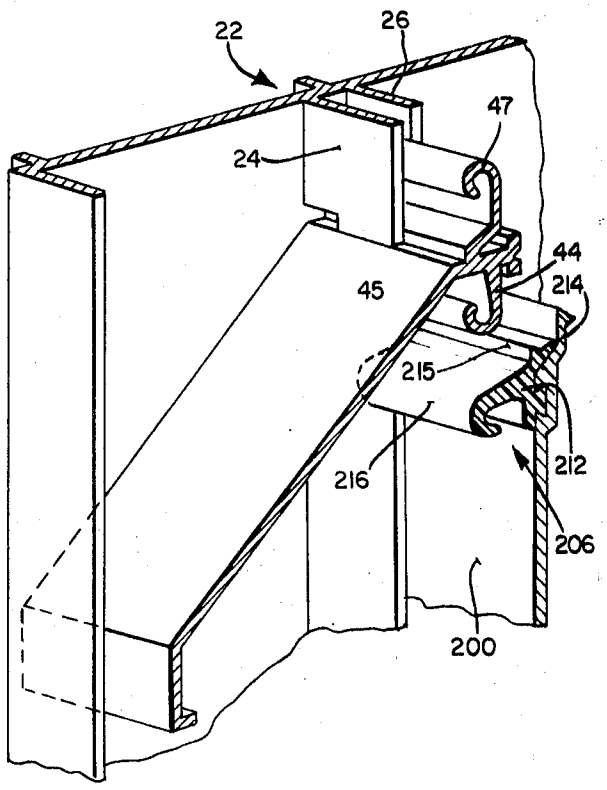

22
24
26
45
44
215
214
212
220
216
206
200
47
208
210
204
46
222

Fig. 8

Fig. 9


22
26
47
24
44
45
214
215
212
216
206
200

COMBINATION AIR DAMPER

BACKGROUND OF THE INVENTION

This invention relates to ventilators and more particularly to ventilators having fixed louvers and movable blades.

In the prior art such ventilators were composed of a multitude of parts which when assembled provided a structure for a particular use. Typical of the prior art devices are the fixed blade ventilator, the movable blade unidirectional ventilator, and the adjustable movable blade air damper. These devices provided distinct functions which were not adaptable to a single unit nor could they be combined for compact installations necessary for use in thin walls.

SUMMARY OF THE INVENTION

The present invention overcomes the deficiencies of the prior art by providing a combined air damper and fixed blade ventilator having a plurality of blades which are interconnected by a unique multifunction hinge element, which element interlocks with side members to form a unified structure which neither rattles nor is subject to corrosion because of dissimilar metal components. The preferred embodiment comprises a minimal number of preformed parts which can be quickly and easily assembled without additional fastening hardware. The hinge element provides a means adaptable to a plurality of movable hinged blades for both support and effective air lock damping.

Accordingly it is an object of my invention to provide a new air damper ventilator of simplified design which provides a plurality of air control functions. This and other objects of my invention will become apparent from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the preferred embodiment of my invention;

FIG. 2 is a view taken as indicated by the lines and arrows 2–2 in FIG. 1;

FIG. 3 is an enlarged perspective view of a portion of the structure shown in the preceding FIGS.

FIG. 4 is a view taken as indicated by the lines and arrows 4–4 in FIG. 3;

FIG. 5 is a view taken as indicated by the lines and arrows 5–5 in FIG. 4;

FIG. 6 is a view similar to FIG. 2 showing an alternate embodiment of my invention;

FIG. 7 is a view taken as indicated by the lines and arrows 7–7 in FIG. 6;

FIG. 8 is a view similar to FIG. 2 showing a further alternate embodiment of my invention; and

FIG. 9 is an enlarged perspective view of a portion of the structure shown in FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claims.

Referring to FIG. 1, a combined air damper designated generally 10 comprises side members 12 and 14 and a plurality of fixed blades 16. The entire unit is preferably made of Aluminum which is formed or extruded and is on the order of 0.081 inches thick. The side members, as shown in FIGS. 2 and 3, are generally E-shaped in cross section and are arranged as mirror images in the structure. Each side member has a front flange 18 FIG. 2 and a rear flange 20 FIG. 2 and a U-shaped center flange designated 22 FIG. 3, all of which extend inwardly toward the opposite side. The U-shaped center flange 22 has a front leg 24 which extends inwardly a greater

distance than the front and rear flanges 18 and h20 respectively and the shorter rear leg 26.

Both legs of the center flange have a plurality of T-shaped notches therein (as at 25 FIG. 3, 27 FIG. 4) spaced at equal intervals and oriented as shown in FIG. 4 with the stems 29 and 31 respectively of the T's extending perpendicular to the wall 28 of the side member 12 and completely severing the inwardly extending legs of the central flange 22. Each cross member of the T-shaped slots cuts through its flange at its juncture with the wall 28.

Each fixed blade 16 consists of a substantially flat longitudinally extending body portion 36 FIG. 3 which preferably terminates in a downwardly extending forwardly presented flanged portion 37 FIG. 3. The rear edge of the blade terminates in a multiple function hinge element designated generally 40 FIG. 3.

The hinge element 40 comprises a web member 42 and two continuous hinge members 44 and 46 on opposite sides of the web member having forwardly presenting hook-shaped hinge parts 45 and 47 respectively, and terminates in a T-shaped clamp portion 48 which extends along the rear edge of the web member 42.

Each hook part follows a nonuniform curve composed of a number of circular arcs formed from decreasing radii as the curve progresses toward the free end of the hook. A similar hook-shape is disclosed in U.S. Pat. No. 1,824,451 granted to Soss in Sept. 1931. As this patent illustrates, it is difficult to describe with precision the curve followed by such a hook. However, it is known to construct mating hinge parts of interlocking hooks wherein the surfaces of the parts shift with respect to one another while they are being articulated. When the hook parts 45 and 47 are combined with mating parts on the movable blades (as will be more fully described hereinafter), they provide just such a shifting joint.

FIXED BLADE LOUVER

The fixed blade louver portion of the structure when combined with the hinge element forms the basic building block of my versatile air damper. The hooked parts 45 and 47 are formed to fit snuggly between and in engagement with the legs 24 and 26 of the U-shaped center flange 22 as clearly shown in FIG. 2. The web member 42 fits snuggly in the slot formed by the stems 29 and 31 of the notches 25 and 27. The T-shaped terminus 48 of the web member 42 overlies the rear face of the leg 26. When the hinge element is fully inserted into the T-shaped notches its edge lies against the wall 28. In this position the T-shaped clamp portion 48 overlies the cross portion of the T-shaped slot 27 as shown in FIG. 4. To clamp the hinge element to the sidewall the member 48 is struck with a punch or other similar took, so that the extending flanges of the cross member of the T are bent inwardly into the T-shaped slot 27 as shown in FIG. 5; the metal being formed around the notched portion of the leg 26 to provide a secure clamp. When the member 48 is thus clamped to each side 12 and 14, the sides are held together. The hooked parts are braced against the channel of the U-shaped center flange 22 at spaced apart points to prevent twisting of the sidewalls about a longitudinal axis. The blades 36 and flanges 37 prevent twisting of the sidewalls about their vertical axes.

The flanges 37 preferably bear against the inner face of the front flange 18. To this end, the blade portion 36 is of such a depth from front to rear that it would be deeper than the space provided between the leg 24 and the flange 18 at the angle at which it is formed with the web 42. Accordingly, it is necessary to bend the blade 36 in the direction of the arrow shown in FIG. 3, said bending being well within the elastic limit of the material of which the blade is composed. The bending force is resisted by the hinge element bearing against the flange 22 at a number of places as will clearly be understood from the preceeding description with reference to the drawings.

In assembling the blade with the side portion 12 the edge of the web 42 is first inserted into the slot 29 and then the blade

is bent to allow the flange **37** to come within the flange **18**. The blade is then fully inserted into the notch and the force on the blade is relaxed so that the blade portion **36** unflexes and brings the flange portion **37** to bear against the flange **18**. The natural resiliency of the material of which the blade is formed causes it to lock in this position by exerting a spring force against the flanges.

To make the blade even more stable, it can be formed with a protrusion along the underneath thereof at the juncture with the web member **42** as shown at **50** FIG. **2**. The protrusion **50** bears against the front face of the leg **24**.

Top and bottom members can also be used to stiffen the structure. For example, top member **52** FIGS. **1** and **2** is formed of a simple channel disposed within the front and back flanges **18** and **20** and is connected thereto as for instance by welding.

The whole structure forms a unitary rigid ventilator having a plurality of fixed blades disposed downwardly at an angle most preferably being 35° to the horizontal.

AUTOMATIC MOVABLE BLADE AIR DAMPER

The structure thus far described is adaptable to a number of automatic and manual blade systems. FIGS. **2**, **3**, and **4** illustrate one type of automatic movable blade which in combination provides a back draft exhaust air controller.

The blade **60** is preferably made of vinyl on the order of 0.051 inches thick. Along the upper longitudinal edge thereof is a preformed hook-shaped hinge part **62** which is designed to mate with the hinge part **45** of the hinge element **40**. The two parts are assembled by sliding them together longitudinally. It will be noted that a complementary hook-shaped hinge extension **64** extends along the inner face of the blade **60**. This forms a part of the hinge part **62** and not only prevents the disengagement of the complete hinge, but also provides a shield to prevent dirt from entering into and fouling the hinge.

To accommodate the blade **60** in overlying relation to the leg **24**, the leg is notched out as at **66**. The hook-shaped parts **62** and **45** are so formed that the inner face **61** FIG. **2** of the blade **60** lies flat against the leg **24**. It will be noted that the pivotal engagement of the hook-shaped parts is within the channel of the U-shaped center flange **22**. Thus the blade **60** is normally urged by natural forces against the leg **24**.

The lower longitudinal edge of the blade **60** includes a two part stop forming a jaw designated generally **68** FIG. **3**. The lower lip **70** of the jaw slants backwardly to engage the outer surface of the hook part **47**. This prevents water and air from getting under the blade.

The upper lip **72** of the jaw rests across the upper surface of the hook-shaped part **47** thereby providing a wiping action blade seal, and offering resistance to inadvertent opening and rattling of the closed blade.

The longitudinally extending jaw **68** terminates short of each end of the blade **60** so that the blade can be flush against the leg **24**.

The above-described structure provides a much improved damper. The continuous hinge element gives rigidity to the blade so that light-gauge vinyl can be used without warping. The vinyl when used with aluminum prevents electrolytic cell action and other types of corrosion. The hook-shaped parts with their ample clearances provide a hinge with a freedom of action which will virtually never bind. This hinge along with the flush fit of the blade against the frame and the jawlike stop and seal on the free end provide a very effective air stop.

In this example, as in the first example, the fixed louver portion should be taken as facing outwardly in its intended environment, that is, the front of the structure shown in FIG. **1** appears as it would on the outside of a building wall in which the louver is mounted. The fixed louvers in combination with the automatic movable blade provide not only the appearance and functions of a fixed louver and the capability of an automatic back-draft exhaust air controller, but also greatly increase the effectiveness of the weather seal of the unit.

The operation of the unit is readily understood by reference to FIG. **2** wherein the position of the movable blades is indicated in phantom and the direction of travel of the blades to the phantom positions in response to exhaust air approaching from the right, is indicated by the arcuate arrows. When the exhaust air diminishes the blades automatically return by gravity to their positions as shown in full lines. The fully sealed closure will be effected even though there is no reverse air flow from the left (that is, from the out-of-doors).

In the alternate embodiment shown in FIGS. **6** and **7** I provide an automatic back-draft intake air controller having the same advantageous sealing features. In this embodiment the blades **80** have a hook-shaped hinge part **82** along the upper longitudinally extending terminal edge to mate with the hook part **45** of the hinge element **40**. The blade **80** is designed to lay flat against the support frame or leg **124** of the central flange **122**. The hinge part **82** is connected to the flat vertically extending portion of the body by the web portion **84**. This web portion **84** functions in a similar manner to the extension **64** FIG. **2**. Similarly the leg **124** is notched out as was the leg **24** FIG. **3** at **66** to accommodate the pivoting hinge parts. Note in this regard that the central flange **122** has been reversed from the flange **22** so that the wider leg **124** is in the rear while the narrower leg **126** is in front. The jaw-shaped stop and seal **90** and **92** is identical to that previously described in FIG. **2**. Of course the size and proportions may have to be changed to accommodate the rear surfaces of the hinge member **46** and hook-shaped part **47**.

In operation air from the out-of-doors enters from the left in FIG. **6** through the fixed portion of the structure and causes the blades **80** to swing open in the direction of the arcuate arrows to the positions shown in phantom. Should there be no air flow from without, the blades would return to their fully sealed condition shown in full lines, by natural forces.

The blades are normally designed so that they will not fully open above the horizontal. The juncture of the web **84** and the main body of the blade **80** will engage the T-shaped portion **48** and prevent this. Exhaust air traveling from right to left, FIG. **6**, will drive the blades down to the fully closed position.

MANUAL MOVABLE BLADE AIR DAMPER

FIGS. **7** and **8** illustrate one type of manually operable movable blade which can be moved to a plurality of positions and which in combination provides a fixed blade and adjustable blade air controller.

The frame and fixed blade portion is identical to that shown in FIGS. **1**—**4**. This embodiment utilizes the upper hinge member **46** and its hook-shaped hinge part **47** to mount the blade **200** for pivotal movement. As in the previous examples, the blade comprises a substantially flat longitudinally extending body portion with a hook-shaped hinge element **204**. The element **204** extends along the lower longitudinal edge and a seal designated **206** extends along the upper edge. The blade is designed to overlie the inner face of the leg **24** to provide an effective air lock.

The hook-shaped part **204** has two extensions **208** and **210**. Extension **210** serves the same function as the hinge extension **64** and accordingly, extends longitudinally along the rear of the blade complimenting the fixed hinge part of the structure. Extension **208** is disposed along the forward edge of the blade extending below the hinge element **204** to prevent dirt from entering into and fouling the hinge.

The seal **206** comprises a flexible portion **212** made of rubber or similar material, which is attached to the blade in any suitable fashion, such as by dovetailing. The second part **214** of the seal, comprises an upstanding flange which is the upper terminal edge of the blade **200** and which is offset from the body of the blade to engage the rear part of the hinge portion **44** when the blade **200** lies flat against the leg **24**. The resilient part **212** of the seal includes a longitudinally extending peak **215** which is disposed to pass over the center of the fixed hinge **44** when the blade is in the position just described,

and rest against the outer surface of the hook-shaped part **45**. The peak provides a wiping action which allows for misalignment and provides a positive seal under such conditions.

In addition the seal has an outwardly extending, downwardly depending, hook-shaped portion **216** extending along the front thereof which serves as a water stop.

Securely fastened to the back of each blade is a rearwardly extending flange **220**. The flanges are pivotally connected to a rod **222**. When the rod is pulled downwardly, the blades are pivoted to the rear as shown by the phantom position in FIG. **8**. The rod and flanges are well known in the art. See for example U.S. Pat. No. 2,355,412 issued Aug. 8, 1944 to H. M. Bird. Such devices are useful for positioning the movable blades in a plurality of predetermined positions from fully opened to fully closed. It is also known in the art to motorize this manual action.

It will be understood that various changes in the details, materials and arrangement of parts which have been herein described and illustrated in order to explain the nature of this invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the following claims.

I claim:

1. An air damper comprising:

a. a frame having side members with inwardly disposed flanges thereon including a central flange having at least two legs, one of which extends inwardly a greater distance than the other;

b. a plurality of fixed blades extending between said side members and interlocked between the front flanges and the central flange;

c. continuous hinge elements connected to said fixed blades, each of said hinge elements comprising at least two hook-shaped parts disposed on opposite sides of a web member; and

d. at least one movable blade having a continuous hook-shaped hinge portion interconnected with one of said hook-shaped parts for pivotal movement with respect thereto, said blade having a seal means thereon for sealingly engaging another of said hook-shaped parts on an adjacent hinge element.

2. The invention of claim **1** wherein a part of the movable blade overlies part of that leg of the central flange which extends inwardly the greatest distance.

3. The invention of claim **1** wherein the seal means comprises a longitudinally extending jawlike portion on the blade engaging the hinge element along at least two lines of contact.

4. The invention of claim **1** wherein the hinge element interlocks with the central flange.

5. The invention of claim **1** wherein the pivotal connection between the hook-shaped hinge portion of the blade and hinge element is offset from the blade and located within the envelope of the central flanges.

6. The invention of claim **1** wherein the hook-shaped hinge portion of the blade has an extension overlying the mating hinge element.

7. The invention of claim **1** wherein the movable blade is connected to the hinge part to swing toward the fixed blade, which is connected to the same hinge element, to open said damper, said blades being positioned on the same side of the central flanges.

8. The invention of claim **1** wherein the movable blade is connected to the hinge part to swing away from the fixed blade, which is connected to the same hinge element, to open said damper, said blades being positioned on opposite sides of the central flanges.

9. The invention of claim **8** wherein said movable blade is positioned at an angle of more than 90° to said fixed blade.

10. The invention of claim **8** wherein means are connected to the movable blades for positioning them in predetermined positions.

11. An air damper comprising:

a. a frame having side members with inwardly disposed flanges thereon including a central flange having at least two legs;

b. a plurality of fixed blades extending between said side members and interlocked between the front flanges and the central flange;

c. continuous hinge elements connected to said fixed blades, each of said hinge elements comprising at least two hook-shaped parts disposed on opposite sides of a web member; and

d. at least one moveable blade having a continuous hook-shaped hinge portion interconnected with one of said hook-shaped parts for pivotal movement with respect thereto, said blade engaging another of said hook-shaped parts on an adjacent hinge element.