# United States Patent

[11] 3,584,566


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[54] **LOUVERED AIR DAMPER AND METHOD OF PRODUCING SAME**
**16 Claims, 6 Drawing Figs.**


[52] **U.S. Cl.** ..... **98/110,** 98/119, 98/121, 49/77
[51] **Int. Cl.** ..... **F24f 7/00**
[50] **Field of Search** ..... 98/110, 121, 119, 107, 40; 160/236; 49/77; 52/473



[56] **References Cited**
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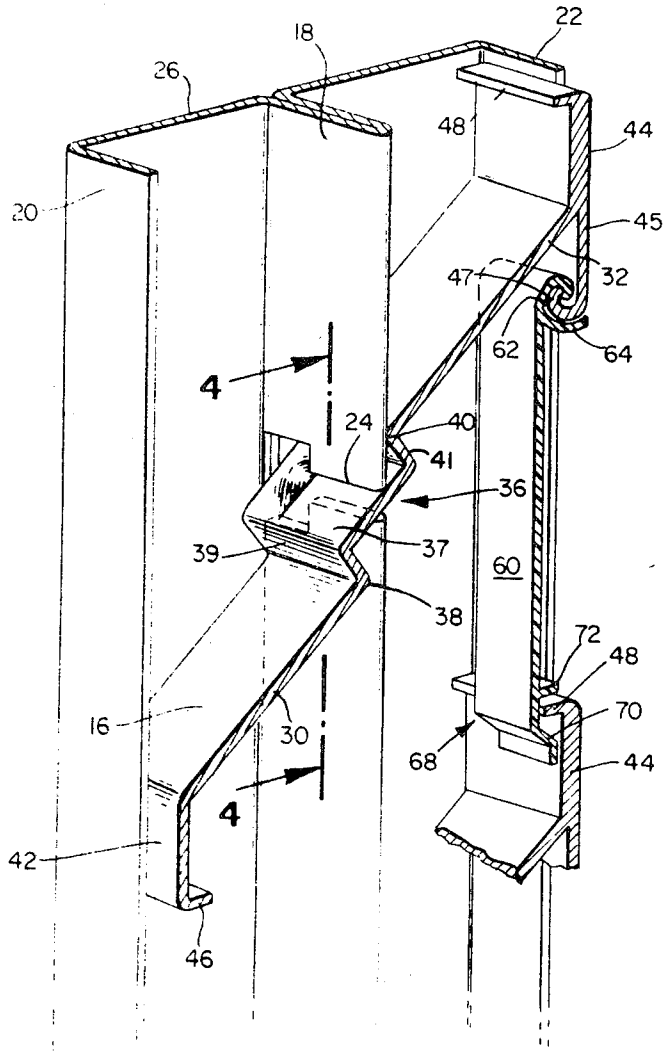
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**ABSTRACT:** An air damper ventilator combines a fixed blade ventilator with means adaptable to check the flow of air or regulate the flow of air as it passes therethrough. The ventilator is fabricated from fixed blades which interlock with side channels to form a unified structure and movable blades which slide together with the fixed blades in articulated engagement therewith.

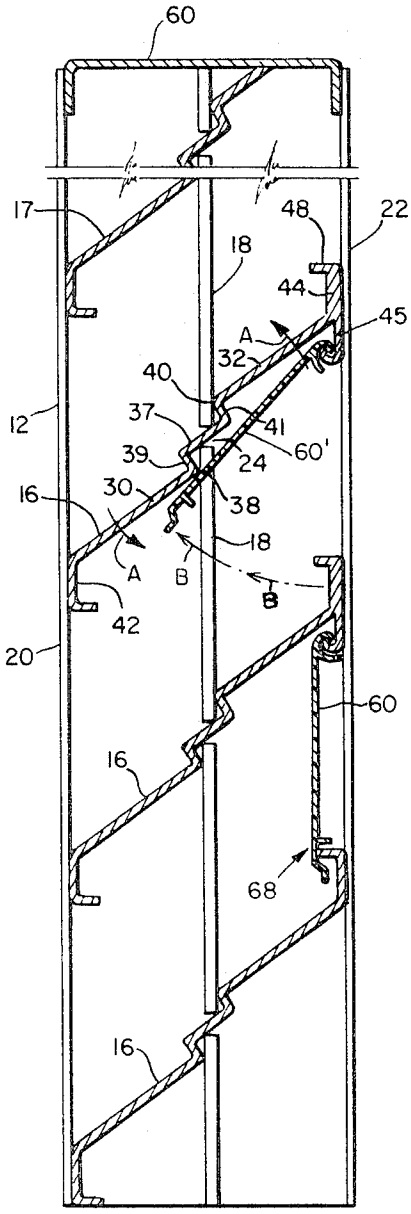



Fig. 2

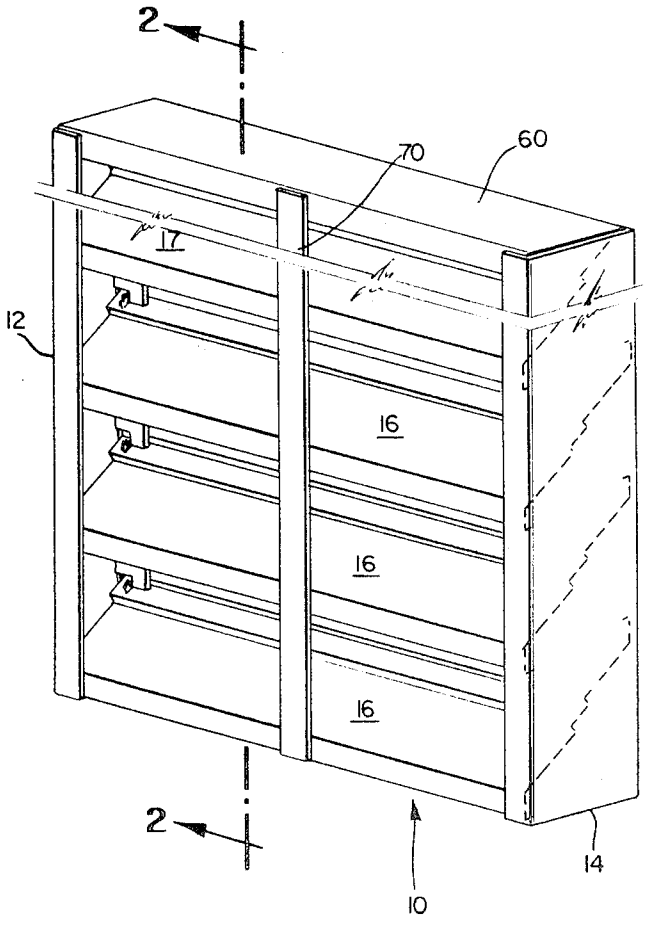



Fig. 1

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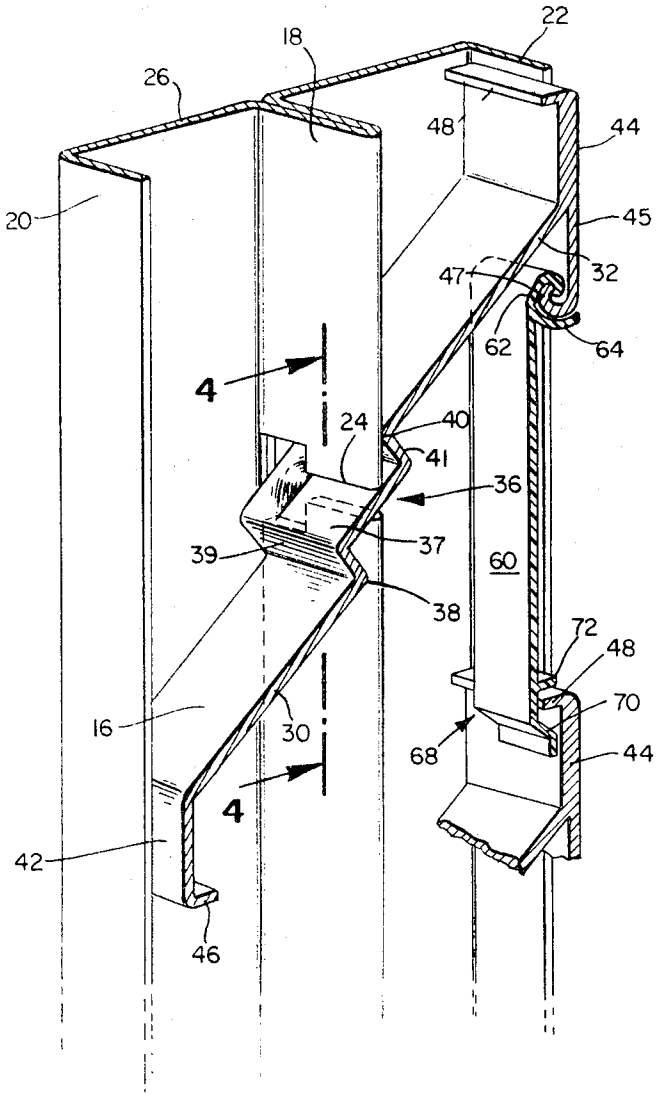



Fig. 3

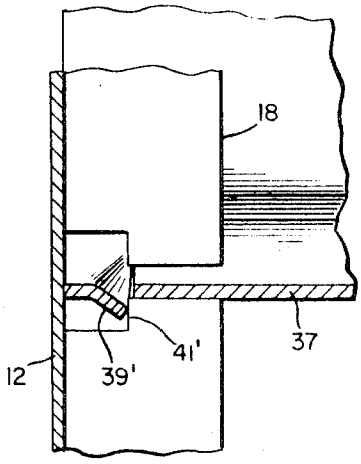



Fig. 4

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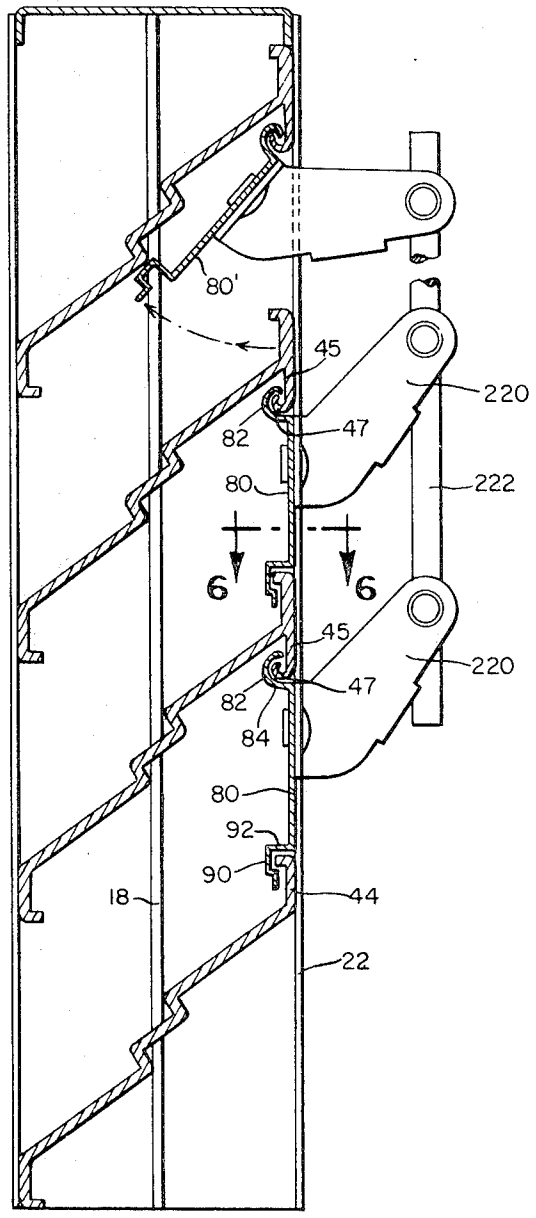



Fig. 5

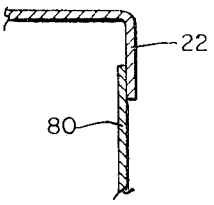



Fig. 6

# LOUVERED AIR DAMPER AND METHOD OF PRODUCING SAME

## CROSS REFERENCE TO RELATED APPLICATIONS

Reference is made to my prior copending applications Ser. No. 815,896, filed Apr. 14, 1969, and Ser. No. 822,873, filed May 8, 1969.

## 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. Such ventilators were composed of a multitude of pieces including nuts, bolts, brackets, etc. which required considerable time to assemble and which, when composed of dissimilar metals, were subject to corrosion.

## SUMMARY OF THE INVENTION

The present invention overcomes the deficiencies of the prior art by providing a louvered air damper having a plurality of fixed blades which quickly and easily are assembled with side members to form a unified structure, and a plurality of movable blades which are readily interconnected to the fixed blades by a unique hinge element.

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.

In the preferred embodiment each blade has longitudinally extending blade portions offset from one another by a Z-shaped web portion. The web and blade portions interlock with a center and end flanges respectively on the side members. One blade end flange includes a portion of the hinge for articulating the movable blade to the fixed blade.

Accordingly it is an object of my invention to provide a new louvered air damper of simplified design which is easy and inexpensive to fabricate.

It is another object of my invention to provide a simplified method of quickly fabricating the damper.

These 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 foreshortened perspective view of the preferred embodiment of my invention;

FIG. 2 is an enlarged 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 proceeding FIGS.;

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

FIG. 5 is a view similar to FIG. 2 showing an alternate embodiment of my invention with portions shown in alternate positions; and

FIG. 6 is a view taken as indicated by the lines and arrows 6–6 in FIG. 5.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

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 the FIGS., a 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 and/or extruded or both and is on the order of 0.081 inches thick. The side members are generally E-shaped in cross section and are arranged as mirror images in the structure. Each side member has a front and a rear flange and a center flange which preferably extends inwardly a greater distance than the front and rear flanges (compare center flange **18** FIG. 3 with front flange **20** and rear flange **22**). The reason for this extension will be more fully explained hereinafter with respect to assembling the structure.

The center flange has a plurality of T-shaped notches cut therein spaced at equal intervals and oriented as shown in FIG. 3 with the stem **24** of the T extending preferably perpendicular to the wall **26** of the side member and completely severing the inwardly extending edge of the flange **18**. The top of the T-shaped slot is cut through the flange **18** right at its juncture with the wall **26**.

Each blade consists of longitudinally extending blade portions **30** and **32** FIG. 3 which are offset by a web portion designated generally **36** FIG. 3. The entire blade is preferably bent into the Z-shape shown to form offset opposed longitudinally extending corners or bearing surfaces **38** and **40**.

The blade portions **30** and **32** preferably terminate in oppositely extending flanged edges **42** and **44** respectively which are bent at an angle to the blade portions and which conveniently include stiffening portions or flanges **46** and **48** respectively which are disposed inwardly. With the blade disposed in operative relation to the side member the flanges **42** and **44** bear against the front and rear flanges **20** and **22** respectively.

The parts described thus far are carefully dimensioned so that in order to place the blades in the operative position shown it is necessary to bend them slightly in the direction of the arrows A,A shown in FIG. 2, said bending being well within the elastic limit of the materials of which they are composed. As shown in FIG. 2 the bending force on the blade is resisted most preferably at four points, namely, between the surfaces of the web **37** and the lower front and upper rear edges of the center flange **18** formed by the stem **24** of the notch, and where the longitudinally extending corners **38** and **40** bear against the center flange **18**. Once the blade is fully inserted into the notch the force on the blade portions **30** and **32** is relaxed so that the flanges **42** and **44** bear against the inner sides of the front and rear flanges **20** and **22** of the side member. 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. The blade is so formed in its natural unflexed state that the horizontal distance between the peaks **38** and **40** FIG. 2 is less than the thickness of the center flange **18**, when that distance is measured with the blade in its unflexed state disposed at the angle at which it will be placed in its operative position. Thus the peaks **38** and **40** will always engage the front and rear faces of the center flange **18** before the blade **16** has been rotated counterclockwise, when viewed as in FIG. 2, sufficiently to allow the end flanges **42** and **44** to come within the flanges **20** and **22**.

It is with respect to this aspect of my invention that the extra length of the flange **18** plays an important part. In assembling the blade with the side portion **12** the edge of the web **37** is first inserted into the slot **24** and then the blade is twisted to allow it to be fully seated with the edge of the blade against the wall **26**.

While it is desirable that the center flange **18** also engage the web **37** as in the preferred embodiment described above, the device can be modified to include a wider slot **24** where the flange **18** does not engage the web **37**, so long as the peaks **38** and **40** do engage the flange **18**. Likewise other modifications can be made within the scope of this invention, as for example, removing the flanges **42** and **44**; although the depending portion **45** would have to remain.

When the web 37 engages the flange 18 with both its upper and lower faces the blade is fixed in its vertical position. To retain the blade in horizontal position the web 37 is crimped in the area of the head of the T-shaped slot. Referring more particularly to FIG. 4 it has been found most desirable to pierce the web 37 behind the notch shown so that a lip 39' depends from the web 37 and engages the notch as at 41', thus positively fixing the blade to the side member 12.

Top and bottom members are used to give the damper a finished appearance. For example, top member 60 FIGS. 1 and 2 is formed of a simple channel disposed within the front and back flanges 20 and 22 and is spot welded thereto. In such a case it may be necessary to cut off a portion of the blade 17 to accommodate the top member.

Where the length of the unit becomes so great that undue flexing will occur, one or more supports such as that shown at 70 in FIG. 1 are used. Such a support comprises a flat piece of bar stock which is spot welded to the outwardly disposed flanges of the blades and the top member.

In the most preferred embodiment of this invention the blades are disposed at an angle of 35° to the horizontal and are so spaced vertically that the leading edge of an upper blade overlaps the trailing edge of its next adjacent lower blade when viewed in normal elevation.

The intermediate web portion 36 has a riser 39 extending above the lead portion of the blade 16 to the web 37. A similar riser 41 extends above the web 37 to the trailing portion of the blade 16. Both risers provide water stops which extend the full width of the blades. An additional water stop is provided by the flange 44 and its inwardly disposed portion 48.

The rear edge of the blade 16 terminates in a hinge element 45 depending therefrom, which is most preferably an extension of the flange 44. The hinge element 45 is continuous across the full width of the blade 16 and has a forwardly presenting hook-shaped hinge part 47.

The hook part 47 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 part 47 is innerconnected with a mating part on the movable blade (as will be more fully described hereinafter), it provides just such a shifting joint.

The fixed blade louver portion of the structure when combined with the hinge element forms the basic building block of my versatile louvered air damper.

## Automatic Movable Blade Air Damper

The structure thus far described is adaptable to a number of automatic and manual blade systems. FIGS. 2 and 3 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 47 of the hinge element 45. The two parts are assembled by sliding them together longitudinally. This assembly is performed prior to completely assembling the fixed blade 16 with both of the sides 12 and 14.

It will be noted that a complementary hook-shaped hinge extension 64 extends along the 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.

The pivotal engagement of the hook-shaped parts is within the channel formed between center flange 18 and the end flange 22.

The lower longitudinal edge of the blade 60 includes a two part stop forming a jaw designated generally 68.

The upper lip 72 of the jaw overhangs the upper surface of the forwardly presenting terminal portion 48 of the flange 44. The lower lip 70 of the jaw slants downwardly and backwardly and terminates in a downwardly depending flange, which together with the upper lip 72 embraces the portion 48.

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.

In this 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 damper 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 opened position of the movable blades is indicated by the upper movable blade 60' and the direction of travel of the blades to this position in response to exhaust air approaching from the right, is indicated by the arcuate arrows B,B. When the exhaust air diminishes, the blades automatically return by gravity to their positions as shown by the lower blade 60.

It will be obvious from what has been described thus far, that the width of the movable blades is less than the total distance between the center flanges 18 of the sides 12 and 14, so that the blades clear the flanges as they rotate to the open position. Accordingly, in order to provide an effective seal it is necessary to have the rear flange 22 of the side members extend inwardly a greater distance than the center flange 18. This does not greatly impair the method of assembly previously described, since the front flange is not extended inwardly. In this instance, the rear portion of the blade 16 is bowed slightly to permit insertion of its web portion 37 into the slot 24. Then it's relaxed so that the portion 44 bears against the flange 22. The front portion of the blade 16 is then bowed slightly so that full insertion of the blade can be accomplished. When the blade is partially inserted, the front portion is relaxed and bears against the flange 20, whereupon full insertion is accomplished by simply shoving the parts together.

## Manual Movable Blade Air Damper

In the alternate embodiment shown in FIGS. 5 and 6 I provide an air controller having blades 80 with hook-shaped hinge parts 82 along the upper longitudinally extending terminal edges to mate with the hook parts 47 of the hinge elements 45. The blade 80 is designed to lay flat against the flange 22 as shown in FIG. 6. The flange 22 most preferably extends inwardly a greater distance than flange 18. 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. 3. The parts 47 and 82 are assembled by sliding them together longitudinally, as in the previous example.

The jaw-shaped stop and seal 90 and 92 are similar to the parts 70 and 72 previously described with respect to FIG. 3. The configuration is modified to accommodate the flange 44 and the position of the blade 80.

FIG. 5 illustrates 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 hinge member 45 and its hook-shaped hinge part 47 to mount the blade 80 for pivotal movement. As in the previous examples, the blade

comprises a substantially flat longitudinally extending body portion with a hook-shaped hinge element **82**. The blade is designed to overlie the inner face of the flange **22** to provide an effective air lock.

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 front or open position as shown by the position of the upper blade **80'**. 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.

What I claim is:

**1.** A louvered air damper comprising:

a. a frame having opposed side members, each of said side members having at least two inwardly disposed flanges spaced from one another, and an intermediate flange depending inwardly between said last mentioned flanges having at least one notch therein presenting an inwardly disposed open end;

b. at least one fixed blade, comprising a plurality of blade portions offset from one another by an intermediate web, said web being connected to said blade portions by risers; said web being disposed in said notch; said blade bearing against said intermediate flange and said first mentioned flanges;

c. a continuous hinge element connected to said fixed blade, said hinge element comprising a hook-shaped part; and

d. at least one movable blade having a continuous hook-shaped hinge portion interconnected with said hook-shaped part for pivotal movement with respect thereto.

**2.** The invention of claim **1** wherein a part of the movable blade overlies part of one said inwardly disposed flanges.

**3.** The invention of claim **1** wherein said intermediate web is Z-shaped.

**4.** The invention of claim **1** wherein said intermediate web engages said intermediate flange along the portions thereof forming said notch.

**5.** The invention of claim **1** wherein said fixed blade engages said intermediate flange at the junctures of said risers with said blade portions.

**6.** The invention of claim **1** wherein said blade portions of said fixed blade include oppositely disposed flanges at the ends thereof.

**7.** The invention of claim **6** wherein said fixed blade is disposed at an acute angle to the horizontal and the flange at the edge of the upper blade portion extends vertically upwardly.

**8.** The invention of claim **1** wherein said notch includes a wider portion remote from the innermost edge of said intermediate flange, and said intermediate web is deformed in the area of said wider portion to engage said intermediate flange.

**9.** The invention of claim **1** wherein the pivotal connection between the hook-shaped hinge portion of the blade and hinge element is located between the intermediate flange and one of said inwardly disposed flanges.

**10.** The invention of claim **1** wherein the movable blade is disposed to swing toward the fixed blade to which it is connected to open said damper.

**11.** The invention of claim **1** wherein means are connected to the movable blades for positioning them in predetermined positions.

**12.** The invention of claim **1** wherein said movable blade has a sealing means thereon for coaction with said fixed blade to provide a weather seal for said device.

**13.** The invention of claim **12** wherein the sealing means comprises a longitudinally extending jawlike portion on the blade.

**14.** The invention of claim **13** wherein one of said fixed blade portions has an upwardly extending flange thereon having an inverted terminal portion, and said jawlike portion on said movable blade is positioned to embrace said terminal portion.

**15.** A method of assembling a louvered air damper having a frame including opposed side members, each of said side members having at least two inwardly disposed flanges spaced from one another, and an intermediate flange depending inwardly between said last mentioned flanges having at least one notch therein presenting an inwardly disposed open end; and at least one fixed blade, comprising a plurality of blade portions offset from one another by an intermediate web, said web being connected to said blade portions by risers, and a continuous hinge element connected to said fixed blade; and at least one movable blade having a hinge portion; comprising: the steps of sliding said hinge portions and said hinge element together to form a hinge, bowing the fixed blade and inserting its web into the notch of said intermediate flange, and releasing the fixed blade whereby it bears against the inwardly disposed flanges.

**16.** In the method of claim **15** wherein said notch includes a wider portion remote from the innermost edge of said intermediate flange, the additional step of deforming said intermediate web in the area of said wider portion to engage said intermediate flange.