Nov. 29, 1949 W. R. MILLER ET AL 2,489,308

BAROMETRIC DAMPER

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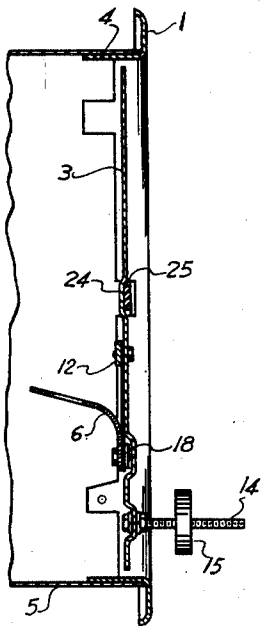

Fig. 2

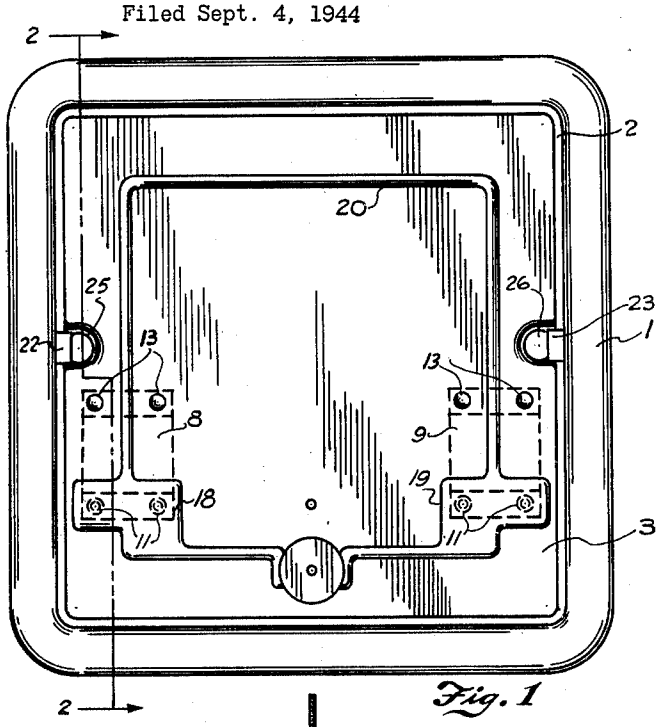

Fig. 1

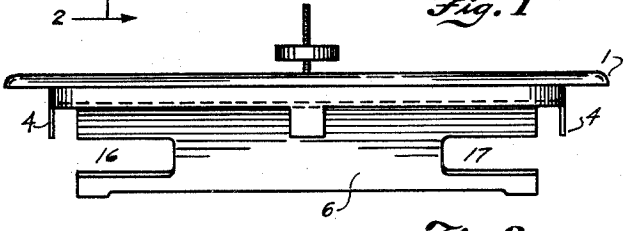

Fig. 3

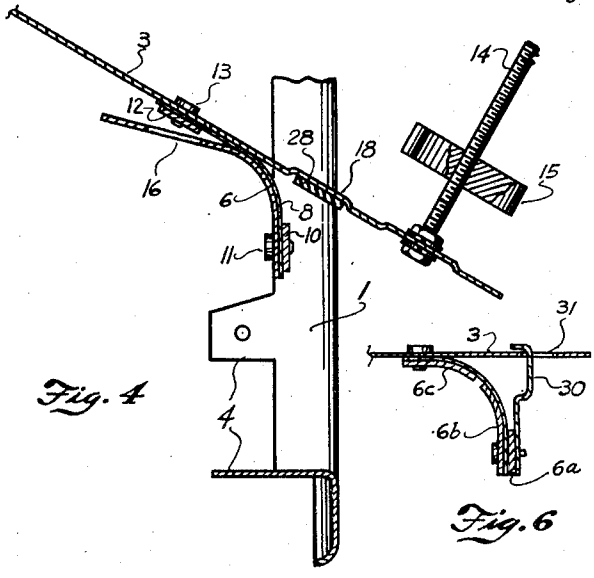

Fig. 4

Fig. 6

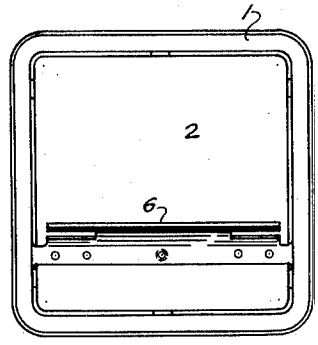

Fig. 5

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BAROMETRIC DAMPER

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10 Claims. (Cl. 236—45)

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It has become common to provide furnaces with barometric dampers which maintain constant draft in the off-take flues. These dampers usually consist of a vane which is pivoted off-center and which is provided with a biasing weight, thereby responding to the difference in pressure between the flue and atmosphere. As this pressure difference or draft increases, the vane moves inwardly for permitting air to enter the flue, thereby tending to maintain the draft constant.

It has been found that dampers of this type usually work satisfactorily when new, but gradually become inoperative over a long period of time. The reason for this is that the bearings become dirty or rusty, thus requiring a substantial force in order to move the damper blade. In order for the damper to maintain a fairly uniform draft it must be movable by a very small force. Thus when the bearings become rusty or dirty the damper remains stationary, even though the draft may change considerably.

The primary object of this invention is to provide a barometric or pressure operated damper which is not subject to loss of efficiency due to age. This result is obtained by completely eliminating the usual bearing type pivots and mounting the damper blade on spring hinges which flex to permit movement of the damper blade.

A further object of the invention is to provide an arrangement for limiting the curvature that the spring hinges may take, thereby insuring that the spring hinges operate well within their elastic limit.

Other objects of the invention will appear from the following description and appended claims.

For a full disclosure of the invention reference is made to the following detailed description and to the accompanying drawings, in which,

Fig. 1 is a front elevation of a barometric damper embodying the invention;

Fig. 2 is a side sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a bottom view of the damper;

Fig. 4 is a fragmentary side sectional view showing the damper in open position;

Fig. 5 is a rear view on a reduced scale of the damper frame; and

Fig. 6 is a view similar to Fig. 4 of a modified form of the invention.

Reference character 1 indicates generally a rectangular frame having a rectangular opening 2 which receives a flat rectangular shaped damper blade 3. The frame 1 is provided with

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an inwardly extending portion 4 which is adapted for reception in a thimble 5 which in turn may be mounted on the smoke pipe leading from a furnace. The frame 1 is also formed with a cross member 6 which extends across the opening 2 from one side of the frame to the other. As shown in Figs. 2 and 4 this cross member is generally arcuate in shape. The purpose of this construction will appear as this description proceeds.

Attached to the front portion of the cross member 6 are a pair of upwardly extending normally flat spring hinges 8 and 9, one spring hinge being located at one side of the frame and the other spring hinge being located at the other side of the frame. Each spring hinge is preferably clamped between the cross member 6 and a clamping member 10, screws 11 serving to draw the clamping members 10 tightly up against the spring hinges. The upper ends of the spring hinges are attached to the damper blade 3. This attachment preferably includes a clamping member 12 for each spring hinge and which is drawn up against its spring hinge by screws 13.

Attached to the lower central portion of the damper blade 3 is an outwardly extending screw 14 which carries an adjustable weight 15. This weight biases the damper in closing direction.

In operation, the difference in pressure between atmospheric pressure acting on the right hand side of the damper, as seen in Fig. 2, and furnace draft acting on the left hand side of the damper, tends to rock the damper in a counter-clockwise direction. This action is opposed by the weight 15 which tends to rock the damper in a clockwise direction. When the furnace draft increases above the setting of the damper as determined by the adjustment of weight 15, the damper rocks counter-clockwise, thus permitting an increased amount of air to pass directly into the flue and thereby check the increase in draft. This rocking of the damper blade is permitted by flexing of the spring hinges. As shown in Fig. 4, the arcuate section of the cross member 6 serves to guide or limit the flexing of the spring hinges. This insures that the spring hinges will not buckle in service, and further insures that the fiber stress in the springs will not exceed the elastic limit.

It should be noted that the cross member 6 is slotted as at 16 and 17. These slots are provided in order to prevent the clamping members 12 for the hinges from striking the cross member. Also the damper blade 3 is formed with depressions 18 and 19 which provide clearance for

the spring hinge clamping members 10. The damper blade also may be formed with suitable stiffening ridges such as 20.

It is desirable to provide suitable stops for preventing the damper blade from swinging outwardly from fully closed position. Such stops may consist of ears 22 and 23 which extend inwardly from the side members of the frame 1. Preferably the damper blade 3 is formed with depressions 24 adjacent these ears for receiving suitable cushioning pads 25 and 26 which may be formed of felt. If desired, additional cushioning pads 28 (Fig. 4) may be located in the depressions 18 and 19 of the damper blade. These cushions will insure that no metal-to-metal contact takes place between the spring hinge clamping members 10 and the damper blade, thereby insuring silence in operation.

In the embodiment of the invention illustrated in Figs. 1 to 4, the spring hinges flex solely about the arcuate portion of the cross member 6. Fig. 6 illustrates a modified form of construction in which the cross member 6*a* consists of a straight piece which extends from side to side of the frame. Secured to the cross member 6*a* is an arcuate cross member 6*b* which serves as a clamping member for the spring hinges. A similar arcuate cross member 6*c* is attached to the damper blade 3 and serves to clamp the free ends of the spring hinges to the damper blade. It will be noted that the arcuate portions of members 6*b* and 6*c* cooperate to limit the curvature of the spring hinges. If desired, a stop bracket 30 may be secured to the cross member 6*a* and extends through an opening 31 in the damper blade. As shown, this stop bracket limits its opening movement of the damper blade. It will also be apparent that the stop bracket 30 prevents outward movement of the damper blade from a vertical position, thereby providing a stop for limiting closing movement of the damper. Preferably, two stop brackets 30 are provided, each bracket being approximately the width of the spring hinge, one bracket being located opposite one spring hinge and the other bracket being located opposite the other spring hinge.

From the foregoing description it will be apparent that the present invention provides a new form of mounting of the damper blade in a pressure actuated or barometric damper. It will further be seen that this new form of mounting completely eliminates the sliding contact as occurs in the usual trunnion type pivots. This arrangement, by completely eliminating friction in the operation of the damper blade, insures that the damper will perform consistently over a long period of time. In addition, this elimination of all friction makes the damper extremely sensitive to changes in draft and therefore permits the damper to hold the draft within closer limits than the prior art devices.

While we have shown and described a preferred form of the invention, it will be apparent that many changes in construction may be made without departing from the invention. We therefore desire to be limited only by the scope of the appended claims.

What is claimed is:

1. In a damper, a support, a damper blade, a flat spring hinge having one end secured to the support and its other end secured to the damper blade, an arcuate bracing member disposed adjacent the spring in position to force a progressive pivot adjustment in the movement of the damper, adjustable biasing means for biasing the damper blade toward closed position, said spring hinge being arranged to cooperate with said adjustable biasing means in biasing the damper blade toward closed position.

2. In a pressure actuated damper, a frame having an opening, a damper blade for the opening, a cross member extending from side to side of the frame across said opening, and a pair of spring hinges, one at each end of the cross member, each spring hinge having one end attached to the cross member and its other end attached to the damper blade.

3. In a pressure actuated damper, a frame having an opening, a damper blade for the opening, a cross member extending from side to side of the frame across said opening, and a pair of spring hinges, one at each end of the cross member, each spring hinge having one end attached to the cross member and its other end attached to the damper blade, said cross member having an arcuate section adjacent each spring hinge for limiting the curvature thereof.

4. In a pressure actuated damper, a support, a damper blade, a pair of flat spring hinges for pivotally securing the damper blade to the support, means for limiting the curvature of said spring hinges, and arcuate means carried by the damper blade adjacent each spring hinge for limiting the curvature of said spring hinges.

5. In a pressure actuated damper, a support, a damper blade, a flat spring hinge having one end secured to the support and its other end secured to the damper blade, a first arcuate member carried by the support, a second arcuate member secured to the damper blade, said arcuate members having constant radii of curvature and being disposed adjacent the spring hinge and limiting the curvature thereof so as to prevent stressing of the hinge beyond its elastic limit.

6. In a pressure actuated damper, a support, a damper blade, a flat spring hinge having one end secured to the support and its other end secured to the damper blade, a first arcuate member carried by the support, a second arcuate member secured to the damper blade, said arcuate members being disposed adjacent the spring hinge and limiting the curvature thereof so as to prevent stressing of the hinge beyond its elastic limit, and a stop member adjacent said spring hinge, said stop member being arranged to engage one part of the damper blade for limiting movement thereof in one direction and to engage another part of the damper blade for limiting movement thereof in the opposite direction.

7. In a pressure actuated damper, a support, a damper blade, a pair of flat spring hinges for pivotally securing the damper blade to the support, and arcuate means carried by the damper blade adjacent each spring hinge for limiting the curvature of said spring hinges.

8. In a draft member an opening, a support adjacent said opening, a leaf spring extending therefrom and secured thereto, a damper in operative position relative to said draft opening and secured to the spring, an arcuate member positioned adjacent the support and said spring whereby the spring is constrained to conform to the arcuate member in progressive hinge movement of the damper.

9. In a device of the character described a support and a leaf spring secured thereto and extending therefrom, a damper supported hingedly on said spring, and an arcuate member

disposed adjacent the spring in position to receive pressure thereof in progressive hinge movement of the damper and said spring whereby the pivot point of said hinge movement progressively moves along the arcuate member.

10. In a device of the character described a support and a leaf spring secured thereto and extending therefrom, a damper supported hingedly on said spring, an arcuate member disposed adjacent the spring in position to receive pressure thereof in progressive hinge movement of the damper and said spring whereby the pivot point of said hinge movement progressively moves along the arcuate member, and a weight adjustably positionable on the damper whereby to differentially respond to the changing pivot point of said damper movement.

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