Sept. 8, 1964 W. W. KENNEDY 3,147,768

AIR FLOW CONTROL DAMPER

Filed Nov. 15, 1961 3 Sheets-Sheet 1

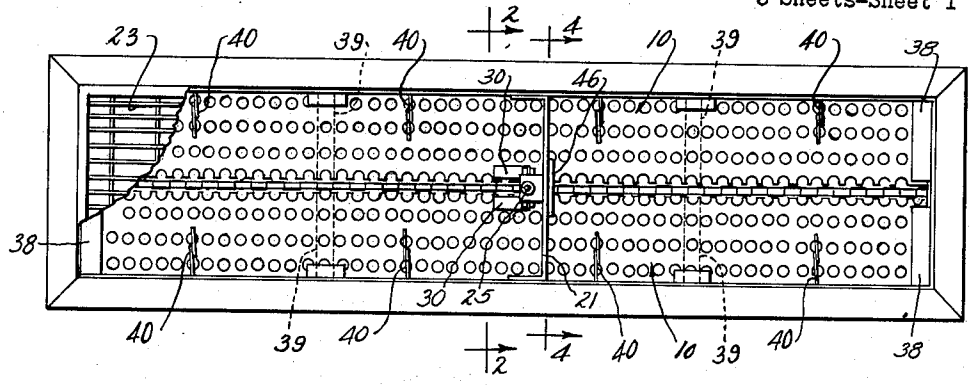


Fig. 1.

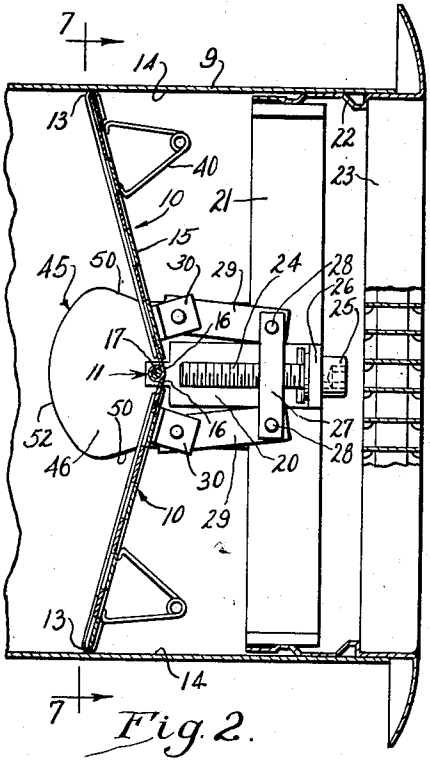


Fig. 2.

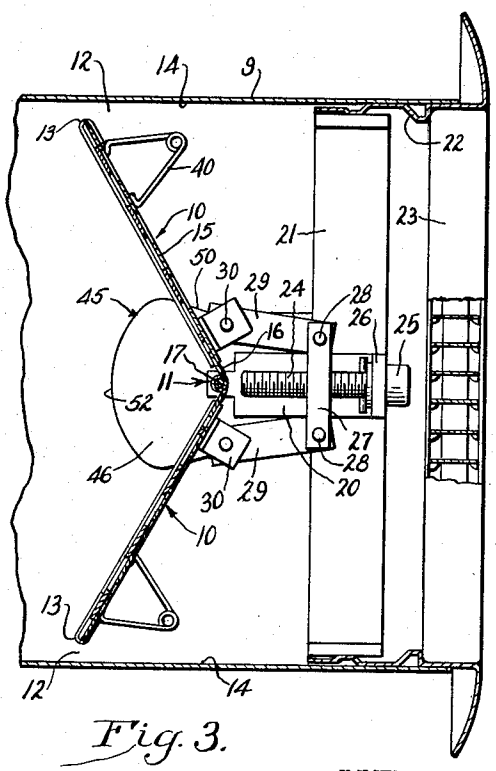


Fig. 3.

INVENTOR.

Walter W. Kennedy

BY

Wolfe, Hubbard, Voit & Osann

ATTORNEYS

Sept. 8, 1964 W. W. KENNEDY 3,147,768

AIR FLOW CONTROL DAMPER

Filed Nov. 15, 1961 3 Sheets-Sheet 2

Fig. 4.

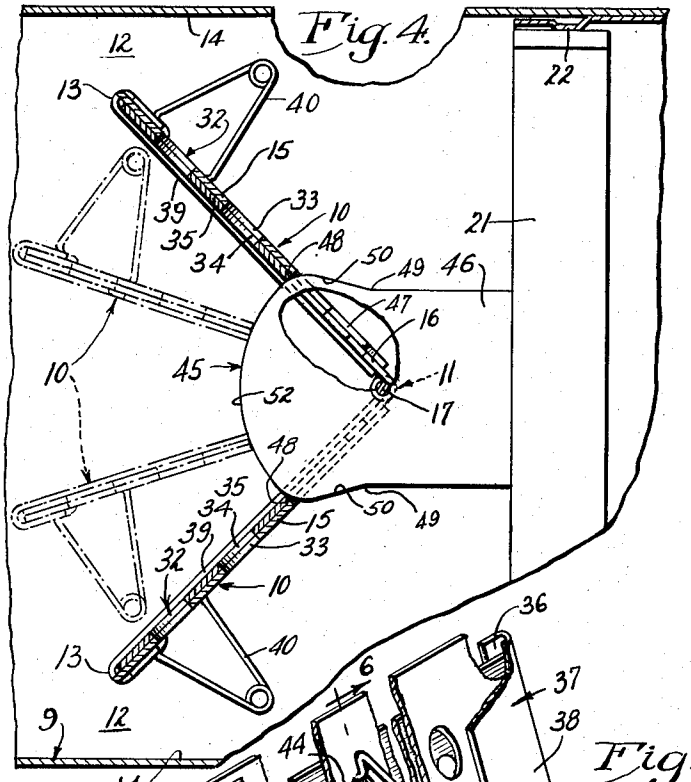


Fig. 6.

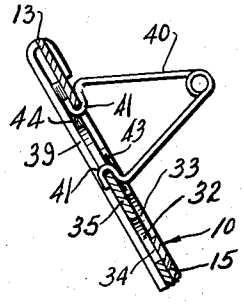
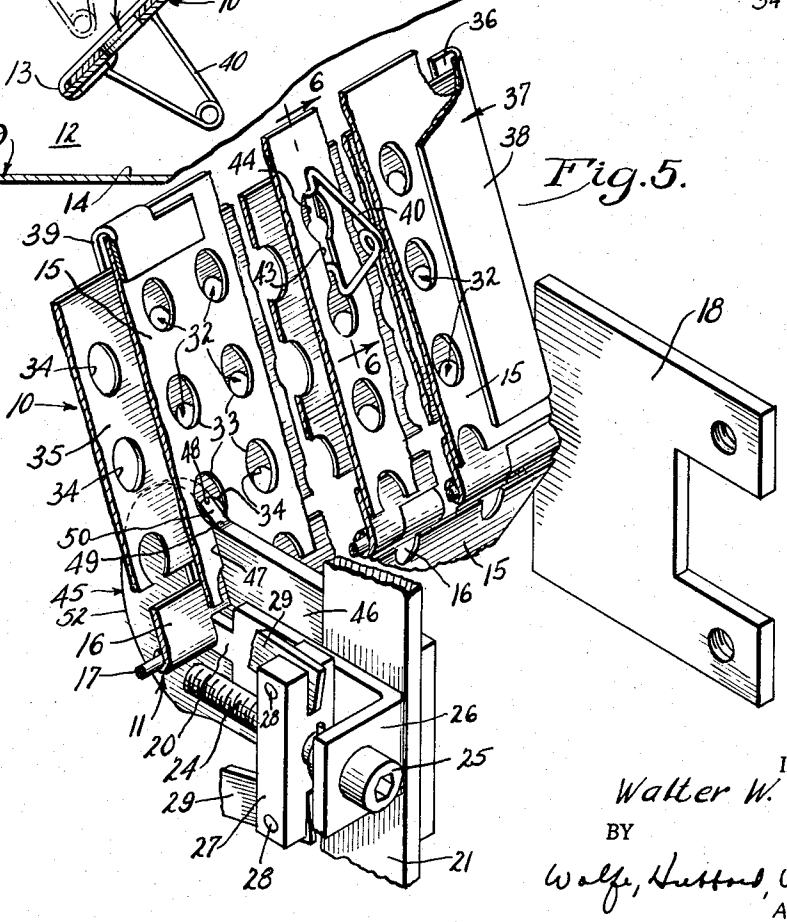


Fig. 5.



INVENTOR.
Walter W. Kennedy
BY
Wolfe, Hubbard, Voit & Osann
ATTORNEYS

Sept. 8, 1964 W. W. KENNEDY 3,147,768

AIR FLOW CONTROL DAMPER

Filed Nov. 15, 1961 3 Sheets-Sheet 3

Fig. 7.

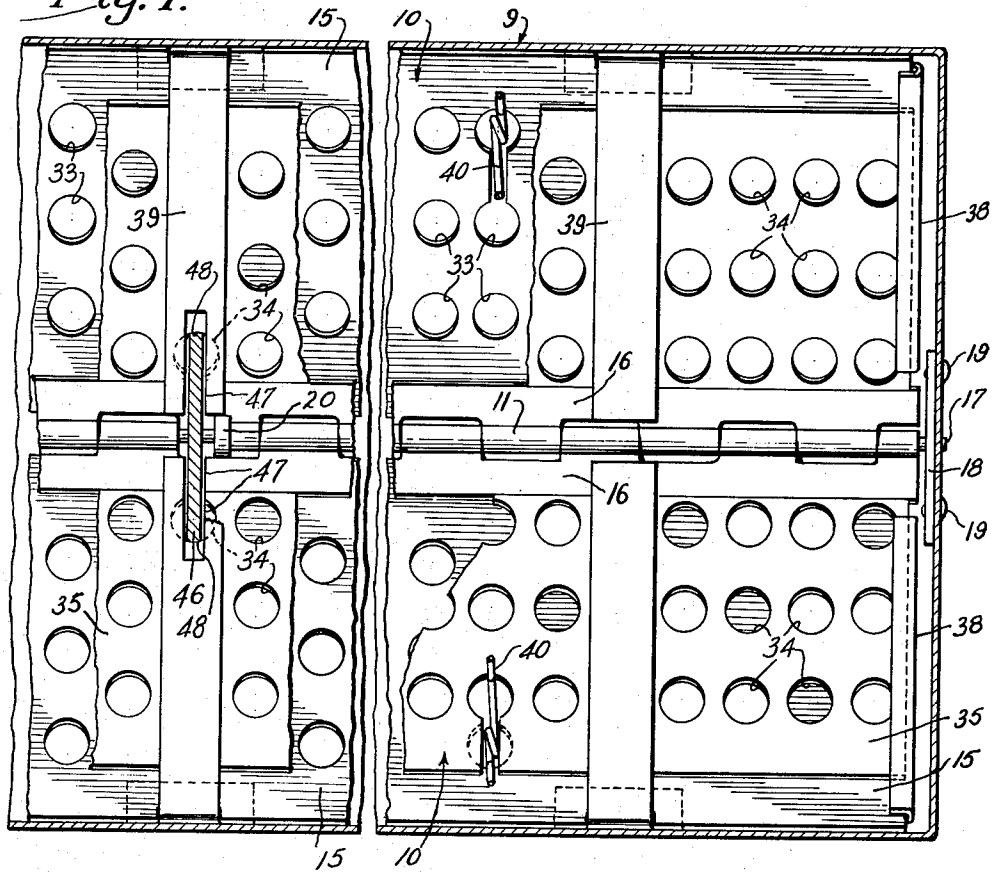


Fig. 8.

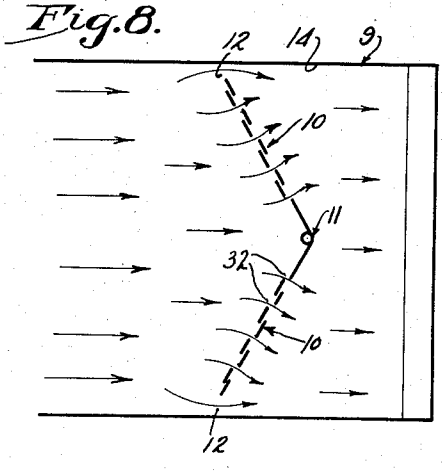
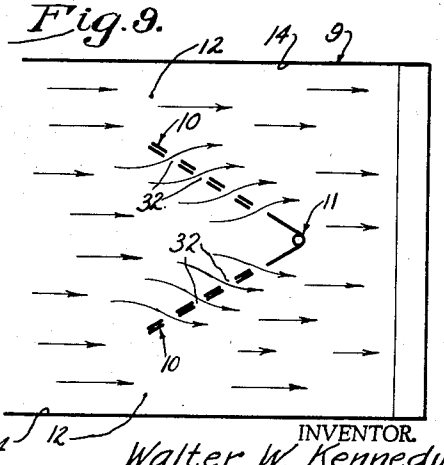


Fig. 9.



INVENTOR.
Walter W. Kennedy
BY
Wolfe, Hubbard, Voit & Osann
ATTORNEYS

United States Patent Office 3,147,768 Patented Sept. 8, 1964

3,147,768

AIR FLOW CONTROL DAMPER

Walter W. Kennedy, Rockford, Ill., assignor to Barber-Colman Company, Rockford, Ill., a corporation of Illinois

Filed Nov. 15, 1961, Ser. No. 152,564
7 Claims. (Cl. 137—614.11)

This invention relates to a damper for controlling the flow of air through a duct by swinging a vane toward and away from the wall of the duct to vary the width of the air passage between the wall and the free edge of the vane. When the damper is nearly closed, the air flow is so confined at the duct wall as to create objectionable noise and prevent proper distribution across the full area of a grille through which the air is discharged into a room. To overcome this difficulty, it has been necessary heretofore to divide the damper into a series of relatively narrow vanes spaced across the duct with a resultant increase in over-all cost of the damper.

The primary object is to provide a swinging type damper in which the desired distribution of the air flow across the duct is achieved in spite of the substantial width of the damper vane.

Another object is to provide such a damper in which a substantial part of the air flows through apertures in the vane when the damper is partially opened.

A further object is to control the size of the apertures automatically in accordance with the swinging movements of the vane and close the apertures when the free edge of the vane reaches the duct wall.

A more detailed object is to perforate the damper vane and control the size of the apertures by edgewise shifting of a perforated plate carried by the vane and having holes cooperating with the vane apertures to form a plurality of valve openings of variable sizes.

The invention also resides in the novel mounting and manner of actuating the valve plate to vary the size of the vane openings in the swinging of the vane.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a front view of an air distributor having a damper incorporating the novel features of the present invention.

FIGS. 2 and 3 are sections taken along the line 2—2 of FIG. 1 and showing different positions of the damper parts.

FIG. 4 is a section taken along the line 4—4 of FIG. 1.

FIG. 5 is a fragmentary perspective view taken from the downstream side of the damper.

FIG. 6 is a fragmentary section taken along the line 6—6 of FIG. 5.

FIG. 7 is a fragmentary sectional view taken along the line 7—7 of FIG. 2.

FIGS. 8 and 9 are schematic views of the duct and damper illustrating the distribution of the air flow with the damper in different positions.

In the drawings, the invention is shown incorporated in a damper adapted to be mounted in a duct 9 of rectangular cross-section and comprising two generally rectangular vanes 10 joined together at their adjacent edges by a hinge 11 for swinging about a fixed axis to vary the widths of air passages 12 defined by the free edges 13 of the vanes cooperating with the adjacent walls 14 of the duct. The vanes are slightly shorter than the width of the duct and comprise flat generally rectangular plates 15 overlapping and spot welded or otherwise secured along their inner edges to the oppositely projecting side bars 16 of the hinge 11. As shown, the latter extends throughout

the lengths of the plates with the projecting ends of the pintle 17 supported in plates 18 which are fastened as by screws 19 to the walls of the duct. Intermediate the ends of the hinge, the pintle is supported in a bracket 20 (FIG. 5) welded to one side of a cross-bar 21 rigid with a tubular frame 22 telescoped in the end of the duct and supporting a grille 23 covering the discharge end of the duct.

When the vanes thus mounted are swung apart to bring their outer free edges against the opposed duct walls, the passages 12 will be closed as shown in FIG. 2, the vanes forming a shallow V with its apex pointing downstream. Swinging of the vanes toward each other to enlarge the flow passages is achieved in this instance by turning a screw 24 whose recessed head 25 is adapted to receive a suitable tool inserted through a hole in the grille 23. The screw is fixed axially and journaled in a lug 26 on the bracket 20 and threads through a nut in the form of a bar 27 whose opposite ends are pivotally connected at 28 to links 29 pivoted at their opposite ends on lugs 30 welded onto the plate 15 near the hinged edges thereof. By turning the screw in a direction to move the nut away from the grille, the vanes will be swung inwardly and away from the duct walls thus increasing the widths of the passages 12.

In accordance with the present invention, the air passing the damper is distributed over the full area of the grille and the velocity of air flow through the passages 12 is reduced thus decreasing the noise incident to the flow when the damper is nearly closed as shown in FIGS. 3 and 8. This is accomplished through the provision of a multiplicity of valve controlled openings 32 of variable size extending through and distributed over the full area of the vanes 10 and closed automatically as an incident to complete closure of the damper (FIG. 2) but opened as the vanes are swung away from the duct walls (FIGS. 3 and 8).

The valve openings are formed by rows of apertures or holes 33 in the plate 15 coacting with similar holes 34 in a plate 35 covering the plate 15 and supported thereby for edgewise shifting to vary the degree of register of each coacting pair of holes. The plate 35 is somewhat narrower than the plate 15, lies against the upstream face of the latter, and is guided in its edgewise movement by the flanges 36 of channels 37 secured to the plate 15 and overlapping both plates at the ends of the vanes. Herein, the wider flanges 38 of the channels are spot welded to the plate 15 on the downstream side thereof. Additional guides are formed by straps 39 laterally spaced apart along the vanes and overlying the shiftable plate 35 with the outer ends bent around the free edges of the plates 15 and 35 and welded to the former. The inner ends of the straps are spot welded to the hinge bars 16.

Means is provided for continuously urging the plate 35 inwardly and thereby reduce the matching areas of the pairs of holes. Herein, this means comprises a plurality of hair-pin type springs 40 projecting from the downstream side of the vanes 10 and having reversely bent ends 41 (FIG. 6) hooked into slots 43 and 44 formed in the plates 15 and 35 on opposite sides of the selected pairs of the holes and extending transversely of the hinge axis. The springs are stressed to separate their legs and thus urge the plate 35 inwardly relative to the plate 15.

Tha edgewise position of the valve plate 35 and therefore the size of the openings 32 in the vanes are controlled in this instance by a stationary cam surface 45 acting on the plate 35 and contoured to allow the springs 40 to reduce the size of the openings 32 progressively as the vanes are swung apart and to close the openings completely as the vanes come against the duct walls (FIG. 3). Herein, the cam surface on the end of a bar 46 secured to one side of the cross-bar 21 and projecting

upstream into notches 47 cut into the inner edge portions of the plates 15 and 35 and the center straps 39. Edges 48 of the holes 34 in the valve plate 35 thus constitute followers and bear against the cam surface 45 which, when the damper is fully closed (FIG. 2), is contacted at points 49 so positioned as to allow the springs to shift the holes 34 out of register with the holes 33 thus completely closing the vane openings 32.

As the vanes are swung away from the duct walls, the followers 48 ride up inclines 50 on the cam as shown in FIGS. 3 and 5, the plate 35 being cammed outwardly to carry the holes 34 partly across the holes 33 and allow for the flow of air through the vanes in a multiplicity of streams as illustrated by the arrows in FIG. 8. As the opening of the damper is continued, larger areas of the holes 33 and 34 come into register as illustrated in FIG. 9 thereby further increasing the uniformity of distribution across the grille 23 of the air passing the damper.

By the time that the followers 48 reach the ends of the inclines 50, the holes 33 and 34 will be in full register as shown in full in FIG. 4. Then, as the opening of the damper is continued, the followers ride around portions 52 of the cam surface which are arcs centered on the hinge axis so that the holes 33 and 34 remain in full register as shown in phantom in FIG. 4.

It will be apparent that in the service use of a discharge outlet of the character described, the damper will normally be opened a substantial amount. As a result, the openings through the vanes will be uncovered and a substantial part of the air to be discharged through the grille will pass through the vane openings and thus be distributed over the full area of the grille. At the same time, the velocity of the individual air streams is reduced thus avoiding the development of objectionable noise when the damper is nearly closed.

I claim as my invention:

1. The combination with an air duct having a flat wall, a damper vane within the duct including a generally rectangular plate perforated by a plurality of laterally spaced apertures extending therethrough, means providing a hinge extending along one edge of said plate and supporting the latter for swinging of the opposite free edge toward and away from a closed position against said wall to vary the width of the intervening air passage or to close the same, a second plate lying against and mounted on said first plate to swing therewith and for edgewise shifting relative thereto and having holes therethrough adapted to register with said apertures, and mechanism for shifting said second plate edgewise relative to said first plate in response to swinging of the latter about said hinge and operable to maintain said apertures covered when the first plate is in said closed position and to uncover the apertures progressively as the plate is moved away from such position to increase the width of said air passage.

2. The combination defined by claim 1 in which said mechanism includes a spring acting between said first and second plates and urging said second plate edgewise in one direction relative to said first plate.

3. The combination defined in claim 2 in which said spring urges said second plate in a direction to close said apertures.

4. The combination defined by claim 1 in which the motion of said second plate relative to said first plate is controlled by a cam stationarily mounted in said duct and engaging a follower on one of said plates.

5. The combination as defined by claim 4 in which said cam projects through slots in said first and second plates and engages a follower rigid with the second plate.

6. The combination defined by claim 1 in which the motion of said second plate is controlled by a cam operating to uncover said apertures progressively as said vane swings away from said closed position to a partially open position and then maintain a substantially fixed opening of the apertures as the opening movement of the vane is continued.

7. The combination with an air duct having a wall, a damper vane within the duct including a plate perforated by a plurality of apertures extending therethrough, means providing a hinge supporting the plate for swinging toward and away from a closed position against said wall to vary the width of the intervening air passage, a second plate lying against and mounted on said first plate to swing therewith and for edgewise shifting relative thereto and having holes therethrough adapted to register with said apertures, and mechanism operated by swinging of said first plate to shift said second plate edgewise relative thereto and vary the area of register of said apertures and said holes in accordance with the amount of swinging of said first plate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,659,880	Kauffman	Feb. 21, 1928
1,798,431	McWilliams	Mar. 31, 1931
2,154,346	Mills	Apr. 11, 1939
2,787,288	Shataloff	Apr. 2, 1957
2,879,799	Jansen	Mar. 31, 1959
2,890,716	Werder	June 16, 1959