March 5, 1957 C. N. O'DAY 2,783,702

ADJUSTABLE VORTEX DAMPER

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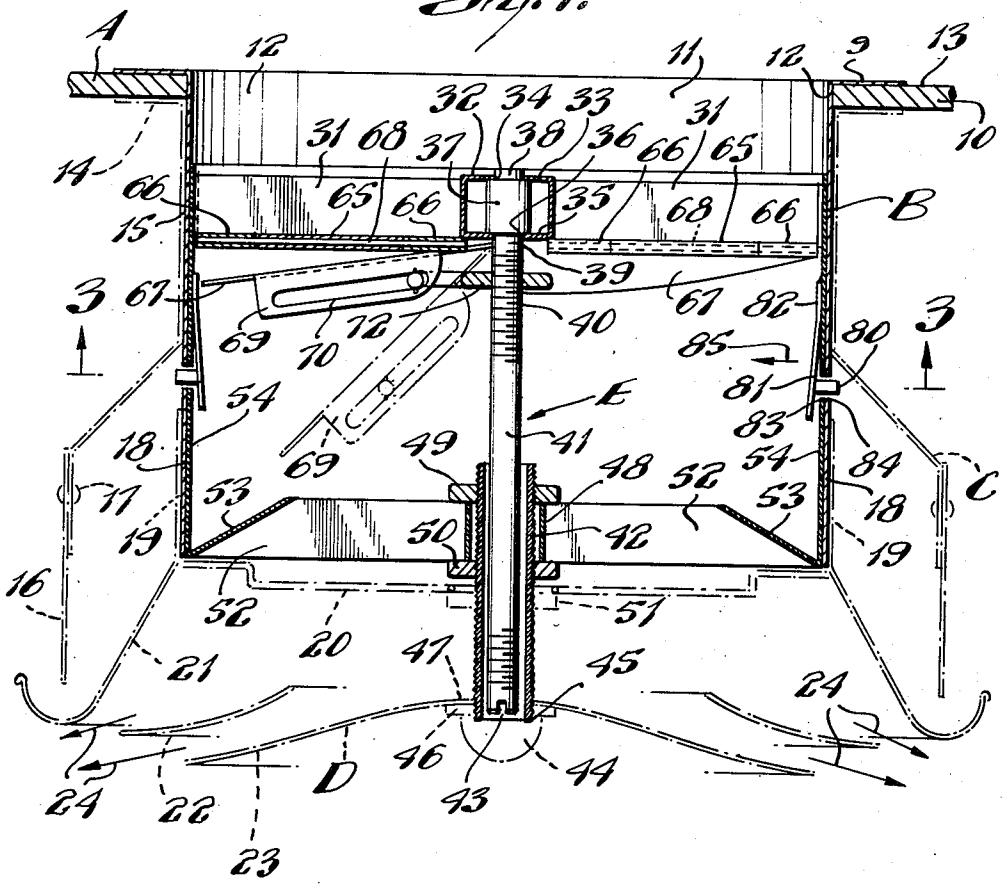
Fig. 1.



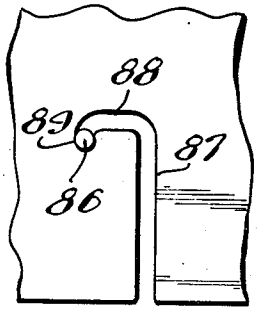


Fig. 2.

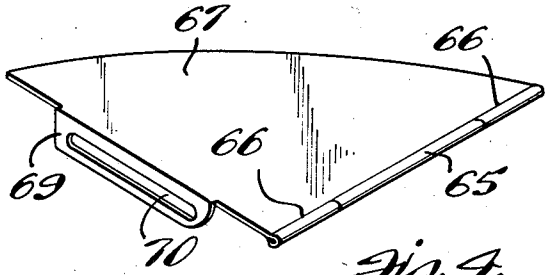


Fig. 4.

INVENTOR.
CORTLAND N. O'DAY
BY
ATTORNEY

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Fig. 3.

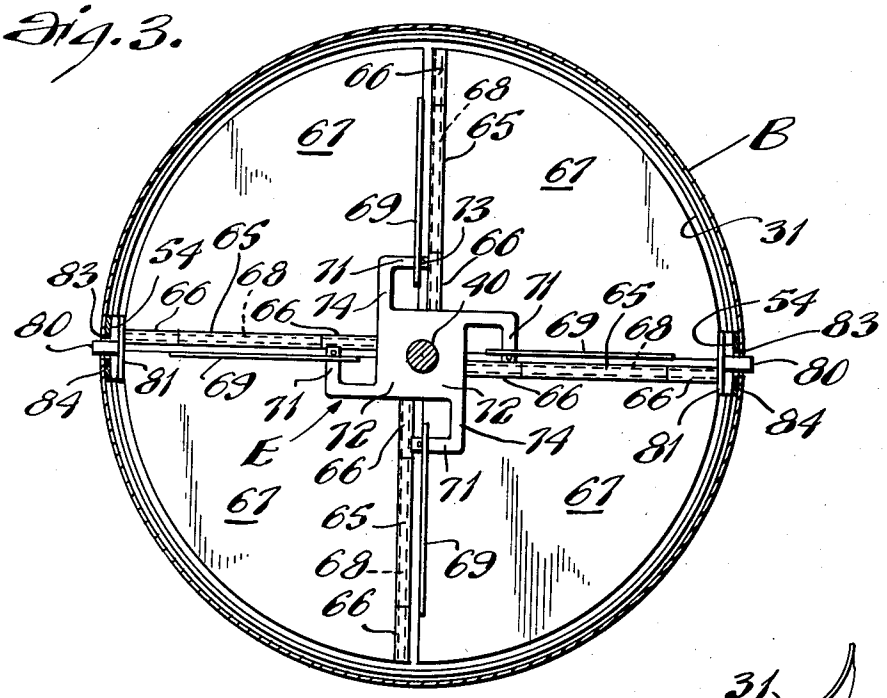
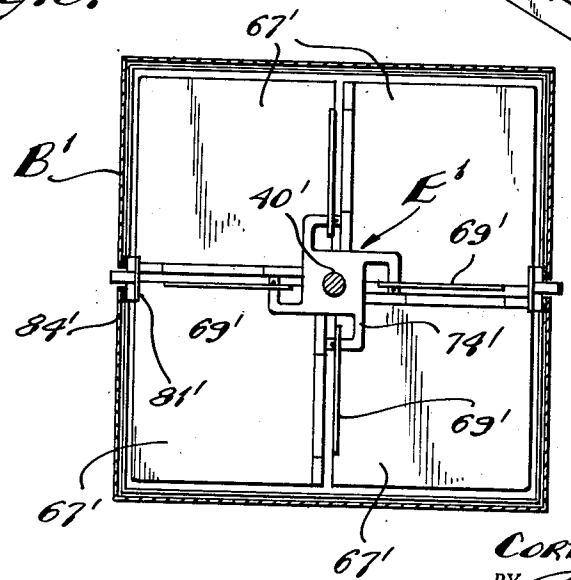


Fig. 6.



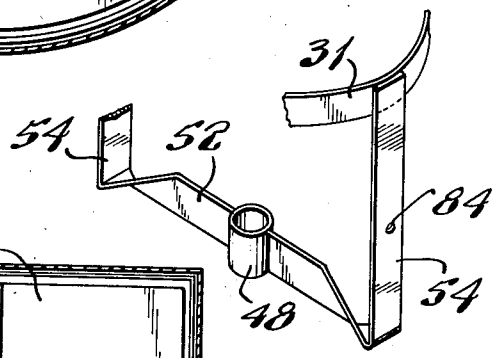


Fig. 5.

INVENTOR.
CORTLAND N. O'DAY
BY
ATTORNEY

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2,783,702

ADJUSTABLE VORTEX DAMPER

Cortland N. O'Day, Port Washington, N. Y., assignor to Air Devices, Inc., New York, N. Y., a corporation of New York

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6 Claims. (Cl. 98—40)

The present invention relates to air ventilating and conditioning systems, and it particularly relates to adjustable devices to control the volume of flow of the air stream in connection with air ventilating and conditioning arrangements.

It is among the objects of the present invention to provide a compact, durable, readily operated adjustable vortex damper control device for ventilating and conditioning systems of the character described which may be readily and inconspicuously installed and detached from the flues and conduits in air ventilating and air conditioning equipment.

Another object is to provide a novel adjustable vortex damper construction which may be readily inserted internally within a conduit and which will give accurate and controlled effect to the flow of air, regardless of the size of the conduit and positioning and construction thereof.

A further object is to provide an improved ventilating and conditioning arrangement particularly adapted to circular conduits but also readily adapted to square, rectangular, polygonal or cylindrical conduits, which will readily and adjustably control the air flow and assure a proper distribution thereof in connection with a ventilating and air conditioning system of the character described.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects, it has been found satisfactory, according to one embodiment of the present invention, to provide a diffuser or ventilating system of the character described having a plurality of adjustable hinged vanes which may be readily adjusted to any position altogether to close, partly to close or altogether to open the conduit through which the air passes and which at the same time will assure a proper distribution of air flow without excess air flowing along or being forced through one side of the conduit.

In the preferred construction, the vanes are mounted upon a series of hinges extending radially from the center of the conduit and each of the vanes are provided with an upturned or downturned lip to engage a spider or other actuator.

A central turning member, preferably threaded, is provided to advance or retract the spider and cause the vanes to assume positions to open or close the conduit. Although generally four vanes are found to be most satisfactory in industrial installations, it is possible to have a greater number or in some instances even a lesser number.

Desirably, the adjustable vortex damper may be

mounted in a tubular, square or rectangular sheet metal conduit by snap connections, bayonet slots, screws or other detachable connections and it is desirably mounted in a transverse conduit leading from a main conduit to the interior of a room.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

Fig. 1 is a vertical transverse sectional view of a preferred form of vortex diffuser according to the construction of the present invention, showing the associated apparatus which may be utilized in association with such diffuser.

Fig. 2 is a diagrammatic side elevational view showing an alternative method of mounting the diffuser in a supporting conduit.

Fig. 3 is a transverse vertical sectional view upon the line 3—3 of Fig. 1 looking upwardly and showing the spider construction.

Fig. 4 is a detail perspective view showing a typical hinge vane construction.

Fig. 5 is a fragmentary perspective view of the internal mount construction or frame-work for the adjusting shaft and vane structure.

Fig. 6 is a view similar to Fig. 4 showing an alternative construction where the diffuser is applied to a square or rectangular conduit.

Referring to Fig. 1, there is shown a main conduit A for the ventilating or conditioning system, a transverse conduit B, an adjustable plaster ring construction C shown in dot-and-dash lines which constitute no part of this invention, an external ceiling or wall diffuser D which also constitutes no part of this invention, and the internal vortex damper E to which this invention is primarily directed.

The external conduit as shown in Fig. 1 has a bottom wall **10** with an opening **11** into which projects the upper portion **12** of the transverse tubular sleeve B. This transverse sleeve B has an outwardly turned portion **9** on the interior **13** of the conduit A.

The sleeve B is held in position by said outturned portion **9** together with the flange **14**, which may constitute a continuation of the side bracket **15**. The bracket **15** carries the adjustable plaster ring **16** by the adjustment bolts **17**.

Fitted to the lower end **18** of the transverse tubular member B, by the flange **19**, is the vaned diffuser outlet D having the attachment or transverse strap **20** with the plates **21**, **22** and **23**, suitably arranged and mounted together so that the entire unit D may be mounted and removed as a unit. The unit D when mounted will give a suitable distribution of air, as indicated by the arrows **24**.

The vortex damper E has a frame structure or frame-work including a base ring **31** which has a plurality of radial members **68** terminating in a central box **32**. The box **32** has an upper plate **33** with an opening **34** and a lower plate **35** with an opening **36**.

The box **32** (see Fig. 1) receives the enlarged element **37**, which is rotatably mounted in said box **32** and has an upward stud **38**. The stud **38** projects through the opening **34**. The element **37** has a downward shaft extension **39** projecting through the opening **36**. The shaft **39** is threaded at **40** and extends downwardly as indicated at **41** through the sleeve **42**.

The lower end of the shaft 39 is provided with a slot 43 with either a fillister slot or Phillips type connection. The slot 43 is accessible by removing the knob or cover nut element 44, which is threaded on the lower end 45 of the externally threaded sleeve 42.

The nut 46, which acts as a stop for the threaded knob 44, is also threaded on the lower end 45 of the sleeve 42 and it abuts the central section 47 of the lower plate 23 of the external diffuser D. The nut 51 also is threaded onto the sleeve 42 against the strap 20 of the diffuser outlet D. The nuts 46 and 51 hold the external diffuser D in position on the outside of the conduit B to cover and conceal the vortex diffuser E.

The sleeve 42 is mounted upon a short sleeve 48 by the nuts 49 and 50. The sleeve 48 is part of and is supported by the webs 52 extending inwardly from the side spider elements 54. The ends 53 of the webs 52 are bent obliquely and continue integrally into the side members 54. The side members 54 at their upper ends are connected to the ring 31 of the vortex diffuser E.

The turned-over or tubular members 65 and the tubular members 66 of the vanes 67 encircle the radial pivot pins 68 and form the hinge construction.

The vanes 67, as best shown in Fig. 4, are each quarter circular and at one radial edge thereof are provided with the down-turned flanges 69 having the slots 70.

Although the flanges 69 may consist of separate angle members spot-welded to the plates 67, they preferably are pieces of metal turned up integrally from the edges of the vane 67 and are internal with the vane 67.

The slots 70 receive the ends 71 of the spider 72. The spider 72 is threaded to the threaded portion 40 of the shaft 39.

The pins or enlargements 73 at the ends of the legs 71 hold these legs in position in the slots 70 and prevent them from slipping out.

The legs 71 consist of right angle extensions of the extensions 74 from the spider body 72 and as many legs 71 are provided as will correspond to the number of vanes 67 employed, whether three, five, six or eight, depending upon the size of the conduit B.

Although the spider construction 54, holding the damper E in position, may be attached by metal screws or rivets, it has been found most convenient to attach it so that it may be readily detached and remounted. For example, the studs 80 mounted on the spring steel elements 81 and spot welded in position at 82 upon the legs 54 may be used.

The studs project through openings 83 and 84, respectively, in the spider 54 and the shell 18 of the tubular member D. By moving the spring leaf inwardly, as indicated by the arrow 85, it is possible readily to insert the unit E or remove it.

Instead of a spring steel element 81 with the stud 80, it is also possible to utilize a stud 86 which will ride in a bayonet slot 87. The slot 87 has an out-turned portion 88 terminating in a recess 89. This slot 87 is provided in the wall 18 of the conduit B.

The frame-work or frame structure of the vortex damper E includes and consists of the base ring or hoop 31, the radial members 68, the central upper box 33, the lower sleeve 48, the radial webs 52 and the side members or legs 54. This is the fixed frame-work of the vortex damper E and in this frame-work is mounted the rotatable shaft 39 having the threaded portion 40 with the stud or enlargement 37 held in the box 33. The lower sleeve 48 carries the outer threaded sleeve 42 which in turn carries the diffuser outlet unit D by means of the nuts or internally threaded discs 49 and 50.

The hinged plates, leaves or vanes which accomplish the vortex effect of the damper E are actuated to a desired angular position by means of the central shaft member 39. The threaded portion or bolt portion 40 of the shaft 39 upon being rotated by means of the fillister slot 43 will cause the spider 72 to move upwardly and downwardly and through the sliding of the pins or legs 71 in the slot 70 in the flanges 69 will swing such leaves, plates or damper elements into an upper or lower position, as for example is indicated in Fig. 1.

These plates when moved to any desired position will give a rotary or circular movement to the air passing downwardly to the diffuser element D and will accompish a vortex movement of the air before it moves into the diffuser D. This will assure better distribution and circulation of the air and eliminate any tendency toward "dead" space.

In the arrangement shown in Fig. 6, the adjustable vortex damper arrangement is shown as applied to a square or rectangular conduit, similarly fashioned parts being indicated by the same numerals primed, as in Figs. 1 to 5.

The element 31 will act to straighten the vanes.

It will be noted that the cylinders 65, 66 and 68 in Fig. 1 as well as the corresponding hinges in Fig. 6 are all disposed radially in respect to the central axis 41 in Fig. 1 and shaft 40' in Fig. 6.

In the alternative construction of Fig. 6, correspondingly functioning parts are referred to by the same numerals and letters as in Figs. 1 to 5 with a prime applied thereto.

While there has been herein described a preferred form of the invention, it should be understood that the same may be altered in details and in relative arrangement of parts within the scope of the appended claims.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. A vortex damper for attachment to the opening of an air conduit, said damper having a framework, a plurality of swinging hinged damper plates pivotally mounted on said frame structure, a mount for securing said framework to said air conduit and an actuator for changing the position of said hinged damper plates to control the flow passage through said opening in said conduit, said damper having an external diffuser as a cover therefor, said diffuser being mounted therein, said frame structure including an upper external cylinder, a plurality of radial supports extending inwardly from said cylinder to the central axis of the damper, a central box mounted on the inside ends of said radial supports, a U-shaped bracket the upper ends of the side legs of which are mounted on said cylinder, said bracket having a central tube on the base of the bracket, said central box and central tube carrying said actuator and said radial supports carrying said plates.

2. An adjustable vortex damper for placement in the conduit leading to an outlet air diffuser and being capable of being positioned inside of and above the air diffuser while accessible for adjustment from below the air diffuser, said damper comprising a frame structure having an upper support member including radially inwardly directed hinge mounts, a central upper element carried by the inside ends of said hinge mounts and a lower support member having inwardly directed radial arms and the inner ends of said arms having a central lower element axially aligned with said central upper element, said frame structure also including outside arms extending between the upper and lower support members parallel to the axis of the damper, a central threaded shaft carried by said central lower and upper elements, a plurality of swinging vanes pivotally mounted on said hinge mounts and connecting means mounted on said threaded shaft and connected to said vanes to adjust the position of said vanes.

3. The damper of claim 2, said connecting means consisting of a spider threaded on said shaft having outwardly extending arms to swing said vanes on said hinge mounts.

4. The damper of claim 2, said vanes having down-turned slotted flanges which cooperate with said connecting means to enable adjustment of the position of said vanes.

5. The damper of claim 2, in which the central upper

element takes the form of a cylindrical box and said shaft has an enlargement carried in said box and extends downwardly and through the central lower element and said shaft being accessible at its lower end for adjustment purposes.

6. The damper of claim 2, said central lower element consisting of a sleeve and an elongated threaded tube extending through said sleeve and mounted on said sleeve for carrying said air diffuser.

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