Oct. 19, 1943. M. SERRE 2,332,351

AIR FLOW CONTROL DEVICE

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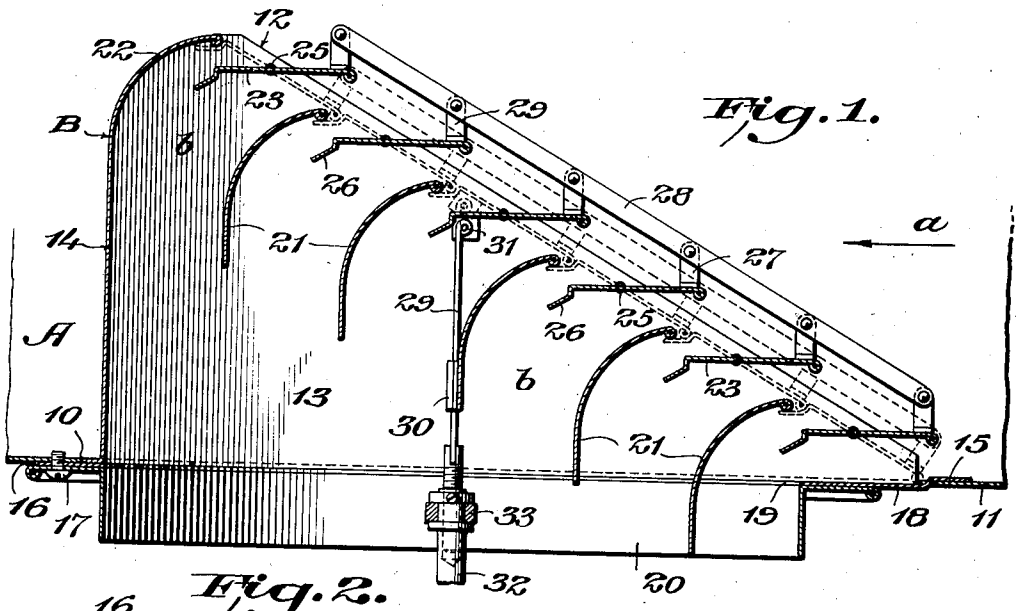


Fig. 1.

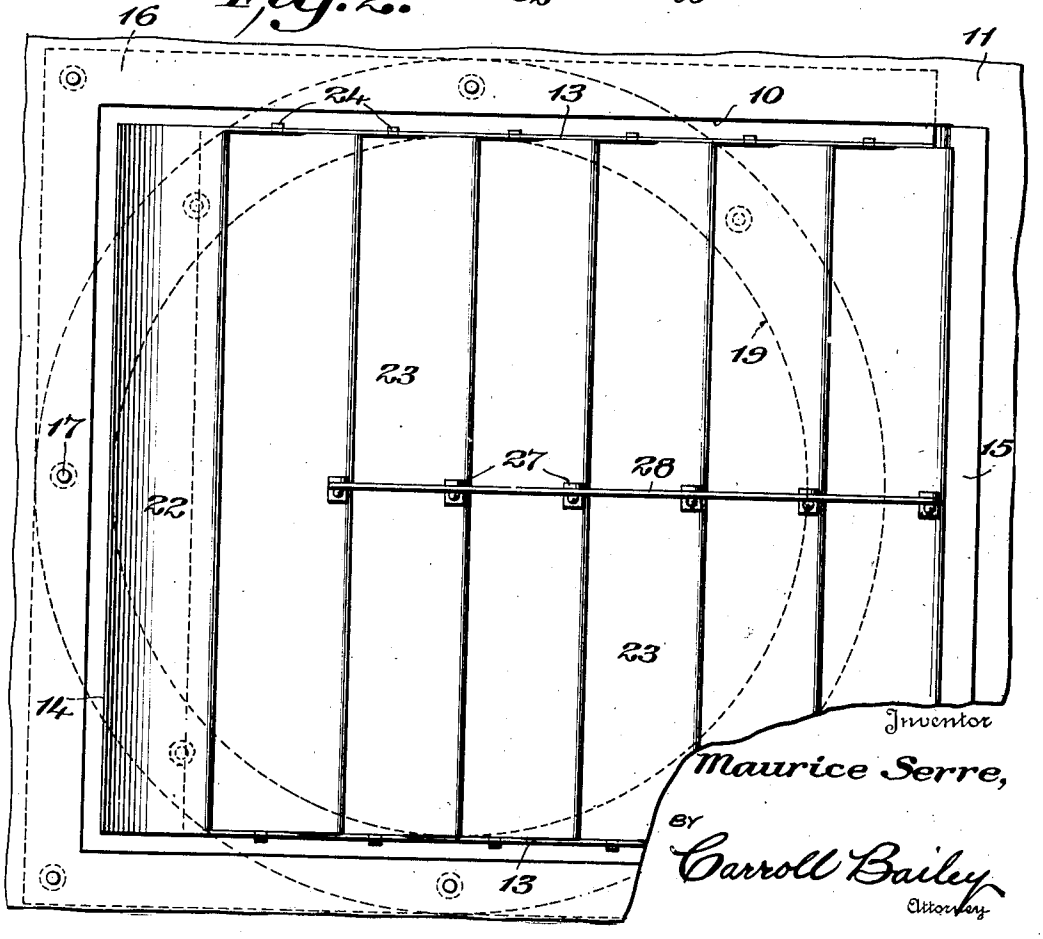


Fig. 2.

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Fig. 3.

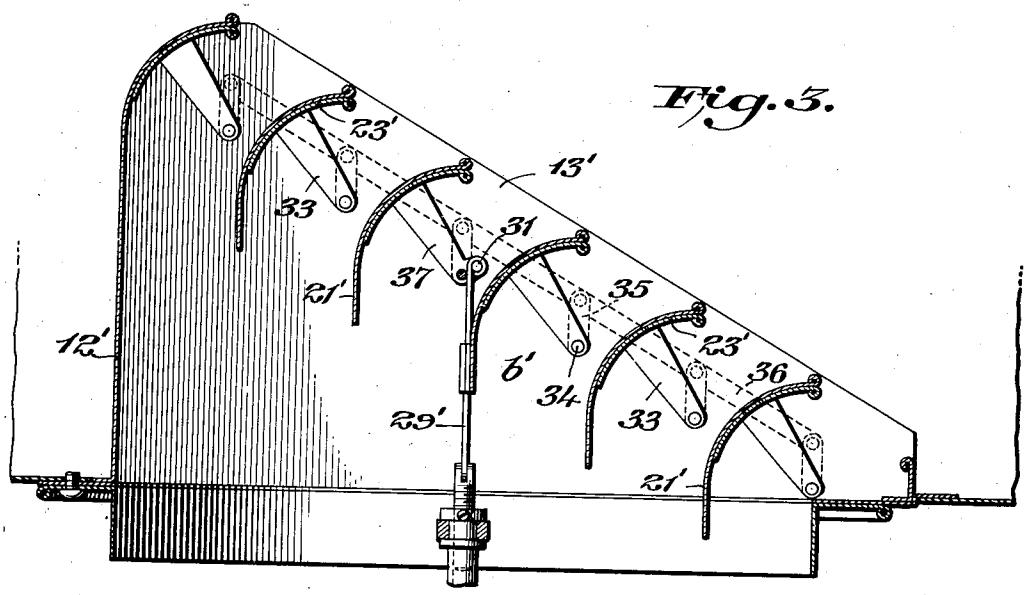
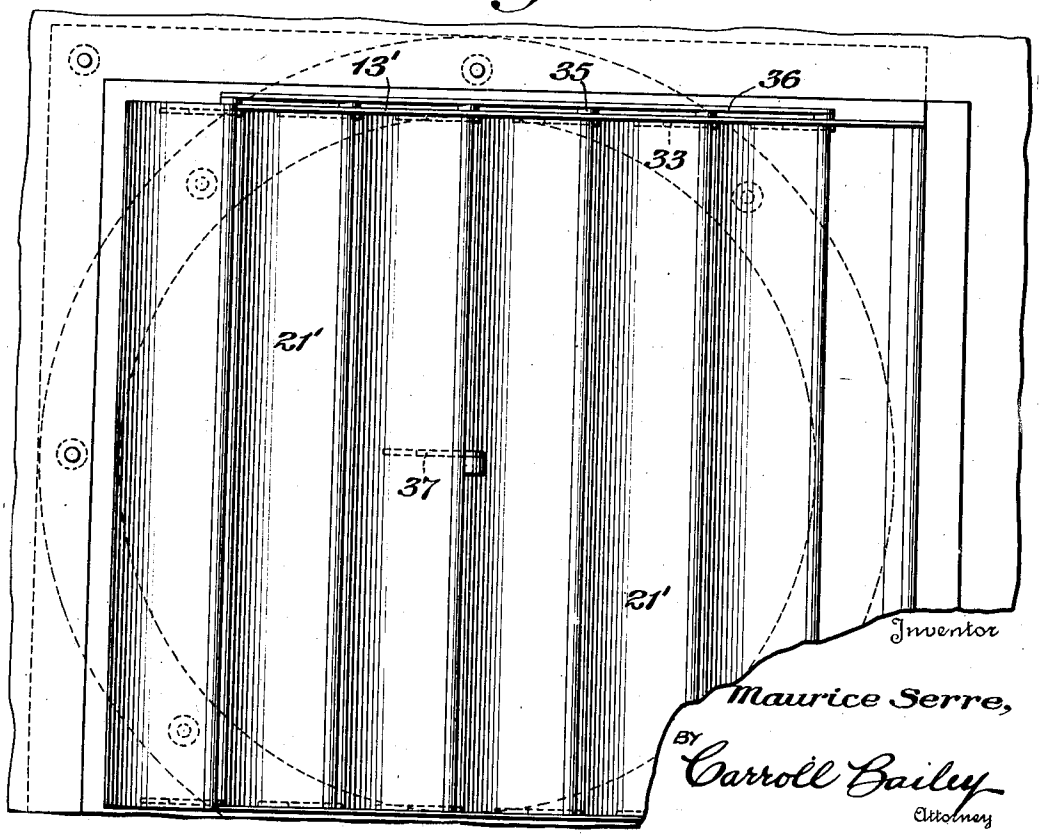


Fig. 4.



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AIR FLOW CONTROL DEVICE

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5 Claims. (Cl. 98—40)

This invention relates to the art of supplying warm or cool, fresh or treated air to rooms or other enclosures for heating, cooling, ventilating, air conditioning or other purposes, and has for its general object to provide an air flow control device to be mounted in an air supply duct to regulate the amount of air delivered from the duct through a bottom or side outlet opening therein, and to direct the air through said opening in a manner such that there is little loss in velocity of the air and the total amount of the air delivered is distributed substantially uniformly throughout the area of said opening.

Another object of the invention is to provide a device for the purpose mentioned which is simple in construction, strong, durable, comparatively cheap and easy to produce, highly efficient in operation, and which embodies a design such that it may quickly and easily be mounted in an air supply duct in operative relationship to a bottom or side air outlet opening in the duct.

Another object of the invention is to provide a device for the purpose mentioned embodying a novel combination of fixed and adjustable air flow control elements and novel means for the adjustment of the adjustable elements thereof.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in a device for the purpose stated embodying the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the accompanying drawings, where like characters of reference denote corresponding parts in related views:

Fig. 1 is a longitudinal section through an air flow control device constructed in accordance with one practical embodiment of the invention, showing the device operatively mounted within an air supply duct.

Fig. 2 is a top plan view of the device as shown in Fig. 1; and

Figs. 3 and 4 are views similar to Figs. 1 and 2, respectively, of an alternative form of the device.

Referring to the drawings in detail, first with particular reference to the form of the invention shown in Figs. 1 and 2, A designates a portion of a supply duct for warm, cool, fresh or treated air, and B designates, generally, the present air flow control device operatively mounted in said duct.

In the drawings the duct A is illustrated by way of example as being disposed horizontally and as having an opening 10 in the bottom wall 11 thereof for the delivery of air therefrom in a downward direction. Regardless, however, of the disposition of the duct A and in which wall thereof the opening 10 is provided, the construction of the device B and its relationship to the duct wall having the opening 10 therein, and to said opening, remains essentially the same. It will be understood, therefore, that the duct may be disposed in any position other than the position shown and that the opening 10 may be provided in any wall thereof for delivery of air therefrom in any desired direction. In other words, the purpose of the device B is to control delivery of air from a duct in a direction at substantially right angles to the duct, and under such conditions it is immaterial how the duct is disposed.

When an air outlet opening is provided in the bottom, top or a side wall of a horizontally disposed duct, or in the front, rear or a side wall of a vertically disposed duct, and in the absence of means to control the flow of air through said opening, most of the air tends to crowd toward the rear end of the opening as regards the direction of flow of air through the duct and to leave the duct at an acute angle thereto, with the result that properly diffused delivery of the air into a room or other enclosure is practically impossible to obtain even by the use of the most efficient types of known air outlet devices. Accordingly, the present device B is designed to direct air from a duct through an outlet opening in a wall thereof in a direction at substantially right angles to the duct and to distribute the delivered air substantially uniformly throughout the area of said opening, whereby the air may, if desired, be delivered directly into a room or other enclosure without serious disadvantage and whereby it will be most thoroughly and satisfactorily diffused if a diffuser is associated with the outlet opening. Moreover, the present device B is designed for adjustment so that the amount of delivered air may readily be regulated.

In describing the invention it will be assumed that the device B is operatively associated with the bottom wall of a horizontally disposed duct A as shown in the drawings, but it is to be understood that this is merely for the sake of simplifying the description and avoiding ambiguity and that the terms used are not to be construed as limiting, since, as afore-

said, the duct and the device may be disposed vertically, for example, and under such conditions the terms used are to be construed accordingly.

The device B comprises a vertically disposed, open-ended casing, designated generally as 12, composed essentially of side walls 13, 13 and a rear wall 14, and in accordance with the invention this casing is mounted in the duct A with its lower open end either in, or in alinement with, the opening 10 in the bottom wall 11 of said duct so that it constitutes a conduit for flow of air from said duct through the said bottom wall thereof.

The casing 12 may, of course, be mounted in the duct A in any desired manner, but to facilitate mounting of the same in said duct it preferably is provided at or near its bottom and at either its front or its rear end with a horizontally disposed lip 15, while at its sides and its other end it preferably is provided with outwardly extending horizontally disposed flanges 16. The opening 10 is of a length and width to freely permit the insertion of the casing 12 therethrough into the duct A, but to prevent passing of the flanges 16 therethrough. On the other hand, the length of the lip 15 is not greater than the width of the opening 10 whereby said lip may readily be passed with the casing 12 through said opening 10. Accordingly, to assemble the casing 12 with the duct A, the end of the casing having the lip 15 first is inserted through the opening 10 to dispose said lip in overlying relationship to the bottom wall 11 of the duct at one end of the opening 10 and the casing then is moved upwardly until the flanges 16 underlie and engage the bottom wall of the duct at the sides and the other end of the opening 10 therein. Thereupon, the flanges 16 are fastened to said bottom wall 10 by one or more screws 17 or in any other suitable manner. In this connection and as is apparent, the lip 15, by serving to support considerable of the weight of the device B during the operation of mounting said device in the duct A, greatly facilitates the mounting operation. Moreover, said lip serves as a support for one end of the device B in lieu of fasteners such as screws or the like and in conjunction with the flanges 16 serves effectively to close the opening 10 against passage therethrough of any air outside of the casing 12.

The lip 15 may be formed as part of one end wall of the casing 12 and the flanges 16 may be formed as parts of the side walls and another end wall of said casing, but preferably said lip and flanges are parts of a bottom plate 18 upon which the casing 12 is mounted, especially since the casing 12 preferably is entirely open at its front end and therefore is devoid of a front end wall, and because it is more practical from a production standpoint to provide a bottom plate such as the plate 18 and to fasten the casing 12 thereto than to form the lip 15 and the flanges 16 as parts of the walls of said casing. An opening 19 of suitable size and shape is, of course, provided in the bottom plate 18 for flow of air therethrough from the casing 12, and preferably a neck 20 is fastened to said bottom plate for the attachment to the device B of an air outlet device of any suitable type for diffusing the air delivered from the duct A through the device B.

Within the casing 12 and extending from side to side thereof is a series of vanes 21 each comprising a vertically disposed lower end portion and a forwardly curved upper end portion, and in accordance with the invention these vanes are spaced apart successively rearwardly and upwardly of one another. Moreover, the upper portion of the rear wall 14 of the casing 12 is curved forwardly as indicated at 22 to constitute in effect a rearmost vane. Thus, the casing 12 is divided into a series of separate air passages *b*, the upper open ends or mouths of which are disposed successively rearwardly and upwardly of one another and face in a direction counter to the direction of air flow through the duct A, as indicated by the arrow *a*. Accordingly, assuming the upper open ends or mouths of the passageways *b* to be unobstructed, it is manifest that some of the air flowing through the duct A will enter each passageway *b* and by the vanes 21 and the rear wall 14 of the casing 12 will be directed from said duct through the conduit constituted by the casing 12 in a plurality of separate streams. Likewise, it is manifest that due to the vertical disposition of the lower end portions of the vanes 21, these separate streams of air will be caused to be delivered from the duct A in a direction at substantially right angles to said duct. Moreover, it is manifest that the vanes 21 will serve to prevent the delivered air from crowding toward the rear end of the casing 12 and at the same time will act to cause the total volume of air flowing through said casing to be distributed substantially uniformly throughout the area of the lower or outlet end thereof. Furthermore, it is manifest that due to the curvature of the upper portions of the vanes 21 the delivered air will not have its velocity seriously reduced in having its direction of flow changed from horizontally through the duct A to downwardly from said duct.

In the mouths of the passageways *b* are damper elements 23 which are duplicates of one another and each of which comprises a plate substantially corresponding in length to the width of the casing 12 and substantially corresponding in width to the width of the mouth of its related passageway *b*. At their ends and intermediate their side edges these damper plates 23 are provided with projections or trunnion formations 24 which are disposed in openings 25 in the casing side walls 13. Thus, each damper element is of butterfly valve type and is pivotally mounted for swinging movement between a horizontally disposed, open position, as shown in full lines in Fig. 1, and an upwardly and rearwardly inclined closed position as shown by dotted lines in said figure.

The rear edge portion of each damper element 23 is downwardly offset as indicated at 26 to accommodate the forward, overlapping edge of the next rearwardly disposed damper element when the damper elements are completely closed. Accordingly, when the several damper elements are completely closed they afford a substantially continuous flat surface to deflect air over the top of the device B and serve to avoid any protuberances against which air flowing through the duct A might impinge and cause disagreeable noise. In this connection it will be noted that when said damper elements are completely closed, the lip 26 of the rearmost or uppermost damper element engages beneath the front edge portion of the forwardly curved portion 22 of the casing rear wall 14 and the front edge of the lowermost or forwardmost damper element engages the plate 18. Besides permitting the damper elements to be in a common plane when closed, the lips 26

assist the vanes 21 in directing air downwardly through the passageways b when the damper elements are opened. Furthermore, due to the damper elements being pivoted intermediate their side edges at points intermediate the sides of the mouths of the passageways b, they are balanced, as regards air flow thereagainst and in any open position thereof admit air to both the front and the rear portions of the passageways b, which is conducive to uniform distribution of delivered air throughout the area of the casing 12. In addition, when said damper elements are fully open they are disposed horizontally and offer little or no resistance to flow of air into the mouths of the passageways b.

A post 27 is fixed to each damper element 23 and said posts are connected together by a rod 28, whereby the several damper elements are adjustable in unison. On the other hand, a vertically disposed, longitudinally shiftable rod 29 is connected to one of the damper elements for rotatably adjusting the same and thereby collectively adjusting the several damper elements. The rod 29 is mounted for vertical sliding movement in a guide member 30 fastened to the lower portion of one of the vanes 21 and is pivotally connected at its upper end to its related damper element 23 as indicated at 31. At its lower end, said rod 29 is screw threaded and has screw threaded engagement with a vertically disposed stem 32, while said stem is mounted in suitable bearing means 33 so that it is rotatable but is held against longitudinal movement. Accordingly, by rotating the stem 32 the rod 29 is moved vertically and adjustments thereby are imparted to the damper elements 23. The bearing means 33 may be mounted in the casing 12 or in the neck 20 as shown or in an air diffuser mounted on said neck 20. In any event, the stem 32 preferably is disposed in axial alinement with the neck 20 so as to extend centrally through an air diffuser if same is mounted on said neck 20. In this connection and as will be understood, the stem 32 may depend any desired distance below the device B and may be provided at its lower end with a suitable handle for effecting its rotation. Manifestly, the described adjusting means permits delicate adjustments of the damper elements and serves effectively to maintain any given adjustment.

The form of the invention illustrated in Figs. 3 and 4 is generally the same as the form of the invention illustrated in Figs. 1 and 2, except in respect to the form of the damper elements. In other words, according to the form of the invention illustrated in Figs. 3 and 4, the damper elements 23' are transversely curved substantially corresponding to the curvature of the forwardly curved upper portions of the vanes 21', and are pivotally mounted so that when they are swung to open positions they each underlie the said forwardly curved upper portion of the next adjacent rearwardly disposed vane either closely adjacent thereto or in engagement therewith. Each damper element is provided at its ends with arms 33 and said arms are fixed to studs 34, which are journaled in openings in the side walls 13' of the casing 12' at points coinciding with the center of curvature of the upper portion of the related vane 21'. In addition, the several studs 34 at one side of the casing 12' have fixed thereto arms 35 which are connected together by a rod 36 whereby the several damper elements are adjustable in unison. A vertically disposed, longitudinally movable rod 29' is provided as in the case of the Figs. 1 and 2 form of the invention for adjusting the damper elements 23', and in this connection and as shown in Fig. 3, one of the damper elements 23' may be provided with a crank arm 37 to which the upper end of the rod 29' may be pivotally connected as indicated at 31'. In this connection and as apparent, by vertically adjusting the rod 29', the damper elements 23' may be swung between their fully open positions shown by full lines in Fig. 3 and their fully closed positions in which they extend across the mouths of the passageways b' between the vanes 21'.

Without further description, it is thought that the features and advantages of the invention will be readily understood. It is desired to point out, however, that various changes in the form and proportion of parts may be resorted to within the spirit and scope of the invention and as defined in the appended claims.

What I claim is:

1. A device to be mounted in an air supply duct to control flow of air therethrough from said duct, said device comprising an open-ended casing to be mounted in said duct in operative relationship to an opening in a wall of said duct to provide a conduit for flow of air from said duct, fixed spaced apart vanes in said casing having inner end portions disposed longitudinally with respect to the duct and in stepped relationship to each other to divide the air into a plurality of separate streams, said vanes having outer end portions disposed at substantially right angles to said inner end portions whereby the separate air streams are directed from the duct in a direction at substantially right angles thereto, a damper element individual to each of the spaces between said vanes, said damper elements being located adjacent to the inlet ends of said spaces, pivotal connections between said damper elements at the ends thereof and the side walls of said casing so that said damper elements are rotatable between open and closed positions with respect to the inlet ends of said spaces, said pivotal connections being disposed in a plane inclined with respect to said duct and said damper elements when in closed positions lying in substantially a common plane inclined with respect to said duct for smooth flow over the same of air flowing through said duct, and actuating means for said damper elements.

2. A device as set forth in claim 1 in which the damper elements are pivoted intermediate their front and rear edges and substantially midway between the inner end portions of the vanes.

3. A device as set forth in claim 1 in which the vanes and the damper elements are arcuately curved and in which the damper element pivots are located at the centers of curvature of said damper elements and said vanes for disposition of said damper elements when in their open positions substantially against the curved portions of said vanes.

4. A device to be mounted in an air supply duct to control flow of air therethrough from said duct, said device comprising an open-ended casing to be mounted in said duct in operative relationship to an opening in a wall of the duct to provide a conduit for flow of air from the duct, fixed, spaced apart vanes in said casing for dividing the air into a plurality of separate streams and for directing the streams through said casing from the duct in a direction at substantially right angles to the duct, an adjustable damper element individual to each of the spaces between said vanes for regulating the amount of air flow-

ing from the duct through said casing, means connecting said damper elements together for unitary adjustment, an actuating element for said damper elements connected to one of said damper elements, said actuating element being disposed coaxially with respect to said casing and extending from said casing for manipulation to adjust said damper elements, and a guide for said actuating element carried by one of said vanes and in which said actuating element is mounted for longitudinal sliding movement to adjust said damper elements.

5. A device to be mounted in an air supply duct to control flow of air therethrough from said duct, said device comprising an open-ended casing to be mounted in said duct in operative relationship to an opening in a wall of said duct to provide a conduit for flow of air from said duct, fixed spaced apart vanes in said casing having inner end portions disposed longitutinally with respect to the duct and in stepped relationship to each other to divide the air into a plurality of separate streams, said vanes having outer end portions disposed at substantially right angles to said inner end portions whereby the separate air streams are directed from the duct in a direction at substantially right angles thereto, said vanes being arcuately curved between their inner and outer end portions, a damper element individual to each of the spaces between said vanes, each damper element being arcuately curved corresponding to the curvature of said vanes and being pivotally mounted at its center of curvature in said casing at the center of curvature of the related vane for swinging movement between a closed position with respect to its related space and an open position in which it lies substantially against the curved portion of the vane forming the rear wall of the related space, means connecting said damper elements together for unitary rotary adjustment to regulate the amount of air flowing from said duct through said casing, and actuating means for said damper elements.

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