

Sept. 17, 1968

F. G. HONERKAMP

3,401,622

AIR DIFFUSER

Filed Aug. 30, 1966

2 Sheets-Sheet 1

FIG. 1

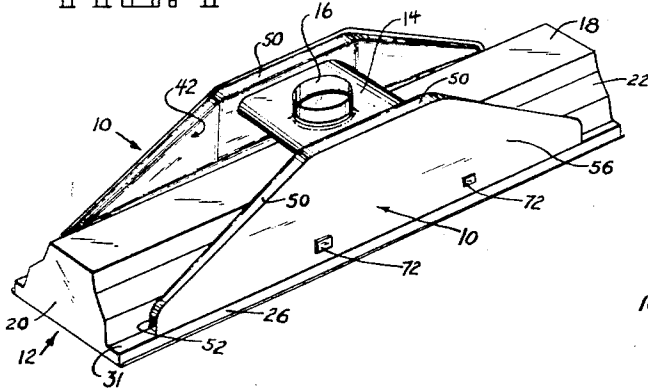


FIG. 2

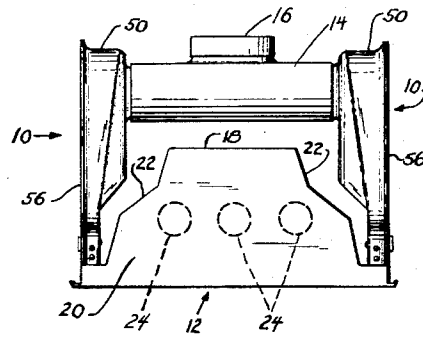


FIG. 3

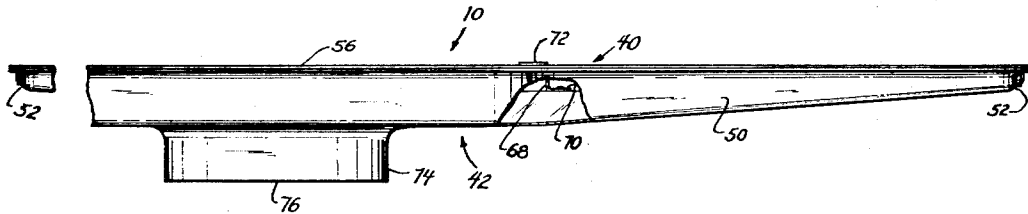
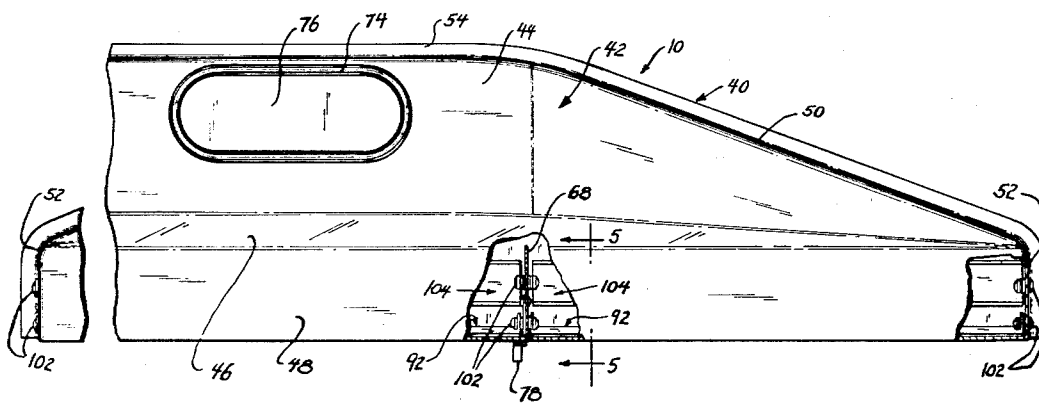


FIG. 4



INVENTOR.

FRIEDRICH G. HONERKAMP

BY

McCormick, Paulding & Huber
ATTORNEYS

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FIG. 5

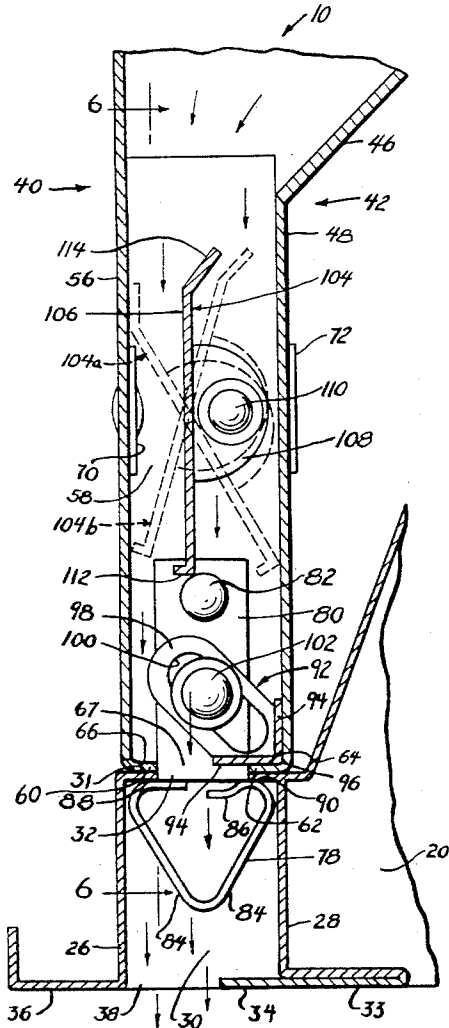


FIG. 6

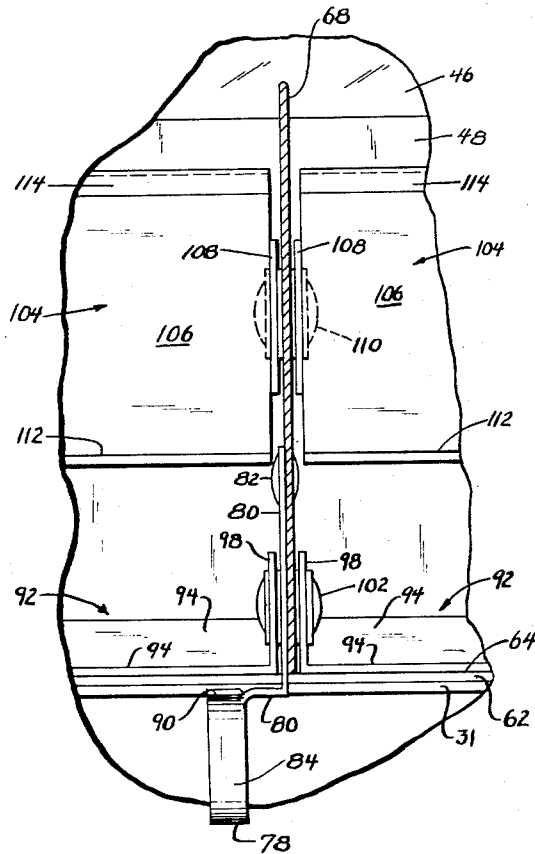
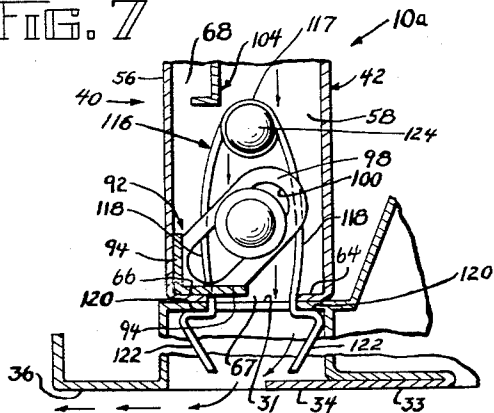


FIG. 7



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3,401,622

AIR DIFFUSER

Friedrich G. Honerkamp, Clarks Summit, Pa., assignor to Dynamics Corporation of America, New York, N.Y., a corporation of New York

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15 Claims. (Cl. 98—40)

ABSTRACT OF THE DISCLOSURE

A slot diffuser receiving air from a distribution source and connected to an air distributor on a light troffer has an elongated deflector supported for pivotal movement about and lateral movement relative to a fixed axis. The deflector is movable to one position to direct a flow of air along one wall of the distributor so that air emanates downwardly from the distributor discharge opening and to another position to direct the flow toward a lip of the distributor so that air impinges on the lip and emanates from the distributor transversely of its discharge opening.

This invention relates in general to air distribution apparatus and deals more particularly with a slot diffuser for connection at a terminal end of an air distribution system to control the volume and direction of air discharge therefrom.

The diffuser of the present invention may be variously employed to control directional distribution of air in diffused form from an air distribution system, however, it is particularly adapted for use with a ceiling recessed light troffer or the like provided with an air flow passageway along a marginal portion thereof. The diffuser is adapted to be mounted above or to the rear of the light troffer and communicate with the troffer air passageway and to control the discharge of air therethrough.

The general aim of the present invention is to provide an improved slot diffuser to control the volume and direction of flow from an air distribution system.

A more particular object of the invention is to provide a diffuser of the aforescribed character to selectively discharge diffused air generally horizontally or in a ceiling plane and generally vertically downwardly from an associated ceiling light troffer or the like.

Another object of the invention is to provide a slot diffuser wherein the volume of air discharged therefrom may be selectively controlled.

A further object of the invention is to provide a slot diffuser wherein the volume and direction of air discharged therefrom may be rapidly and conveniently selectively adjusted from a position generally below or forward of the face thereof without removing the diffuser from an associated troffer.

Other objects and advantages of the invention will be apparent from the following description and from the drawings forming a part thereof.

The drawings show preferred embodiments of the invention and such embodiments will be described, but it will be understood that various changes may be made from the construction disclosed, and that the drawings and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

FIG. 1 is a perspective view of a ceiling recessed light troffer showing a pair of diffusers of the present invention in assembled relationship with the troffer, the diffusers being joined together by a connecting duct.

FIG. 2 is a side elevational view of the troffer and diffusers of FIG. 1.

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FIG. 3 is a plan view of an air diffuser embodying the present invention.

FIG. 4 is a side elevational view of the air diffuser of FIG. 3.

FIG. 5 is a somewhat enlarged fragmentary sectional view taken along the line 5—5 of FIG. 4 and shows the diffuser in an assembled condition with a light troffer.

FIG. 6 is a somewhat enlarged fragmentary sectional view taken along the line 6—6 of FIG. 5.

FIG. 7 is a fragmentary sectional view generally similar to the sectional view of FIG. 5 but shows another embodiment of a clip for retaining the diffuser in assembly with an associated light troffer.

The air diffuser of the present invention is adapted to receive air from a distribution source and to direct the air received therefrom forwardly through an associated passageway which has a lip at its downstream end directed inwardly or toward the center of the passageway. The diffuser is provided with one or more movable air deflectors which may be selectively positioned to direct the flow of air generally toward the lip to cause the air to be discharged generally laterally of the passageway and to direct the flow generally away from the lip to cause air to flow forwardly from the passageway. The diffuser is also provided with one or more damper means to selectively control the volume of air flowing from the diffuser and through the passageway.

In FIGS. 1 and 2 of the drawings, a pair of diffusers indicated generally at 10, 10 and embodying the present invention are shown in assembled relationship with air distributors which form part of a typical light troffer indicated generally at 12. The diffusers 10, 10 are interconnected by a short duct section 14 provided with an inlet opening 16 for connection with an air distribution source (not shown).

The troffer 12 includes an elongated generally horizontal upper or rear wall 18, a pair of transversely disposed vertically extending end walls 20, 20 and longitudinally extending side walls 22, 22. The side walls are inclined generally upwardly and toward the center of the troffer in a series of inclined steps to provide a plurality of reflecting surfaces for elongated tubular fluorescent lamps 24, 24 housed in the troffer. Along each longitudinally extending marginal edge portion of the troffer is provided two transversely spaced and generally parallel elongated side walls 26 and 28 which extend between the end walls 20, 20 to define a relatively narrow elongated air flow passageway 30 best shown in FIG. 5. The passageway 30 is partially closed at its upstream end by a generally horizontally disposed longitudinally extending wall 31 defining a slot 32 communicating with the passageway and which is adapted to communicate with the diffuser 10 in a manner to be hereinafter described.

At its forward or downstream end the marginal edge portion of the wall 28 is bent outwardly or away from the center of the passageway 30 and is folded back against itself to form a longitudinally extending outwardly projecting border flange 33 and a longitudinally extending lip 34 directed inwardly from the wall 28. The forward marginal edge portion of the wall 26 is turned generally outwardly and upwardly to form a longitudinally extending border flange 36.

An elongated air discharge opening 38 at the face of the troffer 12 is defined by the wall 26 and the inner edge of the lip 34. The border flanges 33 and 36 serve to reduce the occurrence of air turbulence proximate the discharge opening 38 caused by the flow of air therethrough.

Considering now the diffuser and referring particularly to FIGS. 3 through 6, the diffuser 10 generally comprises a housing indicated generally at 40 defining a relatively narrow elongated air channel adapted to communicate with the troffer passageway 30 at the upstream end

thereof. The construction and configuration of the housing 40 may vary widely but preferably and as shown is formed in two parts and is characterized by relatively thin walls and a generally elongated trapezoidal shape.

The first part of the housing includes an elongated trapezoidally shaped side wall indicated generally at 42 which has a generally vertically disposed upper portion 44, a downwardly inclined intermediate portion 46 and a generally vertically disposed lower portion 48 extending downwardly from the intermediate portion. The first part also includes a top wall 50 and end walls 52, 52 which are integrally connected with the side wall 42. A generally vertically disposed border flange 54 projects outwardly from the top and end walls.

The second part of the housing is formed by a substantially flat vertically disposed trapezoidally shaped side wall 56 which is joined with the first part along the border flange 54 by spot-welding or other suitable fastening means.

The side wall 56, the lower portion 48, and the end walls 52, 52 together define a relatively narrow elongated generally rectangular air flow channel 58. At this point it should be noted that longitudinally extending inwardly directed lips 60 and 62 are respectively formed at the lower marginal edge portions of the wall 56 and the lower portion 48. The lips 60 and 62 respectively provide generally upwardly facing seating surfaces 64 and 66 for a purpose that will be hereinafter evident. It will be further noted that the inner edges of the lips 60 and 62 and the end walls 52, 52 define a slot 67 at the downstream end or face of the diffuser.

To impart rigidity to the elongated housing 40 and to support other parts of the diffuser to be hereinafter described two longitudinally spaced apart generally vertically disposed partitions 68, 68 extend transversely between the wall 56 and the lower portion 48 dividing the channel 58 into three longitudinally elongated sections. Each partition 68 includes a longitudinally directed tab 70 which is riveted or otherwise suitably fastened to the inner surface of the lower portion 48. Each partition further includes a tab 72 which is adapted to extend transversely outwardly through a slot in the wall 56. The tab 72 is bent to a longitudinally extending position after the housing parts are assembled.

Various means may be provided for connecting the diffuser 10 with an air distribution source. As previously noted, the illustrated diffuser 10 is particularly adapted for interconnection with a substantially identical diffuser. For this purpose a relatively short neck 74 providing a generally oval-shaped inlet opening 76 communicating with the interior of the housing 40 is integrally connected with the wall 42 and projects outwardly therefrom. The neck 74 is adapted for connection with the duct section 14 as previously discussed.

Preferably, a means is provided for releasably retaining the diffuser in assembly with an associated light troffer. As best shown in FIGS. 4 through 6 the retaining means preferably comprises a plurality of spring clips 78, 78 depending from the diffuser 10 and adapted to engage the troffer 12 at the upstream end of the passageway 30. Each clip 78 is preferably formed from flat spring metal and is carried by an associated tab 80 which may, for example, be spot-welded thereto or integrally formed thereon. Each tab 80 extends upwardly through the slot 67 adjacent a partition 68 and is secured to the partition by a rivet 82. Each clip 78 has a generally triangular configuration and includes two angularly forwardly and inwardly inclined portions 84, 84 and a free end portion 86 adapted to be sprung generally inwardly when the inclined portions 84, 84 engage the longitudinal edges of the troffer slot 32 as the diffuser is moved into assembly with the troffer 12. Each clip 78 further includes two generally upwardly facing surface portions 88 and 90 which are adapted to bear against associated portions of the

lower surface of the wall 31 to retain the diffuser in assembly with the troffer.

When the diffuser 10 and the troffer 12 are in assembled condition the diffuser slot 67 is generally aligned with the troffer slot 32 and the side wall portions of the diffuser which define the passageway 58 form the general upward extension of the troffer side walls 26 and 28.

In accordance with the present invention the diffuser is provided with at least one air deflector which is supported in the channel 58 for selective positioning therein. The illustrated diffuser 10 has three such deflectors indicated generally at 92, 92 each of which is disposed in an associated section of the channel 58.

The deflector may take various forms but preferably, and as shown, it includes two elongated angularly related portions or rectangular baffles 94, 94 outwardly projecting from a common longitudinally extending vertex 96. The angular relationship between the baffles may vary but preferably the baffles are angularly spaced within 90°. At each of its ends each deflector is provided with a transversely disposed ear 98 which has an elongated slot 100 therein. Preferably, and as shown, the slot 100 is arranged with the center line thereof generally bisecting the included angle formed by the baffles 94, 94.

Each deflector 92 is arranged for pivotal movement about an axis extending longitudinally of the channel 58 and for lateral movement relative to the side walls thereof. Pivotal support for each end of each deflector 92 is provided by a pivot pin or rivet such as indicated at 102 which is received within an associated slot 100 and which engages an associated partition 68 or end wall 52 approximately midway between the side walls of the channel.

Each of the deflectors 92 may be selectively positioned in one of two positions to control the direction of air discharge from an associated portion of the passageway 30. Further support for each deflector is provided by one or the other of the seating surfaces 64 and 66 which provide means for maintaining the said deflector in a selected position.

In FIG. 5 a deflector 92 is shown in a first position wherein one of the baffles 94 lies generally adjacent one side wall 42 and the other of the baffles rests on the seating surface 64 and projects generally inwardly from the wall 42. Air from the distribution source flows generally downwardly through the channel 58 and is directed generally toward the troffer side wall 26 by the deflector and generally away from the lip 34 as indicated by the arrows in FIG. 5. Thus, air flows generally downwardly or forwardly from the passageway 30 when the deflector is in a first position.

In FIG. 7 a deflector 92 is shown in a second position and it will be noted that one of the baffles 94 resides generally adjacent the other side wall 56. The other baffle 94 rests upon the seating surface 66 and projects generally inwardly from the wall 56. When the deflector is in its second position air flowing from the diffuser is directed generally toward the troffer side wall 28 so that the resulting flow through the passageway 30 impinges upon the lip 34 to cause air to flow generally laterally outwardly through the discharge opening 38 as generally indicated by the arrows in FIG. 7.

The diffuser of the present invention is preferably also provided with damper means for controlling the air flow emanating therefrom without substantially altering the directional pattern of air flow therethrough. In the presently preferred embodiment of the invention a separate damper means or damper indicated generally at 104, 104 is provided in each section of the channel 58 upstream of the deflector 92 as best shown in FIGS. 4 through 6.

Each damper 104 comprises an elongated vane 106 pivotally supported in the chamber 58 for movement between open and closed positions. At each end of the vane 106 is formed a transversely extending ear 108 which re-

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ceives a rivet 110 seated in an associated partition 68 or wall 52 to provide pivotal support for the vane.

At its lower or downstream end, the longitudinally extending marginal edge portion of each vane 106 is bent outwardly or toward the wall 56 to form an elongated lip 112 generally normal to the surface of the vane. The upper marginal edge portion of each vane 106 is inclined relative to the vane to form an elongated longitudinally extending lip 114 which is adapted to engage the wall 56 when the damper is pivoted in a counterclockwise direction to a closed position indicated by broken lines at 104a in FIG. 5. It will be noted that in the closed position a lower edge of the vane 106 bears against the wall 42 so that the flow of air through the channel 58 is totally restricted.

In FIG. 5 the damper 104 is shown by solid lines in its maximum open position. It will be further noted that the damper remains in an open position when it is pivoted in a clockwise direction to the broken line position indicated at 104b. In the latter position the lip 112 engages the wall 56 and the lip 114 is inwardly spaced from the wall 42 to permit air to flow therebetween.

The diffuser 10 may be rapidly and conveniently adjusted from a position below or forward of the troffer 12 without separating the diffuser from the troffer. Preferably, an elongated rod or the like is employed to selectively position the air deflector 92 and the damper 104.

To adjust the deflector, a rod is inserted upwardly through the troffer passageway 30 and through the diffuser slot 67 to engage the lower surface of a deflector vane 94. When an upwardly directed force is applied to the said vane the deflector is caused to move generally upwardly and laterally inwardly due to the angular relationship between the vanes 94, 94 and the slots 100, 100. As the deflector reaches a position wherein it is free to pivot about its axis the rod is used to urge the deflector to pivot generally toward its other position on the opposite side of the channel. When the deflector attains a position wherein a portion of one of its vanes engages the opposite side wall of the channel further pivotal movement is limited and the deflector is caused to move generally downwardly and outwardly to seek a position wherein one of the vanes lies generally adjacent the inner surface of an associated side wall of the diffuser and the other of the vanes rests upon an associated seating surface.

Adjustment of the damper 104 may be accomplished by inserting a rod upwardly through the channel 58 to engage a surface of the vane 106 above or below the vane axis as required to urge the vane to pivot to a selected position.

In FIG. 7 is shown another diffuser indicated generally at 10a embodying the present invention and adapted for use with a troffer such as indicated at 12. The diffuser 10a includes a housing indicated generally at 40 and an air deflector and a damper means respectively generally indicated at 92 and 104. The aforementioned components are substantially identical in all respects to the corresponding parts of the previously described embodiment. However, the diffuser 10a differs from the one previously described principally in the construction and arrangement in the means for retaining the diffuser in assembly with the troffer 12.

Specifically, the retaining means comprises a spring clip indicated generally at 116. The clip which is preferably formed from spring wire is wound in one or more coils 117 at its central portion and has two elongated legs 118, 118 which extend downwardly and outwardly through the diffuser slot. The free end portions of the legs 118, 118 are bent generally outwardly to provide upwardly facing surface portions 120, 120 adapted to engage the downwardly facing surface of the troffer wall 31. The legs 118, 118 include downwardly and inwardly inclined outer end portions 122, 122 for engaging the

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inner edges of the troffer slot 32 when the diffuser 10a is brought into assembly with the troffer 12 in a manner previously described. A single rivet 124 extends through the coils 117 and engages an associated partition 68 to retain each clip 116 in assembly with the diffuser 10a.

The invention claimed is:

1. A slot diffuser for use with an air distributor having two generally parallel elongated side walls defining an elongated air flow passageway and having an elongated lip at the downstream end of said passageway and directed inwardly from one of said walls toward the center of said passageway, said lip and the other of the said walls defining an elongated air channel adapted to communicate downwardly with said distributor air passageway at the upstream end thereof, said diffuser side walls forming the general upward extension of said distributor side walls, means for connecting said channel with an air distribution source, and an elongated air deflector including at least two elongated angularly related portions, said deflector being supported within said channel for pivotal movement about a fixed axis extending longitudinally of said channel and for lateral movement relative to said fixed axis to a first position wherein one of the said side portions lies generally adjacent one side wall of said channel and the other of the said portions projects generally inwardly therefrom and toward the center of said channel and to a second position wherein the other of the said portions lies adjacent the other side wall of said channel and said one side portion projects generally inwardly therefrom and toward the center of said channel, said deflector serving in said first position to direct air flow from said channel and generally along said other passageway wall so that air emanates generally downwardly from said passageway, said deflector serving in said second position to direct air flow from said channel generally along said one passageway wall so that said air impinges upon said distributor lip and emanates from said discharge opening along a generally transverse path relative thereto.

2. A diffuser as set forth in claim 1 wherein said axis is provided by at least one pivot pin fixed relative to said diffuser about midway between said side walls thereof, said pin being received in an elongated slot in said deflector.

3. A diffuser as set forth in claim 1 is further characterized by said angularly related portions of said deflector comprising elongated generally rectangular baffles having a common longitudinally extending vertex.

4. A diffuser as set forth in claim 3 wherein said baffles are arranged with an included angle not exceeding 90°.

5. A slot diffuser as set forth in claim 1 wherein said means for supporting said deflector includes seating means for maintaining said deflector in said first and second positions.

6. A slot diffuser as set forth in claim 5 wherein said seating means comprises a lip directed inwardly from each of said diffuser side walls, each said lip including a generally upwardly facing seating surface.

7. A slot diffuser as set forth in claim 1 including damper means for controlling air flow from said chamber, said damper means being ineffective with respect to the directional control of air flow as achieved by the aforesaid deflector.

8. A slot diffuser as set forth in claim 7 wherein said damper means comprises an elongated vane pivotally supported in said chamber for movement between open and closed positions.

9. A slot diffuser as set forth in claim 1 including means for releasably retaining said diffuser in assembly with said distributor.

10. A slot diffuser as set forth in claim 9 wherein said means for releasably retaining said diffuser in assembly with said distributor comprises a spring clip depending

from said diffuser and adapted to engage said distributor at the upstream end of said passageway.

11. An air diffuser comprising two generally vertical side walls defining an elongated air channel opening downwardly, means connecting said channel with an air distribution source, an air deflector including at least two elongated horizontally extending angularly related portions, means providing a variable horizontally extending pivot axis above said angular related portions for supporting said deflector within said channel for generally arcuate movement below said axis between first and second positions to one and the opposite side of said axis to selectively alter the pattern of air flow from said channel, said deflector in said first position having one of said portions disposed generally adjacent one side wall and the other of said portions extending inwardly therefrom and generally toward the center of said channel, said deflector in said second position having the other of said portions disposed generally adjacent the other side wall and said one portion extending inwardly from said other side wall and generally toward the center of said channel, and seating means for providing vertical support for said deflector in said first and second positions.

12. A diffuser as set forth in claim 11 wherein said axis is provided by at least one pivot pin fixed relative to said diffuser about midway between said side walls

thereof, said pin being received in an elongated slot in said deflector.

13. A diffuser as set forth in claim 11 further characterized by said angularly related portions of said deflector comprising elongated generally rectangular baffles having a common longitudinally extending vertex.

14. A diffuser as set forth in claim 13 wherein said baffles are angularly arranged with an included angle not exceeding 90°.

15. A slot diffuser as set forth in claim 13 wherein said seating means comprises a lip directed inwardly from each of said diffuser side walls, each said lip including a generally upwardly facing seating surface.

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ROBERT A. O'LEARY, *Primary Examiner.*

W. E. WAYNER, *Assistant Examiner.*

U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

Washington, D.C. 20231

**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,401,622

September 17, 1968

Friedrich G. Honerkamp

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 56, "apparatus" should read -- apparent --; line 69, "piar" should read -- pair --. Column 6, line 14, after "elongated air" insert -- discharge opening, said diffuser comprising two generally parallel elongated side walls defining an elongated air --.

Signed and sealed this 27th day of January 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents

