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AIR DIFFUSING DEVICE WITH ADJUSTABLE AIR TURNING VANE

Filed June 16, 1964

FIG 1

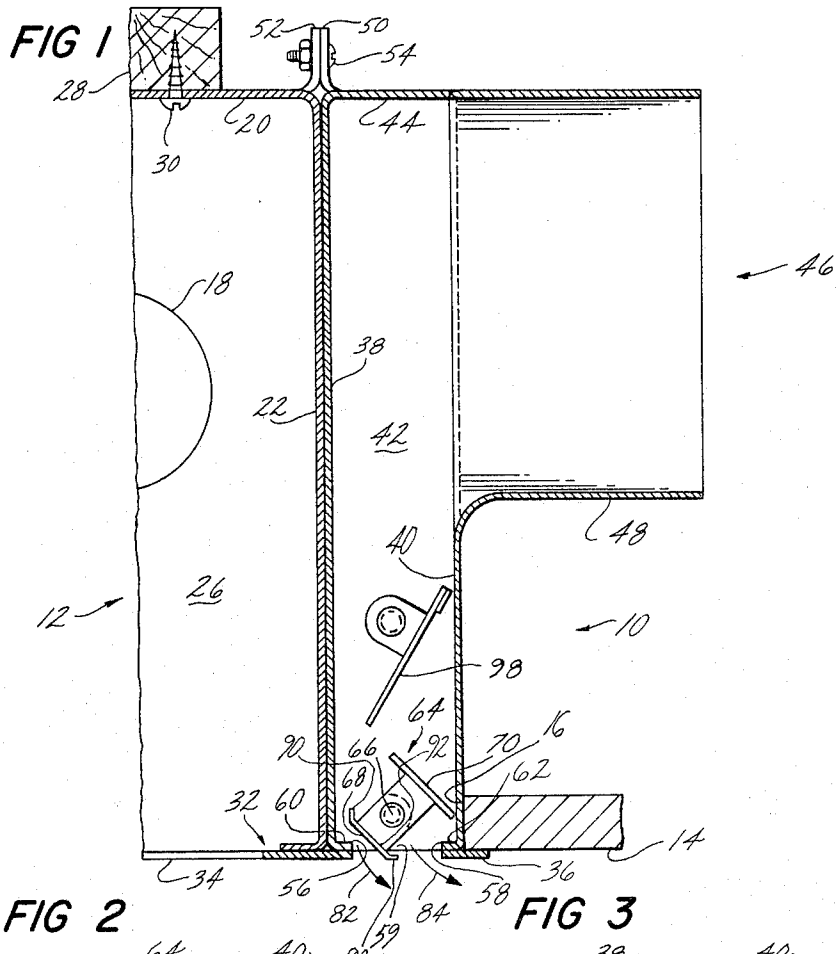



FIG 2

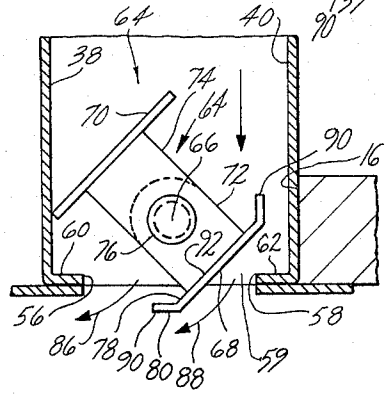
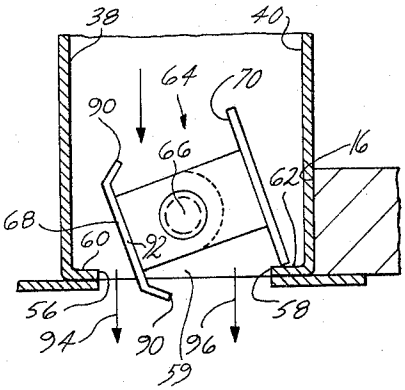



FIG 3

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# AIR DIFFUSING DEVICE WITH ADJUSTABLE AIR TURNING VANE

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This invention relates to systems for distributing air to a room or other enclosure and more particularly to an air diffuser for use in the ceiling of such a room for controlling the direction of an air stream emanating from the distribution system.

It is the general object of the present invention to provide an improved air diffuser which is capable of controlling the direction of the air stream emanating from an air distribution system.

A more specific object of the present invention is to provide a diffuser of the type mentioned which is particularly well adapted for connection with a ceiling mounted light troffer.

The drawing shows a preferred embodiment of the invention and such embodiment will be described, but it will be understood that various changes may be made from the construction disclosed, and that the drawing 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 drawing:

FIG. 1 is a vertical transverse section through an air diffusing device embodying the present invention and a light troffer;

FIG. 2 is an enlarged fragmentary vertical transverse section of the FIG. 1 device showing the parts in a second position; and

FIG. 3 is an enlarged fragmentary vertical transverse section of the FIG. 1 device showing the parts in still another relative position.

An air diffusing device **10** embodying the present invention is shown in FIG. 1 in association with a flush mounted light troffer **12** and the device will be so described as its advantages are particularly well illustrated in such an installation. It is to be understood, however, that air diffusing devices constructed in accordance with the invention have a wide variety of other uses in air distribution systems generally. For example, an air diffusing device embodying the invention may be mounted in a false ceiling with or without a light troffer, or such a device may be so constructed as to be contiuously connected with an elongated ventilating air duct. In the last mentioned construction, a linear type air diffusing device would result which device might be adapted to support adjacent ceiling tiles in a hung ceiling.

Referring now with greater particularity to FIG. 1, a ceiling **14** of a room or other enclosure is provided with an elongated opening **16** for receiving the elongated light troffer **12**. The troffer **12** houses one or more fluorescent light tubes such as one indicated at **18** and includes a horizontal top wall **20**, similar opposing side walls **22, 22** (one shown) and similar short vertical end walls **26, 26** (one shown). The top wall **20** of the troffer housing **12** is or may be secured to a beam **28** or the like as by means of screws **30, 30** (one shown). Thus, the light troffer **12** may be supported within the opening **16** with the illuminating tubes **18, 18** mounted therein in a conventional manner.

When the light troffer **12** is so secured in the ceiling opening **16**, the side walls **22, 22** have their lower edges



substantially flush with the lower surface of the ceiling **14**. The lower edges of the end walls **26, 26** of the troffer are similarly situated so that a cover plate **32** may be placed over the bottom of the troffer to close the same and provide an attractive appearance to an observer in the room therebelow. The cover plate **32** is shown as including a transparent central portion **34** for the downward passage of light from the tubes **18, 18** and a marginal portion **36** which overlays the adjacent opening defining portion of the ceiling **14**. The latter portion **36** also defines an elongated air discharge slot which is substantially coextensive with the discharge outlet of the air diffusing device **10** to be described in greater detail hereinbelow. The cover plate may be secured in place by conventional means not shown.

Still with reference to FIG. 1, the air diffusing device **10** is shown connected along one side wall **22** of the light troffer **12**. The device **10** has elongated first and second side walls, **38** and **40** respectively, which are oppositely arranged in laterally spaced relationship to define the generally vertical sides of an air chamber therebetween. Means are provided for so supporting said side walls, **38** and **40**, and as shown said means comprise short opposing generally vertical end walls **42, 42** (one shown) which cooperate with said side walls **38** and **40** to further define said chamber. The lower edges of the side and end walls are substantially flush with the lower surface of the ceiling **14** and the upper edges of these walls are connected with a generally horizontal top wall **44** to define a downwardly open air chamber.

While the detailed construction of the diffuser may vary widely, it is shown as being formed of sheet metal with the first side wall **38** and the top wall **44** thereof being integrally formed and the second side wall **40** and end walls **42, 42** being formed separately and connected together with the top wall **44** by suitable means such as welding. The device **10** is connectible with a supply of ventilating air and preferably the second side wall **40** is provided with an air inlet opening **46** as shown. An annular flange or collar **48** may be provided adjacent the inlet **46** to permit the chamber to be connected by suitable means to a source of conditioning or ventilating air under pressure. Said means may comprise a conventional conduit for connecting the inlet **46** to a ventilating air supply duct (not shown).

As shown in FIG. 1, when the air diffusing device **10** is used with the light troffer **12**, the first side wall **38** of the former is preferably flat and vertically arranged to lie adjacent the side wall **22** of the light troffer **12**. The device **10** is attached to the troffer **12** by narrow flanges **50, 50** (one shown) which are spaced longitudinally along the upper edge of said first side wall **38**. The flanges **50, 50** are connected to correspondingly located flanges **52, 52** (one shown) on the troffer **12** by a series of connecting bolts **54, 54** (one shown).

In accordance with the present invention each of the air diffuser side walls **38** and **40** has a longitudinal air deflecting flange or lip extending along the inner side and from end to end thereof. Thus, flanges or lips **56** and **58** on the side walls **38** and **40** at the lower edges thereof define an elongated downwardly open air discharge outlet **59** communicating with the air chamber **42**. The lips **56** and **58** have upper surfaces **60** and **62** respectively which are generally flat and substantially parallel with the lower surface of the ceiling **14** in which the air diffusing device **10** is mounted.

In further accord with the present invention an elongated air turning vane assembly indicated generally at **64**, is pivotally supported by the end walls **42, 42** of said device **10** for movement about a longitudinal axis **66** which is equidistantly spaced between and slightly above the upper surfaces **60** and **62** of the lips **56** and **58** respectively.

The vane assembly 64 comprises an air turning vane member 68 and an air shielding member 70, which members are oppositely arranged diametrically about said axis 66 and held in fixed relation to one another by inturned end portions 72 and 74 on each of said members (one end shown.) A pair of rivets or bolts 76, 76 (one shown) in aligned holes in the end portions 72 and 74 and in the end walls 42, 42 hold the vane assembly 64 at any of the selected positions shown in the drawing, or at intermediate positions.

The turning vane member 68 is adapted to be operatively associated with the first and second side wall lips 56 and 58 as shown in FIGS. 1 and 2 respectively. The cross sectional shape of this vane 68 may be characterized as incurvate, the generally concave inner surface 78 thereof being in radially spaced relation with the axis 66 and the generally convex outer surface 80 thereof being in air turning relationship with said lips when the vane assembly is in first and second positions shown respectively in FIGS. 1 and 2. As so constructed and arranged at least the major portion of the air being discharged by the device 10 will be turned away from the vertical direction, generally perpendicularly with respect to the axis 66, and towards one or the other of two possible horizontal directions in the manner indicated by the arrows 82 and 84 in FIG. 1, and the arrows 86 and 88 in FIG. 2. In the sheet metal construction shown, the vane member 68 may be more particularly described as having marginal or edge portions 90, 90 which are inclined with respect to the central portion 92 thereof, each of said edge portions 90, 90 being bent some 45° towards the axis 66 to provide the said generally concave surface 80. In the first and second vane assembly positions shown and described herein, the central portion 92 of said vane 68 forms a 45° angle with the vertical and the edge portions 90 and 90 are either vertically or horizontally arranged depending on the particular direction of horizontal air deflection desired (FIG. 1 or FIG. 2).

Although the aforesaid angular setting of the turning vane 68 will produce a maximum turning of the discharged air stream from the vertical direction, it will be apparent that other degrees of turning can be achieved with the device 10 by positioning the vane assembly at some lesser inclination to the vertical. FIG. 3 shows the discharge air as only slightly turned by the vane 68, the central portion 92 of the latter being substantially aligned with the vertical to minimize the deflection of the discharged air as indicated by the arrows 94 and 96. Thus, a third vane assembly position is available which is beyond the first vane assembly position in a clockwise direction and which minimizes the deflection of air from said vertical direction. It will be apparent that a fourth position, beyond said second vane assembly position in a counterclockwise direction is also available with the device shown.

Turning now to the shielding member 70 and its function as part of the vane assembly 64, said member will be seen to comprise a rectangular flat plate which is located opposite the vane 68 and which is generally parallel to the central portion 92 of the vane. The shielding member is so spaced from the axis 66 and is of such a width that one or the other of its marginal or edge portions lies adjacent the inner side of one of said side walls 40 and 38, when the vane assembly is in said first and second positions respectively. As so constructed and arranged, the air shielding member 70 blocks the air which would otherwise flow through that portion of the discharge outlet adjacent the second lip when the vane 68 is in air turning relationship with said first lip, as best shown in FIG. 1. Conversely, the shielding member 70 blocks the air from flowing through that portion of the outlet adjacent said first lip when the vane 68 is in air turning relationship with said second lip as shown in FIG. 2.

Finally, and still with reference to the shielding member 70, the said marginal edges are adapted to engage the upper surfaces 60 and 62 of each of the lips 56 and 58



when the vane assembly 64 has been rotated to the said third or fourth positions described above. As shown in FIG. 3, the shielding member is thereby rendered ineffective as it is substantially aligned with the vertical direction and the air is permitted to be discharged generally downwardly in a substantially vertical direction as indicated by the arrows 94 and 96.

In the device shown, an air damping means is preferably also provided in the chamber for controlling the volume of the air flow emanating from the air distribution system. As shown in FIG. 1, said means comprise an elongated rectangular blade 98 which is pivotally supported in the end walls 42, 42 for movement between a fully open position whereat the blade is parallel with the side walls 38 and 40, and a flow restricting position (such as that shown in FIG. 1) whereat the blade 98 is arranged at an angle to said vertical direction.

Operation of the device is suggested above but may require further brief description. With the vane assembly in the first position of FIG. 1, air at the far left flows downwarly adjacent the vane assembly and then rightwardly off the upper surface 60 of the lip 56. The larger volume of air at the right is blocked by the shield 70 and must flow downwardly between the shield 70 and the vane 68. In passage downwardly between these two elements the air engages the central portion 92 of the vane and then the righthand edge portion 90 so as to be discharged rightwardly in generally horizontal direction. Air cannot flow vertically downwardly from the device as there is no line-of-sight passage for the air.

In the second position of FIG. 2, operation is as described but in a reverse sense.

In the position of FIG. 3, air is free to flow vertically between shielding member 70 and the vane 68. The larger volume of air flows through this opening. Thus, air at the far left which engages the upper surface 60 of the lip 56 and which might tend to discharge horizontally is nevertheless entrained in the larger air stream and flows substantially vertically downwardly.

The invention claimed is:

1. A device for controlling the direction of air emanating from an air distribution system; said device comprising first and second longitudinally extending side walls, means for supporting said walls in laterally spaced relationship so that the device can be entered in an elongated opening in a ceiling or the like, first and second air deflecting lips depending inwardly from the lower edge portions of said first and second side walls and defining an elongated air discharge outlet therebetween, an elongated air turning vane assembly, means pivotally supporting said vane assembly for movement about a longitudinal axis which is spaced between and slightly above said lips, said vane assembly having an elongated vane member located in downwardly spaced radial relation to said assembly axis, and said vane assembly being movable between first and second positions whereat said vane member is positioned in air turning relationship with said first and second lips respectively for the deflection of the air away from the vertical and in opposite generally horizontal directions.

2. A device for controlling the direction of air emanating from an air distribution system as set forth in claim 1 wherein said elongated vane member has marginal portions which are inclined with respect to the central portion thereof to form air deflectors, each of said edge portions being inclinde towards the axis of rotation of said vane member to provide a generally concave upper surface and a generally convex lower surface thereof.

3. A device for controlling the direction of air emanating from an air distribution system as set forth in claim 1 wherein said vane assembly includes a shield member diametrically opposite said vane member so that said shield member blocks the air from flowing through that portion of said discharge outlet adjacent said second lip when said vane member is positioned in air turning re-

lationship with said first lip and so that said shield member blocks the air from flowing through that portion of said discharge outlet adjacent said first lip when said vane member is positioned in air turning relationship with said second lip.

4. A device for controlling the direction of air emanating from an air distribution system as set forth in claim 3 wherein said vane assembly is movable beyond said first and second positions to third and fourth positions whereat said vane member and shield member are substantially aligned with the vertical to minimize the deflection of air away from the vertical.

5. A device for controlling the direction of air emanating from an air distribution system as set forth in claim 3 wherein said shield member is parallel to said vane member, said vane assembly being movable beyond said first and second vane positions into third and fourth vane assembly positions whereat said vane and said shield member are substantially aligned with the vertical to minimize the deflection of air away from said vertical direction.

6. An air diffusing device for controlling the direction of air discharged into a room or other enclosure; said device comprising elongated opposing generally vertical side walls adapted to be entered in an elongated slot in the ceiling of the room so that their lower edges lie substantially in the plane of the lower surface of the ceiling, short opposing generally vertical end walls connected between said side walls and having lower edges substantially in the plane of the lower edges of said side walls, a generally horizontal top wall connected to upper edges of said side and end walls and cooperating therewith to define a downwardly open air chamber, a longitudinal air deflecting lip extending along the inner side and from end to end of each of said side walls at the lower edges thereof to define an elongated downwardly open air discharge outlet communicating with said air chamber, means for connecting said chamber to a source of air under pressure, an elongated air turning vane assembly pivotally supported by said end walls for movement about a longitudinal axis which is spaced between and sligtly above said lips, said vane assembly having an elongated vane member which is curvate in cross section with its inner surface in radially spaced relation to said axis, and said vane assembly being movable from and to first and second positions whereat the outer surface of said vane member is positioned in air turning relationship with said first and second lips respectively for the selective deflection of at least a portion of the discharged air generally horizontally.

7. A device for controlling the direction of air being discharged into a room as set forth in claim 6 wherein said vane assembly includes a shield member which is oppositely arranged with respect to said vane member about said axis, said shiled member serving to block the air from flowing through that portion of said discharge outlet adjacent said second lip when said vane is positioned in air turning relationship with said first lip and to block the air from flowing through that portion of said discharge outlet adjacent said first lip when said vane is positioned in air turning relationship with said second lip.

8. A device for controlling the direction of air being discharged into a room as set forth in claim 7 wherein said vane assembly is movable beyond said first and second positions to third and fourth positions whereat said vane member and said shield member are substantially aligned with the vertical to minimize the deflection of air away from said vertical direction.

9. A device for controlling the direction of air being discharged into a room as set forth in claim 8 and including damper means upstream of said vane assembly.

10. A device for controlling the direction of air being discharged into a room as set forth in claim 9 wherein



said damper means comprises an elongated rectangular blade pivotally supported in the end walls of said chamber for movement between open and closed positions.

11. A device for controlling the direction of air emanating from an air distribution system, said device comprising first and second longitudinally extending side walls, means for supporting said walls in laterally spaced relationship so that the device can be entered in an elongated opening in a ceiling or the like, first and second air deflecting lips projecting inwardly from the lower edge portions of said first and second side walls and defining an elongated air discharge outlet therebetween, an elongated air turning vane assembly, means pivotally supporting said vane assembly for movement about a longitudinal axis located between said lips, said vane assembly including an elongated vane member having first and second longitudinally extending marginal edge portions which are inclined upwardly with respect to a central portion thereof to define a concave upper surface of said vane member, said vane assembly being movable between first and second positions wherein the lower surface of said vane member is located in air turning relationship with said first and second lips respectively, said upper concave surface of said vane member serving to split the air being discharged through said outlet into two streams one of which is turned toward the horizontal by one or the other of said inclined marginal vane edge portions and the other of which streams is turned by one of said lips in conjunction with the lower surface of said vane member.

12. A device for controlling the direction of air being discharged into a room as set forth in claim 11 wherein said vane assembly includes a shield member mounted in spaced relation to said vane member and operable to block the air from flowing through that portion of said discharge outlet adjacent said second lip when said vane member is positioned in air turning relationship with said first lip and to block the air from flowing through that portion of said discharge outlet adjacent said first lip when said vane member is positioned in air turning relationship with said second lip.

13. A device for controlling the direction of air being discharged into a room as set forth in claim 11 wherein said center portion of said vane member is oriented at approximately a 45 degree angle with respect to the vertical when said vane assembly is in said first and second positions, and wherein said upwardly inclined marginal edge portions define approximately a 45 degree angle with said center portion, said vane assembly being movable beyond said first and second positions to third and fourth positions respectively wherein said center portion is oriented substantially vertically to minimize the deflection of air away from the vertical.

14. A device for controlling the direction of air being discharged into a room as set forth in claim 11 wherein said vane assembly includes a shield member arranged generally parallel to said vane member and in spaced relation therewith so as to cooperate with said vane member in turning the discharged air away from the vertical.

15. A device for controlling the direction of air being discharged into a room as set forth in claim 14 wherein said vane assembly is movable beyond said first and second positions to third and fourth positions respectively wherein said vane and shield members are substantially aligned with the vertical to minimize the deflection of air away from the vertical.

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