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AIR DIFFUSER

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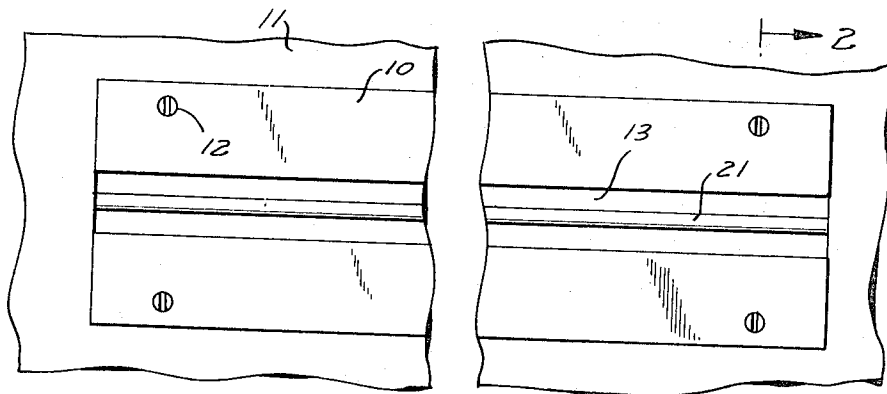


FIG. 1

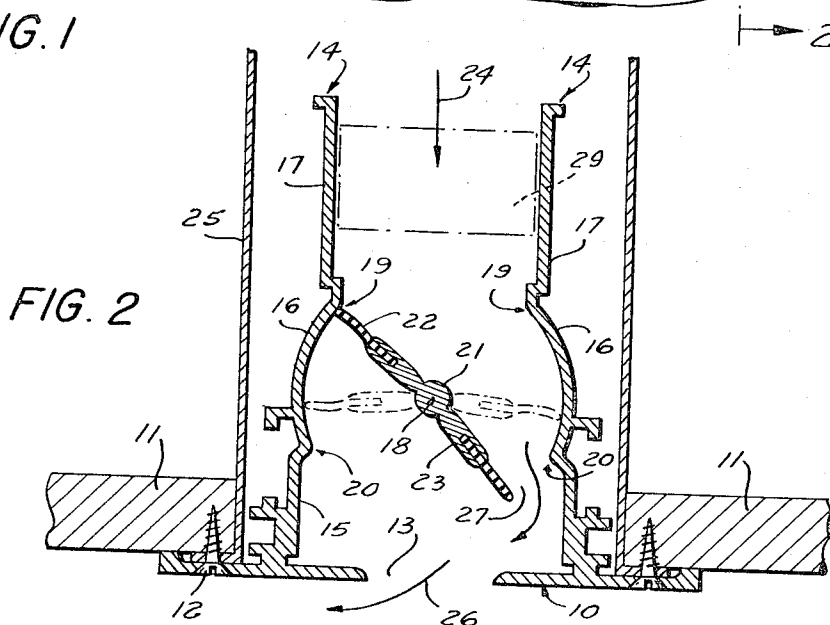


FIG. 2

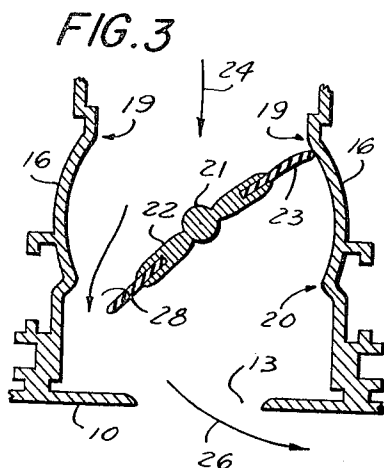


FIG. 3

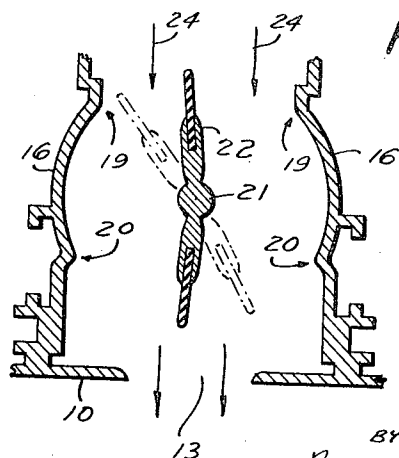


FIG. 4

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## AIR DIFFUSER

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7 Claims. (Cl. 98-40)

This invention relates to air diffusers, and has particular reference to the type of diffuser which introduces air into a room through an elongated slot, usually situated in the ceiling of the room.

It is a general object of the invention to provide an improved diffuser structure which permits the direction of the air flowing in, as well as its volume, to be controlled in a simpler manner than has been possible heretofore.

A more particular object is to provide a diffuser installation in which a single control can be utilized to regulate not only the air flow direction but also the volume. The control means provided by the invention is a single, compact and easily adjustable shaft mounted within an air passage of special character and provided with vanes cooperating in a novel manner with specially-designed opposed concave walls of the air passage.

A general objective of the invention is to provide a structure that can be readily manufactured at relatively low cost, that can be installed easily and expeditiously, and whose adjustments can be effected quickly and reliably with a minimum of effort and without requiring any unusual skill.

A feature of the invention resides in the provision of an air passage having opposed concave walls concentric to the axis of a rotatably adjustable shaft upon which oppositely extending vanes are mounted, the walls being so arranged with respect to the angularity of the vanes to each other that air flow can be directed in controllable amounts against one wall or the other, or cut off completely. In the preferred embodiment of the invention this is achieved by having the inlet end of the passage between the walls narrower than the outlet end.

Another feature of the improved structure involves the provision of parallel extensions upon the opposed concave walls at the inlet end of the passage between them, for accommodation of a cooperating diffusing unit which helps to distribute the air more uniformly along the length of the slot through which it enters the room.

The improved diffuser of this invention is structurally simple and unusually compact, highly effective in achieving its contemplated function and easy to install and adjust. One way of producing it, and achieving the objectives of the invention, is illustrated in the accompanying drawings, in which:

FIGURE 1 is a face view of the outlet slot of an illustrative diffuser installation in the ceiling of a room;

FIGURE 2 is a cross-sectional view substantially along the line 2-2 of FIGURE 1; and

FIGURES 3 and 4 are views similar to FIGURE 2 showing the adjustability of the control shaft and some of the variations in air flow that can be produced.

In the installation chosen for illustration a metal frame 10 is shown secured to the ceiling 11 of a room by means of screws 12. The frame is provided with an elongated substantially rectangular slot 13 through which air is introduced into the room. Extending upwardly from the frame are spaced wall structures designated 14. Their inner contours are symmetrical and in opposed relation and each of them comprises a lower section 15, a medial section 16 of concavely curved character, and an upper section 17. The curved walls 16 are concentric to a horizontal axis 18. Their upper ends 19 are closer together than their lower ends 20. The walls 16 thus define

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an air passage whose inlet, between the regions 19, is narrower than the outlet, between the regions 20. The slot 13 is considerably narrower than the outlet referred to and lies directly beneath it and in alignment with it.

Mounted for rotation on the axis 18 is a control shaft 21. Extending from it in opposite directions are vanes 22 and 23, having widths adapting them to move into and out of sliding engagement with the walls 16 when the shaft 21 is rotated. The outer edge regions of the vanes are preferably composed of flexible material (e.g., rubber or the like) so that the establishment of air-tight engagements between vanes and walls will be facilitated.

The vanes 22 and 23 are preferably arranged, as shown, at an angle of slightly less than 180 degrees to each other.

Air is fed to the passage between the parts 14 in the direction of arrows 24. Any suitable duct means may be employed for this purpose. For example, the opposed outer walls 25, shown secured in position by the screws 12, may constitute part of conventional ductwork. Any other means for supplying air may also be employed.

With the vanes 22, 23 disposed in a substantially vertical direction (FIG. 4) the air will flow past them along both walls 16 and will emanate from the diffuser slot 13 in a direction substantially perpendicular to the ceiling 11. This mode of introduction of air into a room might be desirable, for example, in an installation in which the air is warm and is intended to heat the room. By varying the inclination (e.g., as shown in dot-dash lines in FIG. 4) the amount of air flow can be correspondingly regulated.

In case the air is to be introduced tangentially, i.e., more or less parallel to the ceiling as indicated by arrows 26 in FIGS. 2 and 3, the shaft 21 is rotatively adjusted to any of various possible settings in which the vanes are oblique and are in contact with only one or the other of the concave walls 16. In FIG. 2, for example, the vane 22 is in engagement with the left-hand wall 16 near its upper end, while the vane 23 extends downwardly into the space between the sections 15. This deflects the incoming air against the right-hand wall 16 and causes it to pass around the vane 23, through a passage 27 of variable width, and emanate from the slot 13 in a generally leftward direction. Similarly, if the shaft 21 is adjusted to position the vanes as shown in FIG. 3, the incoming air will be guided against the left-hand wall 16 and around the vane 23 (again, through a passage 28 of variable width) so that it emanates from the slot 13 in a generally rightward direction. In each of these cases, the width of the air passage 27 (FIG. 2) or 28 (FIG. 3) can be altered by slight rotations of the shaft 21 so as to regulate the amount of air flow. The extent to which the angularity of the vanes 22, 23 to each other deviates from 180 degrees is a factor which determines the maximum possible width of each passage 27, 28. Another factor is the extent to which the spacing between the parts 20 exceeds that between the parts 19. This angularity and spacing are therefore to be chosen, in manufacture, in accordance with requirements of intended use.

The type of air introduction indicated in FIGS. 2 and 3 might be desirable, for example, in an installation whose function is to provide cooled air for the room.

In dot-dash lines in FIG. 2 and adjustability of the control shaft 21 is shown whereby both vanes 22 and 23 are in engagement with the corresponding walls 16 so that the flow of air into the room is completely blocked.

It will be noted that the diffuser involves only a single movable part, and that it is possible, by adjusting it into any of numerous possible settings, optionally to provide for either perpendicular or tangential flow into the room, to vary the amount of flow, or to cut off the flow entirely. Heretofore, the attainment of these results has

required mechanisms of relatively complex character, involving a multiplicity of louvers and other movable parts.

It is preferable to mount a fixed diffuser element of the honeycomb type (not shown), such as that described in U.S. Patent No. 2,907,260, in the space 29 (FIG. 2) between the upper extensions 17. This serves to distribute the inflowing air more uniformly along the length of the outlet slot 13.

Structural details relating to the support and mounting of the several parts have been omitted in the interest of simplicity of illustration. Any suitable bearings for the control shaft 21 may be provided, in rigid association with the frame 10, to maintain the shaft axis in coincidence with the center of curvature 18 of the walls 16; and any desired means may be employed to vary the rotational settings of the shaft 21 and to hold it in any selected setting.

Two or more of the diffusers may obviously be arranged in side-by-side relation, if desired.

In general, it will be understood that numerous details described and illustrated herein can be altered by those skilled in the art without necessarily departing from the spirit and scope of the invention as expressed in the appended claims.

What is claimed is:

1. In an air diffuser, a pair of opposed concave walls defining an air passage between them and arranged symmetrically on opposite sides of a horizontal center line, the wall curvatures being concentric to said line, the upper wall edges being spaced to form an inlet for air to be diffused, the lower wall edges being spaced to form an outlet, the spacing between the lower edges being greater than the spacing between the upper edges, a shaft mounted for rotative adjustment on an axis coincident with said center line, and vanes carried by said shaft and extending radially in opposite directions, the outer edges of said vanes being adapted to engage with said walls when the shaft is rotated, whereby said vanes may be optionally positioned (a) with both vanes out of engagement with said walls so that air can flow downwardly along both walls, (b) with both vanes engaging said walls so that air flow is blocked, or (c) with only one vane in engagement with the upper part of a selected one of said walls so that air flow can be directed in varying amounts along the other of said walls.

2. An air diffuser as defined in claim 1, including a frame supporting said walls and shaft and adapted to be secured to a ceiling, said frame being shaped to define an elongated slot opening beneath and in alignment with said air passage.

3. An air diffuser installation comprising a frame adapted to be secured to the ceiling of a room and provided with an elongated slot through which air can emerge into the room, a pair of opposed concave elongated walls carried by said frame above said slot and defining between them an elongated air passage aligned with said slot, said walls being symmetrically located on opposite sides of a horizontal center line, the wall curvatures being concen-

tric to said line, the upper wall edges being spaced to form an inlet, the lower wall edges being spaced by a greater amount to form an outlet, a shaft mounted in said frame for rotative adjustment on an axis coincident with said center line, vanes carried by said shaft and extending radially in opposite directions, the outer edges of said vanes being adapted to engage with said walls when the shaft is rotated, and duct means for supplying air to said inlet, whereby said vanes may be optionally positioned (a) with both vanes out of engagement with said walls so that air can flow downwardly along both walls, (b) with both vanes engaging said walls so that air flow is blocked, or (c) with only one vane in engagement with the upper part of a selected one of said walls so that air flow can be directed in varying amounts along the other of said walls.

4. An air diffuser as defined in claim 1, in which said vanes lie at an angle of slightly less than 180 degrees to each other.

5. An air diffuser as defined in claim 1, in which the outer edges of the vanes are composed of flexible material to facilitate the establishment of air-tight engagement between vanes and walls.

6. An air diffuser as defined in claim 3, in which said walls have extensions on their upper edges, and in which a honeycomb-type diffusing unit is mounted between said extensions to intercept the air supplied by said duct means and enhance its even distribution along said inlet.

7. In an air diffuser, a pair of opposed concave walls defining an air passage between them and arranged symmetrically on opposite sides of a horizontal center line, the wall curvatures being concentric to said line, the upper wall edges being spaced to form an inlet for air to be diffused, the lower wall edges being spaced to form an outlet, the spacing between the lower edges being greater than the spacing between the upper edges, a shaft mounted for rotative adjustment on an axis coincident with said center line, and vanes carried by said shaft and extending radially in opposite directions, said vanes each having a width substantially equal to the radius of curvature of said walls, said vanes lying at an angle of slightly less than 180 degrees to each other, whereby said vanes may be optionally positioned (a) with both vanes out of engagement with said walls so that air can flow downwardly along both walls, (b) with both vanes engaging said walls so that air flow is blocked, or (c) with only one vane in engagement with the upper part of a selected one of said walls so that air flow can be directed in varying amounts along the other of said walls.

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