Sept. 23, 1958 R. S. LOWENSOHN 2,852,999

AIR DIFFUSER

Filed June 27, 1955 2 Sheets-Sheet 1

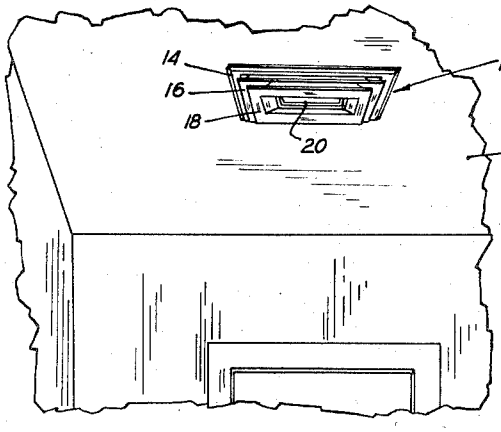


FIG.1

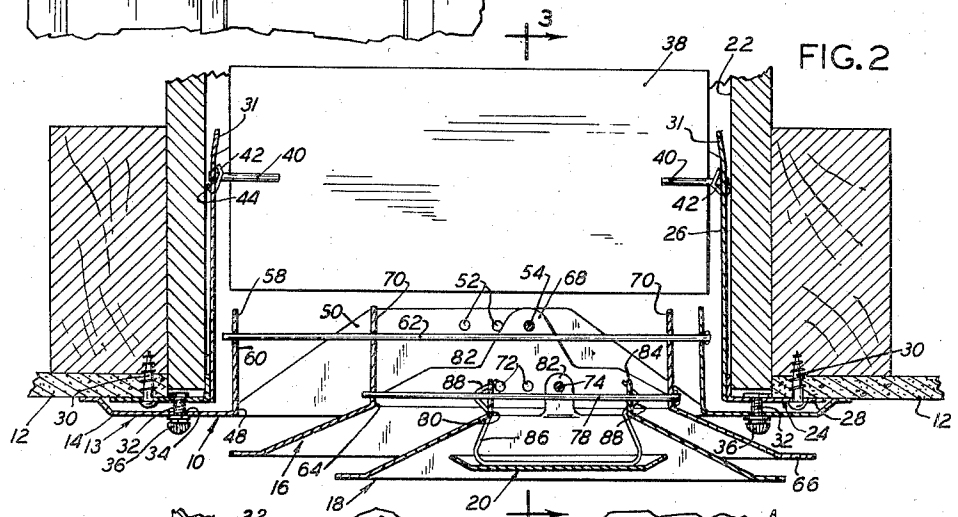


FIG.2

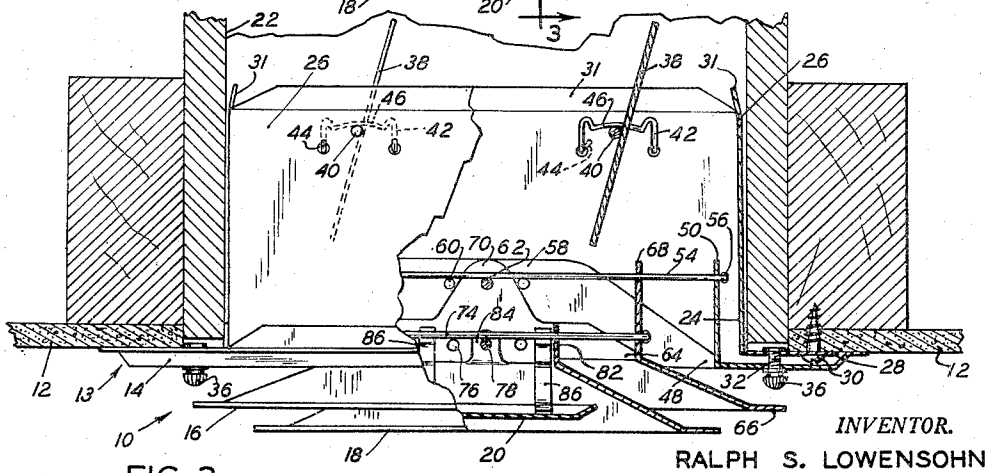


FIG.3

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AIR DIFFUSER

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FIG. 4

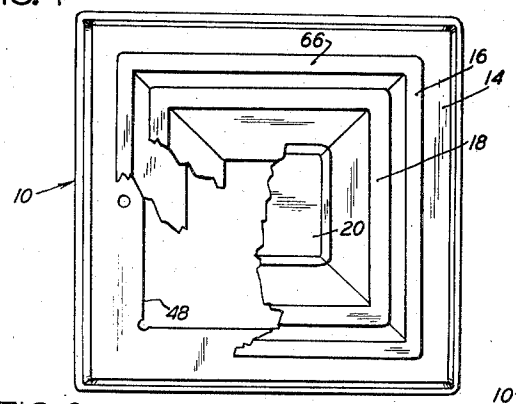


FIG. 5

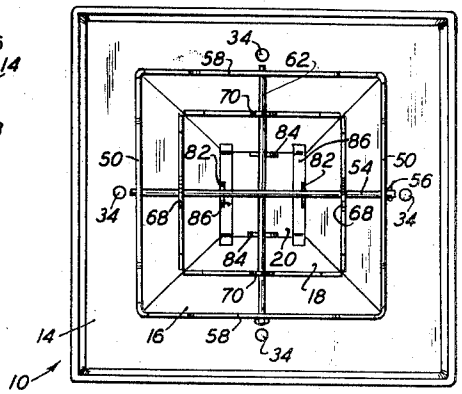


FIG. 6

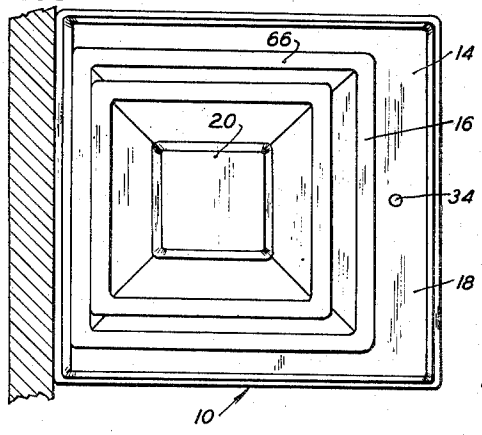
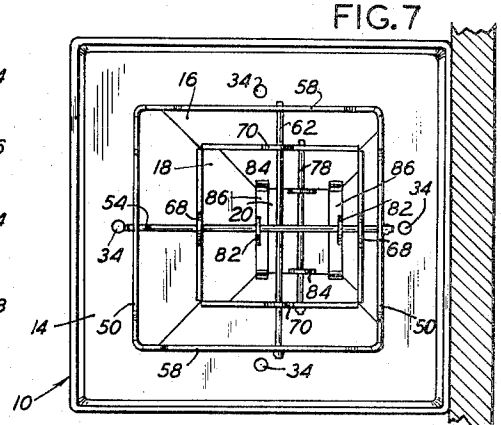


FIG. 7



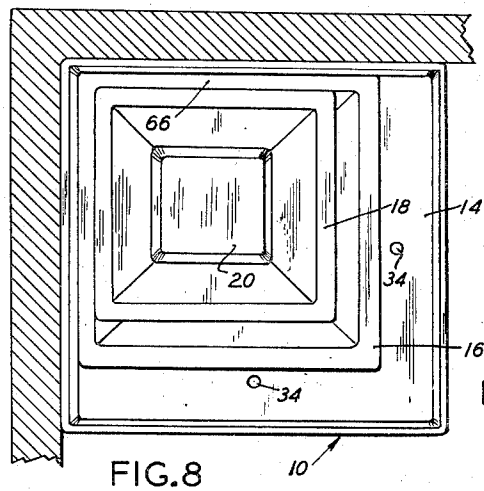


FIG. 8

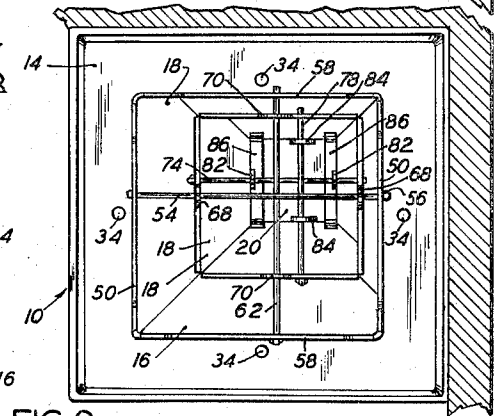


FIG. 9

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United States Patent Office 2,852,999
Patented Sept. 23, 1958

2,852,999

AIR DIFFUSER

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Application June 27, 1955, Serial No. 517,994

4 Claims. (Cl. 98—40)

This invention relates to an air diffuser, and more particularly to a device for directing air into a room or other enclosure from an air inlet opening, in which one or more diffuser elements may be shifted laterally of the opening in order to direct the air in a desired direction and in which the volume of air discharged may also be adjusted.

In many cases it is desirable to direct air for ventilation or for heating or cooling into a room in a desired direction, particularly when the air inlet is located in the ceiling of the room. When the air inlet is in the central portion of the ceiling, it is usually desirable to direct the air substantially equally in all directions outwardly from the air diffuser and downwardly at an angle to the ceiling which is less than a right angle thereto. When the air inlet is close to a wall it is usually advantageous to direct most of the air away from the wall, i. e., to diffuse the air through an angle of substantially one hundred eighty degrees, and when the air inlet is in or near the corner of a room, it is advantageous to direct the air away from the corner, i. e., to diffuse the air through an angle of approximately ninety degrees. Also, the air diffuser should be relatively inconspicuous and pleasing to the eye. Heretofore, air diffusers having exposed vanes which can be angularly adjusted have been proposed, but such diffusers are usually unsightly and in many cases do not provide the requisite adaptability for all possible locations of ceiling air inlets. Also, it has been proposed to provide air diffusers of a plurality of types adapted for employment in ceiling air inlets in various positions in the ceiling but this has required a variety of different stock models, one for each type of air inlet location.

In accordance with the present invention, a single unitary air diffuser is provided which has one or more diffuser rings or elements which may be shifted laterally of the air inlet opening and held in adjusted position so as to direct the incoming air in a desired direction and diffuse it laterally either through approximately one hundred eighty degrees or approximately ninety degrees, or which may be positioned to diffuse the air substantially uniformly in all directions laterally from the diffuser. Intermediate conditions of diffusion can also be obtained so as to vary the amount of air directed in a given direction. That is to say, nearly any desired lateral distribution of air from the air diffuser can be obtained. Also, the air diffuser structure is preferably provided with one or more damper elements which can be employed to regulate the volume of air discharged from the diffuser, i. e., they can be employed to restrict the flow of air through the diffuser, such damper elements in the present invention also being adapted to provide additional directional control over the air being diffused. In general, such damper elements will be adjusted to a desired position in the initial balancing of the ventilating or heating or cooling system and then allowed to remain in adjusted position. In all adjusted positions the air diffuser of the present invention remains nearly flush with the ceiling surface, i. e., it does not project substantially into the room, and has a pleasing appearance.

It is therefore an object of the present invention to provide an improved air diffuser particularly adapted for employment in an air inlet in the ceiling of a room and which is adjustable to provide substantially any desired distribution of air around the diffuser.

Another object of the invention is to provide an air diffuser which directs air entering the room through the ceiling thereof downwardly at an angle to the ceiling of less than ninety degrees and which may be adjusted to provide substantially any desired distribution of the air laterally of the diffuser.

Another object of the invention is to provide an air diffuser particularly adapted for installation in the opening of a ceiling duct and which has a pleasing appearance and can be employed to direct the air downwardly and laterally from the diffuser with substantially any desired distribution.

A further object of the invention is to provide an air diffuser for the opening of a ceiling duct which can be adjusted to provide a substantially uniform distribution of the air downwardly and radially from the diffuser and which also can be adjusted for directing substantially all of the air downwardly and laterally from one side of the diffuser.

A still further object of the invention is to provide an air diffuser for diffusing air from an inlet duct in the ceiling of a room, which diffuser is of pleasing appearance and which can be adjusted to diffuse the air downwardly and laterally with a substantially uniform radial distribution, and which can be adjusted to restrict the lateral diffusion of the air to either substantially one hundred eighty degrees of substantially ninety degrees.

Other objects and advantages of the invention will appear in the following description thereof given in connection with the attached drawings of which:

Fig. 1 is a perspective view of one corner of a room showing the diffuser of the present invention installed in the ceiling of such room;

Fig. 2 is a vertical section taken through the air diffuser structure of the present invention and showing it in position in a ceiling duct and adjusted to direct air largely to the left in such figure;

Fig. 3 is a partial vertical section taken on the line 3—3 of Fig. 2, with the left portion of certain of the parts shown in elevation;

Fig. 4 is a bottom view of the diffuser assembly alone showing the diffuser elements in a central position with portions in such diffuser elements broken away;

Fig. 5 is a top view of the diffuser assembly with the diffuser element in the position shown in Fig. 4;

Fig. 6 is a bottom view of the diffuser assembly positioned against a side wall and with the diffuser elements arranged to direct air away from such wall;

Fig. 7 is a top view of the diffuser assembly with the diffuser elements in the position shown in Fig. 6;

Fig. 8 is a bottom view of the diffuser assembly positioned against two corner walls with the diffuser elements positioned to direct the air outwardly from both walls; and

Fig. 9 is a bottom view of the diffuser assembly showing the diffuser elements in the position of Fig. 8.

Referring more particularly to the drawing, the diffuser assembly **10** is shown in Fig. 1 in position in the ceiling **12** of a room, and the details of the assembly are shown more clearly in Figs. 2 and 3. The diffuser assembly **10** includes a body member **13** including a decorative flange **14**, an outer diffuser element **16** in the form of a square ring, an inner diffuser element **18** also in the form of a square ring, and a cap plate **20**, the diffuser ring **16** being adjustably supported on the body member **13**, the inner

diffuser ring 18 being adjustably supported by the diffuser ring 16, and the cap plate being supported by the diffuser ring 18, as will be described more in detail below. The diffuser assembly 10 may be supported in the opening in a duct 22 in the ceiling 12. That is to say, the body member 13 may be attached to a support member 24 having a collar 26 extending upwardly into the duct 22 and having a flange 28 surrounding the lower end of the collar, the flange fitting against the ceiling surface and being secured thereto, for example, by screws 30, and the collar having tabs 31 at its upper end which are bent inwardly at a slight angle to the axis of the collar to facilitate insertion of the collar 26 into the duct 22. The flange 28 of the support member 24 has a plurality of screw-threaded weld studs 32 extending downwardly therefrom. The flange 14 of the body member 13 has corresponding holes 34 therein through which the weld studs 32 extend, and the flange 14 may be held in position on the studs 32 by knurled nuts 36. The collar portion 26 of the support member 24 supports a pair of damper vanes 38 having pivot pins 40 secured to opposite ends thereof, for example, by welding, the pins 40 extending through holes in the opposite side walls of the collar portion 26 and being engaged by spring clips 42 which frictionally resist rotation of the pins 40 and thus hold the vanes 38 in adjusted position. The spring clips 42 have hook portions 44 at their ends positioned in suitable holes in the collar portion 26 and a central portion 46 resiliently engaging the ends of the pins 40. It will be apparent that the damper vanes 38 may be adjusted by merely removing the cap plate 20 as described below and moving the vanes with any suitable tool such as screw driver or small stick of wood inserted through the opening thus provided.

The body member 13 of the diffuser assembly 10 has a central opening 48 and has tabs 50 on opposite sides thereof extending upwardly into the collar 26 adjacent the walls thereof. The tabs 50 each have a plurality of laterally spaced holes 52 therein, such holes in the two tabs being in alignment and being positioned adjacent the upper edges for receiving the ends of a rod 54 which extends between the two tabs 50. In Fig. 2 three holes 52 are shown in the tabs 50, although it is apparent that any desired number of such holes can be employed. The rod 54 may be positioned in pairs of aligned holes in three different positions in Fig. 2, the rod 54 being positioned in the right holes in such figure. As shown in Fig. 3, the rod 54 may have an enlarged head 56 on one end thereof to assist in positioning the rod in the tabs 50, and it is noted that the walls of the collar 26 prevent removal of the rod 56 from the tabs 50 when the diffuser assembly 10 is in position with the tabs 50 within the collar 26. The body member 13 also has tabs 58 on opposite sides of the central opening 48, the tabs 58 being positioned at right angles to the tabs 50. The tabs 58 also have a plurality of laterally spaced holes 60 therein, such holes being adapted to receive the ends of a rod 62 extending between the tabs 58. It will be noted that the holes 52 in the tabs 50 are positioned above the holes 60 in the tabs 68 so that the rod 54 is positioned above and clears the rod 62.

The outer diffuser ring 16 has an outwardly and downwardly inclined ring portion surrounding a central opening 64 and has a horizontal boundary flange 66. The outer diffuser ring 16 likewise has upstanding tabs 68 on opposite sides of the opening 64, which tabs are parallel with and extend upwardly within the tabs 50 of the body member 13. The tabs 68 of the diffuser ring 16 each have a hole therein for receiving the rod 54. Also, the diffuser ring 16 has upstanding tabs 70 on opposite sides of the opening 64, which tabs are at right angles to the tabs 68 and parallel to the tabs 58 of the flange member 14. The tabs 70 have holes therein for receiving the rod 62, the holes in the tabs 70 being below the holes in the tabs 68. It is apparent that the diffuser ring 16 is thus supported upon the rods 54 and 62, which are in turn supported in the tabs 50 and 58 of the body member 13. It will be further apparent that the rod 54 can be positioned in any of the aligned pairs of holes 52 in the tabs 50 so as to move the diffuser ring 16 laterally of the rod 54, i. e., longitudinally of the rod 62, and that the tabs 70 of the diffuser ring 16 can slide along the rod 62. Similarly, the rod 62 can be positioned in any of the aligned pairs of holes 60 of the tab 58 so as to move the diffuser ring 16 laterally of the rod 62, i. e., longitudinally of the rod 54, and that the tabs 68 will slide along the rod 54. The diffuser ring 16 may thus be adjusted in two directions at right angles relative to the flange member 14, and with respect to either direction of adjustment may be secured in three adjusted positions.

The diffuser ring 18 is supported in the diffuser ring 16 in a manner entirely analogous to the way in which the diffuser ring 16 is supported in the body member 13. That is to say, the upstanding tab members 68 of the diffuser ring 16 have laterally spaced holes 72 therein for receiving a rod 74 extending between the tabs 68, the holes 72 being positioned below the holes receiving the rod 54. Similarly, the tabs 70 of the diffuser ring 16 have laterally spaced holes 76 for receiving a rod 78 extending between the tabs 70, the holes 76 in the tabs 70 being positioned below the holes 72 in the tabs 68 so that the rod 78 is positioned below the rod 74. The diffuser ring 18 is similar in form to the diffuser ring 16 but smaller in its lateral dimensions and it also has a central opening 80. The diffuser ring 18 also has upstanding tabs 82 positioned on opposite sides of the opening 80 with holes therein for receiving the rod 74 and upstanding tabs 84 at right angles to the tabs 82 and also positioned on opposite sides of the central opening 80, the tabs 84 having holes therein for receiving the rod 78. It will be apparent that the rod 74 may be positioned in any of the aligned pairs of holes 72 and that the tabs 84 will slide on the rod 78. Similarly, the rod 78 may be positioned in any of the aligned pairs of holes and the tabs 82 will slide on the rod 74. The diffuser ring 18 may thereby be moved to any one of a plurality of selected positions relative to the diffuser ring 16 with respect to two different directions at right angles to each other.

The cap plate 20 is supported in the central opening of the diffuser ring 18. The cap plate 20 has a pair of spring clip elements 86 secured to its upper surface, for example, by welding, the spring clip elements having upwardly turned ends bent to provide a notch for resiliently engaging the inner edge of the diffuser ring 18 on either side of the tabs 84. The ends of the spring clip elements 86 are provided with a return bent portion 88 acting as camming elements to enable the spring clip elements to enter the opening 80. It will be apparent that the cap plate 20 may be installed by merely pushing the cap plate upwardly with the ends of the spring clip elements 86 directed toward the opening 80 in the diffuser ring 18. The spring clip elements 86 snap into position and hold the cap plate in position.

In Figs. 4 and 5 the diffuser rings 16 and 18 are shown in their central position, which is the position of these elements also shown in Fig. 1. In the position of Figs. 4 and 5, the rod 54 is in the central hole of the holes 52 (Fig. 2), the rod 62 in the position of Figs. 4 and 5 is in the central hole of the holes 60 (Fig. 3), the rod 74 in the position of Figs. 4 and 5 is in the central hole of the holes 72 (Fig. 2), and the rod 78 in the position of Figs. 4 and 5 is in the central hole of the holes 76 (Fig. 3). When the diffuser rings 16 and 18 are in the central position shown in Figs. 4 and 5, it will be apparent that there is discharge of air outwardly and downwardly from the diffuser assembly substantially equally in all lateral directions since the passages between the diffuser elements and between these elements and the flange 14 and the

cap plate 20 provide substantially equal passage areas in all directions. Such an arrangement is ordinarily employed when the diffuser assembly is mounted in a ceiling surface in the central portion of the ceiling or in other locations where it is desired to direct the air substantially equally in all lateral directions.

By removing the knurled nuts 36 from the weld studs 32 it is apparent that the entire diffuser assembly 10 may be removed from the support member 24 and, upon being removed, any of the rods 54, 62, 74 and 78 may be individually removed by a sliding motion endwise of a rod and then reinserted in different pairs of aligned holes to move one or the other of the diffuser rings 16 and 18. For example, the rod 62 of Fig. 2 may be pulled endwise out of the holes 60 in the tabs 58 and also out of the holes in the tabs 70 of the diffuser ring 16. The tabs 68 of the diffuser ring 16 then may be moved along the rod 54 until the holes in the tabs 70 align with another pair of holes 60 in the tabs 58 of the body member 13. The rod 62 may then be reinserted. Thus, in Fig. 7 the rod 62 has been moved to the left from a central position in the tabs 58, and, similarly, the rod 78 has been moved to the left from a central position in the tabs 70 to move the diffuser rings 16 and 18 to the right in Fig. 6. That is to say, both the diffuser ring 16 and the diffuser ring 18 have been moved to their rightmost position in Fig. 7, i. e., their leftmost position in Fig. 6. This is also the adjustment of the diffuser rings in Figs. 2 and 3, i. e., the diffuser rings 16 and 18 are both in their rightmost position in Fig. 2 but are both centrally disposed so far as a direction parallel to the rods 62 and 78 is concerned. With this adjustment of the diffuser rings, the air is directed to the left in Fig. 2 and substantially equally to both right and left in Fig. 3. That is to say, the air is directed largely through an angle of one hundred eighty degrees so as to be directed along the wall in Fig. 6 and also in a direction away from the wall, but very little air is directed toward the wall. Another position of the diffuser rings 16 and 18 is shown in Figs. 8 and 9. Thus, in Fig. 9 both the diffuser rings 16 and 18 have been moved to their upper right position, i. e., they have moved to their upper left position in Fig. 8. Under these conditions the air is directed so as to be diffused substantially through an angle of ninety degrees.

The damper vanes 38 are employed primarily to restrict the flow of air through the diffuser assembly. In the position shown in Fig. 3, they present very little resistance to flow of air through the diffuser and, if aligned with the walls of the collar portion 26 of the support member so as to be vertical in Fig. 3, they present substantially no resistance to flow of air. It is apparent, however, that the vanes 38 may be turned so as to substantially obstruct flow of air through the air diffuser. Thus, the vanes can be turned to be substantially perpendicular to the axis of the collar member 26, in which case the passage for air through the diffuser structure is substantially closed. It is apparent that the vanes 38 may be employed to balance a ventilating system where a plurality of air ducts are employed, each having diffusers to control the air discharge therefrom. When the vanes 38 are employed in partly closed position, it is apparent that they may also function as air-directing elements. That is to say, the angle they make with the axis of the collar portion 26 may be varied, and for any given setting of the vanes such angle may be reversed so as to make a one-hundred-eighty-degree difference in the directional effect of the vanes. Also, the entire support member 24 may be removed and turned ninety degrees about the axis of the collar 26 so as to make a ninety-degree change in the directional effect of the vanes 38.

The exposed surfaces of the diffuser rings 16 and 18, as well as the cap plate 20 and the flange 14, may be given any desired decorative treatment, i. e., they may be painted any desired color or be of aluminum or stainless steel or be plated with chromium or other metal. It will be noted (see Fig. 8) that the members just mentioned completely cover the opening in the duct in any of their adjusted positions and present a pleasing appearance. While the diffuser rings 16 and 18, flange 14 and cap plate 20 have been shown as being square in horizontal outline, it is apparent that such elements may have any other suitable shape such as rectangular, round, or oval, and that a number of diffuser rings other than the two shown can be employed.

I claim:

1. An air diffuser comprising an annular body member adapted to be secured to the end of an air duct and having a central opening therein, a diffuser ring positioned in said opening having slanting side walls for distributing air discharge through said central opening outwardly and laterally of said central opening in a plurality of directions, and means for supporting said diffuser ring from said body member, said means providing for shifting said diffuser ring laterally of said opening for varying the distribution of said air in said directions and including two rods extending across said opening at right angles to one another, and rod supporting means on said body member engaging and supporting said rods at the opposite ends of each, said diffuser ring having a plurality of holes therein for receiving said rods whereby said ring may slide axially of said rods to various spaced positions along said rods, said rod supporting means including means for holding the ends of one of said rods at any one of a plurality of positions spaced laterally of said one rod.

2. An air diffuser comprising an annular body member adapted to be secured to the end of an air duct and having a central opening therein, a diffuser ring positioned in said opening having slanting side walls for distributing air discharged through said central opening outwardly and laterally of said central opening in a plurality of directions, and means for supporting said diffuser ring from said body member, said means providing for shifting said diffuser ring laterally of said opening for varying the distribution of said air in said directions and including two rods extending across said opening at right angles to one another, and rod supporting means on said body member engaging and supporting said rods at the opposite ends of each, said diffuser ring having a plurality of holes therein for receiving said rods whereby said ring may slide axially of said rods to various spaced positions along said rods, said rod supporting means including means for holding the ends of one of said rods at any one of a plurality of positions spaced laterally of said one rod and means for holding the ends of the other of said rods at any one of a plurality of positions spaced laterally of said other rod.

3. An air diffuser comprising an annular body member adapted to be secured to the end of an air duct and having a central opening therein, a first diffuser ring positioned in said opening having slanting side walls for distributing air discharged through said central opening outwardly and laterally of said central opening in a plurality of directions, and first supporting means for supporting said diffuser ring from said body member, said means providing for shifting said diffuser ring laterally of said opening for varying the distribution of said air in said directions and including two rods extending across said opening at right angles to one another, and rod supporting means on said body member engaging and supporting said rods at the opposite ends of each, said diffuser ring having a plurality of holes therein for receiving said rods whereby said ring may slide axially of said rods to various spaced positions along said rods, said rod supporting means including means for holding the ends of one of said rods at any one of a plurality of positions spaced laterally of said one rod, said diffuser ring having a central opening therein, a second diffuser ring positioned in the last-mentioned opening, and second supporting means for supporting said second diffuser ring, said second supporting means providing for shifting said second

diffuser ring laterally of said last-mentioned opening independently of said first supporting means.

4. An air diffuser comprising an annular body member adapted to be secured to the end of an air duct and having a central opening therein, a first diffuser ring positioned in said opening having slanting side walls for distributing air discharged through said central opening outwardly and laterally of said central opening in a plurality of directions, and first supporting means for supporting said diffuser ring from said body member, said means providing for shifting said diffuser ring laterally of said opening for varying the distribution of said air in said directions and including two rods extending across said opening at right angles to one another, and rod supporting means on said body member engaging and supporting said rods at the opposite ends of each, said diffuser ring having a plurality of holes therein for receiving said rods whereby said ring may slide axially of said rods to various spaced positions along said rods, said rod supporting means including means for holding the ends of one of said rods at any one of a plurality of positions spaced laterally of said one rod and means for holding the ends of the other of said rods at any one of a plurality of

positions spaced laterally of said other rod, said diffuser ring having a central opening therein, a second diffuser ring positioned in the last-mentioned opening, second supporting means for supporting said second diffuser ring from said first diffuser ring, said second supporting means including two rods extending across said last-mentioned opening at right angles to one another and second supporting means on said first diffuser ring for supporting the ends of each of the last-mentioned rods at any one of a plurality of positions spaced laterally of the corresponding one of said last-mentioned rods.

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