Dec. 20, 1966 S. SHUR 3,292,522

DIFFUSER

Filed Jan. 25, 1965 2 Sheets-Sheet 1

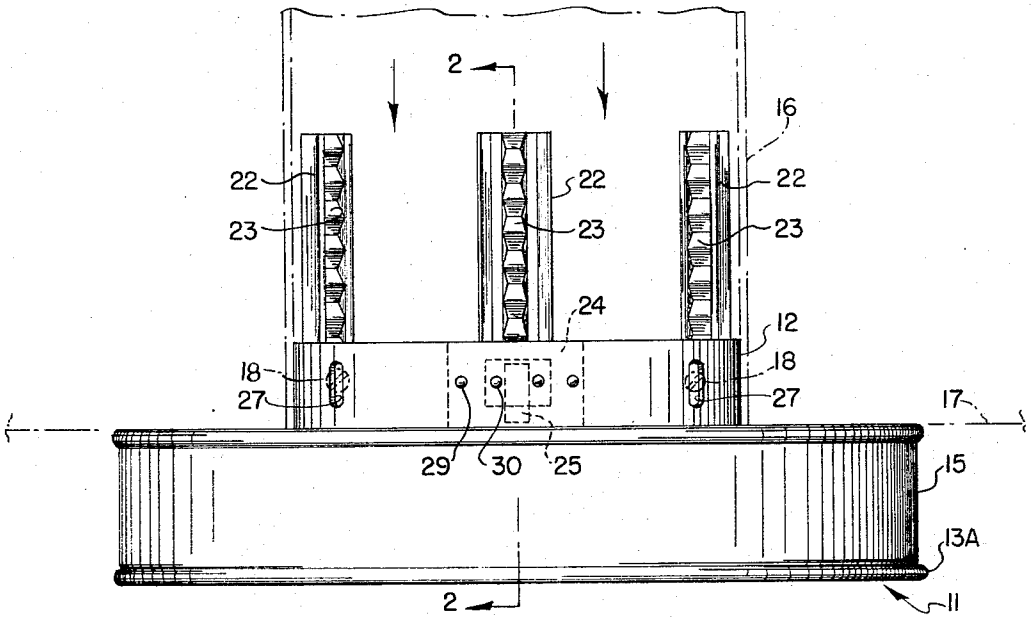


FIG. 1

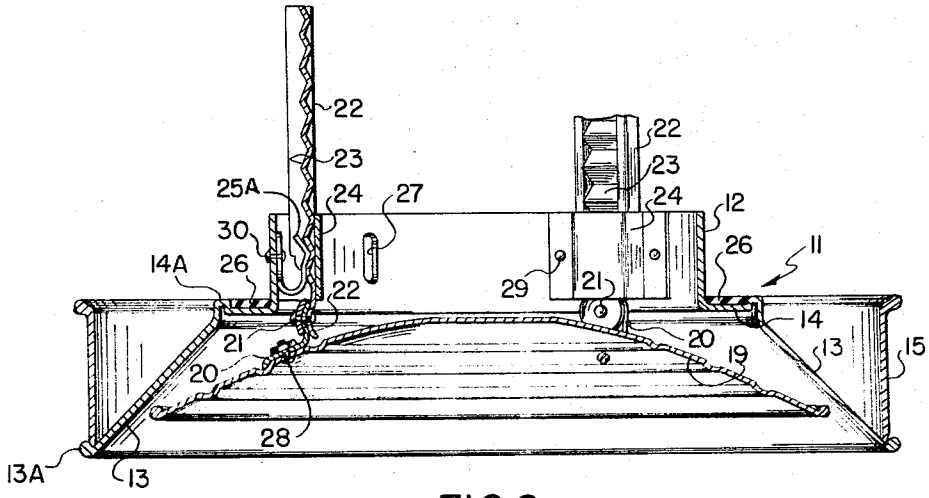


FIG. 2

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Dec. 20, 1966 S. SHUR 3,292,522

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Filed Jan. 25, 1965 2 Sheets-Sheet 2

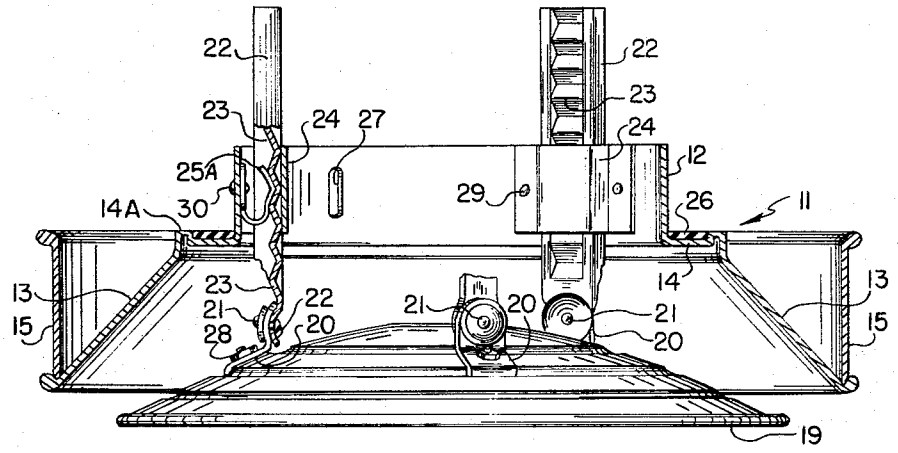


FIG. 3

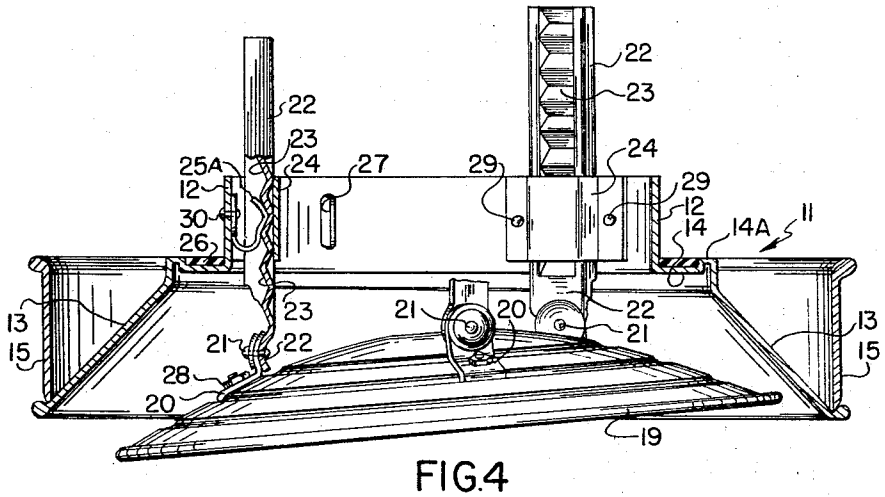


FIG. 4

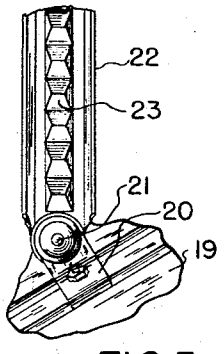


FIG. 5

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DIFFUSER

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10 Claims. (Cl. 98—40)

My invention relates to diffusers, such as diffusers for air outlets mounted to the terminal of an air duct.

In the usual use of such diffusers, the air duct is positioned near a ceiling or wall surface and has an open end to which an outlet member is secured. My improved diffuser is an outlet member secured to the open end of a duct and which is adapted to control both the flow of the air or other gas from the duct and also adapted to control the direction of the flow.

An object of my invention is to provide an improved outlet member constructed so that the amount of flow of air or gas therefrom may be conveniently and readily controlled.

Another object is the provision of an outlet member arranged whereby the direction of the flow from the outlet may be readily controlled by a simple manipulation of parts.

Another object is the provision of an improved outlet having a diffusing plate plate which may be conveniently and readily adjusted to desired position and there held in adjusted position without dislodgement or movement by the flow of air.

Another object is the provision of such an improved outlet, particularly utilizable for air-conditioning systems, readily mounted into position, and which is economically fabricated of metal or the like.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is an elevational view of the preferred form of my improved diffusing outlet member shown mounted in position, a duct to which it is attached being shown in broken lines and a ceiling surface also being shown in broken lines;

FIGURE 2 is a cross-sectional view of the device shown in FIGURE 1 looking in the direction of the arrows 2—2 of FIGURE 1, and showing the diffusing plate adjustably positioned to almost close the outlet and thus to closely restrict the flow therefrom;

FIGURE 3 is a cross-sectional view similar to that of FIGURE 2 but showing the diffusing plate adjusted downwardly to enlarge the effective area for outward flow of air and hence the volume of outward flow of air (in FIGURES 1, 2 and 3, the diffusing plate is shown in a general plane normal to the axis of the outlet member);

FIGURE 4 is a cross-sectional view somewhat like that shown in FIGURES 2 and 3 but showing the diffusing plate tilted or cocked at an angle to the axis of the outlet member whereby the effective area on one side of the outlet member is enlarged and on the other side is restricted, and further whereby the flow of air from the outlet member is generally directed from the side having the enlarged effective area, in this case the side on the left in FIGURE 4; and

FIGURE 5 is an enlarged view showing the connection between the diffusing plate and arm member which supports the diffusing plate and showing the diffusing plate tilted or cocked at an exaggerated angle for purposes of illustration.

The outlet member is denoted generally by the reference character **11**. It is round or annular in plan view, following the usual contour for such outlets. The outlet member **11** has a cylindrical portion **12** which is secured to the open end of a metal air duct **16** shown in broken lines in FIGURE 1. By means of three nut and bolt assemblies **18** extending through three equidistantly spaced vertical slots **27** in the cylindrical portion **12**, the cylindrical portion **12** is adjustably positioned relative to the duct **16** and then secured thereto by tightening the nut and bolt assemblies **18**.

Extending radially outward from the bottom of the cylindrical portion **12** is an annular shoulder portion **14** having a bead or raised edge **14A** extending therearound. Extending downwardly and radially outward from the bead **14A** is a frusto-conical or bell portion **13** terminating at the bottom edge with a ledge **13A**. A cylindrical-shaped annulus **15** is supported on the ledge **13A** so that the top edge of the annulus **15** abuts the ceiling surface **17** where the outlet member is located. A gasket **26** of rubber, cork or other suitable material, is disposed on the shoulder **14** within the bead **14A** so as to make a seal between the shoulder **14** and the ceiling **17**.

Positioned centrally of the outlet member **11** between the inclined walls of the bell portion **13** is a diffusing plate **19**. The plate **19** is concave or plate-shaped and has rigidizing annular beads formed in the process of stamping or forming the plate.

There are three angle-shaped metal brackets **20** secured to the plate **19** at equidistant locations therearound by nut and bolt assemblies **28**. These brackets **20** have an angular portion extending upwardly from the back of the plate **19**.

There are three arm members **22** of stamped metal and of general channel shape. Each of these arm members **22** is secured by a pivot connection **21** (of which there are three) to a respective bracket **20**. The pivot connection **21** is such as to permit tilting or cocking of the plate **19** on the axis of the pivot connection relative to the axis of the respective arm member **22**. The pivot connection **21** is relatively tight or snug so as to permit pivotal tilting only under manual force during adjustment but so as to frictionally resist ready tilting under the force of flow of air or gas against the plate **19**.

Stamped in the bottom of the channel forming each arm member **22** is a toothed or corrugated portion **23**. This portion **23** is such as to provide a plurality of peaks and valleys spaced longitudinally of each arm member and in effect this portion **23** provides a rack for engagement of a detent or the like between two selected peaks of the many peaks in a series.

There are three guide members **24** secured to the inner wall of the cylindrical portion **12** at equidistantly spaced locations therearound. Each guide member **24** is secured by rivets **29** to the cylindrical portion **12**. Each guide member **24** is in the form of a channel having a vertically arranged open space extending therethrough. The inner dimension of the open space is such as to slidably engage the back wall and side walls of each arm member **22**. Thus the guide members **24** permit vertical movement of the arm members through the openings in the guide members.

Positioned within each guide member **24** and carried by the cylindrical portion **12** by means of rivets **30** is a spring **25**. Each of the three springs **25** is a steel spring leaf bent downwardly and hence outwardly and upwardly to form a loop as better seen in the drawing. The bias of each spring **25** is radially inward so as to press against the corrugated portion **23** of the respective arm member **22**. Each spring **25** has an engaging portion **25A** bent into a corner or angle form so as to better extend into the valley between the two adjacent peaks of the corresponding corrugated portion **23** of an arm member **22**. Thus the bias of the springs **25** is such as to urge the engaging portions **25A** of the same radially inward in

resilient interengagement with the corrugated portion 23 of the respective arm member 22. The resiliency of the springs 25 is such, however, that by forcibly moving the arm member longitudinally through its respective guide member 25, the spring 25 yields to permit the engaging portion 25A thereof to ride up over a peak of the corrugated portion 23. Upon termination of the manual force, the spring 25 resumes its position so as to press the engaging portion 25A into a valley between the peaks and thus to resiliently resist movement of the arm member 22 longitudinally through its respective guide member 24.

In FIGURE 1, the plate 19 is horizontal, that is, normal to the axis of the outlet member and in a relatively raised position. The diffusing plate is symmetrically arranged whereby the effective area between the outer edge of the plate 19 and the inclined wall of the bell portion 13 is substantially uniform therearound.

In FIGURE 3 the plate 19 has been forcibly moved downwardly so as to overcome the resilient bias of the springs 25 and the effective area between the outer edge of the plate 19 and the inclined wall of the bell portion 13 is substantially enlarged so as to increase the permissive flow of air down through the outlet member. The flow of air is downwardly as illustrated by the two vertical arrows pointing downwardly in FIGURE 1.

In FIGURES 1, 2 and 3 the plate member is normal to the axis of the outlet member so that the effective area around the diffusing plate 19 is substantially equal.

In FIGURE 4 the diffusing plate has been tilted or cocked relative to the axis of the outlet member. This diminishes the effective area on the right side in FIGURE 4 and increases the effective area on the left side in FIGURE 4. This disposition of the diffusing plate tends to direct the mass or greater portion of the air flow in a direction downwardly and to the left in FIGURE 4. As the plate 19 and bell portion 13 are round, the difference between the maximum effective area on one side and the minimum effective area on the other side is gradually changed along the edges intermediate the location of maximum effective area and minimum effective area. It is seen in FIGURE 4 that the tilting of the diffusing plate 19 requires that the diffusing plate be tilted or cocked relative to the axis of the respective arm member 22. This is provided by yieldably frictional engagement of the parts at the pivot connection 21 so as to allow the cocking or tilting of the plate member 19 relative to the axis of each arm member 22 in response to manual force manipulating the plate member 19. Of course, other angles and dispositions of the plate member 19 may be readily made and manipulated.

In FIGURE 5 there is shown one of the arm members 22 and its connection with one of the brackets 20 through the pivot connection 21. As seen in the drawings, the pivot connection is a rivet interconnecting nested cup-shaped portions and a cup-shaped washer so as to provide yieldable resistance and at the same time pivotal movement as required. In FIGURE 5, the tilting or cocking has been exaggerated at a greater angle than would normally be used, this being done for purposes of illustration.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A diffusing structure for an air outlet of a discharge duct, comprising the combination of, an annular member having a cylindrical portion adapted to register with and to be secured to said discharge duct for passage of air therethrough, said annular member having a frusto-conical portion flaring outwardly from said cylindrical portion for guiding outward and forward flow of air passing through said cylindrical portion, a plate member located generally centrally of said frusto-conical portion for diffusing air passing forwardly through said frusto-conical portion and around the edge of the plate member, adjustable mounting means for supporting said plate member in selective angles to the axis of the annular member and at selective distances from said cylindrical portion, said mounting means including a plurality of arm members extending rearwardly of the plate member and being substantially equidistantly spaced around the same, guide members carried by the said cylindrical portion and slidably receiving said arm members, respectively, to guide the arm members along paths substantially parallel to the axis of the annular member, said arm members each having an elongated detent-engaging portion extending therealong, and spring-biased detent members carried by said cylindrical portion in juxtaposition to said arm members, respectively, and positioned to resiliently press against a said detent-engaging portion to resiliently resist movement of the arm members along said paths relative to said guide members, pivot connecting means connecting each of said arm members and said plate member to permit limited angular tilting of the plate member relative to the axes of said arm members, said plate member being angularly tiltable relative to the axis of said annular member by changing, in opposition to the resistance of said detent members, the positions of the arm members along said paths relative to the annular member to extend at different distances therefrom and by changing the angle of the plate member to the axes of the respective arm members to accommodate the said different distances from the said cylindrical portion, the angular tilting of the plate member varying the spacing of the edges thereof from the frusto-conical portion of the annular member.

2. A structure as claimed in claim 1 and in which said elongated detent-engaging portions are provided by a series of corrugations formed in the arm members having parallel peaks spaced lengthwise of the respective arm member, and in which said spring-biased detent members are leaf springs carried by the cylindrical portion and in engagement with an arm member within a respective guide member, the springs being biased to urge the respective arm members against the guide members and to maintain resilient engagement with the arm members at said corrugations.

3. In an air diffuser for an annular outlet member having a cylindrical portion registerable with the end of an air duct and connectable thereto, a frusto-conical portion extending forwardly thereof, and a round plate member located in the frusto-conical portion intermediate the sloping walls thereof for governing the flow of air outwardly through the frusto-conical portion around the edge of said plate member, improved mounting means for said plate member comprising three equidistantly spaced angle brackets secured to the plate member and positioned on the rear side thereof, three arm members extending rearwardly of the plate member and pivotally connected, respectively, to said angle brackets for permitting angular tilting of the plate member relative to the axes of the respective arm members, each of said arm members having an elongated toothed portion extending longitudinally thereof along a side thereof, three guide members each carried by the outlet member adjacent a said arm member, each having an opening extending therethrough for accommodating an arm member and permitting longitudinal movement therethrough, said guide members being positioned to guide the arm members in movements along paths parallel to the axis of the outlet member, and three spring members carried by the outlet member, each spring

member being positioned adjacent a said guide member and biased to resiliently press against the toothed portion of a said arm member to resiliently urge the arm member in engagement with the guide member and to resist longitudinal movement of the arm member along its respective path, the arrangement permitting variation in the spacing of the plate member along the axis of the outlet member from the inclined walls of the frusto-conical portion and the angular tilting of the plate member relative to said axis to vary the spacing of the peripheral edge of the plate member from said inclined walls on different sides of said axis.

4. Improved mounting means as claimed in claim 3 and in which said arm members are stamped metal and the elongated toothed portion of each is comprised of corrugations pressed in the arm member and in which the peaks of the corrugation are spaced lengthwise of the arm member, and in which the said spring members are leaf springs secured to said cylindrical portion and formed into loops biased to expand against said toothed portion.

5. Improved mounting means for a diffusing plate in an annular outlet member having a cylindrical portion registrable with an air duct and a bell portion having inclined walls extending forwardly and outwardly, the position of the diffusing plate relative to said inclined walls of the bell portion governing the flow of air out through said bell portion, said mounting means comprising a plurality of elongated arm members substantially equidistantly spaced apart and connected to the plate member for limited angular movement of the plate member relative to the respective arm members, guide means carried by the outlet member and slidably engaging each said arm member for permitting the arm members to move along parallel paths and to extend varying amounts from the cylindrical portion, and resiliently-biased engaging means carried by the outlet member and biased against each said arm member to resist resiliently movement of each said arm member along its respective path, the varying of the relative extension of each said arm member along its respective path from said cylindrical portion and the varying of the angular tilt of the plate member relative to the respective arm members permitting the change in the position of the plate relative to the inclined walls of the said bell portion.

6. Mounting means as claimed in claim 5 and in which there are three arm members, individual guide means associated with each arm member, and individual resiliently biased engaging means associated with each arm member.

7. Mounting means as claimed in claim 6 and in which each arm member is provided with a toothed portion extending therealong in engagement with said resiliently-biased engaging means for yieldably locking the arm member in fixed position along its said path, and in which said resiliently-biased engaging means associated with the arm member is a looped leaf spring biased toward expansion to press a portion of the leaf spring against said toothed portion.

8. An adjustable air diffusing device for an outlet member communicating with an air duct, said outlet member having outwardly and forwardly sloping walls between which the air from the air duct forwardly flows, comprising the combination of, a plate disposed between said sloping walls to baffle the air flow and cause the air to flow between the peripheral edges of the plate and said sloping walls, first means for supporting said plate between said sloping walls, second means for adjustably varying the position of the plate carried by the support means along the axis of the outlet member for changing the spacing of the plate from said sloping walls in accordance with the position of the plate along said axis, third means for adjustably varying the angle of the plate relative to said axis for varying the relative spacing of the peripheral edges of the plate on opposite sides of said axis from said sloping walls in accordance with said angle, and fourth means for resiliently locking the plate in adjusted position along said axis and at an adjusted angle to said axis, said fourth means resiliently yielding to manual force moving the plate along said axis and simultaneously to manual force moving the plate to varying angles to said axis.

9. An adjustable air diffusing device as claimed in claim 8 and in which there are three assemblies of means equidistantly spaced around the outlet member and plate, said assemblies being substantially uniformly spaced from said axis, and each assembly including said first, second, third and fourth means.

10. An adjustable air diffusing device as claimed in claim 8 and in which said first means includes three arm members connected at spaced locations to the plate, said second means includes guide members guiding longitudinal movements of the respective arm members toward and away from the outlet member, and said third means includes a pivot connection between each arm member to the plate to permit angular tilting of the plate relative to the axis of the respective arm member.

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