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ADJUSTABLE AIR DISTRIBUTION GRILLE

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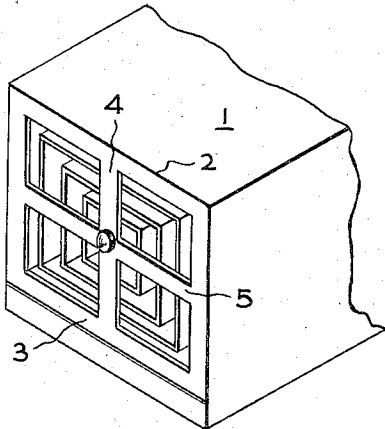


FIG. 1

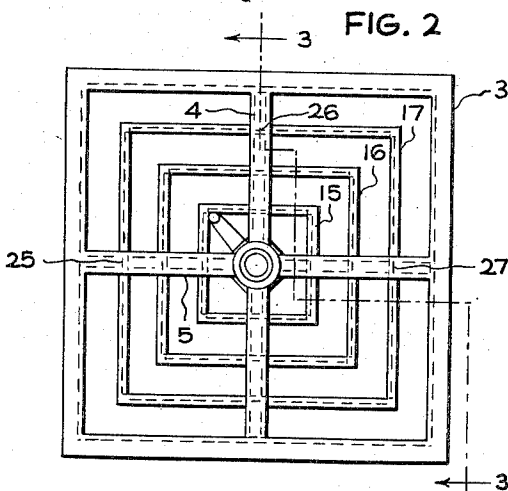


FIG. 2

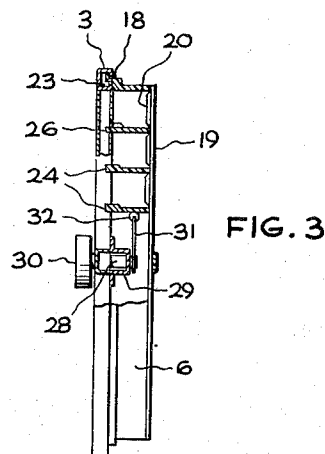


FIG. 3

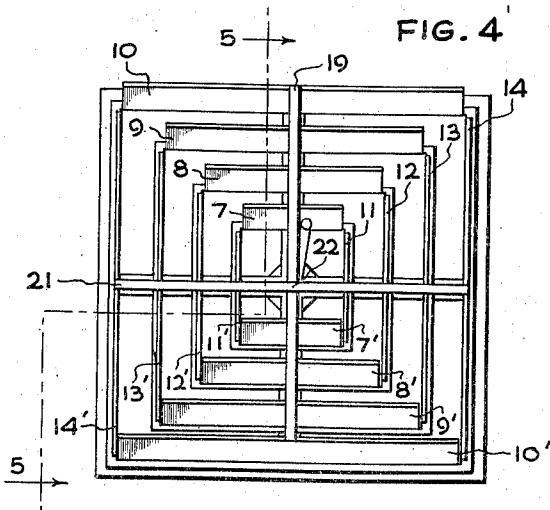


FIG. 4

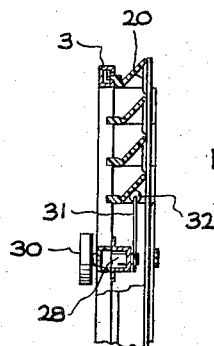


FIG. 5

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1

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ADJUSTABLE AIR DISTRIBUTION GRILLE

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6 Claims. (Cl. 98—40)

This invention relates to a grille for controlling the direction and pattern of air discharged into a room or space and more particularly to a grille having sets of vanes selectively adjustable to vary the angle of discharge of air from ventilating devices.

In air distribution devices such as an air conditioner from which ventilating air is discharged, sets of spaced-apart parallel louvers or vanes have been employed, each set operable in unison to vary over a wide frontal range the angle at which the air is discharged into a room or space. In order to have each set operate independently without encountering interference from the adjacent sets, it has been necessary to remove sections from each vane. This arrangement at best provides only limited movement for each set of vanes. In addition the need for many vanes in order to obtain the most effective air distribution has required extensive supporting means for each vane as well as an additional structure for operating each set of vanes in unison resulting in a cumbersome structure subject to rattling and misalignment when in use.

Accordingly, it is an object of my invention to provide a new and improved, adjustable, air distribution grille for ventilating or air conditioning apparatus.

It is another object of my invention to provide a novel, adjustable, air distribution grille having a plurality of sets of vanes which is molded from suitable resilient material to form a one-piece unitary structure.

It is a further object of my invention to provide an air distribution grille containing dual sets of vanes which can be rapidly and collectively adjusted by a single control means to give a uniform discharge of air over a wide angular range.

It is still another object of my invention to provide an adjustable, one-piece, air distribution grille which can be molded from inexpensive material, which is not subject to rattling and misalignment when in use, and which can be readily and quickly assembled and disassembled within an opening to give a pleasing appearance.

In carrying out my invention, I provide an air distribution grille for a ventilating or air conditioning device that is molded in one-piece out of a resilient material such as rubber or polyethylene plastic. The grille contains a plurality of concentrically arranged, substantially square, vane sections which are arranged in radially increasing sizes with their adjacent sides in spaced-apart parallel relationship. Integrally molded means are provided on the grille whereby the angle of the parallel vanes in each direction may be collectively varied by means of a selective control device when the grille is mounted in cooperative relationship with a supporting frame.

The features of my invention believed to be novel are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing in which:

2

Fig. 1 is a partial perspective view of an air conditioning apparatus including my invention;

Fig. 2 is a vertical view of my invention with its supporting frame;

Fig. 3 is a view partially in section of my invention taken substantially along line 3—3 of Fig. 2;

Fig. 4 is a vertical rear view of my invention shown in Fig. 2; and

Fig. 5 is a view partially in section of my invention taken substantially along line 5—5 of Fig. 4.

Referring now to Fig. 1, I have shown therein a portion of an air conditioning unit 1 which is provided with an air discharge opening 2 at one end of the unit. Arranged within the opening 2 is a frame member 3 which is substantially square in shape and is provided with a vertical cross member 4 and a horizontal cross member 5. The frame 3 is preferably formed from relatively thin sheet metal bent over as shown in Fig. 3 to provide a hollow interior. The cross members 4, 5 may be similarly formed and are preferably integral with the frame. Fabricating the frame member in this manner not only tends to reduce the cost of manufacture but also reduces its weight.

I provide, as shown best in Fig. 3, a one-piece molded grille 6 located directly behind the frame 3 for setting up the desired air flow from the unit 1 which may be molded from some resilient material preferably polyethylene plastic or rubber. The grille 6 comprises a plurality of horizontal vanes and vertical vanes arranged in spaced parallel relationship. Referring now to Fig. 2 and Fig. 4, at the central portion of the grille 6, I provide a pair of horizontally arranged parallel vanes 7, 7', and a pair of vertically arranged parallel vanes 11, 11', all of substantially the same length united during the molding of the grille by a continuous integral portion or bead 15 of increased thickness extending along one edge of each of the four vanes forming a substantially square vane section. In a similar manner a series of vane sections comprising horizontal vanes 8 through 10, 8' through 10' and vertical vanes 12 through 14, 12' through 14' are united during the molding of the grille by beads 16 through 18 respectively forming in radially increasing sizes a plurality of concentric vane sections. All of the horizontal and all of the vertical vanes are arranged in spaced parallel relationship. It will be noted here also, with reference to Fig. 2, that the plane of every vane in the grille in the position shown is parallel to the center line of the air conditioning unit opening 2. Also all of the vane sections have a common center which lies substantially along the center line of the air conditioning unit opening 2. It will be noted here that although I have shown the vane sections preferably in a substantially square shape, the vane sections in my grille lend themselves readily to any generally rectangular form. For instance each pair of horizontal vanes may be constructed of greater length than the vertical vanes in each assembly.

As shown in Fig. 4, it will be seen that the integral beads 15 through 18 which unite the vane sections do not restrain the vanes from movement but instead provide a pivot point around which each of the horizontal and vertical vanes can pivot. Since only the forward edge of the vanes is formed with the bead, both ends of each vane are free and unrestrained. Thus, all of the horizontal vanes are free to pivot in an up or down movement and the vertical vanes are free to pivot to the right or left with respect to the air conditioner discharge opening 2.

For controlling the movement of the vanes, I provide first a vertical linking member 19 molded integral with the edges of all of the horizontal vanes opposite from the vane edge containing the molded bead. This linking

3

member 19 is so arranged that when the horizontal vanes are in the unflexed position of Fig. 3, the vanes are perpendicular to the member and in spaced parallel relationship with each other. Therefore a pivotable movement of any one of the horizontal vanes would cause a similar movement in the same direction in all of the other horizontal vanes. This action is shown clearly in Fig. 5. The linking member 19 may be strengthened and rendered less flexible by providing ribs 20 which extend on the link as shown in Fig. 3 between each set of horizontal vanes.

To arrange the vertical vanes for collective movement in a manner similar to the horizontal vanes, I have also provided a horizontally disposed linking member 21 extending across the grille rear as shown in Fig. 4 and molded integral with the edges of the vertical vanes opposite from that of the molded beads. The linking member 21 is also arranged so that the vertical vanes form a 90° angle with the link when the vanes are in the unflexed position. This linking member 21 may also be provided with strengthening ribs (not shown) similar to the ribs 20 of the link 19. Thus the vertically arranged vanes are maintained in spaced parallel relationship by the link 21 with the plane of each vertical vane parallel to the center line of the air conditioner discharge opening 2. Movement of any of the vertical vanes would thus result in a similar movement of the remaining vertical vanes with the vanes being maintained at all times in spaced parallel relationship by the linking member 21 similar to the action of the horizontal vanes.

It will be noted here that when the grille is molded in one piece together with the linking members 19, 21, the linking members will necessarily unite in a solid joint at the point where the two members cross at the center of the grille. Naturally, if the horizontal and vertical linking members are to be moved independently, some provision must be made so that the two linking members may slide freely with respect to each other. Thus, I preferably separate the two linking members at 22 by cutting the joint formed therein leaving each linking member intact and free to slide over each other without interference.

The molded one-piece grille 6 is arranged to be supported within the discharge opening 2 of an air conditioning unit 1 as shown in Fig. 1 on the frame 3 having a pair of cross members 4, 5 preferably deep drawn from a single sheet of metal. As shown in Fig. 3, the sides of the frame 3 are bent over to provide a recess 23, which extends rearwardly around all sides of the frame. The crossed strips 4 and 5 may likewise be formed to provide a hollow interior. Spaced along the vertical strip 4 are a plurality of recesses or notches 24 as shown in Fig. 3. These notches are arranged throughout the length of the strip and are spaced to accommodate the forward edge of the horizontal vanes 7 through 9 and 7' through 9'. Similarly, I also provide notches 25 extending throughout the length of the horizontal strip 5 and spaced so as to accommodate the forward edge portion of the vertical vanes 11 through 13 and 11' through 13'.

Referring now to Fig. 3, at the location along the edge of the horizontal vane 9 where it is to be inserted within the corresponding notch 24 in the vertical strip 4, the bead 17 is eliminated at 26 and only the general vane thickness is presented to the notch at this point. While I have shown this feature only on vane 9 in Fig. 3, this portion of reduced thickness 26 is provided on every horizontal vane and on every vertical vane at 27 in my molded grille. These portions of reduced thickness can be seen by reference to Fig. 2 where the junction of each vane and its associated support strip is shown along with the portions of reduced thickness 26, 27. My purpose in providing these portions of reduced thickness is primarily to facilitate the molding of a one-piece grille. I do not feel, for the purposes of my invention, that it is necessary to include a detailed discussion of the molding techniques involved in forming the one-piece grille as they are not

4

part of my invention. I believe that it will be sufficient to state that in order to form the linking members 19, 21 integral with the vanes it is necessary that the portions of reduced thickness 26, 27 be provided on each vane directly above or opposite the linking members in order to provide for a mold design which will form the integral linking members and also permit separation of the mold members and the withdrawal of the vanes from the mold.

Although I have preferably shown connecting integral beads for the vane sections, it may be desired to eliminate this integral bead and the resulting more complicated mold design. In this event a metal bead can be used, clamped to the vanes, in place of the integral bead in assembling each vane section and the narrow portions 26, 27 can be dispensed with.

It will therefore be seen that to assemble the grille 6 within the supporting frame 3, the appropriately formed integral bead 18 extending around the outer vanes of the grill is snapped into the recess 23 formed in the sides of the frame 3. At the same time the bead portions 15 through 17 are inserted within the notches 24, 25 in the horizontal and vertical frame supporting strips 4, 5 at the locations 26, 27 respectively on the vanes where the beads are reduced in thickness. Preferably the vanes are only press fitted within the supporting strips 4, 5 but, if it is desired, any type of holding means on the support strips may be provided to securely retain the vanes. For instance a tab may be cut in the strip wall and folded against the vane.

Thus, the grille is attached to the frame 3 and the frame is inserted within the opening 2 of the air conditioning unit of Fig. 1. All of the horizontal and vertical vanes at this time are parallel to the center line of the discharge opening 2. In summation, I mold in one piece all of the horizontal and vertical vanes, their associated beads, and the linking members with their strengthening ribs to form my grille and insert the completed grille into a supporting frame. Then the frame and grille are inserted into the discharge opening of an air conditioning unit.

For controlling the angular position of the horizontal and vertical vanes, I provide a control shaft 28 extending through an opening (not shown) at the center of the frame 3 where the support strips 4, 5 intersect. The shaft 28 is suitably journaled for rotatable movement within a housing 29 shown in section in Fig. 3. The shaft may be rotated by means of a manual knob 30 arranged at the shaft end which extends out from the forward face of the frame 3. At the other end of the shaft 28 extending within the grille 6, I provide an arm 31 securely fixed thereto and extending at substantially a 90° angle from the shaft within the interior of the vane section formed from vanes 7, 7' and 11, 11'. This arm 31 preferably terminates in a rounded portion 32.

To operate my air distribution grille 6, if the manual knob 30 is rotated to the position where the arm 31 lies within a corner of the center vane section as shown in Fig. 2, all of the horizontal and vertical vanes in the grille are parallel to the center line of the discharge opening 2. If the knob 30 is rotated in a clockwise direction from this position, it will be seen that the arm end portion 32 will gradually rise in an upward direction to flex the vane 7 upwardly around the pivot point established where the vane edge 26 is held by the notch 24 in the support strip 4. The bead 15, due to its thickness, is maintained rigid permitting the vane to pivot as shown in Fig. 5. Hence, as all of the horizontal vanes 7 through 10 and 7' through 10' are united at their rear edge by the integral linking member 19 it will be seen that all of the horizontal vanes will likewise pivot upwardly pivoting around the points at which the vanes are secured to the frame 3 and the support strip 4. Therefore, as the arm 31 continues to rotate, the angle of the horizontal vanes becomes greater with respect to the center line of the grille until the arm reaches a vertical position and the horizontal vanes occupy their maximum angle. This action is clear-

5

ly shown in Figs. 4 and 5 where it also will be seen that even though the horizontal vanes are pivoted the vertical vanes remain stationary in their original position in a plane parallel to the center axis of the frame.

To move the vertical vanes, the manual knob 30 is rotated in a counter-clockwise direction from that of the neutral position of Fig. 2, and the portion 32 of the arm 31 bears against the vane 11. Thus, not only does the vertical vane 11 pivot around the point at which it is secured to the support strip 5, but, due to the linking member 21, all of the remaining vertical vanes also pivot in a similar direction around their supporting points being maintained in spaced parallel relationship by the linking member. Thus, the vertical vanes are pivoted to the left with respect to the view of Fig. 2 causing the air within the discharge passage 2 to be directed to the right. It will be noted here that, since I have provided that the linking members 19 and 21 are to be detached at the joint 22, they will slide independently over each other.

In a similar manner, the vane 11' may be pivoted to the right with respect to the view of Fig. 2 by rotating the arm 31 clockwise allowing the projection 32 to bear against this vane whereupon all of the vertical vanes will pivot similarly to the right. Thus, the air would be directed from the discharge passage to the left. Continuing to rotate the arm 31 in a clockwise direction, it would then be brought to bear against the horizontal vane 7' pivoting it downwardly and the air would be directed in an upward direction. With this arrangement therefore, the horizontal vanes may be moved upwardly or downwardly as desired and also the vertical vanes may be moved to the right or to the left depending upon the position of the operating arm 31.

In view of the foregoing, it will be seen that my invention provides a mechanically efficient, yet structurally simple, adjustable air distribution grille, which may be molded in one piece from resilient material. The molding techniques required in the formation of my grille are simple and require no unusual equipment as my grille readily adapts itself to the conventional type of molding equipment. This feature not only results in a savings in cost but reduces the need for maintenance and adjustments usually required in grilles containing many separately formed intersecting vanes as well as the rattling common to a complex assembly. At the same time the grille presents a pleasing frontal appearance as a whole. The vanes or air-deflecting louvers of my grille may be adjusted over a wide range to cause the passage of air through a duct opening over a wide range in a number of different directions. Another of the outstanding features of my invention is that I provide a single operating mechanism which enables me to quickly and selectively vary the angle of the vanes in my grille.

In accordance with the patent statutes, I have described what at present is considered to be the preferred embodiment of my invention; however, it should be obvious to those skilled in the art that various modifications may be made therein without departing from my invention, and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An adjustable air distributor comprising a frame member defining an air passage, a one-piece, molded resilient grille containing a plurality of concentrically arranged, rectangular vane sections arranged in radially increasing sizes and having adjacent sides in spaced parallel relationship, each of said sections having a pair of spaced horizontal vanes and a pair of spaced vertical vanes, an integral marginal bead on each of said sections connecting the forward edge of said pairs of horizontal and vertical vanes while the rearward portion of each of said vanes remains free for individual pivotal movement, means molded integral with all of said horizontal vanes

6

to maintain said horizontal vanes in spaced parallel relationship, means molded integral with all of said vertical vanes to maintain said vertical vanes in spaced parallel relationship, said means holding said horizontal vanes in adjacent parallel relationship being free to move independently of said means holding said vertical vanes in spaced parallel relationship, means on said frame to support said grille within said air passage defined by said frame, and adjustable means to selectively vary the angular position of either said horizontal or vertical vanes to vary the angle at which the air is discharged through said passage.

2. An adjustable air distributor comprising a substantially square frame member defining an air passage, a spacer strip member on said frame across said air passage, a one-piece, molded, resilient grille containing a plurality of concentrically arranged, substantially square vane sections arranged in radially increasing sizes and having adjacent sides in spaced parallel relationship, each of said sections having a pair of spaced horizontal vanes and a pair of spaced vertical vanes, an integral marginal bead on each of said sections connecting the forward edge of said pairs of horizontal and vertical vanes while the rearward portion of each of said vanes remains free for individual pivotal movement, a vertical linking member molded integral with all of said horizontal vanes to maintain said horizontal vanes in spaced parallel relationship, a horizontal linking member molded integral with all of said vertical vanes to maintain said vanes in spaced parallel relationship, said vertical linking member being free to move independently of said horizontal linking member, means on said frame member to support the outer vane section of said grille around said air passage defined by said frame member, means on said spacer strip to accommodate the forward edge portion of all of said individual vanes crossing said strip, and adjustable means to selectively vary the angular position of either said horizontal or vertical vanes to vary the angle at which the air is discharged through said passage.

3. An adjustable air distributor comprising a substantially square frame member defining an air passage, a horizontally and a vertically arranged spacer strips on said frame across said air passage, a one-piece, molded, resilient grille containing a plurality of concentrically arranged, substantially square vane sections arranged in radially increasing sizes and having adjacent sides in spaced parallel relationship, each of said sections having a pair of spaced horizontal vanes and a pair of spaced vertical vanes, an integral marginal bead on each of said sections connecting the forward edge of said pairs of horizontal and vertical vanes while the rearward portion of each of said vanes remains free for individual pivotal movement, a vertical linking member molded integral with all of said horizontal vanes to maintain said horizontal vanes in spaced parallel relationship, a horizontal linking member molded integral with all of said vertical vanes to maintain said vanes in spaced parallel relationship, said vertical linking member being free to move independently of said horizontal linking member, means on said frame to support the outer vane section of said grille around said air passage defined by said frame members, means on said horizontal and vertical spacer strips to accommodate the forward edge portion of all of said individual vanes crossing each of said strips and adjustable means to selectively vary the angular position of either said horizontal or vertical vanes to vary the angle at which the air is discharged through said opening.

4. An adjustable air distributor comprising a frame member defining an air passage, a horizontally and a vertically arranged spacer strips on said frame across said air passage, a one-piece, molded, resilient grille containing a plurality of concentrically arranged, substantially square vane sections arranged in radially increasing sizes and having adjacent sides in spaced parallel relationship, each of said sections having a pair of spaced

7

horizontal vanes and a pair of spaced vertical vanes, an integral marginal bead on each of said sections connecting the forward edge of said pairs of horizontal and vertical vanes while the rearward portion of each of said vanes remains free for individual pivotal movement, a linking member molded integral with all of said horizontal vanes to maintain said horizontal vanes in spaced parallel relationship, a linking member molded integral with all of said vertical vanes to maintain said vanes in spaced parallel relationship, said linking member holding said horizontal vanes in spaced relationship being free to move independently of said linking member holding said vertical vanes in spaced relationship, means on said frame to support the outer vane section of said grille around said air passage defined by said frame, means on said horizontal and vertical spacer strips to accommodate the forward edge portion of all said individual vanes crossing each of said strips, means movable into engagement with either of one pair of horizontal vanes thereby to move all of said horizontal vanes of said grille to adjust the horizontal angle of discharged air, said means also movable into engagement with either of one pair of vertical vanes thereby to move all of said vertical vanes of said grille to adjust the vertical angle of discharged air, said movable means also movable out of engagement with any of said vanes.

5. An adjustable air distributor comprising a substantially square frame member defining an air passage, a horizontally and a vertically arranged spacer strips on said frame across said air passage, a one-piece, molded, resilient grille containing a plurality of concentrically arranged, substantially square vane sections arranged in radially increasing sizes and having adjacent sides in spaced parallel relationship, each of said sections having a pair of spaced horizontal vanes and a pair of spaced vertical vanes, an integral marginal bead on each of said sections connecting the forward edge of said pairs of horizontal and vertical vanes while the rearward portion of each of said vanes remains free for individual pivotal movement, a vertical linking member molded integral with all of said horizontal vanes to maintain said horizontal vanes in spaced parallel relationship, a horizontal linking member molded integral with all of said vertical vanes to maintain said vanes in spaced parallel relationship, said vertical linking member being free to move independently of said horizontal linking member, means on said frame to support the outer vane section of said grille around said air passage defined by said frame, means on said horizontal and vertical spacer strips to accommodate

8

the forward edge portion of all of said individual vanes crossing each of said strips, a centrally disposed, rotatable shaft supported on said spacer strips, an arm on said shaft, said arm positioned within the center vane section and arranged to engage selectively each of said vanes in said center section when said shaft is rotated to vary the angle of either said horizontal or vertical vanes whereby the angle at which the air is discharged through said passage is varied.

6. An adjustable air distributor comprising a substantially square frame member defining an air passage, a horizontally and a vertically arranged spacer strips on said frame across said air passage, a one-piece, molded, resilient grille containing a plurality of concentrically arranged, substantially square vane sections arranged in radially increasing sizes and having adjacent sides in spaced parallel relationship, each of said sections having a pair of spaced horizontal vanes and a pair of spaced vertical vanes, an integral marginal bead on each of said sections connecting the forward edge of said pairs of horizontal and vertical vanes while the rearward portion of each of said vanes remains free for individual pivotal movement, a vertical linking member molded integral with all of said horizontal vanes to maintain said horizontal vanes in spaced parallel relationship, a horizontal linking member molded integral with all of said vertical vanes to maintain said vanes in spaced parallel relationship, said vertical linking member being free to move independently of said horizontal linking member, a recess extending along an edge of said frame member to receive the marginal bead of the outer vane section, a plurality of spaced slots arranged on each of said spacer strips to accommodate the forward edge portion of all of said individual vanes crossing each of said strips, a centrally disposed, rotatable shaft supported on said spacer strips, an arm on said shaft, said arm positioned within the center vane section and arranged to engage selectively each of said vanes in said center section when said shaft is rotated to vary the angle of either said horizontal or vertical vanes whereby the angle at which the air is discharged through said passage is varied.

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