March 31, 1964 W. W. KENNEDY 3,126,811

AIR DISTRIBUTION OUTLET

Filed March 6, 1961 3 Sheets-Sheet 1

Fig. 1

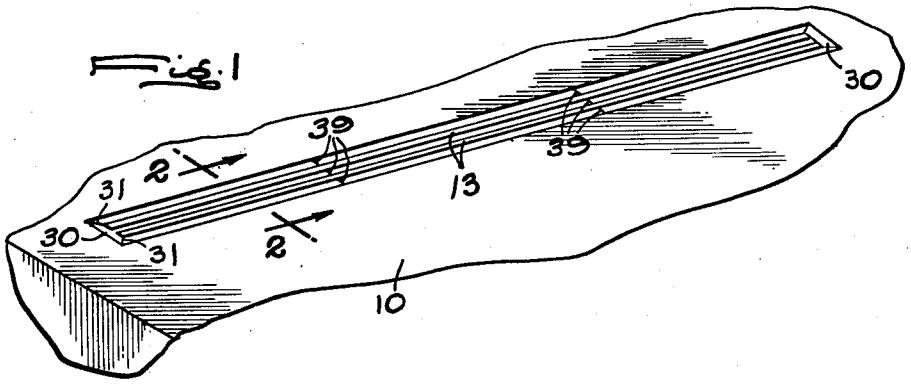


Fig. 2

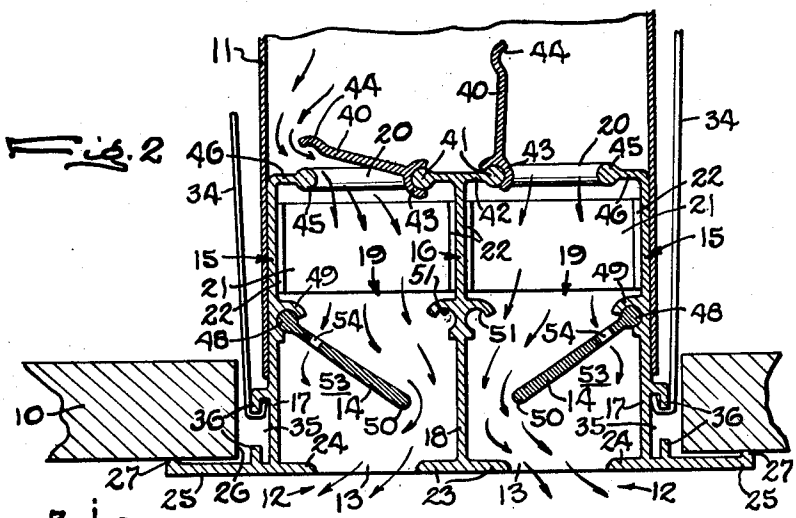
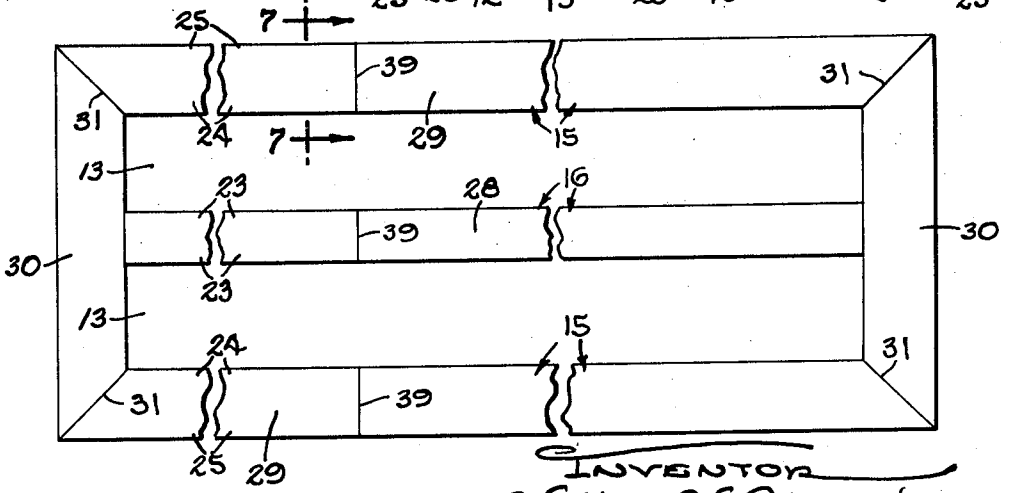


Fig. 3



INVENTOR
Walter W. Kennedy
By Wolfe, Hubbard, Voit & Osann
ATTORNEYS

March 31, 1964 W. W. KENNEDY 3,126,811

AIR DISTRIBUTION OUTLET

Filed March 6, 1961 3 Sheets-Sheet 2

Fig. 4

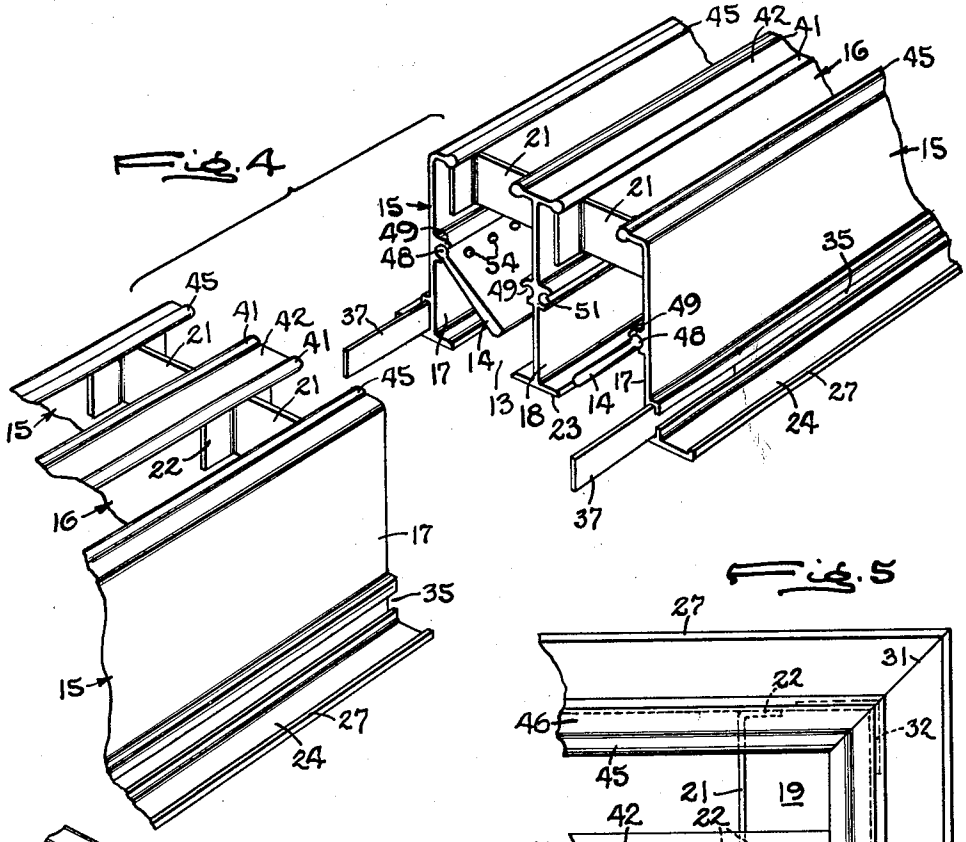


Fig. 5

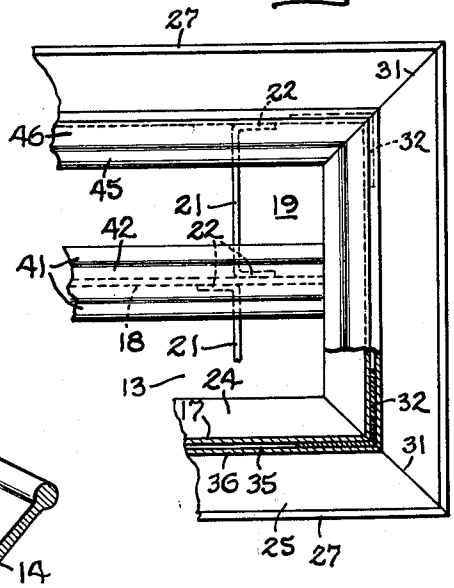


Fig. 6

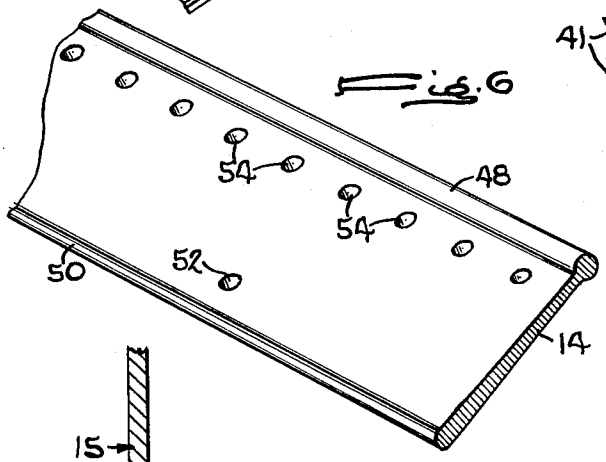
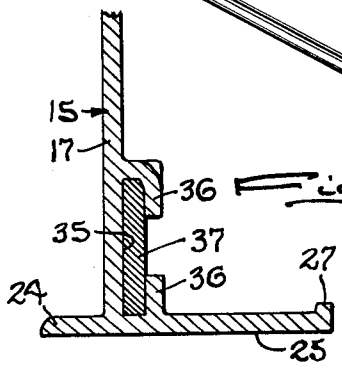


Fig. 7



INVENTOR
Walter W. Kennedy
By Wolfe, Hubbard, Voit & Osann
ATTORNEY

March 31, 1964 W. W. KENNEDY 3,126,811

AIR DISTRIBUTION OUTLET

Filed March 6, 1961 3 Sheets-Sheet 3

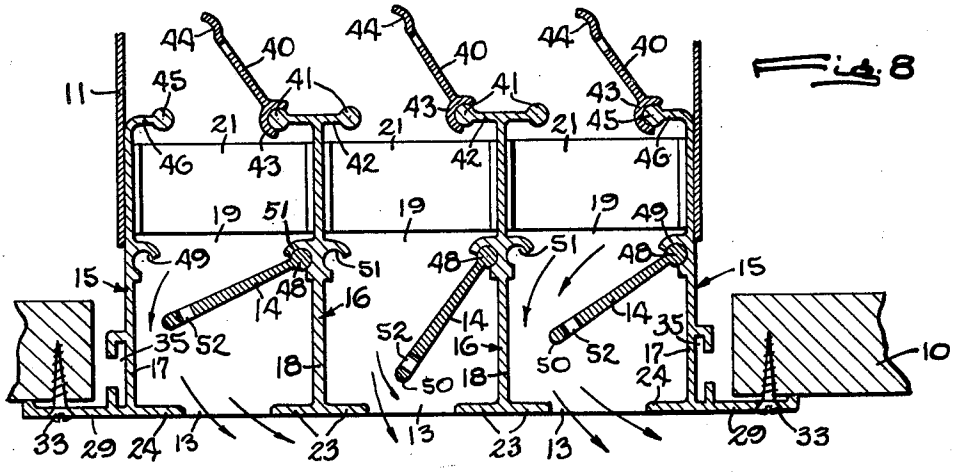


Fig. 8

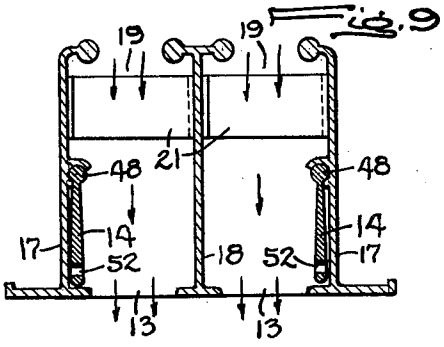


Fig. 9

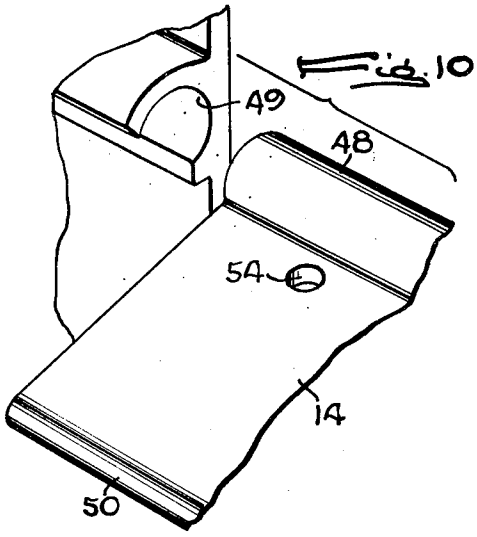


Fig. 10

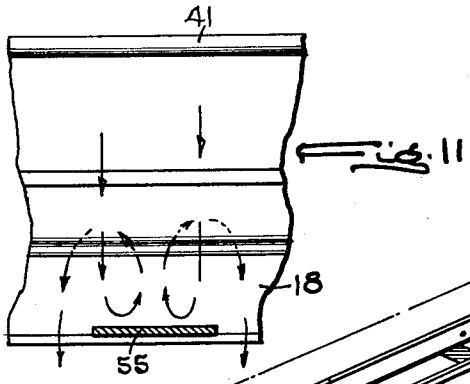


Fig. 11

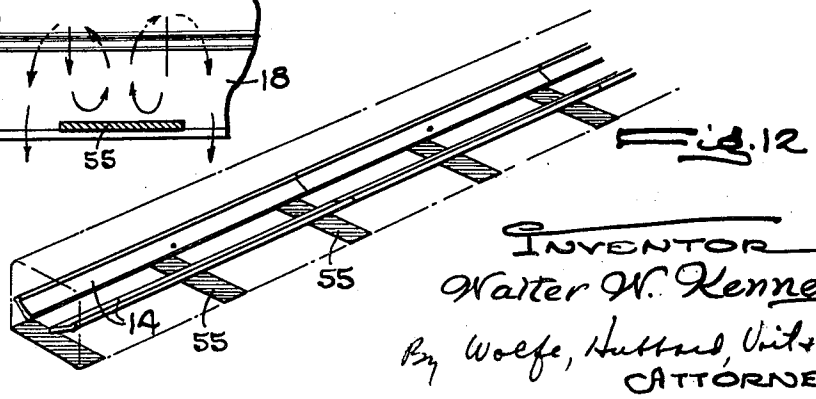


Fig. 12

INVENTOR
Walter W. Kennedy
By Wolfe, Hubbard, Voit & Osann
ATTORNEYS

United States Patent Office 3,126,811 Patented Mar. 31, 1964

3,126,811

AIR DISTRIBUTION OUTLET

Walter W. Kennedy, Rockford, Ill., assignor to Barber-Colman Company, Rockford, Ill., a corporation of Illinois

Filed Mar. 6, 1961, Ser. No. 93,740
10 Claims. (Cl. 98—40)

This invention relates to an air diffuser for delivering air into a room through an elongated narrow slot and the general object is to provide such a device which is more decorative and appealing from an architectural standpoint, is more economical to manufacture, and is more versatile than prior strip type air diffusers.

Another object is to provide for selectively varying the direction of air discharge by adjustment of a deflector arranged in a novel manner within the diffuser.

A further object is to provide an air diffuser of the above character which may be constructed from extruded parts assembled in various combinations to vary the number of discharge slots or the lengths thereof.

Still another object is to provide for assembly of the deflector in a plurality of positions and thereby increase the number of air discharge patterns obtainable by adjustment of the vane.

The invention also resides in the novel construction of the deflector vane to achieve accurate control of the discharged air stream.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a fragmentary perspective view of the ceiling of a room equipped with an air diffuser embodying the novel features of the present invention.

FIG. 2 is a section taken along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary face view.

FIG. 4 is an exploded perspective view.

FIG. 5 is a fragmentary plan view.

FIG. 6 is a fragmentary perspective view of a deflector vane.

FIG. 7 is a fragmentary section taken along the line 7—7 of FIG. 3.

FIG. 8 is a view similar to FIG. 2 showing a modification.

FIG. 9 is a view similar to FIG. 1 showing a different position of the deflector vanes.

FIG. 10 is a fragmentary perspective view illustrating the manner of mounting the deflector vane.

FIGS. 11 and 12 are fragmentary views of another modification.

The improved air diffuser is adapted to be set into the ceiling 10 or other wall of a room to receive conditioned air along its length from a supply duct 11 and to distribute ribbon-like streams 12 of the air through elongated narrow slots 13 each of which is open across its full width and is enclosed by a frame which presents a neat and artistic appearance. The parts are preferably formed by extrusion and constructed for arrangement in multiple both laterally and longitudinally so that the number of slots and the lengths thereof may be varied to suit existing conditions. An important feature of the diffuser is the ability to achieve different patterns of the

discharged air by adjustment of deflectors 14 disposed within the diffuser and accessible through the open slots 13.

All of the structure required for performing the various functions performed by the diffuser is incorporated in two elongated bars 15 and 16 of T-shaped cross-section uniform throughout their lengths so as to be extrudable from suitable material, preferably metal. The bars are of the same depth and arranged in pairs with their substantially flat plate-like stems 17 and 18 disposed in laterally spaced parallel relation so as to form the walls of relatively narrow passages 19 through which the air flows edgewise as indicated by the arrows. Adjacent the inlets 20 of the passages, the bars of each pair are joined rigidly by U-shaped straps 21 disposed edgewise to the air flow and having end flanges 22 welded or otherwise suitably secured to the opposed walls of the plates 17 and 18 to form therewith a box-like housing with the passage inlet 20 at the inner edge and the discharge slot 13 at the outer edge.

Each of the slots 13, which is usually about ¾ inch wide and about half the width of the passages 19 between the walls 17 and 18, is defined by an inturned right angular flange 23 on the bar 16 and, in this instance, a similar flange 24 of substantially the same width on the bar 17. The flanges 23 thus form the cross-member of the T of the bar 18. The cross-member of the bar 17 is formed by the flange 24 and a coplanar flange 25 projecting outwardly from the bar to overlap the wall opening 26 in which the diffuser is disposed with a shallow and narrow rib 27 bearing against the wall.

By arranging two of the bars 15 on opposite sides of a bar 16 as shown in FIGS. 1 to 5, the diffuser may be formed with two slots 13 separated from each other by a narrow flat surface 28 formed by the flanges 23. The surface constitutes one side of a frame whose other preferably wider side face 29 is formed by the coplanar flanges 24 and 25 on the outer bars 15. The ends 30 of the frame are of similar width and formed in this instance from short lengths of the bar 15 fitted at miter joints 31 (FIGS. 3 and 5) against the ends of the side bars of the diffuser. The ends and side bars may be secured together by angle straps 32 welded into the corners of the box-like air passage defined by the four bars and constituting the end walls of the overall housing structure when the latter is made of substantial length.

Additional slots 13 may be provided by adding other bars 16, three slots being obtained with two such bars which form a third air passage 19 of the same cross-section as the outer passages (see FIG. 8). The unitary assembly thus formed is telescoped into the end of the supply duct 11 and secured to the room wall in any suitable way. This may be accomplished by screws 33 (FIG. 8) entered through holes in the outer flanges 29 or by wires 34 (FIG. 2) suspended from above the ceiling and hooked into a T-slot 35 opening outwardly and defined by flanges 36 integral with the bars 15 on the outer sides thereof.

The T-slot 35 extends the full length of the bar 15 so as to permit any number of the diffusers assembled as above described to be joined rigidly together in end-to-end abutment so as to lengthen the slots 13 correspondingly. The connection is achieved by short lengths of rigid bars 37 (FIGS. 4 and 7) with opposite end portions telescoped

snugly in the T-slots of the alined bars 15. The latter abut at joints 39 which do not detract appreciably from the neat frontal appearance of the diffuser frame. The several diffusers are usually joined in this manner after the bars of each assembly have been connected by the straps 21.

The volumes of air admitted from the duct 11 into the inlet edges of the different passages 19 are determined herein by the angular positions of damper vanes 40 of substantially uniform width equal in length to the bars 15 and 16 and individually hinged along one edge to the upstream edge of one of the passage side walls. These vanes are also metal extrusions and the male parts of the hinge is formed by a cylindrical rib 41 integral with and extending along one edge of a narrow flange 42 turned inwardly from the edge of the bar 16. Telescoped snugly around this rib is an arcuate socket 43 formed along one edge of the vane and enclosing more than half of the rib. The socket is open on one side so that the damper vane may be swung about a quarter of a revolution from a wide open position as shown at the right in FIG. 2 and a closed position in which the curved free edge 44 bears against a similar cylindrical rib 45 formed on a flange 46 of the bar 15 on the opposite side of the air passage. The vane may be slid endwise onto either of the ribs 41 or 45 so that the air from the supply duct may be admitted to the passage inlet 20 on either side thereof, the direction of such entry facilitating control of the discharge pattern later described.

With the diffuser constructed as above described, it will be apparent that the air admitted through the passages 19 all along the lengths of the latter will be formed into the narrow ribbon-like streams 12 and discharged through the open slots 13. With the passages open across their full cross-sections as shown in FIG. 9, the laterally spaced streams will be directed into the room substantially perpendicular to the ceiling 10 as indicated by the arrows.

In accordance with the present invention, the pattern of the discharge may be varied through the use of the deflectors 14 above referred to which are located within the passages 19 and, when positioned to intercept part of the oncoming air stream, coact with one wall of the passage and a corresponding one of the flanges 23 or 24 to change the angle at which the air stream is delivered through the slot 13. Each deflector comprises a substantially imperforate vane somewhat wider than the narrowest width of the passages 19 and mounted to swing about an axis extending along and adjacent one wall of the passage and spaced inwardly from the outlet slot thereof a distance somewhat greater than the width of the vane. As in the case of the damper hinges, each vane hinge preferably comprises a cylindrical rib 48 extruded with the vane and extending along one edge of the latter. The rib is seated in an arcuate socket 49 extruded with the bar 15 along the inside thereof and having an opening which faces downstream and diagonally of the air passage 19.

After alinement axially with the socket as shown in FIG. 10, the rib 48 may be inserted in and pressed through the full length of the socket. Although the fit between the rib and socket as originally manufactured may be relatively loose, the desired friction for maintaining the angular adjustment of the vane 14 may be achieved in the final assembly by longitudinally bending the vane and the rib slightly before insertion thereof into the socket.

When thus mounted, the vanes 14 may be swung from the out-of-the-way positions alongside the walls 17 and behind the flanges 23 or 24 as shown in FIG. 9 to the positions shown in FIG. 2 in which they extend diagonally across the passages 19 with their free rounded edges 50 spaced from the wall 18 and disposed opposite but spaced inwardly from the free edges of the flanges 23. The vanes are thus disposed in planes which intersect the opposite side walls 18 of the air passages 19 and are spaced above the flanges 23. Thus, the upstream faces of the vanes cooperate with the walls 18 to define open V-shaped spaces converging to narrow openings from which the oncoming stream is directed along the walls 18 toward and against the backs of the flanges 23. The latter act to deflect the streams reversely and inwardly into and through the slots 13 through which it flows diagonally and is thus discharged into the room at an angle corresponding to the angular position of the vane as illustrated by the arrows in FIG. 2. The flow of the air in a well defined arcuate path is not affected by the right angular corner between the wall 18 and the inner face of the flange 23 which provide a smooth surface free of shoulders or other interfering obstructions.

With the vanes hinged on the outer bars 15, the two discharged streams 12 will fan outwardly and away from each other thus producing a diverging pattern and a wide spreading of the total flow as is usually desired for the ceiling outlets of cooling systems. It will be apparent that the angle of discharge of each stream may be varied over a substantial range by correspondingly changing the angle of the vanes 14 between the position of maximum deflection and the inactive position (FIG. 9).

To increase the number of discharge patterns obtainable, the hinge sockets 51 similar to the sockets 49 are also formed on the bar 16, there being one such socket on each side of the wall 18. The ribs 48 on the vanes 14 may be inserted alternatively into these sockets so that the vanes may be swung outwardly against the wall 17 and then reversed in direction by the flange 24 so as to be deflected inwardly and toward the adjacent slot as it is discharged into the room. Thus, to discharge all of the streams in the same diagonal direction, all three of the vanes 14 are swung in the same direction away from their supporting bars as shown in FIG. 8.

Detachment of the vanes 14 from one of the bars 15, 16 and transfer thereof to the socket on the other bar may be effected before the initial installation whenever it is desired to change the pattern of discharge from a given diffuser. Since the vanes are readily accessible through the slots 13 they may be readjusted at any time during service use and the angle of discharge varied as desired. To facilitate such adjustment one or more holes 52 for receiving a suitable tool are formed in the vanes preferably near the free edges thereof.

To provide optimum control over the formation of the air streams 12 and the angle of their discharge, the invention contemplates provision for restricted communication between the upstream side of each vane 14 and the space 53 between the downstream side of the vane and the wall of the bar supporting the vane. Herein, such communication is achieved by forming holes 54, usually about 5/32 of an inch in diameter, extending through the vanes at points spaced along and disposed adjacent the hinged edges thereof. The area of the holes is such as to allow enough air to flow into the spaces 53 to prevent the development therein of a negative pressure of substantial value and the high velocity flow of the air around the free edges of the vanes which results in undesirable noises. Such noises may also be eliminated by narrow bars 55 placed across the slots 13 as shown in the modifications of FIGS. 11 and 12.

It will be apparent that the improved diffuser is extremely versatile and easily adaptable to the many different conditions encountered in service use. Most of the adjustments may be made after the initial installation. Units of various sizes may be formed from a few standard parts which may be assembled easily on the job. The extrusions are economical to manufacture and their smooth faces form an artistic frame of pleasing appearance in all of the sizes and shapes in which the parts may be assembled.

Also, by making the vane 14 wider than the passage 19 at its narrowest width to facilitate attaining the various flow patterns above described, the vane may be utilized to perform the additional function of closing the passage when it is desired to prevent the discharge of

air into the room. For this purpose, it is only necessary to swing the vane inwardly away from the slot **13** until it comes against the unused hinge element **49** and is disposed substantially perpendicular to the passage walls **17, 18.**

I claim as my invention:

1. An air distributor having, in combination, parallel walls laterally spaced apart and defining the sides of an elongated passage adapted for the flow of air edgewise therethrough in one direction, right angular flanges rigid with and extending along the downstream edges of said walls and turned inwardly in a common plane to define between their opposed edges a slot-like outlet disposed between said walls, a deflector vane disposed in and extending along said passage, means on a first one of said walls supporting said vane from one of its edges to swing about an axis extending along such wall and spaced inwardly from the flange thereof, said vane when extending diagonally of said passage and in a direction toward said slot-like outlet coacting with the other of said walls and the flange thereof to deflect the air flowing through said passage in an arcuate path around the free edge of the vane and through said outlet diagonally of said plane, said supporting means being spaced inwardly from said outlet and pivotally connecting one edge of said vane to said one wall and including first and second hinge elements extending along and respectively secured to such wall and vane edge and detachably interengageable to provide for swinging of the vane from a position alongside such wall to a position diagonally of said passage, and a hinge element duplicating said first element and secured to the other of said walls for alternative detachable interengagement with said second element of said vane whereby to support the vane on said other wall for extension diagonally of said passage in the opposite direction.

2. An air distributor as defined in claim 1 in which one of said hinge elements is a cylindrical rib and the other comprises a semi-cylindrical socket opening diagonally of said air passage to provide for angular adjustment of the vane relative to its supporting wall.

3. An air distributor having, in combination, a first wall, a member providing a second wall laterally spaced from said first wall and cooperating with the latter to define the sides of an elongated passage adapted for the flow of air edgewise therethrough in one direction, a flange rigid with and extending laterally from the downstream edge of said first wall and cooperating with the downstream edge of said member to define an elongated open outlet slot substantially narrower than the width of said air passage and free of obstructions, a deflector vane disposed in and extending along said passage, and means pivotally connecting said second wall and one side edge of said vane along an axis disposed adjacent and extending along such wall and spaced inwardly from said slot for swinging of the vane between a retracted position alongside such wall and a deflecting outlet positioned in a plane extending diagonally across said passage in a direction toward said elongated open outlet slot and intersecting said first wall behind said flange, said vane, when in said deflecting position, defining with said first wall an intervening free space of V-shaped cross-section and coacting with such wall and the flange thereof to deflect the oncoming air stream against said first wall and past the free edge of the vane and then reversely across the back of said flange and diagonally through said slot along a path inclined opposite to the inclination of the vane, and said vane, when in said retracted position uncovering said slot to permit the oncoming air stream to be discharged through said slot substantially perpendicular to the plane thereof.

4. An air distributor as defined in claim 3 including a flange on the outlet edge of said second wall concealing said vane when the latter is in said retracted position.

5. An air distributor as defined in claim 3 in which the inner faces of said first wall and said flange provide a continuous surface free of obstructions in the path of the air stream beyond said vane.

6. An air distributor as defined in claim 3 in which said vane is at least as wide as said air passage and is adapted to close the latter when swung to a position substantially perpendicular to said walls.

7. An air distributor having, in combination, a housing defining an elongated open slot for the discharge of an air stream into a room and including first and second plate-like members joined together and presenting first and second walls laterally spaced apart and defining the sides of an elongated passage free of obstructions adapted for the flow of air edgewise therethrough in one direction toward said slot, said housing including a flange rigid with and extending laterally from the downstream edge of said first wall and toward the second wall and defining one edge of said slot, an elongated deflector of substantially uniform width disposed in and extending along said passage and spaced upstream from said slot, means on said housing for swingably supporting said deflector with the latter extending laterally of and diagonally toward said outlet slot and across said passage from said second wall to a free edge portion disposed adjacent but short of said first wall whereby to define with the latter wall an intervening free space of V-shaped cross-section converging toward the first wall and terminating at a narrow slot-like opening between such wall and said free edge portion, the upstream surface of said deflector coacting with said first wall and said flange to deflect the air forced through said passage first laterally against said first wall, through said opening and then reversely across the back of said flange and diagonally out through said slot along a path inclined opposite to said deflector, the axis of swinging defined by said supporting means adapting the deflector for adjustment into different diagonal positions across said passage whereby to correspondingly change the path of discharge of said air stream through said slot.

8. An air distributor as defined in claim 7 including means providing for a limited flow of air between said V-shaped space and the space on the opposite and downstream side of said deflector whereby to relieve any negative pressure tending to develop in the latter space.

9. An air distributor as defined in claim 8 in which said last mentioned limited flow means includes at least one aperture extending through said deflector.

10. An air distributor having, in combination, an inner wall member, two outer wall members laterally spaced outwardly from said inner member, means joining said three members into a rigid housing, the opposite side walls of said inner member and the respective outer members cooperating to define first and second elongated passages adapted for the flow of air edgewise therethrough, said inner member including two substantially perpendicular flanges rigid with and projecting in opposite directions from the downstream edge thereof and cooperating with the downstream edges of said outer wall members to define laterally spaced open slots constituting the outlets of said passages, elongated deflectors each disposed in and extending along one of said passages, means on said housing swingably and adjustably supporting one of said deflectors with one longitudinal edge thereof lying along the outer wall of the said first passage and the deflector extending laterally and diagonally across the passage and toward the open slot of said first passage to a free edge portion disposed adjacent but short of the inner wall of said first passage whereby to define with the latter wall an intervening free space of V-shaped cross-section converging toward the inner member and terminating at a narrow slot-like opening between such member and said free edge portion, means on said housing similarly and swingably supporting the other of said deflectors in the other of said passages with said other of said deflectors extending toward the open slot

of said second passage to a free edge portion disposed adjacent but short of the inner wall of said second passage whereby to define with the latter wall an intervening free space of V-shaped cross-section converging toward said inner member and terminating in a narrow slot-like opening between such member and the free edge portion of the deflector, the upstream surfaces of said deflectors coacting with the opposite sides of said inner member and the flanges thereon to deflect two air streams forced through said passages first laterally and inwardly against said inner member through said openings and then reversely across the backs of said flanges and diagonally

through said slots along paths diverging away from each other beyond the face of the diffuser and in directions determined by the adjustments of the respective deflectors about the swinging axes defined by said two deflector supporting means.

References Cited in the file of this patent

UNITED STATES PATENTS

345,692	Hayes	July 20, 1886
2,320,007	Otto	May 25, 1943
2,687,686	Broberg	Aug. 31, 1954
2,940,376	Lambert	June 14, 1960

Disclaimer

3,126,811.—*Walter W. Kennedy*, Rockford, Ill. AIR DISTRIBUTION OUTLET. Patent dated Mar. 31, 1964. Disclaimer filed Sept. 1, 1965, by the assignee, *Barber-Colman Company.*

Hereby enters this disclaimer to claims 3, 5, 6 and 7 of said patent.

[*Official Gazette December 14, 1965.*]