May 25, 1965 H. E. STRAUB ETAL 3,185,068

AIR DISTRIBUTION DEVICES

Filed April 9, 1963

FIG. 1

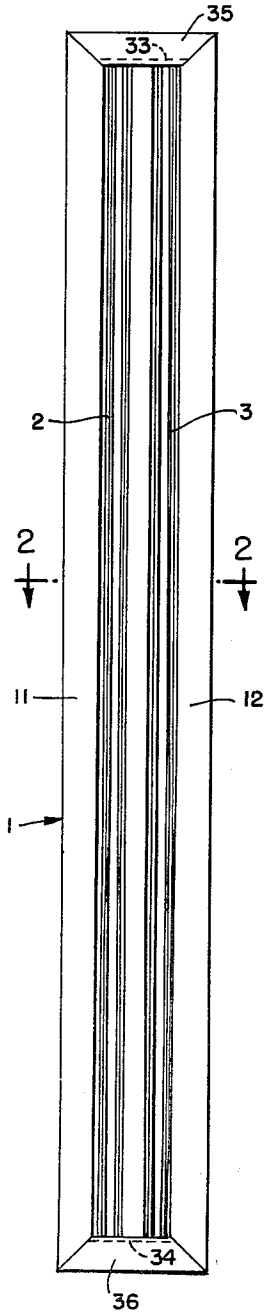


FIG. 2

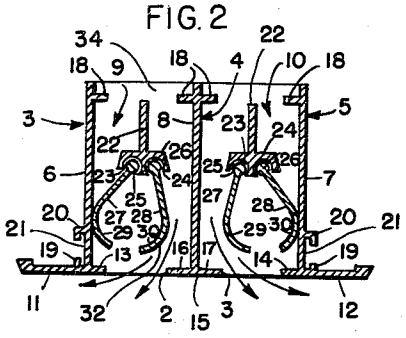


FIG. 3

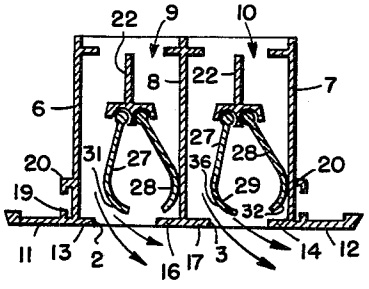
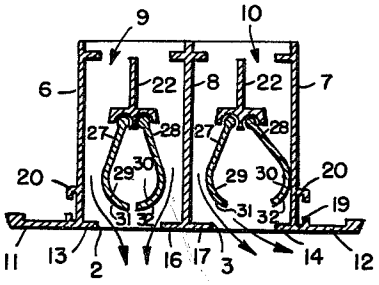


FIG. 4



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3,185,068

AIR DISTRIBUTION DEVICES

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5 Claims. (Cl. 98—40)

This invention, in general, relates to air distribution devices. More particularly, the invention pertains to air diffusers in which the air is discharged through one or more elongated slots.

Diffusers are the terminal units of air distribution systems, i.e., the devices through which air distributed by an air distribution system of a building or the like is discharged into a room. These diffusers are connected with the building ductwork. Slot diffusers, like most diffusers, are usually mounted flush in the ceiling of a room although they may also be mounted in a wall or walls of a room.

This invention relates to slot diffusers and to improvements in structures for selectively adjusting the air discharge pattern of slot diffusers. The diffusers of the invention are capable of providing selectively a plurality of air discharge patterns, i.e., a two-way horizontal pattern, a one-way horizontal pattern, or a vertical pattern.

The best air discharge pattern for a diffuser in a ceiling depends upon several factors. When the air supplied to the diffuser is warm air, the best air discharge pattern usually is a vertical pattern, i.e., one in which the diffuser air discharge stream is directed outwardly at right angles to the face of the diffuser and the ceiling in which it is mounted. Warm air, being lighter or less dense than colder air, is best directed into the room at right angles to the ceiling to mix it with the cooler air in the lower areas of the room to warm the latter.

On the other hand, when the air supplied through the diffuser is cool air, the best air discharge pattern usually is a horizontal pattern, i.e., one in which the air stream or streams are directed laterally outwardly from the diffuser substantially parallel with the face of the diffuser and the ceiling. The greater density of cool air causes it to fall or descend into a body of warmer air. This makes the horizontal pattern the most desirable because the cool air can be spread across the ceiling or a portion thereof. It falls as its velocity drops and ultimately mixes with and cools the warmer air in the lower areas of the room. If a vertical pattern were used with a cool air discharge stream, drafts causing discomfort to occupants of the room may result. Also, the horizontal pattern provides a more even distribution of the cooling air throughout the room and thereby keeps the room temperature more uniform throughout.

In accordance with the invention, the diffusers of the invention comprise a diffuser face with one or more elongated, air discharge slots therein. Walls on the diffuser define air passage(s) communicating with the slot(s). There is an air-deflecting lip or flange along at least one, preferably both, longitudinal edge of each slot, made, for example, by wall portions of the wall forming the face of the diffuser. These lips or flanges are substantially at right angles to the walls forming the air channels of the diffuser and form at the downstream side of the air channel(s) air-deflecting surfaces along the longitudinal edge(s) of the slot(s) substantially at right angles to the flow direction of the air stream(s) in said channel(s).

Positioned in the channel upstream from the slot is at least one, and preferably two, baffle plates or air-deflector vanes. The baffle plate or vane extends longitudinally at least approximately coextensively with the elongated slot and is pivotally mounted to swing about a longitudinal axis whereby it may be pivoted toward or away from the side walls of the air channel. One baffle plate or vane is sufficient to achieve the basic objectives of the invention, but two, side-by-side baffles or plates which have a convex outer, air flow surface along the downstream edge provide improved air patterns.

The principles and concepts of the generic invention are further described and illustrated in a preferred embodiment of the invention which is illustrated in the drawing wherein:

FIG. 1 is a bottom plan view of a double slot diffuser of the invention; and

FIGS. 2, 3 and 4 are cross-sectional views taken on section 2—2 of FIG. 1 and showing, respectively, the positioning of the baffle plates or vanes in the air channels to give (*a*) a two-way, oppositely horizontal or lateral air discharge pattern, (*b*) a one-way horizontal or lateral air discharge pattern, and (*c*) a vertical-horizontal combination air discharge pattern.

Referring to the drawings, there is shown a double slot diffuser **1**. The face of the diffuser has therein a pair of parallel, elongated, air discharge slots **2, 3**. The diffusers of the invention may be made from metal extrusions. The double slot diffuser of the drawing may comprise extrusions **3, 4** and **5** forming the side walls **6, 7** of the diffuser and a middle wall **8** parallel therewith, the walls **6, 7** and **8** forming a pair of parallel air channels **9, 10**.

The side walls **6, 7** may have flanges **11, 12**, respectively, formed as an integral part of the extrusion along the downstream edge of the respective side wall. When the diffuser is inserted and mounted in a slot in the ceiling or wall, the flanges **11, 12** lie against the ceiling or wall adjacent to the slot therein.

The walls **6, 7** each also have at their downstream edge a narrow, longitudinal lip or flange **13, 14** at least substantially coextensive with the respective slots **2, 3**. The lips or flanges are directed inwardly into the channels **9, 10**, respectively, and their upper surfaces form narrow air-deflecting surfaces substantially at right angles to the air stream in the channels substantially at the mouths of the channels (the slots **2, 3**). Air permitted to flow through the channels near the respective wall **6** or **7** is deflected by the lips or flanges **13, 14** into a lateral flow path (shown by the arrows in FIGS. 2–4).

The middle wall **8** has at its downstream edge a longitudinal wall substantially coplanar with the flanges **11, 12**. The wall **15** forms lips or flanges **16, 17** extending from wall **8**, respectively, into channels **9, 10** at the mouths thereof. Wall **15** and flanges **11, 12** form the face of the diffuser with slots **2, 3** therein. Air permitted to flow through the channels near the wall **8** is deflected by the lips or flanges **16, 17** into a lateral flow path.

The walls **6, 7, 8** may have longitudinal lips **18** near the upstream edges thereof, to which lips may be attached or on which lips may be seated a distributor piece or pieces (not shown) used to connect the diffuser with an air supply duct (not shown). The flanges **11, 12** each may have a longitudinal lip **19**, and the walls **6, 7** each may have an L-shaped, longitudinal lip **20**. These members form a longitudinally-extending T-slot **21** on the lower end of the outer side of each of walls **6, 7**. The T-slots can be used to mount the diffuser on structural members of a ceiling or the like.

In order to selectively control or adjust the air discharge pattern of the diffuser, air-flow-directing means is provided in each channel **9, 10** whereby the air flowing through each channel may be allowed to flow against and be deflected by flanges or lips **13, 14, 16** and/or **17**. The member or members employed as the air-directing means may be a baffle plate or vane means pivotally mounted in and extending longitudinally in the air channels. The

baffle plate or vane means pivots about axes extending longitudinally in the channels, and it may be swung into proximity or actual contact with or away from side walls 6, 7, 8 of the respective channels.

In the illustrated embodiment, an extruded, vane-support bar 22, which in transverse cross-section is like an inverted T, is positioned in the upstream side of each channel 9, 10 approximately midway between the walls 6 and 8 and 7 and 8. The undersurface of the cross-leg of the inverted T, vane-supported member, which extends substantially the length of channels 9, 10, has a pair of round, longitudinal grooves 23, 24, the arc of which is slightly more than 180°.

The cylindrical longitudinal edges 25, 26, respectively, of vanes or baffle plates 27, 28 snap into the grooves 23, 24 and are pivotally supported therein. The vanes or baffle plates 27, 28 extend substantially the length of the channels 9, 10. They may be of any suitable shape in transverse cross-section, i.e., flat plates, curvate in transverse cross-section, etc. The best shape for the plates or vanes is one in which the outer, air flow surface of the downstream portion 29, 30 of each plate or vane is offset, preferably convex, in a direction toward the center of the channel. This gives a convex, outer surface 31, 32 on each vane or plate over which the air may flow with least turbulence. The vanes 27, 28 may be extruded metal vanes of curvate, transverse cross-section. The friction between the grooves 23, 24 and the cylindrical edges 25, 26 of the vanes or baffle plates is sufficient to hold them in the adjusted position against the force of the air stream.

The walls 6, 7, 8 may be supported in the illustrated relationship to each other by any suitable means. For example, the walls 6, 7, 8 and support bars 22 may be attached at their ends to end walls 33, 34 of the slot diffuser. The end walls 33, 34 may have, if desired, flange members 35, 36 fitted with and lying flush or coplanar with flanges 11, 12.

The desired air discharge pattern is selected by pivotally positioning the vanes or baffle plates. The supply air flowing into the upstream sides of channels 9, 10 is split into two streams in each channel by the vane-support member 22. When the vane or baffle plate 27 of channel 9 and the vane or baffle plate 28 of channel 10 are pivoted against or in proximity to the outer walls 6, 7, respectively, of the channels, and when the other vanes of each channel are left spaced from the middle wall 8 (FIG. 2), a two-way, lateral air discharge pattern results. In this adjusted position, the flow of air adjacent the outer walls 6, 7 of channels 9, 10 is blocked. The air flows through channels 9, 10 between the wall 8 and the members 22 and the vanes 28 or 27, respectively. The air is deflected by lips or flanges 16, 17, and a two-way, lateral discharge pattern results.

In FIG. 3, the vanes or baffle plates are pivotally adjusted so that air is discharged laterally from each channel in the same direction, i.e., a one-way horizontal pattern. In FIG. 4, there is shown a vane or baffle plate adjustment providing a vertical discharge pattern from channel 9 and a horizontal pattern from channel 10. The vertical pattern results by allowing air to flow between the outer surfaces of both vanes 27, 28 and the side walls of the channel. The lips or flanges 13 and 16 of channel 9 deflect the divided streams of air toward the center of the channel, and the reunited streams form a vertical discharge pattern, i.e., an air stream flowing outwardly from the diffuser at a substantially right angle to the face of the diffuser. The vanes of channel 10 may be adjusted like those of channel 9 to give a vertical pattern from both slots 2 and 3.

Furthermore, when both vanes 27, 28 are pivoted into contact with the side walls of channels 9 and/or 10, the vanes may then serve as dampers blocking air flow through the respective channel(s). Also, the diffusers of the invention may have only a single channel and slot where a two-way horizontal pattern is not required. A double slot diffuser is ordinarily adequate for most needs, but the diffusers of the invention may be three, or even four, channel and slot diffusers, if desired.

The air pattern controllers 27, 28 of the diffusers of the invention are used to adjust the air discharge flow direction over a range of 180°, i.e., between a horizontal full left pattern and a horizontal full right pattern. The pattern may also be a two-way (left-right) pattern, a vertical pattern, a combination vertical-horizontal pattern, or an air flow pattern between full horizontal and full vertical. The diffusers are very versatile in their discharge patterns whereby they may be adjusted to fit a wide variety of requirements for air discharge patterns. The vanes can be adjusted at any time after installation of the diffuser because they are accessible through slots 2, 3.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. A slot diffuser comprising a pair of spaced, oppositely disposed, elongated, side walls defining the opposite sides of an elongated air flow channel, an elongated lip on the longitudinal, downstream edge of each of said walls, each lip extending inwardly into said channel at the downstream portion thereof, said lips defining therebetween an open, elongated, unobstructed air discharge slot along the downstream side of said diffuser, a vane support member, means supporting said member in spaced relation to and between said elongated walls and upstream from said discharge slot, an elongated first vane extending longitudinally of said channel, an elongated second vane extending longitudinally of said channel in substantially side-by-side relationship with said first vane, means pivotally supporting the upstream longitudinal edges of said vanes on said vane support member with substantially parallel, adjacent pivot axes thereof extending longitudinally of said channel and spaced from said elongated walls, either of said vanes adapted to be set in open position directing air flow through said channel into respective paths along respective opposite walls and against the upper surfaces of the respective flanges thereof, the downstream, longitudinal edges of said vanes being near but upstream of said slot when said vanes are in open position, and said vanes having a transverse width sufficient to allow said vanes to be pivoted individually into contact with a respective one of said elongated walls, whereby each vane can be individually, pivotally adjusted to positions between full open position and full closed position to set the air discharge pattern from said slot.

2. A slot diffuser as claimed in claim 1 wherein the downstream portions of said vanes have a transversely convex surface facing the respective side wall of said channel, said convex surfaces being in close proximity to but spaced upstream from said slot.

3. A double slot diffuser comprising substantially parallel, elongated walls defining therebetween two substantially parallel, elongated air flow channels, the downstream edge of each of said walls having a lip directed inwardly into the respective channels, said lips defining therebetween a pair of side-by-side, elongated air-discharge slots, vane support means, means supporting said vane support means in said channels about midway between the walls thereof, and a pair of side-by-side, elongated vanes having their upstream edges pivotally supported on each of said vane support means in each of said channels, either of said vanes in their respective channel adapted to be set in open position directing air flow through the respective channel

into respective paths along a respective elongated wall and against the upper surfaces of the respective flanges thereof, the downstream, longitudinal edges of said vanes being near but upstream of the respective slot when said vanes are in open position, said vanes having transverse widths sufficient so that they are adapted to be swung into contact with or away from a corresponding wall of a respective channel about pivot axes substantially parallel with said walls, whereby each vane can be individually, pivotally adjusted to positions between full open position and full closed position to set the air discharge pattern from the respective slot.

4. A double slot diffuser as claimed in claim 3 wherein the downstream portions of said vanes have a transversely convex surface facing the respective side wall of the respective channel, said convex surface being in close proximity to but spaced upstream from the respective slot.

5. A slot diffuser comprising a pair of spaced, oppositely disposed, elongated side walls defining an elongated air flow channel therebetween, a lip on the downstream, longitudinal edge of each of said walls, each lip directed

inwardly toward the center of said channel, said lips defining therebetween an open, elongated air-discharge slot, vane support means, means supporting said support means in said channel about midway between said elongated walls, two side-by-side, elongated vanes depending from said vane support means with their upstream edges pivotally supported on said means and with the pivot axes thereof substantially parallel with said walls, said vanes each having a transverse curvature in at least the downstream portions thereof and providing a convex surface facing oppositely outwardly and toward a respective wall, the curved downstream portions of said vanes being in close proximity to but spaced upstream from said slot.

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ROBERT A. O'LEARY, *Primary Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,185,068 May 25, 1965

Harold E. Straub et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 74, for "their" read -- either --.

Signed and sealed this 26th day of October 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents