United States Patent

Balfanz, Jr.

[15] **3,665,837**

[45] **May 30, 1972**

[54] LINEAL AIR DIFFUSER BAR

[72] Inventor: **Glenn F. Balfanz, Jr.**, Western Springs, Ill.

[73] Assignee: **Chicago Metallic Corporation**, Chicago, Ill.

[22] Filed: **May 13, 1970**

[21] Appl. No.: **36,946**

[52] **U.S. Cl.** ..... **98/40 D**, 98/103

[51] **Int. Cl.** **F24f 13/06**

[58] **Field of Search** ..... 98/40 D, 40 DL, 13, 103

[56] **References Cited**

UNITED STATES PATENTS

2,985,090	5/1961	Quin	98/40 DL
3,051,073	8/1962	Kennedy	98/40 DL
3,223,019	12/1965	Schuh	98/40 D
3,353,473	11/1967	Oneson et al.	98/40 D

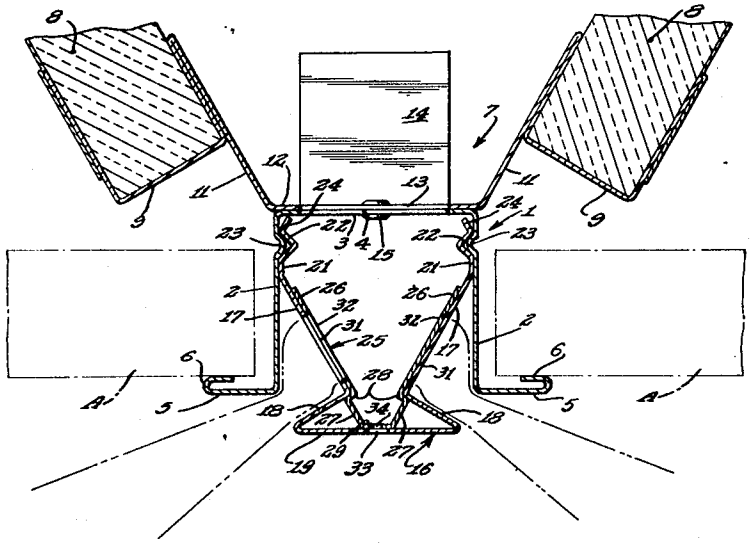
Primary Examiner—William E. Wayner

Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

An air diffusing assembly for use in a suspended ceiling system employing a plurality of ceiling panels, comprising an inverted channel-shaped structure having means along the sidewalls thereof for supporting ceiling panels, the intermediate connecting portion of the channel structure having openings therein for the supply of air to the channel interior, and provided with means engageable with a supply duct for supplying air thereto, such assembly having an air diffuser member, of generally V-shape in transverse cross-section, disposed in the channel member with the side walls thereof downwardly converging, at least one of such sidewalls having openings therein for the passage of air therethrough, and a damper member cooperable with the air diffuser member and having a sidewall slidable along the inner face of the air diffuser member to selectively vary the effective size of the openings in said diffuser sidewall for controlling air flow therethrough.

18 Claims, 8 Drawing Figures



Patented May 30, 1972 3,665,837

3 Sheets-Sheet 1

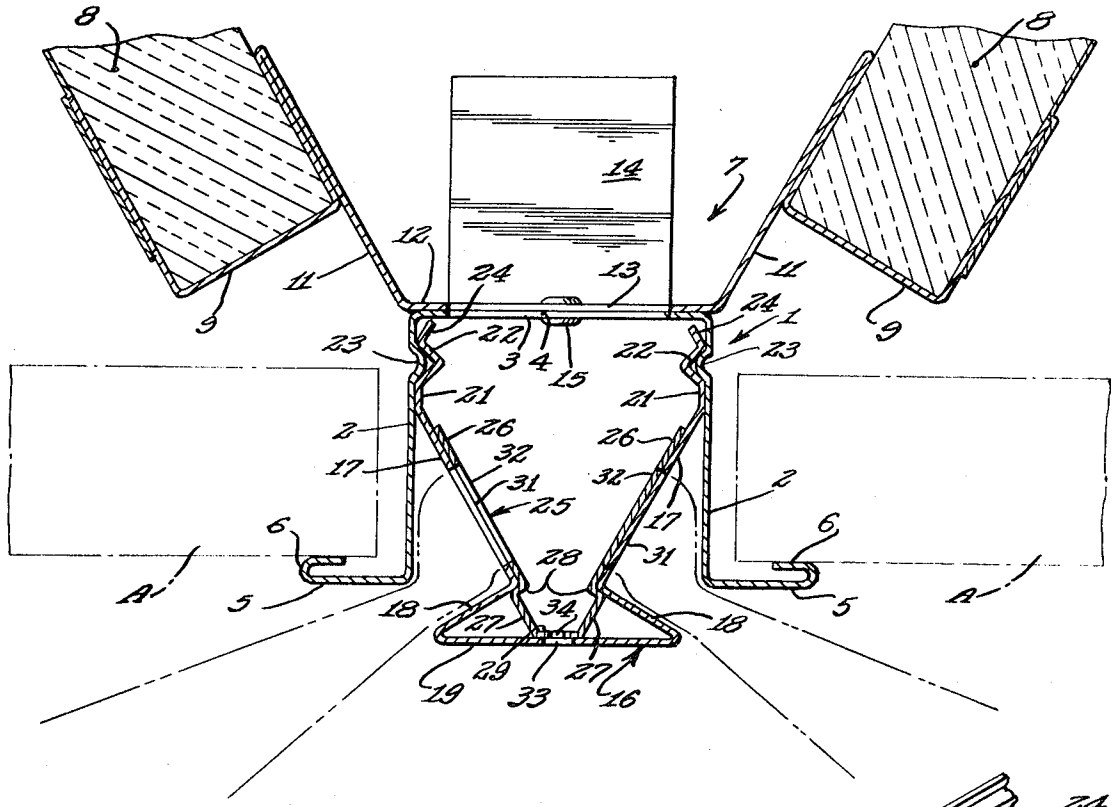


Fig. 1

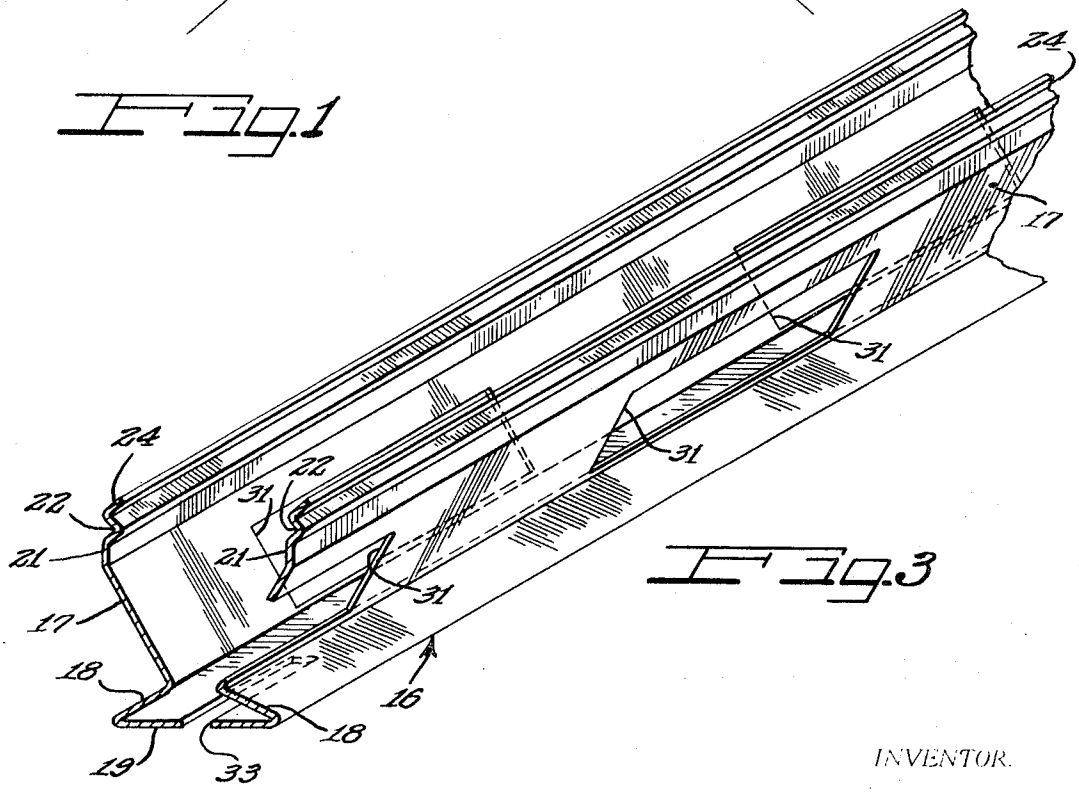


Fig. 3

INVENTOR.

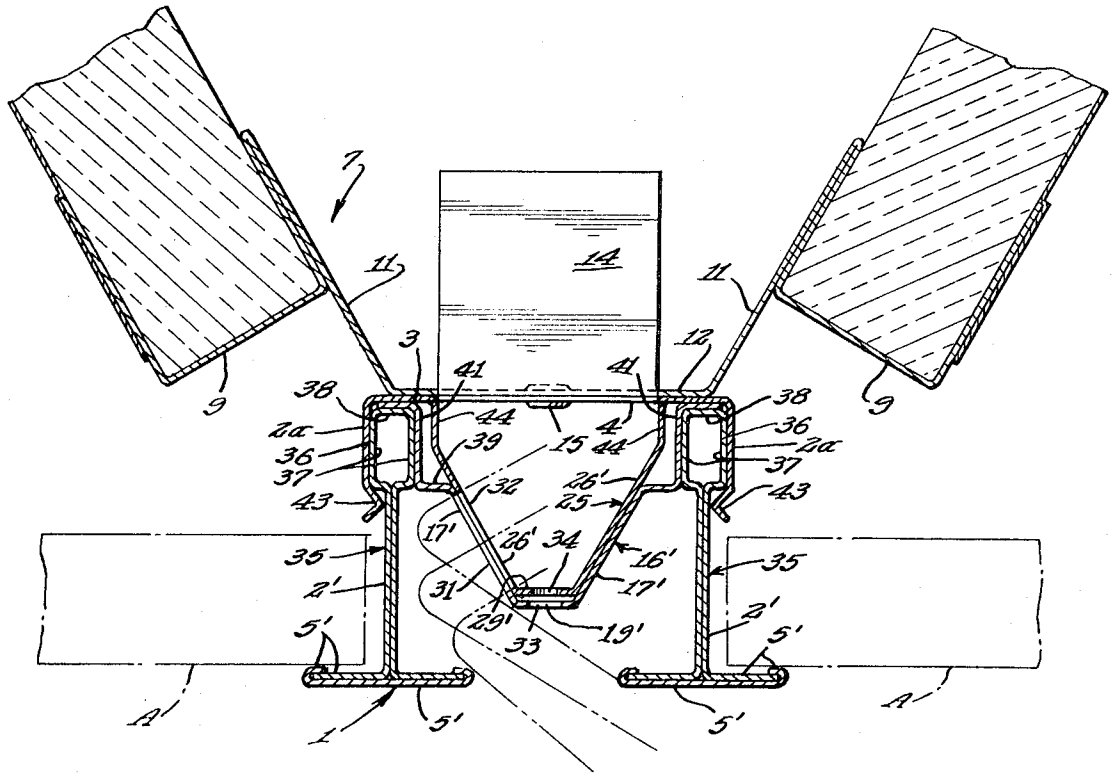
Glenn F. Balfanz, Jr.

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

Patented May 30, 1972 3,665,837

3 Sheets-Sheet 2

Fig. 5



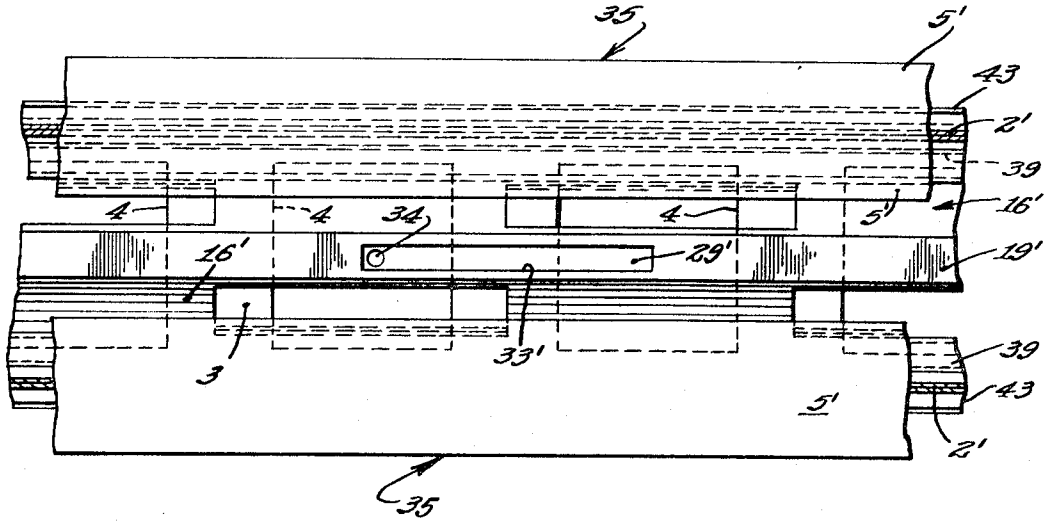


Fig. 6

INVENTOR.

Glenn F. Balfanz, Jr.

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

Patented May 30, 1972 3,665,837

3 Sheets-Sheet 3

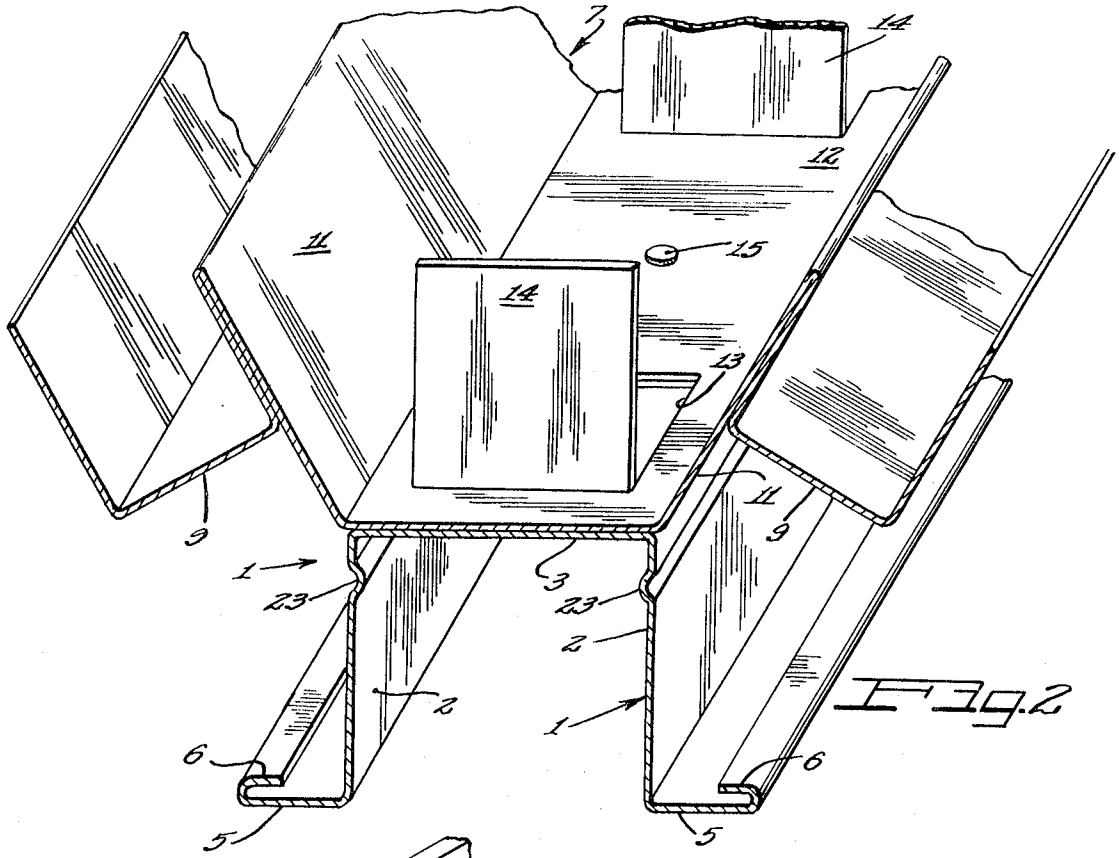


Fig. 2

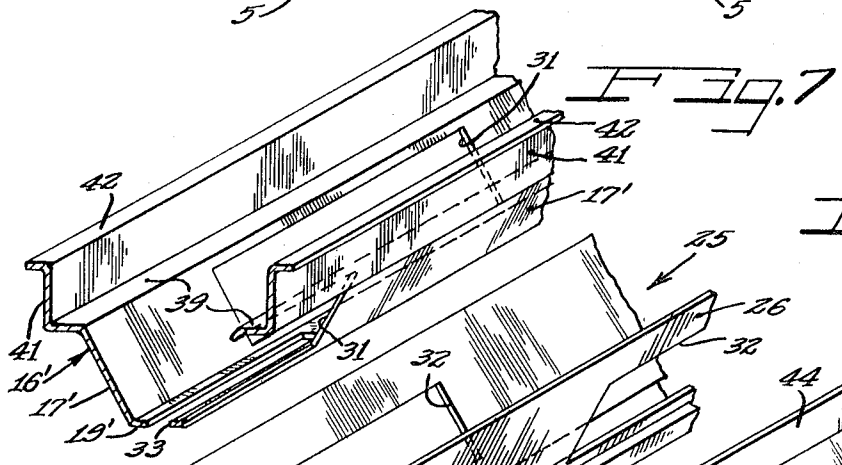


Fig. 7

Fig. 8

Fig. 4

INVENTOR.

Glenn F. Balfanz, Jr.

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

LINEAL AIR DIFFUSER BAR

BACKGROUND OF THE INVENTION

Suspended ceiling structures employing a suitable suspension grid are usually constructed from runners of generally inverted T-shape having a vertically extending intermediate web portion, usually terminating along its upper edge in a hollow bead and at its lower edge in outwardly extending aligned flanges adapted to support cooperable ceiling panels.

In many, if not most cases, a sizable air space exists above the suspended ceiling system which had no effective function and at best provided space for electrical lines, etc., as well as air ducts, any discharge openings of which were usually in the form of individual grill structures and the like.

More recently, systems have been devloped in which the panel supporting runner structures also form more or less continuous air discharge outlets for a suitable air duct positioned directly above. It has been ascertained that by suitable design this type of system will provide a relatively uniform air delivery pattern over the full length of the discharge duct to provide a more effective air delivery system than with previous arrangements such as standard ducts, diffusers, pressurized plenum systems and the like.

However, previous systems of this type have involved relatively complicated design structures which become costly and at the same time may require special installational procedures.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to an air diffuser structure forming a part of the suspended ceiling grid, which is relatively simple in construction, capable of being fabricated with a minimum of separate pieces and at the same time provide a highly efficient structure which includes damper means for varying the air flow through the structure.

In a preferred form of the invention the adjacent ceiling panels are adapted to be supported on a channel-shaped structure, which may be formed from a single strip of sheet material, and is adapted to receive and support a diffuser member which may be removable, if desired, having cooperable therewith a damper member movable relative thereto to permit adjustment of the air flow through the structure. Likewise, the structure may be provided with suitable air flow directional characteristics and at the same time provide an attractive structure that will readily and harmoniously blend with the usual runner structures.

In another preferred form of the invention, the channel-shaped structure may be constructed from two standard type runners.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings where like reference characters indicate like or corresponding parts:

FIG. 1, is a transverse cross-sectional view through an air diffuser structure constructed in accordance with the present invention;

FIG. 2, is a perspective view of the channel assembly illustrated in FIG. 1;

FIG. 3, is a perspective view of a portion of the diffuser member illustrated in FIG. 1;

FIG. 4, is a perspective view of the damper structure illustrated in FIG. 1;

FIG. 5, is a sectional view similar to FIG. 1 of a modification of the structure therein illustrated;

FIG. 6, is a bottom plan view of the structure illustrated in FIG. 5;

FIG. 7, is a perspective view of the diffuser structure illustrated in FIG. 5; and

FIG. 8 is a perspective view of the damper structure illustrated in FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 1 through 4, the embodiment of the invention therein illustrated comprises an inverted channel-shaped structure or member designated generally by the reference numeral 1, formed from a strip of sheet metal, bent to provide a pair of channel sidewalls 2 connected at their upper edges by an intermediate wall 3, which has a plurality of spaced generally rectangular-shaped openings 4 therein forming air inlets. The lower edges of the sidewalls 2 each terminate in oppositely directed outwardly disposed flange portions 5, the free edges of which may be bent back upon themselves to provide respective edge beads 6, with the flanges adapted to receive and support the adjacent edges of respective ceiling panels A, indicated in broken lines.

The channel member may be provided with a mounting structure 7 by means of which the channel member may for example be secured to walls 8 of a duct structure, such walls in the example illustrated extending downwardly in converging directions with their lower edges seated in U-shaped portions 9 of the structure 7. In the embodiment illustrated, the supporting structure 7 is provided with outwardly diverging sidewalls 11 which are connected adjacent their lower edges by an intermediate portion 12 and integrally connected at their outer edges with the adjacent edge portion of the cooperable U-shaped portion 9. The intermediate wall 12 of the mounting structure 7 is provided with openings 13 of the same size and shape as the openings 4 and aligned therewith, such openings being formed by cutting the stock forming the structure along three sides of the opening and bending the material along the fourth side in an upward direction to provide respective diffusing vanes 14. The channel member 1 and mounting structure 7 may be suitably secured together, as for example by a plurality of rivets 15 extending through adjacent portions intermediate the respective openings 4 and 13 at spaced intervals along the structure.

Disposed within the channel member 1 is air diffusing member, indicated generally by the numeral 16, having generally downwardly converging sidewalls 17 terminating at their lower edges in outwardly extending portions 18 which in turn are connected at their bottom edges by a generally horizontally extending portion 19. The walls 17 are secured adjacent their upper edges to the channel structure 1 by suitable means which, in the embodiment illustrated, comprises generally vertically extending portions 21 integrally connected to the respective walls 17 at their upper edges and formed with an inwardly directed corrugation 22 forming a more or less V-shaped groove or channel adapted to receive a cooperable inwardly directed bead 23 formed on each channel sidewall 2, with the free edge portions 24 extending angularly from the plane of the sidewalls 2 to provide camming means enabling the diffusing member to be sprung into place as illustrated in FIG. 1.

Disposed within the diffusing member 16 is a damper member, indicated generally by the reference numeral 25, having upwardly diverging sidewalls 26 disposed to closely overlie the inner faces of the respective sidewalls 17 of the diffusing member and provided at their lower ends with outwardly offset wall portions 27 connected to the associated wall 26 by respective shoulder portions 28 with the lower edges of the portions 27 being connected by a horizontally extending wall 29. As will be apparent from a reference to FIG. 1 the respective walls of the damper member are so proportioned that the shoulders 28 will bear on the outwardly extending wall portions 18 and the bottom wall 29 disposed upon the inner face of the wall 19 of the air diffusing member, whereby the damper member is effectively retained in the position illustrated in FIG. 1 but may be moved longitudinally along the air diffusing member.

As clearly illustrated in FIGS. 1 and 3, the respective walls 17 of the air diffusing member 16 are provided with a plurality of longitudinally spaced openings 31 therein, such openings in the embodiment illustrated being disposed in both of the walls

17 in staggered relation, with the portions of the wall disposed between adjacent openings having a length approximately equal to the length of an opening. As illustrated in FIG. 4 the damper member 25 is provided with similar openings 32 in each wall 26 of like size and spacing. Thus by relative movement of the damper member with respect to the air diffusing member the openings in the respective members may be either aligned or partially or completely closed off by the intermediate portions of the walls between respective openings. As will be apparent from a reference to FIGS. 1, 3 and 4 the air diffusing member 16 may be provided with one or more slots 33 in the bottom wall 19 thereof adapted to register with corresponding openings 34 in the bottom wall 29 of the damper member. Thus by insertion of a suitable tool or member, as for example a nail, through the slot 33 into an opening 34 pressure may be exerted in a longitudinal direction on the damper member to slide the same relative to the air diffusing member for effecting an adjustment of air flow through the structure.

It will be noted, from a reference to FIG. 1, that the inclined wall portions 18 of the air diffusing member function as air deflectors to deflect the air laterally as well as downwardly, as generally indicated by the broken lines.

It will be appreciated that, if desired, the openings 32 and 33 may be disposed in only one sidewall of the air diffusing member 16 and adjacent wall 26 of the damper member 25, where discharge of air is desired in only a single direction.

The construction illustrated in FIGS. 5 through 8, while embodying an air diffusing member and damper member of slightly different configuration than that illustrated in FIGS. 1–4, differs primarily in the construction of the channel structure 1, utilizing two runners 35 of generally standard construction. Each of the runners illustrated comprises an intermediate web portion 2', defining the sidewalls of the channel structure, each of which terminates along its lower edge in oppositely disposed flange portions 5', the outermost flange of each runner corresponding to the flange portion 5 of the construction illustrated in FIG. 1 and forming supporting means for a plurality of sealing panels A, shown in broken lines, adapted to rest thereon. Each runner 35 is provided at the upper edge of its web portion with a longitudinally extending tubular bead portion 36 of generally rectangular transverse cross-section having vertically extending sidewalls 37 and a top wall 38.

The air diffusing member 16' in this construction, while of generally similar shape to that illustrated in FIG. 1, it is provided with a horizontally extending intermediate wall 19' from which the sidewalls 17' extend upwardly in diverging directions, terminating at their upper edges in horizontally extending portions 39 from which upwardly extending portions 41 extend and in turn terminate at their upper edges in outwardly disposed flange portions 42. In this construction the channel-shaped structure is completed by the intermediate wall member 3 which is provided at its outer edges with downwardly extending sidewall portions 2a, terminating at their lower edges in inwardly directed longitudinally extending ribs or beads 43 of more or less V-shape in transverse cross-section, the lower edge portions of which diverge outwardly and downwardly.

It will be appreciated that in this construction the bead portions 36 effectively interlock the air diffusing member and the upper portion of the channel structure including the top intermediate wall 3 and sidewalls 2a with the air diffusing member 16', the upper flange portions 42 of which are clamped between the top wall of the associated bead 36 and the intermediate wall 3 with the corrugations or beads 43 preventing undesired disengagement of the bead portions 36 of the runner structures 35 from the assembly.

As illustrated in FIG. 8, in this construction the damper member 25' is provided with a horizontal bottom wall 29' from which the sidewalls 26' extend upwardly and outwardly in diverging directions and terminate at their upper edges in vertically extending portions 44. The proportions of the damper structure are selected that the diverging sidewalls 26' will nest on the cooperable sidewalls 17' of the air diffusing member, with the upper edges of the vertical portions 44 bearing on the lower surface of the intermediate wall 3, and the bottom wall 29' of the damper member being disposed closely adjacent to the bottom wall 19' of the air diffusing member. The intermediate wall 3 is provided with openings 4, in the same manner as the channel member of FIG. 1, and the duct engaging structure 7 may be constructed identical with that of FIGS. 1 and 2, and similarly mounted.

As in the initially described embodiment, the air diffusing member 16' and damper member 29' each may be provided with air openings 31 and 32 in one or both sidewalls thereof and the bottom walls 16' and 19' may be provided respectively with one or more access openings 33' and tool engaging openings 34' to facilitate adjustment of the damper member relative to the air diffusing member.

The construction of FIG. 5 may be readily assembled by disposing the air diffusing member and damper member in cooperable relation with respect to the intermediate wall 3 and snapping each bead 36 of the associated runner 35 into interlocked positions as illustrated in FIG. 5, springing the beads or corrugations 43 outwardly to permit passage of the associated bead 36 into interlocked position, the walls 2a having sufficient resiliency to permit such insertion and following the same return to their original positions.

It will be appreciated from the above description that the present invention provides a relatively very simple construction utilizing, in the construction illustrated in FIG. 1, apart from the mounting structure 7, merely three component parts, the channel member 1, air diffusing member 16 and damper member 29. The construction illustrated in FIG. 5, while requiring two additional pieces in the form of the runners 35 enables the utilization of standard runners as a part of the structure, providing a continuity of appearance with respect to the remainder of the sealing grid structure with which the invention is to be employed.

It will be appreciated that the present invention is completely compatible with existing types of grid systems and does not require any unusual or complicated installation techniques. Likewise, the basic components may be readily fabricated utilizing the same general type of equipment employed in connection with other sealing components resulting in a relatively inexpensive construction.

Having thus described my invention it will be obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention and hence I do not wish to be understood as limiting myself to the exact form and arrangement of parts herein shown and described.

I claim as my invention:

1. An air diffusing assembly for use in a suspended ceiling system employing a plurality of ceiling panels, comprising an inverted channel-shaped structure constructed from a single sheet of material having an intermediate wall and parallely extending sidewalls depending therefrom, said sidewalls terminating respectively in outwardly extending flanges, disposed in a common plane for engagement with respective ceiling panels, said intermediate wall of said channel having openings therein for the supply of air to the channel interior, means cooperable with said channel-shaped structure for conducting air to said openings, an air diffuser member of generally V-shape in transverse cross-section, having a pair of downwardly directed converging sidewalls connected at their respective upper edges to the channel structure, said converging sidewalls terminating in outwardly diverging wall portions connected at their bottom edges by an intermediate wall portion, said diverging wall portions each being spaced from the junction of the channel walls and associated flanges to provide air passages therebetween with said intermediate connecting portion being disposed below said flanges, at least one of said converging sidewalls having openings therein for the passage of air therethrough, and a damper member disposed in the air diffuser member and having a sidewall slidable along the inner face of said air diffuser member instructed to selectively vary the effective size of the openings in the associated diffuser sidewall for controlling air flow therethrough.

2. An assembly according to claim 1, wherein said air conducting means comprises a channel-like member having an intermediate portion secured to the connecting portion of said channel structure and having openings therein communicating with the openings in said U-shaped structure, the free edges of said channel-like member being constructed for engagement with respective walls of an air duct.

3. An assembly according to claim 2, wherein the edges of said channel-like member each are of U-shape in transverse cross-section to form a channel in which the edges of the adjacent walls of such an air duct may be disposed.

4. An assembly according to claim 1, wherein said channel-shaped structure and said air diffuser are provided with interlocking portions operated to retain the same in assembled relation.

5. An assembly according to claim 1, wherein said damper member is generally V-shape in transverse cross-section, having sidewalls overlying and slidable on the inner faces of the sidewalls of said air diffuser member, the walls of said damper member having offsets therein adjacent their lower edges engageable with said outwardly diverging portions and connected by an intermediate portion bearing on the intermediate portion of said air diffuser member.

6. An assembly according to claim 5, wherein said air conducting means comprises a channel-like member having an intermediate portion secured to the connecting portion of said channel structure and having openings therein communicating with the openings in said U-shaped structure, the free edges of said channel-like member being constructed for engagement with respective walls of an air duct.

7. An assembly according to claim 5, wherein said intermediate portion of the air diffuser member is provided with access openings therein to permit access to said damper member for adjusting the same.

8. An assembly according to claim 7, wherein said intermediate portion of the damper members is provided with an opening therein adapted to align with the opening in said air diffuser member for receiving an adjusting member.

9. An air diffusing runner assembly for assembly in a suspended ceiling system employing a plurality of ceiling panels supported by a suspended grid structure formed by a plurality of suitably connected runners of generally inverted T-shape in transverse cross-section, providing oppositely directed aligned flanges upon which peripheral edge portions of such ceiling panels are adapted to rest, comprising an inverted channel-shaped structure constructed from a single sheet of material having an intermediate wall and parallely extending sidewalls depending therefrom, said sidewalls terminating respectively in outwardly extending flanges, disposed in a common plane for engagement with respective ceiling panels, said flanges having a transverse width substantially equal to that of the respective runner flanges and adapted to present a corresponding appearance, said sidewalls each having a vertical height substantially equal to the corresponding height of the runners of the grid structure in which it is to be assembled and form a part thereof, the intermediate connecting portion of said channel having openings therein for supply of air to the channel interior, means cooperable with said channel-shaped structure for conducting air to said openings, an air diffuser member of generally V-shape in transverse cross-section, having a pair of downwardly directed converging sidewalls connected at their respective upper edges to the channel structure, at least one of said converging sidewalls having openings therein for the passage of air therethrough, and a damper member of generally V-shape in transverse cross-section disposed in the air diffuser member and having respective sidewalls slidable along the inner faces of the adjacent walls of said air diffuser member, at least one of which is constructed to selectively vary the effective size of openings in the associated diffuser sidewall for controlling air therethrough.

10. An assembly according to claim 9, wherein said air conducting means comprises a channel-like member having an intermediate portion secured to the connecting portion of said channel structure and having openings therein communicating with the openings in said channel-shaped structure, the free edges of said channel-like member being constructed for engagement with respective walls of an air duct.

11. An assembly according to claim 10, wherein the edges of said channel-like member each are of U-shape in transverse cross-section to form a channel in which the edges of the adjacent walls of such an air duct may be disposed.

12. An assembly according to claim 9, wherein said channel-shaped structure comprises a pair of spaced runner members each having an intermediate web forming the sidewalls of said channel-shaped structure and each provided at its lower edge with said outwardly extending flange, each of said webs being provided at its upper edge with a longitudinally extending bead, and a horizontally disposed member connecting said beads and forming the intermediate portion of said channel member, said horizontally disposed member having downwardly depending sidewall portions constructed to engage said beads for preventing downward movement of said runners relative to said connecting member, said air diffuser member having its upper edge portions each disposed on the top of the adjacent runner bead and having the adjacent wall of the diffuser disposed in engagement with the sidewall of the adjacent runner bead for preventing disengagement of such bead from the bead engaging portions of said horizontally extending member.

13. An assembly according to claim 12, wherein said damper members are constructed with upper edge portions disposed adjacent the horizontally disposed connecting member, operative to prevent relative separating movement between said damper and diffuser members.

14. An assembly according to claim 13, wherein said damper member is generally V-shape in transverse cross-section having sidewalls overlying and slidable on the interface of the sidewalls of the diffuser member, the diffuser and damper member having respective cooperable intermediate portions at their lower converging edges, said intermediate portion of the diffuser member being so positioned with respect to the plane of said runner flanges that an air passage is provided between the junction of such intermediate portion with each sidewall of the diffuser member and a free edge of the adjacent runner.

15. An assembly according to claim 14, wherein said runners are each provided at the lower edge of the web portion with oppositely disclosed flange portions, all aligned in a common plane, with the intermediate portion of the diffuser member being spaced above such plane, wherein said air passages are each defined by the juncture of said intermediate and sidewall portions of the diffuser member and the edge of the adjacent runner flange.

16. An assembly according to claim 15, wherein said air conducting means comprises a channel-like member having an intermediate portion secured to the connecting portion of said channel structure and having openings therein communicating with the openings in said U-shaped structure, the free edges of said channel-like member being constructed for engagement with respective walls of an air duct.

17. An assembly according to claim 16, wherein said intermediate portion of the air diffuser member is provided with access openings therein to permit access to said damper member for adjusting the same.

18. An assembly according to claim 17, wherein said intermediate portion of the damper members is provided with an opening therein adapted to align with the opening in said air diffuser member for receiving an adjusting member.

* * * * *