United States Patent [19]

Rachlin et al.

[11] **3,760,709**

[45] **Sept. 25, 1973**

[54] **VENTILATING AIR DISTRIBUTING CHANNEL SPREADER-SUPPORTING BRACKET**

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[22] Filed: **June 12, 1972**

[21] Appl. No.: **262,040**

Related U.S. Application Data

[62] Division of Ser. No. 10,508, Feb. 11, 1970, Pat. No. 3,673,945.

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

[51] **Int. Cl.** **F24f 7/04**

[58] **Field of Search** ..... 98/40 D

[56] **References Cited**

UNITED STATES PATENTS

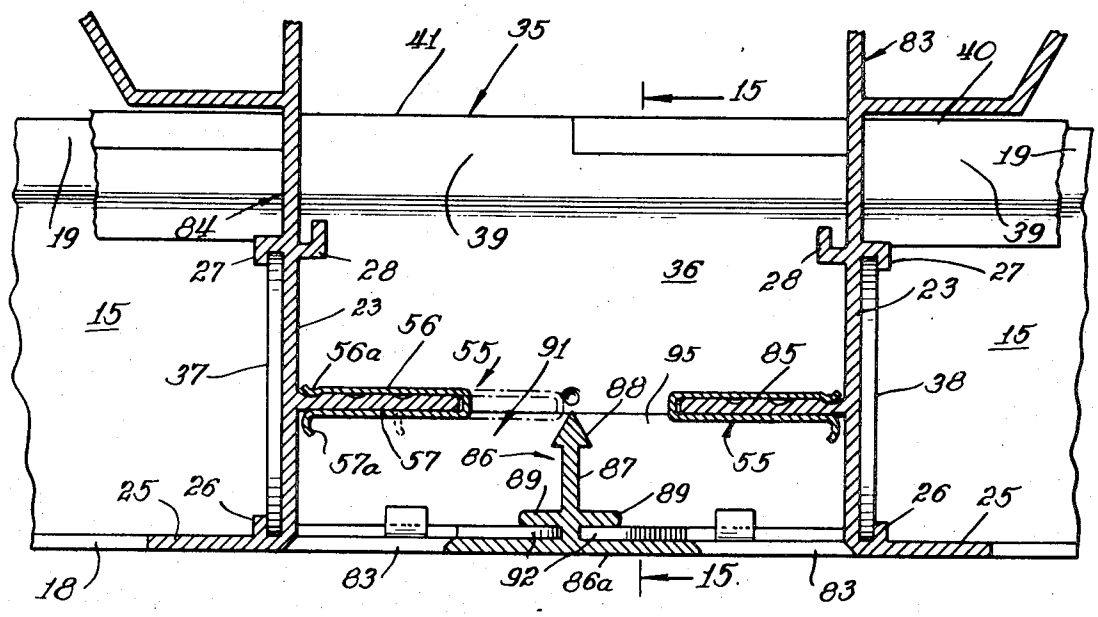
3,223,019 12/1965 Schuh ..... 98/40 D

Primary Examiner—William F. O'Dea
Assistant Examiner—Peter D. Ferguson
Attorney—Howard H. Darbo et al.

[57] **ABSTRACT**

The supporting grid (e.g., main and cross inverted tees) of a suspended ceiling also supports ventilation air-distributing apparatus including an air flow spreader. This apparatus comprises a lower air flow channel section formed of two extruded metal bars having vertical webs with hooks on the outside of the web defining ways into which the wings of a bracket project to hold the spaced bars in a channel assembly. A clip integral with the bracket hooks over the top of a grid tee and has gripper conformations to mate with a clip on the opposite side of the tee to align channels. The air from the duct discharges out through the opening between the webs and a spreader directs the air generally outwardly, as well as downwardly. In one aspect of the invention, special brackets are provided to support the air flow spreader at its proper position.

2 Claims, 15 Drawing Figures



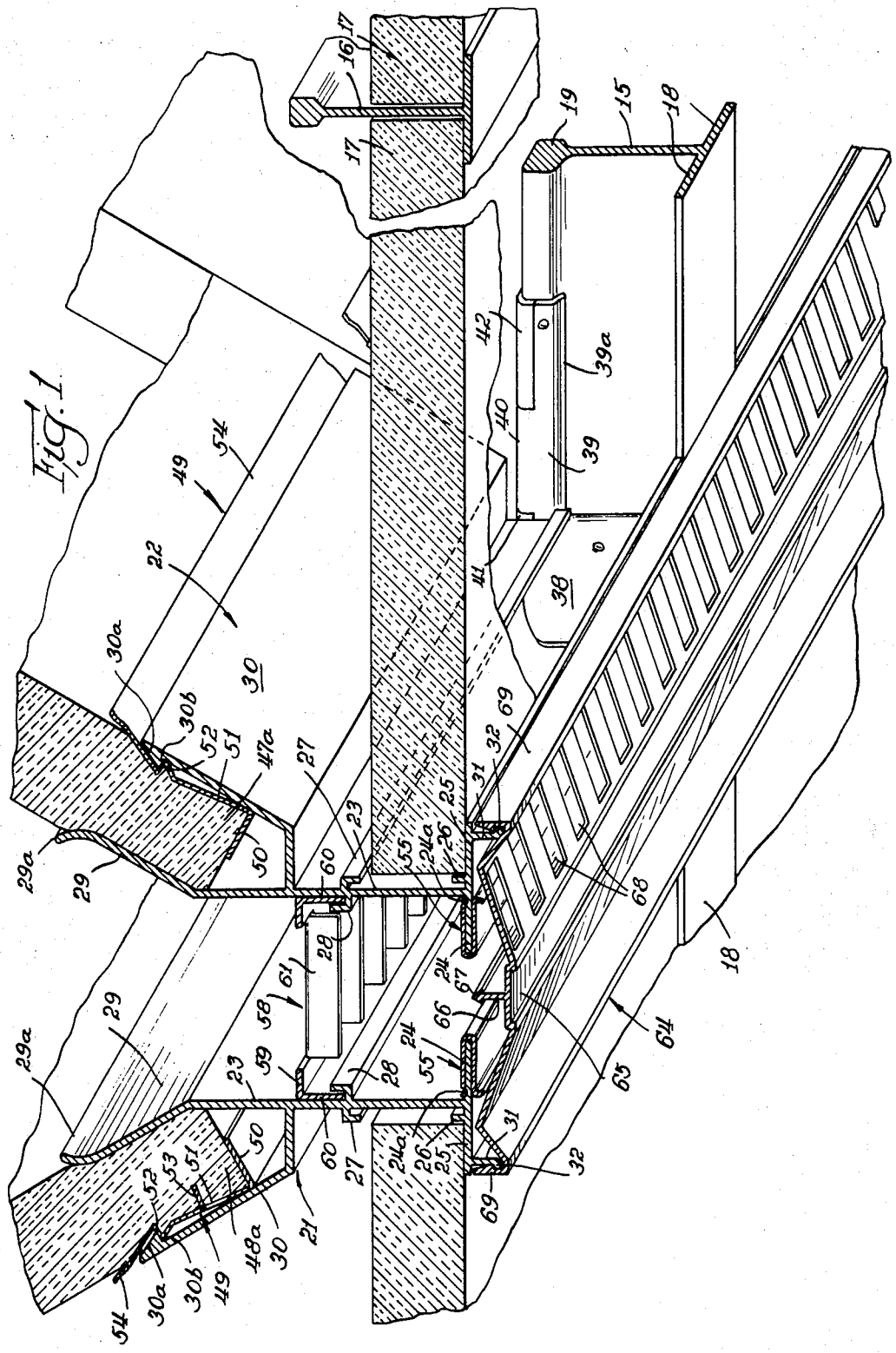

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Fig. 1

Fig. 2.

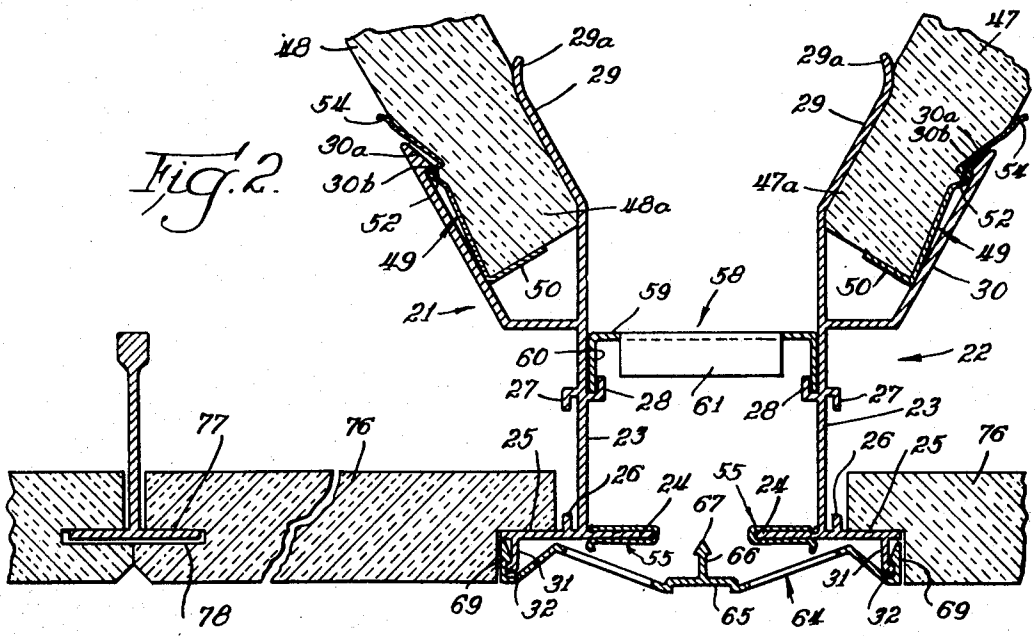


Fig. 3.

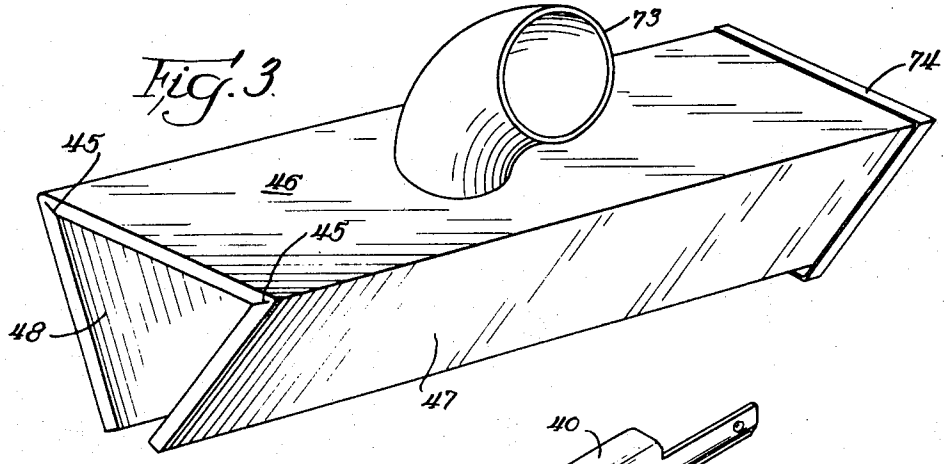
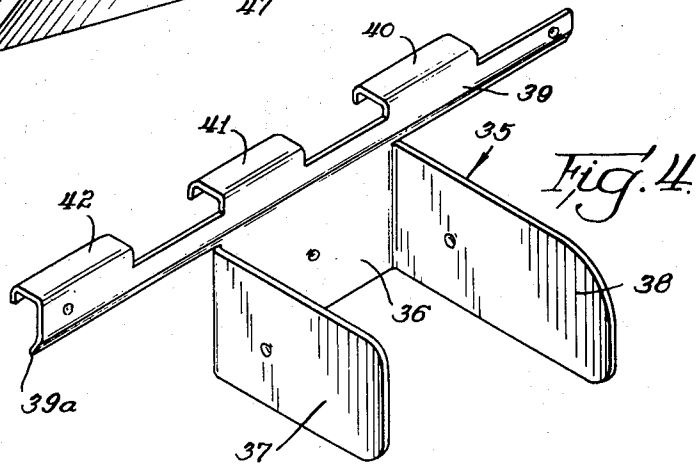


Fig. 4.



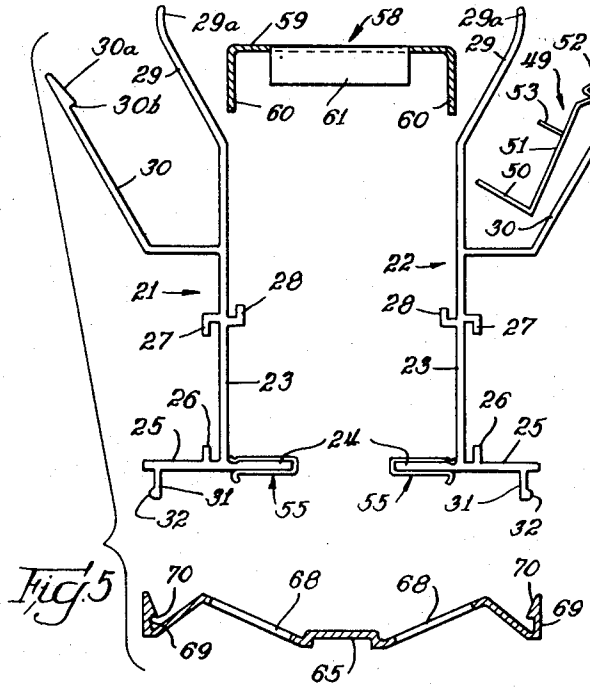


Fig. 5

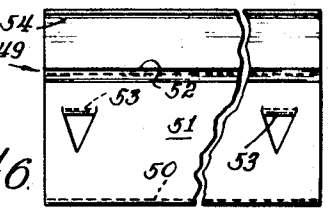


Fig. 6

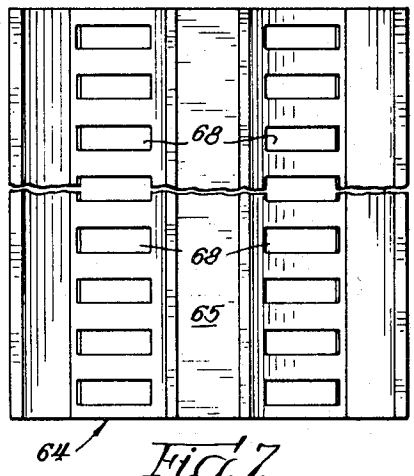


Fig. 7

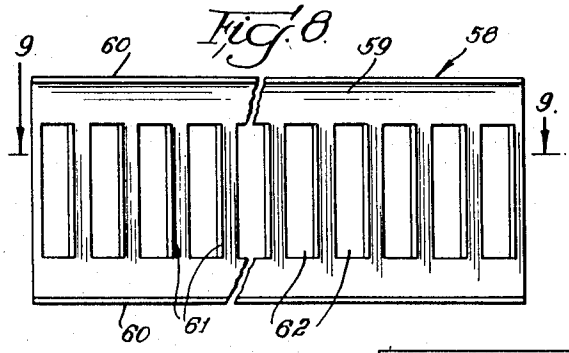


Fig. 8

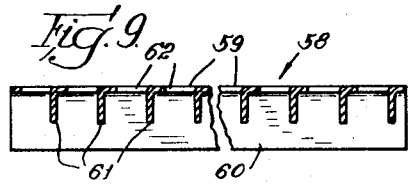


Fig. 9

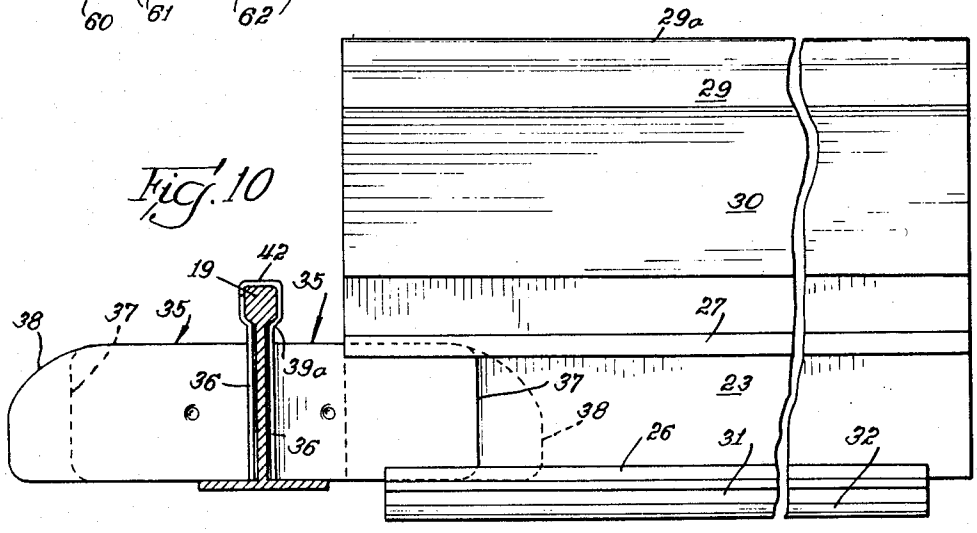


Fig. 10

Fig. 11.

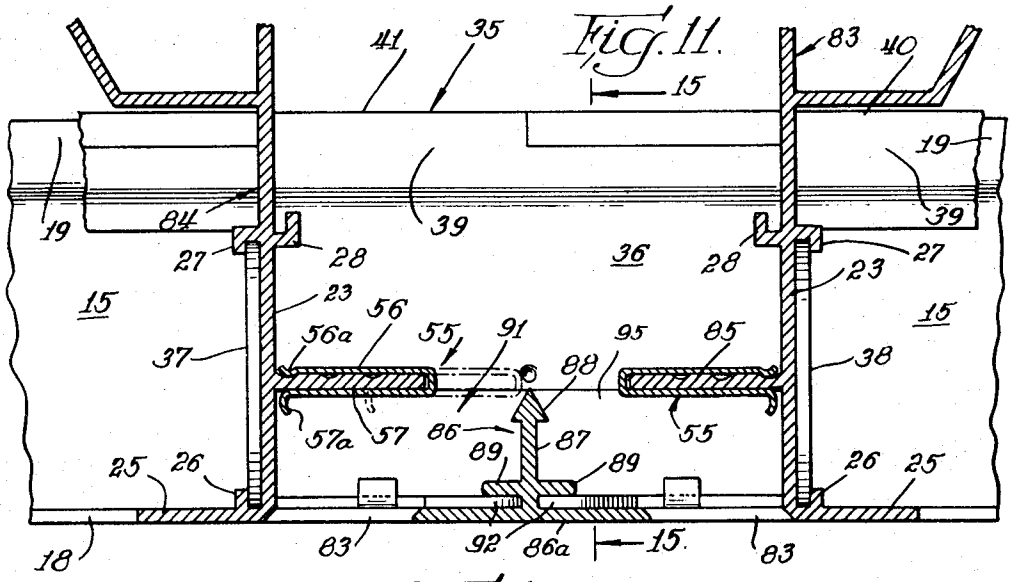


Fig. 12

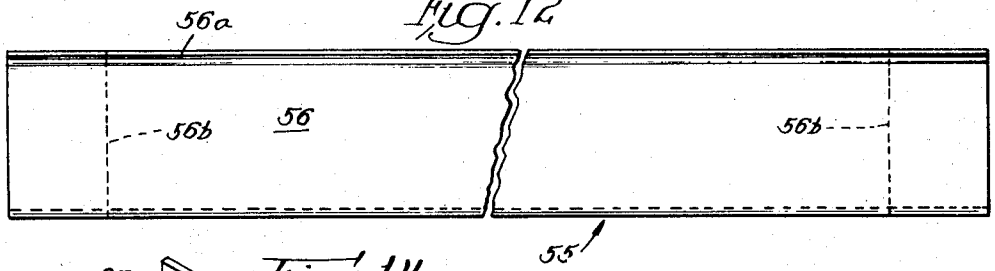
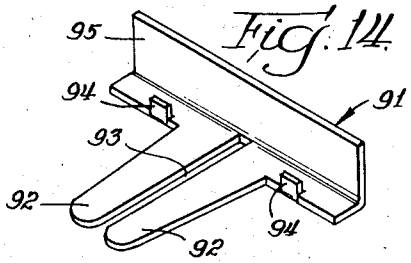


Fig. 14



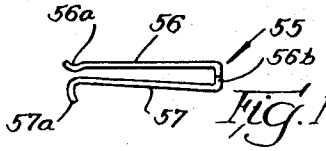
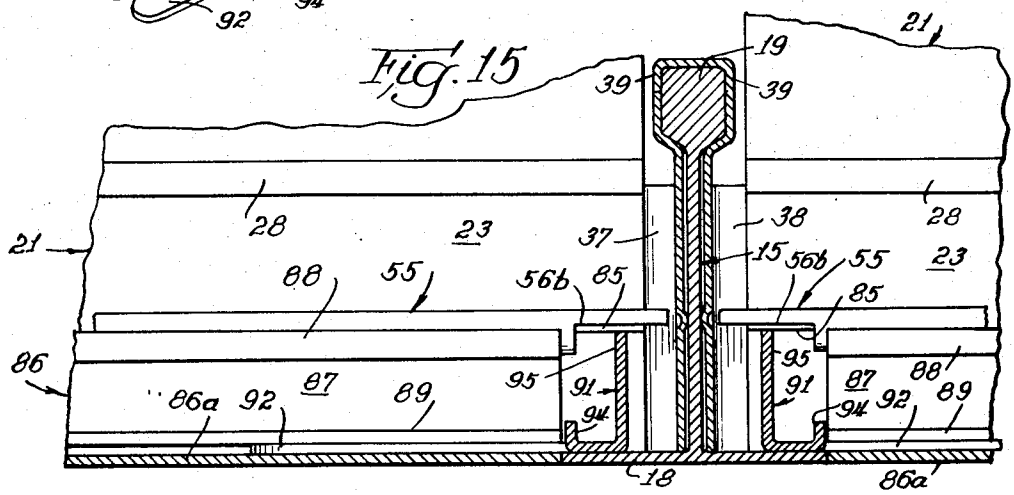


Fig. 13

Fig. 15



VENTILATING AIR DISTRIBUTING CHANNEL SPREADER-SUPPORTING BRACKET

RELATED APPLICATION

This application is a division of application Ser. No. 10,508, filed Feb. 11, 1970 now U.S. Pat. No. 3,673,945, dated July 4, 1972. It relates particularly to the bracket that supports and positions the air flow spreader.

BACKGROUND AND SUMMARY OF THE INVENTION

Various forms of structures have been proposed and used for providing ventilating air distribution in connection with suspended ceilings. The systems in commercial use suffer from a common disadvantage, namely, they must be assembled (to a greater or lesser extent) at the ceiling level. This is difficult and awkard to do. Inevitably, it results in very high labor costs. As the very minimum they require the installation and attachment of wires, rods, or other supports to the air duct and distribution apparatus while the latter is otherwise being held in place. Great care and skill is needed to properly install the structures.

Also, in known systems, installation requires measuring and cutting and otherwise fitting of materials and parts in expensive custom manner. The bill of materials for a given job requires considerable figuring to arrange for a balanced and adequate supply of materials and parts. The systems and installation procedures are geared to now obsolete scales of building trade labor costs.

The present invention provides a simplified air-distributing apparatus which may be completely assembled at a convenient working location (on a bench or even on the floor) and then merely lifted into place and deposited on the ceiling grid structure. There is no necessity for any independent suspension for the air distribution apparatus. It uses the same suspension, i.e., the tees or channels of the ceiling grid structure, that is otherwise present for supporting the ceiling.

A principal object is to provide a special bracket for supporting and properly positioning the air flow spreader of a ceiling air-distributing apparatus which is characterized by flexibility of application in that it is readily adapted to differing size, capacity, functional and appearance requirements and by modular dimensioning which makes possible efficient packaging, storage, handling and shipping, as well as installation.

Other objects and advantages will become apparent from the following description.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of portions of an installation utilizing one embodiment of the invention;

FIG. 2 is a sectional view illustrating the embodiment of FIG. 1 employed in a ceiling wherein the air-distributing apparatus is flush with the surface of the ceiling;

FIG. 3 is a perspective view of an example of a fiberglass duct section;

FIG. 4 is a perspective view of one of the brackets used for supporting the apparatus from grid tees;

FIG. 5 is an exploded view of the apparatus hardware;

FIG. 6 is a side view of one of the fiberglass duct retainers;

FIG. 7 is a bottom view of the air discharge grille;

FIG. 8 is a plan view of the air extractor;

FIG. 9 is a section as viewed along the line 9—9 of FIG. 8;

FIG. 10 is a partially disassembled view illustrating the manner in which the bracket of FIG. 4 is used;

FIG. 11 is a cross-sectional view of an alternative embodiment of the invention;

FIG. 12 is a bottom view of an air flow control damper;

FIG. 13 is an end view of one of the air dampers;

FIG. 14 is a perspective view of a support bracket employed in the embodiment of FIG. 11; and

FIG. 15 is a cross-sectional view showing the manner in which the support bracket of FIG. 14 is employed.

DESCRIPTION OF SPECIFIC EMBODIMENTS

The following disclosure is offered for public dissemination in return for the grant of a patent. Although it is detailed to ensure adequacy and aid understanding, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how others may later disguise it by variations in form or additions or further improvements. The claims at the end hereof are intended as the chief aid toward this purpose, as it is these that meet the requirement of pointing out the parts, improvements, or combinations in which the inventive concepts are found.

FIG. 1 illustrates the use of an embodiment with a ceiling system comprising conventional grid of longitudinal (main) tees **15** and cross-tees **16**, with ceiling tiles **17**. The tees conventionally have a bottom flange **18** on each side and a bulbous head **19**. Any conventional means, such as wires (not shown), for supporting main tees **15** may be employed.

In this embodiment of the invention two bar members, generally **21** and **22**, are employed. These bar members are formed from extruded metal, e.g., aluminum. They are identical and one has been turned end for end with respect to the other so that one forms a "left" and the other forms a "right." Describing, specifically, the bar on the left in FIG. **1**, the section from which the bar member is formed comprises a vertical web **23**, having at the lower end thereof an inwardly extending flange **24** and an outwardly extending flange **25**. A longitudinal rib forms what may be termed a finger **26** extending upwardly in spaced relation to web **23**. A hooked rib forms an upper finger **27**. These two ribs, equally spaced from web **23**, define a partially enclosed way for receiving the wings of the mounting brackets, as hereinafter described. An inwardly extending rib forms a shelf **28**. Extending upwardly from the top of web **23** is an angular arm **29**. A second arm **30** extends outwardly from web **23** in spaced, parallel relation to arm **29**.

Adjacent the distal edge of the exterior bottom flange **25** is a downwardly extending support member **31** having a rib **32** along the bottom thereof.

To support the bar members **21** and **22** in proper relation to each other and form the air-distributing channel, and to mount the channel on the tees **15**, a pair of brackets, generally **35**, are employed (as best seen in FIGS. **1**, **4** and **10**). Bracket **35** is formed from sheet metal and includes a plate **36** which eventually lies alongside the vertical portion of the tee. Extending outwardly at right angles from plate **36** are a pair of wings

37 and 38. These wings are of a size to be received and securely retained in the ways defined by fingers 26 and 27 of the bars. When fully inserted in the ways, the web 23 of the bar members abuts the main plate 36 of the bracket.

Extending upwardly from the main plate 36 is a clip portion in the form of a bar 39 with three grippers 40, 41, 42 integral therewith. The grippers 41 and 42 are spaced apart by gaps equal to their individual lengths and are disposed eccentrically with respect to the center line of the bracket (as it exists midway between wings 37 and 38). The positioning is such that when the two brackets are applied to opposite sides of a supporting grid tee (see FIGS. 10 and 15) the grippers from the two sides inter-digitate so that opposite wings of the two brackets on each side of the tee are in exact alignment. The lower portion 39*a* of the bar 39 fits under bulbous head 19 of the tee when the bracket is mounted thereon. This, in combination with the gripper 42 extending around the top of the head 19 and down partially over the far side, provides a secure gripping of the tee by the bracket.

A section of fiberglass ducting is used for the air supply duct. This is conventional ducting material which may be formed to the shape most convenient for the particular installation. Two folds 45 (FIG. 3) to form a triangular duct is usually the simplest. This triangular duct has a top 46 and two sides 47 and 48. The lower portions 47*a* and 48*a* of the two sides are inserted into the two slots defined by the spaced arms 29 and 30 of the bars 21 and 22. To facilitate this, the upper portions of arms 29 are outwardly curved, as indicated at 29*a*. The upper portion of arm 30 has an inwardly extending taper 30*a* extending to a step 30*b*. A duct retainer, generally 49, is applied to the sides of the duct before the latter is put into place. This retainer comprises a length of sheet metal having a bottom flange 50, a side 50 formed with an outwardly projecting detent 52, inwardly projecting prongs 53 and an upper release lever 54. These duct retainers 49 are applied to the edges of the duct with the prongs 53 being pressed securely into the fiberglass duct material. As the duct with its retainers then is inserted between the arms 29 and 30, the resilient fiberglass material being somewhat compressed in the process, the detent 52 ultimately snaps into place behind step 30*b* so as to securely lock the fiberglass duct to the bar members 21 and 22, the joint being self sealing against air leakage. Inward pressure on release lever 54 will disengage detent 52 from step 30*b* and permit removal of the duct from the channel.

Shutters, generally 55, are employed on inner flanges 24 to serve as dampers for the regulation of the air flow. These shutters are formed of continuous lengths of sheet metal bent into a U so as to have an upper plate 56 and a lower plate 57. These plates frictionally grip the inner flanges 24. The inner flanges may be formed with grooves 24*a* into which the detent end 56*a* can seat at a variety of positions. The end 57*a* is bent outwardly to form a handle to facilitate the manipulation of the damper from the room below the ceiling.

Between the bar members 21 and 22 is an air extractor, generally 58 (FIGS. 8 and 9). It comprises a plate 59, the longitudinal edges of which have been bent down to form flanges 60. Along the center portion a plurality of three-sided cuts were made with the metal within the cut areas being bent down to form a series of deflectors 61 and leaving openings 62 in the metal. The function of the extractor is to turn air downwardly when supplied for linear flow through the duct.

Along the under side is a cap or grille, generally 64, also preferably formed by metal extrusion. Along the under side, the cap has a center recess 65, into which the upper edge of a partition may be inserted if the area being ventilated is divided into rooms. A divider 66 extends upwardly at the center line of the cap and has an arrowhead ridge 67 along the top thereof. At each side of divider 66 the cap is provided with a plurality of openings 68. Along each side are upwardly extending support flanges 69 having hooks 70 (FIG. 5) along the inner sides thereof. These hooks 70 are for engaging the bulbous ridges 32 of support members 31 to hold the cap in place.

It is common practice to position the longitudinal tees 15 on four foot centers. Accordingly, the bar members 21 and 22, the extractor 58, the duct sections 46–48, the duct retainers 49 and the shutters 55 would be cut into, and supplied in, 4 foot lengths (or just that amount short of 4 feet to allow for the thickness of the metal at each side of the center line of the tees). The caps may also be supplied in lengths exactly 4 feet long.

While all of the hardware for a single unit may be packaged together, assembled or unassembled, and so supplied to the job, it may be more economical to package and ship the several component parts separately. The units will then be assembled at the job site, but this need not be done overhead; it can be done conveniently and rapidly on the floor or on a bench. Advantageously, a sheet of fiberglass ducting is scored (for bending), a duct retainer 49 applied to each long edge and bars pressed onto the ducting. The duct is then formed by bringing the sides up until the bars confront each other and the end brackets 35 are inserted to hold the bar members together in the proper spaced relation. Insertion of the bracket wings into the ways is facilitated by the greater length and curved end of wing 38. Shutters are already in place on their supporting flanges 24 as the bars are supplied. The assembly is then turned right side up and the extractor 58 (if used) is put into place.

The thus assembled complete, integral unit is now ready to be positioned on the ceiling structure. It is relatively light and can be handled readily by one man. He lifts it up and deposits it at the desired location spanning a pair of grid tees. While it is resting on the tees, and working on one end at a time, he presses the clips at the tops of brackets 35 down securely over the heads of the tees. The unit is now in place, and the workman can proceed with the assembly and installation of another unit. If the job plans call for two or more lengths of duct and channel to be connected in series, the next unit is similarly placed in position in the grid in longitudinal alignment with the first unit. Exact alignment is automatically provided by the interdigitating fit of grippers 40, 41, 42 of the two associated support brackets. Following usual practice, the joint between adjacent ends of the units are taped to prevent appreciable air leakage.

The air-distributing runs may be supplied with ventilating air by longitudinal (usually called "linear" in the trade) flow through the fiberglass duct from a source connected at one end, in which case the extractors are usually employed to turn the air downwardly, or the air may be supplied to the units from a supply duct through boot connections 73. Ends of ducts may be closed by

means of closures 74 conveniently cut from the fiberglass ducting material and taped into place.

When all of the units of a given row have been put into place, the cap 64, cut to the proper length, is appled to the whole row of units. If the ducting extends from wall to wall of the room, then the cap 64 would be of that length. By pushing upwardly on cap 64 the supports 69 are forced into place so that the hooks 70 engage the ridges 32 of supports 31. As is apparent in FIG. 1, the cap 64 is below the bottom of flanges 18 of the tees so that a "finished " appearance is achieved. Should the cap 64 only extend across a part of the room, filler plugs (not shown) may be inserted into the gaps at the exposed ends, which gaps would be below the bottom of bar members 21 and 22 and above the cap 64.

As is indicated above, caps 64 may be supplied in the same lengths as the other parts of the apparatus, in which case no cutting is necessary on the job. The continuous length of cap presents a better appearance because most, if not all, of the butt end joints may be avoided. If the air-distributing units are arranged to meet at, for example, right angles in the ceiling, the parts of the apparatus, including the caps, may be cut to form a mitre type joint.

After the system has been installed, the dampers are set for the desired air flow from each side of cap 64. The flow on each side may be adjusted individually, since the gap between head 67 and the shutter 55 on each side is individually controllable. As a matter of fact, if desired, one side may be shut off entirely by bringing the shutter on that side over against head 67.

The air-distributing apparatus illustrated in FIG. 2 is identical with that already described. However, FIG. 2 illustrates the manner in which this system is employed in connection with a ceiling of the type wherein the ceiling tiles 76, instead of resting on the exposed flanges 77 of the tees, have slots 78 into which the flanges 77 extend. In this arrangement the tiles 76 that are to rest on flanges 25 of the air-distributing channels are notched out so that when the tile is in place it will be horizontal. The flanges 25 and the flanges 77 are at the same elevation whether the tiles and ceiling arrangement are of the type illustrated in FIG. 1 or the type illustrated in FIG. 2, but in the latter the supporting grid structure is hidden from view.

FIGS. 11–15 illustrate a modified form of the invention. The configuration of the bar members 83 and 84 is the same as that of the bar members 21 and 22 with the following modifications:
Internal flanges 85 are arranged at a higher level than flanges 24 and the cap-supporting members 31 are dispensed with. Instead of the apertured cap 64, a center spreader 86 is employed comprising a plate 86*a* with an upright divider 87 having a traingular head 88. Flanges 89 extend outwardly on each side of divider 87 in spaced parallel relation to plate 86*a*. Again, the spreader may be an extruded section cut to a length such as to extend between the flanges 18 of adjacent tees 15 in the ceiling grid structure.

Brackets 91 are employed to support the spreader in the air-distributing apparatus. Each bracket has a pair of horizontal prongs 92 which fit on opposite sides of divider 87 between flanges 89 and plate 86*a*. A slot 93 between the prongs accepts the divider and, for purposes that will be understood as this description proceeds, the slot extends all of the way to the inner surface of back 95 of the bracket. Upturned ears 94 are handle elements useful in ceiling mounting and demounting procedures.

As is best seen in FIG. 15, the brackets 91 rest on the flanges 18 of the tees 15 when the apparatus has been mounted in the ceiling structure. The top edges of the backs 95 of the brackets engage the undersides of flanges 85 in the fully assembled and mounted unit with the result that the spreader 86 is securely held against upward movement. If shutters 55 are provided full length, the end portions are notched, as at 56*b*, to provide clearance for brackets 91. The brackets rest upon their supporting tees between wings 37 and 38 of brackets 35. The backs 95 of the brackets 91 are as long as the inside distance between webs 23 of the bar members 83 and 84 so that the spreader 86 is centered between the two bar members. This results in equal air discharge slots 83 at each side of plate 86*a* through which the ventilating air can flow. As previously described, the amount of air being discharged through each slot can be controlled by the manipulation of dampers 55. This embodiment of the invention provides an especially attractive flush distributor arrangement.

While cap 64 of the form of the invention first described is supported by the channel assembly, the spreader 86, like the channel itself, rests upon the ceiling grid structure which, then, prevents downward or longitudinal movement of the mounted spreader. At the same time, the spreader supporting brackets 91 interrelate with the channel structure to prevent upward or lateral movement of the mounted spreader. Because of this three-way interrelationship, and because it is desirable to make the spreader demountable, special procedures, along with the special brackets, are employed in mounting the apparatus of FIG. 11. After the channel-duct unit has been assembled and placed in position in the ceiling grid structure, a bracket 91 is inserted as far as it will go into each end of a spreader and this subassembly is then arranged in position in the lower portion of the channel with the ends of plate 86*a* abutting the edges of supporting flanges 18. Using handle ears 94, the installer then pushes the brackets at each end of the spreader outwardly to positions upon flanges 18 with the backs of the brackets spanning the distance between the top surfaces of flanges 18 and the under surfaces of flanges 85. The spreaders are thus firmly secured in position. To remove a spreader from an assembled system, should that become desirable, the process is reversed.

If desired, the spreader sub-assembly may be arranged in position within the assembled channel with the brackets moved outwardly to plates 36 of brackets 35 and held in place as the unit is raised into position and mounted in the ceiling grid.

It will be understood that ventilating air supplied to the air-distributing channels will flow downwardly to the cap or spreader, as the case may be, then the stream will be divided and deflected to flow outwardly in opposite directions along under the ceiling, merging and mixing with the air in the room to provide draftless ventilation. By adjustment of the shutter dampers, the flow may be directed and the flow characteristics controlled to meet the needs of the particular location.

The apparatus itself is susceptible of many variations to adapt it to particular air requirements. The units may be installed in any lengths. If lengths less than the nor-

mal space between grid supports are to be employed, an additional grid tee or two may be used to support the unit. Esthetic and functional considerations may be readily reconciled and met. The units may be installed at any location along the lengths of the grid tees.

If narrower flow channels are desired, this is readily accomplished by appropriate alteration of the bracket dimensions. For example, the bars **83** and **84** may be fixed closer together by reducing the width of plate **36** of bracket **35** and the length of the back **95** of bracket **91.**

It should also be noted that, while the form of bracket **35** is that to be used with the very commonly used grids composed of inverted tee members, the shape of this bracket may readily be adapted for the same use with grids employing other grid rail shapes, such as channels, instead of tees.

As is suggested in the foregoing description, ventilating air may be supplied to the distributing channels either linearly from one end of the duct which is a part of the unit, in which case the air extractors would ordinarily be employed to turn the longitudinal flow downwardly as the air is fed to the room below, or more or less transversely of the duct when the air is fed from a main supply duct through flexible boots. In the latter case, the extractors may be dispensed with. If the space above the suspended ceiling is used as a supply plenum, the fiberglass ducts will be omitted, the ventilating air flowing directly into the distributing channels from the plenum space.

We claim:

1. In an air-distributing unit adapted to fit into and be supported by the tees of a suspended ceiling tee grid system, in combination, an air spreader comprising an elongated horizontal plate having a median vertical divider extending the length thereof and a pair of flanges extending outwardly from the divider in spaced relation to the plate to form with the plate a way on each side of the divider, and brackets for supporting said spreader in the unit, each said bracket comprising a vertical back portion dimensioned to fit between unit and grid structural elements in the assembled and mounted unit whereby to prevent vertical and lateral movement of said bracket and a pair of spaced horizontal prongs adapted to be received respectively in said ways and defining a median slot for slidingly receiving said divider therein, said slot extending to said back of said bracket whereby said bracket may be inserted into said ways at the end of said spreader to such an extent that the over-all length of the resulting sub-assembly is increased by only the thickness of said backs of said brackets.

2. Structure in accordance with claim **1** and including handle means on said bracket for manual engagement to adjust the position of said bracket in relation to the divider.

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