

[54] **ADAPTER MEANS FOR COUPLING A
PREPOSITIONED AIR PLENUM CHAMBER
TO A LATER POSITIONED AIR BAR**

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[58] Field of Search **98/40 D, 40 DL, 40, 114;
52/302, 495**

[56] **References Cited**

UNITED STATES PATENTS

3,591,076	7/1971	Bryans	236/49
3,126,811	3/1964	Kennedy	98/40
3,406,623	10/1968	Lambert	98/40
3,331,305	7/1967	Oneson	98/40
3,301,165	1/1967	Stanley	98/40
3,440,947	4/1969	Averill	98/40
3,353,472	11/1967	Lee et al.	98/40

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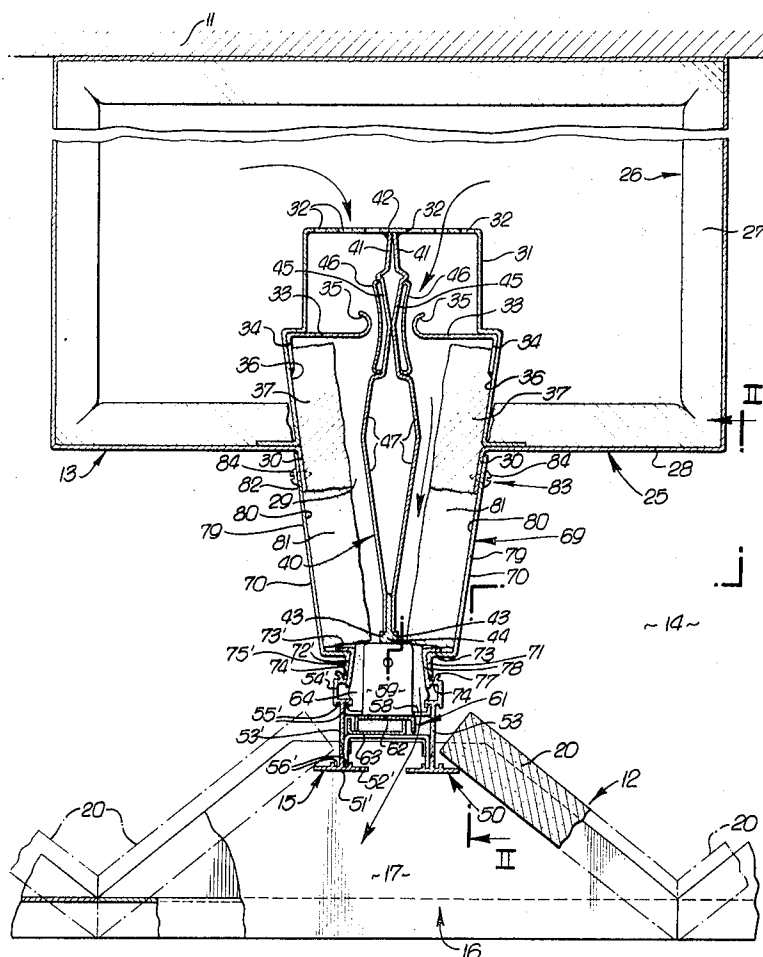
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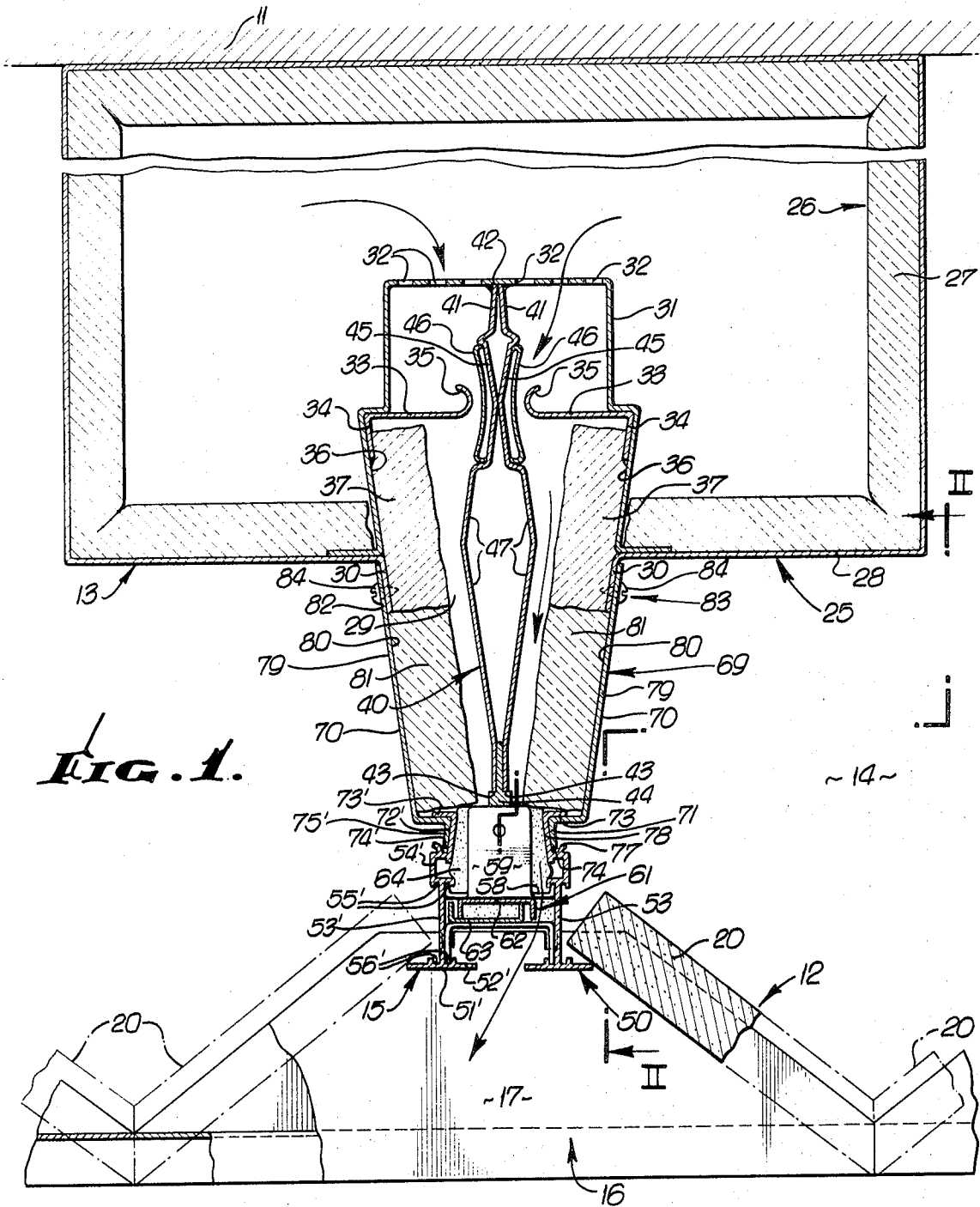
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ABSTRACT

A soffit-mounted prepositioned air plenum chamber with an outlet over an air bar provided as part of a suspended ceiling installation, and an adapter means therefor which includes a plurality of panel members, each with a bottom flange which is snappingly secured into a lateral channel upper extension of an inverted T-bar member in the air bar, an upper flange which is secured to the associated outlet wall of the plenum chamber, and middle portion which provides one side of an air directing throat to direct flow of air from the chamber through the air bar and into the room below. The panel members may be located in opposed pairs in longitudinal array with spaces between selected adjacent panel member pairs with blank-off members and end-closing members therebetween to close the outlet of the air plenum chamber to the air bar while opening the air bar to the attic space between the soffit and the suspended ceiling to divide the air bar into supply sections and return sections. The panel members, blank-off members and end closing members are easily removed and replaced to permit the interchanging of supply sections and return sections to give the greatest possible flexibility to the ventilating system.

8 Claims, 5 Drawing Figures





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FIG. 2.

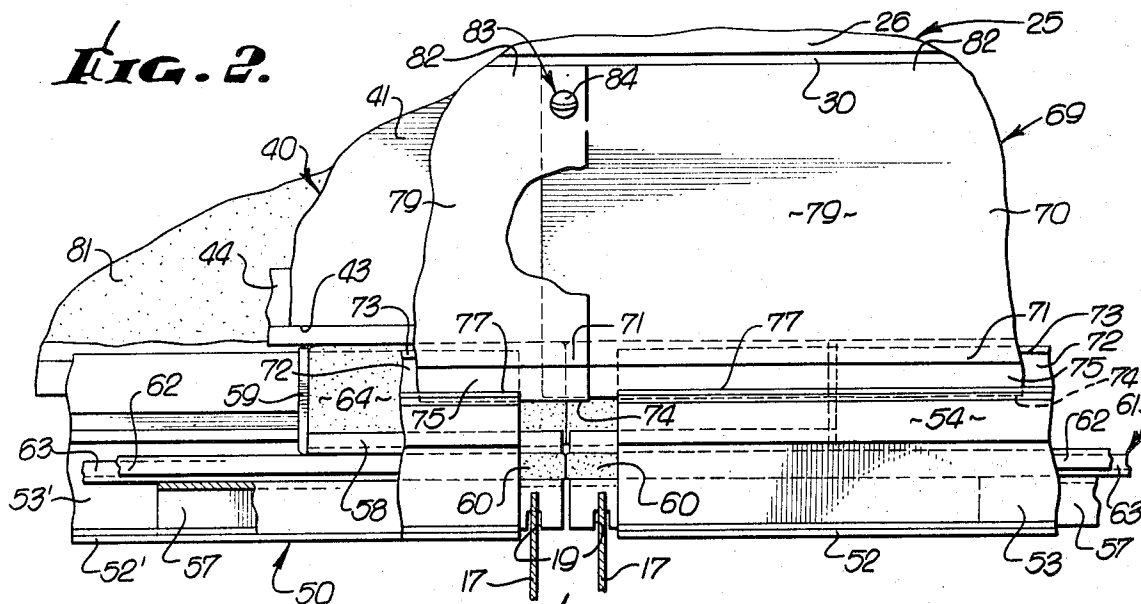
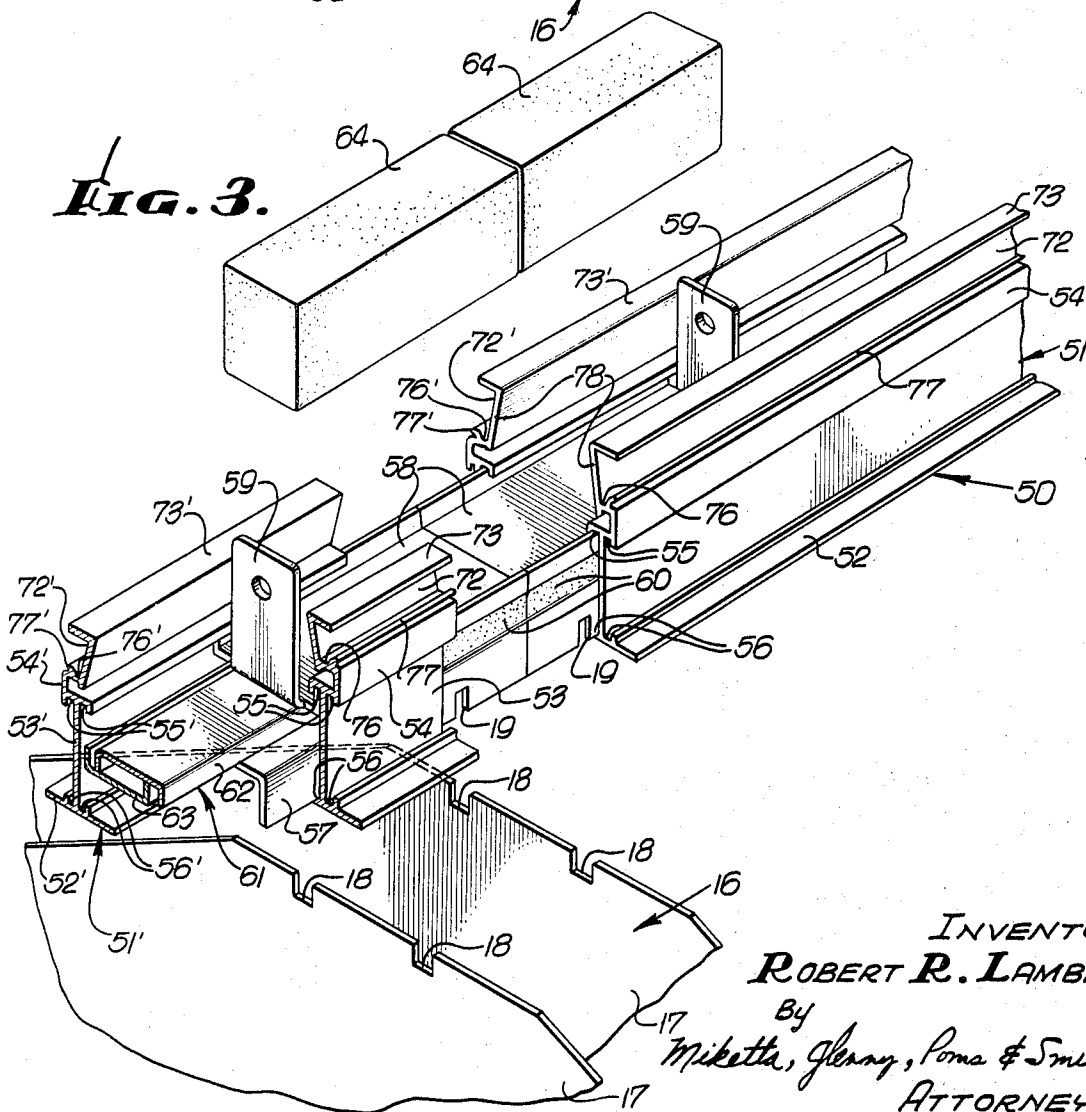
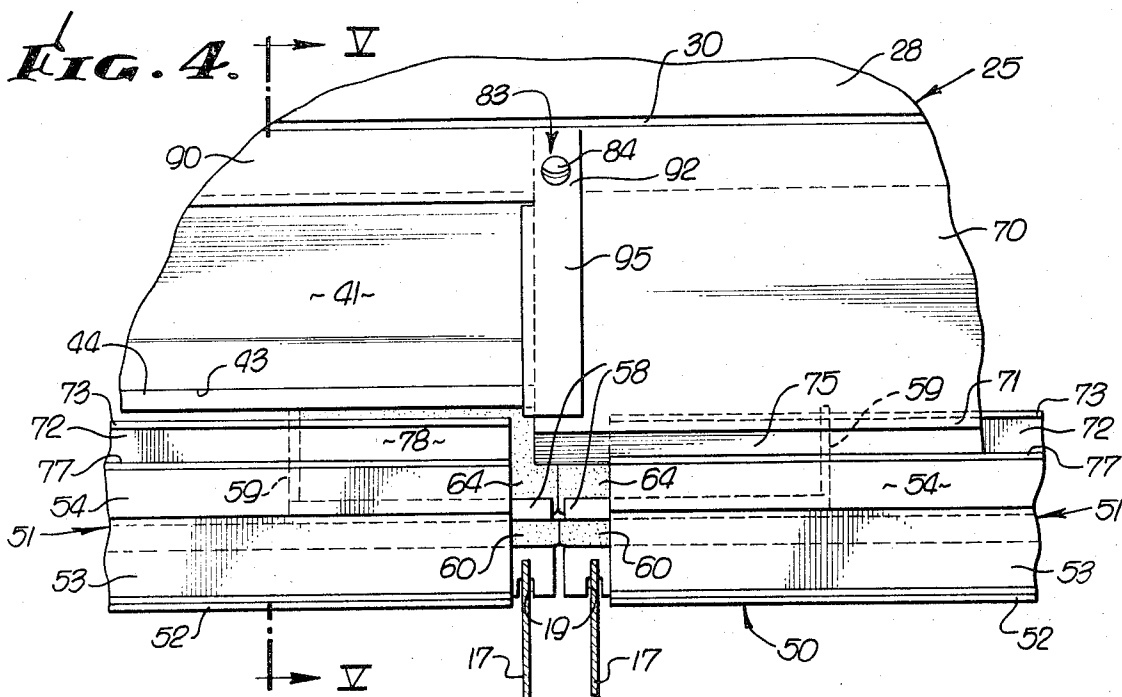
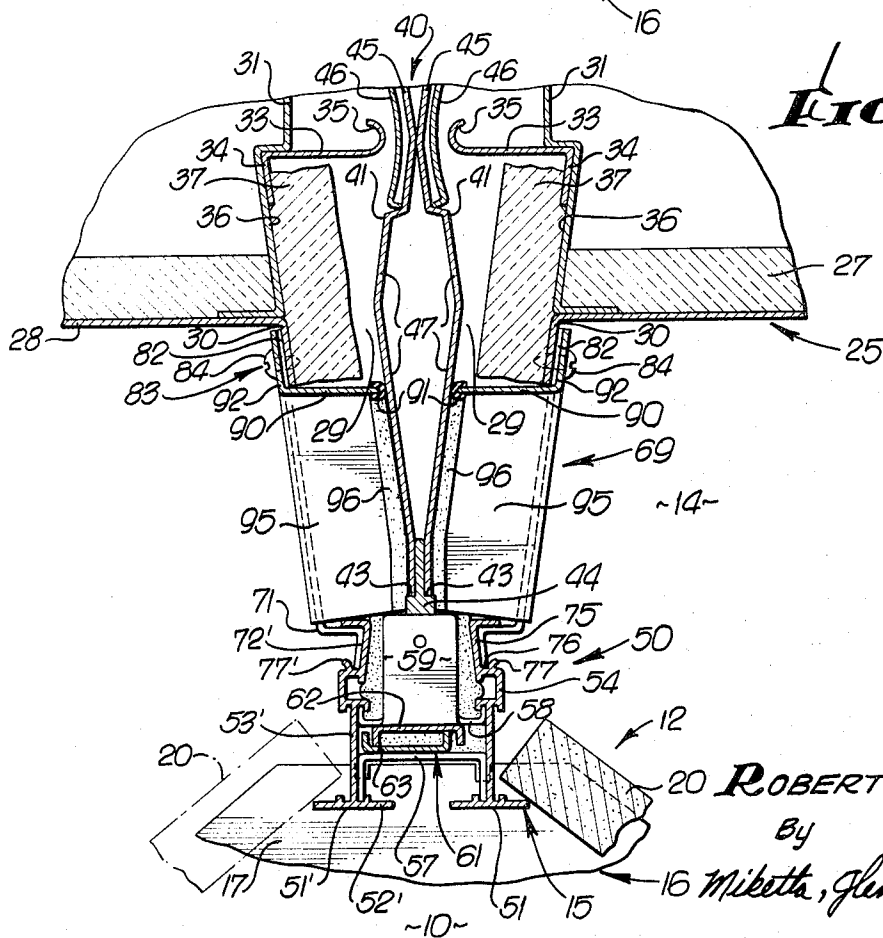


FIG. 3.



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BACKGROUND OF THE INVENTION

This invention relates to room ventilating systems for use with suspended ceilings, and more particularly to such systems having adapter means coupling a prepositioned air plenum chamber thereof to an air bar located in the suspended ceiling installation.

Heretofore, the component parts of a room ventilating system have been installed in a building after the gridwork or framework of the suspended ceiling is positioned below the real ceiling or soffit. The customary procedure is to position a suspended ceiling framework and the air bars contained therein, in the room first. The framework then divides the ceiling space below the real ceiling or soffit into a series of openings, usually square-shaped, through which the air plenum chamber, the air ducts and related parts of the ventilating system must pass to be installed. To install the air plenum chamber, air duct and related parts, the ventilating tradesman must work through the already positioned framework passing the air plenum chamber, the air duct and related parts, most of which are rather bulky, through the openings in the gridwork and positioning these parts while working through these openings. Once the ductwork and plenum chambers have been properly positioned, and secured to the air bars in the suspended ceiling framework, then the ventilating tradesman must wait while the ceiling installers and electricians return to insert the ceiling tile and light fixtures into the framework to complete the suspended ceiling.

Even though the suspended ceiling is now complete, the newly installed ventilating system is not yet operable. The ventilating tradesman must now return to adjust the air flow of the plenum chambers, air ducts and related parts that they have previously installed. With some of the better planned and simpler systems, the adjustment of the air flow may be accomplished from below the suspended ceiling, but with many of the more sophisticated and automatic ventilating systems, the adjustments in the system must be made, initially at least, in the plenum chamber outlets. However, access to the outlets can be obtained only from the attic space above the suspended ceiling, causing certain ceiling tiles to be repeatedly removed and replaced by the ventilating tradesman as the system is adjusted, checked and readjusted until the desired air flow is obtained in the room. As can readily be appreciated, the heretofore used assembly procedure involves the ventilating tradesman working under adverse conditions and involves duplication of effort between the ventilating tradesman and the ceiling installers.

Another drawback to the heretofore used ventilating systems has been their lack of flexibility to accommodate different room subdividing plans and provide these different plans with suitable air flow patterns. With most heretofore used ventilating systems, once the system has been designed and installed, the air flow pattern delivered by the system is limited by the provision of fixed supply sections and fixed return sections of the air bar. Some of the better planned ventilating systems provide supply areas and return areas which may be easily and simply changed or interchanged with a minimum of effort to provide different air flow pat-

terns as desired. One such system uses a movable plenum chamber sitting on a continuous air bar and supplied with air through a flexible duct. The chamber is thus movable along the air bar to change the supply and return sections of the air bar. Other such systems use selectively changeable blank-off plates, return openings, etc. to provide for changing the supply sections and return sections of the ventilating system. Such ventilating systems permit the changing of the partitions and the subdivisions of the room below the suspended ceiling as required for the maximum utilization of the space and still provides the proper air flow for such changes, without requiring the installation of a new ventilating system.

Even with such changeable systems, it appears to be unnecessarily complicating to install the component parts of the system through and into a ceiling space broken up by the suspended ceiling framework when the component parts could be more easily installed prior to the positioning of the ceiling framework. The final planned positions of the air bars of the suspended ceiling are shown in the building plans, and so it should be possible to preposition and attach the plenum chambers and associated duct work of the ventilating system to the real ceiling or soffit, prior to the installation of the ceiling and framework, thereby simplifying such installation.

If the air plenum chambers and associated duct work are attached to the ceiling prior to the installation of the suspended ceiling, then the outlet of the plenum chambers would be located over the air bars once the suspended ceiling framework is up, but would not necessarily be at the right height to be received by the air bars. Therefore some means would have to be provided to couple the air plenum chamber outlets to the air bars to direct the flow of air from the air plenum chambers through the air bars and into the room. Such means should also provide easy access to the plenum chamber outlets to facilitate ease in adjusting the air flow therefrom, and should accommodate minor misalignment that may occur between the plenum chamber outlets and the associated air bars therefor.

Therefore it is a primary object of this invention to provide adapter means which permits the prepositioning of air plenum chambers prior to the installation of the suspended ceiling framework and air bars therein, with the adapter means coupling the outlets of the air plenum chambers to the air bars to direct the flow of air from the chambers through the air bars and into the room below.

Other and additional objects of this invention are to provide adapter means that permit the installation of the plenum chambers and associated duct work therewith, without the interference and complication caused by the suspended ceiling gridwork; to provide adapter means that permits the complete installation of the suspended ceiling and air bars contained therein by the ceiling tradesman, after the major component parts of the ventilating system have been installed; to provide adapter means including panel members which may be simply and easily installed after the suspended ceiling has been completed; to provide adapter means which permits ready access to the outlets of the plenum chambers adjust any air regulating means located therein; to provide adapter means including, as required, blank-off members and end-closing members which together with the panel members divide the air bar into supply

sections and return sections; to provide adapter means capable of selectively changing the supply sections and return sections of the air bar to selectively vary the air flow pattern in the room; and to provide adapter means which gives a ventilating system the greatest possible flexibility for use where the subdivision of a room can be frequently changed to permit the best possible space utilization of the room.

BRIEF DESCRIPTION OF THE INVENTION

The improvement, according to this invention, in a room ventilating system wherein an air plenum chamber with an outlet is prepositioned above and in spaced alignment with an air bar provided as part of a suspended ceiling installation below the plenum chamber, includes the provision of adapter means between the chamber and the air bar for directing the flow of air from the chamber outlet through the air bar and into the room below. The adapter means may include panel members with a bottom flange which snaps into a lateral channel, upper extension in the inverted T-bar members of the air bar, an upper flange which is secured to the plenum chamber, and a middle portion which provides one side of an air directing throat. If the panel members are provided in opposed pairs in longitudinal spaced relationship, then the adapter means may also include end-closing members, and blank-off members, to divide the air bar into supply sections and return sections.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of a portion of a room, having a ventilating system with a prepositioned air plenum chamber coupled by the adapter means, according to this invention, to an air bar located in the suspended ceiling of the room;

FIG. 2 is a partially cut-away side elevational view taken along the broken plane II—II of FIG. 1 showing the construction of the panel members of the adapter means of FIG. 1;

FIG. 3 is a partially exploded perspective view of a portion of the air bar assembly of FIG. 1, for receiving the adapter means;

FIG. 4 is a side elevational view similar to FIG. 2 with the panel members of the adapter means shown located in opposed pairs and longitudinally spaced along the air bar, with blank-off members and end-closing members of the adapter means inserted between the opposed pairs to close the outlet of the air plenum chamber and to open the air bar to the attic space, thereby dividing the air bar into supply sections and return sections;

FIG. 5 is a cross-sectional view taken along the plane V—V of FIG. 4 and shows the details of construction of the blank-off members, the end-closing members, and the panel members of the adapter means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the figures, and particularly to FIG. 1, a room 10 has a real ceiling or soffit 11, and a suspended ceiling 12 with a ventilating system 13 located between the suspended ceiling 12 and the soffit 11 in the attic space 14 formed therebetween. The suspended ceiling 12 is shown as being a coffered ceiling, with a framework 15 supported by a plurality of trusses 16, only one of which is shown. The trusses 16 extend from one side wall of the room to the opposite side

wall, and includes as seen in FIG. 3, two parallel spaced plates 17 containing notches 18 which mate with notches 19 in the framework 15 to support and position the framework 15 in the room 10. The suspended ceiling 12 is completed by the provision of ceiling tile 20, one of which is inserted into each opening of the framework 15.

The ventilating system 13 primarily includes a prepositioned air conduit and plenum chamber assembly 25. As best seen in FIG. 1, the assembly 25 includes a plurality of duct sections 26. The duct sections 26 are constructed from insulating duct board 27 surrounded by a sheet metal skin 28. The duct sections 26 have a generally rectangular cross-section with a longitudinal outlet 29 centrally located in the lower wall thereof and defined by downwardly extending outlet walls 30 of the skin 28.

A hat-shaped channel 31 is secured in each duct section 26 over the longitudinal outlet 29 to attach the two halves of the lower wall of the duct section 26 together. The upper web of the hat-shaped channel 31 is provided with a series of metering apertures 32 which meter the flow of air from the duct section 26 into the longitudinal outlet 29. A pair of inwardly extending horizontal neck plates 33 are secured by the flanged outer edges 34 thereof to the hat shaped channel 31. The neck plates 33, each have adjacent rounded inner edges 35, providing a neck area to further restrict the flow of air to the outlet 29. The inner faces 36 of the side webs of the hat-shaped channel 31 below the neck plates 33 and the inner faces 36 of the downwardly extending outlet walls 30 of the skin 27 are provided with insulation board sections 37 to define the longitudinal outlet 29.

The air conduit and plenum chamber assembly 25 is also provided with air foil means 40. The air foil means 40 includes a pair of shaped plates 41 with the upper edge portion thereof longitudinally secured centrally of the upper web of the hat-shaped channel 31. The lower edge portion 43 of the shaped plates 41 is secured to a notch strip 44 to connect the plates 41 together at the lower edge portion 43. Between the two edge portions 42 and 43, the shaped plates 41 are formed into a neck portion 45 between the rounded inner edges 35 of the neck plates 33. The neck portion 45 of the shaped plates 41 mounts on opposite sides thereof bellows or dampener bags 46 which may expand to engage the rounded inner edges 35 to effectively close the neck area and thereby close the access of air from the duct section 26 to the outlet 29.

Below the neck portion 45, the shaped plates 41 spread apart in a throat portion 47 to form with the insulation board sections 37 a throat area which directs and guides the flow of air from the longitudinal outlet 29 of the air conduit and plenum chamber assembly 25.

The assembly 25 contains mounting means (not shown) for securing the individual duct sections 26 to the real ceiling or soffit 11 in alignment to provide an air supply, with the longitudinal outlet of the duct section 26 positioned in spaced relationship over the eventual position of an air bar 50 located in the after-installed framework 15 of the suspended ceiling 11.

The air bar 50 includes right and left inverted T-bar members 51, 51' each having a lower horizontal flange 52, 52' and a vertically upwardly extending web 53, 53' ending in a head 54, 54'. The head 54, 54' contains downwardly opening longitudinal grooves 55, 55' adja-

cent the respective vertical webs 54, 53' and opposite, upwardly opening longitudinal grooves 56, 56' in the horizontal flange 52, 52' again adjacent the respective vertical web 53, 53'.

A lower inverted U-channel 57 is inserted into the lower grooves 56, 56' to space the inverted T-bar members 51, 51' apart. The lower channel 57, as seen in FIG. 3, contains the notches 19 which position the framework 15.

Over the lower channel 57 is an upper channel 58 which is slid into the upper grooves 55, 55' in the heads 54, 54'. The upper channel 58 has one end thereof up-turned to form a vertical end plate 59. A resilient pad 60 is located between the lower channel 57 and the upper channel 58 at the ends thereof to maintain the separation between the two channels 57 and 58.

Weir means 61, including an upper nested channel 62 and a lower nested channel 63 are inserted into the space between the channels 57 and 58. The weir means 61, as best seen in FIG. 1, is extendable and retractable to selectively close and open the space between the inverted T-bar support members 51, 51' so as to control the flow of air therebetween.

The air bar 50 is completed by the provision of two resilient blocks 64 at either end thereof and between the vertical end plates 59 of longitudinally adjacent upper U-channels 58 to close the juncture of longitudinally adjacent sections of the air bar 50 in the suspended ceiling framework 15.

Adapter means 69 according to this invention, must be provided to couple the prepositioned air conduit and plenum chamber assembly 25 to the after-installed air bars 50 of the suspended ceiling 12, to guide the flow of air from the longitudinal outlets 29 through the air bars 50 and into the room 10. The adapter means 69 generally includes a plurality of panel members 70, and as needed, blank-off members 90, and end-closing members 95.

Each panel member 70, in the preferred embodiment of this invention, includes a bottom flange 71 which mates with a horizontally outwardly opening recess slot 72 in a lateral channel 73 of the head 54 of an associated inverted T-bar member 51. The bottom flange 71 includes a flat linear toe edge 74 on an offset foot 75 with the toe edge 74 designed to snap into a slot 76 formed between a centrally located upwardly extending longitudinal ridge 77 and the inner wall 78 of the lateral channel 73.

The panel member 70 also includes a middle portion 79 having an inner face 80 on which a block of insulation 81 is mounted. The block 81 is similar in thickness to the insulation board section 37 on the downwardly extending outlet wall 30 of the duct section 26.

The panel member 70 also includes an upper flange 82 which, when the lower flange 71 is snapped into the lateral channel 73 of the respective inverted T-bar member 51, is located adjacent a respective outlet wall 30 to be secured to the outlet wall 30 by fastening means 83. The fastening means 83 is shown illustratively as being sheet metal screws 84.

The panel members 70 are attached to the opposite sides of the inverted T-bar members 51, 51' in opposed pairs with the bottom flanges 71 thereof being snapped into the appropriate lateral channel 73 of the inverted T-bar members 51, 51'. The upper flanges 80 of the panel members 70 are secured to the appropriate downwardly extending outlet sidewalls 30 by the sheet

metal screws 84, so that the insulation blocks 80 extend the insulation board sections 37 downwardly to continue the throat area downwardly along the shaped plates 41 of the air foil means 40, to the air bar 50. Notice that the notched strips 44 of the air foil means 40 rest on the upper edge of the vertical end plates 59 to provide additional support to the air conduit and plenum chamber assembly 25, if required.

The panel members 70 together form a continuous wall between the duct sections 26 and the air bar 50 enabling the ventilating system 13 to supply conditioned air continuously. The conditioned air flows down the duct sections 26 to pass through the metering openings 32 and by the damper bags 46 across the neck area to enter the throat area of the longitudinal outlet 29 to be directed by the air foil means 40 therein and the panel members 70 through the air bar 50 and into the room 10. The volume of flow of air into the room is controlled by the amount of expansion of the damper bags 46, as is well-known in the ventilating field.

With the adapter means 69 according to this invention, the air bar 50 may act as an air return, as well as an air supply. The adapter means 69 in such cases also includes blank-off members 90, and end-closing members 95.

When the air bar 50 is to be used as a return, as well as a supply, the panel members 70 must be mounted in opposed pairs with longitudinal space provided between longitudinally adjacent panel member pairs 70 at the desired return sections of the air bar 50 to receive the blank-off members 90 and end-closing members 95 which turn this section of air bar into a return.

As best seen in FIGS. 4 and 5, each blank-off member 90 is of L-shaped cross-section with an inner edge resilient strip 91 that engages the air foil means 40, specifically the outer surface of the shaped plates 41, just below the lower edge of the downwardly extending outlet walls 30, to close the outlet 29. The blank-off members 90 have a pair of longitudinally oppositely protruding tabs 92 which are secured by the fastening means 83 to respective outlet walls 30. Notice in FIG. 5, that the blank-off members 90 close the throat area between the air foil means 40 and the downwardly extending outlet wall 30 associated therewith to close the longitudinal outlet 29 of the air conduit and plenum chamber assembly 25.

The end closing members 95, each have an L-shaped cross-section with a resilient strip 96 along the inner edge thereof, are for engaging the outer surface of the shaped plates 41 of the air foil means 40. Each member 95 also includes a vertical tab 97 extending upwardly from the outer flange of the end-closing member 95 to be secured by the fastening means 83 to the outlet wall 30. Again notice in FIG. 5 that the end-closing member 95 closes the throat area between the lower edge of the outlet wall 30 and the air bar 50. Together then, the panel members 70, the blank-off members 90 and the end-closing members 95 complete the division of the air bar into supply sections and return sections.

As shown in FIG. 1, the conditioned air from the duct sections 26 passes through the longitudinal outlet 29 to be guided by the air flow means 40 and the opposed pairs of panel members 70 through the supply sections of the air bar 50 and into the room 10. Adjacent the supply sections, as seen in FIG. 5, the air from the room 10 passes through the return sections of the air bar 50 and into the attic space 14 outside the duct sections 26

to be carried thereby to the exhaust. The blank-off members 90, and the end-closing members 95 close the outlets 29 of the duct sections 26 over the return sections of the air bar 50 to prevent the conditioned air from passing directly to the exhaust without having circulated through the room 10.

It should be obvious from the previous description of the adapter means 69 according to this invention, that the duct sections 26 of the air conduit and plenum chamber assembly 25 may be secured to the real ceiling or soffit 11 of the room 10 prior to the installation of the suspended ceiling 12 and the air bars 50 contained therein. Once the installation of the suspended ceiling 12 is complete, the panel members 70, the blank-off members 90 and the end-closing members 95 that are the adapter means 69 can be simply and easily installed by raising the appropriate ceiling tiles 20, inserting these small members through the openings created thereby, snapping them into place and securing them by the fastening means 83 before the ceiling tiles 20 are lowered. Such installation steps are much less troublesome and complicated than the heretofore used steps and permit the suspended ceiling to be completely installed all at one time.

If later it is desired to change the air flow pattern in the room 10, simply raising the appropriate ceiling tiles 20 provides access to the panel members 70, the blank-off members 90 and the end-closing members 95 to selectively interchange the positioning thereof and to facilitate the changing of the supply sections and return sections of the air bar 50 to change the flow of air throughout the room 10. The ease in changing the positioning of the members which comprise the adapter means 69 facilitates the greatest flexibility in accommodating various subdividing plans of room 10, serviced by the ventilating system 13, to permit the best possible space utilization thereof.

I claim:

1. An air distribution assembly for use in a suspended ceiling installation comprising:

air bar means for diffusing air into a room area beneath a suspended ceiling and means for mounting the same in said ceiling, said air bar means having means for removably mounting an upwardly extending panel member thereon;

air plenum chamber means for receiving air from a source thereof including an elongated outlet and means for mounting the same in spaced relation above said air bar means, said air plenum means having means for removably receiving a panel member depending therefrom, and

a plurality of panel members removably attached to said mounting means on said plenum means and to said air bar means respectively for directing flow of air from said plenum means outlet to said air bar means.

2. The assembly of claim 1 wherein said panel members are provided in opposed rows along said air bar and plenum means to form a continuous air directing throat therebetween in the space between said plenum and air bar means.

3. In a room ventilating system having an air plenum chamber with a longitudinal outlet prepositioned above and in spaced alignment with an air bar of spaced inverted T-bar members as part of a suspended ceiling installation below the plenum chamber, the improvement comprising the provision of adapter means re-

movably attached to the prepositioned plenum chamber and to the air bar for coupling the outlet of the plenum chamber to the air bar to direct the flow of air from the chamber through the air bar and into the room below the suspended ceiling, wherein each of said panel members includes a bottom flange, and each of said inverted T-bar members includes a recessed slot in a wall of each member to receive and removably retain the bottom flange of an associated panel member inserted therein upon attachment of said panel member to said air bar.

4. The improvement in ventilating system as in claim 3 wherein said bottom flange of each of said panel members is formed in a stepped configuration with a flat linear toe edge on an offset foot portion thereof, and the recessed slot in the wall of an associated inverted T-bar member is in a lateral opening channel with a ridge adjacent the inside wall to snappingly receive the flat linear toe edge of the panel member.

5. In a room ventilating system having an air plenum chamber with a longitudinal outlet prepositioned above and in spaced alignment with an air bar of spaced inverted T-bar members as part of a suspended ceiling installation below the plenum chamber, the improvement comprising the provision of adapter means removably attached to the prepositioned plenum chamber and to the air bar for coupling the outlet of the plenum chamber to the air bar to direct the flow of air from the chamber through the air bar and into the room below the suspended ceiling, said adapter means including:

a plurality of panel members removably attached to said prepositioned chamber and said air bar to form a air directing throat therebetween, said panel member being of a given length, and being provided in associated pairs, said pairs being attached to opposite inverted T-bar members in longitudinal spaced relationship,

end-closing members provided for closing the space between like ends of the associated pairs, said end closing means extending between the plenum chamber and the air bar, and

blank-off members provided for closing the outlet of the plenum chamber between the adjacent ends of the longitudinally spaced pairs to complete the division of the air bar into supply and return sections, the air from the plenum chamber passing through the supply sections to pass throughout the room before returning to the return sections to pass through the return sections of the air bar and into the space above the suspended ceiling.

6. The assembly as in claim 5 wherein the plenum chamber is provided with air foil means extending out of the outlet thereof, the end-closing members are of L-shaped cross-section, and a rubber strip is provided along an inner edge of each end-closing member to sealingly engage the air foil means.

7. The assembly as in claim 5 wherein the plenum chamber is provided with air foil means extending out of the outlet thereof, and the blank off members are of L-shaped cross-section and a rubber strip is provided along an inner edge thereof to sealingly engage the air foil means and close the outlet of the plenum chamber.

8. A panel member in combination with an air plenum chamber with a longitudinal outlet, prepositioned above and in spaced relationship with an air bar of spaced inverted T-bar members provided as part of a

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suspended ceiling installation below said plenum chamber to couple the outlet of the plenum chamber to the air bar, the panel member comprising:

a bottom flange means for being received and releasably retained by an associated inverted T-bar member, 5

an upper flange means for being releasably attached to the air plenum chamber adjacent the outlet thereof, and a middle portion connecting the flange means together to guide the flow of air from the 10

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outlet of the plenum chamber through the air bar and into the room below the suspended ceiling, wherein each inverted T-bar member includes a recessed slot in a laterally opening channel, and the bottom flange of the panel member is formed in a stepped configuration with a flat linear toe edge on an offset foot portion which is snappingly received in the laterally opening channel to secure the two together.

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