Sept. 10, 1968 W. W. THOMPSON 3,400,506

SUSPENDED CEILING OF REMOVABLE PANELS

Filed July 12, 1965 2 Sheets-Sheet 1

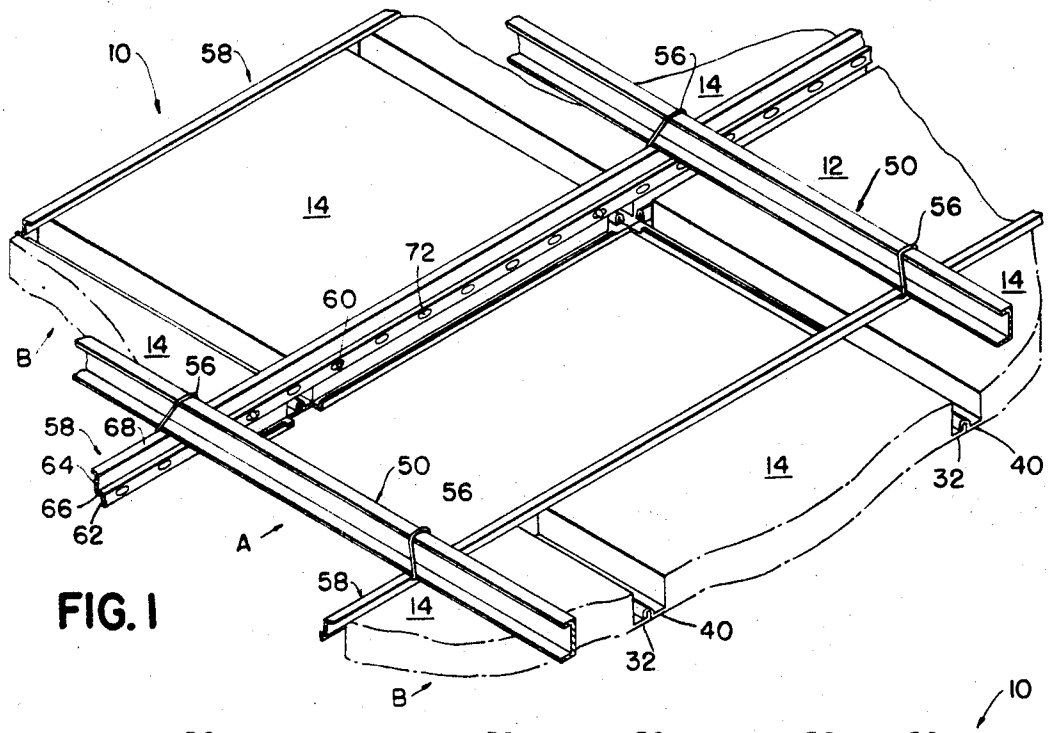


FIG. 1

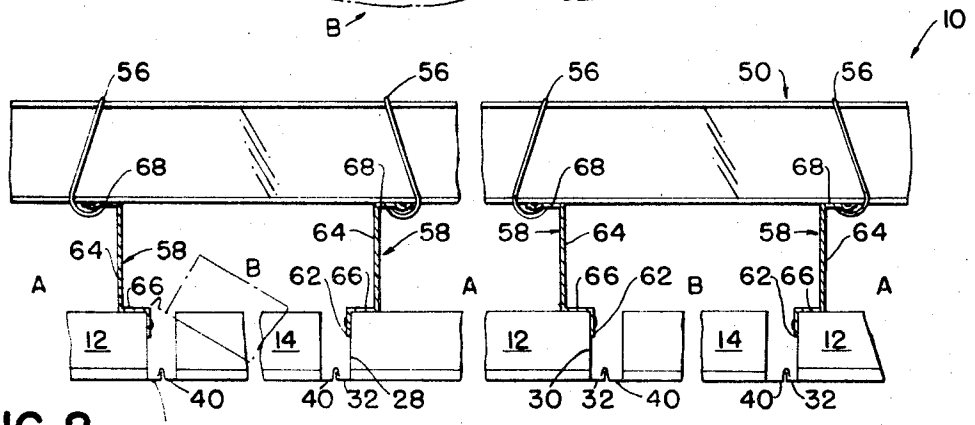


FIG. 2

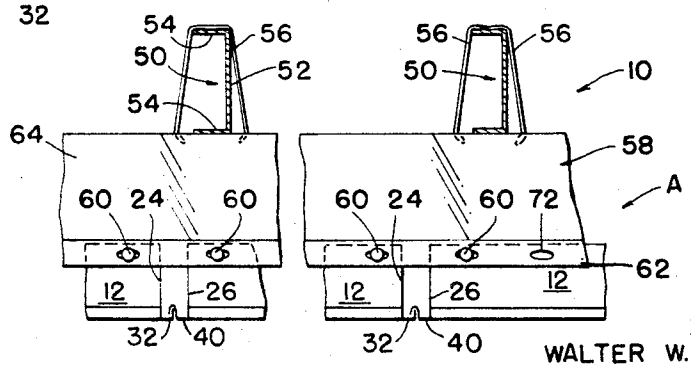


FIG. 3

INVENTOR.
WALTER W. THOMPSON

BY

Whittemore, Hulbert & Belknap

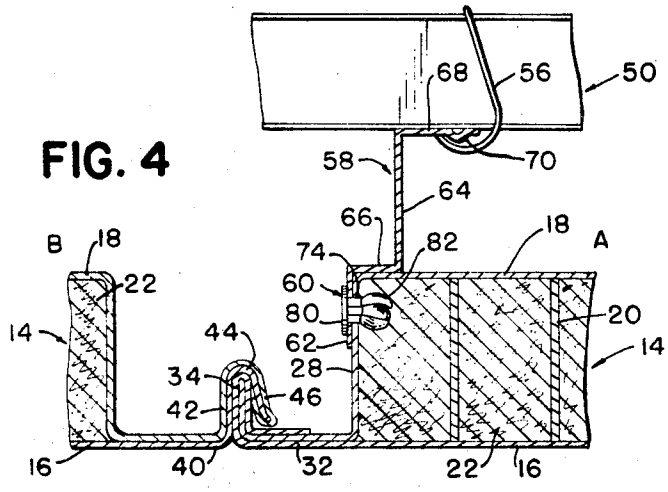
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SUSPENDED CEILING OF REMOVABLE PANELS

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FIG. 4



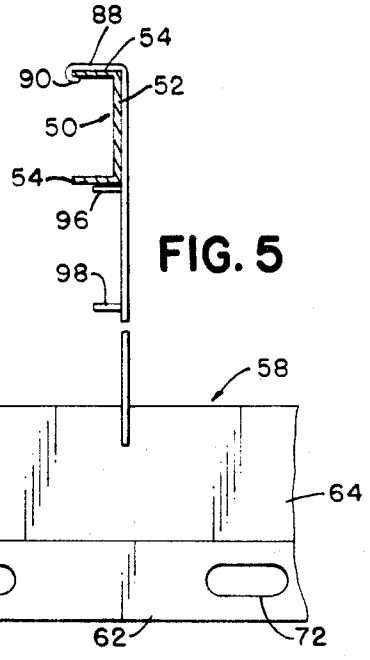


FIG. 5

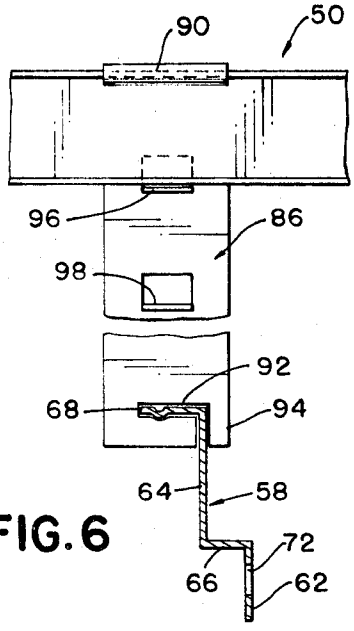


FIG. 6

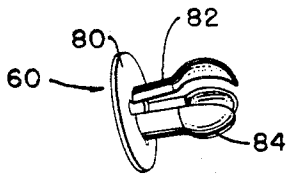


FIG. 7

INVENTOR.
WALTER W. THOMPSON

BY

Whittemore, Hulbert & Belknap

ATTORNEYS

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SUSPENDED CEILING OF REMOVABLE PANELS

Walter W. Thompson, Box 627, Hazlehurst, Ga. 31539

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ABSTRACT OF THE DISCLOSURE

The acoustical system comprises acoutical ceiling panels arranged in parallel rows in a common horizontal plane. The panels are suspended from an overhead support structure which includes spaced parallel bars having depending flanges extending along the opposite sides of the panels in alternate rows. Holes are spaced uniformly along the length of the flanges, and holes along opposite sides of the panels in the alternate rows are spaced apart multiples of the distance between the holes in the flanges. Removable clips project through holes in the flanges and into aligned holes in the panels in the alternate rows to removably secure the latter panels to the flanges. The panels in the alternate or remaining rows are supported on the panels in the alternate rows. For this purpose the panels in the alternate rows have upwardly extending flanges along opposite sides and the panels in the remaining rows have downwardly opening hooks engaging over the upwardly extending flanges.

Broadly, the purpose of the invention is to provide an acoustical ceiling system having a plurality of acoustical panels arranged in parallel rows in a horizontal plane, means for suspending the panels from an overhead support structure including a plurality of spaced parallel elongated bars having depending flanges extending along opposite sides of the panels in alternate rows, fasteners projecting through holes in the flanges and through aligned holes in the panels in the alternate rows to removably secure the latter panels to the flanges, and means for removably supporting the panels in the remaining rows on the panels in the alternate rows.

This invention relates generally to ceiling structure and refers more particularly to an acoustical ceiling structure composed of individual separable panels.

One of the essential objects of the invention is to provide a ceiling structure composed of individual separable panels arranged edge-to-edge in the same horizontal plane to form a continuous ceiling, having novel means for suspending the panels from an overhead support structure.

Another object is to provide an acoustical ceiling structure in which a plurality of spaced parallel bars are removably secured to opposite sides of the panels in certain rows.

Another object is to provide an acoustical ceiling structure in which alternate rows of the panels are secured to the spaced parallel bars by removable means preferably in the form of clips, and the panels in the remaining rows are supported on the panels in the alternate rows.

Another object is to provide an acoustical ceiling structure in which the bars are formed with uniformly spaced holes, the panels in the alternate rows are formed with holes spaced multiples of the distance between the holes in the bars, and the clips project through holes in the bars and into aligned holes in the panels for removably securing the panels to the bars.

Another object is to provide an acoustical ceiling structure in which the holes in the bars are formed in depending flanges which preferably are elongated in the direction of length of the bars in order to facilitate a proper alignment of the panels.

Another object is to provide bars which are of generally

Z-shaped configuration having the depending flanges extending along the opposite side of the panels, upwardly projecting flanges spaced inwardly from the depending flanges and connected thereto by portions extending across the upper surfaces of the panels.

Another object is to provide a means by which the panels in the alternate rows supported from said bars may serve in turn as the support for the panels in the remaining rows, such means comprising upwardly extending flanges along the opposite sides of the supported panels in the alternate rows and downward opening generally U-shaped hooks on the opposite sides of the remaining panels, the hooks engaging over the flanges to provide the connection.

Another object is to provide an acoustical ceiling structure in which the preferred means for supporting the panels in the remaining rows upon the panels in the alternate rows, combined with the Z-shaped configuration of the support bars, facilitates the removal of the panels in the remaining rows by permitting them to be lifted up and then shifted to the side for ultimate removal by the unique Z-shaped configuration of the bars.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a perspective fragmentary view from above of an acoustical ceiling structure embodying my invention.

FIGURE 2 is a schematic fragmentary elevational view, with parts in section, of the acoustical ceiling structure shown in FIGURE 1.

FIGURE 3 is a schematic fragmentary elevational view, with parts in section, of the ceiling structure shown in FIGURE 1, but taken at right angles to FIGURE 2.

FIGURE 4 is an enlarged fragmentary sectional view of a portion of FIGURE 2 showing in greater detail the connection between panels and the connection of a panel to one of the support bars.

FIGURE 5 is a fragmentary view partly in section illustrating a modification of the invention.

FIGURE 6 is a fragmentary view partly in section of the structure shown in FIGURE 5 but taken at right angles thereto.

FIGURE 7 is a perspective view of one of the clips employed for removably securing a panel to a support bar.

Referring now more particularly to the drawings, and especially to FIGURES 1 to 4 and 7, the ceiling structure is generally indicated by the reference numeral **10** and is composed of individual separable rectangular accoustical panels **12** and **14**. The panels **12** are arranged in the alternate rows A, and the panels **14** are arranged in the rows B between the rows A. All of the panels are in a common horizontal plane.

The panels **12** are identical to one another and each has a sheet metal front facing **16** and a sheet metal rear facing **18** which is parallel to and spaced above the front facing. The front facing is preferably perforated and a honeycomb structure **20** is sandwiched between the facings. The honeycomb may be formed of a cardboard material, and, together with the facings **16** and **18**, provides a strong composite structure which resists bending or twisting. A heat insulating and sound absorbing material **22**, which may be formed of glass, wool or wood fibers, fills the cells of the honeycomb **20**. The margins of the back facing **18** of each panel **12** are turned at right angles toward the front facing **16** to define the parallel ends **24** and **26** and the parallel sides **28** and **30**.

A supporting portion **32** is provided along the opposite side edges of each panel **12**. A similar supporting portion **32** is also provided along one end edge of each panel

12. The supporting portions are formed by surface-to-surface extensions of the front and back facings. Referring to FIGURE 4, the supporting portion 32 there shown is formed by the surface-to-surface integral lateral extensions of the front and back facings beyond the side 28. These surface-to-surface extensions project laterally outwardly in the plane of the front facing and are then turned at right angles to the plane of the front facing vertically upward or toward the back facing to provide an upright flange 34 parallel to the side 28. The flange forming metal of the front facing 16 extends over the end of the flange forming metal of the back facing 18 and along the opposite side thereof and continues along that part of the supporting portion 32 which is parallel to the plane of the front facing 16 so that the supporting portion 32 is formed of three layers of metal in surface-to-surface contact for strength and rigidity. The supporting portion 32 along the opposite side 30 of each panel 12 is identical to the one shown in FIGURE 4 and projects from said opposite side 30 of the panel, and the end supporting portion 32 of each panel 12 is also identical to that shown in FIGURE 4 projecting from the end wall 24.

The remaining end edge of each panel 12 is provided with a marginal extension in the form of a supported portion 40. This is a hook portion, and since identical hook portions 40 are provided on each panel B, one of which is shown in the enlarged view of FIGURE 4, reference will be made to FIGURE 4 to describe this supported portion. The supported portion 40 is formed by integral extensions of the front and back facings 16 and 18 beyond the corresponding end or side of the associated panel. These extensions of the front and back facings are in surface-to-surface contacting relation with each other and extend laterally outwardly from the panel in the plane of the front facing 16, then turn at right angles toward the back facing 18 and parallel to the end wall of the panel to form an upright vertical flange 42 which is returned to form a hook 44 the opposite flange of which is indicated at 46. It will be noted that the metal of the back facing 18 continues beyond the free end of the hook and along the opposite surface of the metal formed as an extension of the front facing 16 to provide a triple layer of metal for the flange 46 of the hook. The remainder of the supported portion 40 is in two layers. Preferably and as shown in FIGURE 4, the flange 46 of the hook 44 is inclined from the base of the hook away from the flange 42.

It will be understood that the supporting portions 32 extend for the full length of the side edges and one end edge of each panel 12 and that the supported portion 40 likewise extends for the full length of the opposite end edge thereof. As already stated, the panels 12 have three supporting portions 32 and one supported portion 40, the supported portion 40 being at one end and the three supporting portions being at the remaining end and at the two sides.

The panels 14 are identical to the panels 12 except for the margins thereof, each panel 14 having at the two side edges and one end edge a supported portion 40 and at the opposite end edge a supporting portion 32.

The overhead support structure is composed of a plurality of laterally spaced parallel horizontal channels 50 which extend at right angles to the panel rows. These channels are supported in any suitable manner from the permanent overhead ceiling structure. As shown, each channel is disposed on its side and has the vertical web 52 and the spaced horizontal flanges 54.

The panels in the A rows are suspended from the channels 50 by means of the wires 56, the elongated bars 58 and the clips 60. The bars 58 are sheet metal members and extend in spaced parallel relation to one another at right angles to the channels 50, or in other words, parallel to the rows A and B of panels. Each bar 58 has a vertical depending flange 62 which extends in surface-to-surface contact with the sides 28 and 30 of the panels in the alternate rows A. Actually the bars 58 are arranged in pairs, one pair of bars being provided for each row of panels A with one bar of each pair along one side of the panels in the A row and the other bar along the opposite side of the panels in the A row. The bars 58 also have the upwardly extending vertical flanges 64 which are spaced inwardly from the depending flanges 62 but in parallel relation therewith. These flanges 62 and 64 are connected by the horizontal flanges 66 which extends in surface contact with the back facing of the panels in the A row. The flanges 62, 64 and 66 define a generally Z-shaped configuration.

At their upper ends, the bars have the horizontal supporting flanges 68, and the wires 56 extend over the channels 50 and their free ends are bent under and inward with respect to the channels so as to engage the horizontal flanges 68 of the bars and removably suspend the bars from the channels. Preferably the horizontal flanges 68 may have the beads 70 behind which the wire ends may engage to prevent accidental separation.

The depending flanges 62 of each bar are formed along the lengths with a series of aligned uniformly spaced holes or apertures 72. The apertures are elongated in the direction of length of the bars. The spacing between the apertures or holes 72 is uniform as stated and may, for example, be four inches between centers.

The side walls 28 and 30 of the panels in the alternate rows A are each formed with a pair of holes or apertures 74. These holes are circular and spaced apart in the direction of length of the panel. The spacing between centers of the holes 74 is a multiple of the spacing between the holes 72 in the depending flange of the bar 58. In other words, if the spacing between centers of holes 72 in the bar is four inches, the spacing between centers of the holes 74 in the panels of the row A may, for example, be four inches or eight inches or sixteen inches, or any other multiple of four. The purpose of this is to facilitate an alignment of the holes in the panels with the holes in the support bars. The fact that the holes 72 are elongated also makes it easier to align them with the holes in the panels.

In order to removably secure the panels in the A rows to the support bars 58, clips 60 are employed. The clips may be of different constructions although preferably are of the type shown having a flat disc-shaped head 80 and legs 82 extending at right angles from one side of the head. The legs 82 are resilient and have enlargements 84 near their free ends. The diameter of the circle defined by the three legs of each clip measured around the enlargements 84 is, in the free state of the clip, somewhat larger than the diameter of the holes 74 and the minor cross dimension of the holes 72. Incidentally, the diameter of the holes 74 is equal to the minor cross dimension of holes 72. Preferably also, the diameter of the circle defined by the legs in their free state measured around the portions of the legs between the enlargements 84 of the head 80 is also somewhat greater than the diameter of the holes 74 so that when the clips are inserted as shown in FIGURE 4, the legs will be resiliently deformed inwardly slightly and thereby grip the holes with a radially outward pressure.

On assembly, the clips have to be forced with some degree of pressure to cause the legs to contract sufficiently to clear the enlargements 84. Likewise upon removal the clips can be forced out of the apertures by inserting a screwdriver blade or the like under the head.

In order to install the acoustical ceiling structure, and assuming the bars 58 are secured in place and suspended from the channels 50 by means of the wires 56, the panels 12 in the rows A are first put up. As before stated, the bars 58 which are all parallel to one another are arranged in pairs so that the distance between the depending flanges 62 of each pair of bars is equal to the distance between the side walls 28 and 30 of the panels in the rows A.

In order to put the A rows of panels in place, the panels are pushed up between the depending flanges 62 of a pair of bars so that their upper surfaces bear against

the connecting portions **66** of the bars. The panels may then be moved into position lengthwise of the bars to align the two holes on opposite sides of each panel with a pair of holes in the depending flanges **62** of the bars **58**. The clips **60** are then pushed through the aligned holes to the assembled condition illustrated in FIGURE 4. The panels may be installed one at a time in this manner, each succeeding panel being laid in by first engaging the hook **44** of the supported portion **40** along one end thereof over the flange **34** of the supporting portion **32** along the adjacent end of the preceding panel in the row. The panels in the A rows may be vary rapidly installed in this manner, setting them in place one at a time and pressing the clips through the aligned holes to secure them to the bars **58**, being sure to engage the hook of each panel installed over the flange of the adjacent end of the previously installed panel. Since the alternate rows A are first installed in this manner, the space between the A rows is open so that the installer has easy access to the sides of the panels for pressing the clips **60** into place.

The panels **14** are installed in the B rows by turning them edgewise to elevate them above the level of the common horizontal plane established by the installed A rows of panels **12**, and then the panels **14** are lowered so that the hooks **44** along their sides engage over and are supported on the flanges **34** of the panels **12** in the A rows. As each panel **14** is installed, its end having the hook **44** is engaged over the flange **34** of the end of a B panel previously installed.

According to this construction, the panels in both the A and B rows altogether form a continuous ceiling structure and are disposed in edge-to-edge relation in the same horizontal plane.

In the event there is any need for access to the area above the ceiling structure, the panels in the B rows may be very easily removed by tilting them and lifting them to disengage the hook and flange marginal connections and then turning them slightly so that they can be withdrawn downwardly. If the system needs to be disassembled, the B panels can be readily removed as described and access is then easily had to the clips **60**, which may be removed by inserting a tool such as the blade of a screwdriver under the heads of the clips and drawing them out of the holes. After the clips are removed the A panels obviously can be taken down with ease.

The Z-shaped configuration of the bars **58** is advantageous in the removal of the B panels because the inward offset of the flanges **64** provides space above the A panels for the B panels, and the B panels are raised and tilted to disconnect the marginal flanges **34** and hooks **44**. This is shown in dotted lines in FIGURE 2.

FIGURES 5 and 6 show a modification of the invention in which the bars **58** are suspended from the channels **50** by the hanger plates **86** instead of the wires previously described. The hanger plates **86** are employed in order to drop the ceiling still further and as viewed in FIGURES 5 and 6 they suspend the bars **58** a few inches beneath the channel.

Each hanger **86** is in the form of a flat plate member having a horizontal flange **88** at the upper end return-bent at **90** to engage over the top flange **54** of the channel. The main body of the plate **86** extends vertically downward along the web of the channel and at its lower end has a generally L-shaped notch **92**. One leg of the notch **92** is vertical and extends upwardly from the lower edge of the plate and the other leg of the slot is horizontal. The upper horizontal flange **68** and the vertically extending portion **64** of the bar **58** fit into the legs of the L-shaped slot. The bars **58** are suspended from the plates **86** in this manner. The bars may be inserted in the L-shaped slots by first bending the tab **94** along one side of the vertical leg of the slot to substantially right angles with respect to the main body portion of the plate. This allows the bar to be inserted into the L-shaped slot, and thereafter the tab **94** is bent down to the plane of the main body of the plate in the position shown.

In order further to secure the hanger **86** to the channels a tab **96** is struck out from the main body portion thereof so as to underlie the lower flange **54** of the channel.

It will be noted that a second tab **98** is also struck out from the material of the main body portion of the hanger bracket, spaced an inch or so beneath the first tab. In the event the channel to which the hanger plates are secured is wider, that is of greater vertical dimension, than the one shown, the tab **96** may be folded back into the plane of the plate **86** and the tab **98** may serve to engage the lower flange of the channel.

What I claim as my invention is:

1. An acoustical ceiling system comprising a plurality of acoustical panels arranged in parallel rows in a common horizontal plane, means suspending said panels from an overhead support structure including a plurality of spaced parallel horizontal elongated bars arranged in pairs respectively associated with the alternate rows of panels, said bars of each pair having throughout their lengths depending flanges extending along opposite sides of the panels in the associated alternate row, said bars of each pair having flanges extending upwardly from the panels in the associated alternate row and spaced inwardly toward one another from the depending flanges thereof, and also having webs connecting the upper ends of said depending flanges to the lower ends of said upwardly projecting flanges across the upper surfaces of the panels in the associated alternate row, holes provided in said depending flanges along the length thereof, holes along said opposite sides of the panels in said alternate rows, fastening means in the form of resilient studs projecting through holes in said depending flanges and into aligned holes in said panels in said alternate rows to removably secure the latter panels to said depending flanges, and means removably supporting the panels in the remaining rows on the panels in said alternate rows, said studs being readily insertable into and removable from said aligned holes, and being accessible from beneath the ceiling system when the adjacent panel in one of said remaining rows is removed, the inward spacing of said upwardly projecting flanges of said bars relative to the depending flanges thereof facilitating the lifting of the panels in the remaining rows from supported relation with respect to the panels in said alternate rows and removal of the lifted panels from the system, and said webs locating the panels in said alternate rows when the latter panels are installed.

2. The acoustical system defined in claim **1**, wherein the holes in said depending flanges are equally spaced apart and elongated in the direction of length of said depending flanges.

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HENRY C. SUTHERLAND, *Primary Examiner.*