July 1, 1969 W. W. THOMPSON 3,452,496

ACOUSTICAL CEILING STRUCTURE AND PANEL THEREFOR

Filed April 3, 1967 Sheet 1 of 2

FIG.1

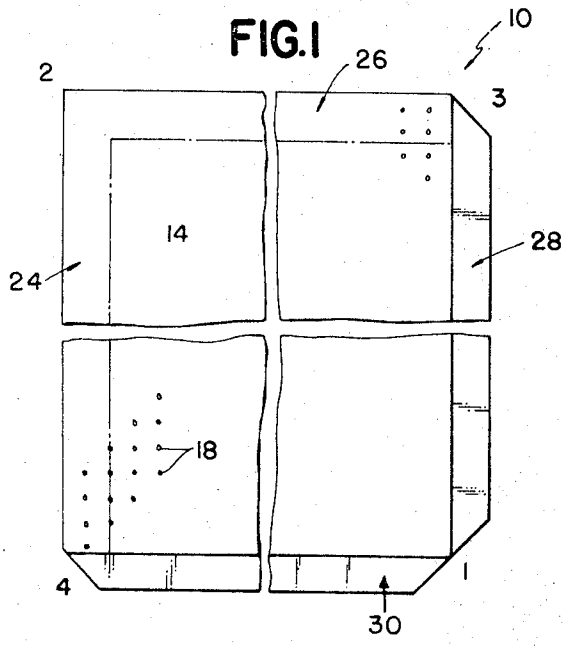


FIG.2

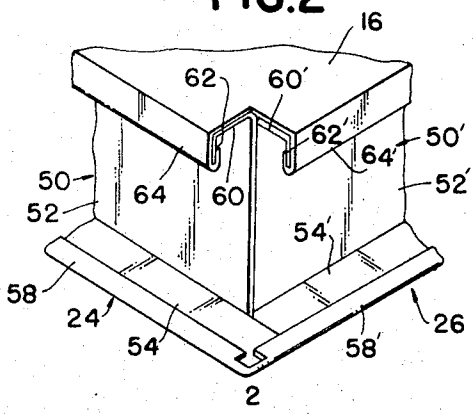


FIG.3

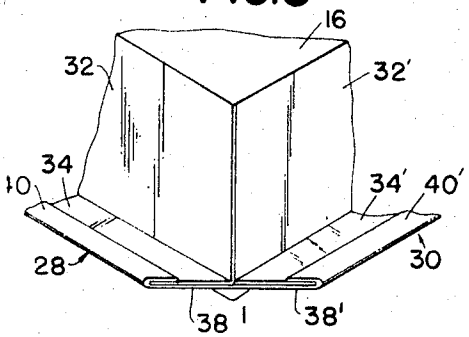


FIG.4

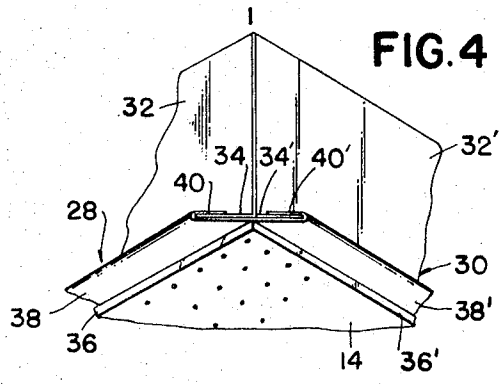


FIG.5

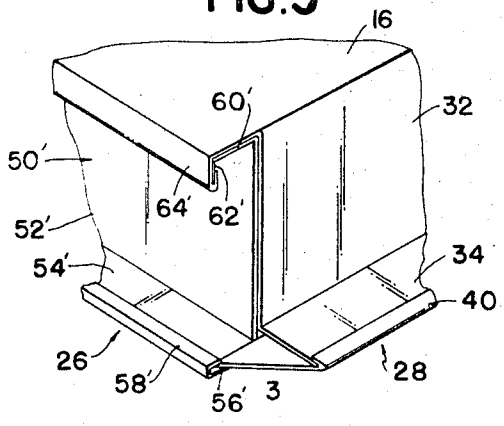
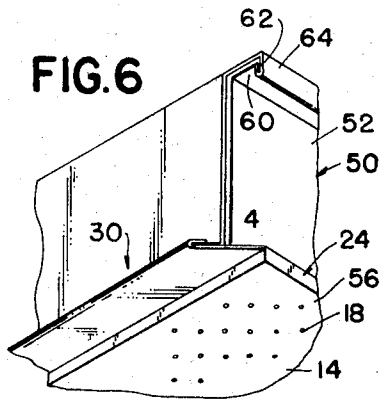


FIG.6



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ACOUSTICAL CEILING STRUCTURE AND PANEL THEREFOR

Filed April 3, 1967 Sheet 2 of 2

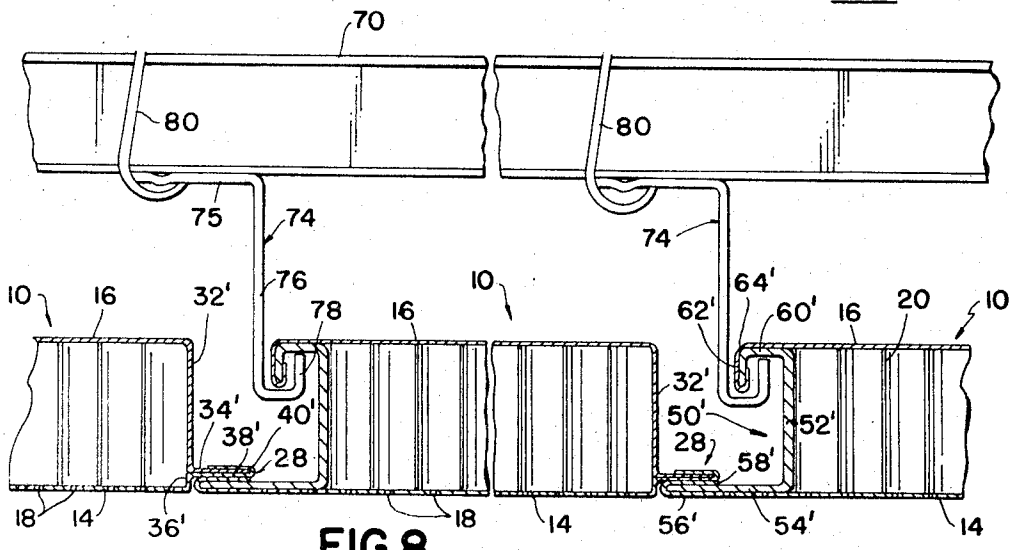

FIG.8

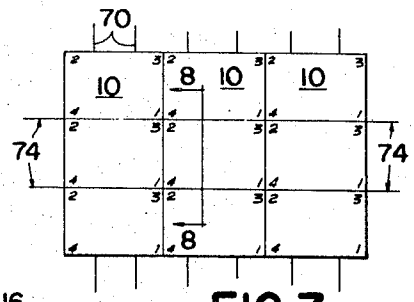

FIG.7

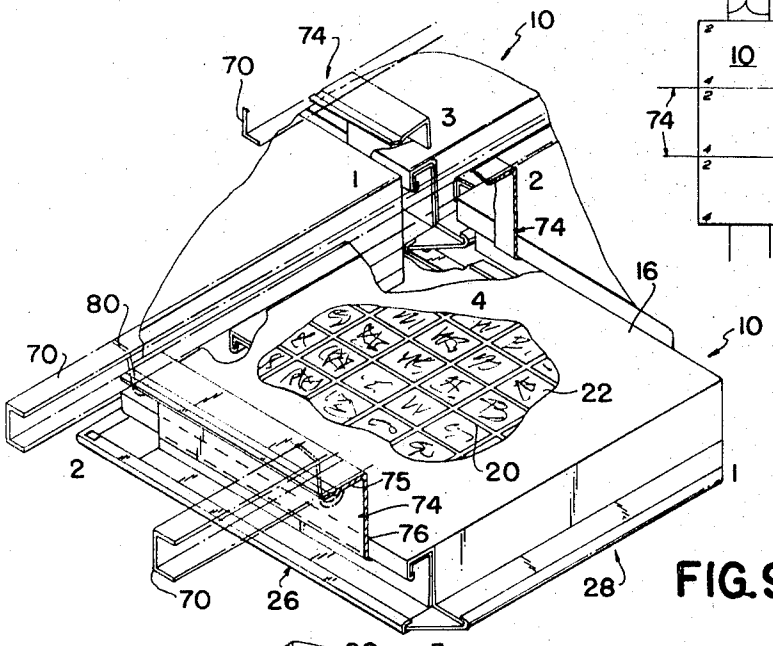

FIG.9

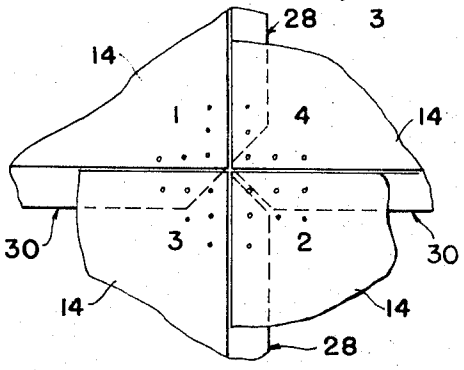

FIG.10

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ACOUSTICAL CEILING STRUCTURE AND PANEL THEREFOR

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U.S. Cl. 52—145
6 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to an acoustical ceiling panel and to a ceiling structure composed of a plurality of the panels.

The panel is preferably rectangular, having a bottom perforated sheet providing a flat bottom surface adapted to be exposed to sound, a top sheet, and sound deadening material between the sheets. The panels are arranged in a ceiling structure in parallel rows and are similarly oriented.

Each panel has supporting flanges along an end and a side edge which are flush with the bottom surface of the panel. Each panel also has supported flanges along the other end and side edges. The supported flanges of each panel are supported on the supporting flanges of adjacent panels. The supported flanges of each panel are spaced above the bottom surface thereof a distance such that the bottom surfaces of all panels are flush.

Means are provided for suspending each panel adjacent one of the edges having the supporting flanges from an overhead support structure.

Background of the invention

The invention refers to acoustical panel construction and is an improvement on the construction shown in U.S. Patent No. 3,241,282.

Summary of the invention

An essential object of the invention is to provide an improved acoustical panel which when installed with other panels of like construction in a ceiling structure will provide a unitary or monolithic appearance.

Another object is to provide a ceiling structure composed of panels so constructed that any one of them is individually removable without disturbing the other panels.

Another object is to provide a panel with supporting flanges along two adjacent edges and supported flanges along the remaining two edges, such that the supported flanges of each panel in a ceiling structure rest upon and are supported by the supporting flanges of the adjacent panels.

Another object is to provide a panel in which the supporting flanges of each panel are flush with the bottom surfaces thereof and the supported flanges are spaced upwardly from the bottom surface a distance such that the bottom surfaces of all of the panels in a ceiling structure are flush with one another.

Another object is to provide means for suspending the panels adjacent one of the edges having the supporting flanges from an overhead support structure.

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 bottom plan view of a panel constructed according to my invention.

FIGURE 2 is a fragmentary perspective view of one of the corners of the panel.

FIGURE 3 is a fragmentary perspective view of another corner.

FIGURE 4 is a fragmentary perspective view of the corner shown in FIGURE 3, taken from a different angle.

FIGURE 5 is a fragmentary perspective view of another corner.

FIGURE 6 is a fragmentary perspective view of another corner.

FIGURE 7 is a semi-diagrammatic bottom plan view of a ceiling structure composed of the panels shown in FIGURES 1–6.

FIGURE 8 is an enlarged sectional view taken on the line 8—8 in FIGURE 7.

FIGURE 9 is a fragmentary perspective view of the ceiling structure as seen from above.

FIGURE 10 is an enlarged fragmentary view of a portion of FIGURE 7.

Referring now more particularly to the drawings, the panels **10** are rectangular and of identical construction. Each has a rectangular bottom facing or sheet **14**, and a rectangular top facing or sheet **16** which is parallel to and spaced from the bottom sheet **14**. These sheets **14** and **16** may be of any suitable material but preferably are formed of sheet metal. The bottom facing of sheet **14** is formed with a multiplicity of perforations **18**.

A honeycomb structure **20** is sandwiched between the facings or sheets **14** and **16**. The honeycomb structure **20** may be formed of a cardboard material and, together with the sheets **14** and **16**, provides a strong composite panel structure which is resistant to bending and twisting. The honeycomb structure **20** is preferably secured by a suitable adhesive to the sheets **14** and **16**, and a sound absorbing material **22**, which may be glass, wool or wood fibers, fill the cells of the honeycomb structure **20**.

The panel **10** has a flange **24** along one end edge, and has a flange **26** along one side edge. Flanges **24** and **26** are sometimes referred to as supporting flanges because in an acoustical ceiling structure composed of a plurality of identical panels **10**, the flanges **24** and **26** support adjacent panels. Panel **10** also has a flange **28** along the opposite end edge and a flange **30** along the opposite side edge. Flanges **28** and **30** are sometimes called supported flanges because in a ceiling structure composed of a plurality of identical panels **10**, the flanges **28** and **30** rest upon and are supported by the flanges **24** and **26** of adjacent panels.

The corners of the panel in FIGURE 1 are, for convenience and for the purpose of later reference, designated **1, 2, 3** and **4**.

The end of the panel between corners **1** and **3** is closed by an end wall **32** which is integral with the top sheet **16**. Wall **32** extends at right angles to the bottom and top sheets **14** and **16**. Wall **32** terminates short of the bottom sheet **14** and has a right angle flange **34** extending outwardly at right angles to wall **32** and parallel to the bottom and top sheets **14** and **16**. The bottom sheet **14** has an integral end continuation which is bent upwardly at right angles to the sheet where indicated at **36**, and then outwardly to provide a flange **38** parallel to the bottom sheet **14** and in surface-to-surface contact with the bottom of flange **34**. Flange **38** is then return-bent over the top of flange **34**, the return-bent portion being designated **40**, so as to lie in surface-to-surface relation with the top of flange **34** and provide three layers of material. The flanges **34** and **38** and the return-bent portion **40** together form the supported flange **28** along one end of the panel.

The side of the panel between corners **1** and **4** is of the same construction as the end of the panel between corners **1** and **3** just described, except that the side of the panel may be longer than the end thereof depending upon the particular dimensions employed.

Similar parts have the same reference numerals primed. Thus, the side of the panel between corners **1** and **4** is closed by a side wall **32'** which is integral with the top sheet **16**. Wall **32'** extends at right angles to the bottom and top sheets **14** and **16**. Wall **32'** terminates short of the bottom sheet **14** and has a right angle flange **34'** extending outwardly at right angles to wall **32'** and parallel to the bottom and top sheets **14** and **16**. The bottom sheet **14** has an integral side continuation which is bent upwardly at right angles to the sheet where indicated at **36'**, and then outwardly to provide a flange **38'** parallel to the bottom sheet **14** and in surface-to-surface contact with the bottom of flange **34'**. Flange **38'** is then return-bent over the top of flange **34'**, the return-bent portion being designated **40'**, so as to lie in surface-to-surface relation with the top of flange **34'** and provide three layers of material. The flanges **34'** and **38'** and the return-bent portion **40'** together form the supported flange **30** along one side of the panel.

The end of the panel between corners **2** and **4** is closed by a generally L-shaped member **50** which is preferably of metal and is shown as being of a somewhat heavier and stronger section than the bottom and top sheets **14** and **16**. Member **50** has an upright portion **52** which extends between and at right angles to sheets **14** and **16** to close the end of the panel. Member **50** has a flange **54** which extends outwardly of the panel at right angles to the upright portion **52** at the bottom end thereof. The bottom sheet **14** has an integral extension **56** which extends outwardly along and in surface-to-surface contact with the bottom of flange **54**, being return-bent at **58** over the top of flanges **54** to provide three laminations of material. The flange **54**, extension **56** and the return-bent portion **58** together form the supporting flange **24**, and it will be noted that the bottom face of flange **24** as provided by the bottom face of extension **56** is flush with or in the plane of the flat bottom surface of sheet **14**.

The upper end of the upright portion **52** of member **50** has a flange **60** extending outwardly at right angles thereto and then bent downwardly as indicated as **62** parallel to the upright portion **52** so as to provide a hook formation by means of which the panel may be suspended from an overhead ceiling structure. The top sheet **16** has an end extension **64** which extends over the portions **60** and **62** of the member **50** and is return-bent along the inner surface of portion **62**.

The side of the panel between corners **2** and **3** is of the same construction as the end of the panel between corners **2** and **4** just described, except that the side of the panel may be longer than the end thereof depending upon the particular dimensions employed. The same reference characters primed indicate similar parts. Thus, the side of the panel between corners **2** and **3** is closed by a generally L-shaped member **50'** which is preferably of metal and is shown as being of a somewhat heavier and stronger section than the bottom and top sheets **14** and **16**. Member **50'** has an upright portion **52'** which extends between and at right angles to sheet **14** and **16** to close the side of the panel. Member **50'** has a flange **54'** which extends outwardly of the panel at right angles to the upright portion **52'** at the bottom end thereof. The bottom sheet **14** has an integral extension **56'** which extends outwardly along and in surface-to-surface contact with the bottom of flange **54'**, being return-bent at **58'** over the top of flange **54'** to provide three laminations of material. The flange **54'**, extension **56'** and return-bent portion **58'** together form the supporting flange **26**, and it will be noted that the bottom face of flange **26** as provided by the bottom face of extension **56'** is flush with or in the plane of the flat bottom surface of sheet **14**.

The upper end of the upright portion **52'** has a flange **60'** extending outwardly at right angles thereto and then bent downwardly as indicated at **62'** parallel to the upright portion **52'** so as to provide a hook formation by means of which the panel may be suspended from an overhead ceiling structure. The top sheet **16** has a side extension **64'** which extends over the portions **60'** and **62'** and is return-bent along the inner surface of portion **62'**.

The supported flanges **28** and **30** are spaced from the bottom sheet **14** a distance equal to the thickness of flanges **24** and **26**. The bottom surfaces of flanges **24** and **26** are, as previously stated, flush with or in the same plane as the flat front surface of bottom sheet **14**.

The panel **10** is intended to be installed in an acoustical ceiling structure with other panels of identical construction as shown in FIGURE 7. As there shown, the panels are similarly oriented and are arranged in a horizontal plane in parallel rows. An overhead support structure is provided made up of spaced parallel, transverse channels **70**. The elongated, generally L-shaped support strips **74** have horizontal portions **75** engaging the undersurfaces of the channels **70**, vertical depending portions **76** extending downward, and hooked portions **78** removably engaging under the hooked portions **60'**, **62'** along the side between corners **2** and **3** of the panels. These strips **74** are removably secured to the channels **70** by wires **80** and extend at right angles to the channels continuously along all of the panels in the row.

In the installed ceiling structure, the supported flanges **28** and **30** of each panel rest upon and are supported by the supporting flanges **24** and **26** of adjacent panels. Since the bottom faces of supporting flanges **24** and **26** of each panel are flush with the bottom face thereof and since the supported flanges **28** and **30** are spaced upwardly of the bottom face a distance equal to the thickness of the supporting flanges **24** and **26**, it will be apparent that the front faces of all of the panels in the ceiling structure will be disposed in the same horizontal plane. In view of the fact that there are no support runners between panels or gridwork separating panels, the view of the ceiling structure as seen from below according to FIGURE 7, is one of a monolithic or continuous ceiling structure.

A firm support is provided for each panel because each panel is suspended along the side having the supporting flange **26** from an overhead support structure, and is supported along the opposite side and along one end upon the supporting flanges of adjacent panels.

The arrangement is such that any one panel may be removed from the assembly without disturbing the other panels. This is accomplished by raising the corner **1** of a particular panel and then twisting it slightly to disengage the panel from the suspending strips **74** along the side between corners **2** and **3**, and then lowering the disengaged panel from the space it previously occupied.

The panels may be of varying dimensions and may be rectangular or square as desired. While the terms "side" and "end" have been used throughout the specification to refer to certain edges of the panel, it should not be inferred that the "sides" are necessarily longer than the "ends." With respect to the supporting and supported flanges, it will be noted that a three layer or lamination construction is provided for added strength. This edge construction as provided by the flanges also prevents delamination of the top and bottom sheets from the honeycomb core structure. Delamination, if it ever occurs, will ordinarily begin at the edges.

It will be noted that in the ceiling construction illustrated in FIGURE 7 the flange or hook portion **60**, **62** along the end having the supporting flange **24** is not suspended from overhead. The purpose of flanges or hook portions **60**, **62** is convenience of construction. It also allows the installer to begin installing the panels in a 90° change of direction, so that the panels instead of extending in rows from right to left as in FIGURE 7, extend at right angles thereto. In that event, the support strips **74** would engage the flanges or hook portions **60**, **62** instead of those designated **60'**, **62'**.

What I claim as my invention is:

1. A rectangular acoustical ceiling panel having a flat

bottom surface, supporting flanges extending laterally outwardly from said panel along two adjacent edges of said panel and extending flush with said bottom surface, supported flanges extending laterally outwardly from said panel along the remaining two edges of said panel, said panel being adapted to be installed in a ceiling structure with other panels of like construction and like orientation in parallel rows with said supported flanges of each panel in said ceiling structure supported upon the said supporting flanges of adjacent panels, said supported flanges of said panel being spaced upwardly from the bottom surface thereof a distance such that the bottom surfaces of all panels in said ceiling structure will be flush with one another, said panel having a bottom sheet providing said bottom surface and a top sheet parallel to and spaced above said bottom sheet, members provided along the first-mentioned two edges having upright portions extending between said sheets and closing said first-mentioned two edges and also having horizontal suspension flanges extending laterally outwardly from the upper ends of said upright portions by which said panel may be suspended from an overhead support structure, said suspension flanges being disposed below and in surface to surface contact with said top sheet.

2. The acoustical ceiling panel defined in claim 1, wherein said members having horizontal flanges extending laterally outwardly from the lower ends of said upright portions disposed above and in surface-to-surface contact with said supporting flanges to reinforce the latter.

3. An acoustical ceiling structure comprising individual rectangular acoustical panels of identical construction arranged edge-to-edge in parallel rows, said panels having flat bottom surfaces and being similarly oriented, each panel having laterally outwardly extending supporting flanges along one end edge and one side edge extending flush with said bottom surface, each panel having laterally outwardly extending supported flanges along the other end edge and the other side edge, said supported flanges of each panel being supported upon the said supporting flanges of adjacent panels, said supported flanges of each panel being spaced upwardly from said bottom surface thereof a distance such that the bottom surfaces of all of said panels are flush with one another, each panel having a bottom sheet providing said bottom surface and a top sheet parallel to and spaced above said bottom sheet, members provided along the first-mentioned two edges of each panel having upright portions extending between said sheets and closing said first-mentioned two edges and also having horizontal suspension flanges extending laterally outwardly from the upper ends of said upright portions by which each said panels may be suspended from an overhead support structure, said suspension flanges being disposed below and in surface-to-surface contact with said top sheet.

4. The acoustical ceiling structure defined in claim 3, wherein said members have horizontal flanges extending outwardly from the lower ends of said upright portions disposed above and in surface-to-surface contact with said supporting flanges to reinforce the latter.

5. A rectangular acoustical ceiling panel having a flat bottom surface, supporting flanges along two adjacent edges of said panel extending flush with said bottom surface, supported flanges along the remaining two edges of said panel, said panel being adapted to be installed in a ceiling structure with other panels of like construction in

parallel rows with said supported flanges of each panel in said ceiling structure supported upon the said supporting flanges of adjacent panels, said supported flanges of said panel being spaced upwardly from the bottom surface thereof a distance such that the bottom surfaces of all panels in said ceiling structure will be flush with one another, said panel having a bottom perforated sheet providing said bottom surface, a top sheet parallel to and spaced above said bottom sheet, sound deadening material between said sheets, said supporting flanges being formed by extensions of said bottom sheet, L-shaped members along the first-mentioned two edges having upright portions extending between said sheets and closing said first-mentioned two edges and also having horizontal flanges extending from the lower ends of said upright portions, said horizontal flanges being disposed above and in surface-to-surface relation with said supporting flanges to reinforce the latter, said L-shaped members having horizontal flanges extending from the upper ends of said upright portions by which said panel may be suspended from an overhead support structure, said horizontal flanges extending from the upper ends of said upright portions being disposed below and secured in surface-to-surface contact with said top sheet.

6. A rectangular acoustical ceiling panel having a flat bottom surface, supporting flanges extending laterally outwardly from said panel along two adjacent edges of said panel and extending flush with said bottom surface, supported flanges extending laterally outwardly from said panel along the remaining two edges of said panel, said panel being adapted to be installed in a ceiling structure with other panels of like construction and like orientation in parallel rows with said supported flanges of each panel in said ceiling structure supported upon the said supporting flanges of adjacent panels, said supported flanges of said panel being spaced upwardly from the bottom surface thereof a distance such that the bottom surfaces of all panels in said ceiling structure will be flush with one another, said panel having a bottom sheet providing said bottom surface and a top sheet parallel to and spaced above said bottom sheet, members provided along the first-mentioned two edges having upright portions extending between said sheets and closing said first-mentioned two edges and also having horizontal suspension flanges extending laterally outwardly from the upper ends of said upright portions by which said panel may be suspended from an overhead support structure, said suspension flanges being secured to said top sheet, said members having horizontal flanges extending laterally outwardly from the lower ends of said upright portions disposed above and in surface-to-surface contact with said supporting flanges to reinforce the latter.

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U.S. Cl. X.R.

52—485, 588, 592; 181—33