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ACOUSTICAL SYSTEM

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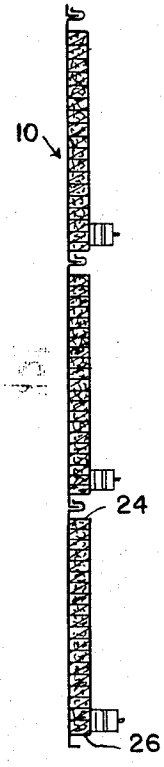


FIG.3.

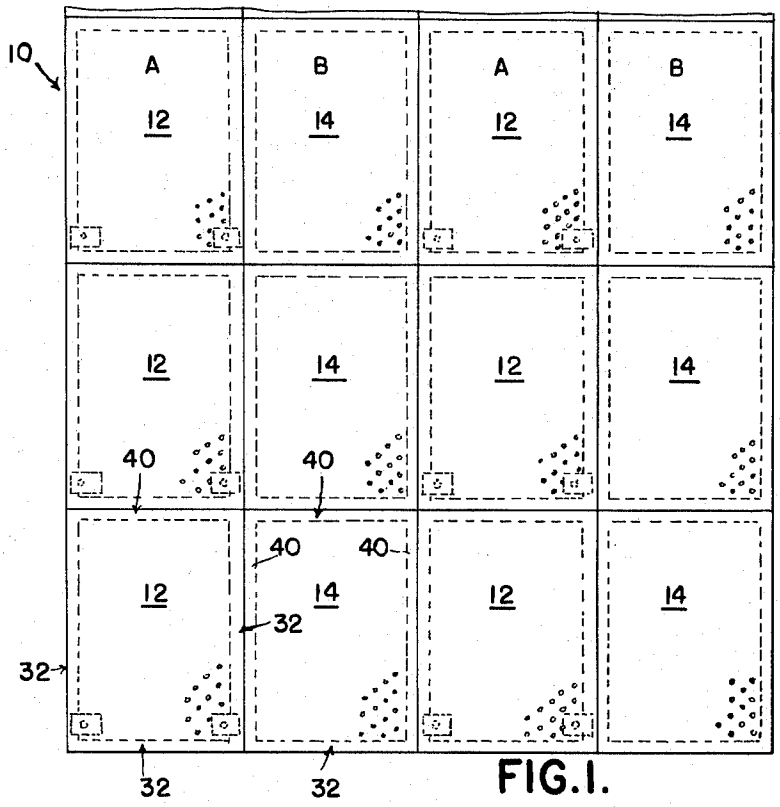


FIG.1.



FIG.2.

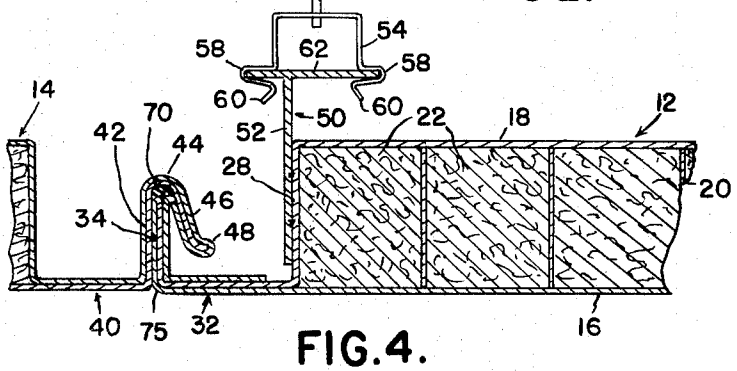


FIG.4.

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ACOUSTICAL SYSTEM

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

One object of this invention is to provide a ceiling structure composed of individual separable panels arranged edge to edge and in the same plane to form a continuous ceiling, the panels having an edge to edge supporting engagement with each other designed to facilitate assembly and disassembly.

Another object is to provide an acoustical ceiling structure in which adjacent panels have an upwardly extending flange on the edge of one and a downwardly opening channel-shaped hook on the edge of another engaged over and supported on the flange.

Another object is to provide an acoustical ceiling structure in which the panels are arranged in laterally spaced rows, the panels in alternate rows each having at one end edge an upwardly extending flange and at the opposite end edge a downwardly opening hook engaged over and supported by the flange of the adjacent panel in the same row.

Another object is to provide an acoustical ceiling structure wherein the panels in the alternate rows have upwardly extending flanges at the opposite side edges thereof, and the panels in the remaining rows have downwardly opening hooks at the opposite side edges respectively engaged over and supported by the side flanges of the adjacent panels in the alternate rows. This construction enables one man installation and maintains the panels in straight rows without zig-zag.

Another object is to provide support means in the form of suspension hangers for the flanged ends of the panels in the alternate rows.

Another object is to provide sealing material in the base of each hook to be engaged by the edge of the flange received therein.

Another object is to provide a hook construction for the panel edges wherein the ends of the hooks are turned out or an entire wall of the hook is inclined from the base thereof from the opposite wall, for the purpose of facilitating the entry of a flange and to draw the panels together.

Other objects and features of the invention will become more apparent as the following description proceeds, especially when considered with the accompanying drawing, wherein:

FIGURE 1 is a bottom plan view of a ceiling structure according to my invention.

FIGURE 2 is a line diagram of the ceiling structure shown in FIGURE 1, in end elevation.

FIGURE 3 is a line diagram in side elevation.

FIGURE 4 is an enlarged sectional view of a portion of FIGURE 2.

Referring now more particularly to the drawing, the ceiling structure is generally indicated by the reference numeral **10** and is composed of individual separable rectangular acoustical panels **12** and **14**. As viewed in FIGURE 1, the panels **12** are arranged in the alternate rows A and the panels **14** are arranged in the rows B between the rows A.

The panels **12** are identical and each has a sheet metal front facing **16** and a sheet metal rear facing **18** which is parallel to and spaced behind the front facing. The front facing is 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 **16** and **18** respectively 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 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 outwardly from the end wall **26**.

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. As shown in FIGURE 4, 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 **12**. 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 front or end wall of the panel to form an upright flange **42** which is return bent to form a hook **44** the opposite flange of which is indicated at **46** and terminates in a turned-out end **48**. It will be noted that the metal of the back facing **18** continues beyond the end **48** 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.

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

A T-shaped member 50 is secured to each side edge of each panel 12 near the the end thereof having the supporting portion 32. The stems 52 of the T-shaped members 50 are rigidly secured in surface-to-surface relation to the sides 28 and 30 of each panel 12. A generally channel-shaped resilient clip 54 is associated with each T-shaped member, the clips 54 being suspended from an overhead ceiling structure. The clips 54 are thus suspended by rods 56 which together with the clips form suspension hangers. The legs of the clips are shaped to provide opposed channels 58 and terminate at their lower ends in flanges 60. Hence the cross member 62 of the T may be snapped into the opposed recesses or channels 58 of the associated clip by merely pressing upwardly to cam the legs apart by engagement with the flanges 60. The cross members 62 of the T-shaped members are in off-center relation with respect to the stems in order to clear the hook and flange connection between adjacent panels.

In order to install the acoustical ceiling structure, and assuming the suspension hangers composed of the rods 56 and clips 54 are in place, the row A of panels 12 are first put up. This is accomplished by engaging the hook 44 of the supported portion 40 along one end of each panel 12 over the flange 34 of the supported portion 32 along the adjacent end of the next panel in the row. Then the end of the panel 12 having the flanged or supported portion 32 is engaged with the clip 54 of the adjacent hanger by means of the T-shaped member 50. The next panel in the row is then installed in the same manner, that is, its hook shaped end is engaged over the flanged end of the installed panel, and its flanged end is then suspended from the associated clip 54. The first panel 12 to be installed in the row A may be supported by laying on a suitable flange provided by a wall angle or channel fixed to the wall of the enclosure.

Alternate rows A are installed in this manner, and then the panels 14 of the rows B are installed to complete the ceiling structure. The panels 14 are installed in the rows B by turning them edge-wise to elevate them above the level of the common horizontal plane established by the installed rows A of panels 12, and then panels 14 are lowered so that the hooks along their sides engage over and are supported on the flanges 34 of the panels 12 in the rows A. As each panel 14 is installed, its end having the hook 44 is engaged over the flange of the end of a B panel previously installed. The first panel 14 to be installed in B rows may be supported by laying on a suitable flange provided by a wall or channel fixed to the wall of the enclosure.

By reason of the inclined wall 46 of each hook and the turned-out terminal portion 48 thereof, it will be apparent that the hooks 44 may be readily engaged over the associated flanges. Moreover, a lead-in is thereby provided to firmly engage the flange in the base of the hook and to draw the panels together by the movement of the flange along the inclined wall 46 to the narrow base of the hook during installation.

Preferably a strip of sealing material 70 fills the base of each hook 44 along the full length thereof to be engaged by the flange received therein to provide a seal against the transmission of air and also to provide a sound barrier.

As shown in FIGURE 4, the panel extensions forming the portions 32 and 40 are rounded as indicated at 75 in order to avoid the appearance of any sharp edges or shadows which might result from a small degree of misalignment of the panels.

According to this construction, the panels together form a continuous ceiling structure and are disposed in edge-to-edge relationship in the same plane. As viewed from below, the front facings 16 are coplanar and any misalignment of panels is minimized from the standpoint of appearance by the bevel along the meeting edges. Moreover, the panels in the rows B being supported by the panels in the rows A can be readily removed by simply lifting them from hook engagement, turning them edgewise and then lowering them through the opening between the other panels for access to the area above the ceiling. The panels are very rigid because of the sandwich construction provided by the front and back facings and intermediate honeycomb core, and the marginal portions 32 and 40 are also extremely strong, being composed of two and three layers of metal.

One man can install this ceiling. When putting up the A rows, the hooked end of one panel is engaged over the flange of another, and the hooked end is thus supported while the flanged end is connected to a clip 54. The B panels can also be installed by one man in the manner described above.

The B panels tie together the A panels in side by side relation stabilizing and rigidifying the entire ceiling and preventing the panels from spreading apart. The hooked connection between panels also keeps them in straight rows without zig-zag.

What I claim as my invention is:

1. In a ceiling structure, a plurality of individual, separable, rectangular, acoustical panels arranged substantially in edge-to-edge relation in a common horizontal plane in parallel rows to form a continuous ceiling, the panels in alternate rows each having at one end edge an upwardly extending flange and at the opposite edge a downwardly opening hook straddling the flange of the adjacent panel in the same row, said panels in the alternate rows having upwardly extending flanges at the opposite side edges thereof, and the panels in the remaining rows having downwardly opening hooks at the opposite side edges thereof respectively straddling the side flanges of the adjacent panels in said alternate rows.

2. The ceiling structure defined in claim 1, wherein the panels in said remaining rows each have at one end edge an upwardly extending flange and at the opposite edge a downwardly opening hook straddling the flange of the adjacent panel in the same row, the hook and flange connection between panels enabling one man installation and being effective to maintain the panels in straight rows, and support means for the flanged ends of the panels in said alternate rows.

3. In a ceiling structure, a plurality of individual, separable, rectangular, acoustical panels arranged substantially in edge-to-edge relation in a common horizontal plane and in parallel rows to form a continuous ceiling, the panels in alternate rows each having at one end edge a horizontally extending supporting portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent end edges of said panels, the panels in said alternate rows each having at the opposite end edge a horizontally extending supported portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent end edges of said panels and disposed in surface-to-surface engagement with the upright portion of the supporting portion of the adjacent panel in the same row, the upright portion of each said supported portion having a downwardly opening return-bent portion constituting a hook straddling the upright portion with which it is disposed in surface-to-surface engagement, said panels in alternate rows having at each side edge thereof a horizontally extending supporting portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent side edges of said panels, the panels in the remaining rows having at each side edge thereof a horizontally extending supported portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent side edges of said panels and disposed in surface-to-surface engagement with the upright portion of said supporting portion on the side edge of a panel in the adjacent alternate row, the upright portion of each said supported portion on the side edges of the panels

in said remaining rows having a downwardly opening return-bent portion constituting a hook straddling the upright portion with which it is disposed in surface-to-surface engagement.

4. In a ceiling structure, a plurality of individual, separable, rectangular, acoustical panels arranged substantially in edge-to-edge relation in a common horizontal plane and in parallel rows to form a continuous ceiling, said panels having front and back facings, each panel having at one end edge a horizontally extending supporting portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent end edges of said panels, each panel having at the opposite end edge a horizontally extending supported portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent end edges of said panels and disposed in surface-to-surface engagement with the upright portion of the supporting portion of the adjacent panel in the same row, the upright portion of each said supported portion having a downwardly opening return-bent portion constituting a hook straddling the upright portion with which it is disposed in surface-to-surface engagement, means suspending the panels in said alternate rows near the ends thereof having said supporting portions, said panels in alternate rows having at each side edge thereof a horizontally extending supporting portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent side edges of said panels, the panels in the remaining rows having at each side edge thereof a horizontally extending supported portion projecting outwardly therefrom and provided with an upright portion substantially parallel to the adjacent side edges of said panels and disposed in surface-to-surface engagement with the upright portion of said supporting portion on the side edge of a panel in the adjacent alternate row, the upright portion of each said supported portion on the side edges of the panels in said remaining rows having a downwardly opening return-bent portion constituting a hook straddling the upright portion with which it is disposed in surface-to-surface engagement, said supporting portions including the upright portions thereof being formed from extensions of said front and back panel facings arranged in surface-to-surface relation with each other, said supported portions including the upright portions thereof as well as said return-bent portions being formed from extensions of said front and back panel facings arranged in surface-to-surface relation with each other, said supporting and supported portions projecting laterally from said respective panels in substantially the horizontal plane of the front facings of said panels.

5. The ceiling structure defined in claim 4, wherein said suspending means comprises a pair of T-shaped members for each panel in the alternate rows, each T-shaped member projecting above and having the stem thereof secured to a side edge of a panel in an alternate row adjacent the end thereof having the supporting portion, a clip suspended from an overhead ceiling structure connected to the cross-member of each T-shaped member, said cross-member of each T-shaped member being in off-center relation with respect to the stem thereof so that the portion of said cross-member projecting laterally outward with respect to the panel by which it is carried is shorter than the inwardly projecting portion thereof, to clear the connection between panels in adjacent rows.

6. The acoustical structure defined in claim 5, wherein sealing material fills the bight of each hook and cooperates with the upper edge of the upright portion it straddles to provide a seal.

7. In a ceiling structure, individual, separable, rectangular, acoustical panels arranged substantially in edge-to-edge relation in a common horizontal plane, each panel having a flat perforated member defining its bottom surface, and means providing a connection between adjacent edges of said panels including a horizontally extending supporting portion projecting from one of said panels and having an upright portion substantially parallel to the adjacent edges of said panels, and a horizontally extending supported portion projecting from the other of said panels and having an upright portion substantially parallel to the adjacent edges of said panels and disposed in surface-to-surface engagement with the upright portion of said supporting portion, the upright portion of said supported portion having a downwardly opening return-bent portion constituting a hook straddling the upright portion of said supporting portion, said supported and supporting portions being formed at least in part from extensions of said perforated members, said extensions being disposed in the horizontal plane of the perforated members of said panels.

8. In a ceiling structure, individual, separable, rectangular, acoustical panels arranged substantially in edge-to-edge relation in a common horizontal plane, said panels having front and back facings, and means providing a connection between adjacent edges of said panels including a horizontally extending supporting portion projecting from one of said panels and having an upright portion substantially parallel to the adjacent edges of said panels, and a horizontally extending supported portion projecting from the other of said panels and having an upright portion substantially parallel to the adjacent edges of said panels and disposed in surface-to-surface engagement with the upright portion of said supporting portion, the upright portion of said supported portion having a downwardly opening return-bent portion constituting a hook straddling the upright portion of said supporting portion, said supporting portion and upright portion thereof being formed from extensions of said facings of said one panel arranged in surface-to-surface relation with each other, said supported portion and the upright portion thereof as well as said return-bent portion being formed from extensions of said facings of said other panel arranged in surface-to-surface relation with each other, said supporting and supported portions projecting laterally from the respective panels in substantially the horizontal plane of the front facings of said panels.

9. The ceiling structure defined in claim 8, wherein sealing material fills the bight of each hook and cooperates with the upper edge of the upright portion of the supporting portion to provide a seal.

10. In a ceiling structure, individual, separable, rectangular, acoustical panels arranged substantially in edge-to-edge relation in a common horizontal plane, each panel having a substantially flat perforated member, a substantially flat second member extending over said perforated member in spaced, parallel relation thereto, and a relatively rigid honeycomb core between said members to resist warping, and means providing a connection between adjacent edges of said panels including a supporting portion projecting from one of said panels and having an upright portion substantially parallel to the adjacent edges of said panels, and a supported portion projecting from the other of said panels and having an upright portion substantially parallel to the adjacent edges of said panels and disposed in close parallel, opposed relation with the upright portion of said supporting portion, the upright portion of said supported portion having a downwardly opening return-bent portion constituting a hook straddling the upright portion of said supporting portion, said supporting portion and upright portion thereof being formed from an extension of at least one of said members of said one panel, said supported portion and the upright portion thereof as well as said return-bent portion being formed from an extension of at least one of said members of said other panel, said supporting and supported portions projecting laterally from the respective panels in substantially the horizontal plane of the perforated members of said panels.

11. The ceiling structure defined in claim 10, wherein each of said panels is provided along the opposite edges thereof contiguous with said adjacent edge with laterally outward extensions to support said panels in a ceiling structure, said laterally outward extensions being formed from integral extended portions of at least one of said members.

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RICHARD W. COOKE, JR., *Primary Examiner.*