May 8, 1962 J. E. STANLEY 3,032,833

DEMOUNTABLE ACOUSTICAL CEILING

Filed April 22, 1957 3 Sheets-Sheet 1

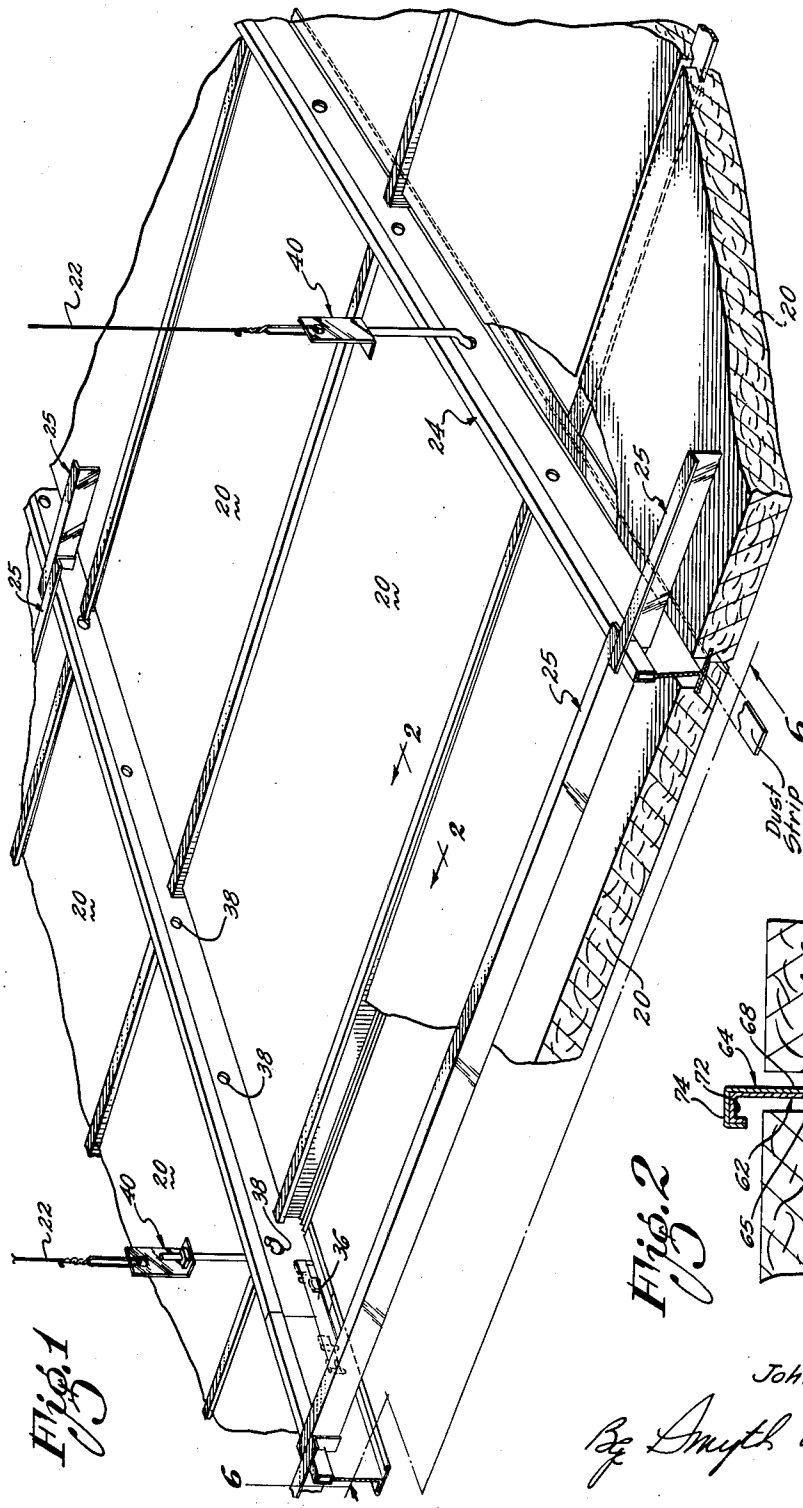

Fig. 1

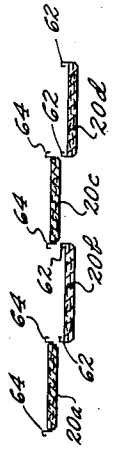

Fig. 3

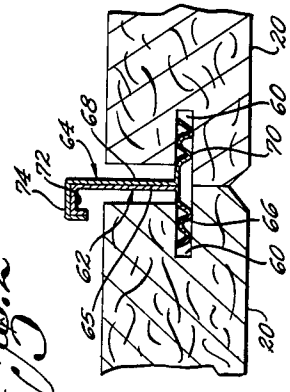

Fig. 2

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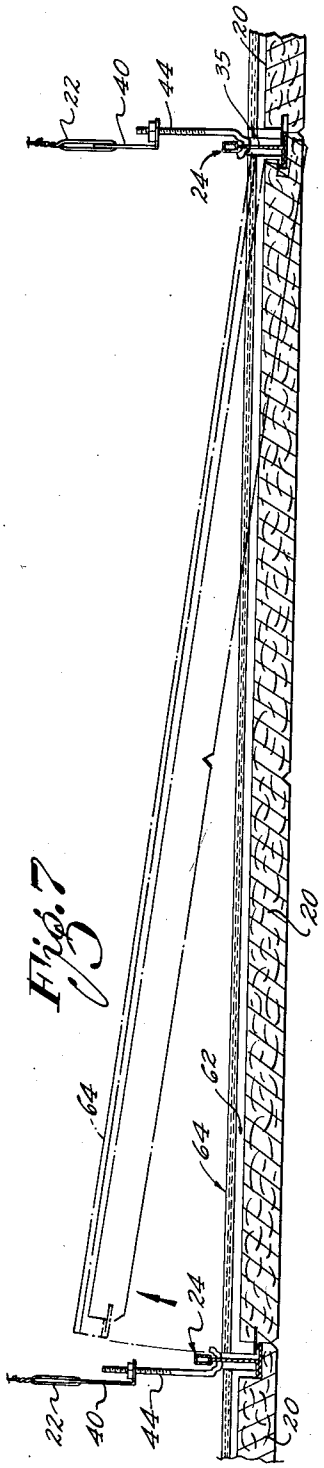

Fig. 7

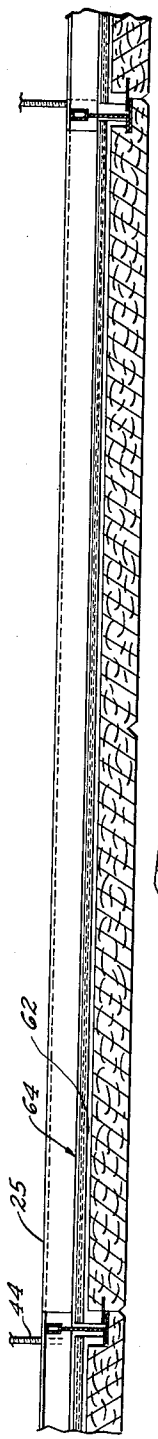

Fig. 6

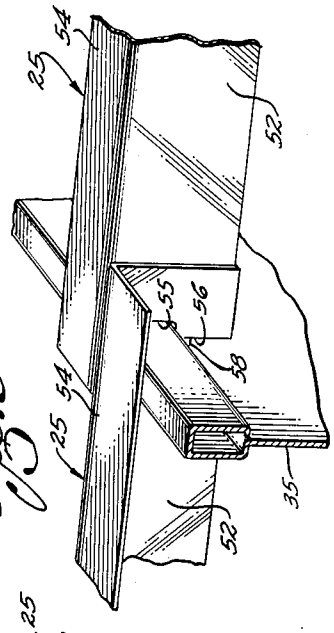

Fig. 5

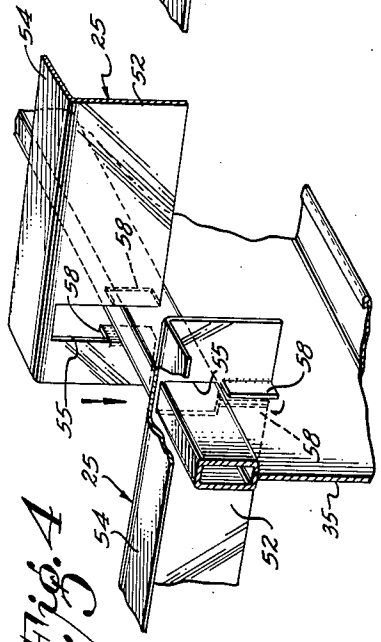

Fig. 4

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Fig. 8

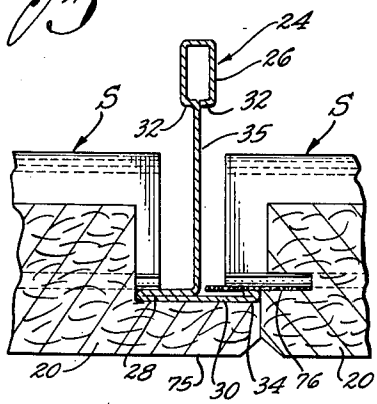


Fig. 12

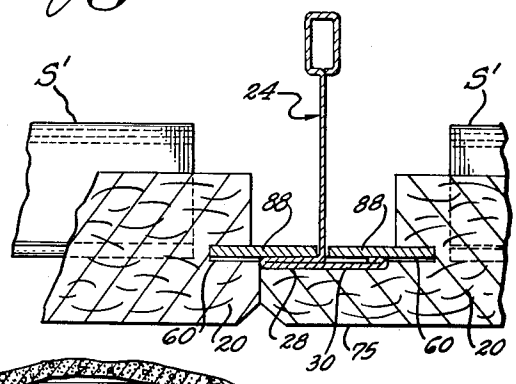


Fig. 10

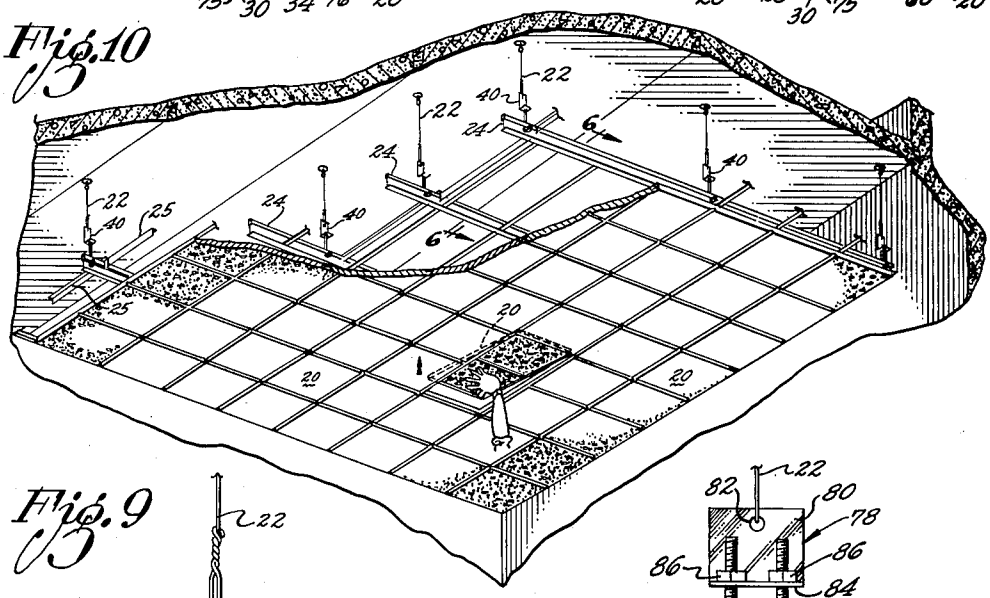


Fig. 9

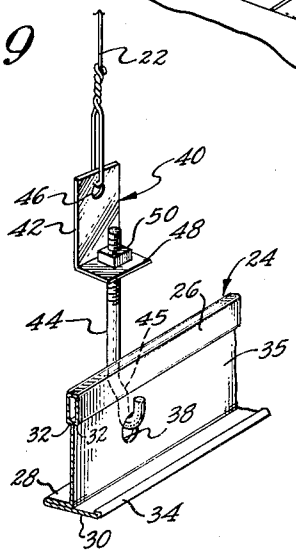
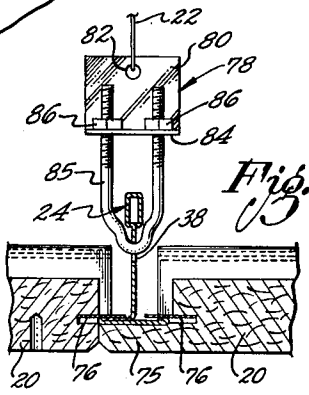


Fig. 11



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3,032,833

DEMOUNTABLE ACOUSTICAL CEILING

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Filed Apr. 22, 1957, Ser. No. 654,414
5 Claims. (Cl. 20—4)

This invention relates to an acoustical ceiling construction and is directed particularly to the solution of certain problems that are encountered in the construction of such a ceiling.

One of the problems is to minimize the cost of the materials for the ceiling. Another problem is to minimize the installation labor cost. Another problem is to provide an acoustical ceiling in which the support structure is adjustable for leveling the ceiling. Still another problem is to meet the demand for such an acoustical ceiling in which all of the supporting frame structure is concealed, only the acoustical tile being visible. A further problem is to provide an acoustical ceiling that is demountable in the sense that individual tiles may be readily removed temporarily as needed for access to the space above the ceiling. A still further problem is to provide an acoustical ceiling that is sealed to the degree necessary to permit the space above the acoustical tiles to be used as a return air plenum in an air conditioning system.

Each of these problems may be readily solved separate and apart from the other problems. Difficulties arise, however, when several of the solutions must be combined in a single ceiling construction, and especially when the endeavor is to avoid complications in the structure. The present invention solves all of these problems by means of a relatively simple construction.

The invention keeps material costs low by utilizing structural elements that may be produced economically by mass production methods. Further savings in material cost are achieved by using a supporting structure assembly that employs only a relatively few structural members for its purpose and in which the individual structural members are relatively light in weight.

The problem of minimizing labor cost is met by a number of different features. One of these features is the elimination of overhead runners, such as the commonly used channel runners. Under present building practices, these overhead runners must be installed by craftsmen of a different trade from the craftsmen that install the acoustical ceiling proper. The invention provides a support grid for the ceiling tiles that may be directly suspended from overhead building structure by simple flexible wires or the like. Thus, the invention eliminates the need for overhead runners so that the whole ceiling including all of its supporting structures may be installed by the usual craftsmen.

Another feature, with respect to savings in installation labor, is elimination of nails, screws or other time-consuming fastening devices. Fabrication of the supporting grid involves merely attaching parallel primary support members to the suspension wires, placing transverse spacer members in position to intersect and interconnect the primary support members, and then simply bending pliable tongues on the prefabricated spacer members for interlocking engagement with the primary support members.

Further savings in installation labor are achieved by reducing the necessity for skill and excessive care in the assembly of the acoustical ceiling. The primary support members are connected to the pendant wires by prefabricated hangers having adjustment nuts that may be manipulated to provide an exceedingly simple procedure for leveling the support grid. In addition, the lateral spacers

in the support grid are prefabricated to precise dimensions and are adapted to interconnect the primary support members in a rigid manner to space the primary support members apart with accuracy. Thus, the assembled grid is accurately constructed in accord with the precise dimensions of the individual acoustical tiles.

In the preferred practice of the invention, the primary support members are of the cross-sectional configuration of an inverted letter T, each having opposite longitudinal bottom flanges to provide longitudinal surfaces for supporting the rows of tiles. The tiles have kerfs in their opposite edges. To install an individual tile, it is necessary merely to insert secondary support members into the kerfs of the tile and to place the secondary support members in positions resting on the longitudinal support surfaces of the primary support members. As will be explained, the secondary support members may either be positioned longitudinally of the primary support members or may be positioned transversally to span the spaces between the primary support members. The second support members that are positioned longitudinally of the primary support members may be simple flat splines and the alternately used secondary support members that span the spaces between the primary support members may be of the general character of a so-called T-spline. Preferably, such T-splines, when used, are of split construction, as will be explained, to facilitate demounting of the tiles.

To conceal the supporting grid structure, the acoustical tiles are placed with their lower faces below the level of the primary support members and are positioned close together edge to edge. Upper portions of the tiles are cut away to clear the bottom portions of the primary support members and marginal portions of the tiles extend under the primary support members for concealment thereof. Only one end of an acoustical tile extends under a primary support member, however, the other end being free to swing upward for removal, as will be explained.

The various features and advantages of the invention may be understood by reference to the following detailed description in conjunction with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative:

FIGURE 1 is a perspective view from above of an installed ceiling constructed in accord with the presently preferred practice of the invention;

FIGURE 2 is an enlarged section taken as indicated by the line 2—2 of FIGURE 1 to show the construction of a longitudinally split T-spline that is employed in the preferred practice of the invention;

FIGURE 3 is a simplified cross-sectional view on a reduced scale showing how alternate tiles in a row may be provided with different halves of the split T-splines;

FIGURE 4 is a fragmentary perspective view indicating the manner in which the ends of two adjacent spacer members may be assembled to a primary support member;

FIGURE 5 is a similar view showing the members completely assembled together;

FIGURE 6 is a section taken as indicated by the angular line 6—6 of FIGURE 1 showing how a marginal portion of a tile may extend under a primary support member with the other end of the installed tile free to swing upward for removal;

FIGURE 7 is a view similar to FIGURE 6 showing one end of a tile swung upward in the procedure for removing the tile.

FIGURE 8 is an enlarged fragment of FIGURE 6 showing how the end portion of a tile extends under a primary support member for concealment thereof;

FIGURE 9 is a perspective view of a hanger employed in the preferred practice of the invention, the hanger

being shown in engagement with a primary support member;

FIGURE 10 is a perspective view from below of a finished ceiling constructed in accord with the preferred practice of the invention, portions of the structure being broken away;

FIGURE 11 is a view partly in section and partly in side elevation showing an alternate form of hanger; and

FIGURE 12 is an enlarged view similar to FIGURE 11 showing the longitudinal secondary support members in cross section.

As best shown in FIGURES 1 and 10, the ceiling construction includes a rigid grid for supporting rows of tiles **20**, the grid being suspended from the overhead building structure by flexible means in the form of wires **22**. The rigid grid comprises spaced parallel horizontal primary support members **24** connected to the wires **22** and parallel spacer members **25** that interconnect the primary support members.

As best shown in FIGURES 8 and 9, each of the primary support members **24** may be made of sheet metal bent back on itself to form a longitudinal hollow enlargement **26** along its upper edge and to form two opposite longitudinal flanges **28** and **30** along its bottom edge. The longitudinal enlargement **26**, which may be of rectangular cross-sectional configuration, forms two downwardly presented shoulders **32** on opposite sides of the primary support member. The bottom flange **28** of the primary support member is of double thickness and the second flange **30** is folded or rolled at its edge to provide a double-thickness bead **34**. By virtue of this construction, a primary support member **24** has relatively great strength for its weight, since it has a relatively wide vertical web **35** reinforced by the longitudinal hollow enlargement **26** and since the two bottom flanges **28** and **30** stiffen the web against lateral flexure.

When necessary, the primary support members **24** may be interconnected end to end to extend across a relatively long room space and for this purpose connecting clips **36** made of sheet metal may be used as shown in FIGURE 1. Each of the clips **36** comprises simply a strip of flexible sheet metal formed with lateral tongues at its ends, which tongues are inserted into slots of the two primary support members and are then bent back for positive engagement.

The primary support members **24** may be connected to the suspension wires **22** in any suitable manner. In the present embodiment of the invention, the vertical web **35** of each primary support member **24** has a number of spaced apertures **38** for engagement by hangers **40**. As best shown in FIGURE 9, each of the hangers **40** may comprise an angular piece of sheet metal **42** and a rod member **44** bent to form a hook for engagement with one of the apertures **38**. Preferably, the rod member **44** is formed with an off-set **45** to clear the enlargement **26** of the primary support member. The angular piece of sheet metal **42** has an aperture **46** for engagement by a suspension wire **22** and is formed with an apertured flange **48** to receive the rod member **44**. The rod member **44** is threaded at its upper end to receive an adjustment nut **50** for engagement with the apertured flange **48** and this nut may be rotated to shorten or lengthen the hanger for the purpose of leveling the support grid.

As best shown in FIGURES 4 and 5, the spacer members **25** may take the form of sheet metal angles each of which has a vertical web **52** and a top flange **54**. Each of the spacer member **25** is provided at each of its opposite ends with a slot extending upward from its lower edge, this slot being dimensioned to permit the end of the spacer member to straddle a primary support member **24**. In the present practice of the invention, each of these slots is formed by making a rectangular aperture **55** in the vertical web of the spacer member of a dimension to straddle the rectangular enlargement **26** of a primary support member **24** and by then cutting a narrow slot **56** centrally of the rectangular aperture with the slot extending to the bottom edge of the vertical web **52** and with the slot dimensioned in width to straddle the vertical web **35** of a primary support member. The narrow slot **56** together with the rectangular aperture **55** forms a pair of tongues **58**. When these tongues **58** are bent away from the plane of the vertical web **52** of the spacer member as indicated in FIGURE 4, the tongues form an entrance to the rectangular aperture **55** for the enlargement **26** of a primary support member. When a spacer member **25** is positioned in this manner with the enlargement **26** of a primary support member **24** in the rectangular aperture **55**, the tongues **58** of FIGURE 4 may be bent back into the plane of the vertical web **52** as indicated to effect positive engagement of the spacer member with the primary support member.

Each of the tiles **20** is supported from the described support grid by a plurality of secondary support means and for this purpose each of the tiles is formed with kerfs **60** in its edges in a well known manner. In the preferred practice of the invention, each of the secondary support means is of a type commonly known as a T-spline and is generally designated by the letter S in the drawings. Each split T-spline S has the configuration in cross section of an inverted letter T and is of a special split construction. Thus, each split T-spline S comprises two separate longitudinal sections or support elements **62** and **64**.

As shown in cross section in FIGURE 2, the two split T-spline sections **62** and **64** are L-shaped in cross section and are positioned back to back to provide a composite configuration that is characteristic of a T-spline. Section **62** has a vertical web **65** and has a bottom flange **66** to engage a kerf **60** of an adjacent tile **20**. This bottom flange **66** is preferably corrugated, as shown, to fit snugly into the kerf. In the same manner, the second section **64** of the split T-spline has a vertical web **68** and a corrugated bottom flange **70** to engage the kerf **60** of an adjacent tile **20**. The top edge of the split T-spline section **62** is reinforced by an overhanging flange **72** and the top edge of the section **64** is reinforced in a similar manner by an overhanging flange **74** that makes hook engagement with the overhanging flange **72**. In the manner shown in FIGURE 1, the opposite ends of the split T-splines S rest on the bottom flanges of the primary support members **24** to support the tiles **20** in rows between the primary support members.

It is apparent from an inspection of FIGURE 2 that with the overhanging flange **74** of the split T-spline section **64** in hook engagement with the overhanging flange **72** of the other split T-spline section **62** the two sections of the split T-spline are in positive engagement with each other at the normal installed position of the split T-spline but that the two sections may be separated simply by lifting the split T-spline section **64** upward to disengage the overhanging flange **74** from the overhanging flange **72**. It is further apparent that if every other tile **20** in a row of tiles is supported by split T-spline sections **64**, these tiles may be readily demounted from their installed positions by simple upward movement. Thus, as shown somewhat diagrammatically in FIGURE 3, if four tiles **20*a***, **20*b***, **20*c*** and **20*d*** are placed in sequence in a row and the tiles **20*a*** and **20*c*** are provided with split T-spline section **64**, while the alternate tiles **20*b*** and **20*d*** are provided with the split T-spline sections **62**, the tiles **20*a*** and **20*c*** may be disengaged from the other tiles by upward movement. After the tiles **20*a*** and **20*c*** are removed, the remaining alternate tiles **20*b*** and **20*d*** may be removed. In this manner, the described arrangement makes possible an acoustical ceiling that is completely demountable in the sense that any number of the acoustical tiles may be dismounted when desired for access to the space above the ceiling.

In the present embodiment of the invention, one end of each tile in a row is cut back on its upper side to clear

the bottom of a primary support member 24 and to form a bottom marginal portion 75 which underlies and conceals the primary support member as best shown in FIGURE 8. Obviously, this end of the tile cannot be lifted for the purpose of demounting the tile but, as shown in FIGURE 7, the other end of the tile terminates short of the next primary support member 24 and may be lifted as indicated in broken lines in FIGURE 7. Thus, a tile equipped with split T-spline sections 64 along its opposite edges may be tilted upward in the manner indicated in FIGURE 7 and then may be easily maneuvered out of the ceiling assembly. When a tile is swung upward in this manner to fulcrum about the end that has the bottom marginal portion 75, the lower end of the two inclined split T-spline sections 64 rock against the corresponding primary support member 24 with the consequence that the split T-spline sections are slightly longitudinally displaced along the kerfs of the tile. In practice, this slight shifting of the split T-spline sections is not troublesome.

The preferred practice of the invention further includes a flat spline 76 positioned at the swinging end of each tile, as shown in FIGURE 8, to serve as a barrier to dust and to minimize air leakage through the ceiling. The flat spline 76 may be made of fibrous material and is of a length no greater than the corresponding dimension of the tile so that the flat spline may be lifted with the tile without interference by adjacent tile.

The described ceiling may be assembled on the job in a rapid manner without sacrificing accuracy in dimensions and alignment. The spacer members 25 drop readily into their assembled positions and it is a simple matter to bend the tongues of the spacer members back into the planes of the vertical webs 52 for positive engagement between the spacer members and the primary support members 24. The spacer members 25 are accurately prefabricated so that the assembled rigid grid is of the precise dimensions required for supporting the tiles 20 in accurately aligned rows.

Since the bottom flanges 66 and 70 of the split T-spline sections 62 and 64 are corrugated for snug fit into the kerfs 60 of the tiles, the split T-spline sections may be preassembled to the tiles. The flat splines 76 may also be preassembled since they may be held in position at their opposite ends by the corresponding split T-spline sections. After the ceiling is completely installed, access to the space above the ceiling may be achieved by swinging up any of the tiles that are equipped with the split T-spline sections 64. The alternate tiles that are equipped with the split T-spline sections 62 may be removed by first removing the adjacent tiles that are equipped with the split T-spline sections 64.

FIGURE 11 shows a hanger 78 that may be substituted for the hanger 40. The hanger 78 comprises an angular piece of sheet metal 80 having an aperture 82 for engagement with a suspension wire 22 and having a bottom flange 84 apertured to receive the two legs of a U-shaped rod 85. The U-shaped rod 85 hooks through an aperture 38 of a primary support member 24 in the usual manner and is provided with a pair of nuts 86 in abutment with the bottom flange 84 for leveling adjustment of the support grid.

FIGURE 12 indicates how split T-splines S' may be made shorter than the tiles 20 to serve merely as means to interconnect the tiles and to seal the junctures of the tiles without actually supporting the tiles. The tiles are supported solely by secondary support elements in the form of relatively heavy flat splines 88 which may be made of metal or any suitable material. The flat splines 88 engage the kerfs 60 at the ends of the tiles and rest on the bottom flanges 28 and 30 of the primary support members 24. Thus, each of the flat splines 88 runs longitudinally of a primary support member 24 with one longitudinal half of the flat spline resting on the primary support member and the other longitudinal half engaging the kerf 60 of the adjacent tile. Each of the flat splines 88 is of the same length as the width of the tile with which it is engaged so as not to interfere with removal of the individual tile from the ceiling when desired.

My description in specific detail of the preferred practice of the invention will suggest various changes, substitutions and other departures from my disclosure within the spirit and scope of the appended claims.

I claim:

1. An assembly of elongated members to form a grid for suspension from overhead building structure to support rows of ceiling tiles, comprising: a plurality of primary support members directly suspended from the overhead building structure, each of said primary support members having lower longitudinal flanges on its opposite sides to support the rows of tiles and having a downwardly facing longitudinal shoulder above the level of said lower portions; a plurality of spacer members spaced above the level of the lower edges of said primary support members and interconnecting successive pairs of said primary support members, each of said spacer members having a slot extending upward from its bottom edge near each of its ends and straddling an upper portion of one of said primary support members including said shoulder thereof, said slots being of the width of the upper portions of said primary support members to permit the spacer members to be moved laterally into straddling engagement with the primary support members, each of said spacer members having pliable tongue means adjacent each of said slots extending across the slot in the path of withdrawal of said shoulder and thereby positively interlocking the spacer member with the straddled primary support member to form a rigid grid structure; and secondary support members resting on said flanges of the primary support members and spanning the spaces between the primary support members, said secondary members having flanges adapted to engage the tiles.

2. A combination as set forth in claim 1, in which each of said primary support members is enlarged in cross section at an upper longitudinal portion thereof to form two downwardly facing longitudinal shoulders; and in which each of said spacer members has two pliable tongues on opposite sides of each of its slots engaging said two shoulders respectively.

3. A combination as set forth in claim 2, in which each of said primary support members is made of sheet metal with the sheet metal bent back on itself to form an upper longitudinal hollow enlargement providing said two shoulders.

4. A combination as set forth in claim 1, in which each of said primary support members is enlarged in cross section at an upper portion thereof to form two downwardly facing longitudinal shoulders; and in which each of said spacer members is made of pliable sheet material and has an aperture near each of its ends of the same cross-sectional configuration as said enlargements; and in which each of said spacer members has a slit extending from each of said apertures to the bottom edge of the spacer member, said apertures and slits straddling said primary support members in interlocking engagement with said shoulders.

5. In an acoustical ceiling construction suspended from overhead building structure, the combination of: a plurality of acoustical tile arranged in rows with their bottom faces forming a ceiling surface, said tiles having kerfs in their edges; a series of spaced parallel horizontal primary support members extending along the junctures of said rows of tiles, each of said primary support members having longitudinal flanges on its opposite sides at its lower edges supporting said tiles by said kerfs, the bottom faces of said tiles being below the level of said primary support members, said tiles being positioned close together edge to edge to conceal said primary support members, each of said primary support members having a downwardly facing longitudinal shoulder on at least one of

its sides; means directly connected to said primary support members and suspending said primary support members from the overhead building structure; and spacer members interconnecting the successive pairs of said primary support members to form therewith a support grid for said tiles, said spacer members being dimensioned in length in accord with the dimensions of said tiles to place said primary supports at said junctures of the rows of tiles for supporting the tiles, each of said spacer members having near each of its ends a slot extending upward from its lower edge to straddle a primary support member, said slot being formed with at least one tongue in engagement with said shoulder of the primary support member to lock the spacer member to the straddled primary member.

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