United States Patent

Kidney

[15] **3,640,042**

[45] **Feb. 8, 1972**

[54] ACCESS-PROVIDING DIRECT SUSPENDED CEILING STRUCTURE WITH REMOVABLE LOCKED-IN TILE SECTIONS

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[21] Appl. No.: **840,910**

[52] **U.S. Cl.**.....**52/475,** 52/127, 52/484, 52/488, 52/496

[51] **Int. Cl.**.....**E04b 5/54**

[58] **Field of Search**.....52/144, 127, 145, 496, 484, 52/488, 495, 467, 669, 668, 664, 667; 287/189.36 C

[56] **References Cited**

UNITED STATES PATENTS

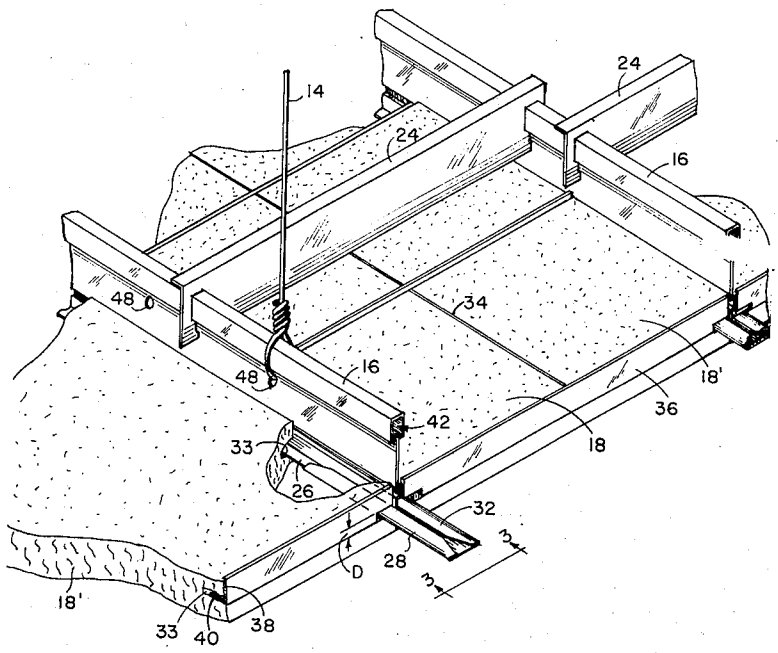
3,032,833	5/1962	Stanley	52/484
3,055,466	9/1962	Brown	52/484
3,320,713	5/1967	Downing	52/DIG. 5
3,381,437	5/1968	Kidney	52/497
3,416,282	12/1968	Daugherty	52/627

Primary Examiner—John E. Murtagh
Attorney—Bryan, Parmelee, Johnson & Bollinger

[57] **ABSTRACT**

An access-providing, rigid, properly aligned, suspended ceiling structure for acoustic tiles and the like is described, having removable locked-in tile sections and hidden support structure. The structure employs selectively shaped horizontal parallel beams which have flanges to fit within tile kerfs to provide a tile-supporting structure, which is hidden from view of persons in the room below. Spacer bars extend across between the beams and rigidly anchor them in place. Enlarged ceiling sections are removable by the employment of crossbars sized to fit in tile kerfs between beams with the ends of the crossbars being provided with selectively sized cutouts to permit free longitudinal, unobstructed movement of slidable splines located on the beam flanges. The slidable splines have lengths smaller than tile dimensions supported by the beam flanges and are movable within tile kerfs for ceiling section removal. The horizontal parallel beams are shaped to provide a high load-carrying capability, with their shaping advantageously employed to enhance removability of individual tiles.

21 Claims, 13 Drawing Figures



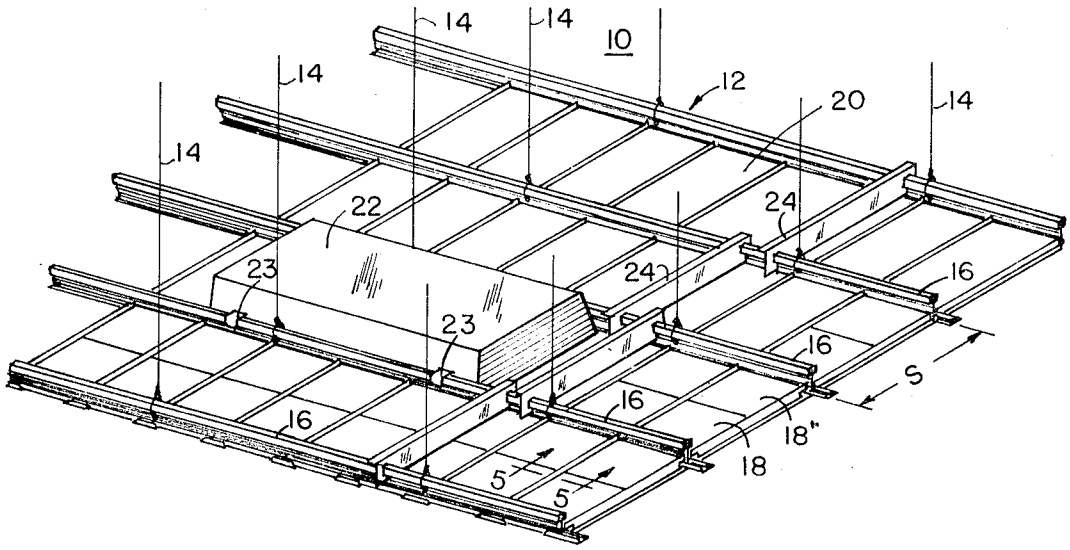


FIG.1

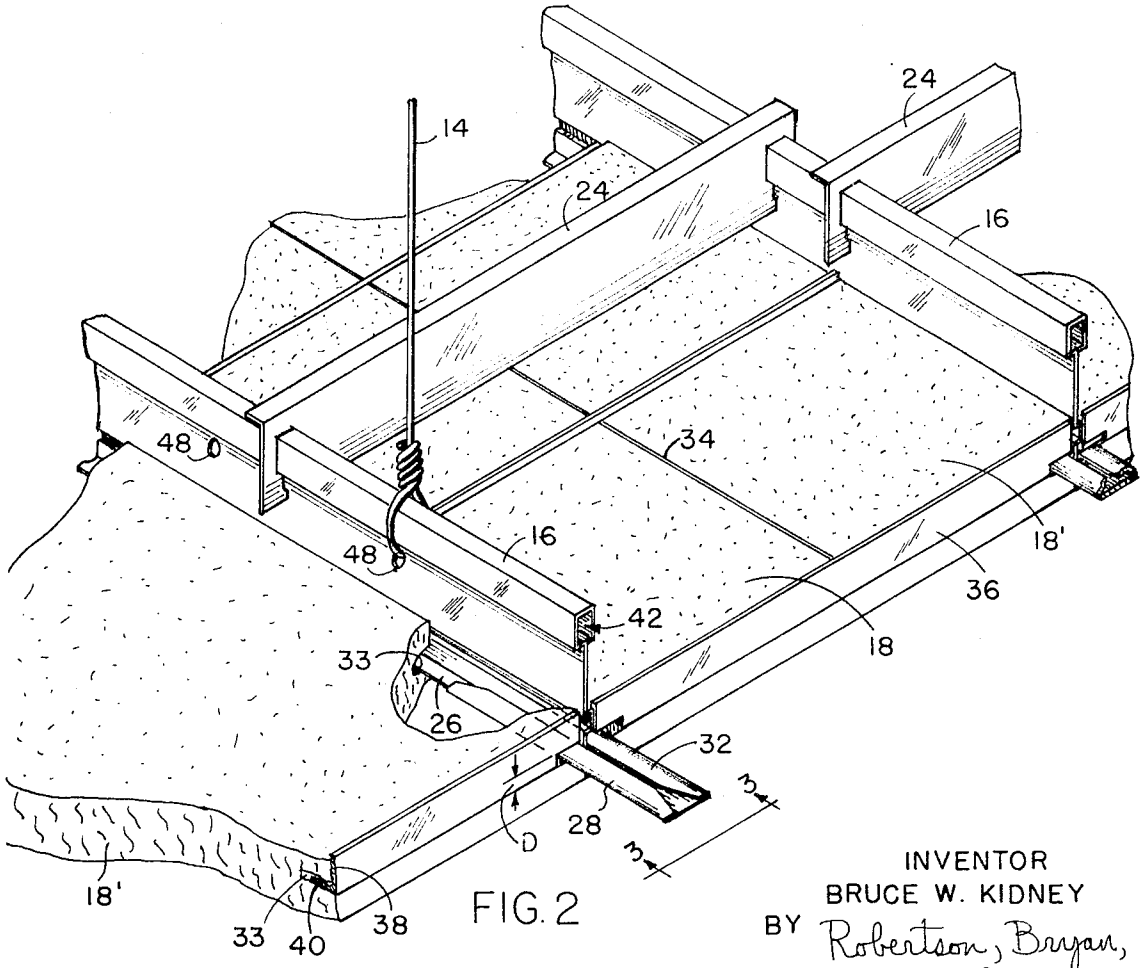


FIG. 2

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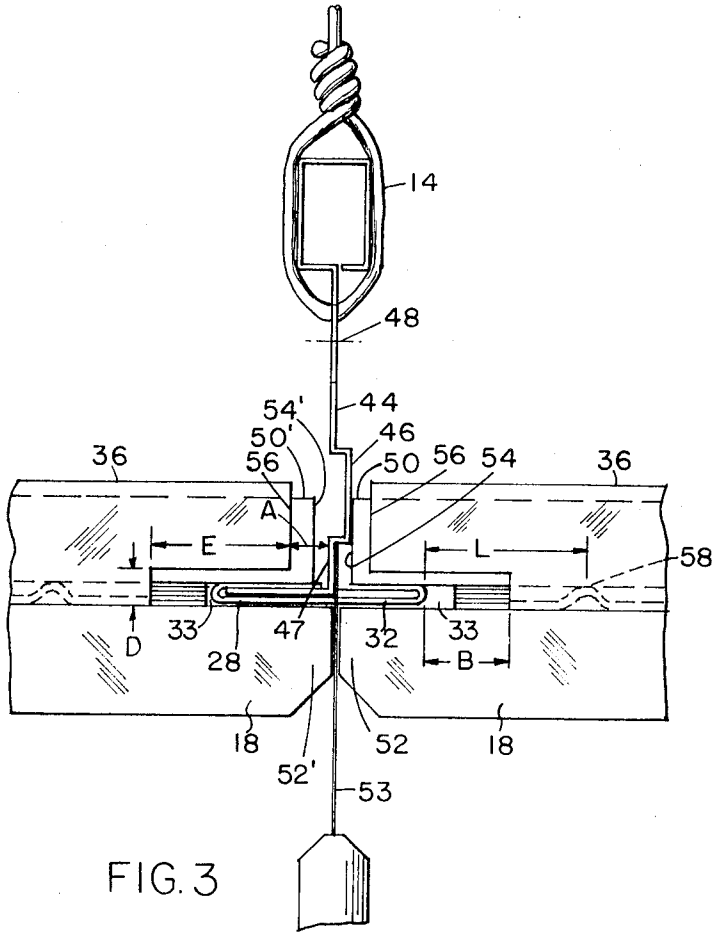


FIG. 3

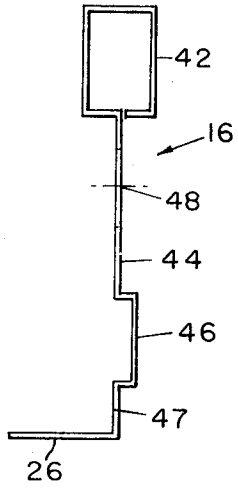


FIG. 4

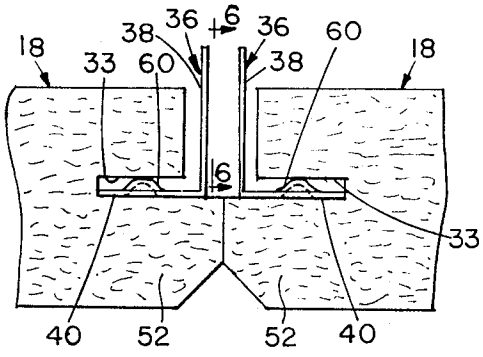


FIG. 5

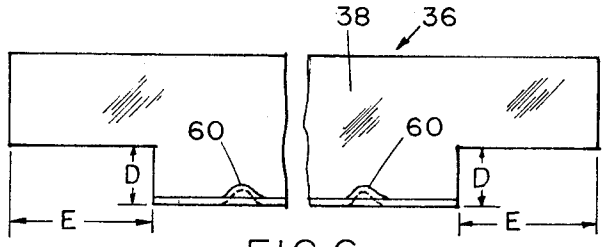


FIG. 6

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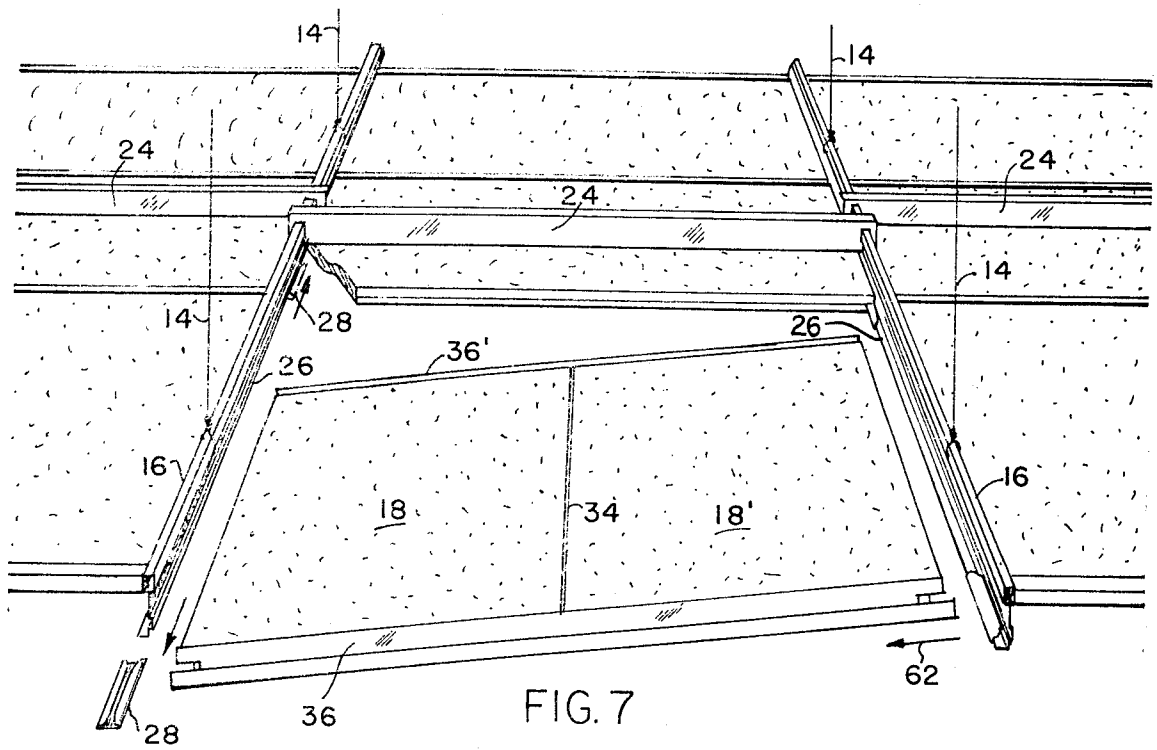


FIG. 7

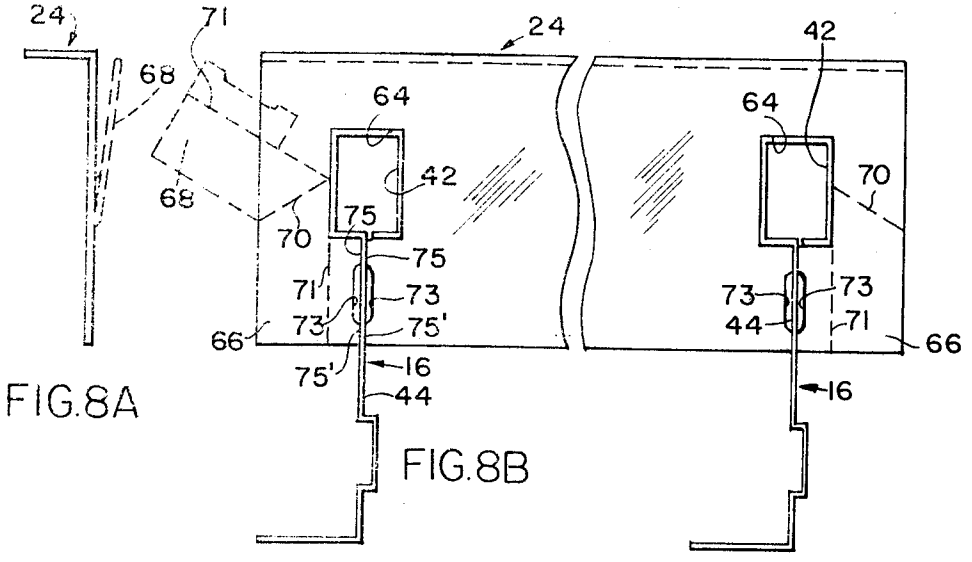


FIG. 8A

FIG. 8B

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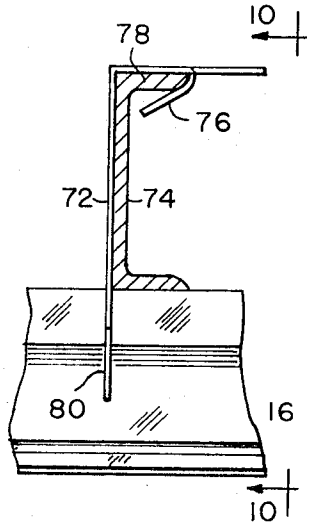


FIG. 9

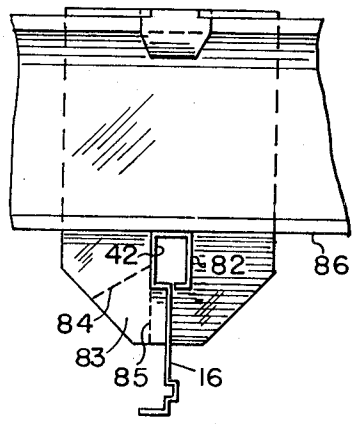


FIG. 10

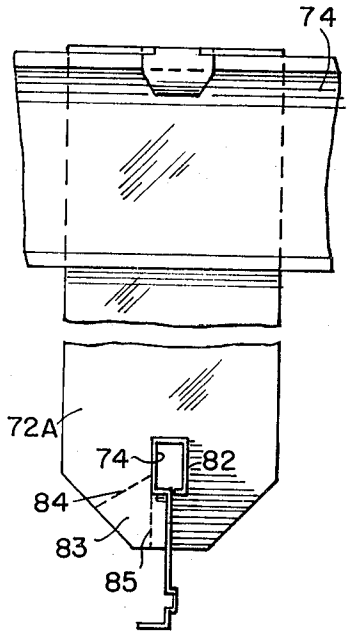


FIG. 11

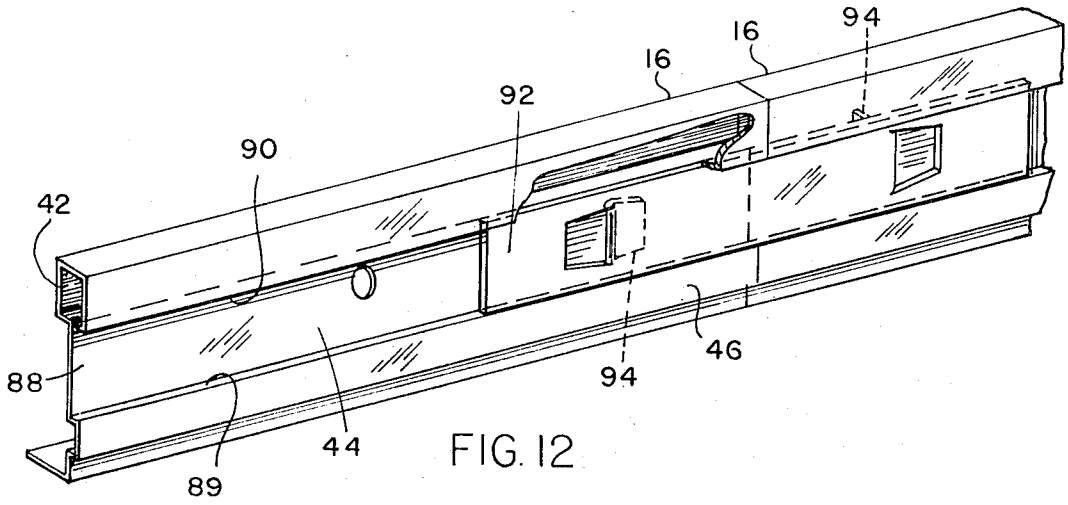


FIG. 12

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ACCESS-PROVIDING DIRECT SUSPENDED CEILING STRUCTURE WITH REMOVABLE LOCKED-IN TILE SECTIONS

This invention generally relates to an access-providing suspended acoustic ceiling assembly with removable locked-in tile sections and more particularly to a suspended acoustic ceiling structure wherein sections of acoustic tiles are selectively removable for enlarged access to a plenum area above the ceiling or for receiving light fixtures, the supporting structure for the acoustic tile sections being hidden from view of the persons in the room below.

In my U.S. Pat. No. 3,381,437 I have described a suspended ceiling with an invisible support structure whereby access to the plenum area above the ceiling becomes possible at any desired location by the convenient removal of a ceiling tile located below the plenum area of interest. Such individual tile removal capability is obtained by the employment of tile-supporting splines which can be snapped onto the flanges of main supporting beams to be slidingly mounted on the flanges and to fit within longitudinal slits or kerfs in tile edges to support the tile. An easily accomplished longitudinal movement of splines along the flange of a supporting beam will drop any desired tile out of its position in the ceiling.

Among the advantages of this invention are those resulting from the fact that it enlarges the ceiling sections that may be conveniently removed from a suspended ceiling structure utilizing the aforementioned splines, to provide large clearance access into the plenum space above the ceiling for maintenance personnel and enabling light fixtures to be supported directly from the beams.

It is a further advantage of the invention to provide a hidden supporting structure for a suspended ceiling wherein large ceiling sections are removably supported without sagging.

Further advantages of the present invention result from the fact that it enables the selectively shaped horizontal parallel beams to be held rigidly parallel in predetermined spaced relationship so that these beams can be suspended on wires directly from the building structure above. That is, the horizontal beams and spacer bars provide a rigid grid without the necessity of employing the heavy structural channels which conventionally are installed in the prior art ceiling structures.

The ceiling produced by this invention is durable, rigid and strong and hides the acoustic tile supporting elements from the viewer located below the ceiling. The ceiling of this invention further has the advantage that fewer supporting beams are needed, larger tiles may be employed, and correspondingly larger access areas are provided upon the removal of tiles.

In the practice of my invention, the ceiling supporting beams are horizontally aligned parallel to one another supported on wires directly from the building's structure and are selectively spaced from each other and rigidly held in spaced parallel relationship by spacer bars. The distance between the spaced parallel beams may span several smaller tiles or a single large tile. Each of the supporting beams has a longitudinally extending vertical web which has as its lower edge a tile-supporting flange extending generally transversely, i.e., horizontally, from one side of the web. Slidable splines are snapped into place onto the supporting flange, as described in my patent, to provide movable support members for the acoustic tiles located on the other side of the web where there is no flange. Removable tile sections are assembled by employing crossbars fitting into slits or kerfs in the peripheral edges of the acoustic tiles. The crossbars are angled sections with a cross flange and are selectively shaped at the ends thereof to allow free passage of the slidable splines. Removable tile sections are formed by placing the cross flanges of two crossbars into oppositely located kerfs of the tile or tiles used in a section. Thereupon, the assembled tile section is inserted from below onto the main supporting beams where it is supported by beam flanges and slidable splines. The resulting acoustical ceiling includes large removable sections sufficiently sturdy to present a horizontal ceiling free from sagging

tiles and the spaced main ceiling beams are sufficiently strong for directly receiving light fixtures.

Another feature of the invention contemplates a suspended ceiling structure stabilized by the employment of spacer bars. The spacer bars are provided with accurately placed slots sized to engage the supporting beams and rigidly hold and accurately space the beams from one another. The spacer bars are easily installed to form a quickly assembled rigid suspended ceiling structure, all of which can be suspended on vertical wires running down from the building structure above, e.g., such as the floor girders or floor slab above.

A further advantage provided by the horizontal beams employed with the invention is their increased load-carrying capability. This is obtained with an upper edge enlargement and a longitudinal rib along the vertical web of the beam. The rib provides a selected spacing between tiles to facilitate movement of splines to remove a tile and advantageously adds rigidity as well as load-bearing capacity to the beam.

The various features, aspects and advantages of the present invention will be more fully understood from a consideration of the following detailed description in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of the access-providing suspended ceiling structure with removable locked-in tile sections as seen from the plenum area above the ceiling.

FIG. 2 is an enlarged perspective view of a portion of the ceiling structure of FIG. 1 showing the selectively shaped main beams which are directly suspendible on wires and are held rigidly in spaced parallel relationship by the spacer bars, with portions of the acoustical tile broken away to reveal details.

FIG. 3 is a sectional view taken along the line 3—3 in FIG. 2 and shown on further enlarged scale.

FIG. 4 is an end view of a direct-wire-suspendible supporting beam having a predetermined configuration.

FIG. 5 is a sectional view taken along the line 5—5 in FIG. 1, drawn on enlarged scale and showing an assembly of acoustical tiles and crossbars.

FIG. 6 is a sectional view taken along the line 6—6 in FIG. 5 showing details of the crossbar.

FIG. 7 is a perspective view of the ceiling structure as seen from the plenum area above showing the removal of an assembled pair of tiles from their locked-in position between adjacent supporting beams.

FIGS. 8A and 8B are respectively an end view and a side view of a spacer bar utilized in rigidly spacing and aligning the main supporting beams of the ceiling structure according to the invention.

FIG. 9 shows the flexibility of installation capabilities of a ceiling structure embodying the present invention. If structural channels are available, then the main supporting beams can be fastened to such channels by a supporting clip engaged with the beam and channel as shown.

FIG. 10 is an elevational view taken along the line 10—10 in FIG. 9 showing further aspects of the beam-to-channel clip.

FIG. 11 is an elevational view of a beam-to-channel clip of extended length.

FIG. 12 is a perspective view of a main supporting beam and a beam splicing spline for interconnecting the ends of two beams.

With reference to FIG. 1 there is shown a direct-wire-suspended acoustical ceiling structure including a light fixture resting on the main beams of the suspended ceiling, with a plenum area 10 seen above the suspended ceiling 12. The ceiling 12 is conveniently and inexpensively supported by a plurality of vertical wires such as 14 attached to the building structure above (not shown), such as floor girders, toggles or shots, known as inserts, in the floor slab above. The wires 14 are attached to main supporting beams 16 which are horizontally mounted in spaced parallel relationship with one another and rigidly held with predetermined spacing. In the ceiling of FIG. 1, the beams are so spaced that pairs of square acoustic tiles may be supported between beams such as tiles 18—18' or an enlarged double-length rectangular tile 20 may be em-

ployed. A light fixture 22 is shown positioned between and resting with brackets 23 on the beams 16. In addition, there are spacer bars 24 extending across and engaged with the beams 16 to maintain their predetermined spacing and generally provide rigidity to the direct-wire-suspended structure. The spacer bars 24 are spaced at intervals longitudinally of the beams 16.

FIG. 2 illustrates a typical portion of the suspended ceiling of FIG. 1 showing a pair of square acoustical tiles 18—18' mounted between a pair of main supporting beams 16—16. Each supporting beam 16 has a tile-supporting horizontal flange 26 (see also FIG. 4) on which is mounted a plurality of longitudinally slidable splines 28 of the type described in the above-identified patent. The slidable splines 28 effectively provide the opposite sides 30 of the beams 16—16 with supporting members 32 generally located in coplanar relationship with the flanges 26 of the beams. This supporting member 32 fits within tile kerfs such as 33 so that one side of tile 18 is supported by the slidable spline 28. The sliding of the spline 28 along the flange 26 from the kerf 33 in tile 18 will thereby remove support from that tile thus permitting one edge of the tile to be lowered for removal from below. The sectional cutout region of a tile as shown in FIG. 2 illustrates that the flange 26 of the beam also fits within a tile kerf 33.

Since the spacing, such as S indicated in FIG. 1, between a pair of main supporting beams 16—16 is equal to twice the size of a single tile 18, a natural tendency of the pair of tiles 18—18 would be to sag under their own weight in the middle at their juncture line 34. Such sagging would become unsightly when viewed from below, and the crossbars 36 serve to provide tile support for pairs of tiles 18—18' spanned between main supporting beams 16—16. These crossbars 36 have angled L-shaped sections as seen in FIG. 5, including a vertical web 38 for spacing between the main beams and a cross flange 40 sized and shaped to fit within the tile kerfs. The cross flange 40 extends transversely from the web 38 of the crossbar 36 and on one side thereof so that a pair of crossbars 36—36' (see FIG. 7) engaged in the kerfs on opposite sides of the pair of tiles 18—18' define a removable ceiling section.

Each of the crossbars 36 is further selectively shaped at the ends thereof so that slidable splines 28 may be longitudinally moved without interference or obstruction by the crossbars. For this reason the lower portion of the crossbar webs 38 and its flange 40 are selectively notched out to a depth D (FIGS. 3 and 6) sized to permit a spline to freely pass underneath. Thus, the crossbar flanges 40 terminate short of the end of the webs 38 by a distance E selected to allow the entire spline including its supporting member 32 to freely slide by it. It is noted in FIG. 3 that the upper portions of the crossbar webs 38 terminate closely adjacent (distance A) to the sides of the main supporting beam 16 to prevent any significant sliding motion of the crossbar 36 such as would cause interference with the longitudinally slidable splines 28.

In order to stabilize the ceiling structure, spacer bars 24 (see FIG. 2) are employed at spaced intervals along the supporting beams 16 to maintain the spacings S between the beams as well as to hold and lock the main beams against twisting or displacement. A spacer bar 24 is illustrated in FIG. 2 and is shown to snugly fit and engage in locking relationship about an upper box beam section 42 of a pair of main supporting beams 16. The spacer bar is an angled bar of inverted L-shape which at the ends thereof is provided with slots which are generally T-shaped, having an enlarged head sized to engage the box beam enlargement 42 of the beam 16 and for engaging the sidewalls of the beams in locking engagement as will be described in relation to FIG. 8.

With reference to FIG. 4, the main supporting beam 16 configuration is clearly illustrated. It includes an upper enlargement 42 in the form of a rectangular box beam section. A vertical web 44 interconnects the box beam enlargement 42 with the horizontal supporting flange 26. The web 44 is further provided with an offset protrusion 46 laterally extending on the side of the web 44 opposite from the side to which the flange extends to slightly offset the joint line between the tiles as is more clearly illustrated in the adjoining FIG. 3. This lateral protrusion, i.e., longitudinally extending rib section 46, is shown as having generally a rectangular channel shape, and it advantageously cooperates with the flange 26 to stiffen the lower portion of the web 44 against twisting or deflection. The beam 16 is lightweight but strong and stiff, having sufficient strength for direct suspension from vertical wires 14 without the use of structural channels. Moreover, these beams 16 have sufficient strength for supporting the light fixtures 22 having a width S, which in this example is 2 feet. Apertures 48 are formed at spaced intervals along the web 44 for the attachment of direct supporting wires 14, as seen in FIGS. 2 and 3.

In the FIG. 3 it may be observed that tiles 18 are each provided with a peripheral kerf 33 separating upper sections 50—50' from lower sections 50—50'. The upper sections 50—50' are slightly recessed at their end surfaces 54—54'. Normally, therefore, the lower sections 52—52' of the tiles tend to contact one another leaving a small space between the upper sections 50—50'. The spline 28 is longitudinally slidable along the main beam flange 26 by the employment of a very thin strong steel blade 53 as shown in FIG. 3. The joint between lower sections 52—52' of the tiles is advantageously offset slightly (to the right of the beam portion 47 below rib 46) by the laterally protruding rib section 46 which engages the upper tile section 50. Therefore, when the thin blade 53 is inserted, it can conveniently extend upwardly alongside of the portion 47 of the web 44 until it reaches the rib section 46 and in this way the user is assured that the edge of the blade 53 has secured a mechanically positive engagement with the end of the slidable spline 28. Thus, the user can conveniently push the slidable spline along the flange 26 without fear that the blade 53 may suddenly skid past the spline 28.

The lateral protrusion 46 of the web of the main supporting beam 16 is so sized that it will abut the upper section 50 of the adjoining tile 18 and actually force a slight offset of the joint between the lower sections 52—52' just sufficiently to enable insertion of the thin blade 53 and yet not so much as to lose aesthetic appeal of the ceiling. The protrusion 46 as shown in the FIGS. 3 and 4 is rectangular in form and extends longitudinally along the web. It is possible to utilize an effectively similar protrusion of somewhat different shape, but the rectangular shape is preferred as will be explained in relation to FIG. 12.

A further feature illustrated in FIG. 3 is the selective spacing of the crossbars 36 from the main supporting beam 16. Note that each crossbar 36 is provided with a cutout sized to permit longitudinal movement of the spline. In addition, the crossbar web ends 56 terminate short of the main beam 16 by the distance A, which is less than the spacing B between the crossbar flange and the spline 28.

Thus, in the event a crossbar creeps up to the main beam 16, sufficient space remains for the spline 28 to slide without interference along the flange 26 of the beam. On the other hand, it is desired that the crossbar flange 40 commences its support of a tile as closely as possible to the spline 28. The reason for this resides in the nature of most tiles, which generally are brittle and do not readily withstand a tensile stress. Since the midsection of tiles located between beams is essentially supported by crossbars 36 and since the crossbars do not directly rest upon the beam 16 a concentrated tensile force is applied to the tile such as at support point 58 thereof. This supporting force at 58 results in a force applied along a moment having a length approximately as indicated by the spacing L. By making L as small as possible, tile rupture is avoided.

FIG. 5 illustrates back-to-back mounting of a pair of crossbars 36 between removable sections. It is noted that each crossbar flange 40 is provided with a plurality of protrusions 60 which are sized and shaped to snugly fit the cross flanges 40 with reduced vertical play within each tile kerf and thus maintain the tiles between the main beams 16 in horizontal alignment.

FIG. 6 illustrates that the protrusions 60 are not continuous, but composed of discrete bumps. Although a longitudinal protrusion could be employed, the use of discrete protrusions 60 facilitates insertion of a cross flange 40 into the tile kerfs 33, which due to production tolerances of acoustical tiles are not always exactly uniform in cross section.

FIG. 7 illustrates the removal of a tile section as defined by a pair of tiles 18—18' and a pair of crossbars 36—36'. First by the employment of the thin blade 53 as shown in FIG. 3, the two splines 28 in FIG. 7 are slid along the respective flanges 26 of the main supporting beams 16—16, thereby permitting the left portion of the ceiling section to drop free of the left supporting beam 16 as seen in FIG. 7. As soon as the left end of the removable tile section has lowered enough to clear the supporting beam 16, the tile kerf at the other end of the ceiling section may be cleared from the flange 26 of the right supporting beam 16 by applying a transverse motion as indicated by arrow 62. In this manner, both tiles 18—18' along with both crossbars 36—36' are removed and an enlarged access space to the plenum area above the ceiling is provided. In this example this access space is 2 feet wide, corresponding to "S" in FIG. 1, and the access space can be made as long as may be desired by removing more than one of the ceiling sections in the manner as described.

It is to be understood that when these ceiling sections are held in place by the slidable splines 28, they are locked in place so that they can neither be lifted up by hand nor by differential air pressure or drafts of wind and they cannot be lowered. In other words, they are positively locked in place when they are in their installed positions, and yet an enlarged access can be obtained wherever desired by building maintenance personnel.

Spacer bars 24, as previously explained, both maintain accurate spacing between the supporting beams, as well as rigidly holding the beams 16 against twisting. The spacer bars are located at intervals along the main supporting beams. For instance, in practical dimensions the spacer bars may be located every 10 to 15 feet, whereas the removable ceiling sections are generally 2 feet wide.

Each spacer bar 24 is easily attached to a beam for quick assembly of the ceiling structure. This is accomplished by providing each spacer bar, prior to assembly as shown in FIG. 8B with a pair of T-shaped slots 64 having an enlarged rectangular headspace sized to snugly enclose the box beam section 42 of the main supporting beam 16. As shown in FIG. 8B, after engagement of the spacer bar onto a beam 16 the slot 64 also snugly clamps against a portion of the beam web 44 below the rectangular beam section 42. This snug enclosure of a beam 16 by the spacer bar 24 is accomplished by initially providing the spacer bar with a bendable tab 66 originally in the bent-up position as indicated in FIGS. 8A and 8B at 68.

With the tab 66 in the initial position at 68 the beam channel 42 can be engaged into the slot 64 and after such placement the tab 66 is bent down along multiple fold lines 70 and 71 to a generally vertical planar position to firmly lock or capture the beam in position relative to the spacer bar. This bending engagement is easily accomplished with a metal gripping tool such as a pair of pliers. It is noted that the tab 66 may be bent in place with a single fold line 70 which may be placed at other locations for minimum interference during bending. The T-shaped slot 64 is further provided on the vertical stem portion of the T-shape with opposed indentations at 73 to assure double pairs of web-gripping points 75—75' on opposite sides of the web 44.

When desired, the main supporting beam may alternately be attached to the conventional structural channels by employing easily applied clips. FIGS. 9 through 11 illustrate such a clip 72 which is attached to a structural channel member 74 which is either suspended from or attached to the building structure. The clip 72 is formed with an upper bendable flange 76 which may be wrapped by bending over the end of a flange 78 on the structural channel member 74. The depending portion 80 of the clip is provided with a T-shaped slot 64 (FIG. 8B) and sized to snugly engage the rectangular channel section 42 of the beam 16 as well as a portion of the beam web 44 similar to the spacer bar 24 of FIG. 8.

The clip 72 is thus provided with a bendable tab 83 initially bent along the fold lines 84 and 85 to allow insertion of the beam 16 in slot 82. Subsequently, the beam is captured in the slot by bending the tab as indicated in FIG. 10. It is seen that the lower portion 86 of structural channel member 74 rests against the upper box beam section 42, and in this manner the horizontal alignment of the beams 16 is determined by the orientation of the channel member 74. However, as illustrated in FIG. 11 at 72A, the clip may also be elongated.

The advantage of utilizing a rectangular shaped protrusion 46 in the web 44 of the main supporting beam 16 may be appreciated from reference to FIG. 12. As shown in this figure a channel 88 is effectively defined by the rectangular protrusion upper edge 89, the planar portion of the web 44, and the lower surface 90 of the rectangular box beam section 42. A beam splice 92 sized to fit in snug relationship into this channel may be advantageously used to reinforce the main beam 16 for interconnection with another main beam aligned therewith. The splice 92 for this purpose is provided with laterally extending tabs 94 which after insertion into suitable apertures in the webs of beams 16 are bent to lock the splice onto the beams 16. The splice-coupled main supporting beams 16 are rigidly held as well as maintained in proper alignment.

Having thus described a new ceiling structure, several advantages thereof now readily appear. The employment of enlarged removable tile sections facilitates assembly of the suspended ceiling. Substantial access areas are possible with the ceiling structure of this invention, yet without loss of rigidity with the employment of spacer bars. The spacer bars both accurately locate main supporting beams parallel to one another as well as clamp the suspended structure in a mechanically rigid position. The main supporting beams 16 having box beam sections 46 are strong, stiff and yet are light in weight. Further horizontal alignment and rigidity are obtained by selective shaping of the main supporting beams to accommodate splices sized to fit in channels of the supporting beams. The splices and spacer bars are easily installed to provide an economic properly aligned, rigid suspended ceiling structure.

What is claimed is:

1. In a suspended ceiling assembly formed of selectively removable tiles, each having peripherally located kerfs and having horizontally mounted parallel spaced longitudinal supporting beams, each beam having a longitudinal web and a horizontally disposed longitudinal tile-supporting flange extending generally transversely from one side of the lower edge of the web and sized to fit within tile kerfs to support a plurality of tiles, supporting splines slidably mounted on the tile-supporting flange for sliding movement therealong and within tile kerfs, each of said splines having a tile-supporting member extending generally transversely from the web on the other side thereof and with the member located generally coplanar with the supporting flange for sliding within tile kerfs, said splines having lengths smaller than the tile dimensions supported by the supporting flange for tile removal upon the longitudinal movement of a spline along the supporting flange, the improvement comprising crossbars mounted generally transversely to and between webs of adjacent supporting beams, said crossbars being sized and shaped to fit between adjacent supporting beam webs to assure unobstructed longitudinal movement of splines, with each of said crossbars further having a cross-tile-supporting flange located in general coplanar relationship with the supporting beam flange and extending generally transversely from a side of the lower edge of the crossbar to fit within tile kerfs, aid crossbars being removable along with tiles upon selective longitudinal movement of splines along flanges of the supporting beams, the cross flanges of the crossbars being sized to terminate with selective clearance from the webs of the longitudinal supporting beams to permit free longitudinal movement of the splines with the webs of the crossbars having an effective length sufficient to

maintain clearance of cross flanges from the longitudinally moving splines.

2. The assembly as claimed in claim 1, wherein the cross flanges of the crossbars are provided with vertical protrusions sized to locate said cross flange in tile kerfs with reduced vertical play between tiles and crossbars and maintain the tile portions between supporting bars in horizontal alignment.

3. The assembly as claimed in claim 2, wherein the vertical protrusions are discreet portions with limited longitudinal dimensions, said crossbar flanges providing tile support between supporting beams.

4. An acoustic ceiling assembly formed of selectively removable acoustic tile sections with tiles having peripherally located kerfs comprising horizontally mounted parallel longitudinal supporting beams, each beam having a longitudinal web and a horizontally disposed longitudinal tile-supporting flange extending generally transversely from one side of the lower edge of the web and sized to fit within tile kerfs to support a plurality of tiles, supporting splines slidably mounted on the tile-supporting flange for sliding movement therealong and within tile kerfs, each of said splines having a tile-supporting member extending generally transversely from the web on the other side thereof and with the member located generally coplanar with the supporting flange for sliding within tile kerfs, said splines having lengths smaller than the tile dimensions supported by the supporting flange for tile removal upon the longitudinal movement of a spline along the supporting flange, crossbars each mounted generally transversely between webs of adjacent supporting beams, said crossbars having longitudinal webs of a length to fit between adjacent supporting beam webs and selectively shaped to assure unobstructed longitudinal movement of splines, with each of said crossbars further having a crossbar-supporting flange located in general coplanar relationship with the supporting beam flange and extending generally transversely from a side of the lower edge of the web of the crossbar to fit within tile kerfs, said crossbar flanges providing tile support between supporting beams, said tile support commencing at a point spaced from the beams by a distance sufficient to permit unobstructed movement of splines, said crossbars being removable along with tiles therebetween upon selective longitudinal movement of splines along flanges of the supporting beams.

5. The assembly as claimed in claim 4 and further including spacer bars mounted between adjacent supporting beams to maintain said crossbars in effectively close supporting relationship with splines and supporting beam flanges.

6. The assembly as claimed in claim 5 wherein the spacer bars are provided at the ends thereof with bendable tabs sized to engage the supporting beams.

7. The assembly as claimed in claim 5 wherein the upper portions of the webs of supporting beams are selectively enlarged to form a grippable edge, and wherein the spacer bars are provided at ends thereof with a slot sized to snugly engage the grippable edge.

8. The assembly as claimed in claim 7 wherein the spacer bars are provided with laterally bendable tabs located to enlarge the slots for insertion of the beam-grippable edge therein, and to capture the beam within the slot upon a substantially coplanar bending of a tab.

9. The assembly as claimed in claim 8 wherein the grippable beam edge is rectangularly shaped and the slot is rectangular with the tab sized to snugly engage a portion of the beam web upon a coplanar bending of the tab.

10. The assembly as claimed in claim 4 wherein each of the webs of the supporting beams are provided with a longitudinally extending transverse lateral protrusion generally located opposite tiles for slight displacement thereof to enhance accessibility to splines.

11. The assembly as claimed in claim 10 wherein said lateral protrusion is formed of a longitudinally extending substantially rectangular deformation in the supporting member web.

12. The assembly as claimed in claim 10 wherein the supporting beam is further provided with an upper enlargement sized to define with the web and the lateral enlargement an open channel, and beam splices sized to snugly fit within the channel for beam support.

13. The assembly as claimed in claim 4 and wherein the beams at the upper web end thereof are provided with an enlarged grippable edge and beam clips having slots sized to capture the grippable beam edge, said clips having laterally bendable tabs located to enlarge the clip slots for grippable edge insertion with said edge being captured in the slot upon generally planar closure of the laterally bendable tab.

14. The assembly as claimed in claim 13 wherein the upper end of the clip includes a transversely extending flange having a bendable lip end for clip mounting.

15. An acoustic ceiling assembly formed of selectively removable acoustic tiles having peripherally located kerfs comprising horizontally mounted parallel-spaced longitudinal supporting beams, each beam having a longitudinal tile-supporting flange extending generally transversely from one side of the lower edge of a web and sized to fit within tile kerfs to support a plurality of tiles on said one side, supporting splines slidably mounted on the tile-supporting flange for sliding movement therealong and within tile kerfs, each of said splines having a tile-supporting member extending generally transversely from the web on the other side thereof and with the member located generally coplanar with the supporting flange for sliding within tile kerfs on said other side, said splines having lengths smaller than the tile dimensions supported by the supporting flange for tile removal upon the longitudinal movement of a spline along the supporting flange, the web of each of said supporting beams being provided with a laterally extending protrusion protruding from said other side of said web from said flange, said protrusion being located at tile height on the web on one side only for lateral displacement of the joint between tiles by a preselected distance toward said other side to facilitate insertion of a thin blade in said joint for longitudinal movement of splines from below of the ceiling structure.

16. The acoustic ceiling assembly as claimed in claim 15 wherein the longitudinal protrusion is located on the other side of the web opposite of the flange side.

17. An acoustic ceiling assembly formed of selectively removable acoustic tiles having peripherally located kerfs comprising horizontally mounted parallel-spaced longitudinal supporting beams, each beam having a longitudinal web and a horizontally disposed longitudinal tile-supporting flange extending generally transversely from one side of the lower edge of the web and sized to fit within tile kerfs to support a plurality of tiles, supporting splines slidably mounted on the tile-supporting flange for sliding movement therealong and within tile kerfs, each of said splines having a tile-supporting member extending generally transversely from the web on the other side thereof and with the member located generally coplanar with the supporting flange for sliding within tile kerfs, said splines having lengths smaller than the tile dimensions supported by the supporting flange for tile removal upon the longitudinal movement of a spline along the supporting flange, the web of each of said supporting beams being provided with a laterally extending rectangular cross-sectional shaped protrusion on the web and located at tile height for lateral displacement of tiles by a preselected distance to facilitate longitudinal movement of splines from below of the ceiling structure, the upper part of the beam terminating in a rectangular enlargement sized to define with the rectangular protrusion an open longitudinal splice-retaining channel, and a splice sized to snugly fit within the splice channel to maintain beams in horizontal alignment.

18. In an acoustical ceiling assembly formed of selectively removable acoustic tiles having peripherally located kerfs and including horizontally mounted parallel-spaced longitudinal supporting beams, each beam having a longitudinal web and a horizontally disposed longitudinal tile-supporting flange extending generally transversely from one side of the lower edge of the web and sized to fit within tile kerfs to support the tiles

on said one side thereof and with tile-supporting splines longitudinally slidably mounted on the flange for sliding movement therealong and within tile kerfs, the splines each having a tile-supporting member extending generally transversely from the web on the opposite side thereof from said flange for supporting tiles on said opposite side, the improvement comprising a lateral protrusion extending laterally of the web of the longitudinal supporting beams on one side only of the web, said protrusion being located on the opposite side thereof from said flange, said lateral protrusion being sized and located to engage the end surfaces of the tiles above the kerf on said opposite side for producing a slight offset of the joint between the tiles on said one side and opposite side of said web, said offset of the joint being in a direction toward said opposite side to enable insertion of a thin blade upwardly through said offset joint and beside said web for engagement with a spline to produce sliding movement thereof for selective removal of acoustic tiles.

19. In an acoustical ceiling assembly, the improvement as claimed in claim **18**, in which said lateral protrusion extends longitudinally of the web of the supporting beams.

20. In an acoustical ceiling assembly, the improvement as claimed in claim **18**, in which said lateral protrusion is a rib extending continuously longitudinally of the web of the supporting beams on one side only of the web and positioned above the lower edge of the web to be engaged by and thereby to limit the upward insertion of a thin blade through said offset joint.

21. In an acoustical ceiling assembly, the improvement as claimed in claim **18**, in which the lateral protrusion is positioned below the upper edge of the web of the supporting beams and extends continuously longitudinally of the web, the upper edge of the web has an enlargement extending longitudinally therealong, and said enlargement, said lateral protrusion and the web extending therebetween define an open channel located above said protrusion, said open channel facing toward said other side of the web and being adapted to snugly receive a beam-splicing element extending longitudinally therein, said open channel providing longitudinal alignment and vertical support of such beam splice element fitting snugly therein.

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