

Description

This invention relates generally to suspension ceiling grid systems, and more particularly to a novel and improved grid connector system for interconnecting grid runners.

Typical suspension ceiling grid provides interconnected grid runners or tees. Such runners are interconnected to define panel-receiving openings which are usually square or rectangular. The intersections usually provide a through-runner and opposed runners which have end connectors that extend from opposite sides through an opening in the web or the through-runner in an interlocking manner. Some such connectors provide a hook portion which is inserted through the opening in the through-runner and then drops down to engage the remote side of the web below such opening. An example of such a connector is illustrated in US-A-3501185.

Other connectors provide connector-to-connector locking means which directly interlock with the opposing connector. Some connectors which provide a connector-to-connector lock also include a locking structure which interlocks the connector with the remote side of the web of the through-runner. Such locking structure is often referred to as a "first-end-in-lock" because it provides a connection with the web of the through-runner when only one connector is installed in the opening in the through-runner web. This first-end-in-lock therefore provides a connection which functions until the second connector is inserted to complete the intersection. Also, it functions to provide the connection at intersections where only a single runner end is connected to the through-runner.

The locking system which provides a direct interconnection between the two connectors extending from opposite directions through the web opening in the through-runner is often referred to as the "second-end-in-lock" or "connector-to-connector" lock. Examples of grid systems having both a first-end-in-lock and a connector-to-connector lock are illustrated in US-A-4108563 and US-A-4811453.

AU-A-487100, and on which the preamble of Claim 1 is based, discloses a suspension ceiling grid system comprising elongated grid members interconnected at intersections, the grid members including a through-runner and two opposed runners connected on opposite sides to the through-runner, each of the runners including a web, a vertically elongated opening in the web of the through-runner, and generally planar end connectors on the ends of the opposed runners projecting into the opening from opposite sides thereof, each of the connectors providing lateral projections for engaging a side of the through-runner web.

The suspension ceiling grid system of the present invention has the above-defined features of the system of AU-A-487100 but is characterized in that the lateral projections engage a side of the through-runner web remote from the runner associated with the connector and extend beyond both of the ends at the extremities of the opening to provide a first-end-in-lock with the through-runner.

The suspension ceiling grid connector system of this invention can reliably provide a secure, strong connection capable of withstanding large separating forces. In preferred embodiments such connector is easily assembled in a grid and is easily disassembled without requiring tools of any kind, even in a trapped module location in which the two ends of the runner are longitudinally confined by the remainder of the grid. Such disassembly, even in a trapped module location, does not significantly damage the connector, and such connectors are reusable. It is therefore possible to easily remove and/or replace individual grid members from any location in an assembled grid.

A preferred embodiment of the present invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a perspective, exploded view of the preferred embodiment of the suspension ceiling grid system illustrating a through-runner and associated opposed runner ends prior to assembly;

FIG. 2 is similar to FIG. 1, but illustrates the condition which exists after the first end connector is installed in the opening of the through-runner;

FIG. 3 is similar to FIGS. 1 and 2, but illustrates the condition which exists after both end connectors are installed;

FIG. 4 is an enlarged side elevation of one preferred end connector in accordance with this invention illustrating the structural detail thereof; FIG. 4a is a longitudinal section taken along line 4a-4a of FIG. 4;

FIG. 5 is a fragmentary view illustrating the shape of the opening in the through-runner;

FIG. 6 is a side elevation illustrating one of the connectors in intermediate positions through which it moves during normal assembly and disassembly.

FIG. 7 is a side elevation illustrating the installation of the second connector in the opening in the through-runner;

FIG. 8 is a side elevation of an intersection illustrating the two connectors in their installed position;

FIG. 9 is a side elevation similar to FIG. 8, but illustrating how the connectors can accommodate an out-of-alignment condition.

FIG. 10 illustrates, in full-line, the first operation of disassembly from a trapped module condition and, in phantom, completed disassembly by vertical movement; and

FIG. 11 is a plan view illustrating completed disassembly by horizontal movement.

FIGS. 1 through 3 progressively illustrate the assembly of an intersection in the suspension ceiling grid system of the illustrated embodiment of the present invention. Such intersection includes a through-runner 10 and two opposed runner ends 11 and 12. In this illustrated embodiment, all of the runners 10 through 12 are tees formed with a central web 13, a stiffening bulb 14 along one edge of the web 13, and oppositely extending panel supporting flanges 16 along the lower or opposite edge of the web. It should be understood, however, that in accordance with the broader aspects of this invention, the connecting structure can be applied to other forms of grid tees or runners, and that the particular tee structure is illustrative of one preferred embodiment of this invention. It should further be understood that the grid tees are typically formed of a thin sheet metal which is bent to the cross section illustrated. However, in accordance with the invention, the grid tees can be formed in other ways, e.g., by extrusion or the like, and are not illustrated as bent sheet metal in order to simplify the drawings.

In many grid systems for suspension ceilings, an array of parallel, laterally-spaced through-runners are supported from the building structure above the grid by wires or the like, and cross-tees interconnect with the main runners, with two opposed cross-tee ends positioned on opposite sides of the main runner at each intersection. However, this invention is also applicable to basket-weave-type grid systems in which main runs and cross-runs are not provided, strictly speaking. Both types of grid systems, however, provide intersections in which a through-runner extends past opposed runner ends which interconnect with the through-runner at the intersections. Therefore as used herein, the term "through-runner" is used instead of "main runners" so as to encompass within the scope of the invention basket-weave grid systems, main run and cross-run grid systems, and other types of grid systems which may incorporate the present invention.

Typically the runners of a suspension ceiling grid system are interconnected to form rectangular or square openings bounded by flanges 16. Ceiling panels or fixtures, such as lights and air vents, are then positioned in such openings and are supported around the periphery by the associated of the flanges 16.

Referring specifically to FIGS 1 through 3, the web 13 of the through-runner 10 is formed with a

connector opening 18, and the two runner ends 11 and 12 are provided with identical end connectors 19. In the illustrated embodiment, the connectors 19 are formed of separate elements and are connected to the ends of the webs 13 of the runner ends by a rivet-like connection 21.

FIG. 1 illustrates the runners before either connector is installed in the opening 18. FIG. 2 illustrates the condition after the connector 19 of the first runner end is installed in the opening 18 and is held therein by the first-end-in-lock. FIG. 3 illustrates the completely assembled intersection.

Since the two end connectors 19 are identical, only one will be described in detail, with the understanding that such description applies equally to both end connectors 19.

Referring to FIGS. 4 and 4a, each end connector provides a downwardly inclined camming surface 22 extending back from the forward end 23 of the connector along the lower side thereof. The forward end of the connector 19 also provides an upwardly and rearwardly extending camming surface 24, also extending from the forward end 23 of the connector 19. Consequently, the forward end 23 of the connector 19 has a relatively small, vertical height compared to the overall height of the connector and of the connector opening 18. Such structure facilitates the initial entry of the connector into the connector opening 18, as discussed in detail below.

Extending rearwardly from the camming surface 22 is a longitudinally extending edge 26, which extends to an upwardly inclined edge 27. The camming surface 22 and the two edges 26 and 27 cooperate to define a hook-like projection 28 adjacent to the forward end of the connector on the lower side thereof. At the rearward end of the inclined edge 27 a radiused portion 29 blends into a longitudinally extending edge 31, which extends to a shoulder 32. These edge surfaces 27, 29, 31, and 32 cooperate to define an upwardly extending notch 33 rearwardly of the hook-like projection 28. Rearwardly of the notch 33, the lower edge of the connector is angled laterally to provide a stiffening flange 34.

The camming surface 24 extends rearwardly and upwardly, and tangentially intersects a small projection 36 having an edge surface which is a portion of a circle which extends from the camming surface 24 rearwardly to a longitudinal edge 38. The edge 38 extends from the projection 36 rearwardly to an upwardly extending shoulder 39, which forms a part of a stop projection 41. Rearwardly of such projection is a downwardly extending notch 42. Rearwardly of the notch 42, the upper edge of the connector is angled laterally to provide an upper stiffening flange 43.

Additional stiffening is provided by a longitudinally extending boss 44 deformed laterally from the principal plane of the connector and a generally rectangular boss 46 which is positioned at an angle with respect to the length of the connector, and is also formed by deforming the metal of the connector laterally out of the principal plane of the connector. These two stiffening bosses 44 and 46 are positioned so that they overlap in a longitudinal direction a small amount and cooperate to provide the connector with lateral stiffness forwardly from the rivet-like connection 21.

The two projections 28 and 36 cooperate to provide the first-end-in-lock as discussed in detail below. In addition, a second locking system is provided which directly interconnects one connector with the other and provides what is referred to generally as a "connector-to-connector lock." The structure of this locking system includes a lateral strap portion 51 located at the forward end 23 of the connector. The strap is formed by the forward end 23 and a rectangular opening 52 spaced back from the forward end 23 by a distance equal to the width of the strap 51. The other portion of the connector-to-connector lock is provided by a rearward opening 53.

The forward edge of the opening 53 is provided by two angulated edge portions 54 and 56, which are angulated rearwardly and laterally and intersect at the forward center 57 of the opening 53. These edge portions 54 and 56 are inclined laterally from the main plane of the connector by deforming the metal thereof to form a pyramid-like lateral projecting boss 58. This boss 58 is deformed from the principal plane of the connector in a direction opposite the direction of the boss 44.

The rearward edge 62 of the opening is also inclined laterally from the principal plane of the connector in the same direction as the edge portions 54 and 56. In the illustrated embodiment, the edge portion 62 is provided at the forward end of the boss 46, and is deflected laterally when the boss 46 is produced. Such boss, it should be noted, is deflected in an opposite lateral direction from the boss 44.

The intersection 57 and the edge 62 are spaced apart a distance slightly greater than the width of the strap 51, so that when two connectors are installed through an opening 18 from opposite sides of a through-runner, the strap of each connector is positioned within the opening 53 of the other connector. In such position, because the intersection 57 and the edge 62 are laterally displaced from the plane of the connector, the forward and rearward edges of each lateral strap are in alignment with the adjacent pair of inclined edge portions 54 and 56 or the edge 62. Therefore, the strap of each connector provides a connector-to-

connector lock which resists relative longitudinal movement between the two connectors installed within a given connector opening 18. The forward opening 52 is positioned and sized so as to accept the pyramid-like boss 58 of the other connector when two connectors are interconnected.

As best illustrated in FIG. 5, the connector opening 18 formed in the web of the through-runner 10 is vertically elongated and symmetrical about a central vertical plane. The opening 18 includes a narrow portion 63 extending downwardly from the upper edge 65 and a similar narrow portion 63 extending upwardly from the lower edge 66 of the opening. Such narrow portions 63 have a width sized to closely fit two end connectors 19 extending therethrough. Between the narrow portion 63, the opening provides a central portion 64 of greater width, and which is joined to the narrow portions 63 by tapered transition portions 64a. The width of the central portion is sized to receive the forward ends of the bosses 44 of the two connectors with a close fit.

Reference should now be made to FIG. 6, which illustrates the manner in which a connector 19 is normally installed in a connector opening 18 of a through-runner 10. Initially, the connector 19 is moved longitudinally into the opening 18 at an angle, as illustrated in full-line in FIG. 6. This is easily accomplished since one or the other of the camming surfaces 21 or 24 will engage the adjacent end of the opening and guide the connector as it is moved into the opening. Such longitudinal movement is, therefore, very easily accomplished, and it is not necessary to precisely position the connector to start it into the associated opening.

The longitudinal movement of the connector continues until the hook-like projection 28 passes the lower edge 66 of the opening 18. As the connector is moved forward toward the phantom position, the upper camming surface 24 engages the upper edge 65 of the opening 18 and cams the connector down until the forward end 67 of the flange 16 of the associated runner end 12 engages the top surface 68 of the flange 16 of the through-runner. It should be noted from the full-line position that the two flanges engage before the upper projection 36 passes through the opening, and the dimensions are such that the upper projection 36 extends above the upper edge 65 of the opening 18. From the full-line position of FIG. 6, the runner end is tipped upwardly toward the horizontal position while being pressed forward. This causes the inclined edge 27 to move down along the lower edge 66 of the opening and the upper camming surface to move down and forward along the upper edge 65 of the opening 18.

The end connector, however, is sized so that as the runner end approaches the horizontal posi-

tion, the upper surface 68 of the flange continues to attempt to hold the upper projection 36 above the upper edge 65 of the opening 18.

The projection 36, however, is rounded so that it functions to cam the connector downwardly when the associated runner is tipped up to a horizontal position, causing a temporary deflection of the flange 16 of the through-runner. Therefore, the projection 36 snaps through the opening 18 of the through-runner and after passage through the opening, the engagement between the flanges 16 raises the connector up slightly so that the upper edge 65 of the opening is below the upper extremity of the projection 36. The notch 33 is sized to allow such temporary downward movement, permitting the upper projection to snap through the opening.

When the connector reaches the phantom position of FIG. 6, the first-end-in-lock is completed and the projection 36 cooperates with the inclined edge 27 to engage the remote side of the web of the through-runner to lock the connector in position. In fact, when the first-end-in-lock is completed, a sufficient locking force is provided to allow the first installed runner end to be cantilever-supported on the through-runner. This is an important feature of the invention, since the connection will support the runner temporarily in a cantilever fashion if the installer releases his grip on the runner preparatory to installing the other end connector at the opposite end of the runner involved. It also functions to ensure that the through-runner is restrained against twisting movement even if only one connector is installed in a given opening.

For example, if the through-runner tends to twist or rotate in an anticlockwise direction, its web engages the shoulder 39 at the upper end of the opening and the upwardly inclined edge 27 at the lower edge of the opening to resist such twisting movement. Similarly, clockwise twisting or rotation of the through-runner is resisted by engagement between the projection 36 and the upper edge of the opening 18 while engagement between the shoulder 32 and the lower edge of the opening occurs.

Removal of a single connector from an installed position is accomplished easily by merely pressing down on the runner end 12 to again temporarily deflect the flange of the through-runner so as to clear the upper projection 36 while moving the runner to a downwardly angled position so that the upper projection 36 moves back through the opening. Once this has occurred, the runner can be pulled longitudinally out of the opening and is cammed upwardly to clear the opening by engagement between the inclined edge 27 and the lower edge 66 of the opening 18.

After the first end connector is installed in a given opening, the second end connector is inserted from the opposite side through the opening in the same manner as illustrated in FIG. 7, causing the projection 36 of the second connector to snap through the opening to a fully installed position as illustrated in FIG. 8. In such position, the lateral strap 51 of each connector 19 is positioned within the opening 53 of the other connector and a connector-to-connector connection is provided on each side of the web of the through-runner. When the two connectors are installed, the forward ends of the bosses 44 engage the side of the opening to ensure that the two connectors are held in face-to-face contact. This ensures that the connector-to-connector locks engage.

When the two connectors are installed, sufficient clearance is provided to allow the two runner ends 11 and 12 to be inclined slightly relative to each other, so that a strong connection is provided even when the runner ends are not in direct alignment, as best illustrated in FIG. 9. Further, because the edges of the opening 53 provided by the edge portions 54 and 56 are inclined, clearance is provided to allow such misalignment without affecting the connector-to-connector lock formed with the associated of the straps 51.

In accordance with this invention, a runner can be removed or replaced at any location within a grid without difficulty and without the use of special tools. This is true even if the runner is in a trapped module condition in which the two ends of the runner involved are held by the surrounding grid members against longitudinal movement in both directions. When disassembling an intersection from a non-trapped module condition, in which the remote end of the runner is free to be moved laterally and longitudinally, a downward force is applied to the runner end to temporarily deflect the flange 16 of the through-runner 10. This moves the projection 36 down clear of the upper edge 65 of the opening 18. Simultaneously, the runner is tipped down to move the projection back out of the opening. Thereafter, the connector 19 is raised up out of the opening to complete disassembly. Because the edges 54 and 56 of the opening 53 are inclined back, such movement of the connector 19 being removed to an inclined position is accommodated. Further, the upward removal is also accommodated. In effect, the connector-to-connector lock is established and/or released by relative vertical movement of the connectors generally in a direction aligned with the length of the opening.

During installation, the forward end of the connector is cammed downwardly by the camming surface 24, and such movement causes the inclined surface 27 to cam the connector forwardly. Consequently, the connector moves in an inclined

direction which is generally aligned with the length of the opening 18 and, during such movement, the connector-to-connector lock engages. During removal, the opposite movement occurs and the connector moves along an inclined upward and rearward path again generally aligned with the length of the opening 18. Because the engaging edges of the connector-to-connector lock are also inclined, the connector-to-connector lock allows such movement and is released.

The removal from the trapped module condition can be accomplished in either of two ways. FIG. 10 illustrates in full-line the first step in the removal of a runner 11 from a trapped module condition. The first step in such removal is performed by grasping the through-runner on each side of the intersection and rotating the upper part of the through-runner 10 in a direction away from the runner 11 which is to be removed. Such rotation can be accomplished easily with the hand, but does require some force since it is necessary that the web of the through-runner at the upper end of the opening 18 move past the projections 36 and 41.

In accordance with the preferred embodiment, the connectors are made of steel or the like which is strong and quite hard. On the other hand, the runners themselves are formed of a common quality cold-rolled steel which is not as hard. Therefore, when the through-runner is rotated to the full-line position of FIG. 10, the projection 41 of the connector which is not being removed cuts through the web immediately above the opening 18. Although this cutting action does permanently produce a narrow cut in the web of the through-runner above the opening 18 it does not interfere to any material extent with the future re-installation of a pair of connectors in the opening.

As the through-runner is rotated to the full-line position, the flange of the through-runner 10, through its engagement with the flange of the runner end 11, causes the runner end 11 to raise up relative to the runner end 12. This vertical relative movement causes the straps 51 to move vertically out of the associated opening 53 and disconnects the connector-to-connector lock provided by such straps. Further, the upper edge 65 of the opening 18 moves down along the inclined camming surface 24.

As soon as the through-runner has been rotated to the full-line position, complete removal of the connector 19 of the runner end 11 can be accomplished in either of two ways. The first and usual removal involves the upward movement of the runner end 11. It is recognized that some interference does exist, but sufficient flexibility exists in the system to allow the connector end 19 of the runner 11 to move upwardly and be cammed by the cam

surface 24 clear of the opening. Once one end of the runner 11 is disconnected, the runner is no longer in a trapped module condition and the other end can be disconnected in the usual way.

In instances in which the ceiling structure is so close to the grid as to prevent vertically upward movement during the removal of the runner end 11, the removal can be performed in a horizontal direction by merely driving the runner horizontally in a direction aligned with the length of the through-runner and away from the connector 19 of the runner end 12, as illustrated in FIG. 11. Here again, because some interference exists, such horizontal movement results in some bending of the connector adjacent to the rivet connection, as illustrated in FIG. 11.

With either type of removal of the trapped module connector, there is no material damage to the connector or the opening, and the same connector can be reinstalled in the opening if desired. If vertical disassembly has been used, reinstallation is accomplished by bringing the connector down into the full-line position. Again, the interference is accommodated during such movement by applying force on the through-runner in one direction and on the runner end 11 in the opposite longitudinal direction, which causes sufficient temporary deformation of the two runners 11 and 12 to cause the camming surface 22 to guide the connector 19 for re-entry into the opening 18. Completion of the reinstallation is then accomplished by rotating the through-runner back to its vertical position. This causes the straps 51 to move back into the associated openings 53 and re-establishes the connector-to-connector lock. Because no significant damage occurs to the openings or the straps, a full strength connection is re-established.

In instances in which the connector has been removed by horizontal movement rather than vertical movement, reassembly is accomplished by moving the connector along the length of the web of the through-runner back to the opening 18 in the through-runner. The connector is then bent back to a straight condition so that the through-runner can be rotated back to its vertical position to cause the connector-to-connector lock to be re-established.

In practice, it is often desirable to bend the connector 19 of the runner end 11 a slight additional amount so that the end of the connector 19 will not dig into the web as the connector is moved into the opening 18. Here again, because the bend occurred adjacent to the rivet, the locking portion of the connector is not distorted and the connector-to-connector lock is re-established.

In both procedures for releasing a connector from a trapped module condition, the rotation of the through-runner from its vertical position to the angled position illustrated in FIG. 10 causes vertical

movement of one connector relative to the other, and such vertical movement in a direction generally aligned with the opening causes release of the connector-to-connector lock so that full removal of the connector can be easily achieved. Conversely, during re-installation or reconnection, the rotation of the through-runner 10 back to the vertical position causes relative vertical movement between the connectors in a direction generally aligned with the length of the opening 18, and re-establishes the connector-to-connector lock.

With the present invention, a simple connector structure is provided for suspension ceiling grid systems providing for easy assembly of the grid. Further, a very strong connection is provided capable of meeting all standards for strength because a dual connector-to-connector lock is provided. Further, a very stable first-end-in connection provides stability to an intersection even when two connectors are not installed within the same opening.

Claims

1. A suspension ceiling grid system comprising elongated grid members (10-12) interconnected at intersections, said grid members including a through-runner (10) and two opposed runners (11,12) connected on opposite sides to said through-runner, each of said runners including a web (13), a vertically elongated opening (18) in the web of said through-runner, and generally planar end connectors (19) on the ends of said opposed runners (11,12) projecting into said opening (18) from opposite sides thereof, each of said connectors (19) providing lateral projections (28,36) for engaging a side of the through-runner web (13), characterized in that said lateral projections engage a side of the through-runner web (13) remote from the runner associated with the connector and extend beyond both of the ends (65,66) at the extremities of the opening (18) to provide a first-end-in-lock with said through-runner (10).
2. A suspension ceiling grid system as set forth in Claim 1, wherein said grid also includes at least one intersection in which only one end connector (19) is positioned within a through-runner opening (18), and wherein said first-end-in-lock is engageable with both sides of said through-runner web (13) beyond both ends (65,66) of said through-runner opening (18) to resist tipping of said through-runner (10), said first-end-in-lock being operable to cantilever support the associated runner (11 or 12).
3. A suspension ceiling grid system as set forth in Claim 1 or Claim 2, wherein said runners provide flanges (16) along one edge of said web (13), wherein said flanges (16) of said opposed runners (11,12) engage one side of said flange of said through-runner (10) and normally maintain one of said lateral projections (28,36) in alignment with said remote side of said through-runner web (13) beyond the adjacent end of said opening (18), said flanges of said through-runner being temporarily deflectable to permit passage of said one lateral projection through said opening.
4. A suspension ceiling grid system as set forth in Claim 3, wherein said end connectors (19) provide connector-to-connector locks (51,53) on each side of said through-runner web (13).
5. A suspension ceiling grid system as set forth in Claim 4, wherein said connector-to-connector locks (51,53) are engageable and releasable by relative movement therebetween in directions generally aligned with the length of said opening (18).
6. A suspension ceiling grid system as set forth in Claim 5, wherein said connector-to-connector locks (51,53) include spaced rearwardly facing surfaces (54,56), said rearwardly facing surfaces on each end connector (19) being engageable with rearwardly facing surfaces on an associated end connector (19) extending through said opening (18) to prevent separating movement of said associated end connectors.
7. A suspension ceiling grid system as set forth in Claim 6, wherein at least one of said rearwardly facing surfaces (54,56) is inclined to permit misalignment if said end connectors (19) without releasing said connector-to-connector locks (51,53).
8. A suspension ceiling grid system as set forth in Claim 5, wherein said through-runner (10) and end connectors (19) permit tipping of the through-runner with respect to said end connectors to clear opposed surfaces (36,39) of one of said end connectors and permitting lateral movement of said one end connector to release said connector-to-connector locks (51,53).
9. A suspension ceiling grid system as set forth in Claim 8, wherein said end connectors (19) each provide lateral projections (28,36 and 32,39) engageable with both sides of said



movement of one connector relative to the other, and such vertical movement in a direction generally aligned with the opening causes release of the connector-to-connector lock so that full removal of the connector can be easily achieved. Conversely, during re-installation or reconnection, the rotation of the through-runner 10 back to the vertical position causes relative vertical movement between the connectors in a direction generally aligned with the length of the opening 18, and re-establishes the connector-to-connector lock.

With the present invention, a simple connector structure is provided for suspension ceiling grid systems providing for easy assembly of the grid. Further, a very strong connection is provided capable of meeting all standards for strength because a dual connector-to-connector lock is provided. Further, a very stable first-end-in connection provides stability to an intersection even when two connectors are not installed within the same opening.

Claims

1. A suspension ceiling grid system comprising elongated grid members (10-12) interconnected at intersections, said grid members including a through-runner (10) and two opposed runners (11,12) connected on opposite sides to said through-runner, each of said runners including a web (13), a vertically elongated opening (18) in the web of said through-runner, and generally planar end connectors (19) on the ends of said opposed runners (11,12) projecting into said opening (18) from opposite sides thereof, each of said connectors (19) providing lateral projections (28,36) for engaging a side of the through-runner web (13), characterized in that said lateral projections engage a side of the through-runner web (13) remote from the runner associated with the connector and extend beyond both of the ends (65,66) at the extremities of the opening (18) to provide a first-end-in-lock with said through-runner (10).
2. A suspension ceiling grid system as set forth in Claim 1, wherein said grid also includes at least one intersection in which only one end connector (19) is positioned within a through-runner opening (18), and wherein said first-end-in-lock is engageable with both sides of said through-runner web (13) beyond both ends (65,66) of said through-runner opening (18) to resist tipping of said through-runner (10), said first-end-in-lock being operable to cantilever support the associated runner (11 or 12).
3. A suspension ceiling grid system as set forth in Claim 1 or Claim 2, wherein said runners provide flanges (16) along one edge of said web (13), wherein said flanges (16) of said opposed runners (11,12) engage one side of said flange of said through-runner (10) and normally maintain one of said lateral projections (28,36) in alignment with said remote side of said through-runner web (13) beyond the adjacent end of said opening (18), said flanges of said through-runner being temporarily deflectable to permit passage of said one lateral projection through said opening.
4. A suspension ceiling grid system as set forth in Claim 3, wherein said end connectors (19) provide connector-to-connector locks (51,53) on each side of said through-runner web (13).
5. A suspension ceiling grid system as set forth in Claim 4, wherein said connector-to-connector locks (51,53) are engageable and releasable by relative movement therebetween in directions generally aligned with the length of said opening (18).
6. A suspension ceiling grid system as set forth in Claim 5, wherein said connector-to-connector locks (51,53) include spaced rearwardly facing surfaces (54,56), said rearwardly facing surfaces on each end connector (19) being engageable with rearwardly facing surfaces on an associated end connector (19) extending through said opening (18) to prevent separating movement of said associated end connectors.
7. A suspension ceiling grid system as set forth in Claim 6, wherein at least one of said rearwardly facing surfaces (54,56) is inclined to permit misalignment if said end connectors (19) without releasing said connector-to-connector locks (51,53).
8. A suspension ceiling grid system as set forth in Claim 5, wherein said through-runner (10) and end connectors (19) permit tipping of the through-runner with respect to said end connectors to clear opposed surfaces (36,39) of one of said end connectors and permitting lateral movement of said one end connector to release said connector-to-connector locks (51,53).
9. A suspension ceiling grid system as set forth in Claim 8, wherein said end connectors (19) each provide lateral projections (28,36 and 32,39) engageable with both sides of said



through-runner web (13) beyond both ends (65,66) of said through-runner opening (18) normally preventing said through-runner (10) from rotating about its longitudinal length, said through-runner (10) being rotatable about its length past some of said projections (28,36 and 32,39) causing said connector ends to move relative to each other to release said connector-to-connector lock (51,53) and permit removal of one end connector (19) from a trapped module condition.

10. A suspension ceiling grid system as set forth in Claim 9, wherein said one end connector (19) is removable from said trapped module condition by movement generally aligned with the length of said opening (18).

11. A suspension ceiling grid system as set forth in Claim 9, wherein said one end connector (19) is removable from said trapped module condition by movement lengthwise of said through-runner (10).

12. A suspension ceiling grid system as set forth in Claim 11, wherein said end connectors (19) provide lateral boss means (44) to stiffen said end connectors and prevent substantial bending of the forward portion thereof when removed by said movement thereof lengthwise of said through-runner (10).

Patentansprüche

1. Traggerippesystem abgehängter Decken umfassend längliche, an Kreuzungsstellen miteinander verbundene Traggerippeelemente (10-12), wobei genannte Traggerippeelemente eine Laufschiene (10) und zwei gegenüberliegende Schienen (11, 12) enthält, die an gegenüberliegenden Seiten mit genannter Laufschiene verbunden sind, wobei jede der genannten Schienen einen Steg (13), eine vertikal längliche Öffnung (18) im Steg der genannten Laufschiene und im allgemeinen planare Endverbinder (19) an den Enden genannter gegenüberliegender Schienen (11, 12) enthält, die in genannte Öffnung (18) von gegenüberliegenden Seiten davon hineinragen, wobei jeder der genannten Verbinder (19) seitliche Vorsprünge (28, 36) zum Eingriff mit einer Seite des Laufschiene-Stegs (13) aufweist, dadurch gekennzeichnet, daß genannte seitliche Vorsprünge in eine Seite des Laufschiene-Stegs (13) eingreifen, die von der mit dem Verbinder verbundenen Schiene entfernt ist und sich über beide Enden (65, 66) an den äußersten Enden der Öffnung (18) hinaus erstrecken, um mit ge-

nannter Laufschiene (10) einen sogenannten First-end-in-Verschluß zu schaffen.

2. Traggerippesystem abgehängter Decken nach Anspruch 1, worin genanntes Traggerippe auch zumindest einen Kreuzungspunkt enthält, an dem nur ein Endverbinder (19) innerhalb einer Laufschiene-Öffnung (18) angeordnet ist, und worin genannter First-end-in-Verschluß mit beiden Seiten des genannten Laufschiene-Stegs (13) über beide Enden (65, 66) genannter Laufschiene-Öffnung (18) hinaus in Eingriff bringbar ist, um einem Kippen genannter Laufschiene (10) standzuhalten, wobei genannter First-end-in-Verschluß betreibbar ist, um die verbundene Schiene (11 oder 12) freitragend zu stützen.

3. Traggerippesystem abgehängter Decken nach Anspruch 1 oder 2, worin genannte Schienen Flansche (16) entlang einer Kante genannten Stegs (13) aufweisen, worin genannte Flansche (16) genannter gegenüberliegender Schienen (11, 12) mit einer Seite von genanntem Flansch genannter Laufschiene (10) in Eingriff stehen und normalerweise einen der genannten seitlichen Vorsprünge (28, 36) mit genannter entfernter Seite genannten Laufschiene-Stegs (13) über das angrenzende Ende genannter Öffnung (18) hinaus in Ausrichtung halten, wobei genannte Flansche genannter Laufschiene zeitweise biegsam sind, um den Durchgang des genannten einen seitlichen Vorsprungs durch genannte Öffnung zu ermöglichen.

4. Traggerippesystem abgehängter Decken nach Anspruch 3, worin genannte Endverbinder (19) Verbinder-zu-Verbinder-Verschlüsse (51, 53) auf jeder Seite genannten Laufschiene-Stegs (13) schaffen.

5. Traggerippesystem abgehängter Decken nach Anspruch 4, worin genannte Verbinder-zu-Verbinder-Verschlüsse (51, 53) durch relative Bewegung dazwischen in Richtungen eingreifbar und lösbar sind, die im allgemeinen mit der Länge genannter Öffnung (18) ausgerichtet sind.

6. Traggerippesystem abgehängter Decken nach Anspruch 5, worin genannte Verbinder-zu-Verbinder-Verschlüsse (51, 53) beabstandete, nach hinten gerichtete Oberflächen (54, 56) enthalten, wobei genannte nach hinten gerichtete Oberflächen auf jedem Endverbinder (19) mit nach hinten gerichteten Oberflächen eines verbundenen Endverbinders (19) in Eingriff bringbar sind, der sich durch genannte Öff-



nung (18) erstreckt, um eine Trennbewegung genannter verbundener Endverbinder zu vermeiden.

7. Traggerippesystem abgehängter Decken nach Anspruch 6, worin zumindest eine von genannten nach hinten gerichteten Oberflächen (54, 56) geneigt ist, um eine Fehlausrichtung der genannten Endverbinder zu ermöglichen, ohne genannte Verbinder-zu-Verbinder-Verschlüsse (51, 53) zu lösen. 5
8. Traggerippesystem abgehängter Decken nach Anspruch 5, worin genannte Laufschiene (10) und genannte Endverbinder (19) ein Kippen der Laufschiene im Verhältnis zu genannten Endverbindern ermöglichen, um gegenüberliegende Oberflächen (36, 39) von einem der genannten Endverbinder zu befreien und um eine seitliche Bewegung von einem genannten Endverbinder zu ermöglichen, um genannte Verbinder-zu-Verbinder-Verschlüsse (51, 53) zu lösen. 10 15 20
9. Traggerippesystem abgehängter Decken nach Anspruch 8, worin jeder der genannten Endverbinder seitliche Vorsprünge (28, 36 und 32, 39) aufweist, die mit beiden Seiten genannten Laufschiene (13) über beide Enden (65, 66) genannter Laufschieneöffnung (18) hinaus in Eingriff bringbar sind, wodurch eine Drehung genannter Laufschiene (10) um ihre Längsachse normalerweise vermieden wird, wobei genannte Laufschiene (10) über einige genannte Vorsprünge (28, 36 und 32, 39) hinaus um ihre Länge drehbar ist, wodurch ein Bewegen genannter Verbinderenden relativ zueinander bewirkt wird, um genannten Verbinder-zu-Verbinder-Verschluß (51, 53) zu lösen und das Entfernen eines Endverbinders (19) aus einem (ein)geschlossenen Modul zu ermöglichen. 25 30 35 40
10. Traggerippesystem abgehängter Decken nach Anspruch 9, worin ein genannter Endverbinder (19) durch eine im allgemeinen mit der Länge genannter Öffnung (18) ausgerichtete Bewegung aus genanntem (ein)geschlossenen Modul entfernbar ist. 45
11. Traggerippesystem abgehängter Decken nach Anspruch 9, worin ein genannter Endverbinder (19) durch längsseitige Bewegung genannter Laufschiene (10) aus genanntem (ein)geschlossenen Modul entfernbar ist. 50 55
12. Traggerippesystem abgehängter Decken nach Anspruch 11, worin genannte Endverbinder (19) seitliche Verstärkungsmittel aufweisen, um

genannte Endverbinder zu versteifen und um ein wesentliches Biegen des vorderen Abschnitts davon zu vermeiden, wenn sie durch genannte längsseitige Bewegung davon genannter Laufschiene (10) davon entfernt werden.

Revendications

1. Système de quadrillage pour plafonds suspendus comprenant des parties de quadrillage allongées (10-12) reliées entre elles à des intersections, les parties de quadrillage comprenant une traverse (10) et deux entretoises (11, 12) opposées, reliées sur des côtés opposés à la traverse, chacune des entretoises comprenant une âme (13), une lumière verticale (18) ménagée dans l'âme de la traverse et des connecteurs d'extrémité (19) généralement plans, aux extrémités des entretoises (11, 12) opposées, dépassant dans la lumière (18) à partir de côtés opposés de celle-ci, chacun des connecteurs (19) possédant des saillies latérales (28, 36) destinées à coopérer avec un côté de l'âme (13) de la traverse, caractérisé en ce que les saillies latérales coopèrent avec un côté de l'âme (13) de la traverse qui est éloigné de l'entretoise associée au connecteur et s'étendent au-delà des deux parties terminales (65, 66), aux extrémités de la lumière (18), afin de constituer un blocage-par-la-première-extrémité avec la traverse (10). 10 15 20 25 30 35 40 45
2. Système de quadrillage pour plafonds suspendus selon la revendication 1, dans lequel le quadrillage comprend également au moins une intersection dans laquelle seul un connecteur d'extrémité (19) est positionné à l'intérieur d'une lumière (18) ménagée dans la traverse, et dans lequel le blocage-par-la-première-extrémité est susceptible de coopérer avec les deux côtés de l'âme (13) de la traverse au-delà des deux extrémités (65, 66) de la lumière (18) ménagée dans la traverse afin d'empêcher le basculement de la traverse (10), le blocage-par-la-première-extrémité pouvant fonctionner pour supporter, en porte-à-faux, l'entretoise (11 ou 12) associée. 50 55
3. Système de quadrillage pour plafonds suspendus selon la revendication 1 ou 2, dans lequel les entretoises possèdent des nervures (16) sur un bord de l'âme (13), dans lequel les nervures (16) des entretoises (11, 12) opposées coopèrent avec un côté de la nervure de la traverse (10) et maintiennent normalement l'une des saillies latérales (28, 36) en alignement avec le côté éloigné de l'âme (13) de la



traverse au-delà de l'extrémité adjacente de la lumière (18), les nervures de la traverse pouvant être temporairement déviées pour permettre le passage d'une saillie latérale à travers la lumière.

4. Système de quadrillage pour plafonds suspendus selon la revendication 3, dans lequel les connecteurs d'extrémité (19) permettent des blocages de-connecteur-à-connecteur (51, 53) sur chaque côté de l'âme (13) de la traverse.

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5. Système de quadrillage pour plafonds suspendus selon la revendication 4, dans lequel les blocages de-connecteur-à-connecteur (51, 53) peuvent être créés et supprimés par un déplacement relatif entre eux, dans des directions globalement alignées avec la longueur de la lumière (18).

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6. Système de quadrillage pour plafonds suspendus selon la revendication 5, dans lequel les blocages de-connecteur-à-connecteur (51, 53) comprennent des surfaces (54, 56) espacées et orientées vers l'arrière, les surfaces orientées vers l'arrière, sur chaque connecteur d'extrémité (19) étant susceptible de coopérer avec des surfaces orientées vers l'arrière présentes sur un connecteur d'extrémité (19) associé s'étendant à travers la lumière (18) afin d'empêcher un mouvement de séparation des connecteurs d'extrémité associés.

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7. Système de quadrillage pour plafonds suspendus selon la revendication 6, dans lequel au moins l'une des surfaces (54, 56) orientées vers l'arrière est inclinée pour permettre un défaut d'alignement des connecteurs d'extrémité (19) sans qu'il y ait suppression des blocages de-connecteur-à-connecteur (51, 53).

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8. Système de quadrillage pour plafonds suspendus selon la revendication 5, dans lequel la traverse (10) et les connecteurs d'extrémité (19) permettent un basculement de la traverse par rapport aux connecteurs d'extrémité pour libérer les surfaces opposées (36, 39) de l'un des connecteurs d'extrémité et permettent un déplacement latéral de l'un des connecteurs d'extrémité afin de supprimer les blocages de-connecteur-à-connecteur (51, 53).

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9. Système de quadrillage pour plafonds suspendus selon la revendication 8, dans lequel les connecteurs d'extrémité (19) possèdent chacun des saillies latérales (28, 36 et 32, 39) susceptibles de coopérer avec les deux côtés de l'âme (13) de la traverse au-delà des deux

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extrémités (65, 66) de la lumière (18) ménagée dans la traverse, ce qui empêche normalement la traverse (10) de tourner autour de sa longueur longitudinale, la traverse (10) pouvant tourner autour de sa longueur au-delà de certaines des saillies (28, 36 et 32, 39), ce qui entraîne le déplacement des connecteurs d'extrémité l'un par rapport à l'autre afin de supprimer le blocage de-connecteur-à-connecteur (51, 53) et de permettre le retrait d'un connecteur d'extrémité (19) d'une configuration en module coïncé.

10. Système de quadrillage pour plafonds suspendus selon la revendication 9, dans lequel un connecteur d'extrémité (19) peut être dégagé de sa configuration en module coïncé par un déplacement globalement aligné avec la longueur de la lumière (18).

11. Système de quadrillage pour plafonds suspendus selon la revendication 9, dans lequel un connecteur d'extrémité (19) peut être dégagé de sa configuration en module coïncé par un déplacement longitudinal de la traverse (10).

12. Système de quadrillage pour plafonds suspendus selon la revendication 11, dans lequel les connecteurs d'extrémité (19) possèdent des bossages latéraux (44) destinés à renforcer les connecteurs d'extrémité et empêcher la courbure importante de leur partie avant lorsqu'ils sont retirés en les déplaçant longitudinalement par rapport à la traverse (10).