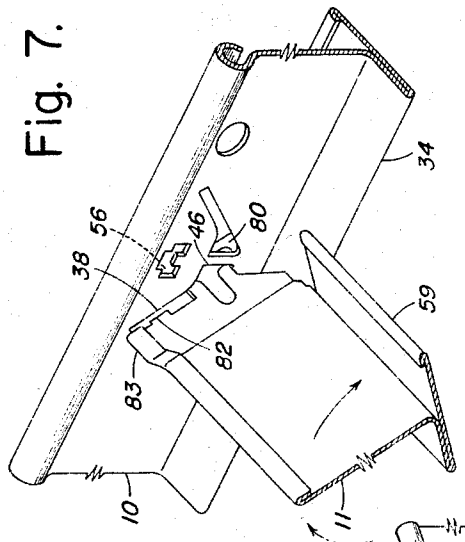
Nov. 8, 1966 H. ZNAMIROWSKI 3,283,467

ACOUSTICAL CEILING SUSPENSION FASTENING SYSTEM

Filed Sept. 1, 1964 2 Sheets-Sheet 1

Fig. 7.



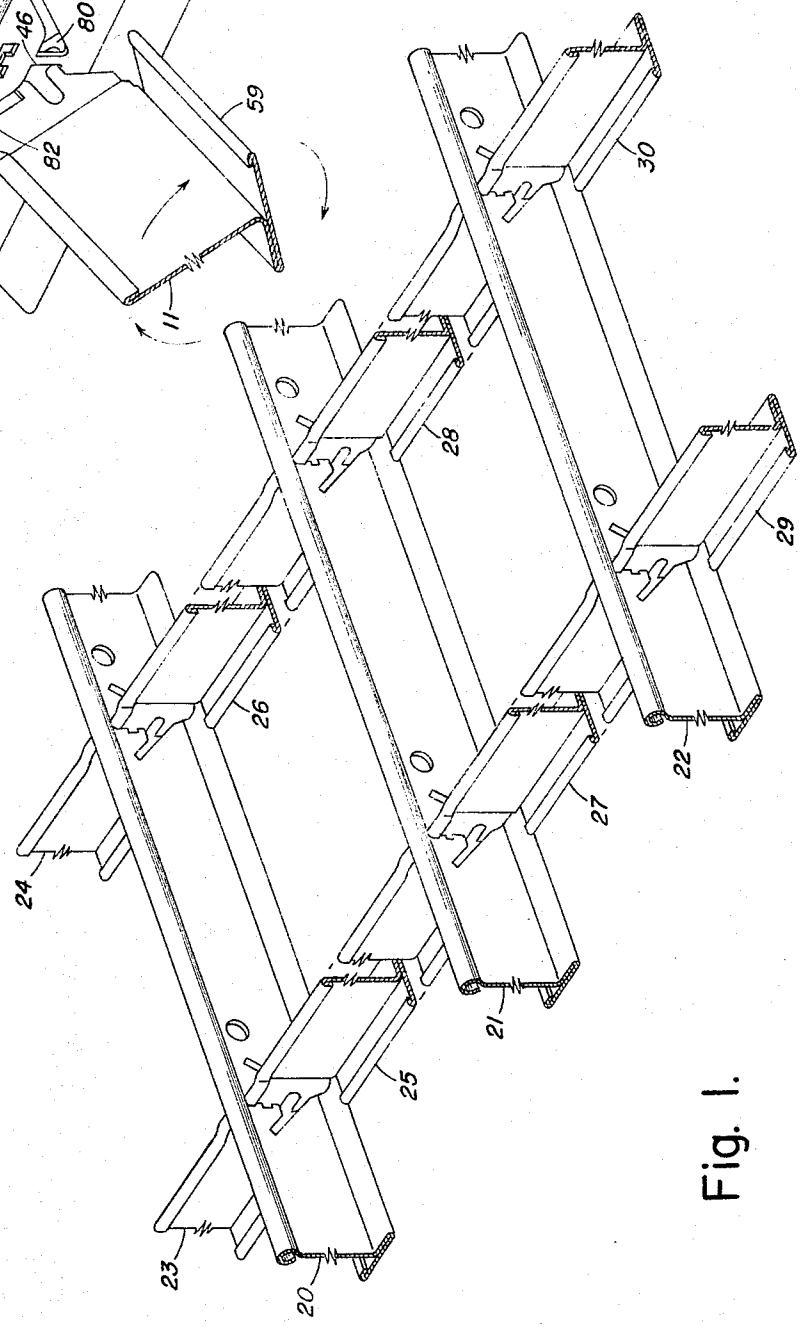


Fig. 1.

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ACOUSTICAL CEILING SUSPENSION FASTENING SYSTEM

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Fig. 2

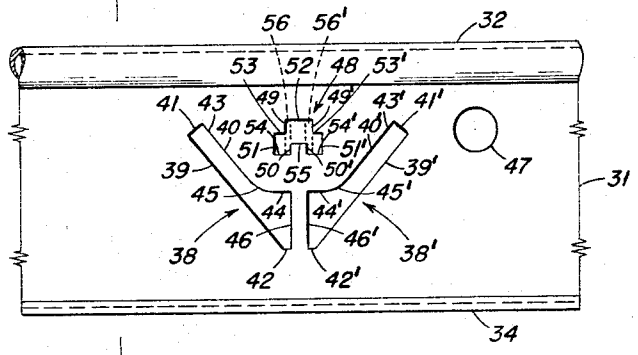


Fig. 3.

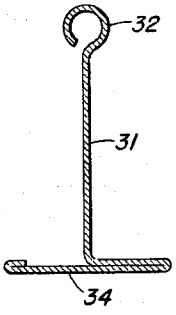


Fig. 8.

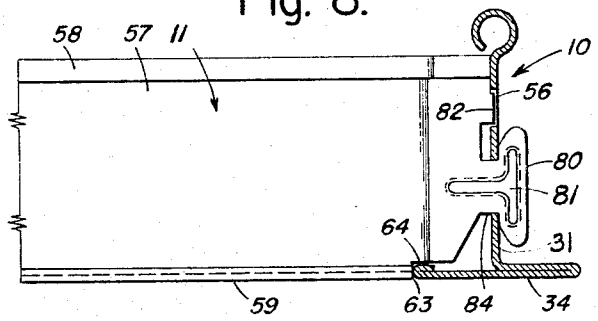


Fig. 5.

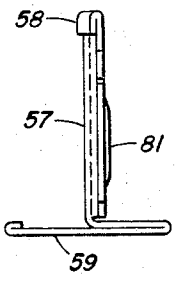


Fig. 6.

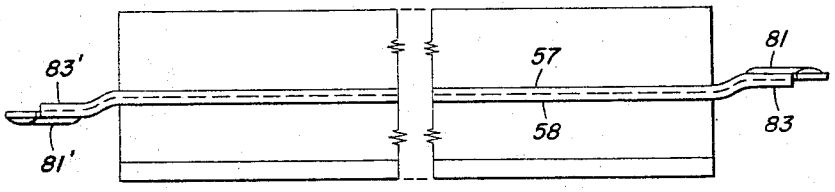
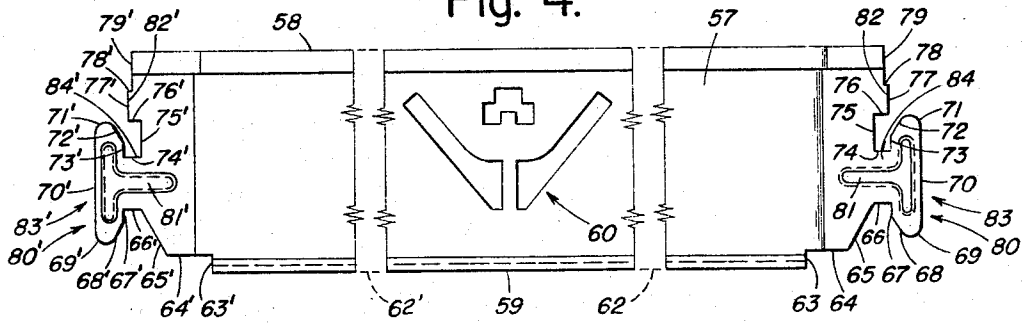


Fig. 4.



United States Patent Office 3,283,467 Patented Nov. 8, 1966

3,283,467

ACOUSTICAL CEILING SUSPENSION FASTENING SYSTEM

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Filed Sept. 1, 1964, Ser. No. 393,557
9 Claims. (Cl. 52—663)

The present invention relates to ceiling constructions and more particularly to suspended ceiling constructions in which a metallic grid system is suspended from primary ceiling members and is used to support acoustical tiles and other ceiling panels.

In recent years it has been common in the construction of new buildings and in the renovation of old buildings to employ suspended ceilings in which acoustical tiles or other types of ceiling panels are supported by flanged beams, usually made of steel or aluminum. In most such systems the flanged beams are arranged in a rectangular grid system with long parallel beams, called "main runners," being joined at suitable intervals by transverse parallel beams, called "cross-T's." In some systems the bottom flange of the metal beams forms a part of the visible ceiling surface, while in others the metal beams are not visible after the ceiling panels are installed.

In acoustical ceiling systems in which main runners and cross-T's are arranged into a rectangular grid, it is important that the attachment of the cross-T's to the main runners afford substantial stability and rigidity. It is also desirable that attachment of the cross-T's to the main runners be effected with as little labor as possible and preferably without the use of tools. It is also desirable that the cross-T's be readily removable, although it is important that accidental disengagement of the cross-T's from the main runners be prevented.

In accordance with the foregoing, it has been a principal object of the invention to provide a novel and improved suspension fastening system for acoustical ceilings.

More particularly, it has been an object of the invention to provide a fastening system in which the cross-T's may be easily attached to the main runners and which, when so attached, afford a grid system having excellent stability and rigidity characteristics.

Another object of the invention has been the provision of a fastening system in which the cross-T's may be installed and locked to the main runners without the use of tools.

Another object of the invention has been the provision of a fastening system in which cross-T's are readily removable but in which accidental disengagement of the cross-T's from the main runners is avoided.

A further object of the invention has been the provision of a fastening system in which the cross-T's may all be identical.

Other and further objects, features and advantages of the invention will appear more fully from the following description of the invention taken in connection with the appended drawings, in which:

FIGURE 1 is a fragmentary perspective view of a suspended ceiling grid system embodying the invention;

FIGURE 2 is a fragmentary side elevation view of a typical main runner for use in the system of the invention;

FIGURE 3 is a sectional view taken along the lines 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary side elevational view of a cross-T constructed in accordance with the invention;

FIGURE 5 is an end elevational view of the cross-T in FIGURE 4;

FIGURE 6 is a fragmentary plan view of the cross-T of FIGURE 4;

FIGURE 7 is a fragmentary perspective view showing a cross-T in position to be locked to a main runner; and

FIGURE 8 is a fragmentary elevational view, partly in section, showing a cross-T locked to a main runner.

Referring now to the drawings, and more particularly to FIGURE 1, the grid system may comprise a series of parallel main runners, as shown at **20**, **21** and **22** and a series of parallel cross-T's disposed at right angles to the main runners and spaced at regular intervals. Cross-T's are shown at **23**, **24**, **25**, **26**, **27**, **28**, **29** and **30**. Typically, the main runners will be suspended from roof trusses or other primary members by wires or other means well known in the art. The main runners will usually be relatively long, 12 feet being a typical length, and main runners will be spliced together end-to-end to span the ceiling space. The cross-T's will usually be spaced along the main runners at regular intervals, for example 2 or 4 feet, and, typically, will be 2 or 4 feet long, providing grid openings of a size to accommodate the acoustical tiles or other panels to be supported on the main runner and cross-T flanges.

A main runner is illustrated in detail in FIGURES 2 and 3 and comprises an upstanding, or vertical, web **31** formed at the top into a rounded rib **32**. The vertical portion terminates in a horizontal ceiling panel-supporting flange **34** extending in both directions from the web **31**. The main runner in cross section is shaped substantially as an inverted "T" and may be rolled or otherwise formed from a single sheet of metal, such as steel. Double web beams and T's may also be used, if desired. When formed from aluminum, the main runner will preferably be extruded. The flange **34** provides an attractive under-surface which is desirable in installations where the under-surface of the main runner forms a visible part of the installed ceiling.

At suitable axial intervals, the main runner web **31** is provided with vertically elongated cross-T attaching apertures or "routes," as shown at **38** and **38'** in FIGURE 2. The route **38'** is a mirror image of route **38**. The axial spacing between adjacent groups of related cross-T attaching routes may be selected as desired to accommodate various grid structures, but, typically, such axial spacing might be 12 inches center to center. That is to say, the related routes **38–38'** might be repeated at axial spacings of 12 inches or more.

The route **38** is located generally in the lower half of web **31** and has side walls **39** and **40** inclined at about 45 degrees from the flange **34**. The side wall **39** terminates in walls **41** and **42**. Wall **42** is substantially parallel to flange **34**. The side wall **40** has an upper segment **43** parallel to wall **39** and a lower segment **44** substantially parallel to flange **34**. Segments **43** and **44** are joined by arcuate segment **45**. Segment **44** is joined to wall **42** by wall **46** which is substantially perpendicular to flange **34**. The corresponding parts of route **38'** are identified by the same numbers as parts of route **38** but with an appended prime (').

Typically, the overall vertical height of the route **38** might be from 0.6 to 0.7 inch. The length of wall **39** might be ¾ inch. The height of wall **46** might be 0.312 inch. The spacing between walls **39** and **40** might be 3/32 inch. The junction of walls **40** and **41** might be vertically spaced from the upper surfaces of flange **34** by 31/32 inch. Wall **42** may be 0.030 inch. Walls **46** and **46'** may be spaced apart by 3/32 inch.

Route **48** cooperates with routes **38** and **38'** in providing locking positions for the cross-T's. Route **48** is comprised of vertical walls **49**, **49'**, **50**, **50'**, **51**, **51'** and horizontal walls **52**, **53**, **53'**, **54**, **54'** and **55**. Walls **49** and **49'** are joined by wall **52**. Walls **49** and **51** are joined by wall **53**; walls **49'** and **51'** are joined by wall **53'**. Walls **50** and **51** are joined by wall **54**; walls **50'** and **51'** are joined

by wall 54'. Walls 50 and 50' are joined by wall 55. Walls 50 and 50' are in the same plane as walls 46 and 46', respectively.

The shape of route 48 is determined primarily by mechanical considerations in the preparation of dies, etc., necessary to its formation. The purpose of the configuration of route 48 is to define slots 56 and 56'. Slot 56 is formed by portions of walls 49, 50, 52 and 54. Slot 56' is formed by portions of walls 49', 50', 52 and 54'. One edge of each of slots 56 and 56' is in the same vertical plane as walls 46 and 46', respectively. Slots 56 and 56' may be 7/32 inch high by 0.030 inch wide. It should be understood that the foregoing and other dimensions set forth herein are given solely by way of example and are not intended to limit the invention.

One or more round apertures 47 may be provided adjacent each group of related routes, i.e., 38, 38', 48, for convenient attachment of main runner supporting wires, as is well known in the art.

As shown in FIGURES 4 and 5, the cross-T's are also shaped into an inverted "T" cross section and have a vertical web 57 terminating in an upper rib 58 of folded metal and a lower horizontal ceiling panel supporting flange 59 extending in both directions from the web 57. The cross-T may have a central route or group of routes 60 for attachment of a bridging T, as is well known. The cenral route may be a simple rectangular opening, if desired, but preferably is comprised of three openings, such as 38, 38' and 48 as described above. For convenience of illustration, the cross-T is broken at 62 and 62', although the overall axial length thereof might be 2 or 4 feet. Generally, the cross-T height will be somewhat less than the main runner height, and the cross-T may be made of lighter gauge metal.

The two end portions 83, 83' of the cross-T are similar to each other and offset to opposite sides of the web. A novel feature of the cross-T lies in the cooperation of a latch which extends through the main runner web and holds the cross-T to the main runner and to a nose which engages the slot 56 or 56', thus holding the cross-T in an upright postiion and preventing its rotation out of position. Each cross-T end portion is comprised of a vertical wall 63 formed by the axial ends of the flange 59 and by the rear of a notch in the end of the cross-T web. The end portion is also comprised of a horizontal wall 64 and an inclined wall 65. A latch 80 projects forwardly from the end portion 83 and is connected to the end portion by a neck 84 defined by walls 66 and 74. Inclined wall 65 extends between walls 64 and 66. The latch 80 is comprised of wall 67, an inclined wall 68, an arcuate wall 69, a vertical wall 70, an arcuate wall 71, an inclined wall 72, and a vertical wall 73. A vertical wall 75 connects to shoulder 74 and is in substantial alignment with the upper end of the inclined wall 65. A nose 82 is defined by a horizontal wall 76, a vertical wall 77 and a horizontal wall 78. A vertical shoulder 79 extends from wall 78 to the top of the rib 58.

The overall dimension across arcuate walls 69 and 71, which define the overall height of the latch 80, might be 11/16 inch. The height of shoulder 77 might be 5/32 inch, and the forward extension of nose 82, measured by the length of shoulder 78, might be 0.020 inch. The height of the neck might be 0.312 inch.

The latch walls 67 and 73 are in the same plane and might extend forward of nose wall 77 by 0.020 inch and forward of shoulder 79 by 0.040 inch. The dimensions are established so that latch walls 67 and 73 engage one side of a main runner web while the shoulder 79 engages the other side and the nose 82 projects into the web, as will be explained below.

In order to provide strength to the latch 80, it is desirable that the metal forming the latch be drawn to form cup 81 as shown in FIGURES 4–6.

As shown in FIGURES 4–6, the web 57 is offset forwardly of shoulder 63. The latch 80 is intended to be installed so that the webs on successive cross-T's are aligned. Preferably, the latches on opposite ends of each cross-T are offset to opposite sides of the web (as shown in FIG. 6) so that both latches may be joined in adjacent main runners with a twisting motion in the same direction in relation to the respective ends of the T as explained below. Each cross-T has either two "right-hand" or two "left-hand" latches, only one hand of latch being utilized in any one grid system to simplify installation. By a "right-hand" latch is meant a latch which is offset to the right of the web when viewed along the web in the direction of the latch in question from a point slightly above and intermediate the two latches. A "left-hand" latch is offset to the left of the web when viewed along the web in the direction of the latch in question from a point slightly above and intermediate the two latches.

By offsetting the latch forward portion slightly to the side, as best shown in FIGURE 6, a substantial axial separation may be made between the main runner web areas contacted by the nose 82 of opposing cross-T latches, the separation being that provided by the surface under wall 55 (FIGURE 2).

As mentioned above, it is desirable that the latches at each end of a cross-T be offset to opposite sides of the cross-T. With such an offset arrangement, the cross-T's on opposite sides of the main runner may be disposed with their webs in substantial alignment, which is highly desirable. This construction also affords a grid structure of greater rigidity than if the cross-T's were disposed off center. Among other advantages, such offset arrangement may provide for exact alignment of rectangular ceiling tiles and may provide better balance because the line of support will intercept the length of the T at its geometric center. Furthermore the T has a much greater safety factor against accidental disengagement. Also, workers can simultaneously install T's in various sections of a ceiling without concerning themselves as to whether they will be using the proper side of the route when they come together.

In route 38 the walls 39, 40, 41 and 42 define an aperture which is large enough to permit the insertion of the latch 80 through the main runner web. The main runner wall 46 with walls 42 and 44 defines an aperture which is large enough to permit entry of the cross-T neck 84 but is small enough so that the latch may not pass through it, thus the main runner walls 42, 44 and 46 define an aperture which permits the neck 84 to be rotated from the inclined position of FIGURE 7 to the substantially vertical position of FIGURE 8. The configuration of arcuate segment 45 permits the smooth rotation of the neck into engagement between walls 42 and 44. In the latter position the cross-T is upright and cooperates with the main runner in supporting ceiling tiles.

Installation of the cross-T to the main runner 10 may be effected as shown for the cross-T 11 in FIGURE 7. The cross-T web is inclined at about 45 degrees to align the latch 80 with the cooperating portion of route 38, and the latch is inserted between walls 39 and 40. Thus, the latch initially is in a pivoted position and extends through route 38 between walls 39 and 40. The cross-T 11 is then twisted to an upright position toward wall 46. Nose 82 engages slot 56 and locks the cross-T in a vertical position. After one end of the T is installed with the web vertical, the opposite end is twisted to incline its latch to align with a cooperating corresponding route of an adjacent beam, and then twisted to a vertical position.

One end of the cross-T 11 is shown fully assembled to the main runner 10 in FIGURE 8. The wall 63 formed by the end of the cross-T flange 59 abuts the adjacent outer edge of main runner flange 34. The bottom surfaces of the flanges are in substantially the same plane, providing the desired smooth ceiling surface. The wall 64 of the cross-T end portion 83 is in the form of a notch which rests on the adjacent main runner flange. The latch 80 in contacting web 31 causes a squeezing or grip-

ping action which produces a tight contact between nose **82** and web **31**, and between the latch **80** and web **31**. The tight contact affords substantial stability and rigidity of the assembled grid by preventing accidental disengagement of the cross-T **11** from the main runner **10**.

Disassembly of the cross-T from the main runner may be effected by forcing the nose **82** outwardly of the cross-T web **31** until clear of slot **56**. The latch is then twisted vertically, moving the latch **80** into alignment with the route between walls **39** and **40**, and permitting the latch to be withdrawn. In a fully installed grid system, a slight flexing of the main runner and/or cross-T would be needed to free completely the nose **82** of the cross-T. To prevent accidental disengagement, it is desirable that the force required to effect this disengagement be considerable, and hence disassembly may require the use of a screwdriver or like tool to force the nose **82** out of slot **56**. However, assembly of the cross-T to the main runner may be accomplished without the use of tools, because of the resiliency of the members.

While the invention has been described in connection with a specific embodiment thereof and in a specific use, various modifications thereof may occur to those skilled in the art without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. Structural members for a suspended ceiling grid structure comprising a main runner having an upstanding web and a flange extending in both directions from the base of said web at substantially right angles thereto, said web defining a plurality of first, second and third routes; and a cross-T having an upstanding web and a flange extending in both directions from the base of said web at substantially right angles thereto, both ends of said cross-T web having a latch and a nose; said first route of said main runner comprising walls defining an aperture adapted to receive said latch when said cross-T is inclined from said main runner flange in a plane at right angles to said main runner web, said aperture being further adapted to permit rotation of said latch to an upright position; said second route being a mirror image of said first route and being disposed adjacent said first route; said third route being disposed in spaced relation to said first and second routes and defining first and second slots, said first slot being disposed in spaced relation to said first route and being adapted to receive said nose of said cross-T web, said second slot being similar to said first slot and being disposed in spaced relation to said second route, whereby a first cross-T inserted in said first route and rotated to engage said first slot, and a second cross-T inserted in said second route and rotated to engage said second slot are rigidly retained at substantially right angles to said main runner.

2. Structural members for a suspended ceiling grid structure as defined in claim **1** wherein said latch and said nose at opposite ends of said cross-T are offset a predetermined distance to opposite sides of said web.

3. Structural members for a suspended ceiling grid structure as defined in claim **2** wherein the offset distance is substantially equal to one-half the distance between said first and said second routes of said main runner.

4. Structural members for a suspended ceiling grid structure as defined in claim **2** wherein said first and said second routes of said main runner are spaced apart by a distance equal to twice the offset of said cross-T latch and nose from said cross-T web.

5. Structural members for a suspended ceiling grid structure comprising a plurality of main runners having an upstanding web and a flange extending in both directions from the base of said web at substantially right angles thereto, said web defining a plurality of first, second and third routes; and a plurality of cross-T having an upstanding web and a flange extending in both directions from the base of said web at substantially right angles thereto, both ends of said cross-T web having a latch and a nose, said latch having an enlarged portion supported axially from said cross-T web by a neck; said first route of said main runner comprising walls defining an aperture adapted to permit passage of said latch when in a position inclined from said main runner flange in a plane at right angles to said main runner web, said aperture being further adapted to permit said neck of said latch to pass from said inclined position to a position perpendicular to said main runner flange when said cross-T is rotated to an upright position; said second route being a mirror image of said first route and being disposed in spaced relation to said first route and adapted to receive a cross-T from the side opposite that from which said first route received said cross-T; said third route being disposed in spaced relation to said first and second routes and defining first and second slots; said first slot being disposed in spaced relation to said first route and being adapted to receive said cross-T nose; said second slot being similar to said first slot and being disposed in spaced relation to said second route, whereby a first cross-T latch inserted in said first route and rotated to engage a first cross-T nose in said first slot, and a second cross-T latch inserted in said second route and rotated to engage a second cross-T nose in said second slot, are rigidly retained in a predetermined position with relation to said main runner.

6. In a suspended ceiling grid structure having a plurality of spaced parallel main runners and a plurality of cross-T's connecting the main runners, both main runners and cross-T's having an axially extending upstanding web and a pair of axially extending flanges projecting horizontally from the web, the improvement in the means for connecting the cross-T's to the main runners comprising a latch projecting forwardly from a cross-T web and arranged to enter an adjacent main runner web first aperture when aligned by rotating the cross-T to an inclined position in a plane at right angles to the main runner web, said aperture being adapted so that said latch may be rotated from said inclined position to an upright position; and a nose projecting forwardly from said cross-T web and adapted to enter a main runner second aperture when said cross-T is in said upright position, whereby said cross-T is locked in said upright position.

7. A grid structure as defined in claim **6** wherein said cross-T further comprises an upwardly extending shoulder arranged to contact the main runner web adjacent the main runner second aperture to firmly engage the surface of said main runner web, wherein said latch firmly engages one side of said main runner web and holds said shoulder against the other side of said main runner web retaining said nose in said second aperture to prevent accidental disengagement of said cross-T from said main runner.

8. In a suspended ceiling grid structure having a plurality of spaced parallel main runners each having an axially extending upstanding web and a flange extending horizontally from both sides of the base of the main runner web, said main runner webs each having a plurality of axially spaced apertures located at an intermediate height in said main runner web, a cross-T structure for installation between a pair of adjacent main runners, said cross-T structure having an axially extending upstanding web and a flange extending horizontally from both sides of the base of the cross-T web and terminating axially inwardly of the forward end of the cross-T web by a distance substantially equal to one-half of the width of a main runner flange, the improvement in the cross-T web comprising an offset portion at each end of the cross-T web, each offset portion further comprising a vertical latch member forming the forward end of said offset portion and adapted to extend through an adjacent main runner web when the forward end of the cross-T web is aligned with a cooperating aperture in the main runner web adapted to receive said latch; said offset portion further comprising a nose extending from the end portion a

lesser distance than said latch and adapted to extend into a cooperating slot in said main runner web to lock said cross-T member in a vertical position.

9. In a suspended ceiling grid structure having a plurality of spaced parallel main runners and a plurality of cross-T's connecting the main runners, in which both the main runners and cross-T's have axially extending webs and a flange extending horizontally from both sides of the webs, the improvement in the means for connecting the cross-T's to the main runners comprising a plurality of spaced apertures in the main runner webs having a narrow elongated portion inclined at an angle to the flange, an upright portion substantially perpendicular to the flange, and a passage connecting the inclined segment and the upright segment; an end portion at each end of the cross-T's having a neck, a latch supported by the neck, and a shoulder, said latch being larger than said neck; said aperture inclined portion in said main runner web being adapted to permit insertion through the web of said cross-T latch when said cross-T is inclined to position said latch in alignment with said inclined portion, and said aperture upright segment portion and said aperture passage being adapted to permit passage of said neck when said cross-T after insertion of said latch through said web is rotated from said inclined position to an upright position substantially perpendicular to the flange of said main runner wherein said latch engages one side and said shoulder engages the other side of said main runner web; said main runner web having a second aperture and said shoulder at each end of said cross-T's having a nose at the end thereof, said second aperture being adapted to permit entry of said nose, whereby upon rotation said cross-T is locked in upright position due to the insertion of said nose into said second aperture.

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