Sept. 6, 1966 R. N. WEINAR 3,270,479

SUSPENSION GRID SYSTEM FOR A CEILING CONSTRUCTION

Filed Aug. 9, 1963 3 Sheets-Sheet 1

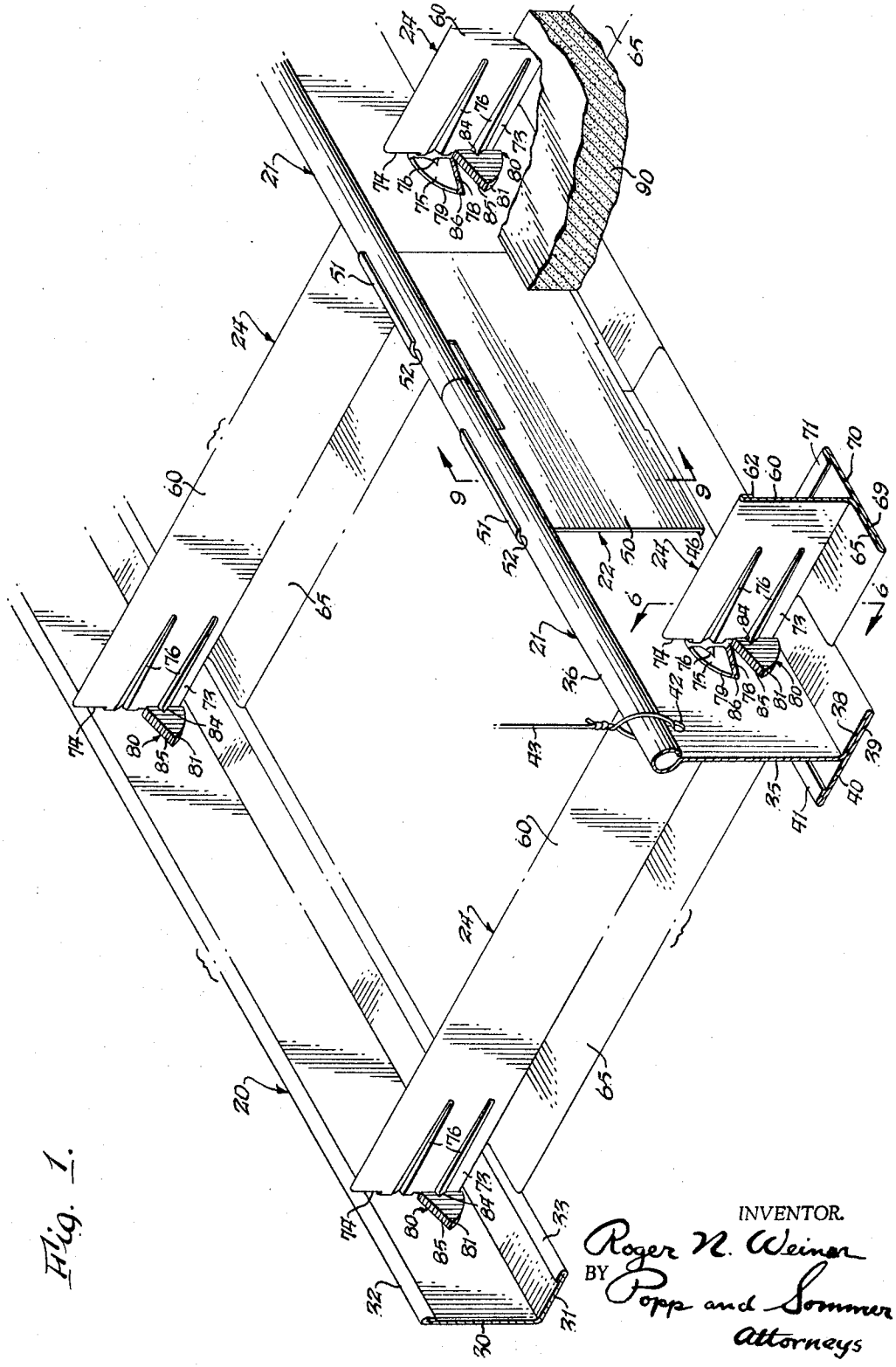

Fig. 1.

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Fig. 3.

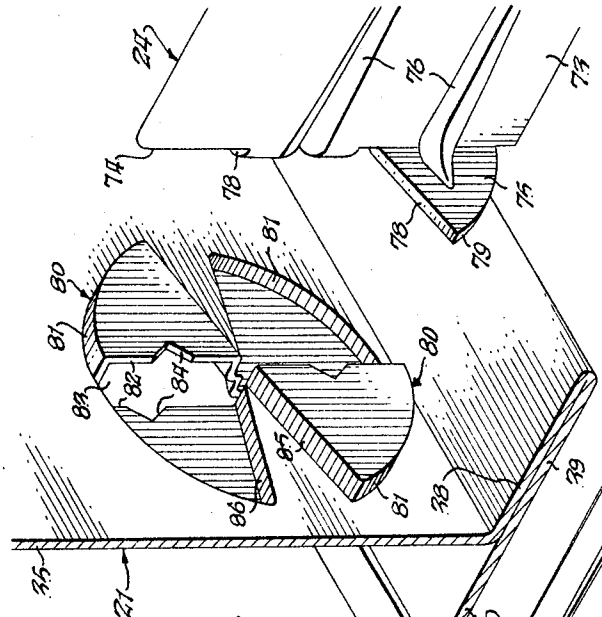

Fig. 4.

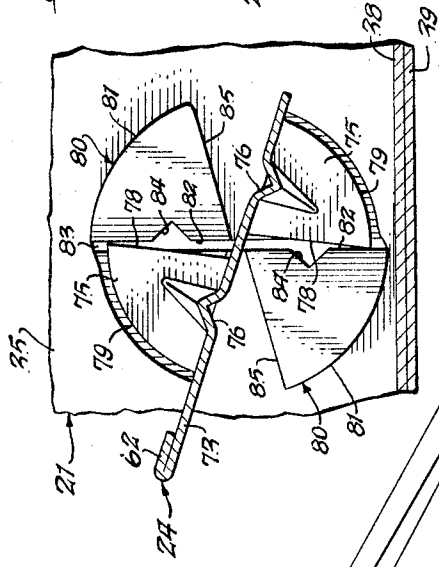

Fig. 5.

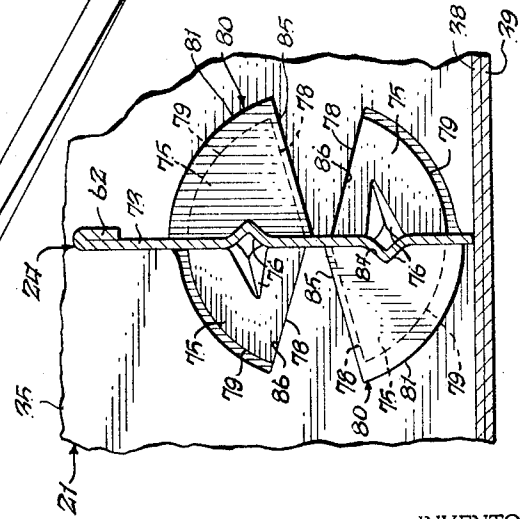

Fig. 2.

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Sept. 6, 1966 R. N. WEINAR 3,270,479

SUSPENSION GRID SYSTEM FOR A CEILING CONSTRUCTION

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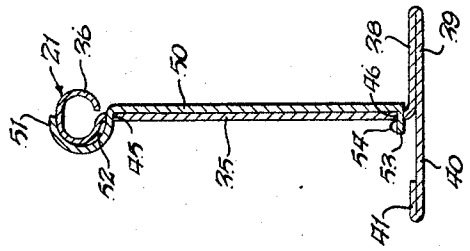

Fig. 9.

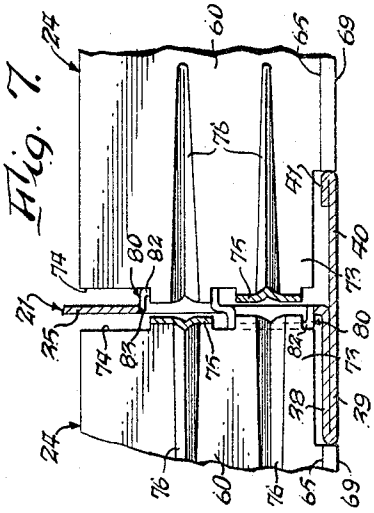

Fig. 7.

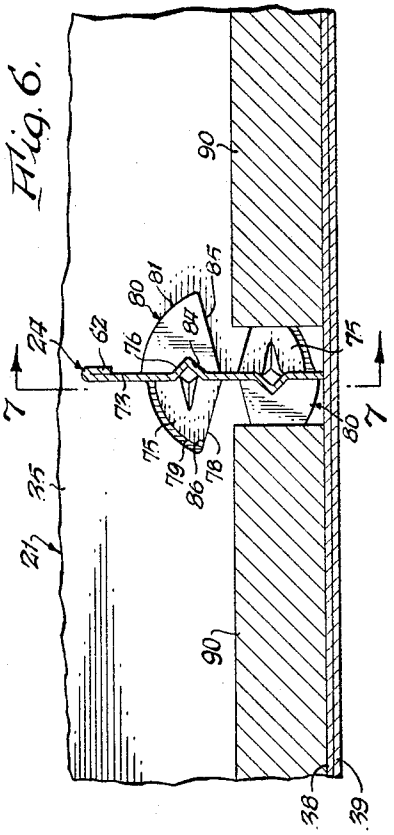

Fig. 6.

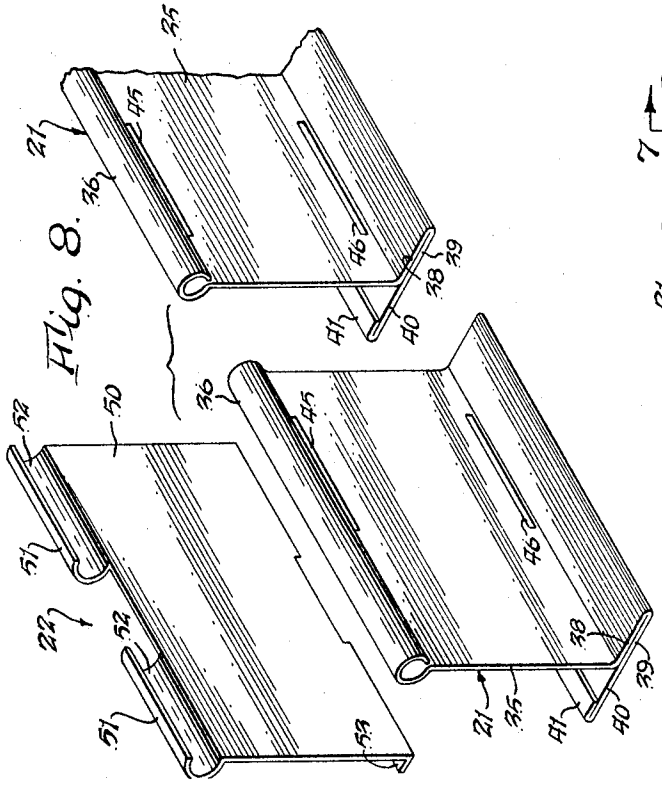

Fig. 8.

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3,270,479

SUSPENSION GRID SYSTEM FOR A CEILING CONSTRUCTION

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Filed Aug. 9, 1963, Ser. No. 301,146
8 Claims. (Cl. 52—667)

This invention relates to a suspended grid for a ceiling construction and more particularly to the attachment of cross T's to the perimeter molding and to the main T's.

One of the objects of the present invention is to provide cross T's which can be rapidly and securely fastened at their opposite ends to perimeter molding or main T's and which will adequately withstand the load, such as ceiling panels and the like, imposed upon the cross T's.

Another object of the invention is to provide such a mounting for the ends of cross T's which does not involve any fastening members other than the materials of the T's and perimeter molding itself.

Another object is to provide such a mounting for the ends of cross T's which does not involve any tools used in the actual attachment of the cross T's to the main T's or perimeter molding, it being merely necessary to twist the ends of the cross T's in opposite directions, aline the same and release the cross T's.

Another object of the invention is to provide such a mounting for cross T's in which the ends of the cross T's can be readily formed in the field by the use of a suitable machine.

Another object is to provide such a mounting for cross T's which places the entire ceiling grid, composed of the connected perimeter molding, main T's and cross T's, under stress, thereby to provide freedom from noise, such as rattling in response to extraneous vibrations, or noise coming from expansion and contraction of the grid due to temperature changes.

Another object of the present invention is to provide a mounting for the opposite ends of cross T's which permits the cross T's to be arranged in longitudinal alinement, with each pair of opposing ends secured to the web of a common main T.

Another object of the invention is to provide a simple, low cost and secure splice plate between abutting ends of the main T's.

Another object of the invention is to provide such a splice plate between the abutting ends of the main T's which does not require any fastening devices other than those which are integral with the splice plate and main T's themselves.

Another object is to provide such a splice plate for the abutting ends of main T's and does not require any tools for applying the splice plates to the abutting ends of the main T's.

Other objects and advantages of the invention will be apparent from the following description and drawings in which:

FIG. 1 is a fragmentary perspective view of a portion of the grid structure for a ceiling, illustrating the perimeter molding, a main T and a cross T, the latter being secured to the main T and perimeter molding in accordance with the present invention.

FIG. 2 is a perspective view of a cross T in its normal unstressed state, illustrating the helical form of the web and flanges concentric with the longitudinal axis of the T.

FIG. 3 is an enlarged exploded perspective view of one end of a cross T and a socket or offset portion in the web of a main T for receiving the same to secure the cross T's to the main T's.

FIG. 4 is a transverse section through one end of a cross T before insertion into the sockets or offset portions of a main T.

FIG. 5 is a view similar to FIG. 4 illustrating the cross T after insertion into the sockets or offset portions and fully fastened in position.

FIG. 6 is a fragmentary vertical section taken on line 6—6, FIG. 1 and also showing the ceiling panels supported on the bottom flanges of the main T's.

FIG. 7 is a fragmentary vertical sectional view taken on line 7—7, FIG. 6.

FIG. 8 is an exploded perspective view of a splice for opposing abutting ends of the main T's.

FIG. 9 is an enlarged vertical sectional view taken on line 9—9 of FIG. 1 and showing the splice in cross section and in particular illustrating the detents for retaining the splice plate in position.

In the accompanying drawings the ceiling grid construction is shown as composed of a perimeter molding **20** which forms the margin of the entire grid; main T's **21** connected with the perimeter molding in any conventional manner (not shown); splice plates **22** connecting abutting ends of the main T's when required; and cross T's **24**, the opposite ends of which are fastened to the main T's or perimeter molding in accordance with the present invention.

The perimeter molding **20** of the grid structure is shown as comprising a series of sheet metal bars each of which is generally L-shaped in cross section having a vertical web **30** and an integral flange **31** forming a horizontal continuation of the lower edge of this web, the opposite or upper edge of the web **30** being preferably beaded or folded over as indicated at **32** and the outboard edge of the flange **31** also preferably being beaded or folded over as indicated at **33**. This represents a standard construction of the bars forming perimeter molding of the grid of a supported ceiling.

The main T's **21** are also shown as being of conventional form and as each made of a sheet of metal including a vertical web **35**, the upper edge of which is in the form of an integral tube **36** and the lower edge of which is continued horizontally to form a horizontal flange **38**. The outboard edge of this horizontal flange **38** is continued to form a bottom plate **39** which extends along and in contact with the bottom face of the flange **39** beyond the web **35** so as to form a flange **40** projecting from the bottom of the main T a distance substantially equal to the flange **38** so that the main T's are generally in the form of a sheet metal bulb bar. The outboard edge of the flange **40** is preferably beaded or reversely bent as indicated at **41**.

At intervals, below the tubular upper extremities, the main T's **21** are provided with bores **42** through which suspension wires **43** can be inserted, these suspension wires suspending the grid structure from an overhead support (not shown).

The ceiling grid structure may include a number of main T's **21** arranged end-to-end and their abutting ends, illustrated in FIGS. 1, 8 and 9, are connected together by a splice plate **22** embodying the present invention. For attachment of the splice plates each end of each main T is provided with a pair of horizontal slots **45**, **46**. These slots are shown as being of generally the same length arranged one above the other in the web **35** at opposite ends of each main T **21**, each slot **45** being arranged immediately under and parallel with the bulb or tube **36** of each main T and each slot **46** being arranged immediately above the flange **38** and parallel therewith.

Each splice plate **22** is shown as having a body in the form of a flat plate **50** adapted to rest against either face of the webs **35** of the abutting ends of the main T's **21** as best illustrated in FIGS. 1 and 9. This body is provided with a pair of upward extensions **51** at its opposite ends and which are of semicylindrical form. These semicylindrical upward extensions **51** are offset to the same side of

the plane of the body **50** and are coaxial, their axis being generally coincident with the plane of the body. The internal diameter represented by the faces **52** is substantially equal to the outside diameter of the bulb or tube **36** of the main T **21**. The length of each of the semi-cylindrical extensions **51** is slightly less than the length of a slot **45** and the distance between these semicyclindrical extensions **51** is slightly greater than the distance between the slots **45** when a pair of main T's **21** are arranged in end-to-end abutting relation to each other.

The body **50** of each splice plate **22** is provided with a pair of spaced horizontal flanges **53** which extends in the same direction from the bottom edge of the body. Each of these horizontal flanges is of a length, measured parallel with the main T's, somewhat less than the length of the slots **46** and the distance between these bottom flanges **53** is somewhat greater than the distance between the opposed ends of a pair of the slots **46** when their main T's **21** are arranged in end-to-end abutting relation. An important feature also resides in the fact that these horizontal flanges are provided with at least one, and preferably a series, of upwardly projecting detent teats **54**.

In erecting the main T's and the perimeter molding constructed as above described the lengths of perimeter molding **20** are positioned around the walls (not shown) of the enclosure and the main T's **21** secured thereto in any conventional manner (not shown), the main T's being suspended at suitable intervals by the wires **43**. Where the main T's **21** are required to abut each other, as illustrated in FIGS. 1 and 8, the splicing plates **22** are applied. This is done at each joint by inverting the splicing plate so that the semicylindrical extensions **51** of the plate projects downwardly, the concave faces **52** of these extensions then being brought against the side of the bulbs or tubes **36** at the abutting ends of the main T's **21** with the outboard ends of these semicylindrical extensions **51** in line with a pair of slots **45** at the ends of the abutting T's. The splicing plate **22** is then swung downwardly with the axis of its semicylindrical extensions **51** coincident with the axis of the two bulbs or tubes **36** of the two T's, this causing the semicylindrical upward extensions **51** to thread through the slots **45** and embrace the opposite sides of the bulbs or tubes **36** of the abutting main T's **21**. In bringing the body **50** of the splice plate into contact with the faces of the webs **35** of the abutting ends of T's **21**, the flanges **53** of the splicing plate pass through the slots **46** at the opposing ends of the two T's. These slots are sufficiently wide to frictionally permit the passage of the series of teats **54** with hand pressure but distortion of these teats occurs so that when the splice plate **22** reaches the face-to-face position with the webs of its T bars, as illustrated in FIG. 9, these teats **54** spring up so as to retain the flanges **53** against accidental retrograde movement such as might be caused by vibration and the like.

To the grid of perimeter molding and main T's assembled and supported as above, is then applied, the cross T's embodying the present invention, although it will be understood that, where required, bridging T's (not shown) could be employed, these bridging the spaces between the main T's and being of the same general construction except as to weight. The term "supporting bars" as used in the accompanying claims is meant to include perimeter molding as well as main and bridging T's.

The cross T's made in accordance with the present invention are each preferably made of a single strip of sheet metal of a length to bridge the space between the webs **35** of the main T's **21** and also to bridge each space between the outermost rows of main T's **21** and the perimeter molding **20**.

Each of these cross T's comprises a web portion **60** the lower longitudinal edge of which is beaded or reversely formed as indicated at **62**. The opposite or lower longitudinal edge of this web is continued laterally to form a perpendicular or horizontal side flange **65**. The outboard edge of the side flange **65** is continued in the form of a

bottom plate **69** which is arranged in face-to-face relation to the bottom of the flange **65** and projects beyond the web **60** to form a flange **70** on the opposite side of the web and the outboard edge of which is preferably beaded, as indicated at **71**. The ends **73** of the web **60** of each cross or supported T **24** project beyond the ends of the flanges **65** and **70** thereof, a distance slightly greater than the width of the side flanges **31**, **38** and **40** of the perimeter molding **20** and main T's **21**. Each end edge **74** of the web **60** is formed to provide a pair of attaching wings **75**, **75**, these attaching wings projecting perpendicularly from the corresponding end edge **74** but in opposite direction, one wing **75** projecting from approximately one half the end edge **74** perpendicularly in one direction and the other attaching wing **75** occupying approximately the other half of this end edge **74** and projecting in the opposite direction. These wings are preferably severally reinforced by strengthening ribs **76** which extend lengthwise of the web **60** and also extend around and form part of the base for each attaching wing as best shown in FIG. 3.

Each of the attaching wings **75**, **75** is preferably in the form of the segment of a circle, one generally straight edge of which is integrally attached to the end edge **74** of the web and the other straight edge **78** of which is at an included angle somewhat less than 90° with reference to the attached edge of each wing **75** and terminates in a circular outer edge **79** of the wing. This circular outer edge is shown as being concentric with a major or longitudinal central axis of the cross or supported T **24** and each edge **78** is generally parallel with a radius of this axis.

A feature of the invention is that in the normal or unstressed condition of each supported or cross T **24** its web **60**, flanges **65** and **70**, and also the bottom plate **69** are of helical form concentric with a major or central longitudinal axis of the cross or supported T **24**. The lead of the edges of the helix so formed is such that one end edge **74** of the web **60** is about 90° or at right angles to the opposite end edge thereof as best illustrated in FIG. 2.

At the place where the end of a cross T **24** is to be attached to the web of either the perimeter molding **20** or main T **24**, this web is provided with a pair of laterally offset portions or pockets indicated generally at **80**, each of which in plan is also in the form of a segment of a circle.

The pair of portions **80** of one supporting bar, such as a main T or the perimeter molding, are offset toward the companion pair of offset portions **80** of the other supporting bar for a common cross T. The outer circular perimeter or walls **81** of each pair of segmental-shaped offset portions **80** are generally concentric with each other about a common horizontal axis extending transversely of the web from which the pair of offset portions are formed. Each offset portion **80** terminates in a vertical edge **82** formed by a vertical slot **83** in the offset portion. The vertical edges **82** of each companion pair of offset portions **80** are preferably parallel but in offset relation to each other and each edge is provided with a central indentation or nick **84** to accommodate the reinforcing ribs **76** of the supported cross T's **24** as hereinafter described. Each offset portion **80** is provided with a horizontally extending straight wall **85** which is radial with respect to the circular wall **81** and which forms a seat **86** for the edge **78** of a companion wing **75** of a supported T **24**. The interior of each offset portion **80** conforms in shape and size to the wing **75** which it receives.

With the supporting bars of the ceiling grid, namely the perimeter molding **20** and main T's **21**, erected as previously set forth, the attachment of the cross T's **24** in the grid is a simple matter. One end of one of the cross T's **24** is brought up to one pair of offsets **80**, say, a pair in the perimeter molding **20**. The edges **78** of its pair of wings **75** at that end of the cross T's are then brought to a vertical position; the cross T **24** is brought

to a generally horizontal position; and the pair of wings **75** are brought against the web **30** of the perimeter molding **20** with their edges **78** alongside the vertical slots **83** in the pair of offset portions **80** of the perimeter molding, this position of the parts being illustrated in FIG. 4.

The supported cross T **24** is then turned about its longitudinal axis, which is now horizontal and generally concentric with the pair of segment-shaped offset portions **80** and segment-shaped wings **75**, this turning being in a clockwise direction as viewed in FIG. 4. This causes the two wings **75**, at the end of the cross T being fitted to enter the slots **83** of the pair of offsets **80** in the perimeter molding and their curved edges **79** to travel along the insides of the curved walls **81** until the leading edges **78** of the pair of wings engage and seat against the seats **86** of the walls **85** of the pair of offsets.

The clockwise movement of the supported cross T **24** in a clockwise direction about its major or longitudinal axis as viewed in FIG. 4 is then continued through manual pressure applied from the opposite or now free end of the cross T. This results in a twisting of the cross T **24** about its major or longitudinal central axis in a direction opposite to the lead of the initially helical outboard edges of its web **60** and flanges **65** and **70**. Such torsional movement is permitted by the ends of these flanges **65**, **70** stopping short of the flange **31** of the perimeter molding and is continued until the webs and flanges **60**, **65** and **70** are not only brought into planar form but are twisted into a helix having a reverse bend as compared with the helical lead of the longitudinal edges in the unstressed condition of the cross T **24** as illustrated in FIG. 2.

This twisting is continued until the edges **78** of the pair of wings **75** at the free end of the cross T **24** are brought to a substantially vertical position, following which these edges are brought alongside the slot **83** of the companion pair of offset portions **80** of the main T **21**. The manual pressure holding this free end of the cross T **24** is now relaxed, permitting the cross T to untwist itself about its major or longitudinal central axis, this untwisting causing the leading edges **78** of the two wings **75** at the free end of the cross T **24** to enter the slots **83** of the companion pair of offset portions **80** of the main T **21**. This untwisting continues with the curved edges **79** of these wings **75** riding along the inside faces of the walls **81** of these offset portions **80** until the leading edges **78** of these wings seat against the seats **86** of these offset portions **80** which halts the untwisting.

When this occurs the web **60** and flanges **65**, **70** of the cross T **24** are in planar form, as compared with the initial or unstressed helical form illustrated in FIG. 2, and the bottom of the flat bottom plate **69** of the cross T **24** forms a coplanar continuation of the bottoms of the flange **31** and bottom plate **39** of the perimeter molding **20** and main T **21** to which it is attached. It will be noted, however, that the connections between the cross T **24** and its supporting bars **20**, **21** is still under torsional stress from the cross T because it has not fully untwisted to its relaxed helical state illustrated in FIG. 2. Accordingly the entire grid is under stress so that the parts are prevented from rattling or making other noise due to either external vibrations or to thermal expansion of the parts due to temperature changes.

After the ceiling grid is completed ceiling panels **90** can be mounted on the bottom flanges of the perimeter molding, main T's and cross T's in conventional manner as illustrated in FIG. 1.

As illustrated in FIG. 1, it will be noted that the mounting for the cross T's forming the subject of the present invention permits these cross T's **24** to be mounted in end-to-end or straight line relations. Thus, as the place where a main T **21** is to have a pair of cross T's **24** projecting in opposite directions in straight line relation to each other, two pairs of segmental-shaped offset portions are provided, one pair projecting from one side of the web **35** of the main T **21** and the other pair projecting from the opposite side of the web, all of these segmental shaped offset portions being concentric with a major axis of the two cross T's **24** supported thereby.

Ceiling grid structures frequently include bridging T's which for simplicity of illustration have not been shown. These are merely supporting T's or bars between the main T's **21** or between main T's **21** and the perimeter molding **20** and to which corresponding ends of the cross T's are secured as above described. The term "supporting bars" as used in the accompanying claims is meant to include such bridging T's as well as the main T's **21** and the perimeter molding **20**.

It will be seen that so far as the mounting of the cross T's **24** is concerned, they extend transversely of and bridge the space between the vertical webs **30**, **35** of the supporting bars **20**, **21** which supporting bars each has at least one supporting shoulder **86** offset toward the other supporting bar and arranged at the corresponding end of the cross T but offset from the major axis of the latter. It will further be seen that there are the projections **75** on the opposite ends of the supported T **24** which in the normal unstressed condition of the supported T are out of engagement with the supporting shoulder **86** and are positioned to be engageable with these supporting shoulders **86** to support the supported T **24** on the supporting bars **20**, **21** upon manually twisting the supported T **24** about its major axis and thereafter releasing said supporting T to effect engagement between said projections **75** and supporting shoulder **86**.

From the foregoing it will be seen that the present invention accomplishes the objects and has the advantages initially set forth.

What is claimed is:

1. A grid for a ceiling, comprising a pair of generally horizontal and parallel spaced supporting bars each having a vertical web and at least one horizontal side flange extending longitudinally thereof, a generally horizontal supported T extending transversely of and bridging the space between said vertical webs and having a vertical web and a side flange extending longituidnally thereof, said web of each supporting bar having at least one supporting shoulder offset toward the other supporting bar and arranged at the corresponding end of said cross T but offset from the major axis of said supported T, and projections on the opposite ends of said supported T offset from said major axis thereof and in the normal unstressed condition of said supported T being out of engagement with said supporting shoulders, said projections engaged with said supporting shoulders thereby causing the grid to be under stress; the supported T being assembled by manually twisting said supported T about said major axis and thereafter releasing said supported T in position to effect engagement between said projections and supporting shoulders.

2. A grid for a ceiling as set forth in claim **1** wherein there are a pair of said shoulders on the web of each supporting bar with the shoulders of each pair being on opposite sides of said major axis of said supported T, and wherein there are a pair of said projections at each end of said supported T with the pair of said projections at one end of said supported T exerting pressure against the mating pair of shoulders in the opposite rotative direction of the supported T about its axis from the pressure exerted by the pair of projections at the opposite end of the supported T against the pair of shoulders mating therewith.

3. A grid for a ceiling, comprising a pair of generally horizontal and parallel spaced supporting bars each having a vertical web and at least one horizontal side flange extending longitudinally thereof, the webs of said pair of supporting bars having supporting shoulders arranged generally in transversely alined relation to each other, a generally horizontal supported T having a maximum length substantially equal to the distance between said

webs and having a vertical web and a side flange extending longitudinally thereof, said web and flange of said supported T, in the normal unstressed condition thereof, being of helical form generally concentric with a major axis of said supported T, and projections on the opposite ends of said supported T offset from the major axis thereof and engaged with said supporting shoulders thereby causing the grid to be under stress, and in the normal unstressed condition of said supported T being out of engagement with said supporting shoulders, the supported T being assembled by manually twisting said supported T about said major axis and thereafter releasing said supported T in position to effect engagement between said projections and supporting shoulders.

4. A grid for a ceiling having a pair of generally horizontal and parallel spaced supporting bars having vertical webs and side flanges extending longitudinally thereof, a horizontally and laterally offset portion in the web of one of said supporting bars projecting toward the other supporting bar and forming an upwardly facing shoulder, a portion in the web of the other of said supporting bars being horizontally offset toward the first mentioned offset portion and forming a second upwardly facing shoulder, a generally horizontal supported T substantially equal in length to the distance between said webs and having a vertical web and a side flange extending longitudinal thereof, said web and flange of said supported T, in the normal unstressed condition thereof, being of helical form generally concentric with a major axis of said supported T, and projections on the opposite ends of said supported T offset from the major axis thereof and engaged with said supporting shoulder thereby causing the grid to be under stress, and in the normal unstressed condition of said supported T being out of engagement with said supporting shoulders, the supported T being assembled by manually twisting said supported T about said major axis and thereafter releasing said supported T in position to effect engagement between said projections and supporting shoulders.

5. A grid for a ceiling, comprising a pair of generally horizontal and parallel spaced supporting bars each having vertical webs and side flanges extending longitudinally thereof, a generally horizontal supported T substantially equal in length to and arranged across the space between said webs and having a vertical web and a side flange extending longitudinally thereof, said web and flange of said supported T, in the normal unstressed condition thereof, being of helical form generally concentric with a major axis of said supported T, a horizontally

and laterally offset portion in the web of one of said supporting bars projecting toward the other of said supporting bars and having a marginal portion substantially coincident with said axis, a partion in the web of the other of said supporting bars being horizontally and laterally offset toward the first mentioned laterally offset portion and also having a marginal portion substantially coincident with said axis, a transversely extending wing at each end of said supported T, each of said laterally offset portions having a marginal slot adapted to receive the corresponding wing when said supported T is manually twisted into a helical form reverse to its said helical form in its said unstressed condition, said wings engaged with said offset portions thereby causing the grid to be under stress; the supported T being assembled by manually twisting said supported T about said major axis and thereafter releasing said supported T in position to effect engagement between said wings and offset portions.

6. A grid for a ceiling as set forth in claim 5 wherein each of said supporting bars and said supported T is made of sheet metal bent to form its web and flange.

7. A grid for a ceiling as set forth in claim 5 wherein each of said laterally offset portions is in the form of a segment of a circle generally coincident with said axis with said slot being provided in one radial wall thereof and with the other radial wall forming said seat.

8. A grid for a ceiling as set forth in claim 7 wherein said slot is upright and said seats face upwardly.

References Cited by the Examiner

UNITED STATES PATENTS

1,803,995	5/1931	Chilton	287—53
2,433,902	1/1948	Henrichsen	105—182
2,689,630	9/1954	Drury	52—475
2,990,921	7/1961	Wilde	52—475 X
3,119,475	1/1964	Adams	52—475 X
3,138,227	6/1964	Gordon.	

FOREIGN PATENTS

1,010,046	3/1962	France.
564,707	11/1932	Germany.

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