

[54] **GRID SUPPORT STRUCTURE AND CLIP MEANS THEREFOR**

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[58] Field of Search 52/484, 488, 633, 665, 52/664, 669, 715, 710; 287/189.36 A, 189.35

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[57] **ABSTRACT**

Grid structure adapted to support light diffuser elements below a ceiling structure, comprising longitudinal members and cross members extending between the longitudinal members and defining openings therewith for light diffuser elements, the cross members being connected to the longitudinal members by means of a novel twist-cam clip which is designed to slide along a track mounted on the longitudinal members to a predetermined position, or to be inserted into a track at any point, and the clip then twisted to cam the clip in the track, and by crimping the track adjacent the clip, securing the clip in position for attachment thereto of a cross member.

9 Claims, 12 Drawing Figures

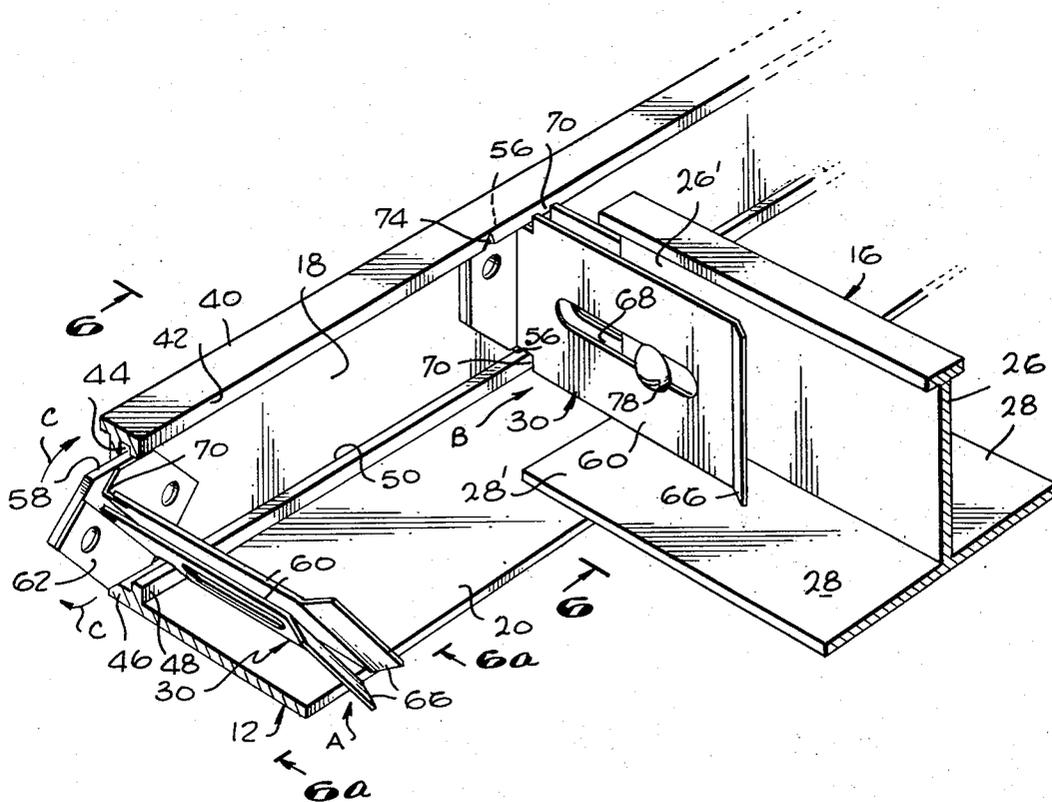


Fig. 1

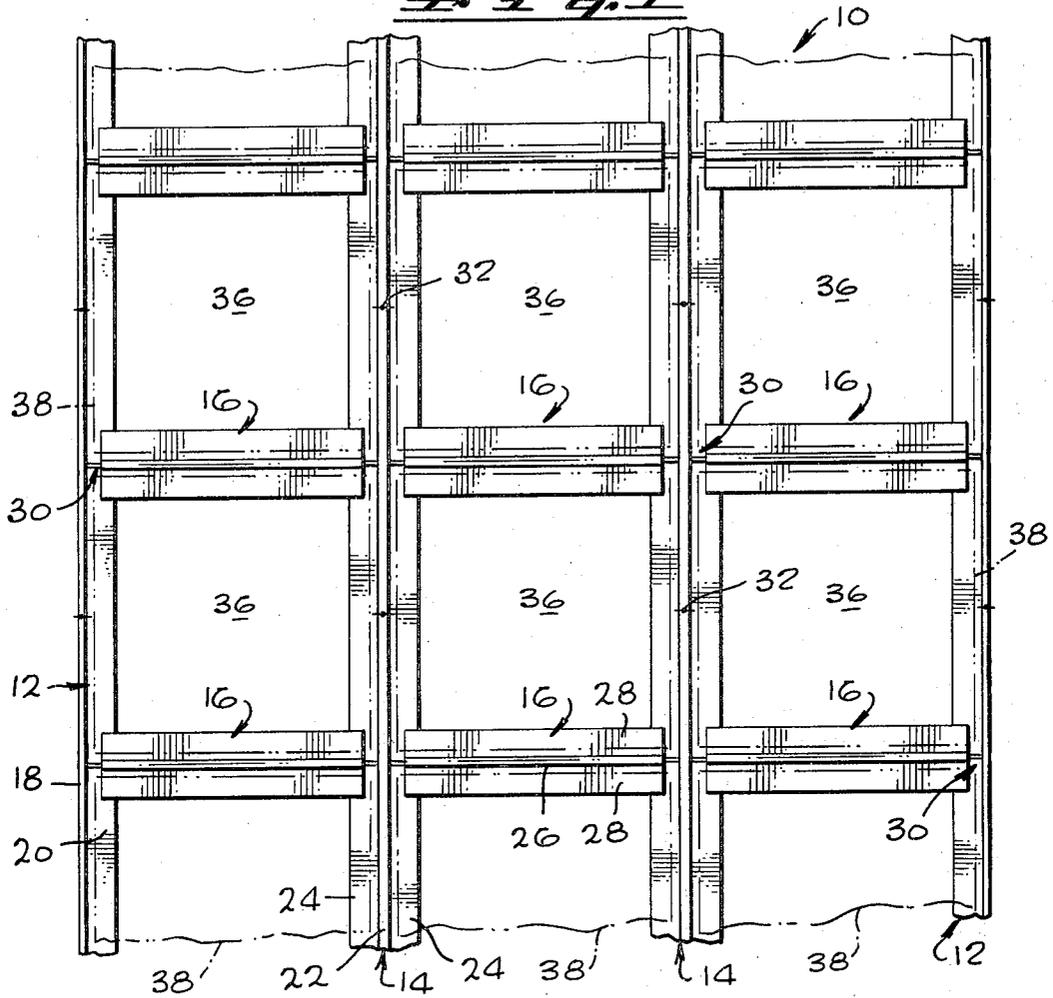


Fig. 2

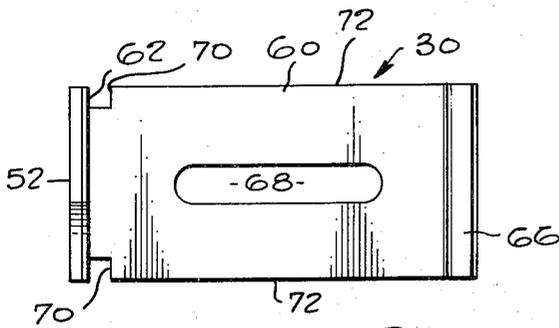


Fig. 3

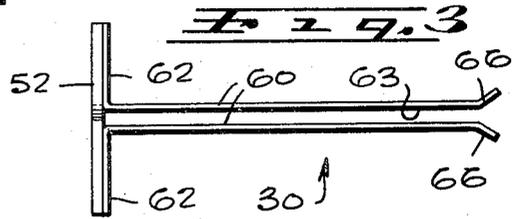
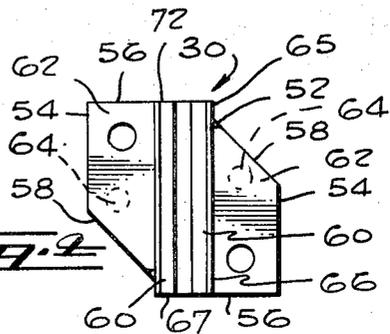
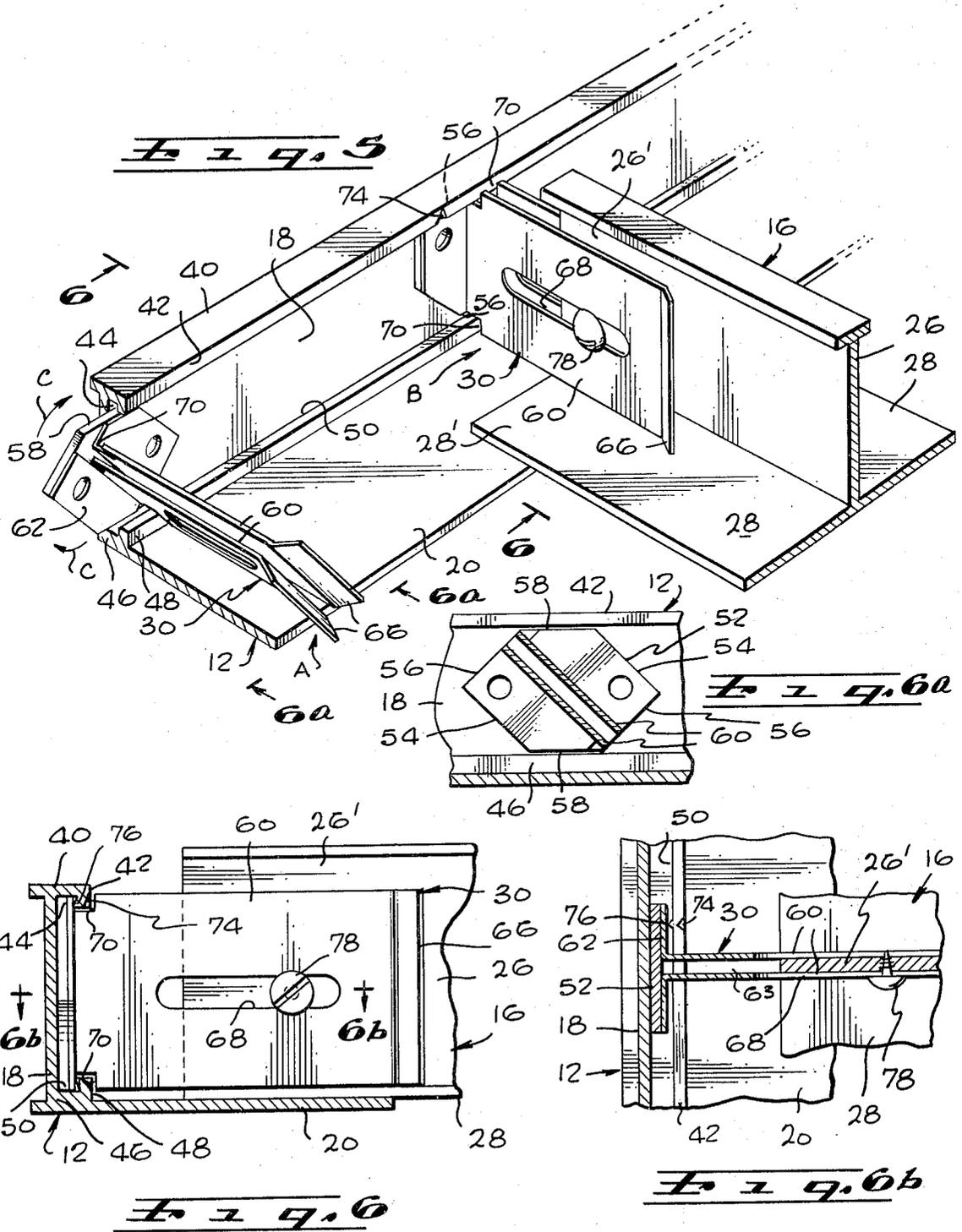


Fig. 4





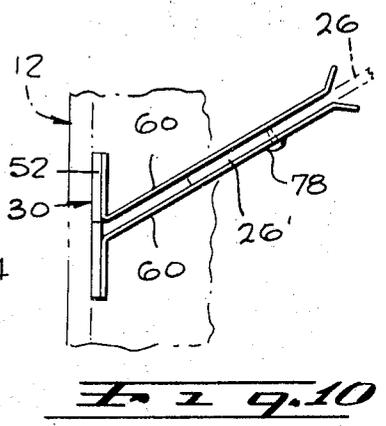
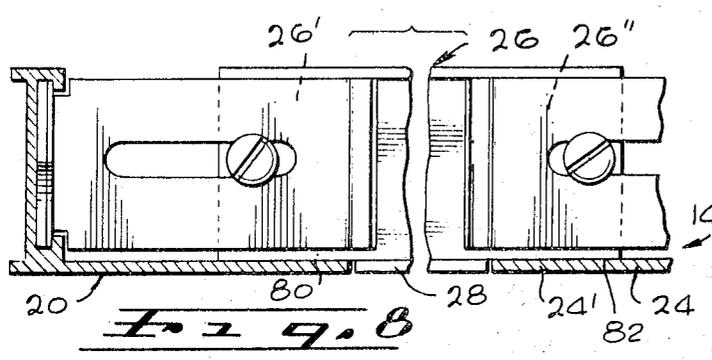
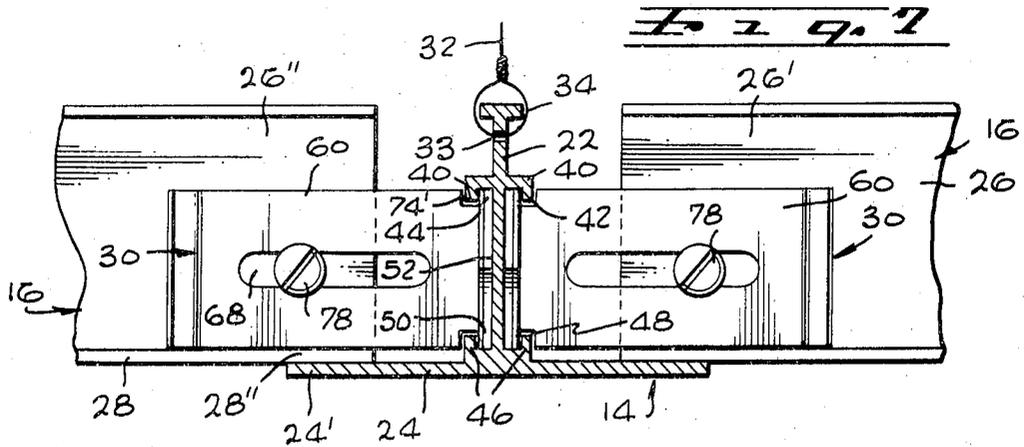
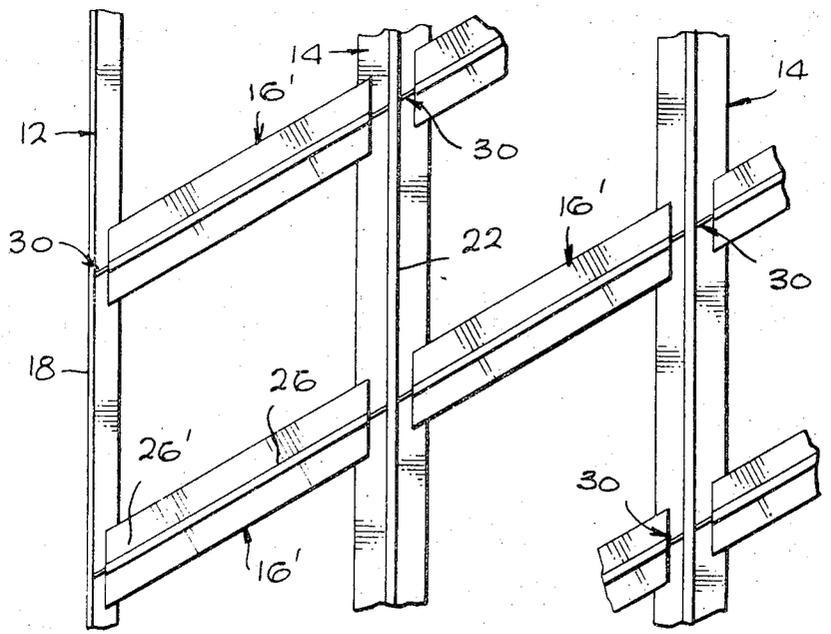


Fig. 9



GRID SUPPORT STRUCTURE AND CLIP MEANS THEREFOR

This invention relates to a grid structure or framework adapted to support light diffuser elements below a ceiling structure, and is particularly concerned with a structure of the above type embodying novel clip means for attaching the cross members of such structure to the longitudinal members thereof.

Illumination derived from fluorescent lighting fixtures, lamps or the like, mounted on a ceiling have been distributed through the use of diffusers carried by a supporting structure suspended from the ceiling below the lighting fixtures. Such structures generally are in the form of a framework or grid structure, generally comprising a series of longitudinal members and cross members, e.g., in the form of inverted T-bar members, with the spaces formed by such members being covered by light diffusers. An illustrative structure of this type is shown and described, for example, in U.S. Pat. No. 3,336,471.

Various means have been employed in the prior art to secure the cross members on opposite sides of a longitudinal member in providing the above-noted framework or grid structure. An illustrative example of such means is the connector clip described and shown in U.S. Pat. No. 3,185,833. Although this type of securing or clip means, which requires pre-punching or formation of slots in the grid members to receive separate clips, is satisfactory to produce a gridwork on a predetermined module, that is, a framework having predetermined and regular locations for cross members with respect to the longitudinal members, such securing or clip means is relatively inefficient where the gridwork modules are irregular, that is, where for example distances between adjacent cross members are unequal, or where the intersections between the cross members and longitudinal members are at angles other than a right angle.

The chief object of the present invention is accordingly the provision of unique clip means for securing cross members to the longitudinal members of a grid structure of the above type, permitting such clip means to be readily mounted and secured at any predetermined position along a longitudinal member, and permitting attachment thereto of a cross member at either a right angle to the longitudinal member, or at an angle other than 90° thereto, such clip means and its associated structure on a longitudinal member, being relatively simple and inexpensive.

The above object is achieved according to the invention by the provision of a novel securing or clip means which is particularly designed in conjunction with the longitudinal members of the above-noted gridwork, such clip means comprising a clip having a base member which functions as a cam, e.g., a polygonal base member, and having attached thereto and extending outwardly therefrom, means, e.g., in the form of tongues, for attachment thereto of a cross member. The longitudinal members of the above gridwork are provided with upper and lower track members or tracks adjacent one or both sides thereof, and the base of the clip is designed to slide back and forth in such tracks to, or to attach to such tracks at, the precise position where an intersecting cross member is to join the longitudinal member. The clip is then twisted to rotate the base thereof and to cam it in fixed position in such

tracks. By crimping the tracks against the clip at such position, the clip is fixedly secured in this position. One end portion of a cross member is then connected to the tongue means extending outwardly from the base of the clip. The opposite end portion of such cross member is connected to another such clip positioned on and secured to an adjacent longitudinal member in the same manner as described above.

The securing means of the present invention thus eliminates the requirement for pre-punching or forming slots in the webs or flanges of the gridwork, to receive conventional pins. Of particular significance, the clip or securing means of the invention can readily be positioned at any precise location along a longitudinal member, and in addition by the provision of a flexible tongue means in association with the base of the clip, permits attachment of a cross member to a longitudinal member where such members are disposed at an angle other than 90°. In addition, the invention device permits joining a pair of cross members on opposite sides of an interior longitudinal grid member having an inverted flange extending on opposite sides of the longitudinal member, or it can be employed to join a cross member to a longitudinal member which is in the form of a wall angle or L-shaped member.

The invention will be more readily understood from the description below of certain illustrated and preferred embodiments, taken in connection with the accompanying drawing wherein:

FIG. 1 is a plan view of an illustrative form of grid structure, embodying the novel clip means of the invention;

FIG. 2 is a side elevation of a clip employed in securing the cross members to the longitudinal members in the gridwork illustrated in FIG. 1;

FIG. 3 is a plan view of the clip of FIG. 2;

FIG. 4 is an end view of the clip of FIGS. 2 and 3, viewing FIG. 2 from the right;

FIG. 5 is a perspective view of a longitudinal member along one side of the gridwork of FIG. 1, or adjacent a wall, showing a track and a clip as illustrated in FIGS. 2-4, slidably mounted in such track, and also showing the clip in its twisted or cammed position in such track and connection of a cross member to the clip in such cammed position;

FIG. 6 is an elevational view of the assembled position of the longitudinal member and cross member by the clip, as viewed on line 6-6 of FIG. 5, and showing the crimping of the track against the base of the clip to secure same in its cammed position;

FIG. 6a is an end view of the clip taken on line 6a-6a of FIG. 5;

FIG. 6b is a horizontal sectional detail taken on line 6b-6b of FIG. 6;

FIG. 7 is an end elevation and section taken on line 7-7 of FIG. 1, and showing attachment of the end portions of a pair of cross members disposed on the opposite sides of an interior longitudinal member carrying opposed lower flanges, by means of the clip means of the invention;

FIG. 8 illustrates a modification of the cross members employed in conjunction with the invention structure;

FIG. 9 is a plan view illustrating a grid structure wherein the cross members are disposed at an angle other than 90° with the longitudinal members, employing the clip means of the invention; and

FIG. 10 is a plan view of a detail of FIG. 9, showing the clip employed in securing the cross members to the longitudinal members in FIG. 9, wherein the tongues of the clip are bent at an angle other than 90°.

Referring to FIG. 1 of the drawing, numeral 10 designates a grid structure or framework, such structure including longitudinally arranged horizontal end or wall members 12 and intermediate or interior longitudinal members 14, and cross members 16 interconnecting adjacent parallel longitudinal members, such longitudinal and cross members generally being formed of a suitable metal such as steel. The outer longitudinal members or wall angles 12 have a vertical flange or web 18 and a horizontal flange 20 integral with the lower end of vertical flange 18, and extending to one side thereof. The interior or intermediate longitudinal members 14 have a vertical flange 22 and opposed lower horizontal flange 24 integral with the lower end of flange 22, and being in the form of inverted T-bars. The interconnecting cross members or spreaders 16 are also in the form of inverted T-bars, such members being of a proper length to separate the longitudinal members 12 and 14 and maintain them in parallel spaced relation to one another. The cross members 16 are of the same cross sectional configuration as the longitudinal members 14 and include a vertical flange or web 26 and lower opposed horizontal flanges 28 integral with the lower end of flange 26.

The longitudinal members 12 and 14 and the cross members 16 are suitably secured together by the novel clips 30 described in detail below, and the resulting grid structure or framework is suspended from the ceiling (not shown) of a building or other like structure, the appropriate distance therebelow in parallel relation to the ceiling by hanging wires 32 (see FIG. 7), the upper ends of which are connected in suitable manner to the ceiling, and the lower ends of which are suitably attached to the upper ends of the vertical flange, e.g., 22, of the longitudinal members 12 and 14, as by passing the wire through a hole 33 in such flange end tying the wire in the form of a loop 34. The cross members or spreaders 16 are secured to the longitudinal members 12 and 14 in appropriate spaced relation to form rectangular or square openings 36 therewith which are adapted to be covered by light diffuser elements, e.g., as indicated in dotted lines at 38.

Referring now to FIGS. 2-6 of the drawing, it will be noted that the outer longitudinal members or wall angles 12, the left hand member 12 of FIG. 1 being illustrated in FIG. 6, are provided with an L-shaped upper member 40 formed integral with the upper edge of the vertical flange 18 of such member 12, and providing a depending land 42 extending longitudinally parallel and spaced from the upper portion of vertical flange 18 adjacent one side thereof, and thus providing an upper groove 44 at the upper end of flange 18 and extending longitudinally thereof. There is also provided and formed integral therewith an L-shaped lower member 46 along the lower longitudinal edge of flange 18, and providing an upwardly projecting land 48 extending longitudinally parallel to and spaced from the lower portion of the vertical flange 18, on the same side thereof as land 42, and forming a lower groove 50 extending longitudinally along the lower end of flange 18. Lands or tracks 42 and 48 are in vertical spaced relation and parallel to each other, and similarly, the upper and lower grooves 44 and 50, respectively, are in verti-

cal spaced relation and extend parallel to each other. It will be noted that the lower L-shaped member 46 is disposed adjacent to and integral with the lower horizontal flange 20 of the longitudinal members 12.

The novel twist-cam clip 30 of the invention, for securing the cross members 16 to the longitudinal members such as 12, is designed for cooperation with the grooves 44 and 50, and with the associated lands 42 and 48 of member 12, for proper positioning and securing of the clips 30 along the longitudinal members 12, as well as 14, for connecting the respective ends of cross members 16 to the adjacent longitudinal members.

The clip 30 can be formed of a metal such as steel, and has a polygonal flat base 52, preferably in the form of a hexagon as shown, having three pairs of respectively parallel sides 54, 54, 56, 56, and 58, 58, the sides being of substantially equal length. However, it will be noted that the distance across opposite parallel sides 54, 54 and across sides 56, 56 is approximately equal, and that such distance is greater than the distance between opposite parallel sides 58.

A pair of tongues 60 are connected to the base 52 of the clip and extend outwardly from one side thereof approximately normal to base 52, the tongues each having at the inner end thereof a flat base portion 62 bent at an angle of 90° to the tongue 60, the base portion 62 of each of the tongues being connected to the same side of the base 52 of the clip, by suitable means, as by spot welding at 64. The tongues are referably flexible to permit them to be bent at an angle other than at 90° to the base 52. It will be noted that the base portion 62 of each of the tongues 60 has three polygonal sides of the same length and angle as the sides 54, 56 and 58 of the base 52, so that the side edges of the base portions 62 connected to both of the tongues 60, coincide and are contiguous with the three pairs of respective parallel sides, 54, 54 and 56, 56 and 58, 58 of the clip base 52.

It is also noted that the two tongues 60 are disposed and extend parallel to each other, and are spaced from each other a distance approximately equal to the width of the vertical flanges 26 of the cross members 16, such space 63 between tongues 60 being adapted to receive an end portion by one of such vertical flanges 26, as described more fully below. As seen in FIG. 4, the tongues 60 are disposed at an angle of about 45° to sides 58 of base member 52, and are positioned diagonally across the base 52 of the clip from adjacent one corner 65 of one side 58 to the diagonally opposite corner 67 of the opposite parallel side 58 of base 52. The outer ends of the respective parallel tongues 60 are flared outwardly, as indicated at 66, to facilitate insertion of an end portion of a vertical flange 26, and each of the tongues 60 are also provided with a centrally located horizontal slot 68, the respective slots 68 of the adjacent tongues 60, being in alignment for receipt of a suitable fastener, as described more fully below. The tongues 60 are also each provided with a pair of notches 70 adjacent the opposite parallel edges 72 thereof, such notches being disposed at the inner ends of such tongues adjacent the base portions 62 thereof.

For securing the cross members 16 to the longitudinal members, e.g., a longitudinal member 12 of the grid structure, as seen in FIG. 5, the narrowest part of the base 52 of the clip 30, corresponding to the distance

across the parallel sides 58 of the polygonal base, is inserted vertically in the parallel upper and lower grooves 44 and 50, between lands 42 and 46, of the vertical flange 18, sides 58 being disposed parallel to such grooves. The distance between sides 58 of the clip 30 is less than the distance between the opposed upper and lower surfaces of the upper and lower grooves 44 and 50 formed by the lands 42 and 46, and the distance between the opposite parallel sides 54, 54 and the distance between the opposite parallel sides 56, 56 of the base of the clip, are each approximately equal or only slightly less than the distance between the upper and lower surfaces of the respective upper and lower grooves 44 and 50.

Further, the combined thickness of the base 52 and the base portions 62 of the tongues connected thereto, is less than the width of the grooves 44 and 50. Thus, it will be seen that base 52 of the clip 30 can be engaged in the grooves 44 and 50, and can be readily slidably moved back and forth along the vertical web 18, by positioning base 52 parallel to vertical flange 18 and inserting the base with the opposite parallel sides 58 in one or both of the grooves 44 and 50, as seen in FIG. 5, there being ample clearance between such sides 58 and the respective surfaces of grooves 44 and 50 for easy and rapid sliding of the clip to any desired longitudinal position along the flange 18. Preferably, as seen in FIG. 6a, the distance between sides 58 of the base 52 is slightly less than the distance between lands 42 and 46 so that base 52 can be inserted vertically between such lands at any desired position along the vertical flange 18 of member 12, and if necessary to further adjust the location of the clip along such flange, one can slide the clip back and forth along flange 18 and grooves 44 and 50, until the clip is located at the precise location where a cross member 16 is to join longitudinal member 12. It will be noted that in the slidably position of the clip, as indicated at A in FIG. 5, and in FIG. 6a, with the sides 58 of the base parallel to the grooves 44 and 50, the tongues 60 are each disposed at an angle to the vertical, e.g., at a 45° angle. Insertion of the base 52 of the clip between lands 42 and 46 and into grooves 44 and 50, and sliding of the clip longitudinally of the vertical flange 18 are accomplished by grasping the tongues 60 with one hand.

When the clip is at the predetermined position along vertical flange 18, e.g., as indicated at B in FIG. 5, clip 30 is then manually twisted clockwise, as indicated by the arrows C, so that one of the other pairs of opposite parallel sides 56 of the clip is now disposed in the opposite grooves 44 and 50 of the track, as seen in FIGS. 5 and 6, and since the distance between such parallel sides 56, as noted above, is approximately equal to the distance between the upper and lower surfaces of the grooves 44 and 50, the clip in the rotated position as indicated at B in FIG. 5, is now cammed in the grooves 44 and 50 formed by lands 42 and 48, and cannot be further rotated in a clockwise direction. It will be noted that the opposite notches 70 formed at the inner ends of each of the tongues 60 of the clip have width and length dimensions and are located such that when the clip is rotated from the position as indicated at A to the position indicated at B, the notches 70 of the tongues 60 receive the upper and lower lands 42 and 48 without any binding. In the rotated position indicated at B, the tongues 60 of the clip 30 are now in a vertical position. To secure the clip in the position indi-

cated at B, the upper and lower lands 42 and 48 adjacent the base 52 of the clip are crimped inwardly, as indicated at 74 in FIG. 6, to frictionally bind the adjacent surfaces to base portions 62 of base 52 opposite the crimped areas 74, against the inner surfaces of the lands 42 and 48, as indicated at 76, to prevent any further rotation of the base 52 in the grooves 44 and 50 and to secure the clip in the position indicated at B.

In the secured position of the clip 30, as indicated at B in FIG. 5 and also in FIG. 6, one end portion 26' of vertical flange 26 of a cross member 16 is passed through the flared ends 66 of the tongues 60, and received in the space 63 between the parallel tongues, with the opposed lower horizontal flanges 28 of cross member 16 resting on the horizontal flange 20 of the longitudinal member 12. When such end portion 26' is properly positioned between the tongues 60, as illustrated in FIGS. 5 and 6, the stem of a suitable fastener, here illustrated as a screw 78, is inserted through the aligned slots 68 of the tongues 60 and threadably connected to the end portion 26' of the vertical flange 26, for securing the cross member 16 in position with respect to the longitudinal flange 12.

The opposite end portion 26'' of the vertical flange or web 26 of cross member 16 is similarly secured by means of clip 30 of the invention to an intermediate or interior adjacent longitudinal member 14, as viewed in FIG. 7. It will be noted that the inner or intermediate longitudinal members 14 are each provided on opposite sides of the vertical flange 22 with a pair of upper and lower L-shaped members 40 and 46, forming upper and lower vertically disposed lands 42 and 48 extending parallel to each other longitudinally along and on opposite sides of vertical flange 22, and forming upper and lower vertically disposed grooves 44 and 50, on each side of vertical flange 22. The base 52 of another clip 30 is positioned in the upper and lower grooves 44 and 50 to the left of vertical flange 22, as seen in FIG. 7, and the clip is slidably manipulated in such grooves to or inserted in such grooves at a predetermined position directly opposite that of clip 30 in the position B as indicated in FIG. 5, and such second clip is then rotated in the manner previously described, to cam the base thereof in grooves 44 and 50, so as to position the tongues 60 of such clip in a vertical position, as shown in FIG. 7, and the upper and lower lands 42 and 48 to the left of vertical flange 22, are then crimped at 74', as previously described, to secure the second pin in such position on flange 22. The end portion 26'' of the cross member 26 is then received in the space between the tongues 60 of the clip 30 shown to the left of flange 22 in FIG. 7, and secured to such clip by means of the fastener 78 received in the slots 68 and connected to end portion 26''. It is noted, as seen in FIGS. 5 and 7, that the opposite end portions 28' and 28'' of the opposed lower horizontal flanges 28 of cross member 16, respectively rest on horizontal flange 20 of longitudinal member 12 and on the left hand flange portion 24' of the opposed lower horizontal flanges 24 of the adjacent intermediate longitudinal member 14.

It will be seen, again viewing FIG. 7, that the end portion 26' of another oppositely disposed cross member 16 can be connected or secured to the right side of intermediate longitudinal member 14, by a clip 30 in a manner similar to that described above, by properly locating and camming the base of another clip 30 in the grooves 44 and 50 formed by lands 42 and 48, on the

right hand side of vertical flange 22 of longitudinal member 14, and fastening the end portion 26' of the vertical flange 26 of an oppositely disposed cross member 16, between the tongues 60 of the clip 30 positioned to the right of vertical flange 22. The opposite end portion 26'' of the last mentioned vertical flange 26 of the oppositely disposed cross member 16 can then similarly be secured by means of a pin 30 to a second intermediate or inner longitudinal flange 14, e.g., the second longitudinal member 14 to the right, as viewed in FIG. 1.

In the manner described in detail above, it is thus seen that the opposite ends of all of the various cross members 16, viewing FIG. 1, can be similarly secured by the clip means of the invention, between adjacent longitudinal members, to provide the framework or grid structure illustrated in FIG. 1.

There is illustrated in FIG. 8 a modification of the structure shown in FIGS. 5 and 7, and wherein the end portions 28' and 28'' of the opposed lower horizontal flanges 28 of the cross member 16 illustrated in FIGS. 5 and 7, are removed, so that as seen in FIG. 8, the lower edge 80 of the end portion 26' of vertical flange 26, rests directly on horizontal flange 20 of the associated longitudinal member and lower edge 82 of the opposite end portion 26'' of vertical flange 26 rests on one of the opposed horizontal flanges 24' of adjacent longitudinal member 14. Thus, in this modification, the ends of the opposed lower horizontal flanges 28 of cross member 16 abut and are in alignment with the lower horizontal flange 20 of the longitudinal member 12, and the opposed lower horizontal flanges 24 of longitudinal member 14.

Now referring to FIGS. 9 and 10, in this modification, it is desired to position the cross members 16 parallel to each other, but at an angle other than 90° to the longitudinal members 12 and 14. This can be accomplished readily by bending the spaced parallel tongues 60 of the clip 30 to the desired angle other than 90°, to the base 52 of the clip, so that the end portions, e.g., the end portion 26', of the vertical flange 26 of the respective cross members 16', when received and secured by the fastener, between the bent tongues 60, as viewed in FIG. 10, are disposed at the desired angle other than 90° to the longitudinal members 12 and 14. It will be obvious that the tongues 60 of the other clips 30 so employed for constructing the grid structure of FIG. 9, with the angularly disposed cross members 16', will be bent at a similar angle to that shown for the tongues 60 of the clip of FIG. 10.

From the foregoing, it is seen that the invention provides a simple, relatively inexpensive means employing a novel clip which can be readily positioned at any desired location along the longitudinal members of a grid structure, particularly adapted for supporting light diffusers or other lightweight panels, and secured in such position for facile attachment thereto of the cross members disposed between such longitudinal members of the gridwork.

I claim:

1. A grid structure adapted to support light diffuser elements or other lightweight panels below a ceiling structure, comprising longitudinal members parallel to each other and cross members extending between said longitudinal members and defining openings therewith, each member including a vertical flange and a horizontal flange at the lower end of said vertical flange, and

means for connecting said cross members to said longitudinal members, said means comprising groove means connected to the upper and lower ends of the vertical flange of each of said longitudinal members, and forming a pair of vertically disposed upper and lower parallel grooves extending longitudinally along and adjacent to at least one side of the vertical flange of each said longitudinal member, clip means secured by said groove means and connected to the opposite ends of said cross members, said clip means each including a base member in the form of a polygon having a plurality of pairs of opposite parallel sides, one pair of opposite parallel sides spaced apart a distance such as to permit slidable movement of said base member in said grooves, to said predetermined position along said longitudinal member, said polygon having a second pair of opposite parallel sides spaced apart a distance greater than said first mentioned distance and sufficient to cam said base member in said grooves when said base member is rotated to a position so as to place said last mentioned parallel sides of said polygon in said grooves, and parallel thereto, said means connected to said base member of said clip means comprising a pair of tongues connected to said base member and extending outwardly from one side of said base member and spaced substantially parallel to each other, said tongues each extending at an angle other than 90° to said base member, said tongues being in vertical position when said base member is rotated to said last mentioned position, said tongues receiving therebetween an end portion of the vertical flange of one of said cross members, said last mentioned securing means being connected to said tongues and to said end portion of said last mentioned vertical flange for fastening said tongues to said end portion, and said cross members being parallel to each other and at an angle other than 90° to said longitudinal members.

2. A grid structure as defined in claim 1, said groove means comprising a pair of opposed lands mounted on the upper and lower ends of the vertical flange of each of said longitudinal members, and extending longitudinally in parallel spaced relation to said last mentioned vertical flange, said land mounted on the lower end of said vertical flange being disposed above the horizontal flange on said longitudinal members, and forming said pair of vertically disposed upper and lower parallel grooves between said lands and said vertical flange.

3. A grid structure as defined in claim 2, said one pair of opposite parallel sides of said polygon being spaced apart a distance less than the distance between said lands to permit insertion of said base member of said clip means between said lands, said base member being cammed in said rotated position, with said second pair of opposite parallel sides of said base member disposed in said upper and lower grooves and parallel thereto, said tongues each having a pair of notches in the base portion thereof and adjacent their opposite edges, said notches registering with said opposed lands when said base member is rotated to said cammed position.

4. A grid structure as defined in claim 2, said means for securing the base member of said clip means in said predetermined cammed position in said grooves, comprising crimped portions of said lands in frictional engagement with said base member of said clip means.

5. A grid structure as defined in claim 1, said base member of said clip means being hexagonal.

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6. A grid structure as defined in claim 1, said tongues of said clip means having aligned slots therein, said securing means for fastening said tongues to said end portion of a vertical flange of one of said cross members comprising a fastener received in said aligned slots and connected to said last mentioned end portion of the vertical flange of said cross member.

7. A grid structure as defined in claim 1, said grid structure including at least one longitudinal member having opposed horizontal flanges integral with the lower end of said vertical flange thereof, and said cross members each having opposed horizontal flanges integral with the lower end of said vertical flange thereof, said at least one longitudinal member having a pair of said groove means each disposed on opposite sides of the vertical flange thereof, said clip means being dis-

posed in said groove means on opposite sides of said last mentioned flange, said clip means mounted on each of said longitudinal members attaching and maintaining opposite end portions of said cross members in position between adjacent longitudinal members.

8. A grid structure as defined in claim 7, including a pair of outer said longitudinal members each comprising a single horizontal flange and a single groove means disposed on one side of said members, said single horizontal flange and single groove means in said respective outer longitudinal members being in opposed relation to each other.

9. A grid structure as defined in claim 7, the horizontal flanges of said cross members resting on the horizontal flanges of adjacent longitudinal members.

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