

Dec. 7, 1965

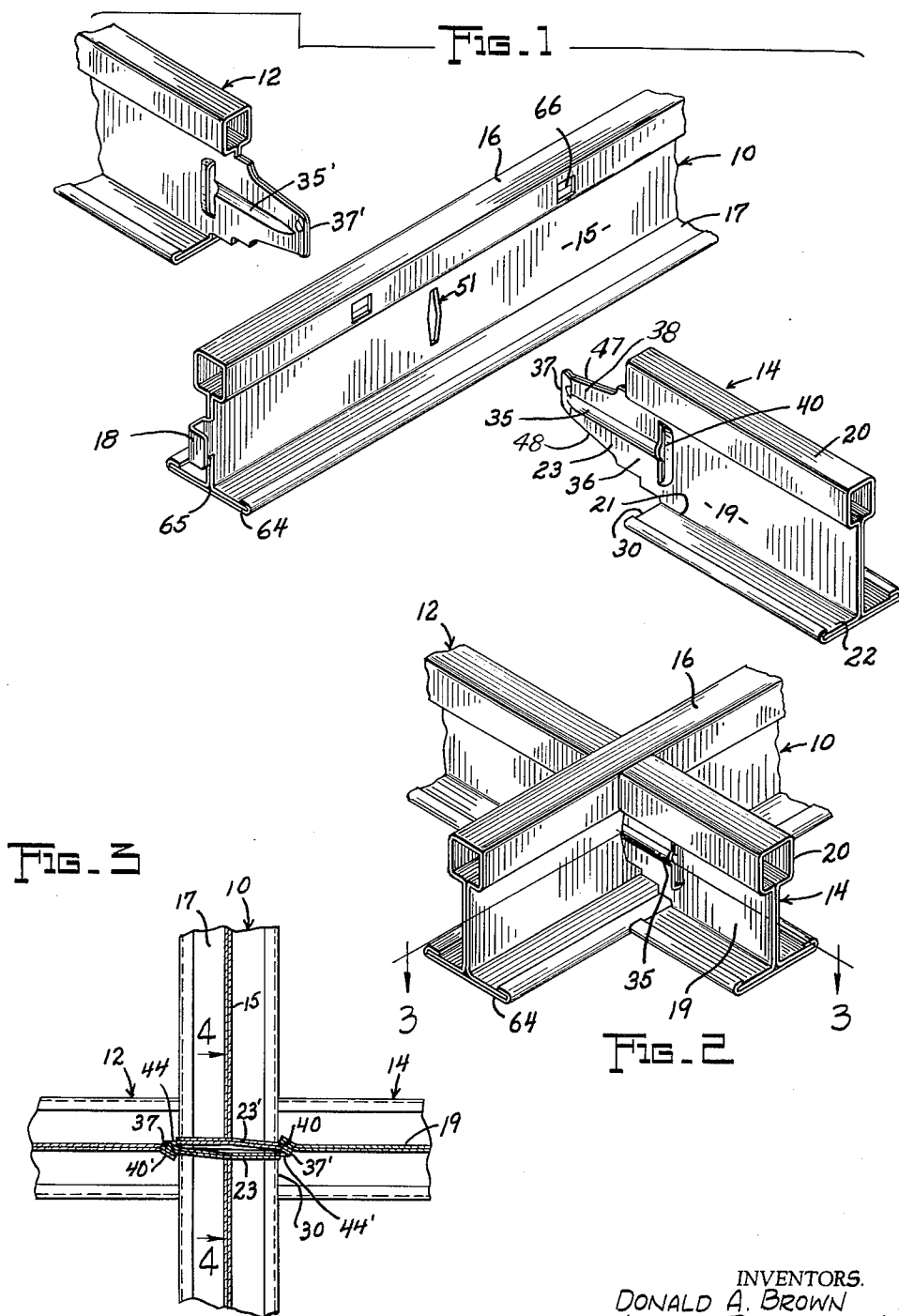
D. A. BROWN ETAL

3,221,846

CROSSING BEAM

Filed Sept. 7, 1962

2 Sheets-Sheet 1



INVENTORS.
DONALD A. BROWN
BY LUCIEN R. DOWNING JR.
Schramm, Kramer & Sturges
ATTORNEYS.

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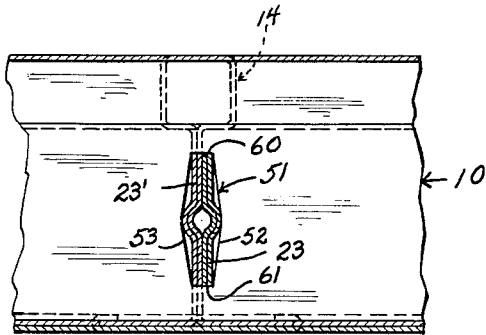


FIG. 4

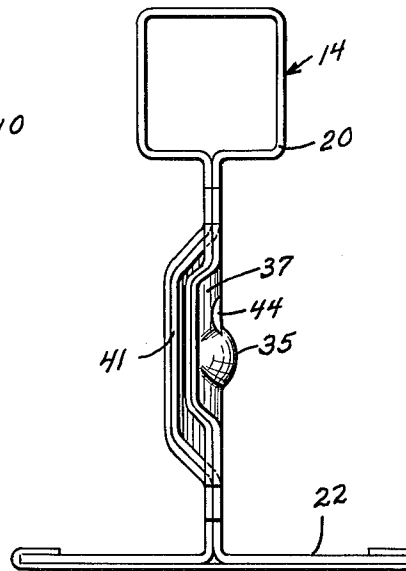


FIG. 5

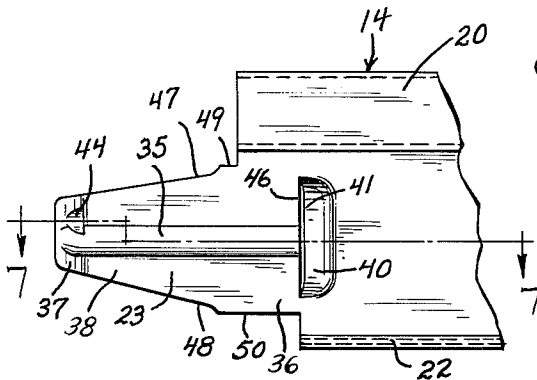


FIG. 6

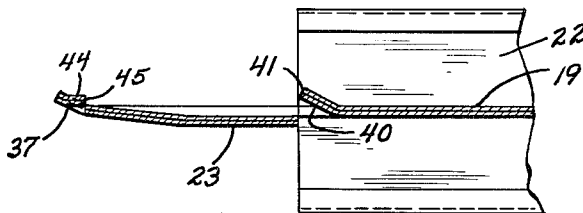


FIG. 7

INVENTORS.
DONALD A. BROWN
BY LUCIEN R. DOWNING JR.

Schramm, Kramer & Sturges
ATTORNEYS.

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3,221,846 CROSSING BEAM

Donald A. Brown, Westlake, and Lucien R. Downing, Jr.,
Avon Lake, Ohio, assignors to Donn Products Incorporated,
Westlake, Ohio, a corporation of Ohio
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6 Claims. (Cl. 189—36)

This invention relates, as indicated, to an improved beam structure and more particularly to the structure of an intersection of a main beam and a cross beam. This invention also relates to a system including such structural members for supporting a wall, floor or ceiling.

Recent years have seen changes in the manner of internal room decoration and furnishing in which emphasis has been laid upon suspended ceilings or ceiling sections. Most usually, such structures are composed of a metallic grid of beam members and panel members supported thereby, such as acoustic tile members, and with or without flush lighting fixtures. The improvements of the present invention have particular utility in connection with suspended ceiling grid structures, and therefore will be discussed with particular reference thereto.

In Patent No. 2,903,104 there has been shown a form of intersecting structure characterized by a hook and notch configuration for the "connector portion" of the cross beam. The present invention is an improvement on such prior structure in respect of an improved tongue or connector portion for the cross beam and its mode of coaction with the main beam and the tongue of a second cross beam. The cross beams of this invention are characterized in that they insure proper assembly with the main beam and with each other by reason of their improved tongue structure and coacting main beam slot structure. A principal advantage of the devices of this invention is that a pair of cross beams may be brought into intersecting interlocking transverse relationship with a main beam in a predetermined geometric configuration by motion along a line normal to the web of the main beam. No angular displacement of the beam out of the plane of the predetermined configuration is necessary as with prior art devices such as mentioned above. Thus, where an auxiliary or suspended ceiling is being constructed, the main beams may be disposed with their upper flanges or beads in contact with the surface being covered without impairing the ease with which the cross beams may be assembled into the geometric pattern selected, e.g. a rectangular grid.

The invention will be better understood by having reference to the annexed drawings wherein:

FIG. 1 is a perspective view of a main beam and a pair of cross beams prior to interconnected assembly.

FIG. 2 is another perspective view showing the elements of FIG. 1 coupled together to form a rigid juncture.

FIG. 3 is a horizontal cross section view taken substantially as indicated along the line 3—3 in FIG. 2.

FIG. 4 is a vertical cross sectional view taken substantially as indicated along the line 4—4 in FIG. 3.

FIG. 5 is an enlarged end view of a cross beam showing details of the improved tongue structure.

FIG. 6 is an enlarged fragmentary side elevation of the tongue of a cross beam hereof.

FIG. 7 is an enlarged fragmentary cross sectional view of the tongue shown in FIG. 6 on the offset plane indicated by the line 7—7 of FIG. 6.

Briefly stated, the present invention is in the provision of a cross beam which is adapted to be disposed in intersecting interlocking transverse relationship with a main beam in a predetermined geometric configuration. The main beam includes a web having a slot therein having a shape adapted to receive and coact with the tongues of

each of a pair of intersecting cross beams to support the same therein and prevent vertical as well as lateral movement of the tongue portions.

The cross beam is characterized by a web having a tongue formed at an extremity thereof and a slot in the web formed as by displacing out of the plane of the web a portion of the web adjacent a vertical cut through the web and adapting it to receive the tip of the tongue of a coacting cross beam to be brought into interlocking engagement therewith. The tip of said tongue is bent slightly out of the plane of the web, of which the tongue is a continuation, for insertion into said tip receiving slot of a coacting cross beam. Said tip is provided with interlocking means adapted to coact with a proximal portion of the tongue of a second cross beam to lock the respective beams together and restrain disengagement of the beams from each other and a main beam in intersecting relationship therewith. To improve the rigidity of the tongue portion, a rib or embossment may be struck into the tongue, preferably along the longitudinal center line of the tongue portion. There may be provided one tongue portion for a terminal cross beam member, i.e. one which intersects the marginal edge of given surface. For cross beams adapted to be disposed interiorly of the marginal edges of the surface and between two main beams, two similarly configured tongues are provided.

The slots in the main beams are so configured as to coact with the upper and lower marginal edges of the tongues of intersecting cross beams at opposed marginal edges of the slot to prevent displacement of the beams normal to said slot edges. The other opposed marginal edges are adapted to coact with the surfaces of the tongues, and particularly with any rigidity improving embossments to prevent lateral displacement when a pair of cross beams are positioned therein in intersecting interlocking engagement.

It should be noted that a pair of cross beams may be interlocked together independently of the main beam, although the juncture is not necessarily rigid in a plurality of planes as is the case with the main beam present.

Referring now more particularly to FIGS. 1—3 of the drawings, there is provided a main beam, generally indicated at 10 which is adapted to co-operate with a pair of cross beam members 12 and 14 to form a rigid interlocking juncture which is a part of a predetermined geometric configuration, e.g. a rectangular configuration or grid comprising a plurality of rectangles. Each of the beams 10, 12 and 14 is conveniently a one-piece sheet metal structure particularly folded and formed to define an upstanding web portion. Thus, in main beam 10, there is provided a web 15 extending between a top bead 16 and a bottom flange 17. The flange 17 extends outwardly from the plane of the web 15 substantially at right angles thereto and to opposite sides of the web 15 so as to provide supporting surfaces upon which acoustic tile panels, or the like, may be positioned. The terminal end of main beam 10 provides coupling element 18 for co-operative attachment either to the next of a successive series of main beams or to other mounted elements for rigidly supporting the main beam in a fixed and generally horizontal alignment.

The cross beams 12 and 14 are substantially identical for opposed coaction with each other and with the main beam 10.

Referring more particularly to cross beam 14, there is provided an upstanding web portion 19 extending between a top marginal edge 20, which may conveniently be a boxed bead portion for improved rigidity, the opposed marginal edge 21 having a flange 22 formed thereat disposed substantially at right angles to the plane of the

web 19, and extending to either side thereof. Cross beam 14 terminates in a tongue portion 23.

Tongue 23 and the adjacent web portion 31 of the cross beam 14 are provided with a continuous embossment 35. As seen in FIG. 1 of the drawing, the embossment 35 extends outwardly from the plane of the drawing. Conversely, the embossment 35' of cross beam 12, being an identical member in reverse or opposed relation, extends inwardly into the plane of the drawing of FIG. 1. This embossment provides a mechanical reinforcement for insuring rigid alignment of the tongue portion 23 substantially in the plane of the web 19.

The distal portion of tongue 23 is bent out of the plane of the tongue 23 to form a tip 37, the direction of the bend being preferably to the side of the tongue 23 opposite the embossment 35 for the purpose hereinafter indicated. The proximal portion 36 of tongue 23 is conveniently provided with an opening or louver 40 formed by cutting and striking the web 19 of beam 14 so as to displace a portion of the web 19 out of the plane of the web. The leading edge 41 of slot 40 (FIGS. 5-7) is positioned and adapted to intercept tip 37' of cross beam 12, for example, and guide it into interlocking engagement with the web 19.

Means are provided for causing the confronting cross beams to be retained in interlocked relationship so that once brought into this relationship they can be longitudinally axially moved apart only with difficulty. In the preferred embodiment of this invention as best shown in FIGS. 5-7, these means are in the form of a detent or "lance" 44 struck out of the plane of tip 37 to the same side of web 19 as louver 40. Edge 45 of detent 44 is adapted to interlock by snap action behind an edge in cross beam 12 corresponding in position and shape to edge 46 of louver 40 and lying in the plane of web 19. Accordingly, the extent of displacement of detent 44 out of the plane of tip 37 is in excess of that sufficient to dispose edge 45 in the plane of the corresponding side of web 19 from its position in tip 37.

In like manner, corresponding tongue parts of an oppositely directed confronting cross beam coact with their opposite coacting members to provide a continuous beam section, the joining of which can be separated only with difficulty.

Tongue 23, as best shown in FIGS. 5 and 6 in the preferred form, is provided with a top marginal edge 47 and a lower marginal edge 48, which edges converge toward tip 37 and at their proximal limits are provided with shoulders 49 and 50, respectively, which are adapted to bear against opposed marginal edges 60 and 61 (FIG. 4) of slot 51 in main beam 10, and stabilize the cross beam against vertical displacement when in assembled form. The longitudinal depths of shoulders 49 and 50 are such that the bead 20 and the flange 22, respectively, are brought into abutting intersecting relationship with the corresponding bead and flange of main beam 10.

Main beam 10, which may be 12 feet long, may have slots 51 on 12" centers, 24" centers, or any convenient location consistent with the desired geometric configuration. As indicated above, the lateral opposed marginal edges 52 and 53 are contoured to receive the embossed tongues 23 and 23' (FIG. 3) in lapped confronting relation (FIG. 4) and to restrain the cross beams, e.g. beams 12 and 14, from lateral movement with respect to web 15 of main beam 10. Thus, while three-point contact of the beam tongues 23 and 23' with web 15 is desirably secured by proper proportioning of the slots and tongues, the interlock of the cross beams is preferably at two points and independent of the main beam thus facilitating fabrication and assembly of the parts at the job site.

As shown in the annexed drawings, the flanges of the various illustrated beams are provided with decorative covers, for example cover 64 on main beam 10. These may be of very thin metal, e.g. enameled cold rolled steel 0.010" thick or resin, and serve to cover the fold line 65.

The improved cross beams of this invention are easy to assemble with main beams, and when contoured in accordance with the preferred embodiment shown in the drawings can be assembled only in the correct manner. If it is attempted to assemble such cross beams in improper relationship to each other, the contours of the tongues in relation to each other and the slots in the main beam is such that it is impossible to insert two beams into the same slot. It is only when the cross beams are properly disposed with respect to each other that two tongues can be inserted in the same slot and brought into interlocking engagement with each other and a coacting intersecting slotted main beam. When so assembled, the webs of beams 12 and 14 are in substantially the same plane.

Most advantageously, when the cross beams of the present invention are assembled with the main beams to form a grid of predetermined geometric configuration, it is not necessary to incline the beams out of the plane of the grid since they are adapted to be brought into rigid interlocking engagement with each other and the main beams by movement in the plane of the grid. This enables the main beams to be supported very close to the surface being covered.

Thus, there has been provided an improved cross beam structure and intersection thereof with a main beam, the latter adapted to be disposed in contiguous or spaced relation to a surface, e.g. suspended from a ceiling by hooks or suspension wires in wire receiving holes 66 in bead 16. These cross beams are characterized by their ease of assembly with the main beams in slots provided therein and their interlocking relationship with each other in end-to-end or confronting relation and their coaction with the main beam to form a rigid intersection as a part of a predetermined geometric configuration adapted to support panel members, e.g. acoustic tile. Each of said beams includes a web having a tongue formed at an extremity thereof. At the proximal end of the tongue portion, i.e. the base of the tongue, the web is deformed out of the plane of the web to form a tongue tip receiving aperture or louver, and the tongue tips are oppositely deformed out of the plane of the respective webs to slidably engage the corresponding mating aperture of the confronting beam member. In such manner the respective tongues are disposed in overlapped juxtaposed relation. Means coacting between the tips and the louvers, e.g. detents, aid in securing the beams in end-to-end interlocked relation to releasably secure the beams together.

Other modes of applying the principle of this invention may be employed instead of those specifically set forth above, changes being made as regards the details herein disclosed provided the elements set forth in any of the following claims, or the equivalent of such be employed.

It is, therefore, particularly pointed out and distinctly claimed as the invention:

1. A beam member releasably disposed in end-to-end interlocked relation with a correspondingly configured confronting beam member, said beam including in combination:

- (a) a web having parallel marginal edges;
- (b) a laterally extending flange along at least one of said marginal edges;
- (c) a tongue having a base portion, a tip portion, and an intermediate portion joining said tip portion with said base portion, said tongue formed at at least one extremity of said web and joined thereto at its base and projecting generally in the direction of the plane of the web, said base and intermediate portions lying substantially in the plane of the web, said tip portion projecting from the plane of said intermediate portion; and
- (d) a tongue tip receiving louver projecting in the same direction as said tip portion and formed in said web adjacent the base of said tongue and receiving the tip of the tongue of said correspondingly configured

confronting beam when said beams are in interlocked relation.

2. A beam member releasably disposed in end-to-end interlocked relation with a correspondingly configured confronting beam member, said beam including in combination:

- (a) a web having parallel marginal edges;
- (b) a laterally extending flange along at least one of said marginal edges;
- (c) a tongue having a base portion, a tip portion, and an intermediate portion joining said tip portion with said base portion, said tongue formed at at least one extremity of said web and joined thereto at its base and projecting generally in the direction of the plane of the web, said base and intermediate portions lying substantially in the plane of the web, said tip portion projecting from the plane of said intermediate portion;
- (d) a tongue tip receiving louver projecting in the same direction as the said tip portion and formed in said web adjacent the base of said tongue for receiving the tip of the tongue of said correspondingly configured confronting beam when said beams are brought into interlocking relation; and
- (e) said tongue tip including means for snap interlocking with the web of said confronting beam member at said louver.

3. In combination a main structural beam member and a pair of cross beams disposed in confronting interlocking relationship to each other and intersecting relationship with said main beam in a predetermined geometric configuration, said main beam including a web and slot in said web, each of said cross beams releasably disposed in end-to-end interlocking relationship with each other and within the slot in the web of said main beam, and each of said cross beams correspondingly configured and including in combination:

- (a) a web having parallel marginal edges;
- (b) a laterally extending flange along at least one of said marginal edges;
- (c) a tongue having a base portion, a tip portion, and an intermediate portion joining said tip portion with said base portion, said tongue formed at at least one extremity of said web and joined thereto at its base and projecting generally in the direction of the plane of the web, said base and intermediate portions lying substantially in the plane of the web, said tip portion projecting from the plane of said intermediate portion; and
- (d) a tongue tip receiving louver projecting in the same direction as said tip portion and formed in said web adjacent the base of said tongue and receiving the tip of the tongue of said correspondingly configured confronting beam when said beams are in interlocked relation.

4. The combination of claim 3 in which the tongues are each provided with a longitudinal embossment to improve rigidity.

5. The combination of claim 3 in which each of said tongues includes a shoulder on each marginal edge contacting respectively with opposed marginal edges of said slot to restrain motion of said cross beams with respect to said main beam.

6. In combination, a main structural beam member and a pair of cross beams disposed in confronting interlocking relationship to each other and intersecting relationship with said main beam in a predetermined geometric configuration, said main beam including a web and a slot in said web, each of said cross beams releasably disposed in end-to-end interlocking relationship with each other and within the slot in the web of said main beam, and each of said cross beams correspondingly configured and including in combination:

- (a) a web having parallel marginal edges;
- (b) a laterally extending flange along at least one of said marginal edges;
- (c) a tongue having a base portion, a tip portion, and an intermediate portion joining said tip portion with said base portion, said tongue formed at at least one extremity of said web and joined thereto at its base and projecting generally in the direction of the plane of the web, said base and intermediate portions lying substantially in the plane of the web, said tip portion projecting from the plane of said intermediate portion;
- (d) a tongue tip receiving louver projecting in the same direction as said tip portion and formed in said web adjacent the base of said tongue and receiving the tip of the tongue of said correspondingly configured confronting beam when said beams are in interlocked relation; and
- (e) said tongue tip including means for snap interlocking with the web of said confronting beam member at said louver.

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RICHARD W. COOKE, JR., *Primary Examiner*.

FRANK L. ABBOTT, *Examiner*.

R. S. VERMUT, *Assistant Examiner*.